MASSACHUSETTS WATER RESOURCES AUTHORITY
Charlestown Navy Yard
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Frederick A. Laskey
Executive Director

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ADMINISTRATION, FINANCE & AUDIT COMMITTEE MEETING

Chair: A. Pappastergion
Vice-Chair: M. Gove
Committee Members:
J. Barrera
J. Carroll
K. Cotter
J. Foti
J. Hunt
V. Mannering

to be held on

Wednesday, March 14, 2012

Location:** **Waterworks Museum
2450 Beacon St.
Boston, MA 02467

Time: 10:00 a.m.

AGENDA

A. Information

1. Delegated Authority Report – February 2012
2. 2011 Annual Update on New Connections to the MWRA System
3. FY12 Financial Update and Summary as of February 2012
4. MIS Five Year Strategic Plan

B. Approvals

1. Amendments to Capital Finance Management Policy

***Note Chestnut Hill location (map attached to blue Board agenda). There are numerous ways to get to the Waterworks Museum; use these links to find the best route from your location: http://www.waterworksmuseum.org/plan-your-visit http://www.waterworksmuseum.org/directionsmaps.**

AF&A(i)
3/14/12

MASSACHUSETTS WATER RESOURCES AUTHORITY

Meeting of the
Administration, Finance and Audit Committee

February 15, 2012

A meeting of the Administration, Finance and Audit Committee was held on February 15, 2012 at the Authority headquarters in Charlestown. Chairman Pappastergion presided. Present from the Board were Messrs. Carroll, Cotter, Foti, Gove, Hunt, Mannering and Walsh. Among those present from the Authority staff were Fred Laskey, Steve Remsberg, Mike Hornbrook, Steve Estes-Smargiassi, Rachel Madden, Kathy Soni, Rick Trubiano, Leo Norton, and Bonnie Hale. The meeting was called to order at 10:30 a.m.

Information

FY2012 2nd Quarter Orange Notebook

Staff highlighted and discussed selected portions of the report.

Delegated Authority Report – January 2012

The report was received without comment.

Fiscal Year 2012 Mid-Year Capital Project Performance Report

Staff briefly reviewed the report.

FY12 Financial Update and Summary as of January 2012

Staff summarized the financial update and there was question and answer.

Rate Basis Data Adjustments Affecting FY13 Assessments

Staff described the two rate basis data adjustments.

Preliminary FY13 Water and Sewer Assessments

There was general discussion and question and answer.

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* Approved as recommended at February 15, 2012 Board of Directors meeting.

Approvals

*Proposed FY13 Current Expense Budget

The Committee recommended approval of transmitting the FY13 Current Expense Budget to the MWRA Advisory Board (ref. agenda item B.1).

There was general discussion and interest expressed in forming a Long-Term Rates Management Committee, to be comprised of Board members and MWRA and Advisory Board staff.

*Approval of the Sixty-Second Supplemental Resolution

The Committee recommended approval of the Sixty-Second Supplemental Resolution (ref. agenda item B.2).

*Approval of the Sixty-Third Supplemental Resolution

The Committee recommended approval of the Sixty-Third Supplemental Resolution (ref. agenda item B.3).

The meeting adjourned at 11:15 a.m.

* Approved as recommended at February 15, 2012 Board of Directors meeting.

AFA A.1
3/14/12

STAFF SUMMARY

TO: Board of Directors
FROM: Frederick A. Laskey, Executive Director
DATE: March 14, 2012
SUBJECT: Delegated Authority Report – February 2012

COMMITTEE: Administration, Finance & Audit

X INFORMATION
___ VOTE

Rachel C. Madden
Director, Administration & Finance

Barbie Aylward, Administrator
Frank Renda, Data & Information Coordinator
Preparer/Title

Michele Gillen
Deputy Director, Administration & Finance

RECOMMENDATION:

For information only. Attached is a listing of actions taken by the Executive Director under delegated authority for the period February 1, 2012 through February 29, 2012.

This report is broken down into three sections:

- Awards of Construction, non-professional and professional services contracts and change orders and amendments in excess of $25,000, including credit change orders and amendments in excess of $25,000;
- Awards of purchase orders in excess of $25,000; and
- Amendments to the Position Control Register, if applicable.

BACKGROUND:

The Board of Directors' Management Policies and Procedures, as amended by the Board's vote on October 14, 2009, delegate authority to the Executive Director to approve the following:

Construction Contract Awards:

Up to $1 million if the award is to the lowest bidder; or up to $500,000 if the award is to other than the lowest bidder.

Change Orders:

Up to 25% of the original contract amount or $250,000, whichever is less, where the change increases the contract amount, and for a term not exceeding an aggregate of six

months; and for any amount and for any term, where the change decreases the contract amount. The delegations for cost increases and time can be restored by Board vote.

Professional Service Contract Awards:

Up to $100,000 and one year with a firm; or up to $50,000 and one year with an individual.

Non-Professional Service Contract Awards:

Up to $250,000 if a competitive procurement process has been conducted, or up to $100,000 if a procurement process other than a competitive process has been conducted.

Purchase or Lease of Equipment, Materials or Supplies:

Up to $1 million if the award is to the lowest bidder; or up to $500,000 if the award is to other than the lowest bidder.

Amendments:

Up to 25% of the original contract amount or $250,000, whichever is less, and for a term not exceeding an aggregate of six months.

Amendments to the Position Control Register:

Amendments which result only in a change in cost center.

BUDGET/FISCAL IMPACT:

Recommendations for delegated authority approval include information on the budget/fiscal impact related to the action. For items funded through the capital budget, dollars are measured against the approved capital budget. If the dollars are in excess of the amount authorized in the budget, the amount will be covered within the five-year CIP spending cap. For items funded through the Current Expense Budget, variances are reported monthly and year-end projections are prepared at least twice per year. Staff review all variances and projections so that appropriate measures may be taken to ensure that overall spending is within the MWRA budget.

CONSTRUCTION/PROFESSIONAL SERVICES DELEGATED AUTHORITY ITEMS FEBRUARY 1 - 29, 2012

DATE OF AWARD	TITLE AND EXPLANATION	CONTRACT	AMENDMENT/CO	COMPANY	FINANCIAL IMPACT
02/03/12	**PRISON POINT CSO FACILITY HVAC AND ODOR CONTROL SYSTEMS UPGRADE** DELETE 105 LINEAR FEET OF DUCTWORK AND ASSOCIATED FIBERGLASS-REINFORCED PLASTIC VOLUME DAMPERS, TEES AND REDUCERS IN THE DETENTION TANKS	**6795**	**5**	**ARDEN ENGINEERING CONSTRUCTORS, LLC**	($34,555.05)
02/09/12	**HYDRAULIC EQUIPMENT SERVICE** AWARD OF CONTRACT TO LOWEST RESPONSIVE BIDDER FOR ANNUAL MAINTENANCE AND INSPECTION, EMERGENCY AND NON-EMERGENCY REPAIR SERVICES FOR HYDRAULIC SYSTEMS AT DEER ISLAND TREATMENT PLANT, NUT ISLAND HEADWORKS, CHELSEA SCREEN HOUSE, PRISON POINT CSO, INTERMEDIATE PUMPING STATION, BRAINTREE WEYMOUTH REPLACEMENT PUMP STATION, UNION PARK CSO, BOS019 AND THE SOUTH BOSTON CSO FACILITIES FOR A TERM OF 730 CALENDAR DAYS	**OP-179**	**AWARD**	**R. ZOPPO CORP.**	$347,550.00
02/22/12	**ELEVATOR MAINTENANCE AND REPAIR SERVICES DEER ISLAND TREATMENT PLANT** DECREASE FOLLOWING BID ITEMS TO REFLECT ACTUAL QUANTITIES USED: PREVENTIVE MAINTENANCE; EMERGENCY AND NON-EMERGENCY MAINTENANCE AND REPAIR SERVICES; PARTS, MATERIALS AND MARK-UP	**S475**	**2**	**UNITED ELEVATOR CO., INC.**	($203,592.60)
02/22/12	**SECURITY EQUIPMENT MAINTENANCE AND REPAIR SERVICES** AWARD OF CONTRACT TO LOWEST RESPONSIVE BIDDER FOR SECURITY EQUIPMENT AND MAINTENANCE AND REPAIR SERVICES FOR A TERM OF 730 CALENDAR DAYS	**EXE-031**	**AWARD**	**VISCOM SYSTEMS, INC.**	$698,125.00

PURCHASING DELEGATED AUTHORITY ITEMS - FEBRUARY 1 - 29, 2012

DATE OF AWARD	TITLE AND EXPLANATION	CONTRACT #	AMENDMENT	COMPANY	FINANCIAL IMPACT
02/01/12	**ELECTRIC BURDEN CARRIERS** AWARD OF A PURCHASE ORDER, TO THE LOWEST RESPONSIVE BIDDER, FOR TEN ELECTRIC BURDEN CARRIERS FOR THE DEER ISLAND TREATMENT PLANT, REPLACING TEN EXISTING VEHICLES THAT HAVE REACHED THE END OF THEIR SAFE, RELIABLE AND SERVICEABLE LIFE	**WRA-3365**		**NORTHLAND INDUSTRIAL TRUCK CO.**	$104,600.00
02/01/12	**NETWORK SWITCHES AND RELATED EQUIPMENT** AWARD OF A PURCHASE ORDER, TO THE LOWEST RESPONSIVE BIDDER, FOR TWO CISCO NETWORK SWITCHES AND RELATED EQUIPMENT, TO UPGRADE SWITCHES AS PART OF THE MIS ONGOING NET 2020 PROJECT	**WRA-3369Q**		**PRESIDIO NETWORKED SOLUTIONS, INC**	$25,575.00
02/13/12	**MECHANICS TOOLS** AWARD OF A PURCHASE ORDER, TO THE LOWEST RESPONSIVE BIDDER, FOR MECHANICS TOOLS USED BY M&O SPECIALISTS	**WRA-3391**		**KAUFMAN COMPANY, INC**	$26,080.48
02/13/12	**REFRIGERATION COILS** AWARD OF A PURCHASE ORDER, TO THE LOWEST RESPONSIVE BIDDER, FOR TWELVE REFRIGERATION COILS FOR THE AIR HANDLER UNITS AT THE DEER ISLAND TREATMENT PLANT, REPLACING EXISTING OBSOLETE COILS	**WRA-3380**		**AIR CONTROL PRODUCTS**	$31,040.00
02/13/12	**ANALYSIS OF OIL, GREASE LUBRICANTS AND FUEL OIL AND RELATED TRAINING** AWARD OF A TWO-YEAR PURCHASE ORDER CONTRACT, TO THE LOWEST RESPONSIVE BIDDER, FOR ANALYSIS OF OIL, GREASE LUBRICANTS AND FUEL OIL ALONG WITH RELATED TRAINING SERVICES, AS PART OF THE PREVENTIVE MAINTENANCE PROGRAM AT THE DEER ISLAND TREATMENT PLANT	**WRA-3379**		**TRIBOLOGIK CORPORATION**	$53,830.00
02/13/12	**LABORATORY INSTRUMENTATION** AWARD OF A SOLE-SOURCE PURCHASE ORDER FOR THE REPLACEMENT OF ONE GAS CHROMATOGRAPH / MASS SPECTROMETER AND TWO GAS CHROMATOGRAPHS FOR THE CENTRAL LABORATORY AT THE DEER ISLAND TREATMENT PLANT			**AGILENT TECHNOLOGIES, INC**	$162,151.23
02/17/12	**RECYCLED COPIER PAPER** AWARD OF A TWELVE MONTH PURCHASE ORDER CONTRACT, TO THE LOWEST RESPONSIVE BIDDER, FOR RECYLCED COPIER PAPER, FOR THE PERIOD MARCH 15, 2012 THROUGH MARCH 14, 2013	**WRA-3395Q**		**W.B. MASON**	$54,213.55
02/17/12	**SUPPLY AND DELIVERY OF POLYMER - DEER ISLAND** AWARD OF A TWO-YEAR PURCHASE ORDER CONTRACT, TO THE LOWEST RESPONSIVE BIDDER, FOR THE SUPPLY AND DELIVERY OF POLYMER TO THE DEER ISLAND TREATMENT PLANT	**WRA-3373**		**POLYDYNE, INC**	$737,100.00

POSITION CONTROL REGISTER (PCR) LOCATION CHANGES FEBRUARY 2012

DATE OF CHANGE	POSITION TITLE	CURRENT PCR#	CURRENT COST CENTER	NEW PCR #	NEW COST CENTER	REASON FOR CHANGE
2/24/2012	WSS Foreman	5411010	Grounds Maint - Metro	3394079	Grounds Maint - West	To meet the staffing needs of Grounds Maintenance Unit -West

AFHA A.2
3/14/12

STAFF SUMMARY

TO: Board of Directors
FROM: Frederick A. Laskey, Executive Director
DATE: March 14, 2012
SUBJECT: 2011 Annual Update New Connections to the MWRA System

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COMMITTEE: Adminstration, Finance & Audit

X INFORMATION
___ VOTE

Pamela Heidell, Policy & Planning Manager
Preparer/Title

Michael J. Hornbrook
Chief Operating Officer

RECOMMENDATION:

For information only. MWRA's system expansion policies require staff to provide the Board of Directors with an annual update on the status of new connections to MWRA's system.

DISCUSSION:

The attached report, *2011 Annual Update on New Connections to the MWRA System*, provides information on all recent water and sewer connections to the MWRA system from outside the service area, including each entity's compliance with the terms and conditions of its contract governing the connection to the MWRA.

The report notes that in 2011, the only application under MWRA's system expansion policies was for sewer service for a single family residence (24 Dean Road, Weston) lying partially within and partially outside the MWRA sewer service area. The sewer connection was approved in March 2011. The report also summarizes recent connections to the MWRA system and tracks water withdrawals and sewer discharges against approved volumes as set forth in water supply and sewer connection agreements. In 2011, all water supply withdrawals by new communities and straddle connections were well below the volumes stipulated in their contracts. Similarly, all sewer connections with reporting requirements reported wastewater discharges below their approved contract limits (prior to 2007, the sewer connection agreements did not include annual reporting requirements).

The attached report also provides information on entities expressing interest in potential admission to the MWRA water or sewer system. In 2011, MWRA staff continued discussions with North Reading, Ashland, Braintree, Holbrook and Randolph regarding admission to the MWRA water system. Detailed information regarding the MWRA water system, potential connection points and meter locations, and cost was provided to the communities and their consultants to inform the communities' studies and deliberations regarding water supply options. MWRA also received inquiries regarding supply of water to a potential casino in Palmer. On the

sewer side, a proposal was advanced for a change in use and an increase in discharge from 105 Research Road in Hingham to MWRA via the Weymouth sewer system. The connection was originally approved by MWRA in 2004. 105 Research Road is being converted from office and warehouse use to a new facility to house the South Shore Educational Collaborative. It is anticipated that Board approval of the increased discharge and a new contract will be sought in April 2012.

2011 ANNUAL UPDATE
NEW CONNECTIONS TO THE MWRA SYSTEM

In 2002, the Advisory Board System Expansion Committee published its report and recommendations regarding MWRA System Expansion. The report recommended that an annual update to the Board on the status of any new connections to the MWRA system be prepared. This recommendation was incorporated into MWRA's revised system expansion policies. Accordingly, annual reports are prepared each year, addressing compliance with contract terms and conditions for all entities recently admitted to the MWRA. Inquiries from potential applicants for admission are also noted in this report.

In 2011, the sole application under MWRA's system expansion policies was for a residence straddling the Weston and Wellesley boundary and seeking sewer service pursuant to OP#4, *Sewer Connections Serving Property Partially Located in a Non-MWRA Community*. There were no applications for connections under either OP#11, *Admission of New Community to MWRA Sewer System and Other Requests for Sewer Service to Locations Outside MWRA Sewer Service Area,* OP#9, *Water Connections Serving Property Partially Located in a Non-MWRA Community*, or O.P. #10, *Admission of New Community to MWRA Water System*. Similarly, there were no emergency water supply requests under O.P. #5, *Emergency Water Supply Withdrawals*.

MWRA staff continued to meet with Ashland, North Reading, and Tri-Town (Braintree, Randolph, and Holbrook) regarding potential future water supply. In the case of both Ashland and North Reading, the communities are actively engaging in engineering studies to determine the most appropriate connection to MWRA. MWRA staff also received inquiries regarding potential water supply to Palmer, should a casino be located in Palmer.

System Expansion Requests, past and future, are addressed further below.

1.0 SUMMARY OF APPROVED CONNECTIONS TO THE MWRA WATER SYSTEM AND INQUIRIES REGARDING FUTURE CONNECTIONS

1.1 APPROVED CONNECTIONS TO THE WATER SYSTEM

Since 2002, when annual reports on system expansion requests began, four communities/water districts have been admitted into the MWRA – Wilmington, Reading, Dedham-Westwood Water District, and Stoughton (Bedford was admitted prior to 2002). In addition, Avalon in Peabody/Danvers and the YMCA in Marblehead/Salem have been admitted pursuant to OP#9, the "Straddle Policy."

Table 1 summarizes the connections to the water system. With the exception of Avalon, (now 14 North) in Peabody/Danvers, each entity entered into water supply agreements with MWRA stipulating terms such as annual water withdrawal limits, entrance fee payments, water conservation, and reporting requirements (when Avalon's admission to MWRA was approved, it was not customary to require water agreements for straddle

connections). Each entity admitted has complied with the terms of their agreements with MWRA. Further, as indicated in Table 1, all water withdrawals in 2011 by the new communities and the straddle connections admitted to the system were well below the volumes stipulated in their contracts (contract limits are used as the basis for the entrance fee).

Table 1
Approved Permanent Connections to MWRA Water System Since 2002

Applicant (location)	**Applicable Policy***	**Approval Date**	**MWRA Approved withdrawal (mgd on an annualized basis)**	**Withdrawal from MWRA in 2011(mgd)**
Wilmington	OP#10, New Community	5/09**	0.6 mgd	.271
Reading	OP#10, New Community	11/05 partial) 10/07 (full)	2.1 mgd	1.636
YMCA (Salem/Marblehead)	OP#09 "Straddle Policy"	11/06	0.0127 mgd	.009
Dedham/Westwood W.D	OP#10, New Community	12/05	0.1 mgd	.026
Avalon (14 North) Danvers/Peabody	OP#09 "Straddle Policy"	05/03	0.012 mgd	.007
Stoughton	OP#10 New Community	6/02	1.15 mgd	.633

Additional information on each recent connection follows in Attachment A.

1.2 INQUIRIES REGARDING FUTURE CONNECTIONS TO THE WATER SYSTEM

In 2011, MWRA staff had discussions with North Reading, Ashland, Braintree, Randolph, and Holbrook and their consultants regarding admission to the MWRA water system. MWRA also coordinated with parties regarding water supply for a potential casino in Palmer. Detailed information regarding the MWRA water system, potential connections points and meter locations, and cost was provided to the communities and their consultants to inform the studies and deliberations regarding water supply options.

North Reading is actively taking steps towards joining the MWRA. The Town's local wells currently supply approximately 0.4-0.5 mgd and well production is declining. The bulk of the Town's demand is now met by water purchases from Andover, which average 0.9-1 mgd. The Town's consultants are currently evaluating wheeling MWRA water through Reading; this is an option that could be implemented this year to supply North Reading with 0.4-1.0 mgd during the fall, winter, and spring. During periods of peak demand in the summer time, capacity in the MWRA's Northern Intermediate High Service area is more constrained and capacity is reserved for existing MWRA communities. In the long term, when the MWRA's Northern Intermediate High Service redundant pipeline to increase capacity and reliability to the service area is completed in 2016-2017, North Reading could become fully served by MWRA (1.4 mgd), and this option is also being pursued. North Reading's local sources are in the highly altered Ipswich River Basin.

Flow alteration is also a concern for Ashland, where there are withdrawal constraints associated with Ashland's existing groundwater sources. For supplemental water, Ashland has evaluated both new local groundwater withdrawals as well as joining the MWRA. Increased groundwater withdrawals from local sources could impact nearby water resources and so would also be subject to withdrawal constraints that could limit use when needed most. Therefore, Ashland is evaluating a connection to MWRA primarily for seasonal use; Ashland's average day withdrawals on an annual basis from MWRA would be approximately 0.5 mgd, and typical maximum day withdrawals would be approximately 1 mgd. MWRA staff provided Ashland information on connection points to the MWRA system, potential pipeline routes, rate projections, entrance costs, and economic analysis. Wheeling water through Southborough to Ashland is an option, and Ashland is working with officials in Southborough to understand the capital improvements that will need to be made for an indirect connection. It is anticipated that a vote to consider joining the MWRA will occur at Ashland's Town Meeting in November 2012.

In 2011, MWRA staff met with Braintree, Randolph and Holbrook which comprise Tri-Town, a regional drinking water supply shared by the three communities. Braintree operates its own treatment plant and a second treatment plant serves the Randolph-Holbrook Joint Water Board. Both treatment plants are aging and a single regional treatment facility has been proposed. In addition, to increase reservoir storage capacity, a reservoir dredging project is proposed. As an alternative to a capital program involving both a new regional treatment plant and a dredging program, a connection to MWRA was explored. MWRA is hopeful that the dialogue between MWRA and Tri-Town will continue as Tri-Town communities formulate their plan to meet water supply and treatment needs.

An additional prospective water connection is for a potential casino in Palmer. MWRA was first contacted by Palmer Water District #1. Palmer was interested in a supply of approximately 1 mgd to supply both the casino as well as ancillary demand to accommodate casino-related growth throughout Palmer and its multiple water districts. In 2011, MWRA was also contacted by a consultant representing the casino, who was evaluating a connection to MWRA to serve the casino-only demand of 0.4 mgd. To supply Palmer, a connection would have to be made to the Chicopee Valley Aqueduct which has ample capacity to serve new users.

Previously, staff reported that a prospective connection is the Weymouth Naval Air Station Redevelopment (Southfield). MEPA documents indicate that MWRA is Southfield's preferred option to meet the long-term water needs of its phased development. The schedule for Phase 2 development at Southfield has been delayed. Phase 1 demands are being met by local sources.

2.0 SUMMARY OF APPROVED CONNECTIONS TO THE MWRA SEWER SYSTEM AND INQUIRIES REGARDING FUTURE CONNECTIONS

2.1 APPROVED RECENT SEWER SYSTEM CONNECTIONS

Table 2 summarizes all permanent connections to the sewer system since the Advisory Board recommended annual reporting on system expansion requests. Entities connecting to the MWRA sewer system from outside the service area have been required to fund inflow removal projects in the receiving area and to pay an entrance fee upon admission to the MWRA. Each entity entered into sewer connection agreements with MWRA stipulating terms and since 2007, all sewer connection agreements have included annual reporting requirements related to volumes discharged. Wastewater discharges are estimated based on water meter readings and bills, and as indicated in Table 2, all entities reported that wastewater discharges in 2011 were below their approved contract limits. In the case of 24 Dean Road, a straddle connection approved in 2011 for a residence straddling the Weston/Wellesley town line, the home renovation triggering the straddle connection will not be completed until April 2012 and consequently, discharges have not commenced.

Table 2
Approved New Connections to MWRA Sewer System Since 2002

Applicant (location)	Applicable Policy	Approval Date	MWRA Approved discharge (gpd))	Estimated Discharge to MWRA in 2011
24 Dean Road	OP#4	3/11	460 gpd	0
D&N Realty	OP#11	6/07	13,000 gpd	4,731 gpd**
Avalon Bay Sharon	OP#11	6/07	16,120 gpd	14,920 gpd**
Herb Chambers Lexus	OP#11	5/07	6,400 gpd	5,390 gpd**
Hingham Fire Station	OP#11	4/07	782 gpd	236 gpd*
Campanelli (Hingham)	OP#11	2/04	2,475 gpd	***
105 Research Rd (Hingham)	OP#11	2/04	2,025 gpd	***

* Wastewater discharges are estimated based on water meter readings.
**Water consumption figures are adjusted downward by 5% to account for a certain percentage of water that is used by the facility and not returned as wastewater (such as landscaping, water consumed).
*** Contract does not contain reporting requirements

The annual reporting requirements contained in the sewer connection agreements also address continuing obligations for the connecting entity that relate to sewer system operations. These range from inflow removal reports to ongoing inspection of the inflow dishes installed in sewer manholes to reduce inflow in Walpole (a condition of the Herb Chambers and D&N Realty inflow removal requirements), to maintaining the ability to cease discharges to MWRA during severe wet weather (Avalon and D&N Realty). Entities have been compliant with their MWRA contract conditions.

Further description of each recent connection is provided in Attachment A.

2.2 INQUIRIES REGARDING FUTURECONNECTIONS TO THE SEWER SYSTEM

In 2011, a proposal for a change in use and an increase in discharge from 105 Research Road in Hingham advanced. The Research Road property is located in southwestern Hingham and conveys flow to MWRA via the Weymouth sewer system. In 2004, MWRA and Research Road LLC entered into a Sewer Connection Agreement for an approved discharge from 105 Research Road to 2,025 gallons per day; at the time, Research Road was used for office and warehouse use. Now, the plan is to renovate, re-use and expand the existing building at 105 Research Road for use for the South Shore Educational Collaborative School. This would increase the approved discharge volume by 3,311 gallons per day for a total of 5,536 gallons per day. It is anticipated that an application will be before the MWRA Board in April, 2012. MWRA has worked with the Applicant, as well as the Town of Weymouth, to ensure the increased wastewater discharge will be mitigated by a four-to-one reduction in inflow. The Applicant has submitted an inflow removal report that addresses the removal/redirection of twelve sump pumps that are now connected to the Weymouth system. Removal of 12 sump pumps equates to an estimated inflow removal of 14,400 gallons per day, pursuant to Massachusetts DEP Policy *Managing Infiltration and Inflow in MWRA Community Sewer Systems Policy No. BRP09-01*. In this policy, DEP determined that a flow credit of 1,200 gallons per day per sump pump is reasonable. In the Hingham Selectmen's letter stating no objection to the increase in discharge, the Town also affirmed that it is actively planning for the construction of sewer treatment plant in South Hingham in order to facilitate future development. In contrast, at one point the Town of Hingham had considered sewering South Hingham and discharging to MWRA.

In 2010, MWRA met with North Reading regarding sewer, but discussions in 2011 between MWRA and North Reading were largely limited to water supply. The Town has previously indicated that it is exploring options to replace on-site disposal in areas of the town with sewers, and a wastewater connection to MWRA is one alternative for wastewater management.

Similar to prior years, little progress was made in 2011 regarding the Cambridge School of Weston's pursuit of an approved connection to the MWRA system. The Cambridge Scholl of Weston (located in Weston, a non-MWRA sewer community) has existing connections to the MWRA sewer system via a connection to the Waltham sewer system, which were never formally approved. CSW and Waltham representatives were informed by MWRA that the existing connections to the system are inconsistent with MWRA's Enabling Act. Consequently, CSW has attempted to complete the process for admission to MWRA. The School has obtained approvals/sign-offs from MEPA, DEP, the Water Resources Commission, and the Weston Board of Selectmen Still, after CSW sent multiple letters to Waltham, seeking consent from the City to allow the existing connection, Waltham indicated in January 2010 that they would not recommend any new or additional connections to the Waltham system. More recently, CSW sought permits

for in-ground discharge of wastewater; DEP contacted MWRA for background information regarding CSW's wastewater discharges.

ATTACHMENT A
DESCRIPTION OF APPROVED CONNECTIONS TO MWRA FROM OUTSIDE THE SERVICE AREA

WATER SYSTEM

- **Wilmington:** Wilmington was admitted into the MWRA Water System in May 2009. Wilmington pursued admission to MWRA due to contamination of the Town's Maple Meadow Aquifer which forced the Town to close five of its nine available drinking water wells. In addition, Wilmington's admission to the MWRA also creates streamflow benefits by reducing the Town's withdrawals in the highly stressed Ipswich River basin where the Town's nine wells are located. Prior to admission to MWRA, Wilmington withdrew water from MWRA under successive six-month emergency withdrawal periods from May-November, 2003- 2008. Wilmington entered into a water supply agreement with MWRA for 0.6 mgd, but may in the future request an additional volume of 401.5 million gallons annually for at total of 620.5 million gallons annually (1.7 mgd), as permitted through the regulatory reviews. Wilmington's request of 0.6 mgd resulted in an entrance fee of $3,126,211 and a Net Entrance Fee of $2,809,320 (the Town had contributed $316,890 towards the entrance fee as a result of Net Asset Valuations paid for its emergency withdrawals) which is being paid in annual installments of $219,162.77 over 20 years (payment schedule reflects a 4.67% annual interest rate). In 2011, Wilmington withdrew .271 mgd.

- **Reading:** Reading was admitted to the MWRA in 2005 and was initially approved to withdraw up to 219 million gallons from May 1 through October 31 (0.6 mgd on an annual volume basis). Shortly after Reading was admitted as a partially supplied community, Reading entered into an Adminstrative Consent Order (ACO) with DEP that required Reading to reduce its withdrawal from the Ipswich River to the extent feasible. Additional reviews pursuant to MEPA and the Interbasin Transfer Act (ITA) were completed, and in July 2007 the Water Resources Commission approved Reading's request to withdraw up to a total of 829 million gallons a year (2.27 mgd) from MWRA. In October 2007, Reading received approval from the Board of Directors to increase its withdrawal from MWRA to 766.5 million gallons annually (2.1 mgd), subject to an additional entrance fee payment of $7,799,606 (which has been paid in full). In the future, Reading may seek an additional 62.5 million gallons a year from MWRA, consistent with the amount approved under the ITA; this additional withdrawal would be subject to MWRA and MWRA Advisory Board approvals and an additional entrance fee. In 2011, Reading withdrew 1.63 mgd from MWRA; as a result, its discontinued use of local sources in the highly-stressed Ipswich River Basin has yielded Ipswich River watershed gains.

- **Leggs Hill YMCA:** As approved by MWRA, the YMCA at Leggs Hill project consisted of a proposed 88,525 square foot YMCA facility with parking, a small athletic field, and 10 single–family homes. Development was proposed on a then

19.5-acre undeveloped parcel of land that fronts Leggs Hill Road and that straddles the corporate limits of both Marblehead and Salem. Most of the site development is in Salem. Salem's water distribution system does not extend to the YMCA's location, and the site is geographically isolated from the remainder of Salem by steep slopes, open space and wetland resource areas. Since Marblehead owns a 16-inch water main in Leggs Hill Road with capacity to serve the YMCA, a connection to MWRA via Marblehead was the preferred water supply option. The connection was approved in November 2006, under OP#09 *Water Connections Serving Property Partially Located in a Non-MWRA Community*, the "Water Straddle" policy. A Water Connection Agreement was executed between MWRA and YMCA; its terms included YMCA's payment of an entrance fee of $70,823, which has been paid in full, and an average annual withdrawal limit from MWRA via the Marblehead water distribution system of 12,696 gpd and up to 18,106 gpd. Water use in 2011 was .009 mgd.

- **Dedham-Westwood Water District:** MWRA approved Dedham-Westwood Water District's (DWWD) admission to the MWRA water system in December 2005, pursuant to the requirements and procedures of OP#10, *Admission of a New Community to MWRA Water System*. DWWD uses MWRA water to supplement its local sources when use of its Fowl Meadow Well is restricted during low flow periods on the Neponset River (per limitations established by the Water Resources Commission). DWWD was approved to withdraw up to 36.5 million gallons on an annual volume basis (0.1 mgd) and up to 2 million gallons on a maximum day basis. Based on a demand on an annual volume basis of 0.1 mgd, DWWD's entrance fee was $548,748 has now been paid in full. In 2011, DWWD's withdrawals from MWRA were 0.026 mgd.

- **14 North (formerly Avalon Bay):** In 2003, Avalon Bay's request to receive MWRA water was approved in accordance with OP#09, "*Water Connections Serving Property Partially Located in a Non-MWRA Community.*" In 2011, the property changed ownership and is now called 14 North. It is a residential community that straddles the Danvers (non-MWRA community) and Peabody (MWRA partially-supplied community) municipal boundary. Of the project's total water consumption, 12,000 gpd is associated with the Danvers portion of the development. The connection to Peabody was based on constraints on Danvers' municipal water supply and the potential impacts of additional water withdrawals from the Ipswich River basin. An average demand of 0.012 mgd was approved by MWRA, and in 2011, 14 North withdrew .007 mgd. An entrance fee of $64,063 was received from Avalon as a single payment in September 2004.

SEWER SYSTEM

- **24 Dean Road, Weston.** In March, 2011, MWRA approved a connection to the MWRA sewer system via the Wellesley sewer system for a residence at 24 Dean Road that is partially located in Weston and partially located in Wellesley, in accordance with MWRA O.P. # 4, *Sewer Connections Serving Property Partially*

Located in a Non-MWRA Community. Wastewater generation attributable to development from outside the MWRA sewer service area was estimated to be 460 gallons per day. Wastewater flow from the 24 Dean Road residence will be transported to the Wellesley system via a short sewer line connecting to an existing sewer manhole at 20 Dean Road, where the Wellesley sewer system currently ends. The wastewater discharge has not commenced as the sewer connection is part of a remodeling effort that is underway and is not projected to be completed until April 2012. MWRA required removal of at least 1,840 gpd of peak inflow. Accordingly, the applicant provided funds to the Town of Wellesley install a fiberglass manhole cover inflow removal dish. Wellesley DPW reported that this dish was installed. The Applicant was required to pay an entrance fee of $18,033, which was received by MWRA in April, 2011.

- **Hingham Fire Station:** In 2007 MWRA approved a connection to the MWRA sewer system through the North Sewer District of Hingham for the Hingham Central Fire Station pursuant to OP#11 *Admission of New Community to MWRA Sewer System and Other Requests for Sewer Service to Locations Outside MWRA Sewer Service Area.* Hingham modernized its Central Fire Station to accommodate modern firefighting equipment, and the existing on-site septic system could not accommodate the new building program. The Fire Station is outside the boundaries of the north sewer district of Hingham served by MWRA. A new 1 1/2-inch sewer service at the Fire Station discharges to an existing town sewer force main. The design flow discharge is 782 gpd, the majority of which is typical sanitary wastewater originating from bathroom facilities, laundry, and building maintenance. The only source of non-sanitary water use is from apparatus bays where water is used for vehicle washing. All wastewater from the apparatus bays is required to go through gas/oil separators prior to discharge to MWRA. Inflow removal was accomplished prior to admission to MWRA. In 2011, the average daily discharge from the Fire Station was 236 gallons per day, well below its approved contract limits.

- **Avalon Bay at Sharon.** In 2007, MWRA approved connection to the MWRA sewer system through Norwood for the Avalon Sharon Rental community. The development consists of a 156 one and two-bedroom apartment homes as well as a clubhouse, outdoor amenity area, heated pool and fitness center, and resident lounge. The development abuts the Sharon/Norwood municipal boundary. Avalon Sharon requested to discharge sewage to the Norwood collection system since Sharon does not provide wastewater service and on-site disposal was found to be impractical. A holding tank was also proposed to provide the ability to restrict discharges to the Norwood and MWRA system during specified times. Avalon's sewer use agreement with MWRA limited flow to an average of 16,120 gpd, required Avalon to fund inflow removal projects in the Town of Norwood, and required an entrance fee payment of $105,686. Avalon has fulfilled these requirements. In 2011, wastewater discharges, based on water bills for 2011 and with a 5% adjustment for consumptive use, was 14,920, about 7.4 % below the contract limits.

- **Herb Chambers Lexus.** In 2007 MWRA approved sewer service to Herb Chambers of Chicopee (HCC) Sharon Lexus Dealership. A retail new car sales and service facility was constructed on a 10.8 acre industrial/commercial property located on U.S. Route 1 and Old Post Road in Sharon. The development included a 100,000 square foot facility, with the lower floor housing 44 service bays and a car wash, and the upper floor entirely dedicated to the retail sales operation. Sharon is not sewered and the soils on the Herb Chambers' site were found to be unsuitable for on-site discharge. Since the site is near the Walpole town line, discharge to MWRA via the Walpole sewer system was proposed. An average daily flow of 6,400 gallons and a maximum daily flow of 10,500 gallons per day were estimated, based on a review of water consumption data from an existing Lexus dealership and on Title V guidelines. As conditions of admission to MWRA, Herb Chambers was required to pay an entrance fee of $40,750 (the entrance fee was based on a daily flow of 10,500 gallons and has been paid in full), and to work cooperatively with the Town of Walpole to realize a four to one verifiable reduction in flow to the MWRA wastewater system. A Final Inflow Removal Report documenting inflow removal was submitted in 2008. MWRA also required HCC to obtain a permit from the Toxic Reduction and Control Unit for a Non-Significant Industrial User. In 2011, estimated daily sewage discharge was 5390 gallons per day.

- **D & N Realty Trust.** In 2007, MWRA approved a connection to the MWRA sewer system through Walpole for the D&N Realty site. The D&N Realty site is an existing development on the Walpole/Foxborough border that contains two buildings that collectively house four different businesses, including a restaurant, function hall known as Christina's, offices, and a small accessory building for outside recreation facilities, known as Funway USA. The on-site sewer system had failed, prior to application to MWRA, and a connection to MWRA was supported by both Foxborough and Walpole. The site is connected to the Walpole system via a new sewer service pipe on the site connecting to 1,180 feet of new sewer. Average daily discharge based on historical records was about 13,000 gpd, and wastewater generation rate based on Title V for the site is 43,393 gallons per day. Title V estimate was used as the basis for the entrance fee calculation and for inflow removal requirements. As conditions of admission to MWRA, D&N Realty was required to pay an entrance fee of $168,391 (which has been paid in full), and to work cooperatively with the Town of Walpole to realize a four to one verifiable reduction in flow to the MWRA wastewater system, providing an approximate daily reduction of 173,572 gallons of peak inflow during a one-year six-hour storm. Inflow removal was accomplished prior to activation of the sewer connection to MWRA. MWRA also required D&N to address the feasibility of on-site storage to retain at least two days of average daily wastewater flows and to make holding/pumping arrangements. D&N reported that in 2011, estimated daily sewage discharge was 4,731 gallons per day. D&N also provided MWRA a copy of an updated an updated agreement with an emergency sewage disposal company whereby the tank could be pumped in an emergency situation or situation whereby MWRA directs D&N to cease pumping during intense storm and surcharge conditions.

- **Campanelli Hingham LLC and Research Road LLC.** Campanelli Hingham LLC and Research Road LLC are commercial establishments that had failing septic systems and limited alternatives for wastewater disposal. They requested to tie into the MWRA system from their sites in Hingham via a 1,900 linear foot force main connecting to the Weymouth sewer system; their discharges were collectively estimated to be 4,500 gallons per day, or less, with no discharge of industrial wastes proposed, broken down as follows, 2,025 gpd from Research Road (105 Research Road) and 2,475 gpd from Campanelli. The MWRA Board of Directors approved the connections in February 2004, with the requirements that the applicants work cooperatively with MWRA to realize a four to one verifiable reduction in flow to the MWRA wastewater system, and pay entrance fees prior to connection (Research Road's entrance fee was $9,133: Campanelli's fee was $11,162, both of which were paid in full). As mentioned in Section 1, 105 Research Road is being converted, expanded to house the South Shore Educational Collaborative. Increased wastewater discharge associated with this conversion, if approved, will require payment of an additional entrance fee, additional inflow removal, and a new contract.

AF&A A.3
3/14/12

STAFF SUMMARY

TO: Board of Directors
FROM: Frederick A. Laskey, Executive Director
DATE: March 14, 2012
SUBJECT: FY12 Financial Update and Summary as of February 2012

COMMITTEE: Administration, Finance & Audit

_X_ INFORMATION
___ VOTE

Kathy Soni, Budget Director
David Whelan, Budget Manager
Preparer/Title

Rachel C. Madden
Director, Administration and Finance

RECOMMENDATION:

For information only. This staff summary provides a financial update and variance highlights through February 2012, comparing actual spending to the FY12 budget, and a preliminary year-end projection.

DISCUSSION:

Total year-to-date expenses are lower than budget by $2.7 million or 0.7% mainly due to lower direct expenses of $2.2 million, indirect expenses of $505,000, and higher total non-rate revenues of $1.4 million for a net variance of $4.1 million.

As discussed during the February Board meeting, in January staff established a defeasance account with the intention of allocating the year-to-date debt service savings to this account for the purpose of using these funds for a June 2012 defeasance. The planned defeasance will provide critical rate relief in the next few years, and continues to be an important component of the multi-year rates management strategy. At the end of February, the defeasance account balance is $11.1 million and should these favorable trends continue the balance is projected to be $17.4 million by year-end. It is important to note that while these funds are allocated for defeasance, the money is available for other budgetary purposes until the defeasance is executed.

Beyond debt service savings, staff projects a surplus of approximately $5.0 million at year-end of which $3.1 million is for lower direct expenses, $367,000 for lower indirect expenses, and $1.5 million is for greater than budgeted revenues. Staff will continue to refine the year-end projections each month as more actual spending information becomes available and update the Board accordingly.

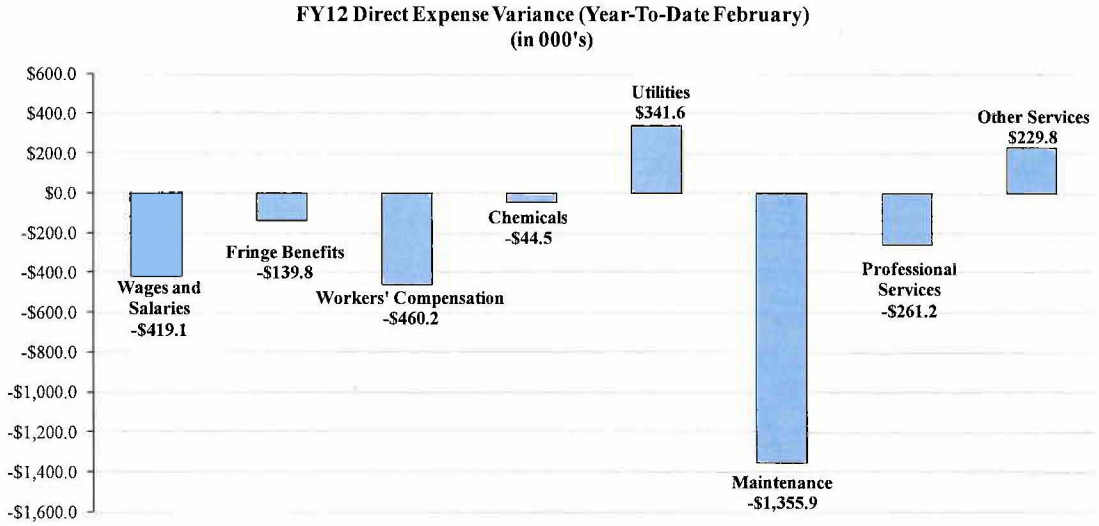
Please refer to Attachment 4 for a more detailed comparison by line item.

Total year-to-date expenses were lower than budget by $2.7 million or 0.7% as indicated below.

	FY12 Budget (Feb.)	FY12 Actual (Feb.)	$ Variance	% Variance
Direct Expenses	$132.3	$130.1	-$2.2	-1.7%
Indirect Expenses	$29.8	$29.3	-$0.5	-1.7%
Debt Service	$241.8	$241.8	$0.0	0.0%
Total	**$403.9**	**$401.2**	**-$2.7**	**-0.7%**

Direct Expenses

Direct expenses totaled $130.1 million, $2.2 million or 1.7% less than budget.



The primary reasons for year-to-date underspending on direct expenses is lower spending for maintenance, workers' compensation, wages and salaries, professional services, and fringe benefits. The underspending is offset by greater than budgeted spending for utilities and other services.

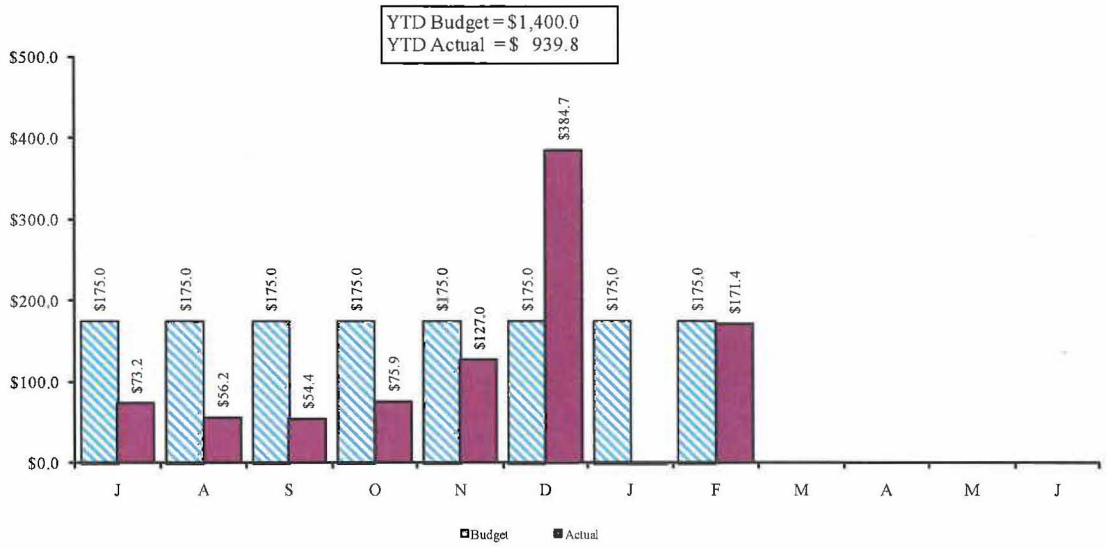
Maintenance

Maintenance is underspent by $1.4 million or 7.7% year-to-date of which $928,000 is for services and $428,000 is for materials. The majority of this underspending is timing related. Staff estimate that maintenance spending will be approximately $1.8 million underspent by year-end.

Workers' Compensation

Workers' Compensation is lower than budget by $460,000 or 32.9% year-to-date. This year, contrary to the experience of FY11, both the reserves ($280,000) and the actual payments ($180,000) are trending below budget.

FY12 Workers' Compensation Spending (Year-To-Date February)
(in thousands)

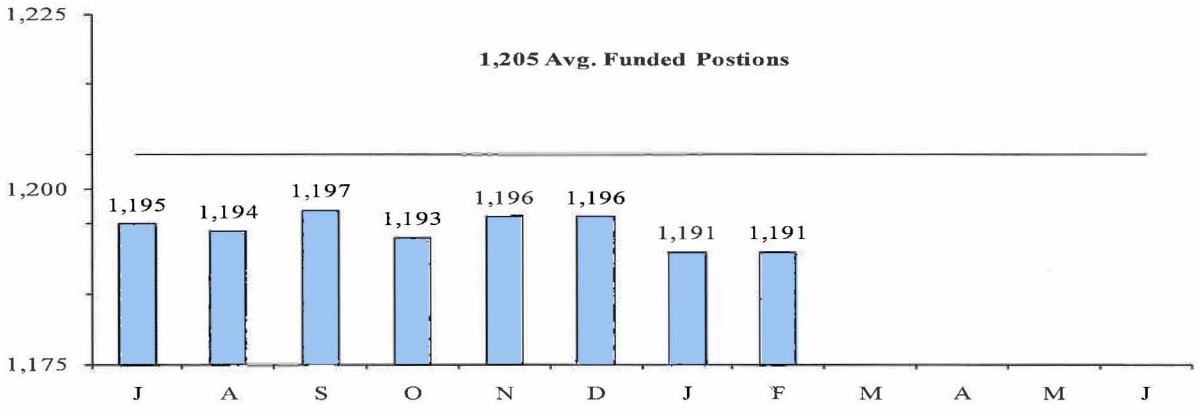


# of Open Claims-Lost Time	43	40	41	42	44	51	49	48				
# of Open Claims-Medical Only	38	47	57	55	52	56	51	52				

Wages and Salaries

Regular Pay is underspent by $492,000 or 0.9% as a result of lower than budgeted filled positions and higher than budgeted leave balance accrual use offset by unbudgeted retroactive pay adjustments for recently settled collective bargaining agreements.

FY12 MWRA Headcount Trend



Professional Services

Professional Services are underspent by $261,000 or 7.3% mainly due to lower Harbor Monitoring activities and lower than projected use of as-needed engineering services.

Fringe Benefits

Fringe Benefits are underspent by $140,000 or 1.2% mainly due to lower than budgeted health insurance, unemployment insurance, and medicare costs offset by higher dental insurance due to an FY11 accrual which was expensed in FY12.

Utilities

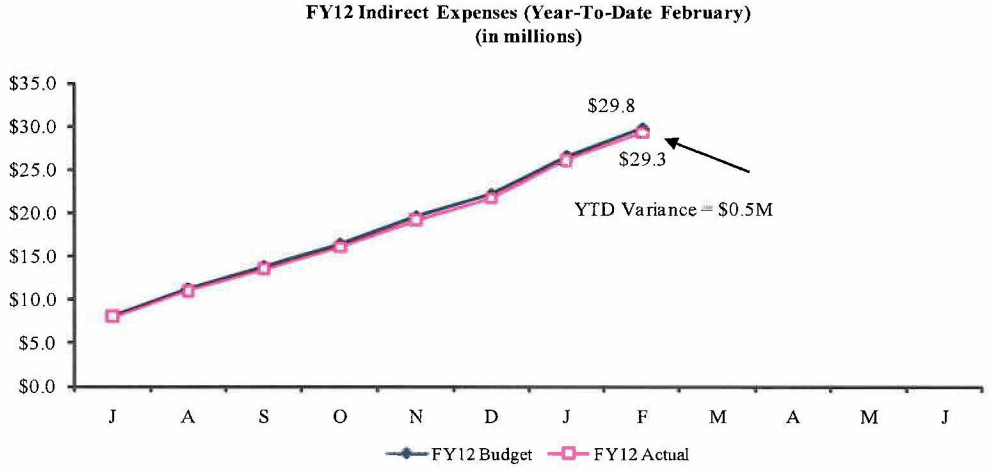
Utilities are higher than budget by $342,000 or 2.3% mainly due to higher electricity pricing and water usage at Deer Island offset by lower spending for natural gas and diesel fuel in Field Operations.

Other Services

Other Services are higher than budget by $230,000 or 1.5% mainly due to sludge pelletization expenses. Sludge quantities year-to-date are greater than budget due to digester maintenance work that has temporarily reduced storage capacity.

Indirect Expenses

Indirect Expenses through February total $29.3 million, $505,000 or 1.7% less than budget.



The majority of the year-to-date underspending on Indirect Expenses is for Insurance of $234,000 mainly due to lower claims and Watershed Reimbursements of $137,000 for an FY11 overaccrual.

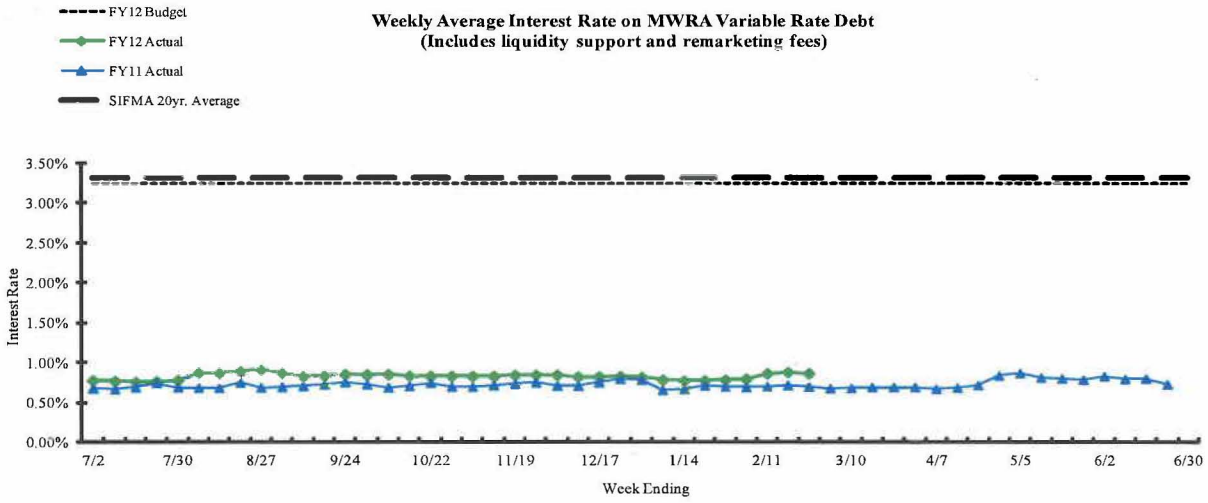
Debt Service Expenses

Debt Service Expenses through February totaled $241.8 million. Debt Service Expenses are at budget level after the approved transfer of an additional $2.4 million of year-to-date savings to the defeasance account in February. The defeasance account balance now stands at $11.1 million. The intent in establishing this account is to allocate the funds for a targeted defeasance in FY12 which will result in rate relief in the next few years.

It should be noted that the favorable variance in February of $2.4 million was comprised of variable rate debt savings of $1.3 million, State Revolving Fund (SRF) savings of $690,000 due to delayed borrowing, and $427,000 for last fall's refunding.

Debt Service expenses include the principal and interest payment for fixed debt, the variable subordinate debt, and the State Revolving Fund (SRF) obligation. Also, included are the commercial paper program for the local water pipeline projects, current revenue for capital, and the Chelsea facility lease payment.

The graph below reflects the variable rate trend by month over the past year in comparison with FY10 and FY11 Actuals and the FY12 Budget for the same period.



Revenue

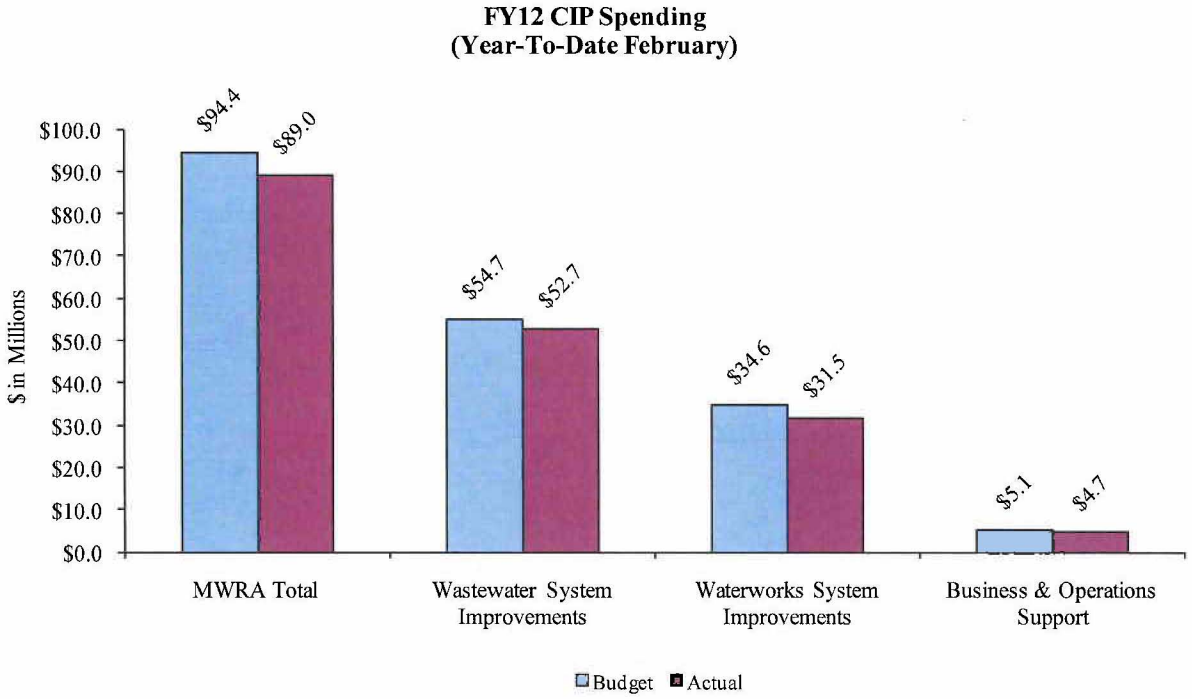
Total Revenue and Income through February is $417.4 million, $1.4 million or 0.3% higher than budget and is mainly due to higher non-rate revenue of $876,000 and investment income of $540,000.

FY12 Capital Improvement Program

Spending through February totaled $89.0 million, $5.4 million or 6.2% lower than budget. After accounting for programs which are not directly under MWRA's control, most notably the Local Water Pipeline program, the Inflow and Infiltration (I/I) program, and the community managed Combined Sewer Overflow (CSO's) projects, the variance is $911,000 or 1.0%.

Underspending was reported in all three programs: Wastewater of $2.1 million, Waterworks of $3.4 million, and Business and Operations Support of $352,000.

CIP Spending By Program:



$ in Millions	Budget	Actuals	$ Var.	% Var.
Wastewater System Improvements				
Interception & Pumping	4.9	5.1	0.2	5.1%
Treatment	20.6	16.2	-4.4	-21.5%
Residuals	0.4	0.0	-0.4	-100.0%
CSO	26.4	29.3	2.9	11.0%
Other	2.4	2.1	-0.3	-13.0%
Total Wastewater System Improvements	**$54.7**	**$52.7**	**-$2.0**	**-3.6%**
Waterworks System Improvements				
Drinking Water Quality Improvements	9.9	8.9	-1.0	-9.7%
Transmission	12.2	13.3	1.2	9.6%
Distribution & Pumping	6.6	10.4	3.8	57.1%
Other	5.9	-1.1	-7.1	-119.3%
Total Waterworks System Improvements	**$34.6**	**$31.5**	**-$3.1**	**-8.9%**
Business & Operations Support	**$5.1**	**$4.7**	**-$0.4**	**-6.9%**
Total MWRA	**$94.4**	**$89.0**	**-$5.4**	**-5.7%**

The main reasons for year-to-date underspending are:

1. Local Water Pipeline Assistance Program of $6.8 million – due to lower than anticipated requests for funding from communities.
2. Wastewater Treatment of $4.4 million - due to lower award and delay for North Main Pump Station Variable Frequency Drive Construction and project delays such as the Digester Module 1 & 2 Pipe Replacement, As-needed Design Contracts, Process Information Control System (PICS) Replacement, and Clarifier Flushing System.
3. Drinking Water Program of $958,000 – mainly due to delays in the Spot Pond Design/Build contract.

The year-to-date underspending is offset by overspending of $3.8 million in Water Distribution and Pumping program mainly due to greater than budgeted spending for Northern Intermediate High Redundancy & Storage – Reading/Stoneham Interconnections and Lynnfield Pipeline and $2.9 million in the Wastewater Combined Sewer Overflow (CSO) program mainly due to the timing of payments for the Brookline Sewer Separation.

Construction Fund Balance

The construction fund balance stood at $72 million as of February 2012. Commercial Paper availability stands at $206 million to fund construction projects.

Attachment 1 – Variance Summary February 2012
Attachment 2 – Current Expense Variance Explanations
Attachment 3 – Capital Improvement Program Variance Explanations
Attachment 4 – FY12 Final versus FY12 Preliminary Year-End Projection

ATTACHMENT 1

	February 2012 Year-to-Date					
	Period 8 YTD Budget	Period 8 YTD Actual	Period 8 YTD Variance	%	FY12 Approved	% Expended
EXPENSES						
WAGES AND SALARIES	$ 57,211,336	$ 56,792,220	$ (419,116)	-0.7%	$ 90,319,013	62.9%
OVERTIME	2,335,804	2,302,908	(32,896)	-1.4%	3,508,630	65.6%
FRINGE BENEFITS	11,891,105	11,751,332	(139,773)	-1.2%	17,954,076	65.5%
WORKERS' COMPENSATION	1,400,000	939,790	(460,210)	-32.9%	2,100,000	44.8%
CHEMICALS	6,074,329	6,029,828	(44,501)	-0.7%	9,047,275	66.6%
ENERGY AND UTILITIES	14,868,248	15,209,803	341,555	2.3%	22,654,931	67.1%
MAINTENANCE	17,637,503	16,281,588	(1,355,915)	-7.7%	29,470,020	55.2%
TRAINING AND MEETINGS	121,744	75,222	(46,522)	-38.2%	251,550	29.9%
PROFESSIONAL SERVICES	3,598,814	3,337,647	(261,167)	-7.3%	5,892,441	56.6%
OTHER MATERIALS	2,190,179	2,151,833	(38,346)	-1.8%	4,765,483	45.2%
OTHER SERVICES	15,001,242	15,231,068	229,826	1.5%	23,323,074	65.3%
TOTAL DIRECT EXPENSES	**$ 132,330,304**	**$ 130,103,239**	**$ (2,227,064)**	**-1.7%**	**$ 209,286,493**	**62.2%**
INSURANCE	$ 1,538,566	$ 1,304,568	$ (233,998)	-15.2%	$ 2,285,870	57.1%
WATERSHED/PILOT	17,214,800	17,080,223	(134,577)	-0.8%	25,576,274	66.8%
BECo PAYMENT	2,529,835	2,393,770	(136,065)	-5.4%	3,965,500	60.4%
MITIGATION	1,028,933	1,005,967	(22,966)	-2.2%	1,528,700	65.8%
ADDITIONS TO RESERVES	131,564	131,564	-	0.0%	195,467	67.3%
RETIREMENT FUND	7,340,438	7,363,170	22,732	0.3%	7,340,438	100.3%
POST EMPLOYEE BENEFITS	-	-	-	---	-	---
TOTAL INDIRECT EXPENSES	**$ 29,784,136**	**$ 29,279,262**	**$ (504,874)**	**-1.7%**	**$ 40,892,249**	**71.6%**
DEBT SERVICE	$ 242,029,241	$ 242,029,241	$ -	0.0%	$ 367,979,918	65.8%
DEBT SERVICE ASSISTANCE	(235,577)	(235,577)	-	0.0%	-	---
TOTAL DEBT SERVICE	**$ 241,793,664**	**$ 241,793,664**	**$ -**	**0.0%**	**$ 367,979,918**	**65.8%**
TOTAL EXPENSES	**$ 403,908,104**	**$ 401,176,165**	**$ (2,731,939)**	**-0.7%**	**$ 618,158,660**	**64.9%**
REVENUE & INCOME						
RATE REVENUE	$ 396,913,461	$ 396,913,461	$ -	0.0%	$ 589,700,000	67.3%
OTHER USER CHARGES	4,793,168	4,899,782	106,614	2.2%	7,142,495	68.6%
OTHER REVENUE	3,433,192	4,202,432	769,240	22.4%	4,872,342	86.3%
RATE STABILIZATION	734,852	734,852	-	0.0%	1,091,780	67.3%
INVESTMENT INCOME	10,087,527	10,627,263	539,736	5.4%	15,352,043	69.2%
TOTAL REVENUE & INCOME	**$ 415,962,200**	**$ 417,377,791**	**$ 1,415,591**	**0.3%**	**$ 618,158,660**	**67.5%**

ATTACHMENT 2
Current Expense Variance Explanations

Total MWRA	FY12 Budget February YTD	FY12 Actuals February YTD	FY12 Actual vs. FY12 Budget		Explanations
			$	%	
Direct Expenses					
Wages & Salaries	57,211,336	56,792,220	(419,116)	-0.7%	Underspending due to lower than budgeted filled positions and higher than budgeted leave balance accrual use offset by unbudgeted retroactive pay adjustments. As of February there were 1,191 filled positions,14 positions lower than the 1,205 funded positions.
Overtime	2,335,804	2,302,908	(32,896)	-1.4%	Very close to budgeted levels.
Fringe Benefits	11,891,105	11,751,332	(139,773)	-1.2%	Lower spending for Health Insurance of $106k, Unemployment Insurance of $22k, and Medicare of $22k offset by overspending for Dental of $21k.
Worker's Compensation	1,400,000	939,790	(460,210)	-32.9%	Lower spending for reserve requirements of $280k and compensation and medical payments of $180k.
Chemicals	6,074,329	6,029,828	(44,501)	-0.7%	Lower spending mainly for Activated Carbon of $117k, Carbon Dioxide of $84k, and Soda Ash of $65k offset by higher Nitrazyme of $165k for Framingham Extension Relief Sewer and Sodium Hypochlorite of $137k.
Utilities	14,868,248	15,209,803	341,555	2.3%	Higher Electricity of $389k at Deer Island, higher Water usage of $170k at DITP and FOD, offset by lower spending for Natural Gas of $132k and Diesel Fuel of $73k mainly in FOD.
Maintenance	17,637,503	16,281,588	(1,355,915)	-7.7%	Maintenance Services are underspent by $928k and Materials are underspent by $428k.
Training & Meetings	121,744	75,222	(46,522)	-38.2%	Underspending in most divisions due to timing.
Professional Services	3,598,814	3,337,647	(261,167)	-7.3%	Underspending for Lab & Testing of $152k mainly for Enquad's Harbor Outfall Monitoring program, Engineering of $106k, and Security of $59k offset by higher spending for Other category of $71k mainly for timing of MIS Strategic Plan.
Other Materials	2,190,179	2,151,833	(38,346)	-1.8%	Lower spending mainly for Equipment Furniture of $40k due to lab equipment delays, Postage of $33k, and Computer Hardware of $32k offset by higher spending for Work Clothes of $48k due to timing, Lab and Testing Supplies of $48k, and Office Supplies of $21k due to timing.
Other Services	15,001,242	15,231,068	229,826	1.5%	Overspending for Sludge Pelletization of $277k mainly due to higher year-to-date quantities, Police Details of $60k, and Grit & Screenings of $54k, offset by lower spending for Mem/Dues of $80k, Health/Safety of $54k, and Space Lease/Rentals of $35k.
Total Direct Expenses	**132,330,304**	**130,103,239**	**(2,227,064)**	**-1.7%**	
Indirect Expenses					

ATTACHMENT 2
Current Expense Variance Explanations

Total MWRA	FY12 Budget February YTD	FY12 Actuals February YTD	FY12 Actual vs. FY12 Budget		Explanations
			$	%	
Insurance	1,538,566	1,304,568	(233,998)	-15.2%	Underspending for Payments/Claims of $205k and Premiums of $30k.
Watershed/PILOT	17,214,800	17,080,223	(134,577)	-0.8%	Lower Watershed Reimbursement due to FY11 overaccrual.
HEEC Payment	2,529,835	2,393,770	(136,065)	-5.4%	Lower spending for mainly for Special Projects of $126k and Capacity Charges of $10k.
Mitigation	1,028,933	1,005,967	(22,966)	-2.2%	
Addition to Reserves	131,564	131,564	-	0.0%	
Pension Expense	7,340,438	7,363,170	22,732	0.3%	
Post Employee Benefits	-	-	-		
Total Indirect Expenses	**29,784,136**	**29,279,262**	**(504,874)**	**-1.7%**	
Debt Service					
Debt Service	242,029,241	242,029,241	-	0.0%	Debt Service Expenses are at budget level after the monthly agreed upon transfer of an additional $2.4 million savings to the defeasance account in February. The defeasance account balance stands at $11.1 million year-to-date.
Debt Service Assistance	(235,577)	(235,577)	-	0.0%	
Total Debt Service Expenses	**241,793,664**	**241,793,664**	**-**	**0.0%**	
Total Expenses	**403,908,104**	**401,176,164**	**(2,731,938)**	**-0.7%**	
Revenue & Income					
Rate Revenue	396,913,461	396,913,461	-	0.0%	
Other User Charges	4,793,168	4,899,782	106,614	2.2%	Mostly due to higher D.I. water usage of $111k.
Other Revenue	3,433,192	4,202,432	769,240	22.4%	Higher Miscellaneous Revenue of $373k; Energy Revenue of $255k due to timing of RPS offset by lower Load Reduction; Permit Fees of $153k, Equipment Disposal of $106k. Offset by lower Penalties of $70k and Hydro-power of $64k at Cosgrove.
Rate Stabilization	734,852	734,852	-	0.0%	
Investment Income	10,087,527	10,627,263	539,736	5.4%	Higher than budgeted Investment Income due to changes in liquidity requirements which allowed higher long term investments offset by lower short term rates.
Total Revenue	**415,962,200**	**417,377,790**	**1,415,590**	**0.3%**	
Net Revenue in Excess of Expenses	**12,054,096**	**16,201,626**	**4,147,528**		

ATTACHMENT 3
Capital Improvement Program Variance Explanations

	FY12 Budget YTD February	FY12 Actuals YTD February	YTD Actuals vs. Budget		Explanations
			$	%	
Interception & Pumping (I&P)	$4,891,559	$5,140,078	$248,519	5.1%	Overspending due to contractor progress on Interception and Pumping Section 156 Rehabilitation Design/Build contract of $1.6M offset by underspending for Chelsea Creek Upgrades Design/Construction Administration contract of $369,000, Braintree-Weymouth Relief Facilities Design 2/Construction Services/Resident Inspection contract of $260,000, and delay in North System Hydraulic Study of $173,000.
Treatment	$20,624,102	$16,188,076	($4,436,025)	-21.5%	Underspending due to lower than budgeted award and delays for the North Main Pump Station VFD Replacement Construction $1.3M; Digester Modules 1 & 2 Pipe Replacement of $1.1M; As-needed Design contracts of $889,000; Clarifier Flushing System of $667,000; Process Information Control System (PICS) Replacement construction of $629,000; HVAC Equipment Replacement Design/Engineering Services During Construction of $389,000; Switchgear Replacement-Construction of $337,000; Electrical Equipment Upgrades-Construction 4 of $292,000; and Expansion Joint Repair - Construction 2 of $208,000. Offset by overspending for Primary and Secondary Clarifier Rehabilitation of $1.4M mainly due to timing, Power System Improvements of $259,000; Transformer Replacement of $238,000 and Digester Sludge Pump Replacement of $168,000.
Residuals	$396,985	$0	($396,985)	-	Underspending due to delay in award of Residuals Technology contract.
CSO	$26,425,753	$29,340,380	$2,914,627	11.0%	Overspending primarily due to Brookline Sewer Separation of $3.0M mainly due to timing, North Dorchester Bay of $1.1M due to timing and unanticipated work; and contractor progress on Cambridge Sewer Separation of $944,000 offset by underspending in CSO Support of $1.1M mainly for favorable renegotiation of the North Dorchester temporary easement.
Other Wastewater	$2,376,112	$2,066,797	($309,314)	-13.0%	Underspending on Inflow and Infiltration (I/I) due to loan repayments being greater than budgeted and community requests for grants and loans being less than budgeted.
Total Wastewater	**$54,714,511**	**$52,735,334**	**($1,979,176)**	**-3.6%**	

ATTACHMENT 3
Capital Improvement Program Variance Explanations

	FY12 Budget YTD February	FY12 Actuals YTD February	YTD Actuals vs. Budget		Explanations
			$	%	
Drinking Water Quality Improvements	$9,868,403	$8,910,736	($957,666)	-9.7%	Underspending primarily due to Spot Pond Storage Facility Design/Build of $1.5M due to lower than budgeted award; Carroll Technical Assistance of $235,000, and Quabbin Ultraviolet Design/Construction Administration/Resident Inspection of $172,000. Offset by overspending due to contractor progress for Ancillary Modifications Construction 2 of $478,000 and Spot Pond Storage Facility Early Construction Water Connection contract of $278,000.
Transmission	$12,179,953	$13,347,602	$1,167,649	9.6%	Overspending for the Hultman rehabilitation work of $1.7M due to contractor progress and acceleration of the project; Dam Projects of $903,000 mainly for contractor progress on the Dam Safety Modifications & Repairs contract for Foss and Weston Reservoirs; and Watershed Land acquisition of $329,000 due to timing. Offset by underspending on Long Term Redundancy of $423,000 on Sudbury Aqueduct MEPA Review due to schedule change and $366,000 due to study work being less than budgeted; Quabbin Transmission System's Oakdale Phase 1A Electrical Design and Construction of $381,000 and Quabbin Aqueduct/Winsor Station of $266,000.
Distribution & Pumping	$6,612,583	$10,390,023	$3,777,440	57.1%	Overspending due to Northern Intermediate High Redundancy & Storage of $2.1M mainly for Reading/Stoneham Interconnections due to progress and unanticipated work; Lynnfield Pipeline of $1.1M due to timing; and Valve Replacement of $314,000 mainly for contractor progress.
Other Waterworks	$5,929,928	($1,145,697)	($7,075,625)	-	Underspending on Local Water Pipeline Assistance Program due to community requests for loans being less than budgeted by $8.4M offset by repayments being less than anticipated by $1.6M.
Total Waterworks	**$34,590,867**	**$31,502,665**	**($3,088,201)**	**-8.9%**	
Business & Operations Support	$5,093,202	$4,741,212	($351,989)	-6.9%	Underspending due to As-Needed Design contracts of $300,000 and Business Systems Plan of $243,000 offset by Alternative Energy projects of $286,000 mainly for work scheduled in FY11 for Charlestown Wind Turbine construction project completed in FY12.
Total MWRA	**$94,398,580**	**$88,979,211**	**($5,419,368)**	**-5.7%**	

ATTACHMENT 4
FY12 Preliminary Projection vs FY12 Final Budget

TOTAL MWRA	FY12 Approved Budget	FY12 Preliminary Projection	Change FY12 Preliminary Projection vs FY12 Approved Budget	
			$	%
EXPENSES				
WAGES AND SALARIES	$ 90,319,013	$ 89,518,832	$ (800,181)	-0.9%
OVERTIME	3,508,630	3,664,213	155,583	4.4%
FRINGE BENEFITS	17,954,076	17,852,992	(101,084)	-0.6%
WORKERS' COMPENSATION	2,100,000	1,722,000	(378,000)	-18.0%
CHEMICALS	9,047,275	9,047,275	-	0.0%
ENERGY AND UTILITIES	22,654,931	22,934,056	279,125	1.2%
MAINTENANCE	29,470,020	27,704,770	(1,765,250)	-6.0%
TRAINING AND MEETINGS	251,550	260,247	8,697	3.5%
PROFESSIONAL SERVICES	5,892,441	5,592,981	(299,460)	-5.1%
OTHER MATERIALS	4,765,482	4,704,073	(61,409)	-1.3%
OTHER SERVICES	23,323,074	23,230,721	(92,353)	-0.4%
TOTAL DIRECT EXPENSES	**$ 209,286,493**	**$ 206,232,160**	**$ (3,054,332)**	-1.5%
INSURANCE	$ 2,285,866	$ 2,025,376	$ (260,490)	-11.4%
WATERSHED/PILOT	25,576,274	25,586,600	10,326	0.0%
HEEC PAYMENT	3,965,499	3,865,499	(100,000)	-2.5%
MITIGATION	1,528,705	1,511,645	(17,060)	-1.1%
ADDITIONS TO RESERVES	195,467	195,467	-	0.0%
RETIREMENT FUND	7,340,438	7,340,438	-	0.0%
POSTEMPLOYMENT BENEFITS			-	
TOTAL INDIRECT EXPENSES	**$ 40,892,249**	**$ 40,525,025**	**$ (367,224)**	-0.9%
DEBT SERVICE (before offsets)	$ 368,329,918	$ 367,384,405	$ (945,513)	-0.3%
VARIABLE RATE DEBT		(16,454,320)	(16,454,320)	N/A
DEFEASANCE ACCOUNT	-	17,399,833	17,399,833	N/A
BOND REDEMPTION			-	N/A
DEBT SERVICE ASSISTANCE	(350,000)	(350,000)	-	0.0%
TOTAL DEBT SERVICE	**$ 367,979,918**	**$ 367,979,918**	**$ -**	0.0%
TOTAL EXPENSES	**$ 618,158,659**	**$ 614,737,103**	**$ (3,421,556)**	
REVENUE & INCOME				
RATE REVENUE	589,700,000	$ 589,700,000	$ -	0.0%
OTHER USER CHARGES	7,142,494	7,142,494	-	0.0%
OTHER REVENUE	4,872,342	5,516,714	644,372	13.2%
RATE STABILIZATION	1,091,781	1,091,781	-	0.0%
INVESTMENT INCOME	15,352,043	16,252,043	900,000	5.9%
TOTAL REVENUE & INCOME	**$ 618,158,660**	**$ 619,703,032**	**$ 1,544,372**	0.2%
VARIANCE		$ 4,965,928	$ 4,965,927	

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STAFF SUMMARY

TO: Board of Directors
FROM: Frederick A. Laskey, Executive Director
DATE: March 14, 2012
SUBJECT: MIS Five Year Strategic Plan

COMMITTEE: Administration, Finance & Audit

_X_ INFORMATION
___VOTE

Russell J. Murray, Jr., MIS Director
Preparer/Title

Rachel C. Madden
Director, Admin & Finance

The Board recommended that MWRA develop a five-year strategic plan for the Management Information Systems Department. A contract was awarded to Westin Engineering, Inc. in July 2011 to complete a review of MWRA's information technology infrastructure, applications, and organization, and provide a strategic plan. This staff summary provides an overview of the highlights of the proposed Plan provided by Westin. A copy of the full report is included with this staff summary.

RECOMMENDATION:

For information only.

DISCUSSION:

The Board recommended that staff develop a five-year strategic plan for the Management Information Systems Department (MIS) to ensure alignment of business goals, objectives, processes and technology within the Authority. At the July 13, 2011 meeting, the Board approved the recommendation of a Selection Committee to award a contract to Westin Engineering, Inc. (Westin) for the development of a Five-Year Information Technology Strategic Plan (IT Plan). Westin's scope of work included evaluating MWRA's current applications, IT systems and infrastructure, as well as organizational structure and staffing requirements. After Westin completed its review, it was charged with developing plans for future improvements to MWRA's IT systems and organizational approach and structure.

Review Process

In order to complete this report, Westin completed an in depth assessment of MWRA's current IT infrastructure and conducted interviews with MIS and staff in various departments throughout the Authority. During the assessment phase, Westin reviewed existing technology resources, evaluated the support for the Authority's current and future business needs, and compared the MWRA's technology capabilities with those of similar utilities. After this review, they met with

MWRA's senior management to review priorities and strategies to address the items identified during the assessment phase. Based on the results of that meeting, Westin developed the proposed IT Plan to provide a framework for MWRA's future needs.

Assessment Findings

Westin's review determined that MWRA was at the forefront of the water/wastewater utilities industry in several categories including the use of Maximo Computerized Maintenance Management System (CMMS) for preventive and predictive maintenance, and reliability centered practices. The other primary areas were MWRA was strong was related to Supervisory Control and Data Acquisition (SCADA) and Process Information Control System (PICS) for operational decision making and executive status updates.

In addition, Westin reported that the MWRA adheres to industry best practices by extensively using Commercial Off-The-Shelf (COTS) software packages to take advantage of upgrades to new functionality and technologies with minimal customization.

In other areas, MWRA was nearing industry best practices for its MIS governance and cyber security efforts. In the area of governance, Westin noted that MWRA has an extensive set of controls associated with reviewing and approving projects and expenditures but recommended thatan additional formal consolidated technology governance process be adopted. They recommended changes to the governance process which they believe would improve coordination, reduce redundancy, and enhance integration among the various technology activities. Westin noted no significant cyber security issues. They recommended that as a "critical infrastructure" MWRA should continue to adhere to the Department of Homeland Security guidelines and closely monitor them for any additional improvements.

There were several areas identified that MWRA should target for improvements and standardization, including IT Management and Processes, Data Management Practices, and Electronic Content and Records Management. The table below provides details on their findings:

Improvement Opportunity	Findings
IT Management and Processes	MWRA needs a more effective, standardized approach to implement information technology systems from planning through design, implementation, and ongoing support. The MWRA has experienced several implementation projects in which the expected benefits were not fully achieved due to inconsistent planning and implementation practices.
Data Management Practices	Much of MWRA's data resides in individual applications where it is difficult to access and/or share data. This practice can lead to inconsistencies and multiple representations of data.
Electronic Content and Records Management	Many Departments have identified the need to: • Address dependence upon paper records, • Support records management activities, • Improve access to information, • Streamline work flows, and • Replace several existing departmental-level document management solutions.

Recommendations:

Based on its review, the Consultant recommended that the MWRA concentrate on four program categories with a total of 15 subprograms that can be completed concurrently over the next five years.

Technology Infrastructure Programs (Includes 4 subprograms) – These four subprograms will assess and implement consolidated and optimized versions of core IT infrastructure elements and improve and optimize data management practices, including: storage, backup, archive and purge processes, and technologies. These improvements will cover the 1,238 desktops, 160 laptops, 105 servers, 20 Wide Area Network Circuits and associated ancillary equipment, as well as the 18 Terabytes of data managed by MIS.

Application Improvement Programs (Includes 7 subprograms) – These seven subprograms will continue MWRA's efforts to update and enhance a wide range of applications to improve efficiencies of business processes and effectiveness of the staff while ensuring the availability, and integrity of the MWRA's data resources. This program relates to 123 applications with 227 modules that support various business functions across the Authority. Seventy-seven, or 63%, of these applications are commercially available off the shelf packages.

Information Security Programs (Includes 2 subprograms) – These two subprograms focus on the resiliency and sustainability of the MWRA's data security practices. They will establish policies, procedures, and information security awareness. The work under this subprogram will also review each IT system and make recommendations to improve its security profile in accordance with the Department of Homeland Security Guidelines.

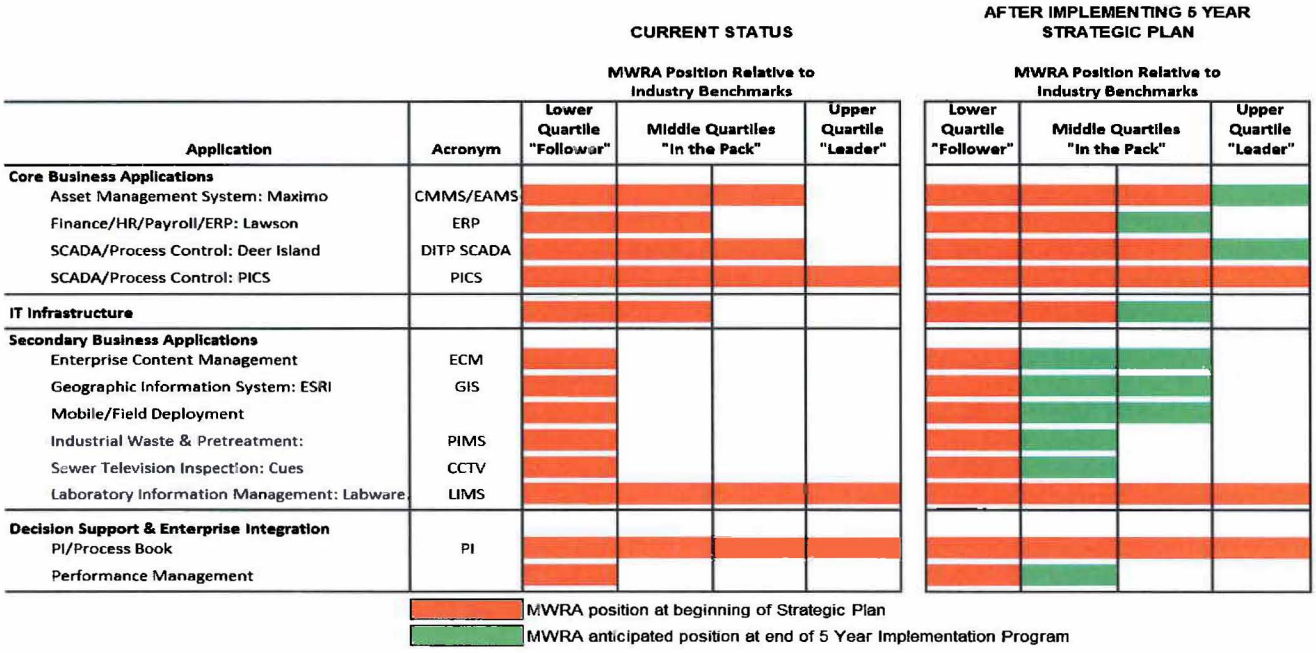
Information Technology Management Programs (Includes 2 subprograms) – These two programs are intended to improve the organization of MIS and the oversight processes for selecting and implementing IT solutions throughout the MWRA. To accomplish those goals, the study recommends that MWRA:

- Develops an Information Technology Service Management (ITSM) Program to improve service delivery.
- Adopts a Standardized Software Development Lifecycle (SDLC) to improve the quality of software delivered.
- Implements a more robust Project Management Program to improve the predictability of deliverables and cost associated with information technology projects.
- Updates the IT Governance Program to ensure that the business and technology priorities of the MWRA are aligned and are being met.

This program also calls for organizational changes to reflect evolving technologies and best practices processes. The proposed functional reorganization will allow for the realignment of MIS resources to more closely reflect current technologies and better meet the needs of the

systems users. These organizational changes coupled with other recommendations in the IT Plan will produce efficiencies that may allow for staffing reductions over time.

As previously discussed, Westin compared MWRA to other water/wastewater utilities to identify where the Authority might adjust its IT efforts based on experiences of comparable utilities. As part of the comparative process, Westin ranked each major technology area into three categories: Lower Quartile, Middle Quartiles, and Upper Quartile. The table below details the MWRA's current rankings (in orange) and what the result would be if the 5-year IT Plan was implemented (in green).



Summary of Programs Schedules and Costs

The IT Plan included a five-year schedule for implementing the recommendations. The proposed schedule accounts for MWRA's priorities, program interdependencies, related business process improvements, and MIS's capacity to support these efforts.

Overall, the recommended expenditures estimated are generally in line with the amounts currently included in the Capital Improvement Program (CIP) budget for FY12 through FY18 period for IT purposes. However, the revised recommendations will redirect funding from certain planned projects to the recommended programs. Staff anticipate that implementation of the recommendations included in the report will result in future reductions to the current expense budget and the CIP beyond the five-year timeframe. The following table provides a summary of the recommended programs, proposed schedule, and costs by category.

Program Category	Proposed Schedule		Estimated Cost By Major Category			
	Begin	End	Hardware	Software	Professional Services	Total Estimated Cost
Technology Infrastructure Programs (Includes 4 subprograms)	Q4 FY12	Q4 FY17	$ 6,090,000	$ 1,335,000	$ 1,795,000	$ 9,220,000
Application Improvement Programs (Includes 7 subprograms)	Q3 FY12	Q4 FY17	$ 425,000	$ 1,100,000	$ 4,275,000	$ 5,800,000
Information Security Programs (Includes 2 subprogams)	Q4 FY12	Q1 FY14	$ 20,000	$ 130,000	$ 550,000	$ 700,000
Information Technology Management Programs (Includes 2 subprograms)	Q4 FY12	Q3 FY17	$ -	$ 350,000	$ 2,350,000	$ 2,700,000
Total By Category			**$ 6,535,000**	**$ 2,915,000**	**$ 8,970,000**	**$ 18,420,000**

BUDGET/FISCAL IMPACT:

The projected $18.4 million cost included in the report is an estimate and will be refined as projects are approved and included in the CIP. Currently, there is approximately $15 million in the CIP during the FY12 – FY18 period for MIS related work. Staff anticipate that through the implementation of these recommendations over time efficiencies will be achieved that will allow for reductions in current expense and CIP spending.

MIS Five Year Strategic Plan

Massachusetts Water Resources Authority

March, 2012 – Final Report

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Westin
Passion for Improving Performance

Table of Contents

1. Executive Summary

The goal of this project is to better align the information management and technology activities of the Massachusetts Water Resources Authority ("MWRA" or "the Authority") with its business strategies through the development of a Management Information Services (MIS) 5-Year Strategic Plan. To improve and more effectively deal with its business challenges, the Authority's objectives for the MIS Strategic Plan are to:

- Increase the efficiency of MWRA's business processes
- Improve the effectiveness of MWRA staff
- Ensure the availability, integrity, and security of MWRA's data.

To achieve these objectives, the Authority engaged Westin Engineering, Inc. ("Westin" or "the Consultant") to address MWRA's needs for:

- Defining a technology vision and direction for applying technology in support of MWRA's business requirements
- Developing a detailed five year action plan, including project budgets, schedules, benefits, risks, and key choices to attain the target states
- Recommending an efficient method for sustained technology planning, support, staffing, personnel training, and decision-making.

The MIS Strategic Planning project assessed existing MWRA technology resources, evaluated their support for the Authority's current and future business needs, compared MWRA's technology capabilities with those of similar utilities, and recommended a program to support the Authority's requirements. The resulting plan includes recommended technology implementation projects, organizational development activities, process improvements, an implementation schedule, and estimated expenditures to execute the plan over the next five years.

1.1 Assessment

The assessment of the Authority's existing information technology capabilities defined the baseline for determining how to best apply technology to support the Authority's business objectives. The most significant findings from the assessment were as follows:

- MWRA is doing many things well in applying technology to support its mission and operations.
- The Authority is at the forefront of the water utilities industry in using its Supervisory Control and Data Acquisition (SCADA) and Process Information Control System (PICS) data for operational decision making and executive status updates.
- The use of Commercial Off-the-Shelf (COTS) software packages has served the Authority well, including offering upgrades to new functionality and technologies.
- Although the MWRA has an extensive set of controls associated with reviewing and approving projects and expenditures, a formal technology governance process for directing the application of technology can improve coordination, reduce redundancy, and enhance integration among the Authority's technology activities.

- MWRA needs an effective, standardized, repeatable approach for implementing information technology systems throughout the life cycle of planning, justifying, designing, implementing, deploying, and ongoing support. The MWRA has experienced several implementation projects in which the expected benefits were only partially achieved due to insufficient planning, inadequate requirements, or not optimizing business processes. This variance in the achievement of the Authority's technology objectives indicates the need for using a practical, proven, best practices-based approach for all technology deployments..
- Much of MWRA's data resides in individual applications, where it is difficult to access and/or share data. This can lead to inconsistencies and multiple representations of data.
- Many Departments have identified the need to address dependence upon paper records, support records management activities, improve access to information, streamline work flows, and replace several existing departmental-level document management solutions.

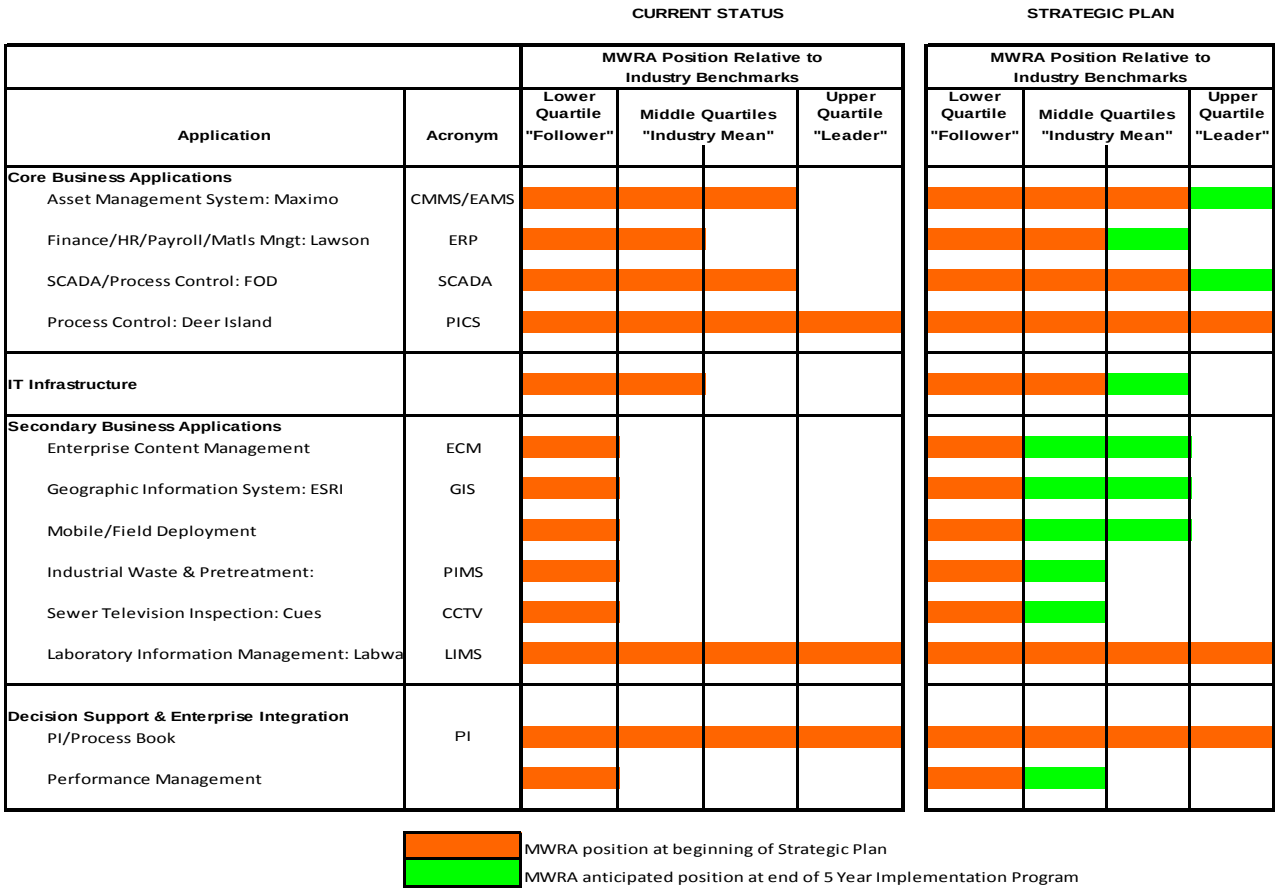
The details of the Assessment are documented in Appendix A of this report.

1.2 Industry Comparison

MWRA's technology capabilities were compared with those of similar progressive water / wastewater utilities to identify where the Authority might adjust its efforts based on experiences of those comparable utilities:

- **Core Business Applications** – MWRA is an industry leader in using its process control and asset management systems; enhancements to its administrative applications can more efficiently and effectively support the Authority's business needs.
- **IT Infrastructure** – The hardware, networking, and databases deliver good performance for most users, but will require upgrades to sustain that service level as the Authority applies additional technology to meet its business challenges.
- **Secondary Business Applications** – The Authority's Laboratory system is exemplary, but MWRA has opportunities to enhance its use of technology in mobile deployment, geographic information systems (GIS), Pretreatment Information Management System (PIMS), and document management.
- **Decision Support and Authority-wide Integration** – MWRA's PI/Process Book deployment establishes an industry standard for supporting management decision-making, but proven technology is also available to integrate systems and improve compilation of Authority-wide performance data.

Appendix E presents the details of the Industry Comparison, including the Authority's predicted ranking from implementing this Strategic Plan's recommendations. The below figure provides a graphical representation of these findings.



1.3 Implementation Program Recommendations

The MIS 5-Year Strategic Plan recommends program initiatives in the areas of Applications, Information Technology Management, Information Security, and Technology. The implementation program is designed as a five year commitment.

- **Applications** – Upgrades and additional modules are recommended for the existing Lawson (finance, human resources, payroll, and materials management); Maximo (maintenance management); and PIMS (industrial waste) applications. The recommendations also include significant expansions in applying GIS, mobile deployment, and electronic content management technologies.
- **Information Technology Management** – The strategic plan recommends implementing an IT Governance process for ongoing allocation of resources and coordinating efforts among multiple technology initiatives to maximize support of the Authority's business goals and objectives. In addition, IT service delivery recommendations address the MIS Department's scope of services, organization structure, and best practices for implementation and help desk support.
- **Information Security** – IT security is a top priority of the Authority. The recommended Information Security Program and Electronic Security Plan are designed to provide a more formal, comprehensive IT security framework than the Authority's existing

decentralized activities, in compliance with Federal standards. The recommendations include standards, policies, and practices that extend to outside contractors and agencies which provide support to MWRA.

- **Technology Infrastructure Program** – The technology infrastructure of networks, computing hardware, databases, and related tools support all of the Authority's information technology activities. The strategic plan contains recommendations for a flexible technology architecture that supports current and anticipated IT needs; infrastructure upgrades to meet projected requirements; enhancements to the Authority's email and users' working data; and data management standards and practices to maximize data integration, reusability, access, and value across the organization.

Each recommended individual program is described in Section 4, and a detailed program description, including scope of work and benefits, is documented in Appendix B.

These recommendations provide the long-term foundation for aligning business functions and technology, resulting in significant benefits in operational efficiency, service levels, and effectiveness. Specific beneficial outcomes are expected to include support for streamlining paper-based business processes, timely sharing and access to existing business data, maximizing value from technology investments, and positioning the Authority for future challenges and change. Section 5 presents the anticipated benefits from the Strategic Plan's recommendations.

The five year schedule provides an organized approach for implementing the Strategic Plan's recommendations. The schedule, presented in Appendix C, reflects MWRA's priorities, program interdependencies, users' ability to absorb new technology and related business process improvements, and the MIS Department's capacity to support these efforts.

This Strategic Plan's overall recommended expenditures are estimated to be generally in line with the amounts allocated in the Authority's CIP budget for FY 2013 through FY 2018 for the MIS Department and for other information technology expenditures. It is recommended that budgeted funds be shifted from certain currently planned projects to the programs recommended in the 5 Year Strategic Plan. The estimated costs for each program are included in Appendix D. The below figure provides a summary of the Scope, Schedule and Budget for these programs.

Summary of Program Scopes, Schedules and Budgets

Scope	Schedule		Budget				
Program Category	Start	End	Total Estimated Cost	Hardware	Software	Professional Services	Resource Assumptions
Technology Infrastructure Program (4 Programs) - These programs will assess and implement consolidated and optimized versions of core IT infrastructure elements as utility like services and commodities. Furthermore, it will look to improve and optimize data management practices, including: storage, backup, achieve and purge processes and technologies.	Q4 FY12	Q4 FY17	$9,220,000.00	$6,090,000.00	$1,335,000.00	$1,795,000.00	*1 consultant for 63 months not including hardware installation services included in the Harware Cost* *MWRA Staffing is estimated at 15 staff at 10% to 20% of their time*
Application Improvement Program (7 Programs) - Upgrades and additional modules are recommended for the existing Lawson (finance, human resources, payroll, and materials management); Maximo (maintenance management); and PIMS (industrial waste) applications. The recommendations also include significant expansions in applying GIS, mobile deployment, and electronic content management technologies.	Q3 FY12	Q4 FY17	$5,800,000.00	$425,000.00	$1,100,000.00	$4,275,000.00	*3 consultants for 66 months including requirements definition, selection, implementation & training* *MWRA Staffing is estimated at 17 staff 5% to 30% of their time*
Information Security Program (2 Programs) - The recommended Information Security Program and Electronic Security Plan are designed to provide a more formal, comprehensive IT security framework than the Authority's existing decentralized activities, in compliance with Federal standards	Q4 FY12	Q1 FY14	$700,000.00	$20,000.00	$130,000.00	$550,000.00	*2 consultants for 15 months deliverables include policies, procedures, standard controls and an IS training and awareness program* *MWRA Staffing is estimated at 2 staff 30% to 50% of their time*
IT Management Program (2 Programs) - The strategic plan recommends implementing an IT Governance process for ongoing allocation of resources and coordinating efforts among multiple technology initiatives to maximize support of the Authority's business goals and objectives. In addition, IT service delivery recommendations address the MIS Department's scope of services, organization structure, and best practices for implementation and support.	Q4 FY12	Q3 FY17	$2,700,000.00	$0.00	$350,000.00	$2,350,000.00	*2 consultants for 60 months and three trainings for MWRA staff* *MWRA Staffing is estimated at 6 staff 10% to 20% of their time*
Total			$18,420,000.00	$6,535,000.00	$2,915,000.00	$8,970,000.00	

2. Project Background

This report contains the findings and recommendations from the Massachusetts Water Resources Authority's Management Information Services 5-Year Strategic Planning project. The goal of this project was to define the Authority's information technology strategy and recommend plans for applying technology to achieve the following:

- Increases in the efficiency of the Authority's business processes
- Improvements in the effectiveness of MWRA staff

To ensure the availability, integrity, and security of MWRA's data The resulting MIS 5-Year Strategic Plan includes recommended technology implementation projects, organizational development activities, process improvements, an implementation schedule, and expenditures that will be required over the next five years to execute the plan.

2.1. Background of Change

The impetus for this MIS 5-Year Strategic Plan is a result of strategic challenges to the Authority, originating both externally and internally. The business needs interviews confirmed that many of MWRA's external business challenges are similar to those facing numerous water and wastewater utilities today. These external business drivers include the following:

1. Changing economic conditions
2. Local, State, and Federal regulatory mandates
3. Public focus on conservation and "being green", including more efficient use of water and energy cost management
4. Emerging information technologies
5. Awareness and knowledge of environmental issues within the service areas, and the impacts of Authority operations on the environment
6. Increasing customer / citizen expectations.

In addition to these external business challenges, the Authority faces additional internal business drivers that include the following:

1. Evolution from facilities construction to operations and maintenance
2. Funding constraints
3. Changing and aging workforce
4. Management interest in applying technology to improve efficiency and services
5. Need to realize maximum value from information technology investments
6. Desire for management analysis and performance reporting

These external and internal challenges require the Authority to deliver solid strategic responses. The MIS 5-Year Strategic Plan has identified key directions in which technology can support Authority management as these challenges are addressed:

1. **Management support for applying technology to improve efficiency and services.** Executive sponsorship of strategies for effectively integrating information systems and

business processes throughout the Authority is an essential component of success.

2. **Focus on streamlining business processes.** This includes reducing manual, paper-based processes and restructuring business processes, especially those that involve multiple organizational units.
3. **Desire for management analysis and performance reporting.** Technology provides support for the collection, accessibility, and sharing of accurate and timely business performance metrics, including gathering data from existing operational applications.
4. **Need to realize maximum value from technology investments.** MWRA's business needs should drive all technology investments, and technology deployments should include optimizing business processes.
5. **Develop the Authority's MIS organization.** Position MWRA's MIS organization for future success by implementing organizational improvements and applying technology to better meet the Authority's business needs.

The situation presents opportunities for improved operational effectiveness that can best be achieved through an integrated, Authority-wide technology planning approach. This plan must address MWRA-wide business requirements and individual Department needs, including necessary linkages to critical external information technology and business process activities.

The Authority has identified a number of objectives for employing information technology. These objectives are aligned with the need to improve performance in response to the external and internal drivers listed above. MWRA will apply information technology to:

- Deliver the right information in a timely manner to managers and staff regardless of where they are located
- Improve decision support
- Control operations, especially in the field
- Improve customer service internally and externally
- Deliver services as cost effectively as possible
- Implement Authority-wide performance measurement
- Improve teamwork through the use of technology for communication, coordination, and decision support
- Align the Authority's technology infrastructure with emerging technology directions.

The Authority's MIS 5-Year Strategic Plan is intended to serve as the foundation for every future information technology initiative. Achieving the Authority's technology objectives requires meaningful integration of information and practices throughout the organization – thereby eliminating redundant, inefficient information and technology "silos." The planning project included developing a thorough understanding of specific business drivers, organizational challenges, visions, objectives, and existing information resources. The planning project also sought to achieve a high level of stakeholder buy-in and understanding throughout the process, which supports successful IS planning now and in future years.

2.2. MIS Strategic Plan Objectives

Driven by these external and internal factors, Authority management identified a number of objectives for this MIS Strategic Plan. The project approach and work plan have been formulated to include the following activities:

- Produce and present a compelling and detailed target state IT vision for the MWRA.
- Assessment of existing technology uses and practices.
- Assessment of the MIS staff resources and governance structures.
- Identification of Authority-wide business needs for applying technology.
- Development of an IS five-year target state and the strategies to achieve MWRA goals and priorities.
- Recommendation of specific, immediate and long-term projects.
- Organization of these projects into a strategic technology plan, designed to attain the Authority's objectives for using technology.

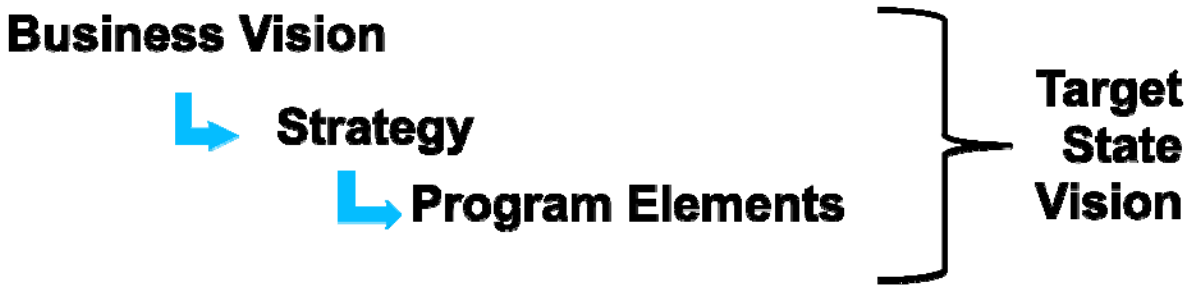
The Authority has commissioned the professional consulting services of Westin Engineering, Inc. to assist in developing the MIS 5-Year Strategic Plan. Westin's approach, which has proven effective in numerous other local governments, provides the framework for realizing the value of information technology and system investments – including business performance monitoring and reporting, improving business processes, information and knowledge sharing, resource coordination, and financial/cost analysis.

To support its effort to improve and to more effectively deal with its business challenges, the Authority is seeking to define and articulate its information technology vision and better align its business applications and technology management with the needs of the business. The MIS 5-Year Strategic Plan is expected to be a catalyst for enhancing the Authority's technology capabilities in support of its efforts to drive performance improvement strategies, core business effectiveness, operational efficiency, enterprise asset management, and responsiveness to the public.

3. Key Strategies

The Authority's business vision for using information technology is a critical starting point for this Strategic Plan. It articulates for the Authority and its IT consultants which future state – among several possible alternatives – is preferred. It also provides a basis for prioritizing the opportunities for improvements identified during the Assessment Phase (Appendix A). These opportunities for improvements were identified by comparing the Authority's current state (of business processes, technology support, and business needs) with best practices for similar water / wastewater utilities. The business vision drives business policy decisions that determine what technology activities will be funded and executed during the next five years. IT can support successful implementation of a wide variety of projects.

The desired future state of general IT utilization at the Authority is defined by a combination of the vision statement and supporting strategies. In the strategic planning process, these are used to help identify and prioritize program elements.



The scope of this Strategic Plan specifically excluded consideration of IT support for SCADA or physical security activities at the Authority. At the same time, our assessment determined that other IT activities at the Authority are performed at numerous locations beyond the MIS Department. Henceforth in this document, we use the term "IT" to refer to the multi-departmental IT activities that support the Authority's general business activities.

3.1. Business Vision Statement

A **Vision Statement** is a statement of what technology will have accomplished for the Authority in the future, expressed in business terms. The Business Vision Statement identifies several objectives for applying information technology to carry out the Authority's mission of providing safe and reliable water and wastewater service.

In strategy workshop held during September, 2011, the project Steering Committee identified key elements of the information technology vision for the Authority. These have been compiled into the following Business Vision statement:

> ***We seek to use information technology to work more efficiently and effectively by identifying and implementing an overall, integrated, sensible, cost-effective and secure approach and to achieve focused and measurable outcomes that support MWRA's business, operational and regulatory functions. This integrated and cost effective support system is driven by strategic management governance and supported by skilled IT staff.***

The project Steering Committee also prioritized strategies that elaborate upon the objectives articulated in the Business Vision Statement for using technology. These strategies, which are listed below, guided the selection of implementation program elements, which are described in Section 4.

3.2. Strategies

Strategies define broad patterns of actions which, once successfully operationalized through implementation of specific programs of action, will help the Authority achieve one or more aspects of the future state vision. Strategies are tied back to this vision through a specific relationship – the organization commits to a strategy ***in order to*** achieve its vision. This is one important way of saying ***why*** the organization should perform a set of actions.

This section highlights the results and conclusions of the Strategic Planning process. A number of strategies were identified in response to (1) the gaps identified in the Assessment (Appendix A), and (2) the business vision for applying technology at the Authority (Section 3.1 immediately above).

Business Improvement Strategies

- Implement Authority-wide document management and control
- Improve utilization of GIS and other spatial data within MWRA
- Develop analysis and reporting programs and supporting tools, for all organizational levels within the Authority
- Develop secure capability for large file transfers
- Improve workflows and reporting for several Lawson modules

- Assess and develop a plan to improve the effectiveness of the Authority's PIMS application
- Improve efficiency, timeliness, and traceability of performance management information
- Enhance integrations among systems
- Enhance mobile computing (especially tablets and smart phones)
- Reduce the number of free-standing small applications and databases
- Maximize use of Commercial Off-The-Shelf (COTS) software with minimum customization
- Adopt a standardized approach for application integration.

Information Management Improvement Strategies

- Improve current levels of customer service and customer satisfaction
- Implement "business analyst" roles and responsibilities.
- Increase skills and capacity of key staff as a focus for managing change
- Develop and monitor formal Service Level Agreements (SLAs) and performance metrics for IT services
- Reorganize MIS to better reflect current and new functions.
- Provide training for IT staff to improve services and adapt to changes
- Pursue a "federated" IT delivery structure, in which IT service delivery functions are formally allocated among several business units that cooperate with one another and that conform to adopted standards and practices.
- Incorporate a consistent approach to lifecycle development and implementation of systems, including organizational change, Authority-wide policies, and methodologies.
- Implement Applications Portfolio Management procedures
- Develop standard specifications boilerplate for use in procurements.

IT Security Improvement Strategies

- Define standard IT security requirements, policies, and practices.
- Maintain logical isolation of SCADA and other mission-critical systems
- Coordinate physical and cyber security efforts.

Technology Improvement Strategies

- Develop an Authority-wide data architecture
- Develop a systems architecture as the framework for infrastructure changes
- Build an IT infrastructure to support evolving computing needs throughout the Authority, including:
    - Enhancing network capacity

  - Upgrading data storage management
  - Upgrading backup procedures and tools.
  - Upgrading disaster recovery
  - Reviewing current server utilization to identify opportunities for consolidation, virtualization
- Include an assessment of IT infrastructure and facilities in new IT projects.

IT Governance Strategies

- Define organization, roles, and responsibilities for IT governance
- Adopt IT governance processes that include:
  - Review of compliance to specifications and standards
  - Justification for customizations
  - Utilize an Authority-wide data architecture to ensure data sharing
- Integrate application portfolio management assessments into governance decision making
- Initiate evaluation of outcomes leading to future strategic plan updates (longer term)
- Require early involvement in technology initiatives by IT management
- Enhance formal review and approval process for applications and systems, based on business cases

These strategies tell us **what** the Authority wants to accomplish though its use of general information technology, but not the specifics of **how**. These strategies were used during the rest of the strategic planning project to define a set of *Program Elements* that say how the Authority will implement Strategies during the five-year planning period, in order to support the Target State Vision.

3.3. Target States

The results of the strategy workshop were used by the consultants to organize current information technology and water / wastewater industry best practices to address the issues and opportunities identified during the assessment phase, to derive Target States for the use of general information technology within the Authority.

The resulting Target States address each significant dimension of the Authority's strategic planning framework. It includes the identification of hardware, software, and business process initiatives and identifies inter-relationships of key elements of the implementation plan. It leverages to the maximum extent possible the existing infrastructural components and investments, while identifying improvements or enhancements.

Many aspects of the Target States presented in this Strategic Plan focus upon process improvements across the software development lifecycle – beginning with working within architectures and standards, systematic methods of identifying and prioritizing requirements, repeatable and effective methods of procuring and implementing technology solutions, and

change management processes to ease implementation. These initiatives build upon the lessons learned to date, and rely upon adoption and implementation of IT industry standards and practices.

Individual programs within this Strategic Plan typically involve elements from all levels of these Target States. A few programs focus entirely upon the foundational elements of organization and governance.

3.3.1 Business Model

Recommendations:

- **Improve information technology service delivery, including responding to requests for support, infrastructure planning and administration, and delivery of new systems or applications.**

In Westin's approach to strategic planning, the business level drives the technology. Westin reviewed the business functions performed by the Authority. In general, the Authority has previously defined a stable set of business functions, which is not anticipated to change within the five-year planning horizon of this strategic plan. However, there are a number of external influences and internal business drivers which present strategic challenges to which the Authority must respond. In addition, the assessment identified a number of opportunities to make processes more efficient, to reduce paper, to improve management decision support, and to deliver more effective technology support for the Authority's business processes. As a result, this Strategic Plan makes a number of recommendations to improve information technology service delivery, including responding to requests for support, infrastructure planning and administration, and delivery of new systems or applications. These are incorporated into broader programs for information technology improvements.

3.3.2 Technical Target State

The vision of IT usage follows Westin's framework for strategic planning. It includes several levels of system architecture, as spelled out in more detail in the following sections.

A target state defines what is desired to be accomplished. It doesn't spell out all the details, since there are usually several ways of achieving the desired state. These technical details are to be defined as part of implementation. This incremental refinement approach mirrors that commonly used in constructing large facilities such as a pumping station, when a needs assessment sketches out a conceptual design, followed by an engineering design study, which leads to construction drawings and specifications.

The relationships among the several levels of architecture that make up the target state are illustrated in Figure 3.1, and discussed below..

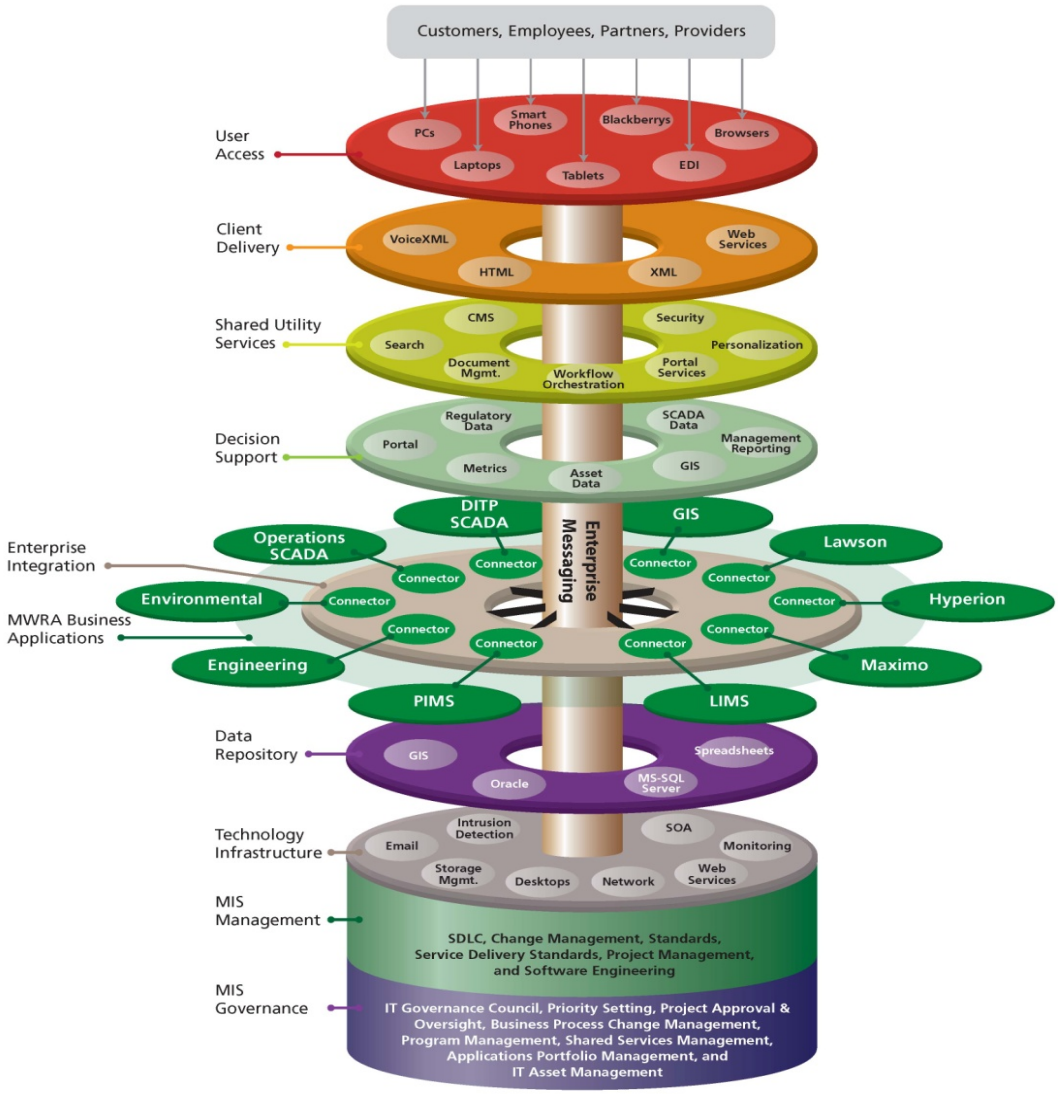


Figure 3.1 Technical Target State

The technical target state provides for the integration of new and existing technologies to deliver department specific and MWRA -wide services through the following layers:

- User Access – methods and devices (3.3.2.1)
- Client delivery – user interface (3.3.2.1)
- Shared utility services (3.3.2.2)
- Decision Support (3.3.2.6)
- Integration (3.3.2.3, 3.3.2.4)
- MWRA Business Applications (3.3.2.5)
- Data Repository (3.3.2.6)
- Technology Infrastructure (3.3.2.7)

3.3.2.1 User Access and Client Layers represent the mechanisms and methods for accessing data and executing automated business processes by the MWRA end users. The mechanisms and methods need to be standardized to: allow for common development tools to minimize support and maintenance overhead and to provide a common user experience no matter what the device or form factor. Current devices are desktop PCs, laptops and BlackBerry devices. Future devices should include smart phones, tablets, along with enhanced business to business integration through web services and electronic data interchange (EDI) methods and techniques.

3.3.2.2 Shared Utility Services Layer represents application services that can be used by other business services to create seamless business processes. Examples of these utility services would be content/document management, portal services, security services, search engine services and workflow orchestration services. These services should be developed by adopting standards and tools which allow for the sharing of functionality across multiple applications.

3.3.2.3 Enterprise Integration Layer supports the Enterprise Application Integration (EAI) program, which replaces complex, proprietary interfaces with standard communications between applications. Current MWRA application interfaces are point-to-point, proprietary and highly coupled. These connections are expensive to maintain and do not gracefully handle updates to software on either side of the interface. In the target architecture, an integration layer allows applications to share data in their native format. The integration engine will:

- Transform and convert data as needed by other applications
- Handle security restrictions related to the data
- Use business rules to route data to and from other applications throughout the Authority (enterprise messaging)

EAI provides not only integration, but also business process workflow and messaging. The development of connectors for legacy applications will expose existing functionality as “services”, allowing them to be invoked commonly through messaging. Other access methods are also available, including database access, direct API, FTP and even e-mail access.

Business process management (BPM, also known as “workflow” or “business rules”) allows orchestration of services to provide new cross-department functionality.

Integration transforms disparate data types and interfaces to a common format allowing sharing of legacy functionality and data. Shared services are common functional components hosted in the integration layer and available to legacy applications as well as business process management workflows. Services can be combined to form compound, cross-department functionality that would have been complicated or impossible using the current approach.

3.3.2.4 Messaging Layer is the communication backbone providing guaranteed and secure communications between legacy applications and the integration tier.

3.3.2.5 Business Application Layer

Recommendations:

- **Formalize applications architecture framework, to which new software solutions must conform.**
- **Coordinate new application development and/or acquisition, from initial consideration through retirement.**

The business application layer defines the individual application systems to be deployed, their interactions, and their relationships to the core business processes of the organization. It includes the User Access and Client Delivery components, which are the "face" of IT for most users. It also includes the Decision Support and Shared Utility Services layers to bring a complete user experience together to accomplish the mission of the organization.

One of the recommended program activities is the formal review and selection of an application architecture. This will build upon the Authority's current investments in MWRA-wide applications (including Lawson, Maximo, and ESRI GIS) and applications support infrastructure (including Oracle and MS SQL-Server, Microsoft operating systems and development platforms). Specific elements that will comprise the application architecture will have to be systematically assessed and adopted by the MIS Department, such as a commitment to a Service-Oriented Architecture (SOA) approach to developing Web services and integration components that transfer data and actions among applications.

Westin recommends an end-to-end approach to defining, acquiring/developing, and implementing applications. This incorporates commitments to data sharing and integration, and support and extension of the current application suite. It is especially important that an application not disrupt the user experience, e.g., when it requires a nonstandard browser or operating system version that is not compatible with other aspects of the application architecture. The Strategic Plan includes programs to enhance several of the existing core applications (such as Lawson and Maximo). It also includes a few additional applications (primarily Enterprise Content Management).

The strategic plan also includes some low-level application standards recommendations, in support of data architecture recommendations. These include investigation of private cloud computing and increasing use of Web services for greater integration capabilities among applications. These recommendations constrain but do not dictate options for application architecture elements.

New candidate applications should be assessed for how well they fit with the Authority's existing application suite. If a module of an existing Authority-wide application is adequate for the business need, it should be the first option. Any decisions about candidate applications, including reassessment of existing applications as they near end-of-life, should incorporate these considerations as part of the IT governance review of the business case for change.

3.3.2.6 Data Architecture, Decision Support and Repository Layers

Recommendations:

- **Manage data as a critical resource of the Authority**
- **Formally specify key data architecture elements**
- **Maximize MWRA's ability to share high-quality data among multiple users.**

Data architecture defines a framework for the structure of an organization's logical and physical data assets and data management resources. The key objective is the ability to extract maximum business value from any data captured by the Authority, regardless of the data resource management system that contains it. This is illustrated conceptually in Figure 3.3, in which users of all Authority-wide applications are accessing shared, common Authority data.

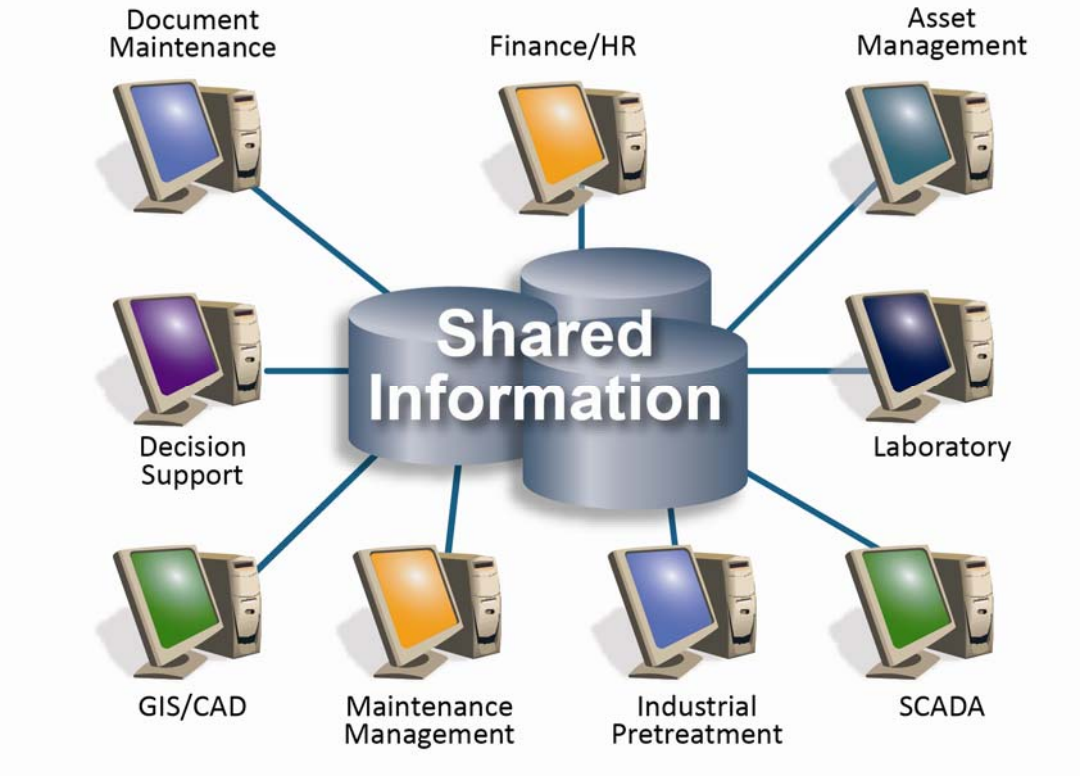


Figure 3.3 – Future Data Architecture

The heart of the data architecture recommendations is readiness for data sharing. This does not include the transport mechanisms that enable actual communications among applications, which is included in the Integration Architecture Layer. Instead, data architecture involves documentation of physical data structures and logical models that capture the meaning of the data to the various business units. It also includes administrative procedures for data stewardship for effective management of the data as a valuable Authority-wide resource.

One of the recommended program activities is formal specification of key data architecture elements for the Authority. The conceptual data architecture being recommended relies on the following components, some of which are new activities at the Authority and some involve better utilization of existing activities. These include development of:

- A logical data model, to identify business definitions and common naming conventions for data elements in a standardized taxonomy. Any new data set should conform to the enterprise logical model so that every physical data element it includes matches a logical data element within the enterprise model. (Of course, a new data set may legitimately require an update to the logical model, as for example when a new regulation mandates

collecting additional water quality measurements.)

- Cataloging of physical data resources, including their contents, layout, and relationship to elements in the logical model. This catalog must be generally available for query by Authority staff, who will be guided by the catalog in requesting copies of data or writing queries against already available data.
- Designation of the "system of record" for key data elements. This may lead to reduction of redundant data sets through substitution of access to the system of record, or may lead to improved business processes to incorporate data flows to synchronize necessary copies with the contents of the system of record.
- Integration with applications architecture elements to ensure generally available mechanisms for sharing data from the system of record across multiple other systems, through dynamic access as needed or updating copies appropriately. This can be accomplished by the implementation of standards for XML messaging based on best available tools and current best practices
- Identification of custodians of the data resources and establishment of governance mechanisms to ensure general accessibility of data, subject to appropriate security restrictions.

3.3.2.7 Technology Architecture and Infrastructure Layer

Recommendations:

- **Establish Enterprise Applications Integration (EAI) across the Authority**
- **Shift approach away from application-by-application infrastructure approach towards an Authority-wide approach.**

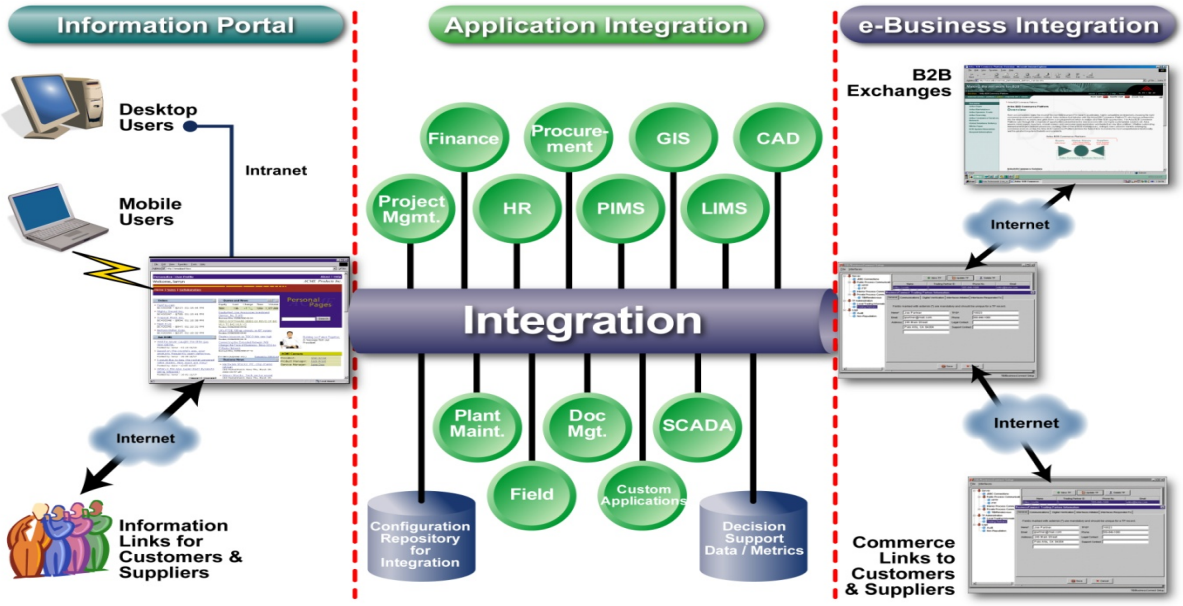


Figure 3.4 – Enterprise Application Integration Architecture

Technology architecture focuses on logical software and hardware capabilities, including IT

infrastructure, middleware, networks, communications, processing, and standards. As with applications architecture, the plan's recommendations involve setting standards and making systematic decisions among alternative technology elements. This emphasizes the logical capabilities, since specifics are best defined on a case-by-case basis (e.g., sizing a server).

This layer of architecture includes a number of policy issues. We have incorporated recommendations on those policies that we think appropriate within individual programs. Section 4.5 includes discussions of a number of these, such as pros and cons of cloud computing as a physical architecture implementation policy.

The target state for technology includes two key directions. First, we recommend a commitment to Enterprise Application Integration (EAI). This provides a cross-departmental "glue" that enables the Authority's various applications to be integrated in a cost-effective and flexible manner. EAI also includes enterprise messaging – cross-department, enterprise business rules; workflow management; and the enterprise message bus – and the selection of vendors and development tools that support a consistent approach to integrations. We recommend exploration of Web services as a core component of integration. Figure 3.4 illustrates how EAI, enterprise messaging, and web services provide a platform for internal and external technology integration.

The second key recommended direction is a shift of strategy away from an application-by-application infrastructure approach towards an Authority-wide approach utilizing pooled infrastructure resources. This supports increased virtualization and other management strategies aimed at simplifying technology support efforts.

The target state for technology infrastructure has four dimensions. Each of these dimensions establishes the goals and objectives associated with all IT infrastructure components see Figure 3.5 and the following descriptions:

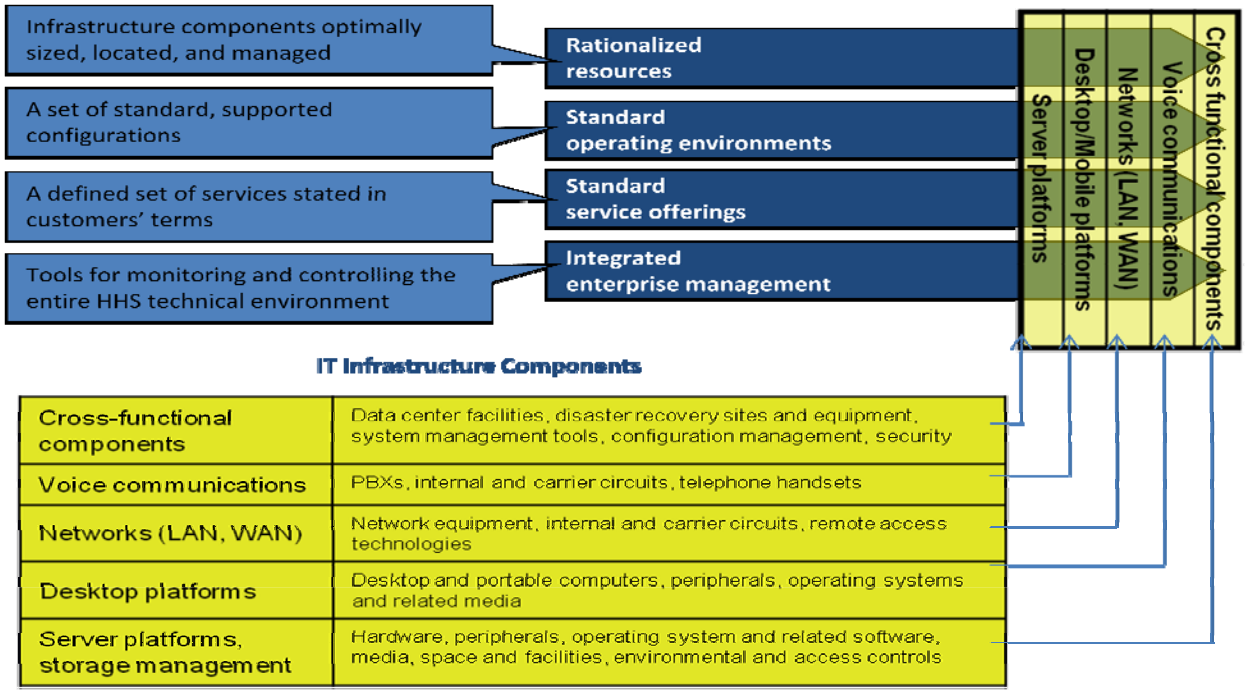


Figure 3.5 - IT infrastructure Target State Guiding Principles

1. Rationalized Resources
    a. IT infrastructure components should be sized and located to take advantage of hardware and software economies of scale.
    b. Access, authentication and security management and administration should be standardized and centralized.
    c. Capacity planning should be instituted to ensure that sharing of resources and backups are optimized
    d. All components physically located in secure environments.
2. Standardized Operating Environments
    a. A finite set of standard operating environments fully supported by the organization, extending to all technology infrastructure components
    b. Full interoperability across operating environments, managed by an MWRA-centric group, utilizing managed services where appropriate.
3. Standard Services Offerings –
    a. A finite set of IT infrastructure service offerings and service level tiers, supported by a services catalog and performance standards
    b. Centrally defined, managed, and measured
    c. Stated in end-user IT customer terms.
4. Integrated Enterprise Management
    a. Operate a centralized service desk and information technology service management function that provides central monitoring and management of all IT infrastructure components, independent of location, from a limited number of locations
    b. Integrated enterprise management covers:
        i. Event Correlation and Management
        ii. Service Desk and Customer Service Functions
        iii. IT asset, configuration and contract management
        iv. Life Cylcle Managment
    c. Key features include:
        i. Automated hardware event notification and tracking
        ii. Remote desktop support
        iii. Remote software distribution
        iv. Multiple channels to help desk (telephone, email, etc.)
        v. Automated asset tracking

As can be seen in Figure 3.6 below, these dimensions are driven by industry best practice to establish MWRA guiding principles to be used in achieving these goals.

Figure 3.6 - MWRA Infrastructure Guiding Principles

3.3.2.8 MIS Organization

Recommendations:

- **Structure IT governance and infrastructure architecture programs so as to coordinate the various IT service delivery groups now in existence.**
- **Take advantage of consolidation of IT infrastructure to streamline MIS and other IT groups.**

Many IT issues relate to the MIS organizational structure and business processes. This strategic plan envisions a reorganized MIS Department that is organized along functional lines. This is intended to support best practices around pooling similar staff resources and focusing upon identifying root causes of incidents and finding long-lasting solutions.

The Strategic Plan's recommendations also include the recognition and strengthening of the current "federated" approach to IT service delivery that has been adopted by the Authority. Figure 3.4 summarizes the functional distribution of the standard inventory of IT business functions (based on COBIT standards; see Section 4.5.5 for a discussion of COBIT and other IT standards). In the Assessment Phase, Westin identified six IT groups in addition to the MIS Department, as well as a number of individuals within other business units whose job duties include a significant level of IT responsibilities.

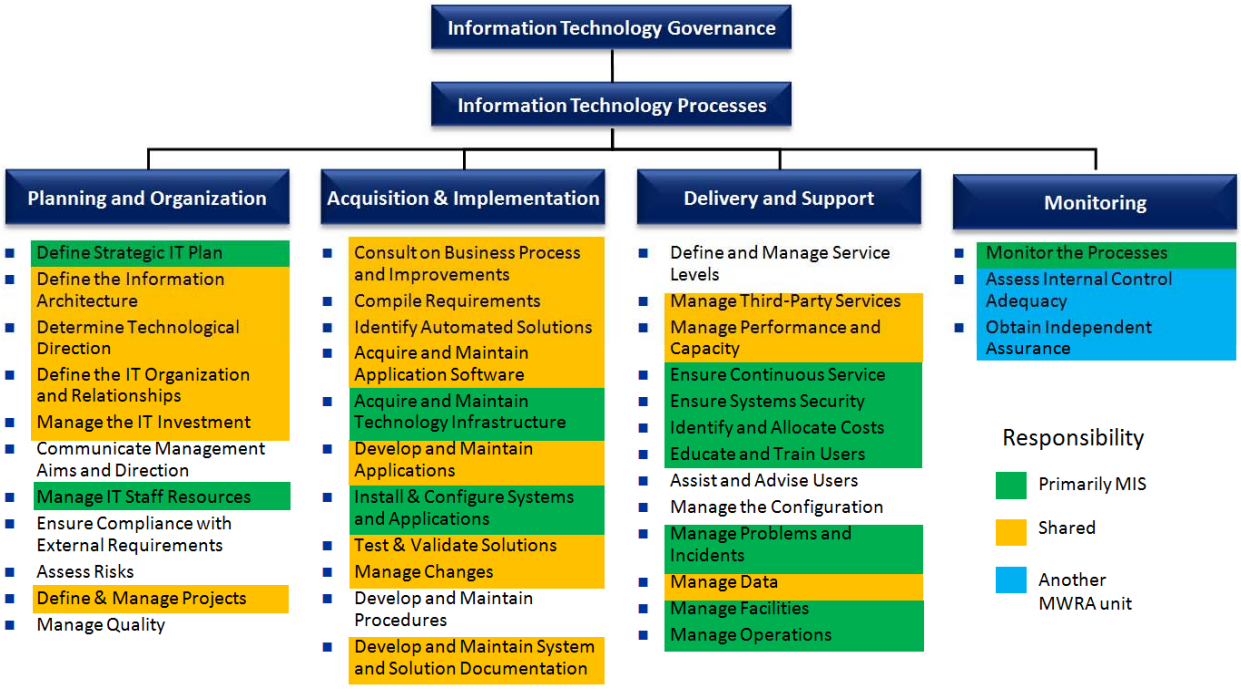


Figure 3.7 – Information Technology Functions

This "federated" approach to IT service delivery (in which business responsibilities are divided among several business units) is not uncommon in utilities and other organizations, and can be quite effective. One reason for setting up a specialized IT group might be to closely couple the IT support with specialized business knowledge – for instance, utilities frequently set up their SCADA operations within facility operations business units. The biggest risk of federated IT service delivery is that it will degenerate into a situation in which each unit acts completely independently) to all of the others, which can lead to confusion and inefficient IT services.

Westin recommends that IT governance and infrastructure architecture programs be structured to coordinate the existing IT service delivery groups. There is already a model for this approach in that all Authority staff utilizes the same general IT network, email, and other systems. The intent is that it should not matter which business unit initiates an IT activity so long as it conforms to Authority standards and best practices. Note that this federated approach could lead to increased staffing levels if the consolidation of common services (e.g. network, server and data base administration) is not addressed. For further discussion see Section 4.5.1 – Staffing.

3.3.2.9 IT Methodologies

Recommendations:

- **Adopt industry-standard methodologies for IT service management.**
- **Adopt consistent, repeatable methodologies for software engineering and Software Development Lifecycle.**

The target state for IT Service Management activities such as application implementation is that projects are scoped and specified appropriately, and systematically implemented in an effective, repeatable manner. This can be formalized by committing to moving up the maturity curve of IT operations, from ad hoc methods that rely strongly on individual heroics towards repeatable, measurable, and predictable methods. Figure 3.8 illustrates several maturity levels of IT services and characteristics of these IT maturity levels.

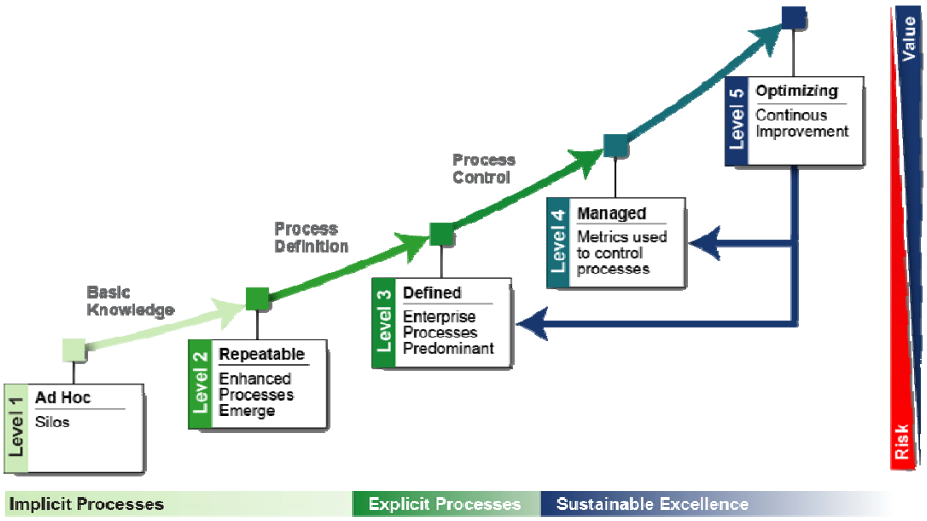


Figure 3.8 – IT Performance Improvement

The Strategic Plan includes a number of recommendations for adopting standard methodologies and best practices. This will provide the framework to move to repeatable project plans and consistent implementations. Figure 3.9 is an example illustrating such a methodology.

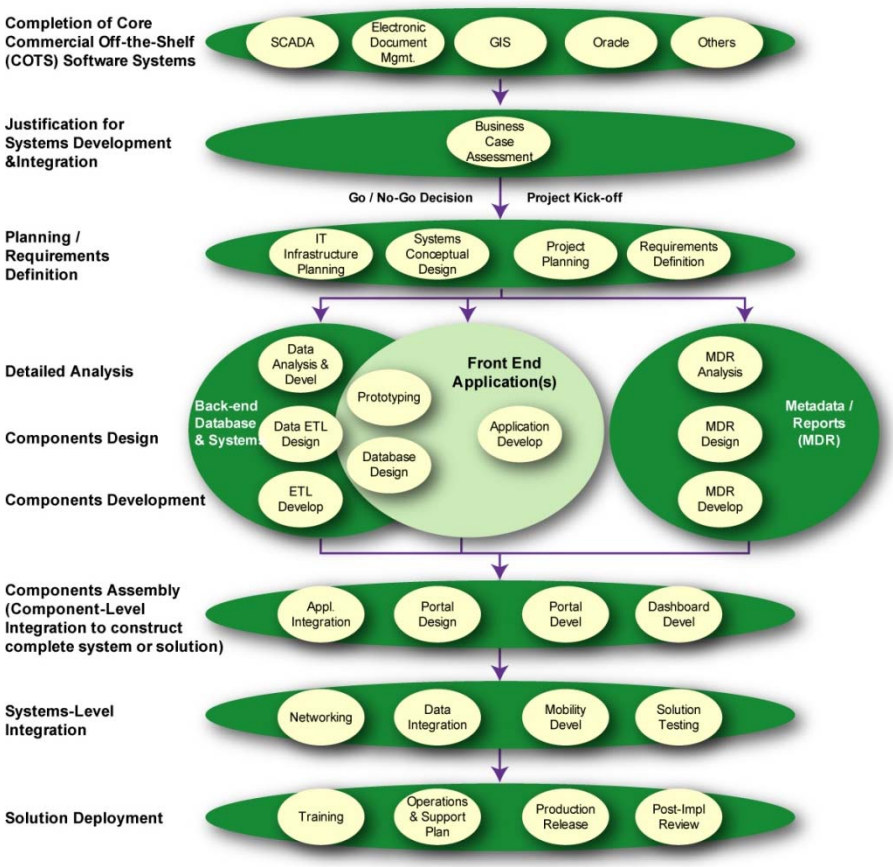


Figure 3.9 – Repeatable Addition of Systems

It is important to recognize that the Authority does not need to develop such processes in-house, though it is highly appropriate to build on lessons learned from past successful projects. Instead, the Authority should research and adopt best practices, standards, and methods already demonstrated to be effective within IT. For example, project management practices have been codified by the Project Management Institute, and are available for adoption from that organization along with implementation tools and training. Other standard methodologies are discussed in Section 4.5 of this document.

4. The Strategic Plan for Technology

At the outset of this Strategic Planning engagement, the Authority's existing technology resources, their present support of business needs, and future business requirements for technology were assessed along the dimensions illustrated in Figure 4.1 below.

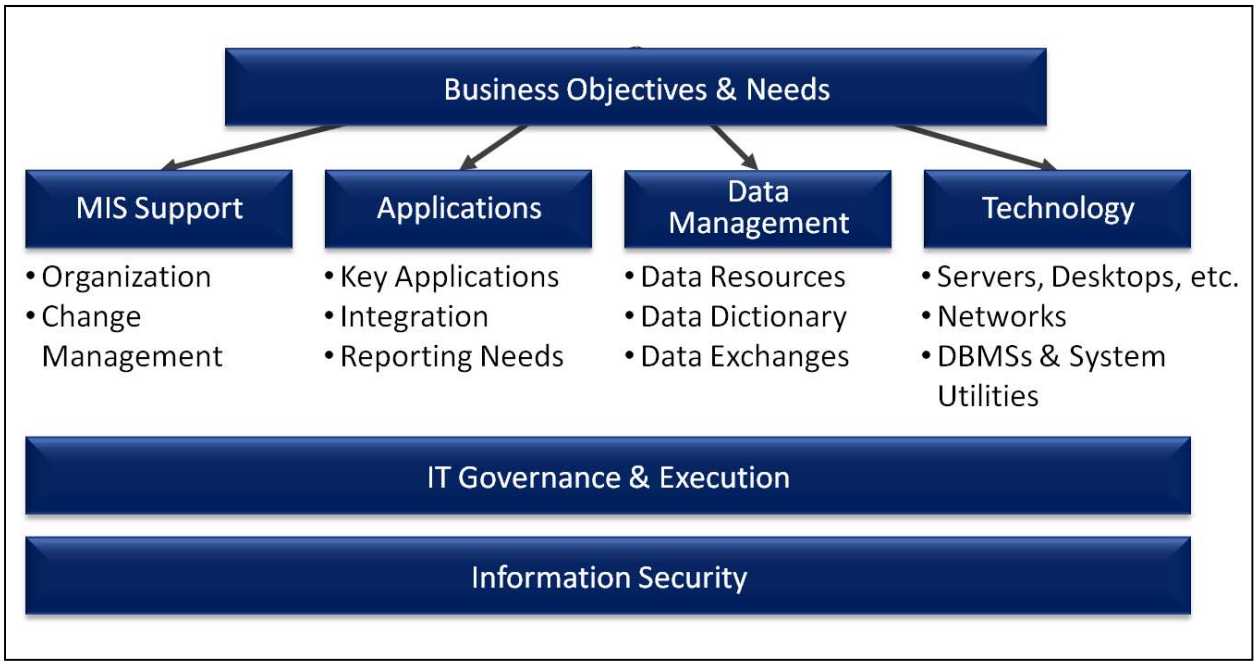


Figure 4.1 – IT Strategic Planing Framework

All of these dimensions must be managed to assure successful achievement of the Authority's Technology Vision and target states identified above. The Assessment approach and findings are summarized in Appendix A of this report.

The MIS 5-Year Strategic Plan is composed of four program areas which contain fifteen (15) actionable programs, each of which addresses various opportunities for beneficially applying technology to address the Authority's highest priority opportunities and strategies. These programs will run concurrently throughout the five year planning period for this Strategic Plan.

A summary of these programs is provided below. Detailed descriptions of each program's scope, benefit types, outcomes, dependencies, and duration are included in Appendix B to this report. The recommended five year schedule for the Strategic Plan is shown in Appendix C, and the estimated costs for each program are presented in Appendix D. The overall MIS Strategic Plan includes four program areas, all of which are critical to the success of the program: (1) Applications, (2) IT Management, (3) Information Security, and (4) Technology.Infrastructure. It should be noted that the mapping of the Planning Framework above to the programs is as follows:

Applications Program addresses the *Business Objectives and Needs* deminsion as well as the Applications demensions IT Management Program addresses the MIS Support and IT Governance & Execution dimensions

Information Security Program addresses the Information Security dimension

Technology Infrastructure Program address the Data Management and Technology dimensions

The Strategic Plan was developed to implement the Technology Vision and the Strategies identified in Sections 2 and 3 of this report above. This action plan is designed to be implemented as a "Program", which contains an integrated set of identified and prioritized projects. Program management consists of a dedicated staff with an enterprise perspective using proven methodologies to implement the projects, business process improvements, and integrations recommended in this plan. Program management is successful in executing complex, multifaceted efforts because of the following:

- Focus on the overall technology vision and on addressing the Authority's business needs.
- Central management of all related projects, business processes, and integration activities.
- Application of ALL the resources and skills needed to successfully achieve the business objectives for technology investments.
- Minimizing "trial and error", resulting in faster realization of tangible business benefits.

4.1. Applications Programs

The recommended applications programs address opportunities related to MWRA's core Authority-wide applications. These are the systems that are widely used to support mission-critical operations (e.g., Maximo, Labware) and administration (e.g., Lawson Finance and Human Resources). The recommended improvements are designed to deliver the functionality required to improve current business practices and meet the Authority's emerging business challenges.

4.1.1 Enterprise Content Management

Implement a Authority-wide Enterprise Content Management (ECM) program to address the organization's dependence upon paper records, support records management activities, improve access to information, streamline work flows, and replace several existing departmental-level solutions.

Schedule: Initial Implementation from October 2013 through September 2015 for first deployment; additional deployments thereafter

Cost:

Hardware	Software	Professional Services	Total
$250,000	**$250,000**	**$1,500,000**	**$2,000,000.00**

ECM is an umbrella term including document management, web content management, search, collaboration, records management, work flow management, document capture, and scanning.

ECM is aimed at managing the life-cycle of information from initial publication or creation all the way through archival and eventual disposal.

Note that this will be a significant Authority-wide effort, affecting the business processes of every Department, and including the following:

- Policies
- Standards
- Alignment with Records Management and Retention Schedule
- Business processes and practices
- Data conversion and management

It is anticipated that ECM will be implemented incrementally, based upon various Departments' needs and the availability of resources to participate in implementation tasks.

4.1.2 Lawson Enhancements

Upgrade Authority's Lawson Finance, Human Resources, and Materials Management installations.

Schedule: Version 9.0.1 Upgrade, Workflow, & Additional Modules from January, 2012 through September 2013; Lawson/Infor 10 Upgrade & Budgeting Module from January, 2015 through July, 2016

Cost:

Hardware	Software	Professional Services	Total
Included in Technology Infrastructure Program	**$500,000**	**$1,250,000**	**$1,750,000.00**

The first Phase of this program will be an upgrade to the most current version of the application software (ver. 9.0.1), implementation of the Contracts Management, Strategic Sourcing, Supplier Order Management, and Process Flow Integrator modules, business process improvements, and reconfiguration of Lawson Finance to utilize newly-available capabilities. The benefits from these upgrades include replacing up to four existing in-house developed applications with integrated functionality, avoiding premium charges for the vendor's support of an old release, automating manual processes, eliminating redundant entry, and improving management reporting and decision support.

The second phase of Lawson enhancements is planned to include upgrading to Infor version 10 and potentially, other beneficial optional modules. Note that the final scope of this Phase will be dependent upon the products, functionality, integratability, technology, and support provided to the Authority subsequent to Lawson's acquisition by Infor Global Solutions in 2011. This Phase potentially also includes implementation of Lawson / Infor's integrated Budget Planning module when the Authority's functional and/or technical requirements overtake the capabilities of the existing Hyperion Budgeting application.

4.1.3 Maximo Upgrade

Upgrade Authority's Maximo installations.

Schedule: Immediate through March, 2013

Cost:

Hardware	Software	Professional Services	Total
Included in Technology Infrastructure Program	**$250,000**	**$1,000,000**	**$1,250,000.00**

This program includes completion of the migration to the Maximo Version 7.5 (which is currently underway), acquisition of additional modules and richer integrations, reconfiguration, improvements in workflows and reporting, consolidation of the two existing Maximo instances, and business process improvement to exploit the added functionality. This upgrade could eliminate the need for some of the Authority's in-house developed applications, which will provide users with an integrated solution, eliminate redundant entry, and reduce MIS support effort.

4.1.4 GIS Applications and Integration

Assess GIS's potential and the Authority's needs to develop an Authority-wide GIS strategic plan which details organizational roles/responsibilities, project priorities, and processes for updating the GIS and keeping its data current.

Schedule: Initial Implementation from July 2012 through June 2013; additional deployments thereafter

Cost:

Hardware	Software	Professional Services	Total
Included in Technology Infrastructure Program	**$50,000**	**$300,000**	**$350,000.00**

The Authority's GIS has reached a level of maturity where it can be integrated to "spatially enable" other Authority applications. Thus, GIS has the potential to support a number of MWRA requirements, including Oracle applications, sewer television inspection (CCTV), PIMS, water transmission system modeling, other databases, and expanded functionality for the existing Maximo integration. In addition, GIS technology can meet several of the Authority's needs for scientific, environmental, and engineering analyses and applications. Achieving these benefits will require planning to ensure the technology is applied in such a way as to provide the foundation for developing and acquiring GIS applications for scientific, environmental, and engineering analyses, as well as expanded "spatial enabling" of existing applications.

4.1.5 Mobile Integrations

Expand the application of mobile computing to meet the Authority's identified business requirements in the Laboratory, Deer Island Operations and Maintenance, and other operations and management areas.

Schedule: October, 2014 through December 2015

Cost:

Hardware	Software	Professional Services	Total
$100,000	$50,000	$0	$150,000.00

Support for mobile integration needs to address uploads, downloads, backups, and wireless communication versus docking; and identify implementation, support, and deployment requirements. A mobile strategy should be defined and kept up-to-date, identifying which technologies and standards will be supported (e.g., tablets, smart phones, laptops, etc.). Viable third-party COTS applications should also be assessed. Mobile capabilities will be implemented and integrated with existing enterprise applications in multiple Phases.

The functional benefits of integrating mobile devices with existing applications include:

- Data entry at the source (which is a best practice), resulting in more timely operational information and improved reporting accuracy.
- Near-ubiquitous access to automated Authority data.
- Elimination of re-keying handwritten data and the QA/QC problems created by re-entry.

4.1.6 Authority-wide Performance Management

Implement automated tools to support the compilation of monthly and quarterly performance and other reports

Schedule: January, 2016 through June, 2017

Cost:

Hardware	Software	Professional Services	Total
$75,000	$0	$125,000	$200,000.00

Reporting needs to be addressed by this program include tools for extracting data from existing operational applications, managing data quality, generating reports (including dashboards, graphics, and various analyses), and automating report assembly. In addition to greater efficiency, benefits from this investment will include more flexible and timely reporting, the ability to drill down into details of problems when necessary, and integrating data from multiple systems in consolidated performance reports.

4.1.7 Pretreatment Information Management System (PIMS) Enhancements

Enhance the Pretreatment Information Management System.

Schedule: January, 2012 through September, 2014

Cost:

Hardware	Software	Professional Services	Total
$ Included in Technology Infrastructure Program	**$0**	**$100,000**	**$100,000.00**

The Authority has a strong preference to meet the TRAC Department's operational requirements by resolving issues with the existing PIMS application. This program will assess the current state of the PIMS implementation to develop and execute a plan for addressing a number of functional issues, as well as needs to comply with new regulations. Benefits of this effort will include improving the TRAC Department's efficiency and ability to serve its customers, assuring data integrity, and complying with the Federal EPA goal of receiving all applicable reports electronically though the CROMERR system by 2014.

4.2. IT Security Programs

While no significant cyber security issues were observed by Westin with the Authority's information technology infrastructure, this project expands and formalizes that program with the objective of better coordinating physical and cyber security efforts for a holistic approach that minimizes the potential for oversights.

Security is a top priority of the Authority and IT (or "cyber") security receives considerable attention. The potential improvements include defining and implementing an information security program, and an electronic security plan including standards, policies, and practices. These standards and policies will be designed to replace ad hoc responses to specific situations.

The goal of this more formal, comprehensive IT Security Program is to provide information security for the information and information systems that support the operations and assets of MWRA, including those provided or managed by an outside entity, including but not limited to any agency of the Commonwealth of Massachusetts, Department of the United States Federal Government, or contractor for MWRA.

A utility like MWRA qualifies as "critical infrastructure" as defined by the US Department of Homeland Security (DHS), and therefore should adhere to the guidelines offered by DHS and US-CERT CSSP (http://www.us-cert.gov/control_systems/csstandards.html#plan) (United States Computer Emergency Readiness Team, Control Systems Security Program). DHS recommends developing an Information Security Program and policy development according to standards such as NIST SP 800-53, Rev 3, "Recommended Security Controls for Federal Information Systems and Organizations," (http://csrc.nist.gov/publications/nistpubs/800-53-Rev3/sp800-53-rev3-final.pdf) which is the standard recommended here. NIST SP 800-82, "Guide to Industrial Control Systems (ICS) Security," (http://csrc.nist.gov/publications/nistpubs/800-82/SP800-82-final.pdf) should be followed for MWRA's SCADA / process control systems.

These recommendations are organized into two programs, discussed below. The Information

Security Program (ISP) is intended primarily to establish organizational arrangements for ongoing provisioning of IT security services to the Authority. The Electronic Security Program (ESP) is intended to coordinate a system-by-system development of Electronic Security Plans that spell out in detail what cyber security measures are appropriate for that system (for example, for Maximo), who is responsible, and what needs to be done.

4.2.1 Information Security Program (ISP) Development

Develop an Information Security Program.

Schedule: April, 2012 through December, 2013

Cost:

Hardware	Software	Professional Services	Total
$20,000	**$30,000**	**$250,000**	**$300,000.00**

An ISP is a management system that represents the policies, procedures, and security controls implemented within an organization. Security controls are the management, operational, and technical safeguards or countermeasures employed within an organizational information system to protect the confidentiality, integrity, and availability of the system and its information assets, including but not limited to sensitive information (for example, personal information).

According to the Computer Security Research Center of the National Institute for Standards and Technology (NIST), an effective ISP must provide both management and staff with a detailed understanding of the goals, approach, and implemented controls for securing the organization's information, and should include the following components:

- Periodic assessments of risk, including the magnitude of harm that could result from the unauthorized access, use, disclosure, disruption, modification, or destruction of information and information systems that support the operations and assets of the organization
- Policies and procedures that are based on risk assessments, cost-effectively reduce information security risks to an acceptable level, and ensure that information security is addressed throughout the life cycle of each organizational information system
- Subordinate plans for providing adequate information security for networks, facilities, information systems, or groups of information systems, as appropriate
- Security awareness training to inform personnel (including contractors and other users of information systems that support the operations and assets of the organization) of the information security risks associated with their activities and their responsibilities in complying with organizational policies and procedures designed to reduce these risks
- Periodic testing and evaluation of the effectiveness of information security policies, procedures, practices, and security controls to be performed with a frequency depending on risk, but no less than annually
- A process for planning, implementing, evaluating, and documenting remedial actions to address any deficiencies in the information security policies, procedures, and practices of the organization

- Procedures for detecting, reporting, and responding to security incidents
- Plans and procedures to ensure continuity of operations for information systems that support the operations and assets of the organization.

4.2.2 Electronic Security Plan (ESP)

Develop a set of Electronic Security Plans.

Schedule: July, 2012 through December, 2013

Cost:

Hardware	Software	Professional Services	Total
$ Included in Technology Infrastructure Program	**$100,000**	**$300,000**	**$400,000.00**

An ESP represents a holistic view of the security controls and standards applied to each system within MWRA's application portfolio. In order to manage the Authority-level risk associated with operating a specific information system, the following lifecycle activities must be undertaken (in the order listed):

- **Categorize** the information system (and classify its data)
- **Select** the set of minimum (baseline) security controls
- **Refine** the security control set based on risk assessment
- **Document** security controls in system security plan
- **Implement** the security controls in the information system
- **Assess** the security controls
- **Determine** agency-level risk and risk acceptability
- **Authorize** information system operation
- **Monitor** security controls on a continuous basis

4.3. Information Technology Management Programs (ITMP)

This set of programs focuses on managing the information technology in use at the Authority. The MIS Department has responsibility for the servers and desktop computers used by Authority staff, as well as the networks and other communications infrastructure that allow these computers to work together. These systems must change over time, as components break or become obsolete, and must be modified to accommodate changes in the Authority's business activities. However, these changes must be managed carefully to avoid creating problems for other users.

4.3.1 MIS Reorganization and Change Management

Reorganize the MIS Department to realign structure to better match current and recommended responsibilities.

Schedule: Immediately through March, 2013

Cost:

Hardware	Software	Professional Services	Total
$ Included in Technology Infrastructure Program	**$250,000**	**$1,250,000**	**$1,500,000.00**

Westin's assessment of general IT service delivery at the Authority identified a number of opportunities for improved coordination, IT governance, and service delivery. This section primarily focuses on the MIS Department, although that group is only one of several that provide information technology services.

The MIS Reorganization and Change Management program addresses the scope of services provided by the MIS Department, organizational relationships, personnel resources, and managing change and uncertainty. The project's objectives include strengthening the MIS Department's scope of services to support best practices in designing, selecting, contracting for, and implementing technology solutions. These best practices include business analysis and design, requirements gathering, package configuration and integration, deployment, and implementation project management. The MIS Department should adopt a System Development Life Cycle (SDLC) of planning, defining, designing, constructing, deploying, and supporting systems.

Management initiatives include developing and enforcing the Authority's technology standards and policies, supporting MWRA departments' applications, and initiating MIS Department performance metrics. This program also includes implementing a new MIS Department staffing model, roles, responsibilities, skills, and training, as well as an enhanced organizational model for serving other Authority technology needs. As an organization, the MIS Department team will include a different composition of skills, adding business analysis, and database administration and management.

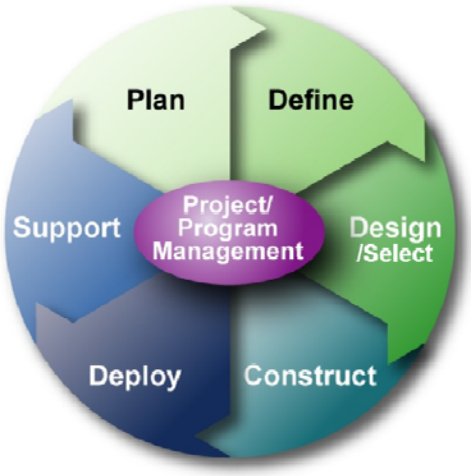
Westin recommends that the current MIS Department be reorganized. The reorganization should be based on grouping similar functions within organizational units. For example, all database administration functions belong together – both for optimum utilization of staff resources and for cross-training and support.

Westin recommends a revised structure based on the following list of functional groupings (Note that these may not represent formal teams within each MIS business unit):

- Administration
  - General Administration
    - Personnel
    - Financial Management
  - Program and Project Management
  - Technical Writing/Publications
  - Asset Management
- Data Management
  - Data Architecture
  - Data Base Design
  - Database Administration
  - Data Administration
  - Library and Records Management.

- Application Services Development
  - Business Analysis and Support
  - Systems Acquisition, Development and Maintenance
  - Systems Analysis
  - Application Design
  - Programming
  - Software Quality Assurance
- Systems Operations and Administration
  - Customer Service Center
  - Training
  - Networks (voice, video & data)
  - Servers
  - Personal Computing Devices
- Information Technology and Security
  - Information Security
  - Technology Architecture and Engineering

One key finding during the assessment phase was that MIS and other groups within the Authority do not have a standard Software Development Life Cycle methodology. This methodology should cover all phases of a software development or procurement project, from initial conception through ongoing support. There are a number of methodologies available from various organizations. Westin recommends that MIS staff investigate various methodologies for end-to-end coverage, fit with other Authority governance practices, and congruence with software engineering and project management practices being expanded concurrently with this program. For illustration, Westin's SDLC model is to the right.



Another key finding was that MIS staff has a strong focus on responding to incidents, whether a call to the Help Desk or a problem with one of the servers. However, there should be more focus on problem resolution. This is more likely to be a problem when the underlying causes of the incident are unclear or fall within the responsibility of more than one team. This program includes the adoption of industry best practices for IT service management and delivery, possibly using the ITIL methodology. Implementing these best practices will be facilitated by the recommended reorganization.

4.3.2 IT Governance

Implement formal IT Governance Program consisting of the following key activities:

- **Establishing a formal IT Governance process**
- **Implementing service delivery standards and governance best practices**
- **Managing the implementation of the five year strategic plan**

Schedule: Immediately through December 2012

Cost:

Hardware	Software	Professional Services	Total
$ Included in Technology Infrastructure Program	**$100,000**	**$1,100,000**	**$1,200,000.00**

IT Governance is the systematic process of allocating resources and coordinating efforts among multiple technology projects. Best practices suggest that MWRA should use IT Governance to direct investments in technology to maximize support of the Authority's business goals and objectives.

To move toward best practices for IT Governance, the Authority should define and implement roles and responsibilities for setting allocating technology resources and recommending technology-related policies and standards. Elements of the Authority's IT Governance should include the following:

- Developing and monitoring formal service level objectives and standards for MIS services and project delivery
- Utilizing business cases, formal reviews, and an approval process for major technology initiatives
- Assuring that the MIS Department management has early involvement in all technology initiatives, including planning and defining technology elements in other departments' major projects
- Implementing Application Portfolio Management
- Applying asset management practices to information technology infrastructure and systems
- Periodically updating the Authority's Information Technology Strategic Plan.

Applications Portfolio Management (APM) is a governance process for ensuring that an organization's technology investment is consistent with its business strategy. It defines key performance indicators and technical metrics for applications and supporting infrastructure, then utilizes trends derived from these metrics to decide when to make further investments in existing technology, modernize/upgrade, or retire and possibly replace. For example, APM involves evaluating the total cost of ownership for each application in an organization's portfolio to identify candidates for replacement (if, for example, an application otherwise meets business needs but requires a nonstandard operating system on the server which requires a specialized server support staff, it may be worthwhile to replace or restructure just to reduce those support costs). APM reinforces business units' ownership of technology initiatives that benefit those business units, rather than being strictly an IT/MIS responsibility.

This MIS 5-Year Strategic Plan is designed to be implemented as an overall program using best project management practices coordinated through a Program Management Office. Program management consists of a dedicated staff with an Authority-wide perspective using proven methodologies to implement the projects, business process improvements, and integrations recommended in this plan. Program management is successful in executing complex, multifaceted efforts because it focuses on the overall technology vision and on addressing the Authority's business needs.

4.4. Technology Infrastructure Programs

This aspect of the Strategic Plan focuses on the infrastructure upon which IT applications depend. Most of these initiatives will be invisible to the average user, but are necessary to deliver the enhanced capabilities identified as priorities for the Authority.

4.4.1 IT Infrastructure Upgrades

Upgrade the Authority's IT infrastructure to better support Authority-wide computing and processing, including development of a flexible systems architecture that supports current and anticipated IT needs, upgrades to current infrastructure, and modifications / extensions.

Schedule: Immediately through June, 2017

Cost:

Hardware	Software	Professional Services	Total
$6,000,000	**$1,000,000**	**$500,000**	**$7,500,000.00**

These upgrades are necessary because the recommended changes to the Authority's utilization of IT (such as increased data accessibility and transfer over networks through the Authority-wide Data Management initiative) may mean that current infrastructure configurations are no longer suitable. Specific upgrades include the following:

- Develop a formal IT systems architecture, to coordinate investments in infrastructure elements.
- Upgrade network infrastructure elements
- Upgrade file storage and management
- Upgrade backup capabilities, to include files on desktop computers
- Improve server management, including standardization, increased use of virtualization, and physical server consolidation
- Enhance fault tolerance and disaster recovery planning
- Develop Enterprise Application Integration (EAI) capabilities, to streamline integration of applications and data sharing

4.4.2 Email Upgrades

Upgrade email system and services

Schedule: July, 2012 through December, 2012

Cost:

Hardware	Software	Professional Services	Total
$50,000	**$25,000**	**$75,000**	**$150,000.00**

The Authority has already begun upgrading the Microsoft Exchange software, which manages Outlook email across the agency. This will remove some constraints on how email can be used, including allowing larger attachments and greater storage capacity. This program includes systematic implementation of increased limits and improved archiving practices. It also involves exploration of automation tools for managing email, including automated archiving, automated backup, legal holds, indexing and search.

4.4.3 Authority-wide Data Management

Implements business and technical standards and practices to maximize data integration, reusability, and value across multiple applications throughout the Authority

Schedule: January, 2013 through December 2014; additional deployments thereafter

Cost:

Hardware	Software	Professional Services	Total
$ included in the Infrastructure upgrades	**$300,000**	**$1,200,000**	**$1,500,000.00**

Data is a critical resource within any organization. To provide every employee with access to data and achieve the maximum value from each element of information, data must be designed for reusability by multiple applications within the Authority. This program implements business and technical standards and practices to maximize data integration, reusability, and value across multiple applications throughout the Authority to achieve these goals. This will include design of a data architecture that structures data resources and information systems to capture a data element in a single authoritative source, and provide efficient linkages among systems such that data can flow from the source to all authorized consuming systems and users.

4.4.4 User Data Management

Expand ability for users to manage their working data on Authority systems

Schedule: Immediate through September, 2012

Cost:

Hardware	Software	Professional Services	Total
$40,000	**$10,000**	**$20,000**	**$70,000.00**

Some employees within the Authority have experienced problems with managing their working files within the current file management structure. This program identifies several initiatives to resolve these issues, which is possible because of upgrades to email software and network file storage capabilities either already underway or recommended elsewhere in this Plan. Major changes include:

- Establish secure method of transferring large files between Authority staff and external collaborators. This may involve a secure variant of FTP (File Transfer Protocol) software or some similar capabilities.
- Increase the maximum file attachment size in MS Outlook.
- Restructure disk storage allocations for work teams.
- Develop user data management strategies to guide server and storage upgrades, etc.

4.5. Recommended Policy Guidelines

This section of the Strategic Plan provides guidance on various policy issues that have come up during the development of the plan. They do not fit comfortably within specific programs, but instead offer guidance during the implementation of the recommended programs.

4.5.1 Staffing

4.5.1.1 Levels of IT Staffing

Establish a target total MWRA IT staffing of 75 which is based on industry averages for utilities as well as the North American average for all industries. Furthermore, following similar industry metrics for staffing levels, optimally 55 would be FTEs and 20 would be contractors. (Note that this level of reductions is only possible if technology alignments and other aspects of this *Strategic Plan* are also implemented.)

Supplement Authority employees with contractors and consultants as necessary to acquire *specialized* skills needed for short periods (for instance, for implementation of a new system).

The prevailing water and wastewater utility IT organizational structure is decentralized and therefore, it is difficult to locate usable standard industry metrics on IT staffing size. There is simply too much variability that depends on technical maturity, organizational (and business user) maturity, IT organizational maturity, etc. The manner in which the Authority has distributed responsibility for various IT functions among seven IT specialty teams (including MIS Department), plus a number of other staff having some level of IT responsibilities within their teams in addition to their primary job functions, makes such comparisons less appropriate. At a minimum, there is inefficiencies in separately managing many of the common technologies (networks, servers, databases, etc.) used by each group regardless of the business purpose.

We are providing some general indicators of staffing trends, and indicating impacts of selected strategies on IT staffing size.

The Gartner Group, in a published summary of their IT Key Metrics Data for 2009 http://www.gartner.com/technology/consulting/key_metrics_data.jsp indicates that across all surveyed firms, IT staffing averages 6.1% of total staffing and for the utility industry 6.2%. It furthermore, notes that for all firms surveyed in North America the average is also 6.2

MWRA has somewhat more IT staffing than the Gartner averages when taken collectively across the MIS Department (55), SCADA (10), PICS (18) and Telog (1). The 84 IT staff count is slightly more than the average of 6.2% of total employees. Using the 84 staff to define the "worst case", the percentage of IT staff to total MWRA staff is currently 7%.

The percentage of IT staffing above these broad averages is probably indicative of the opportunities for improvements identified in this study. It is probable that staffing levels will be reduced over time as the recommended changes are made to IT service delivery processes. As changes are made, the existing organizational structure will increasingly become misaligned with service needs. Current staff will need to be reassigned to new duties as part of the recommended reorganization, which will require retraining of existing staff and possible use of contractors or consultants during the transition. Over time, staffing levels can be realigned within MIS Department and other IT service groups through a combination of attrition and reassignment.

Certain trends can be identified within this variability of support costs, which can help guide the

Authority in its planning for IT changes:

- The percentage of IT costs as percentage of total operating costs has been increasing for all but the largest organizations (from about 1-2% in the early 90's to as much as 20%-40% depending on what and how you track and account for various costs).
- User support staffing can be reduced through:
    - Increased standardization and integration of applications and desktop operating systems. Help desk staff are more effective at solving issues when users are prevented from (or advised against) reconfiguring their own systems, the base application suite is common across all desktops, and proper workflow automation is enabled within the application suite. When help desk staff don't have to rule out all the user-specific customizations that historically occur, they can delve to the heart of the problem right away.
    - Increased use of browser-based user interfaces. Browser-enabled applications eliminate the need for help desk staff to install, configure, upgrade, and debug locally-installed applications. Updates are managed centrally, thereby freeing a great deal of time for help desk staff to provide effective help elsewhere.
    - Increased user competence, through training and experience. When users understand what is happening within and between applications, they are more effective at solving their own problems without having to call help desk staff, which often have to repeatedly provide basic training on the same issues. Users who have a thorough understanding of their own applications are also effective at helping their peers and training new employees.
- Power users such as financial managers, engineers, and scientists require more support than casual users, as they rely on specialized and data-intensive applications. MWRA staff includes a significant component of such power users, who require a variety of different tools. This adds to the demand for support services.
- The vast majority of staff in a utility often has very minimal computer use and therefore makes only minimum demands on user support, though this demand increases with increased automation of operations and maintenance activities. This also depends on the specific situation of the utility and the maturity of computer use by its staff. Over time, however, user experience and training will reduce the need for help desk support.
- Systems support staffing can be reduced through:
    - Standardization of operating systems and hardware. An agency that has to keep administrators on-board who specialize in some obscure operating system can eliminate that dependency through migrating the applications that required that operating system to a more standard operating system such as MS Windows Server. The specialists can then be reassigned to other work within the organization, if they have the appropriate skills.
    - Virtualization of servers. Virtualization substantially reduces the need for systems support when it reduces the number of physical servers to be maintained. However, support staff will need initial training on virtualization technology.
    - Automation of patch management. There are a number of freely-available tools such as WSUS (Windows Server Update Services) that can be used to centrally download Microsoft-related patches, and then pick and choose from those

updates to manage patch deployment for servers and desktops without having to individually visit those systems. (MIS is already utilizing some tools along this line, but more may be possible with further standardization.)

4.5.1.2 Training Investment

Invest in increased IT staff training, to a level of one week per year, to support transitions called for in this Plan and to keep staff skills current.

IT staff training is an ongoing cost for any organization that depends on information technology, which is essential for most organizations today. Staff training falls into four broad categories, including:

- **Keeping up with new releases and other vendor upgrades.** Each release of software includes some changes that require both end users and IT professionals to retrain. Sometimes the changes can be dramatic, almost equivalent to migrating to a different product. Hardware typically does not change quite so drastically, barring major realignments of computing infrastructure, for the level of support provided by IT operations such as those at the Authority, but occasional retraining may be necessary (especially for those charged with desktop computer maintenance). Business unit application experts also need to review release notes to know when changes or new features are available that might adversely impact or help users, so they can communicate these changes to users before they are implemented. This will avoid "feature surprises" for users, as well as help users effectively utilize new features as soon as they are available.
- **Migrating applications to new software or adding new software to the environment**. The level of training required to implement new software varies with the extent to which IT staff will have to develop applications with the new tools, but is always substantial. If the change is a migration to core applications, the complexity of these application environments demand significant levels of training for IT support staff before migration in order to facilitate the configuration of the new product and to plan end user training. The costs of appropriate levels of IT staff training needs to be built in to the project budget that implements the change.
- **Refresher training for staff.** Even when the software does not change dramatically, IT staff may benefit from refresher training.
- **Training for certification and/or job changes**. Staff who are seeking professional certification or whose responsibilities have changed may need intensive training to support these career changes. IT skills and knowledge are specific to particular products to a far greater degree than, for instance, a backhoe operator's skills. The backhoe operator can be expected to transfer those skills to a new model backhoe relatively easily. The database administrator, for instance, will have a far harder time moving from Oracle to SQL-Server due to different management toolsets, terminology, and functionality – even though she or he will pick up the new software much faster than someone who has never been a Database Administrator. This is true because the basic system concepts are often the same from one system to another.

Organizations in relatively stable IT environments, such as the Authority, can get by with less training than cutting-edge high tech firms who need to continuously upgrade to the latest (and often unstable) versions of software and plug-ins. But some investment in ongoing training is

still required – it is analogous to preventative maintenance on plant equipment. (It is important to note that the current IT worker's knowledge of Authority systems and business practices is often more valuable and takes longer to acquire by a new hire than a reasonable annual investment in training to keep the current worker up to date. Some organizations mistakenly feel like they can either rely on staff to self-train or can simply replace the employee with outdated skills with a new hire.)

Current best practices on IT training include:

1. Establish and utilize a pool of formal classroom training funds, sufficient to send an IT staffer to a one-week class every two years. (Some of our more progressive clients may have their IT staff attend off-site training seminars and conferences at least 4-5 times a year.) This can be utilized as a rotating training roster, or managed more like a merit system to reward individuals.
2. Encourage use of remote learning opportunities, whether self-paced or delivered via the Internet. These are not as effective as classroom training, but can work well when what is needed is (a) an orientation to new technology or (b) a refresher course on material that has already been acquired. The organization should provide access to this training, and at least some release time for conducting the training. Low-cost and free self-training sources are often available from vendors and on-line technology associations (such as the Association for Computing Machinery (http://www.acm.org).
3. Support opportunities for IT staff to interact with peers. Conferences are excellent for this, but local user groups and even participation in list-servs (e-mail list servers) and Internet forums can help.
4. Projects that require changes to IT infrastructure or systems should always include training for key IT support staff, as well as power users.

4.5.1.3 Co-Location of IT Staff

Utilize co-location of MIS staff with business units for major projects.

Co-location refers to the physical close location of business unit and IT support staff. It can take several forms:

- A systems acquisition or development project may assign one or more Subject Matter Experts from the business unit to work with the development team. This may even involve relocating to the project work site for the duration of the project. Several agile software development methodologies rely on this co-location.
- An IT liaison role may be assigned to a knowledgeable staffer already within the business unit. This individual may be a "power user", who can directly help with many computer-related issues. She or he may also be a "translator" who can take a request for help and effectively communicate what is needed to the IT support team.
- An IT staffer may be assigned to work with the business unit for an extended period, especially for business process improvement or requirements gathering activities. The staffer may be a passive observer, but may also take on simpler tasks within the business unit, in order to better understand what the business unit actually does.

Best practice is to do whatever it takes to gain clear functional requirements for IT projects and to enhance ongoing communications between the business unit and the IT support organization.

4.5.2 Software Maintenance

Adopt governance policy to keep software under annual maintenance from the vendor until the software is retired.

Adopt governance policy to upgrade software with new releases so as to stay within one point release of current.

Just as business needs drive IT investments, software that meets business needs also drives IT infrastructure. It is important that the Authority acquire appropriate software. It is equally important to manage its software assets to gain maximum advantage from their procurement.

4.5.2.1 Keeping Current

Software that is under active support by its vendor is kept current through updates. These are typically of three kinds:

- Patches may be released as needed, to fix a problem or add an important new function. Operating systems and security software tend to have frequent patches. These may receive a formal number in the vendors naming convention (for example 7.5.2), but often do not.
- Point releases are formal upgrades to the software, dignified by a number in the common naming convention used by software vendors. For example, the current Maximo version is number 7.5, indicating the fifth point release upgrade to Release 7. The relative scope and importance is indicated by the fact that they are a “fractional” release.
- Major releases are major upgrades to the software. They usually include significant changes to the application functionality and/or the underlying data model. Release 7.0 of Maximo was the last major release of that product.

Many IT organizations use a similar model of software configuration management for internally developed applications.

Best practices in software configuration management include:

- Stay current on annual software maintenance agreements, to ensure immediate access to upgrades at a predictable cost.
- Actively monitor vendors for patches and larger releases. Assess each upgrade for criticality, impacts on business, and security.
- Actively test upgrades before releasing to production systems.
- Stay within at least two point releases of current upgrades, barring reasons not to install the upgrade (for instance, most businesses including the Authority completely skipped Microsoft Windows Vista, because the benefits it provided did not offset its negatives). If security or problem fixes are included, consider installation as soon as possible after adequate testing.
- Maintain active configuration management, to ascertain the impacts of each upgrade on the rest of the IT environment. Ensure that upgrades are not performed until inter-application dependencies are checked. For instance, one application integration may require a system upgrade to a later version, but needs to be delayed because another

integrated application does not yet support the new system version. Premature upgrades which break an integrated application are very painful to undo, because they often require a full uninstall, reinstall, re-patching to the previous version, and reconfiguration.

- Exercise greater caution with zero-point releases (for example Maximo 8.0), and delay rollout until the experience of early adopters demonstrates any issues. Major changes by the vendor carry the potential for major problems.

4.5.2.2 Keeping Consistent

Consistency of the IT environment is very important, both to users who may run across e.g. different versions of PowerPoint or other office automation software at different Authority facilities, and for IT staff who must provide support. One reason to delay software upgrades would be if it could not be consistently applied across the Authority.

4.5.2.3 Refresh Cycles

As noted, the upgrade cycle from software vendors provides a short-term refresh cycle for the software. However, even the most actively-maintained product should be reassessed from time to time. Reassessment studies should follow standards for IT Governance in making a business case for the alternative. Any reassessment should include a “do nothing” alternative to represent continuing to utilize the current product.

Best practices on software refresh cycles include:

- If a product becomes orphaned, by neglect or by business failure of the vendor, it should be immediately evaluated for replacement. (Under some circumstances, an orphaned product may continue to be used for several years, but (a) it opens the Authority to increased risk due to lack of vendor support, and (b) sooner or later it will no longer run on current versions of the operating system, database management system, or other infrastructure.
- The typical software product should be evaluated for possible replacement at least five years after purchase, and more frequently thereafter. The capabilities of competing products may have surpassed those of the current product, even if it is under active maintenance. It will be uncommon for software to still be the best solution for more than 10 years after purchase.
- Timing of reassessments should be based on date of procurement, not go-live. A complex application may take a year or more to actually go into production use.

4.5.2.4 Annual Operating Expenses

Annual operating expenses for IT solutions must include several factors:

- Annual maintenance and/or support contracts. These contracts typically provide automatic access to upgrades and to technical support, and help insure continual operation of the software. The cost of contracts is most commonly based on a percentage of the software cost (either at the time the Authority purchased the product, or more typically the current replacement cost), and will typically range from 15% to 25% of that cost per year.

- Support costs not covered under the annual contract. This may include bringing a technician on-site for custom configuration or support for developers, or requesting the vendor to make custom reports or other enhancements.
- Ongoing training for Authority users and IT staff. (See Section 4.5.1.2 for more discussion of training.)

4.5.3 Hardware Maintenance

Adopt governance policy to integrate need for hardware upgrades with general infrastructure architecture management.

Hardware replacement cycles vary widely depending on the supported application and purpose, from 2-3 years for business applications to 4-6 years for specialized applications, to 5-10 years for standalone "kiosk" systems such as truck scale systems with no system interconnections or networking (thereby removing the need for security patch applications). The "if it isn't broken, don't break it" philosophy often applies.

4.5.3.1 Keeping Current

Most computer hardware is upgraded in large steps, through replacing or adding boards or chips. These are usually expansions of capability rather than, strictly speaking, upgrades. (There are a few exceptions, such as upgrading firmware on a printer, but these exceptions do not change the overall argument.)

Therefore, the need to keep hardware current has more to do with technical obsolescence than a hardware vendor issuing upgrades. New releases of software, especially the operating system, can render a hitherto adequate desktop computer no longer suitable for its intended business purpose. (Many desktop computers that ran Microsoft XP were not adequate for its replacement, Vista, which is one reason for Vista's limited market penetration.) When this occurs, there are two responses that may keep the computer in useful service:

- The computer can be upgraded through adding memory chips, a more powerful graphics card, and/or greater disk capacity. (Other upgrades, such as replacing the CPU chip, may be technically feasible but are rarely cost-effective in a business setting.)
- The computer can be reassigned to a less demanding business function. (For instance, a CAD workstation may still be adequate for general office automation or an intrusion detection system (IDS) sensor when it is no longer adequate for design or mapping work.)

Ultimately, though, a desktop computer may simply be unsuitable for Authority use. At that time, it should be replaced. The obsolete machine – if owned by the Authority instead of leased -- may be surplused through sale (under the relevant state laws and Authority procedures), or donated to schools or other agencies where it may still have useful life.

Server computers are more flexible in their design. Often they are procured with space available for subsequent upgrades to support increasing demand. This flexibility means that the server can be upgraded more than the desktop computer.

Obsolete computer hardware should not be kept in inventory.

4.5.3.2 Keeping Consistent

Hardware consistency is not a big issue at the desktop. As long as the computer can run the standard release of the operating system and standard applications software, a reasonable level of variation can be supported. However, greater standardization of hardware makes the technical support challenge much simpler. Many problems with desktop computing are due to quirks in e.g. a specific graphics card.

The major hardware consistency challenge comes when too-lengthy retirement cycles force the IT group to support different versions of operating system or application software, due to inability of the older desktop computers to support the newer software.

4.5.3.3 Refresh Cycles

The selection of refresh cycles for desktop computers is a function of three considerations:

1. Does the computer still deliver the required business functionality? This is best thought of as an all-or-nothing decision, for example will the new operating system release run on it, but see the next consideration.
2. What are the productivity impacts on users? Older machines have greater downtime. While operational, the computer may run slower than those of other users. The user may have to utilize a work-around such as not editing larger documents or not having many documents open at the same time.
3. What are the impacts on IT support staff? All else being equal, support costs increase with computer age. For one example, the State of Texas *PC Lifecycle* policies (2003:14) found that "overall PC support and management costs increase by 20% to 30% in years 4 and 5."

Best practices for computer refresh cycles include:

- Adopt budgetary planning standards for desktop and server computers based on financial calculations that incorporate costs and opportunities due to technological capabilities, not just depreciation schedules.
- Consider lease-vs.-purchase options at appropriate intervals. Comparisons should include costs of purchase, support, and disposal. (Note that most leases, like manufacturer warranties, run for three years.)
- Budget for annual refresh cycles, to level costs over multiple years.
- Desktop computers should in general be replaced after not less than three years, nor more than five years. Four years is a common cycle. Highly demanding uses may require replacement after three years or even sooner, especially if computers are repurposed for less demanding use.
- Laptops, due to increased wear and tear and to relative inability to upgrade, are typically refreshed every two years. Three years is about the longest these devices can be expected to remain serviceable.
- Server computers should in general be replaced after not less than five years, nor more than ten years. Seven years is a common cycle. (Note, however, that this practice is based on replacement with comparable servers. Server consolidation on larger computers and/or server virtualization may justify an earlier replacement.)

4.5.3.4 Annual Operating Expenses

Annual operating expenses for computers must include several factors:

- Annual maintenance and/or support contracts. These contracts typically provide advanced diagnostics and repair services, beyond what MIS can provide. These are more common for servers and mission-critical desktop computers.
- Annual refreshment. The adopted refresh cycle will determine the amount to be expended per year.
- Replacement of failed computers. Each year, a few computers will exhibit failures of such magnitude that it is cheaper to replace than to attempt a repair.
- Provisioning new hires. At the Authority, overall policy is staff reduction as the organization transitions from facility construction to ongoing operations. However, this does not entirely preclude hiring of new staff. Many of these can be assigned existing computers, but this should involve support costs for testing for and dealing with any issues, wiping files of the former user, etc. A few computers may also have to be procured each year.

4.5.4 Architecture Policies

During the course of this strategic planning project, several potential technology strategies were discussed. This section provides some technical background on each option, along with policy recommendations. Specific actions regarding these architecture options have been included in the appropriate programs.

4.5.4.1 Cloud Computing

Investigate low-risk private cloud opportunities as part of general information technology improvements.

Cloud computing is an emerging IT solutions architecture that relies on web communications (intranet and/or Internet) to deliver service without the user having to be concerned about the source of those services except the URL address to which to browse. For the IT manager, it also involves dynamic scalability and virtualized services, without having to specifically allocate the physical infrastructure on which the computing takes place.

Cloud computing can take several architectural approaches. The **public cloud** is what most people think of when they hear about cloud computing. This approach takes full advantage of web-based technologies, so that the resources being consumed can literally be anywhere in the world that has Internet connection. In contrast, the **private cloud** approach uses web-based technologies that do not exit the local network (that is, do not rely on “public” communications infrastructure). The organization establishing a private cloud utilizes all the management services and infrastructure architecture elements of a cloud solution within their own computing facilities. There are a few other approaches, usually referred to as **hybrid clouds**, but these are not important for this discussion.

For the IT manager, “the Cloud” has three functional aspects to consider:

1. Another form of outsourcing. The client agency just uses the Internet as access to any

resources they lease from an external provider. This can range from accessing specialized services such as file backup or supplemental hardware, to complete replacement of server computing.

2. "Something" as a Service. Available services from cloud vendors include software, infrastructure, and other elements of IT service delivery. The cloud contract should specify just what services are included, at what service level. This approach can be utilized via public or private cloud approaches, where the only difference is the service provider.

3. Elasticizing resources. Cloud vendors can lease access to additional servers or other IT infrastructure to cover rapid fluctuations in demand. An agency no longer has to buy and support computing resources sufficient to handle maximum foreseen loads, nor suffer performance overloads. For example, a retail firm the bulk of whose sales occur around Christmas can set up its IT infrastructure for the typical demand experienced over the other 10 months of the year while covering the holiday rush via cloud resources.

All of these may be good ideas for specific services, but all except implementing services through a private cloud suffer from a major disadvantage for a utility – the Internet has to be stable and functioning end-to-end in order for users to access the data and applications being managed out there, which is inherently unlikely during a hurricane or other emergency.

Utilities are exploring some of these possibilities using cloud computing. Public cloud implementation is relatively uncommon and usually involves non-critical applications instead of core functionality. For example, support applications for education/outreach to local schools might go on "the cloud", esp. for a voluminous but short-term need like a big shared science project to run one semester. If an application like this were to be unavailable for a few days, it would be somewhat embarrassing but not a real problem.

Many utilities are instead exploring private cloud solutions. These take advantage of cloud technologies to manage their own machine rooms and other infrastructure. They also involve changes to software engineering practices, since applications need to utilize Web-based user interfaces to take advantage of cloud resources. Several of the technical recommendations Westin is making for the Authority support possible private cloud solutions.

Critics have also raised concerns about security of "the cloud". This concern is only relevant to public cloud implementations; private cloud solutions are no more or less secure than any other solutions the agency provides. The service providing agencies have increasingly addressed these concerns in their service agreements, though concerns linger. Another, potentially more critical and creditable security concern has to do with the physical location of the client's data. If data is managed from off-shore facilities, different rules about privacy and security such as those of the European Union may come into play. Further, many public agencies have laws or policies prohibiting off-shoring of critical operational or facilities data. While service contracts can include language protecting against these concerns, the lack of transparency in vendor operations does not facilitate monitoring of compliance.

In this Strategic Plan Westin has recommended investigation of some low-risk possible public cloud applications like storage and file management in the cloud for fast backups of noncritical data, but we do not recommend making the public cloud a part of core IT architecture. We do recommend that MIS explore private cloud approaches as part of IT Infrastructure Improvements.

Keep in mind that private clouds only deal with the lack security, and maybe control of the true cloud implementations. They still don't deal with the risk of losing access at a critical moment,

unless all resources are pulled inside the LAN. At that point, the Authority should look for some proof that there was any value in web-oriented interaction model vs. traditional client/server or peer-to-peer.

4.5.4.2 Virtualization

Utilize virtualized servers whenever feasible for the applications to be supported.

Virtualization in IT consists of the creation of a simulated or "virtual" computer. It began with efforts to host multiple operating systems on a shared physical server, but was soon recognized as a way to create dedicated computing resources for specific applications without having to implement multiple physical server computers. A non-technical explanation of the process is that a portion of computer memory and other resources is partitioned off from the rest of the server and configured to support a particular application. This includes a dedicated operating system, an instance of all the necessary software for the application, and space for individual users to work. Multiple partitions of this type can be created on the physical server, limited by physical memory and other resources. This complex environment is managed by specialized virtualization software running on the underlying physical computer.

Virtualization can come in three common varieties:

- Server virtualization, as described above.
- Client virtualization, done either as described above on the desktop computer, or through specialized software such as Citrix.
- Web-based virtualization, similar to the discussion of cloud computing in which the user interacts with what appears simply to be a Web site.

Setting up the chosen virtual environment involves up-front expense and complexity. This is typically more than offset by:

- The dramatic simplification of server administration, since the environment can be customized to the application being supported without having to co-exist with other applications.
- The ability to copy live snapshots of virtual servers to a standby physical server, whereby in the event of a total hardware failure, allows the virtual server to start up on the standby physical server and continue operation while the damaged server is repaired. This technology also allows for worry-free regression testing of future software patches and application of operating system security patches, since patches can be relatively easily "undone" by simply reverting to the previous snapshot.
- The ability to separate physical and software major upgrade cycles. Hardware upgrades can be done at the organization's leisure, and the current virtual machines are just copied to the new physical server. Major software upgrades can be done on a copy of a running virtual machine to test the effects. If successful, the test virtual machine can "become" the new production virtual machine. If not, the test virtual machine can just be re-initialized for another try later.
- The reduction in physical servers, each of which requires a certain level of support regardless of what is running on it. This also can help substantially on reduction of electrical and cooling costs in the computer center, furthering "green computing" initiatives.

A new virtualization technology available in Windows 7, Windows Virtual Desktop Access, can also be used to emulate a full client application install while actually functioning as a virtual desktop (http://www.microsoft.com/licensing/software-assurance/windows-virtualization.aspx).

Westin strongly encourages use of server virtualization whenever technically feasible, with resulting reduction in the number of physical servers to be managed.

4.5.4.3 Mobile Computing and Other Client Hardware Options

Explore options for mobile computing as the initial program recommendations are implemented and as the Authority updates this *Strategic Plan.*

These policy discussions thus far have referenced a generic "desktop PC" as the only client computer. Three broad classes of alternative hardware should be considered by the Authority, including:

- Laptops – These are functionally equivalent to true desktop PCs, but in a smaller format that encourages the worker taking the computer from work site to work site. These are especially relevant as the Authority does more with mobile computing, as recommended elsewhere in the *Strategic Plan*. A laptop can make an effective replacement for a desktop computer, especially with a docking station for access to larger screens, keyboards, and etc.
- Tablets, Smart Phones, and Other Alternatives – These recently introduced computing devices are increasingly popular among consumers as personal entertainment and social media tools, and some computing professionals are beginning to see increasing roles in the business. Most of these are not really capable of general computation, being instead best characterized as primarily Web browsers. For the present, these limitations will restrict the suitability as a primary client computer – though for specialized roles such as use of BlackBerrys at the Authority to monitor operations, they may play an increasingly important role.
- Other Thin Client Hardware – These devices are in effect a return to the old terminal mode of communications to the central computing resources. Many use the Web instead of or in addition to direct network communications. They contain limited computing capability, which is usually focused on graphics display. Frequently they have limited memory or disk storage, since the bulk of computing is done on the server.

Most workers in utilities are "knowledge workers", for whom an efficient and comfortable means of entering large amounts of text or numbers is a critical requirement of any computing device. Tablets, despite their strengths in other aspects of computing, typically have on-screen virtual keyboards that become tiring for tasks more demanding than composing an email. This includes mobile-enabled applications that do not have effective and usable drop-down lists configured for required fields. This relegates tablets to at best an auxiliary role. Smart phones also suffer from the restricted screen size and keypad space.

Laptops are a viable alternative to traditional desktop computers. They have the advantage of allowing mobile workers to take their desktop with them, whether among the various Authority facilities or to meetings at other facilities, or even home. Modern laptops support all the functions demanded by the knowledge worker. (At Westin, most consultants do not have a desktop computer – we do everything with laptops, possibly supplemented by docking stations that provide easy access to office networking, the benefits of a larger monitor while at our desks, etc.)

There are four disadvantages of laptop deployment, including:

- Their design makes it harder for Authority staff to provide basic hardware and operating system maintenance.
- They get damaged more frequently than desktops, because they are being carried around from place to place.
- They are subject to theft, due to their portable nature and to being carried outside the secured facilities of the Authority.
- Data on a laptop is more at risk of being compromised, due to portability of the device.

These drawbacks to laptop deployment are offset by two changes to laptop production:

- Laptops have become almost a commodity product. It is a viable approach to simply "run to failure", and replace a laptop whenever damaged. Westin no longer recommends ruggedized laptops for most users (except for a few, high risk work locations such as enclosed spaces). A reasonable-cost full replacement warranty is great for taking care of any major accidental damage or destruction.
- Laptop operating systems now support (a) robust validation for logging on, and (b) robust encryption (via native operating system utilities or third party applications), which make the hardware and any data it contains relatively useless to a thief.

Thin client products suffer from the same risk factors as Web-based, cloud computing. If the communications link is not available, the tool is useless. They are best suited to large organizations in which almost every user has access to exactly the same set of applications. Configuring and managing access to multiple different access needs mitigates some of the cost savings of lower support per user.

Best practices for managing client computers involve:

- Selecting a mix of technologies, based on and justified by the different roles of users.
- Keeping the mix of supported technologies as simple as possible, to minimize support issues.
- Preserving local computing ability, so that workers can continue to be productive in some manner even if the network or other communications to servers fails.
- Utilizing appropriate security practices to prevent high-risk data (personnel records or infrastructure details) from being compromised.

4.5.5 Recommended IT Standards

Adopt appropriate standards for IT services and practices, as specified in specific program recommendations.

Fortunately, many groups have already developed industry standards for various aspects of MIS operations. Westin recommends that the Authority adopt at least the following standards. By adopt, we mean that the Authority should:

- Obtain and work to implement published standards and guides to practice.
- Obtain formal training for key staff in the standards and practices.
- Integrate these standards and practices into day-to-day operations, acquiring software to

support this level of utilization where appropriate.

- Consider these standards and practices in planning, execution, and evaluation of projects and workgroup programs.

Key standards and practices include:

Control Objectives for Information and related Technology (COBIT®)

COBIT is:

- An international unifying framework that integrates all of the main global IT standards, including ITIL, CMMI and ISO 17799.
- A product of 15 years of research and cooperation among global IT and business experts.
- Developed by ISACA®. *www.isaca.org/cobit*
- A tool for compliance with Sarbanes-Oxley and many other global standards.

In 1969, a working group around IT Governance practices formalized their operations, incorporating as the EDP Auditors Association. At one point the group was known as the Information Systems Audit and Control Association, ISACA now goes by its acronym only, to reflect the broad range of IT Governance professionals it serves.

Information Technology Infrastructure Library (ITIL)

ITIL (http://www.itil-officialsite.com) is the most widely accepted approach to IT service management in the world. ITIL provides a cohesive set of best practice, drawn from the public and private sectors internationally. IT Service Management (ITSM) derives enormous benefits from a best practice approach.

Developed by the Her Majesty's Cabinet Office, the ITIL best practices are detailed within five core guidance publications outlining the fundamental ITIL principles, and core-derived publications, which focus on other specific applications or areas within the service management discipline. The core

(http://www.best-managementpractice.com/gempdf/itSMF_An_Introductory_Overview_of_ITIL_V3.pdf)

publications cover:

- Service Strategy -- The achievement of strategic goals or objectives requires the use of strategic assets.
- Service Design -- designing IT services, along with the governing IT practices, processes and policies, to realize the strategy and facilitate the introduction of services into the live environment ensuring quality service delivery, customer satisfaction and cost-effective service provision.
- Service Transition -- capabilities for transitioning new and changed services into operations, ensuring the requirements of Service Strategy, encoded in Service Design, are effectively realized in Service Operations while controlling the risks of failure and disruption.

- Service Operation -- achieving effectiveness and efficiency in the delivery and support of services to ensure value for the customer and the service provider. Strategic objectives are ultimately realized through Service Operations.
- Continual Service Improvement – creating and maintaining value for customers through better design, introduction and operation of services, linking improvement efforts and outcomes with Service Strategy, Design, Transition and Operation.

ITIL Version 3 was released in 2007. It is currently undergoing updates, which are collectively referred to as "ITIL 2011".

Project Management Body of Knowledge (PMBOK)

The Project Management Institute (Http://www.pmi.org) is the world's leading professional body for project management. PMI compiled the core "body of knowledge" that a competent project manager should know into guidebooks referred to as PMBOK. This is a compressed abbreviation of the official title, Guide to the Project Management Body of Knowledge. This has gone through four editions since its creation in 1983, and work is underway to update to a fifth edition, which will grapple with concepts of "agile" project management.

The PMBOK breaks project management practices into five process groups, crosscut by nine knowledge areas. These are considered to be typical of almost all projects.

The five *process groups* are:

1. Initiating
2. Planning
3. Executing
4. Monitoring and Controlling
5. Closing

The nine kn*owledge areas* are:

1. Project Integration Management
2. Project Scope Management
3. Project Time Management
4. Project Cost Management
5. Project Quality Management
6. Project Human Resource Management
7. Project Communications Management
8. Project Risk Management
9. Project Procurement Management

Software Engineering Practices

Unlike other categories of standards, there are a number of software engineering methodologies available, with no consensus as to which is best. A few methodologies have attempted to overcome this complexity through consolidating many best practice details into a coherent, end-to-end framework that covers the software development/selection lifecycle. One of the best of these is the "Unified Process".

The Unified Process began as a consolidation of three leading object-oriented methodologies, each promulgated by a thought leader in software engineering. These individuals later joined a CASE (computer-assisted software engineering) firm named Rational, so the methodology was rebranded as the "Rational Unified Process" (or RUP). Rational was subsequently bought by IBM, which adopted the Unified Process as its core software engineering practice (http://www-01.ibm.com/software/awdtools/rup/). Some practitioners have begun dropping the "Rational" from the name, as IBM continues to absorb that company's intellectual property into its methodology framework.

RUP ties a number of software engineering disciplines together within a four stage lifecycle framework, which includes:

- Inception Phase -- Specification of the initial concept, confirmation that it is worth doing.
- Elaboration Phase – Refining requirements and specifications, validated against business justification
- Construction Phase – Developing or procuring the technology solution
- Transition Phase – Validating the solution, moving it into production, and training users.

A key component of the Unified Process is the Unfired Modeling Language (UML). This set of notation standards was independently developed by the Object Modeling Group (OMG) and subsequently adopted by IBM and others as a means of standardizing notations such as Use Cases. At present, the Unified Modeling Language is at Version 2.3. It incorporates multiple notations and frameworks (14 primary notations, some of which can be used for multiple purposes), from which the project team is expected to select the appropriate artifacts for each project.

One criticism of the Unified Process is that it started out more of a framework than a methodology. That is, it didn't give detailed guidance to the novice practitioner who is trying to implement it. This has been overcome with successive iterations of the Process standards. Another criticism is that between the full rigor of the Unified Process and the complexities of UML notations, the novice can become overwhelmed. Both of these objections have been tackled by various practitioners who have developed "lightweight" implementation methodologies. These purport to provide selection criteria among all the possible options, plus applied guidance for making these concepts workable.

One influential lightweight methodology for Unified Process implementation is Iconix, developed by Doug Rosenberg and productized as ICONIX Software Engineering, Inc. (http://www.iconixsw.com).

5. Expected Benefits

Some of the results of implementing the programs defined in the MIS 5-Year Strategic Plan are expected to be the following:

Improved Productivity

- Reduced time and effort needed to capture and enter data
- Reduced time and effort required to locate, report, and analyze information
- Reduced time and effort to verify or correct data; greater utilization of trusted Authority-wide data like GIS
- Reduced administration frees staff for more complex tasks
- Improved ease of use for key operational systems

Improved Customer Service

- Improved responsiveness to public requests for information
- Improved consistency and quality in handling service requests, issues, and complaints
- Faster turnaround on requests for information by the public and other agencies

Improved Decision Support

- Single view of the situation, widely available to MWRA management and staff
- More timely and consistent responses, especially regarding issues related to operations and policies
- Reduced submission errors, improving data quality
- Reduced data losses and document misplacements
- Improved ease of data accessibility

Improved Return on Authority Technology Investments

- Improved access to Authority information by all managers and staff, regardless of the system in which it is stored
- Improved performance and utilization of existing systems
- Business processes optimized to fully exploit the potential of newly implemented technology
- Improved support for Authority-wide technology initiatives
- Fewer silos of data or incompatible systems
- Expanded utilization and return on the Authority's investment in Geographic Information System technology and data

Improved Positioning of MWRA for Future Change

- Support for less experienced staff by providing simplified access to corporate data and knowledge
- Enables the Authority to adopt more flexible and adaptable technologies and procedures
- Improved ability of MWRA to cope with the pace of technological change
- Improved value from performance measurement and benchmarking

Summary

In summary, the Authority's MIS 5-Year Strategic Plan provides the long-term foundation for aligning business and technology. This effective alignment of business and technology strategies will contribute significant benefits in efficiency, service levels, and effectiveness as business and technology performance contribute to one another to produce operational improvements.

Appendices

Appendix A: Assessment Report

Assessment Background

This section of the MIS 5-Year Strategic Plan Appendices contains the findings, “gaps”, and opportunities from assessing the existing application of information technology to support the Massachusetts Water Resources Authority (“MWRA” or “the Authority”). The scope of this study was general information technology utilization at the Authority (hereafter “MIS”, “general computing” or “technology”), excluding most aspects of SCADA, operations automation, or physical security. This assessment of current technology resources and business needs is a key component in the development of MWRA’s MIS Five Year Strategic Plan. The goal of assessing the Authority’s technology usage is to compare MWRA’s current technology resources with the organization’s business needs and future technology requirements.

1.1 Assessment Approach

During this assessment, Westin’s consultants became familiar with the Authority’s existing information technology resources (including staff, training, hardware, networks, system software, applications, integration, and data); the extent to which Authority-wide users’ information technology needs are being fulfilled; and requirements for applying technology in the future to achieve the MWRA’s business objectives. In addition to utilizing existing MIS documentation, information was gathered through interviews, workshops, walkthroughs, and high-level business process analyses with the Authority’s executives and representatives of all Departments. The specific information which was evaluated included the following:

- Background information including the Authority’s business plans and strategies, prior technology plans, and the Authority’s future plans.
- The configuration and status of existing Authority-wide and departmental information systems.
- The extent to which existing mission critical applications support the business strategies, functional requirements, and anticipated future needs of the Authority’s users.
- Business process-driven requirements for additional and/or enhanced information technology applications, data, integration, decision/analytical systems, and IT infrastructure.
- Existing integrations among Authority-wide applications and data, requirements for integrating current and future systems, and integration potential provided by currently implemented technologies.
- Information technology infrastructure, including servers, networks, desktop and laptop hardware, system software, standards, tools, e-mail, web services, desktop support, system administration, security, and disaster recovery.
- Information technology decision-making, including IT governance, identification and prioritization of technology initiatives in alignment with Authority business drivers, technology procurement and sourcing strategies, and linkages between major technology users and the MIS Department.
- Identification of areas that can benefit from process re-engineering and the application of

new technologies, or areas in which the value of existing technology can be extended.

From analyzing this information and comparing the Authority's activities with industry best practices, Westin evaluated the "gap" between MWRA's current state and future technology requirements in the following dimensions:

- Business Needs and Objectives;
- MIS Support and Organization;
- Applications and Integration;
- Data Management;
- Technology and Systems; and
- Governance and Execution.

These dimensions provide the framework for determining the extent to which the Authority is using technology to support its business strategies. The findings of this assessment are summarized below.

1.2 Background of Change

The impetus for this MIS Five Year Strategic Plan is a result of strategic challenges to the Authority, originating both externally and internally. The assessment confirmed that many of MWRA's external business challenges are similar to those facing numerous water and wastewater utilities today. These external business drivers include the following:

1. Changing economic conditions;
2. Local, State, and Federal regulatory mandates ;
3. Public focus on conservation and "being green," including more efficient use of water and energy cost management;
4. Emerging information technologies;
5. Awareness and knowledge of environmental issues within the service areas, and the impacts of Authority operations on the environment; and
6. Increasing customer / citizen expectations.

In addition to these external business challenges, the Authority faces additional internal business drivers that include the following:

1. Evolution from facilities construction to operations and maintenance;
2. Funding constraints;
3. Changing and aging workforce;
4. Management interest in applying technology to improve efficiency and services;
5. Need to realize maximum value from information technology investments; and
6. Desire for management analysis and performance reporting.

These external and internal challenges require the Authority to deliver solid strategic responses. The MIS Five Year Strategic Plan and a commitment to developing the MIS organization will be part of that response.

1.3 Assessment Activities

The Consultant assessed the Authority's existing technology resources, their support for the Authority's business needs, and future technology requirements. Business needs interviews were conducted with members of executive management and the following organizational units:

- Rates and Budget;
- Treasury;
- Controller;
- Human Resources;
- Procurement, Real Property, and Fleet;
- Affirmative Action;
- Public Affairs;
- Internal Audit;
- Planning;
- ENQUAD (Environmental Quality Department);
- Laboratory Services;
- Wastewater Treatment;
- TRAC (Toxic Reduction and Control Department);
- Facilities Management;
- Water Distribution and Pumping;
- Operations Support;
- Water and Wastewater Operations and Maintenance;
- Engineering and Construction;
- Emergency Preparedness; and
- Water Treatment and Transmission.

The technology assessment project included developing a thorough understanding of specific business drivers, organizational challenges, objectives, and existing information resources. The specific topics discussed with each of these organizations were as follows:

- Scope of responsibilities;
- Current and emerging business challenges;
- Business functions and processes;
- Existing technology resources and satisfaction; and
- Requirements for new technology.

These individual and group interviews provided input to determine the “gap” between the current state and future requirements in the dimensions illustrated below.

The approach to developing the Authority’s MIS Strategic Plan begins with understanding key business needs, objectives, and challenges. All of the technology elements – including MIS services, applications, data, technology infrastructure, and governance – must be aligned with the Authority’s business needs. The MIS Five Year Strategic Plan is expected to be a catalyst for enhancing the Authority’s technology capabilities in support of its efforts to drive core business effectiveness, performance improvement strategies, operational efficiency, enterprise asset management, and citizen and customer responsiveness.

2.0 Assessment Findings

The Westin consulting team assessed MWRA's existing information technology resources, their support for the Authority's business needs, future technology requirements, and water/wastewater utility industry best practices. These assessments determined the "Gap" between the current state and future requirements in four dimensions: IT Management, Information Security, Applications and Integration, Data Management, and Technology Infrastructure. Each "Gap" represents an opportunity for the Authority to enhance its use of technology to support greater effectiveness, improved service levels, and/or increased productivity. Recommended actions for satisfying these "gaps" were developed in later stages in the MIS Five-Year Strategic Plan, where these were somewhat reorganized to make more coherent programs. The findings of this assessment are summarized below.

2.1 Information Technology Management

The assessment of Information Technology (IT) Management includes IT Governance, and the organization and services provided by the Authority's MIS Department.

2.1.1 Best Practices

2.1.1.1 IT Governance

IT Governance is the systematic process of allocating resources and coordinating efforts among multiple technology projects. Best practices suggest that MWRA should use IT Governance to impact the strategic direction and practices of Authority-wide information technology activities. Exemplary IT Governance steers the application of technology in support of the organization's business goals and objectives. Successful IT Governance will contribute to achieving business goals and needs by doing the following:

- Prioritizing the use of IT resources and activities.
- Planning for integration and emerging technologies.
- Assuring IT input into major projects.
- Defining performance objectives for technology investments, and evaluating outcomes against those objectives.
- Providing a feedback loop for communication and input from executives and managers.
- Measuring outcomes from IT activities and projects against objectives to determine the success of those investments.
- Promulgating standardized templates for requesting technology projects and/or developing business cases.
- Making recommendations to management and policy-makers regarding technology-related policies and standards.

IT Governance is primarily focused on IT investments and execution, in collaboration with business units' responsibilities for defining business requirements and demonstrating business justifications, and with various project teams' focus on coordinating schedules and resources to accomplish project objectives.

2.1.1.2 MIS Organization and Services

Services Provided

Westin has compared the services provided by the Authority's MIS department with the industry-standard services typically offered by centralized IT departments to enable their customers (i.e., users) to efficiently perform their jobs. These services include technology planning, acquisition, implementation, support, and monitoring. An alternative to the centralized model is one that distributes these services among multiple business units. This alternative approach requires formal coordination.

In addition, best practices include formal scopes and Level of Service objectives to be provided by the IT department, and regular monitoring and reporting of IT department performance against those scopes and standards.

Organization

Some of the organizational best practices against which the Authority's MIS Department was measured include the following:

- The IT department's organizational structure is clearly defined, including the division of responsibilities between Authority-wide and departmental business units.
- IT resources are sufficient to support the enterprise's business needs, and these resources are organized to support its business functions.
- The IT staff is focused on removing barriers that inhibit the use of information technology to accomplish the enterprise's business objectives.
- IT staff members are hired and promoted based on a combination of technical skills and customer service attitude.
- IT staff members are given adequate training as needed; including cross-training to support one another, and to facilitate reassignment to meet changing needs.

Change Management

Successful achievement of the expected business benefits from technology investments requires a standardized, repeatable approach to implementing technology systems, including best practices throughout the life cycle of planning, justifying, designing, constructing, deploying, and supporting technology applications. A best practices-based approach for technology deployments will include the following:

- Business cases and justifications for technology investments.
- A focus on business process-driven requirements as the foundation for achieving the Authority's technology project objectives.
- Selection of technology to achieve functional, technical, and integration requirements.
- Technology deployments that address people and processes, as well as technology.
- Design and implementation of new business processes that fully exploit the capabilities of newly implemented technology.
- Identification of project prerequisites and impacts.
- Level of project management formality scaled to fit the size, complexity, and strategic

value of a project.

2.1.2 Strengths

The Authority utilizes information technology to provide core functionality in support of its key business activities. The key technology infrastructure (servers, network, and voice), which is the foundation for the Authority's technology capabilities, is stable and currently adequate, with a good history of reliability. The MIS Department provides support for the current technology environment (although sometimes in an informal, ad hoc manner), focusing upon the following services:

- Acquiring and maintaining the Authority's technology infrastructure;
- Installing and managing the configurations of systems and applications;
- Managing infrastructure performance and capacity;
- Ensuring continuous service;
- Ensuring systems' security;
- Educating and training users;
- Managing technology problems and incidents;
- Managing technology facilities and operations; and
- Monitoring technology processes.

In response to business needs, a number of departments also include individuals or groups that perform information technology functions and support. The benefit of these separate technology groups is their familiarity with, and focus upon, the business needs and processes of their individual departments. The central MIS organization has an opportunity to take full advantage of these groups and maximize Authority-wide benefits by assuring coordination, standards, training, and other services.

2.1.3 IT Governance: Gaps and Opportunities

2.1.3.1 IT Governance Gaps

MWRA does not have a formal information technology governance process for directing its support of the Authority's business goals, prioritization of resources, and evaluation of results. As a result, MIS management is making decision of which requests to fulfill, without overall direction or a vision to guide the allocation of resources. Current IT Governance within the Authority relies on overall governance practices, and is primarily through the budget approval process. The current approach of informal enterprise-level prioritization of information technology initiatives leads to inconsistencies and conflicts between competing priorities. Specific consequences have included the following:

- Unforeseen interdependencies when upgrades were not sufficiently coordinated.
- Duplicate effort between departments, e.g., multiple business units independently negotiating with Verizon at the same time.
- No measurement of performance against business objectives for technology investments' outcomes.

- Information technology decisions are frequently reactive.
- A number of technology-related policies and procedures are not clearly understood by Authority staff.

2.1.3.2 IT Governance Opportunities

To move toward best practices for IT Governance, the Authority should define and implement roles and responsibilities for allocating technology resources and recommending technology-related policies and standards. This will be designed to assure the implementation of the Authority's vision for applying information technology in support of MWRA's mission. Elements of the Authority's IT Governance should include the following:

- Utilizing business cases, formal reviews, and an approval process for major technology initiatives.
- Assuring that the MIS Department management has early involvement in all technology initiatives, including planning and defining technology elements in other departments' major projects.
- Implementing Application Portfolio Management.
- Periodically updating the Authority's Information Technology Strategic Plan.

Applications Portfolio Management (APM) is a governance process for ensuring that an organization's technology investment is consistent with its business strategy. It defines key performance indicators and technical metrics for applications and supporting infrastructure, then utilizes trends derived from these metrics to decide when to make further investments in existing technology, modernize/upgrade, or retire and possibly replace. For example, APM involves evaluating the total cost of ownership for each application in an organization's portfolio to identify candidates for replacement (if, for example, an application otherwise meets business needs but requires a nonstandard operating system on the server which requires a specialized server support staff, it may be worthwhile to replace or restructure just to reduce those support costs). APM reinforces business units' ownership of technology initiatives that benefit those business units, rather than being strictly an IT/MIS responsibility.

2.1.4 MIS Organization and Services: Gaps and Opportunities

2.1.4.1 MIS Organization and Services Gaps

Services Provided

The general information technology services (excluding SCADA, PICS and security) provided by the MIS Department were compared with the full range of services typically provided by utilities' centralized technology organizations. The emphasis of the Authority's MIS Department is to provide services that support the technology infrastructure. As a result, there are a number of services associated with planning, acquiring, implementing, and supporting technology, for which the MIS Department shares responsibility with the technology staffs in other Departments. The services provided by the other business departments vary widely, and the definition of how these responsibilities are shared is frequently ad hoc and casual. Figure 1 (below) provides an overview of the services provided by MWRA's MIS Department, in comparison with the industry-standard services typically offered by centralized IT departments to enable their customers (i.e., users) to efficiently perform their jobs. Note the following definitions used in this analysis:

- "Primarily" assigned at approximately 90% of responsibility.
- Unshaded means this service is not clearly assigned, not that it isn't performed for some applications or business units.
- The monitoring activities performed by "Another MWRA Unit" are the responsibility of the Internal Audit Department and the Authority's Outside Auditors.

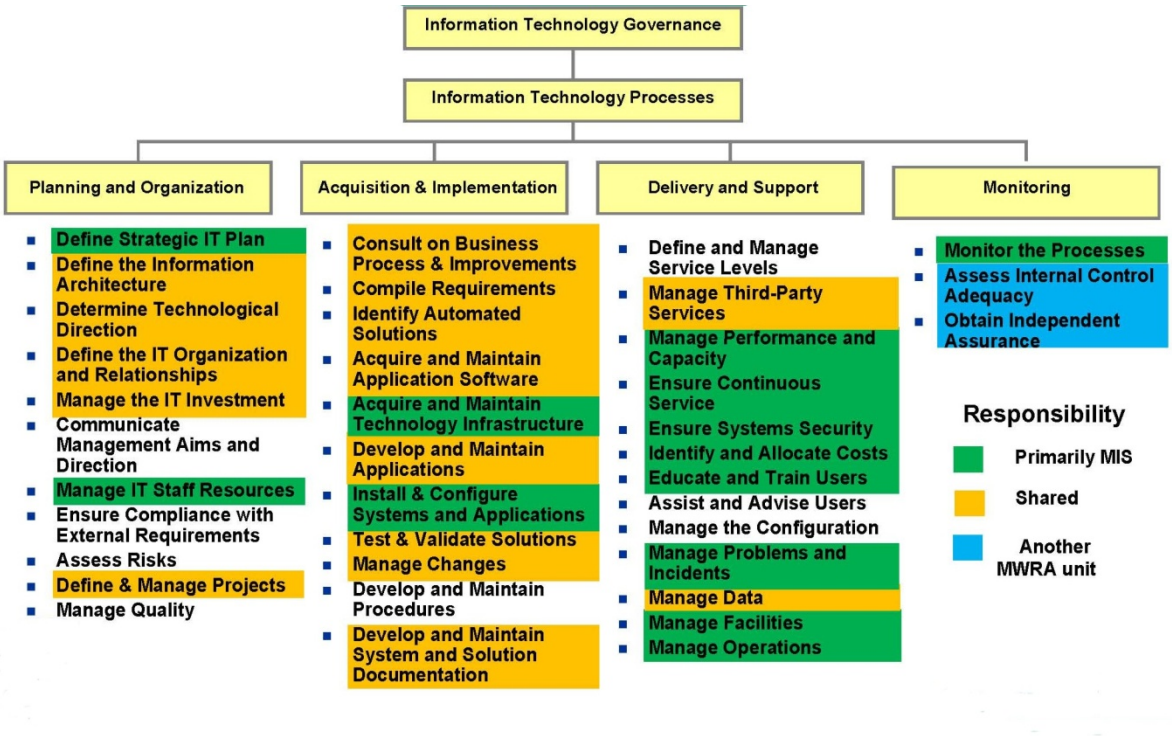


Figure 1: Services provided by MWRA's MIS Department, in comparison with services typically performed by centralized IT departments

Technical support is provided by MIS employees who "own" responsibility for specific Authority-wide applications, as well as a help desk for users' general computing and network issues. Authority staff report varied levels of satisfaction with these MIS services. In general, no one person within MIS "owns" finding a solution to a customer's (i.e., user's) problem. MIS often requires many handoffs to complete a task, resulting in delays. MIS manages "closed" help requests, not "solved problems". In addition, users requested improved communications of MIS's solutions to problems, so they could avoid making the same mistakes in the future.

Organization

The MIS Department ("MIS") consists of 55 employees whose mission is to plan, acquire, implement, and support general information technology usage within the Authority. Authority managers and staff members reported widely varying levels of satisfaction with MIS's technology resources and with the service provided by MIS. Some other Departments have developed their own capabilities for implementing and supporting the technology that supports their missions.

The MIS organization structure and job titles have not been updated to reflect changes in

technologies, roles, and services provided. As a result, the workloads within MIS are unevenly distributed due in part to skills, organization, and culture, which have a negative impact on service delivery. Despite the fast pace of change in information technologies, MIS staff training is not aligned with emerging technologies.

There are several organizations within the Authority that perform information technology functions and support. The benefit of these separate technology groups is their familiarity with, and focus upon, the business needs and business processes of their individual departments. The risk of multiple technology groups includes uneven competencies in critical IT skills and possible lack of coordination with general Authority standards. In addition to the MIS Department, the following organizations include technology groups:

- SCADA;
- PICS;
- Telog;
- Planning (GIS);
- ENQUAD (Scientific and environmental analysis); and
- Security.

In addition, at least three Departments have a dedicated person performing information technology services that include developing reports, data mining, and supporting users. This fragmentation leads to inconsistencies in technology project design, software engineering, compliance with technology standards, and implementation effectiveness.

Change Management

Information technology organizations continually manage change, as new technology solutions are implemented to deliver desired business improvements. Change management involves technology change – e.g., policies for testing new software versions before beginning production usage – as well as people changes – e.g., business process improvement to exploit the capabilities of new technology, and the resulting changes to people's jobs. Because change management is central to achieving successful results from nearly every technology initiative, repeatable, formal, well-planned practices are necessary.

The Authority has had mixed success with its new information technology implementation projects, due to a lack of consistency in MIS's approach to change management throughout the technology lifecycle. The following summarize MIS's current change management performance:

- Current processes for managing IT change within MWRA seem to rely on semi-formal, ad hoc meetings and discussions, rather than a consistent project management approach that formally controls scope, schedule, budget, and strategic value to the Authority.
- Technology change lacks a consistent, complete lifecycle development process that includes the business case, business requirements, construction / configuration, deployment, and support for production usage.
- Organizational change management lacks a consistent approach that encompasses functional requirements gathering, business process redesign, and user training / transitioning.

- Technology deployment projects have not consistently considered Authority-wide data integration, appropriate standardization, consistent design and implementation, or conflict/priority resolution.

In summary, MWRA has experienced several implementation projects in which the expected benefits were only partially achieved due to insufficient planning, inadequate requirements, or not optimizing business processes. This variance in the achievement of the Authority's technology objectives indicates the need for using a practical, proven, best practices-based approach for all technology deployments.

2.1.4.2 MIS Organization and Services Opportunities

Services Provided

As part of improving service and project delivery, the MIS Department has the opportunity to reorganize the services for which it is responsible, and clarify the divisions of responsibilities with other departments' technology groups.

Organization

Additional coordination among all of the Authority's technology groups is necessary to ensure consistency in technology project design, software engineering, compliance with technology standards, and implementation effectiveness. A "federated" technology delivery structure provides an example of the coordination, standards, training, and other services that must be provided – usually by the central MIS organization – to take full advantage of these groups and maximize Authority-wide benefits. In this organizational model, multiple business groups share responsibility for delivering specific services, but are held accountable for coordination and conformance to Authority-wide standards.

A reorganization of the MIS Department needs to reflect the Authority's overall technology and service delivery strategies, as well as the current and emerging technologies that will be supported. Consideration should be given to "rebranding" MIS to reflect its current and future roles and responsibilities within MWRA.

Change Management

The resulting opportunity is to incorporate a consistent, repeatable approach to lifecycle development of technology systems, including organizational change elements, Authority-wide policies, and standardized methodologies. This should integrate with a System Development Lifecycle methodology that includes elements such as a checklist of considerations, a body of best practices to assist project managers, and business process analysis to guide process re-engineering. Training of technology staff and business "subject matter experts" will be essential to maximize this opportunity's return on investment.

2.2 Applications and Integration

The assessment of applications and integration includes the Authority's core applications which use commercial off-the-shelf (COTS) software packages, supplemented by database applications developed by in-house staff and integrations between systems.

2.2.1 Best Practices

Whenever a package is commercially available that fits an organization's business

requirements, the best practice is to procure the Commercial Off-The-Shelf (COTS) software. The selection of the most advantageous COTS solution should be based upon specific and prioritized business requirements. Because successful COTS solutions frequently incorporate industry best practices and exemplary business processes, it is almost always beneficial to modify one's business processes to fit the software, rather than modify the software by customization. In addition, almost all modern COTS software vendors intentionally provide flexibility to tailor their software package to a specific organization's needs using tables, changeable screen layouts, user-defined fields, work flows, and ad hoc reports.

It is also a best practice to subscribe to the COTS vendors' service and maintenance programs, which include new versions and fixes ("patches") to the licensed software packages. This facilitates keeping COTS software current or nearly current with new vendor releases. When new versions and new applications are installed, rigorous technology change management procedures should be followed before production usage begins. Configuration management techniques are used to track changes and maintain software integrity throughout its life cycle.

2.2.2 Strengths

MWRA has implemented a number of applications and technologies in exemplary ways relative to other progressive water and wastewater utilities. The following accomplishments in support of the Authority's operations deserve favorable mention:

- The Deer Island "PICS" and the Authority's SCADA systems appear to be robust, stable, and secure.
- The Authority utilizes its PICS and SCADA data for operational decision making, through a common repository, the Process Information (PI) system and its associated applications. Operational data for executive status updates is also available through the use of mobile devices such as BlackBerrys. This is exemplary for the water utility industry.
- Asset management practices, including preventive programs, predictive maintenance, and reliability centered practices, supported by the Authority's Maximo Computerized Maintenance Management System (CMMS) are at the forefront of water and wastewater utilities.
- Labware Laboratory Information Management System (LIMS) successfully meets operational requirements, including integration with instruments, chain of custody / audit trails, and reporting to other systems (e.g., PIMS, WWQ). Westin endorses the direction of using mobile devices to capture data as close to its source as possible.
- Extensive public information and notification functionality is in place, including a well regarded website, community contacts service, and reverse 9-1-1 capability.
- Business units have built and acquired some job-specific applications, including scientific, environmental, community contact, and contract management applications.

The Authority has licensed Commercial Off-The-Shelf (COTS) software packages to meet its core applications needs. The packages implemented by MWRA are widely used in the utilities industry. They include Lawson for Finance, Human Resources, and Materials Management; Maximo for Maintenance Management; Environmental Systems Research Institute (ESRI) for Geographic Information System (GIS); Labware for the Laboratory; and Hyperion for budget development.

Tailoring these COTS software packages to meet the Authority's business processes has utilized the packages' inherent flexibility in the form of tables, customer name and logo insertion, screen layout modification, user-defined fields, work flows, and ad hoc reporting. These tools for "localization" are supported by the software vendors and are expected to be used during implementation; as such, they are not considered "custom". Customizations that carry the most risk involve changes to the software's programming code, changes to data elements, and repurposing vendor-provided elements. These customizations can be costly, add risk, and cause difficulties during upgrades. Westin sampled the extent to which the Authority had customized its COTS packages, and found relatively few customizations of Lawson, and minimal customizations of Maximo and the Authority's other COTS applications.

2.2.3 Lawson Finance, Human Resources, and Materials Management: Gaps and Opportunities

2.2.3.1 Lawson Finance, Human Resources, and Materials Management Gaps

For the past 12 years, the Authority has used Lawson Software's suite of applications to meet its needs for financial accounting, human resources, and materials management. These applications are integrated with each other, and are widely used by other local governments and utilities. Major Lawson products in production at MWRA include the following:

- General Ledger;
- Requisitioning;
- Purchasing;
- Accounts Payable;
- Accounts Receivable;
- Asset Management;
- Human Resources;
- Training;
- Time Management;
- Payroll; and
- Materials Management.

The Authority's existing business processes and configuration of these packages does not take full advantage of the Lawson applications' capabilities to reduce paper, automate manual processes, and eliminate redundant entry. Since 2008, the Authority has used Version 9.0.0 of the Lawson suite. Subsequently, newer versions and additional optional modules have become available that address the following Authority needs:

- Additional human resources functionality and integration, including enhanced employee self service.
- Work Flow Processing, Sourcing, and Contract Management modules.
- Improved reporting functionality, flexibility, and ease of use.

Upgrades to the newer versions and additions of optional modules provide opportunities to implement work flow (reducing paper and streamlining approvals), make configuration changes (e.g., using encumbrances), replace existing in-house developed applications (e.g., Change

Order Tracking, MBE/WBE), and improve reporting and decision support for management. In addition, an enhanced, integrated Budget Planning module should be considered when the Authority's functional and/or technical requirements overtake the capabilities of the existing Hyperion Budgeting application.

Lawson has notified the Authority that it will begin charging a premium for support of Version 9.0.0, because it is several releases behind the company's current version. In 2011, Lawson Software was acquired by Infor Global Solutions, which already has a significant presence in the public sector software market. While Infor has announced a new release and encouraging plans for existing Lawson public sector customers, it is too early to determine how the Infor acquisition will affect the products, functionality, integratibility, technology, and support available to the Authority during the next five years.

2.2.3.2 Lawson Finance, Human Resources, and Materials Management Opportunities

Upgrades to newer available versions of the Lawson/Infor software and implementation of optional modules provide opportunities to implement work flow (reducing paper and streamlining approvals), replace up to 4 existing in-house developed applications (e.g., Change Order Tracking, MBE/WBE), and improve reporting and decision support for management. During the same projects, the Authority can make configuration changes to take greater advantage of the Lawson applications' capabilities, resulting in reducing paper, automating manual processes, and eliminating redundant entry.

As the impacts of the Infor acquisition unfold over the next five years, the Authority must evaluate its needs in comparison with the available products, functionality, integratibility, technology, and support being provided by the vendor, and in comparison to alternative choices.

When the existing Hyperion Budgeting application no longer satisfies the Authority's functional and/or technical requirements, the enhanced, integrated Budget Planning module should be considered.

2.2.4 Maximo Maintenance Management: Gaps and Opportunities

2.2.4.1 Maximo Maintenance Management Gaps

Maximo is the Authority's Authority-wide Computerized Maintenance Management System (CMMS), which is utilized for management of equipment and linear assets at the Deer Island Treatment Plant, the Field Operations Department, and Vehicle Management and Maintenance. The Authority has made good use of Maximo in developing an exemplary asset management program (in comparison with other progressive water/wastewater utilities).

The Authority currently uses Maximo Version 5.2, which is two major releases behind and is not compatible with Microsoft Windows 7 desktop operating system. MIS has developed integrations that utilize Lawson materials data to cost work orders, and enables purchase requisitions to be associated with work orders. MIS has also developed a "one-way" integration between underground assets and GIS spatial data. Users can click on the representation of an asset on a GIS map and view Maximo asset attributes and work order history data. In addition, a number of specialized applications have been developed to store maintenance management data, because needed capabilities were not available in the then-current versions of Maximo. These applications include the following:

- Lube Sampling Database;
- Preventive Maintenance (PM) Monthly Report;

- Predictive Maintenance (PdM) Monthly Report;
- Reliability Centered Maintenance (RCM);
- Resource Leveling; and
- Tool Tracking.

Newer releases of Maximo potentially include functionality that meets the Authority's needs in place of some of these in-house developed applications.

2.2.4.2 Maximo Maintenance Management Opportunities

An upgrade to the current Maximo version, acquisition of selected options, and reconfiguration to meet the Authority's needs using integrated Maximo functionality could eliminate the need for some of the specialized in-house developed applications. This would provide users with an integrated solution, eliminate redundant entry, and reduce MIS support effort. In addition, the upgrade should consider richer integrations (especially with GIS), business process improvements to exploit the added functionality, improvements in workflows and reporting, and consolidation of the two existing Maximo instances. The MIS Department has begun migrating data from Version 5.2 to the vendor's most current release (Version 7.5) of Maximo.

2.2.5 ArcGIS Geographic Information System (GIS): Gaps and Opportunities

2.2.5.1 ArcGIS Geographic Information System Gaps

GIS is used at the Authority both as an enabling technology (similar to a relational database management system such as SQL-Server) and as a collection of applications designed to capture, store, manipulate, analyze, manage, and present spatially-referenced data. Most of the Authority's GIS knowledge and activity resides in the Planning Department. The Mapping and Data Analysis group of 10 employees (in Planning) developed and maintains the GIS data, supports users throughout the Authority, and performs some application development using ArcGIS tools. However, this business unit is currently not structured to support the needs of large numbers of GIS end users. There is also a GIS Coordinator position in the MIS Department.

At present, a client-server environment is being utilized for managing and maintaining geospatial data ("SDE geodatabases"), but the Authority is beginning to utilize available Web services for zero-footprint clients, mobile, and application integration. GIS analysis is currently being performed by "power users" throughout the Authority on desktop client computers. A GIS "viewer" application is available to users who only need to look at spatial and tabular data, but do not perform any editing. Development work is being done in MIS on a web-based "viewer" application, but is not proceeding expeditiously. There is an unclear division of responsibilities between Planning and the GIS Coordinator in the MIS Department, and no governance process currently exists to determine the roles and responsibilities.

2.2.5.2 ArcGIS Geographic Information System Opportunities

The Authority's GIS has reached a level of maturity where it can be integrated with other Authority-wide applications to "spatially enable" those systems. Thus, GIS has the potential to support a number of MWRA requirements, including expanded functionality for the existing one way GIS integration with Maximo; and data integration with Oracle applications, sewer television inspection (CCTV), PIMS, water transmission system modeling, and with other databases. In addition, GIS technology can be applied to meet needs for scientific, environmental, and

engineering applications and analyses.

An Authority-wide GIS strategic plan, including organizational roles/responsibilities, project priorities, and data maintenance objectives, will provide guidance to these activities, as well as establish processes for updating the GIS and keeping its data current.

2.2.6 Pretreatment Information Management System (PIMS): Gaps and Opportunities

2.2.6.1 Pretreatment Information Management System Gaps

The Inflection Point Solutions PIMS package is used by the Toxic Reduction and Control (TRAC) Department to monitor industrial pretreatment permits, inspections, sampling, and enforcement activities for the Authority's 210 Significant Industrial Users (SIUs) and 1,400 permitted facilities. PIMS integrates with the Authority's Laboratory Information Management System (LIMS), which provides the results of samples. After a troubled five year implementation period, the number of open problem tickets has been reduced to 50 (from over 200), and continues to shrink.

The Authority has a strong preference to meet TRAC's functional requirements by solving issues and enhancing the existing PIMS application. Specific current needs include the following:

- Implementing functionality to comply with new regulatory requirements (e.g., the Federal EPA's Cross Media Electronic Reporting Rule (CROMERR), EPA rules on Dentists).
- Completing or fixing functions that do not work to the satisfaction of the TRAC Department (e.g., scheduling, data integrity/quality control checks, enforcement documents, LIMS integration enhancements, GIS integration, automated bill generation, ad hoc reports).

Addressing these current needs will require IT governance, skilled management of the vendor, a detailed understanding of TRAC's business needs and priorities, and a formal system development life cycle management approach.

2.2.6.2 Pretreatment Information Management System Opportunities

Using Application Portfolio Management techniques, the current state of the PIMS implementation should be assessed, including a detailed analysis of the following:

- Functions that do not work to the satisfaction of the TRAC Department (e.g., scheduling, data integrity/quality control checks, enforcement documents, LIMS integration enhancements, GIS integration, automated bill generation, and certain reports).
- Steps involved in complying with regulatory requirements for enhancements (including CROMERR and the EPA rules on Dentists).
- Additional TRAC business requirements and opportunities which have emerged since the current system was selected in 2006.

This effort will require the participation of MIS, TRAC, and the software vendor. The Authority should apply its governance process and system development life cycle management approach to implementing the recommendations resulting from this analysis.

2.2.7 Scientific and Engineering Computing: Gaps and Opportunities

2.2.7.1 Scientific and Engineering Computing Gaps

The Authority uses both COTS applications (including ArcGIS, AutoCAD, SPSS, and MatLab) and in-house developed applications (HOML Environmental Monitoring and Management System, Central Harbor / Bay Environmental Monitoring Database) to support its scientific and environmental analysis needs. A number of users in the ENQUAD and Engineering Departments develop applications and reports using Oracle databases and application development tools, while MIS support in this area has primarily been to provide the underlying technology infrastructure. Some of the application developers lack the software engineering background necessary to adequately develop and support quality applications and data resources. This has resulted in a number of standalone applications and data repositories whose integrity depends upon the skill of all users. These applications include limited quality assurance, creating the risk for unintended data corruption.

2.2.7.2 Scientific and Engineering Computing Opportunities

Pending requests for scientific and environmental applications include the following:

- Web portal for requesting environmental data, including a map query tool;
- Spatial enabling of beach reports;
- Harbor loading data;
- CSO Reporting; and
- Porting existing MS Access applications to Oracle web applications.

Since 2009, the Federal EPA (which regulates MWRA's environmental activities) has been urging submission of Discharge Monitoring Reports (DMRs) through NetDMR, a software tool for electronic submissions through the web. MWRA currently gathers the required data using Crystal Reports, and makes its submissions on paper. Development of NetDMR submittal capability should be integrated with tools and processes for preparation and data checking.

2.2.8 Performance Measurement: Gaps and Opportunities

2.2.8.1 Performance Measurement Gaps

Performance measurement, primarily in the form of the Orange and Yellow notebooks (hereinafter collectively referred to as "the notebooks"), are the Authority's primary tool for Authority-wide performance reporting. The notebooks are a large assemblage of detailed departmental reports and accompanying analysis, whose content has grown over a number of years. Significant manual effort is required to compile raw data from manual and automated sources, analyze and summarize the data, generate graphics, and comment upon the results. These manual processes result in a 6 week time lag before the notebooks are published.

The most notable exception to the manual processes described above resides in Operations. Much of Operations' data is reported in near-real time through PI and associated systems. This approach to reporting should be emulated in other Departments throughout the Authority.

2.2.8.2 Performance Measurement Opportunities

Automate the compilation of monthly and quarterly performance reports, including tools for extracting data from existing operational applications, managing data quality, generating reports (including dashboards, graphics, and various analyses), and automating report assembly.

2.2.9 Enterprise Content Management: Gaps and Opportunities

2.2.9.1 Enterprise Content Management Gaps

A number of Departments expressed the need for an electronic content management (ECM) system to address the organization's dependence upon paper records, support records management activities, improve access to information, streamline work flows, and replace several existing departmental-level solutions. ECM is an umbrella term including document management, web content management, search, collaboration, records management, work flow management, capture, and scanning. ECM is aimed at managing the life-cycle of information from initial publication or creation all the way through archival and eventual disposal.

MWRA currently is using four different applications – three of which are technologically obsolete – in departmental-level ECM solutions. ECM contains tools for executing the organization's record management policies and processes, and will impact all Departments' business processes, policies, standards, applications, data conversion, and data management. A well-implemented ECM would enhance the Authority's workflow and collaboration, search, storage, and archival practices.

2.2.9.2 Enterprise Content Management Opportunities

A well-implemented ECM would enhance the Authority's workflow and collaboration, search, storage, and archival practices. Note that this will be a significant Authority-wide effort, affecting the business processes of every Department, and including the following:

- Policies;
- Standards;
- Alignment with Records Management and Retention Schedule;
- Business processes and practices; and
- Data conversion and management.

It is anticipated that ECM will be implemented incrementally, based upon various Departments' needs and the availability of resources to participate in implementation tasks.

2.2.10 Reporting and Analysis: Gaps and Opportunities

2.2.10.1 Reporting and Analysis Gaps

Reporting and analysis is performed within individual Authority business units, using a variety of report writing and query tools. In many cases, data that originates in operational systems is manually re-entered into Excel spreadsheets for post processing, analysis, and report generation in the desired formats. In addition to the inefficiency of redundant entry, this practice creates the possibility of entry errors, does not provide a systematic audit trail, and inhibits sharing of data and reports. There is minimal capability to produce reports that use data from multiple source systems, and no data dictionaries (other than those provided by the vendors of operational systems) to support ad hoc report writing.

Operations is more advanced than other areas within the Authority in this respect, having extensive reporting, analysis, and graphic display capabilities through PI, OMS, and related systems.

Many Authority users report that their ability to obtain needed reports is highly dependent upon the knowledge provided by the MIS staff assigned to support them. Where MIS support is

missing or deemed inadequate, some business units have developed in-house reporting specialists. MIS employees and other Departments have also developed simple database applications, which include data entry and some validation, as well as queries and reports.

2.2.10.2 Reporting and Analysis Opportunities

Implementation of data governance and an Authority-wide data architecture will standardize data across multiple systems for a consistent view of the Authority across all Departments.

2.2.11 Integration: Gaps and Opportunities

2.2.11.1 Integration Gaps

MWRA has relatively few integrations among applications, and no Authority-wide data model or Authority-wide application architecture to guide systematic integration planning. During the acquisition and implementation of the Authority's existing technology, priority was not given to integration capability or conformance with the Authority's integration standards. When individual Departments initiate procurements independently of MIS, Authority-wide integration opportunities may not be considered. Consequences from the lack of integration and IT governance include:

- Excessive reliance on paper documents for data transfer;
- Uneven capabilities for establishing business cases, project objectives, and detailed requirements across the Authority;
- Numerous small, independent special-purpose applications; and
- Technology projects that struggle to achieve their business objectives.

A few point to point integrations – generally developed in-house – have been implemented, but no consistent standards and integration approach are being followed, or being specified during the acquisition of new systems.

2.2.11.2 Integration Opportunities

Achieving the Authority's business objectives requires meaningful integration of information and practices throughout the organization, thereby eliminating redundant, inefficient information "silos". Consistent application integration standards need to be developed and utilized in the specification of new technology systems. In addition, a standardized integration approach and application implementation framework should be adopted and followed.

2.3 Cyber Security

2.3.1 IT (or "cyber") security best practices evolve in the face of changing threats, and are actively managed and monitored. Cyber security policies must be integrated with administrative and human resources policies and training. Water and wastewater utilities manage their SCADA and other mission-critical operational systems to a high level of security as determined by DHS and professional organizations, including logically isolating these systems from the rest of the organization.

2.3.2 Cyber Security: Gaps and Opportunities

2.3.3 Cyber Security Gaps

Security is a top priority of the Authority and IT (or "cyber") security receives considerable

attention. No significant cyber security issues were observed with the Authority's information technology infrastructure. SCADA is on entirely separate MWRA network from general computing, which is a best practice, but both systems have a common network provider. MIS has one employee responsible for cyber security, but much of this individual's time is diverted to solving users' problems.

The Authority has good infrastructure and monitoring in place to protect against external threats, but the implementation of security practices at the application and/or individual Authority employee level are fragmented and often ad hoc. In part, this is due to fragmentation of responsibility for internal security practices – separate teams are responsible for network access, user permissions within the application, and possibly for server or database level permissions. Another observed cause of internal security issues is the lack of systematic on-boarding and exit processes for employees, leading to potential lags in notification to appropriate parties to allow or disallow access permissions.

2.3.4 Cyber Security Opportunities

Potential improvements on the Authority's existing cyber security practices include defining and implementing an Authority-wide information security plan, electronic security plan and a cyber security plan including standards, policies, and practices. These standards and policies will be designed to replace ad hoc responses to specific situations. In addition, additional coordination between physical and cyber security efforts will provide a holistic approach that decreases the potential for oversights.

2.4 Data Management

The assessment of data management addresses the Authority's data stewardship practices, including data creation, quality, ownership, maintenance, integration, analysis, and reporting.

2.4.1 Best Practices

Data is a critical corporate asset which has considerable value, needs to be protected, and should be managed efficiently. Some of the best practices for data management are as follows:

- Data is captured once, at the time it is created, and shared for reuse many times; redundant data entry and storage is inefficient, and can result in inadvertent errors.
- Enterprise data is managed within enterprise systems; storage of data in spreadsheets and personal databases is limited to less critical, personal business processes and custom analyses.
- Consistent data management is facilitated by maintaining an enterprise data dictionary with associated metadata, and master data management for datasets which multiple Departments create and change (e.g., asset IDs).
- Reporting and analysis tools facilitate end user utilization without excessive training requirements.
- Data integration is an essential architectural requirement for new applications.

All kinds of business organizations, including utilities, are implementing these data management practices.

2.4.2 Strengths

Data management has not been a priority for prior MIS management, and the Authority's siloed systems create obstacles to executing the best practices listed above. However, the Authority's key data sets are generally trusted. In addition, MIS has implemented data warehouses for Waste Water Quality (WWQ) and for Sewerage Facility Operations Management data (OMS). WWQ contains all results from the Labware LIMS and 15 years of historical data from the previous Beckman LIMS. OMS includes operational data and applications to support process control calculations. Both data warehouses facilitate data analysis, regulatory and operations reporting, long-term trend analysis, and management decision support.

2.4.3 Gaps

MWRA does not consistently treat data as a valuable enterprise asset. Tools to support data management, including an Authority-wide data dictionary and master data management, have not been implemented at the Authority. Only a limited quantity of Authority-wide data management and documentation is in place. The result of deficiencies in data management is that individual databases have the potential for containing overlapping data, which is redundant and can lead to inconsistencies and multiple representations of data.

Some of the barriers to improved data management at the Authority are the following:

- Siloed applications are obstacles to sharing data; when the same data is used by multiple applications, integrations and other means are necessary to share or update

data.

- Data documentation quality varies widely among applications; some are well-documented while others rely only on vendor documentation or examination of the actual data contents.
- There is much manual data transfer and redundant entry between the Authority's systems, especially for reporting.
- Data in spreadsheets and personal databases, which is considerable, is not managed at the enterprise level.
- MIS does not have dedicated data management specialists, but does have Database Administrators who sometimes play this role.
- There are limited data warehouses or reporting repositories outside Operations (which has Operations Management System (OMS) and the Waste Water Quality (WWQ) data warehouses); as a result, queries must go against source systems, one at a time.

To achieve the maximum value for each element of information, it must be designed and managed for reusability across multiple applications within the Authority. This is achieved through a mixture of business and technical standards and practices, which must be implemented within the organization.

2.4.4 Opportunities

Enhancing the Authority's data management practices is essential for reducing redundant entry and storage, improving data integrity, and integrating data from multiple applications. An Authority-wide data architecture should be developed, and supported by Authority-wide data modeling and management, to standardize data across multiple systems for a consistent view of the Authority across all Departments.

2.5 Technology Infrastructure

The assessment of the Authority's general information technology infrastructure addresses all computing hardware, including data and voice networks, servers, desktop and laptop computers, and peripheral equipment.

2.5.1 Best Practices

Reliable technology infrastructure that meets performance expectations is the foundation for all the aspects of information technology that have been discussed above. Some of the best practices for managing technology infrastructure are as follows:

- Technology infrastructure is adequate to support the business needs of the organization, plus some reserve capability for peak demand and incremental growth.
- Infrastructure components are relatively current with vendor-provided updates.
- Technology infrastructure is organized through a systems architecture that facilitates enterprise integration.
- Technology infrastructure minimizes maintenance and operations costs.
- Technology infrastructure utilizes generally available technologies, while being flexible enough to integrate a non-standard component when it is important to the business to do so.
- Technology infrastructure is part of asset management practices within the agency, with systematic budgeting for refresh and upgrade. This is coordinated with new project proposals to include additional infrastructure when needed.
- Adequate plans and facilities for information technology disaster recovery exist, and are tested.

2.5.2 Strengths

The key components of the Authority's technology infrastructure are stable and currently adequate, with a good history of reliability. Users' performance expectations are generally being met, with the exception of one location.

2.5.3 Gaps

MWRA's technology infrastructure provides reliable service which generally meets users' performance expectations, with the exception of the Southborough locations. The servers, machine rooms, and networks are adequate for existing usage, but the network will be challenged when additional large loads (e.g., electronic document management, wider use of GIS) begin passing larger amounts of data. In addition, the consultant believes that existing disaster recovery plans and facilities should be upgraded, including testing of the plans, investigating off-site data storage, and arranging for a hot backup capability. The Authority's reliance on one vendor for critical voice, data, and SCADA telecommunications infrastructure is also a risk.

Inadequate file management and backup practices put the Authority at risk of losing important data that is stored on individual desktop personal computers. Users have folders to store data

on a network server, but the amount of storage allocated to users (200 MB per user) is not adequate for many users. If users utilize capabilities in Exchange to archive email and attachments, the resulting PST files are stored on the individual's desktop disk drives. The user folders on the network are backed up by MIS, but there are no backup practices for data on desktop personal computers. In addition to being an issue with users, this approach makes Authority-wide data management unattainable.

In addition, a number of users have legitimate unmet needs for a secure file transfer mechanism to transfer large electronic files with the state and federal government, industry associations, and academic institutions.

2.5.4 Opportunities

Opportunities to assure the continued reliability and performance of the Authority's technology infrastructure include enhancements to capacity and performance of networking and communications, storage, backups, server consolidation, disaster recovery, and integration approach and tools. A systems architecture should be developed to provide a framework to guide these infrastructure changes, as well as future improvements. This systems architecture should include technical (nonfunctional) specifications to be included in any application or systems procurement or development project.

Appendix B: Program Elements

In this section, each of the programs recommended in MWRA's Five Year Strategic Plan is briefly described. Each Program Definition contains the following information:

- Program Name and Description
- Expected Benefits
- Summary of Program Scope and Approach
- Expected Deliverables
- Interdependencies with Other Programs
- Expected Durations

These Program Definitions are not intended to be fully-developed business cases for implementation, but rather they serve as Stage 1 justifications for inclusion in the Five Year Strategic Plan. We anticipate that each Program Definition will be the starting point for developing more detailed business cases when the Authority moves forward to finalize funding and/or approval to implement all or portions of the recommended strategic plan. The lack of metrics documenting need and indicating possible benefits is due both to this intended use and to the assessment finding that business units within the Authority have not typically been collecting any performance indicators suitable for this purpose. Collection of such metrics should be a key task for the program proponents during development of a more detailed business case to define the program budget request and justify approval to proceed.

This two-stage approach to program definition conforms to Project Management Institute Body of Knowledge recommendations and other best practices. We have worded our recommendations on IT Governance and have developed these MIS Strategic Plan recommendations within what is called a stage-gate approach (although we have de-emphasized the level of formality to be implemented at MWRA). The recommended practices are enhancements to general governance practices, such as Executive Director approval, and are intended to provide a more technical oversight to existing administrative oversight.

- The first stage, as discussed above, is to develop a planning level program scope and justification that allows it to be considered as part of the strategic thinking of the Authority. Looking forward, this will include bringing requests for new IT projects to the IT Governance Committee and maintaining/extending the MIS Strategic Plan over time.
- The second stage comes when a formal approval of budget and scope, and/or formal authorization to proceed beyond an action of the Authority's Executive Director, is required by Board policies. This will require development of a more detailed project scope and budget, backed up by a formal business case.

The programs in MWRA's recommended technology strategic plan are as follows:

Application Programs

- Enterprise Content Management Program
- Lawson Enhancements
- Maximo Upgrade
- GIS Applications and Integration

- Mobile Integrations
- Enterprise Performance Measurement Enhancements
- Pretreatment Information Management System Enhancements

IT Security Programs

- Information Security Program (ISP)
- Electronic Security Planning (ESP)

Enterprise Technology Management Programs

- MIS Reorganization
- Change Management Program
- IT Governance Program

Technology Programs

- IT Infrastructure Upgrades
- Email Upgrades
- Enterprise Data Management
- User Data Management

This list of programs reflects the compilation of business needs for technology during several working sessions with MWRA managers and key staff. These programs implement goals and strategies for applying technology to support MWRA's business strategies.

Enterprise Content Management	
Section Name	**Description**
Project Definition	Implement Authority-wide content and document management (ECM) program. Integrate existing and desired records management practices and policies. Select Authority-wide ECM software, develop and implement associated business processes, and deploy.
Expected Benefits	• Reduced staff time searching for documents, by assuring availability of records when required. • Reduced storage requirements and costs. • Faster and more complete response to requests. • Improved quality assurance, version control.
Summary of Scope/Approach	• Define Authority-wide business needs for content and document management. • Define technology requirements necessary to support records management program and departmental document management / content management needs. • Update records inventories and updates of master retention schedule. • Develop technical specifications for document management, content management, and records management systems. • Select and acquire most advantageous software solution to meet the Authority's requirements. • Develop implementation phasing and plan for each record set, including correspondence, procedures, contracts, ordinances, engineering documents, "as builts", and O and M manuals. • Design business processes and master retention schedule, configure system, design and construct integrations. • Perform required conversions, and quality assurance. • Train staff on new business processes and uses of technology that supports business processes. Repeat until implemented in all departments.
Expected Deliverables	• Electronic Content Management System technology supporting Authority-wide Records Management program, including scheduled records destruction and enterprise application integration.

Enterprise Content Management	
Section Name	**Description**
Project Interdependencies	• Relies on IT Infrastructure Improvements to support storage and networking of records. • Relies on Enterprise Data Management for data dictionary terms list. • Relies on Email Upgrades that support archiving and legal holds. • Coordinate with Electronic Security Plan development activities.
Strategies Implemented	• Enterprise Document Management. • Reduce Paper.

Lawson Enhancements	
Section Name	**Description**
Project Definition	Upgrade to Lawson/Infor Version 9.0.1 and implement Contract Management, Strategic Sourcing, and Process Flow Integrator modules. Reconfigure Lawson Finance to utilize other newly-available functionality if needed by the Authority. Potentially replace Hyperion budgeting application and some stand-alone databases with new Lawson/Infor functionality. Continually assess migration to the most current version of the Lawson/Infor modules including Finance, Human Resources, and Materials Management products. Implement updated configurations and business processes to take full advantage of the additional capabilities.
Expected Benefits	• Increased efficiency through reduction of redundant data entry, automation of manual processes, and elimination of manual and paper steps. • Increased effectiveness through improved management decision support, improved accuracy / quality of data, and enhanced audit tracking of reports. • Reduced MIS support for changes and integrations through new triggers and workflow. • Resolution of issues with specific modules.
Summary of Scope/Approach	• Phase 1 (2012): Upgrade to Lawson/Infor Version. 9.0.1 and implement Contracts and Strategic Sourcing modules. Enhance Lawson Finance by revising the configuration to utilize the newly-available functionality if needed by the Authority. o Upgrade Lawson/Infor software to Version 9.0.1 o Design, reconfigure, test, and deploy software and process changes. o Replace stand-alone Contract Card database, MBE/WBE User Interface, and (potentially) several other MIS-maintained databases. • Phase 2 (2015): Evaluate the functionality and technology of the most current versions and future announced directions of the Lawson/Infor product suite, to determine its continued applicability to MWRA's needs. o Determine potential finance and accounting process enhancements that are supported in Lawson/Infor Version. 10, including encumbrances and pre-encumbrances. o Document Authority processes, enhancement opportunities, and requirements for additional automation in the finance, human resources, and materials management operations.

Lawson Enhancements	
Section Name	**Description**
Summary of Scope/Approach (cont.)	o Determine the extent to which the most current versions and optional modules support these requirements. o Assess any necessary technology infrastructure and MIS staff requirements to support the Lawson/Infor products. o Assess future of Lawson as software offering by new owner (Infor). Determine whether to continue with Lawson/Infor or seek alternative COTS solution. o Consider restarting Lawson Custom Code Review process with Infor, to determine how much of MWRA customization can be incorporated into the base product. • Implement upgrades to most current Lawson/Infor version, workflow (Lawson Process Flow), and beneficial optional modules. o Develop a detailed implementation plan. o Implement new versions and enhanced configurations, workflows, and reporting. o Implement additional Lawson/Infor modules and enhanced business processes. o Replace standalone databases / applications.
Expected Deliverables	• Updated software with enhanced functionality and workflow, improved management reports, superior decision support.
Project Interdependencies	• Benefits from Enterprise Application Integration. • Potential dependency on Technology Infrastructure activities if Lawson/Infor future direction doesn't include UNIX. • Enterprise Content Management. • Enterprise Performance Management Enhancements. • Coordinate with Electronic Security Plan development activities.
Strategies Implemented	• Lawson Enhancements. • Process Improvements. • Reduce Small Databases. • Paper Reduction.

Maximo Upgrade	
Section Name	**Description**
Project Definition	Complete migration to the current Maximo version (7.5), acquire additional modules, and add richer integrations (e.g., with GIS), reconfiguration, and business process improvement to exploit the added functionality. Assess opportunities to improve workflows and reporting. Evaluate consolidating two existing installations of Maximo. Determine whether the functionality of any stand-alone applications will be replaced by the new Maximo version and/or modules.
Expected Benefits	• Increased efficiency through reducing redundant data entry, automating manual processes, eliminating manual steps, and improving business processes. • Eliminate several stand-alone databases and associated maintenance. • Improve Authority-wide decision support. • Maintain vendor support for software.
Summary of Scope/Approach	• Analyze needs/processes. Document existing business needs and business processes and determine gaps. • Review capabilities of current and upcoming Maximo versions and optional modules. Identify improvement opportunities, including configuration and reporting changes, and replacement of standalone databases / applications. • Install, configure, and test updated software with migrated data. Upgrade the Maximo database to Oracle 11G R2. • Design and implement standardized Authority-wide business processes and asset naming conventions with enhanced configurations and workflows in Maximo. • Revisit the Maximo Spatial product upon completion of the 7.5 upgrade (and before implementing an internally developed GIS integration). • Design and implement business processes with enhanced configurations and workflows in Maximo.
Expected Deliverables	• Updated Maximo implementation with additional functionality.
Project Interdependencies	• Benefits from Enterprise Application Integration. • Coordinate with Electronic Security Plan development activities.

Maximo Upgrade	
Section Name	**Description**
Strategies Implemented	• Maximo Enhancements. • Process Improvements. • Reduce Number of Small Stand-Alone Databases.

GIS Applications and Integration	
Section Name	**Description**
Project Definition	Develop Authority-wide GIS strategic plan, including organizational roles/responsibilities, project priorities, and data maintenance objectives. Establish processes for GIS updates and data maintenance to keep data current. Expand role of GIS technology for scientific, environmental, and engineering applications. Develop or acquire GIS applications as needs identified, including expanded "spatial enabling" of existing applications.
Expected Benefits	• Greater usage of GIS data, leading to replacement of paper maps and other geospatial data sets. • Reduced data entry error in systems that require geospatial descriptive attributes such as addresses, drainage basins, municipality, etc. • Greater data quality and staff confidence. • Reduced data questions and supplemental research. • Reduced risk due to use of outdated or incomplete asset inventory. • Improved leveraging of existing technology.
Summary of Scope/Approach	• Assess current business process and data maintenance, QA/QC policies and practices. Review use and desired applications of GIS data. Identify possible data gaps within GIS that would hinder desired utilizations, and initiate corrective actions. • Identify and implement needed integrations between GIS and existing applications not covered in other projects. Identify changes in business processes needed to make optimum use of these integrations. Candidate integrations include: o Enhanced (2 way) Maximo integration with richer functionality for Field Operations. o Enterprise Content Management (ECM), for access to as-builts and asset manuals; and for geospatial indexing of documents. o Lawson Financials (Fixed Assets) and Materials Management. o Pretreatment Information Management System (PIMS). o Laboratory Information Management System (LIMS). • Design and implement business processes to correct, update, and maintain data in GIS and any synchronization with GIS. • Identify currently unmet business needs for GIS capabilities to integrate data and perform analyses. • Develop or acquire applications to meet business needs having a favorable return on investment, including general geospatial data access and queries, possibly including:

GIS Applications and Integration	
Section Name	**Description**
Summary of Scope/Approach (cont.)	o Expanded use of general GIS data viewer technology for additional user groups. o Replace legacy in house built Real Properties application with GIS flex viewer based system. o Integration of CCTV condition assessment data in CUES and GIS (committed). o Integration of TELOG time series data with GIS o AVL integration with Authority asset locations, sampling locations, and other data (committed to acquire; integrations to follow initial roll-out). o Synchronized update for water distribution system data, schematics of the water distribution system, Maximo valve database, and detail records. o Automation of ENQUAD beach reports, and other environmental data. • Identify possible opportunities to add additional data sets to the GIS, including enriching existing GIS data with additional information, such as plant data from CAD drawings.
Expected Deliverables	• List of integrations with other systems that achieve business objectives. • Redesigned “To-Be” business processes with policy recommendations and new roles to match. • Integrations between GIS and existing business systems. • GIS data integration and analysis applications. • Additional GIS data resources.
Project Interdependencies	• Would use tools and techniques from Enterprise Application Integration. • Would use Electronic Content Management as data source. • Coordinate with Electronic Security Plan development activities
Strategies Implemented	• GIS Enhancements. • Maximo Enhancements. • Process Improvements. • Reduce Small Databases. • Reduce Paper.

Mobile Integrations	
Section Name	**Description**
Project Definition	Define integrated business strategy for mobile computing, to focus on Operations staff and Authority management. Select suitable technologies (possibly including tablets, smart phones, and laptops) to meet identified business requirements. Implement support systems and deploy appropriate technologies.
Expected Benefits	• Data entry at the source, resulting in more timely operational information and improved reporting accuracy. • Near-ubiquitous access to automated Authority data. • No more re-keying of handwritten data and the QA/QC problems created by re-entry.
Summary of Scope/Approach	• Investigate mobile solutions available for MWRA Authority-wide applications, including viable third-party COTS mobile apps. Create use case for mobile solutions (addressing uploads, downloads, data updates, backups, and wireless communication versus docking) and identify implementation, support, and deployment requirements. • Identify candidate mobile applications and select based upon the benefit / ROI for MWRA. Potential mobile applications include: o Management – MS Office applications. o Plant and Field Operations and Maintenance – Maximo, O&M Manuals, As-Builts, Plans, and GIS. o Warehouse – Lawson Materials Management. o GPS Devices - Locate MWRA field assets and SIU/LIMS sampling locations to determine latitude and longitude without having to survey them. o Develop GPS accuracy standards for locating assets in the field. • Implement a pilot project to verify satisfactory functionality, effective use, and return on investment (ROI) from mobile access. • Continue to roll-out mobile capabilities solution and integrate with existing Authority-wide applications.
Expected Deliverables	• Standards for using mobile technology with existing Authority-wide applications, and their respective hardware, implementation, support, and deployment requirements with recommendations. • A pilot program to determine the field success of mobile hardware, including trained staff, user guides, and a mobile solution.

Mobile Integrations	
Section Name	**Description**
Project Interdependencies	• Coordinate with Authority-wide application upgrade projects for Lawson, GIS, ECM, and Maximo. • Coordinate with Electronic Security Plan development activities.
Strategies Implemented	• Mobile Computing. • Reduce Paper.

Enterprise Performance Management Enhancements	
Section Name	**Description**
Project Definition	Implement automated tools to support the compilation of monthly and quarterly performance reports, including tools for extracting data from existing operational applications, managing data quality, generating reports (including dashboards, graphics, and various analyses), and automating report assembly.
Expected Benefits	• Improved efficiency in compiling performance data. • More flexible and timely reporting, with the ability to drill down into details when necessary. • Integrate data from multiple systems for generating consolidated performance indicators.
Summary of Scope/Approach	• Identify key performance management indicators and relevant metrics. • Identify sources for measuring individual and team performance indicators. Modify systems to collect necessary data in appropriate formats. • Conduct business practice and workflow analysis to verify alignment with business practices and ensure that the selected solution is properly configured to fit those business practices. • Specify monitoring and reporting requirements. Identify sources for required data. Develop Business Intelligence (BI) applications for managing data quality and automating report assembly. Integrate as needed with existing applications. • Modify transactional systems where necessary to collect required data. • Acquire performance enhancing software products capable of modeling Authority-wide operational data with predictive analytics capabilities.
Expected Deliverables	• Increased reporting capabilities. • System delivering standard reports, analytical capabilities, and tools for extracting, transforming, and loading data.
Project Interdependencies	• To be implemented after key business applications including improvements to GIS, Maximo, and Lawson. • Coordinate with Electronic Security Plan development activities
Strategies Implemented	• MIS Organization. • IT Governance. • Integration. • Data Management.

Pretreatment Information Management System (PIMS) Enhancements	
Section Name	**Description**
Project Definition	Assess the current state of the PIMS implementation to develop and execute a plan for addressing functional issues and complying with new regulations. This will require the participation of the software vendor, MIS, and the TRAC Department.
Expected Benefits	• Improve the TRAC Department's efficiency and ability to serve its customers. • Assure data integrity, to avoid errors related to customer account data. • Comply with the Federal EPA goal of receiving all applicable reports electronically though the CROMERR system by 2014.
Summary of Scope/Approach	• The TRAC and MIS Departments will work with Inflection Point Solutions (the PIMS software vendor) to perform a detailed analysis of the current state of the PIMS implementation. The desired outcome will be to identify and analyze the following: o Specific defects. o Functions that do not work to the satisfaction of TRAC management and staff. o Regulatory requirements that should be addressed by PIMS. o TRAC business requirements which could be satisfied by PIMS. • A plan to resolve these issues will be developed, including schedule, responsibilities, and costs. It is anticipated that the plan will potentially include resolving problems, providing solutions in future vendor software releases, making PIMS configuration changes, and investing MWRA staff time and funds. • The plan will be executed, utilizing change management principles to manage the software vendor in order to obtain the end results that the Authority needs.
Expected Deliverables	• PIMS providing the functionality that meets the defined requirements. • MWRA electronically submitting Federal EPA reports through the CROMERR system, using data generated from PIMS. • TRAC fully utilizing the potential of PIMS to manage its operations efficiently, and having confidence in essential account data.

Enterprise Performance Management Enhancements	
Section Name	**Description**
Project Interdependencies	• It is necessary to stabilize PIMS before considering integrations with GIS or mobile, or implementing additional enhancements. • Coordinate with Electronic Security Plan development activities.
Strategies Implemented	• PIMS Enhancement. • Consistent Project Approach.

Information Security Program (ISP)	
Section Name	**Description**
Project Definition	Establish organizational arrangements for ongoing provisioning of IT security services to the Authority. Define and coordinate implementation of an Authority-wide information security plan, electronic security plans and a cyber security plan including standards, policies, and practices. Expand current IT security program. Communicate standard IT security requirements, policies, and practices. Move towards coordination of standards and policies more than ad hoc response to specific situations. Coordinate physical and cyber security efforts for a holistic approach.
Expected Benefits	• Increased cyber security through: o Consistent application of appropriate IT security standards, policies and practices. o Reduced variance in understanding and execution of security methodologies.
Summary of Scope/Approach	• Perform inventory and assessment of current security infrastructure and practices against Federal guidelines and best practices, like NIST 800-53 rev.3. • Design infrastructure and system improvements and draft new policies to elevate MWRA cyber security. management to better align with appropriate standards, like ISO 27001 and 27002, to include the following control areas: o Organization of Information Security o Asset & Configuration Management o Human Resources Security o Physical and Environmental Security o Communications and Operations Management o Access Control o Information Systems Acquisition, Development and Maintenance o Business Continuity Management o Compliance • Create and implement a cyber security awareness campaign. • Incorporate redesigned security protocols with IT Governance and Authority-wide governance programs for continuous adjustment and improvement.
Expected Deliverables	• Defined standard IT security requirements, policies, and practices in the form of an Authority-wide information security plan, an electronic security plan, and a cyber security plan. • Centralized coordination for cyber security efforts. • Integration of cyber security into IT governance program.

Information Security Program (ISP)	
Section Name	**Description**
Project Interdependencies	• IT Governance • Electronic Security Planning
Strategies Implemented	• IT Security • IT Governance

Electronic Security Planning (ESP)	
Section Name	**Description**
Project Definition	Coordinate a system-by-system development of Electronic Security Plans that spell out in detail what cyber security measures are appropriate for that system (for example, for Maximo), who is responsible, and what needs to be done.
Expected Benefits	• Increased cyber security through: o Consistent application of appropriate IT security standards, policies and practices. o Reduced variance in understanding and execution of security methodologies. o Specific, actionable security plans for major systems and applications.
Summary of Scope/Approach	• Select and prioritize MWRA systems for which an ERP will be developed. Candidate systems include: o SCADA o PICS o Lawson o Maximo o PIMS o LIMS o Exchange o BlackBerry Enterprise Services o OMMS o Process Book o Telogic o MWRA.COM o WPM o CWS o HOML

Electronic Security Planning (ESP)	
Section Name	**Description**
	• Build a set of Electronic Security Plans (ESP) -- one for each major computer system -- that will require: o Training employees on the new security policies o Training MIS system administrators on how to conduct a security review of their system including data classification and risk assessment. o Determining required security controls and implementing those security controls and infrastructure improvements in compliance with the new security policies. o Compiling and documenting required variances of the security controls, and their associated risk elevations, due to systems' inability to function with the desired controls in place. • Incorporate redesigned security protocols with IT Governance and Authority-wide governance programs for continuous adjustment and improvement. • Develop set of supplemental projects as needed for systems which require major modifications for enhanced security.
Expected Deliverables	• Electronic Security Plans for major MWRA systems. • Integration of cyber security into IT governance program.
Project Interdependencies	• IT Governance • Information Security Program
Strategies Implemented	• IT Security • IT Governance

IT Governance	
Section Name	**Description**
Project Definition	Implement formal practices for allocating IT resources among competing demands and prioritizing requests for IT services. Define and implement roles and responsibilities for setting technology-related policies and allocating resources for applying information technology.
Expected Benefits	• Increase the efficiency and effectiveness of the technology services provided to business units. • Increase the coordination of Authority-wide and business unit-level technology activities and policies, and allocate technology resources. • Increase the cost effectiveness of the Authority's IT organizations.
Summary of Scope/Approach	• Establish formal process for IT Governance: o Establish mandate for IT Governance. o Establish an IT Governance Council, to provide an advisory service to upper management and coordination of lower level decisions. o Utilize existing MWRA governance processes to provide strategic and executive policy guidance to the IT Governance Council. o Clarify the responsibilities of all the Authority's information technology organizations and people within and outside the MIS Department, and assure appropriate coordination. o Document Information Technology Investment Process. o Implement formal project review and status tracking for all IT projects**.** o Implement Service Level Agreements and performance metrics. o Establish MIS Strategic Plan Update Process. • Adopt Applications Portfolio Management (APM) practices and assign to specific staff. o Align IT priorities with business priorities. o Perform base-line portfolio analysis. o Assess total costs of a given application, to evaluate upgrade, replace or consolidate options. • Apply Authority-wide asset management practices to information technology infrastructure and systems. o Determine information needed for revised business processes. Review capacity and use of current IT management software.

IT Governance	
Section Name	**Description**
Summary of Scope/Approach (cont.)	o Update and consolidate application inventories. • Adopt industry standards and best practices for MIS service delivery o Choose and formally adopt standards for service and project delivery. o Identify appropriate levels of project management formality, and specify thresholds for moving from simpler to more demanding levels for a project. o Assess Authority policies and procedures for impacts on IT projects. o Provide training and support. • Manage implementation of Strategic Plan using best project management practices, coordinated through a Program Management Office.
Expected Deliverables	• IT Governance model, including processes, roles, responsibilities, and decision authority for setting policy, allocating resources, managing problems, and assuring the implementation of MWRA's vision for applying technology to its business. • Performance metrics for the MIS Department. • Creation of organizational infrastructure necessary to establish IT Governance practices within MWRA. • APM system configured and in place. • Named methodologies and frameworks for supporting and managing service and project delivery for IT. • Asset management practices for IT assets. • Consistent project management practices for IT projects.
Project Interdependencies	• IT Governance is a prerequisite for implementing many of the changes in this plan. • Coordinate with IT Security programs.
Strategies Implemented	• IT Governance. • IT Infrastructure. • Applications Management. • MIS Services. • Consistent Project Approach.

MIS Reorganization and Change Management	
Section Name	**Description**
Project Definition	Reorganize MIS Department to better align responsibilities with current and emerging requirements. Implement a focus on resolution of customer service issues. Enhance capabilities for planning and implementing organizational change, integrated with Software Development Lifecycle, project management and Information Technology Service Management.
Expected Benefits	• More efficient MIS customer support through clear "ownership" and responsibilities for projects/services/processes. • More effective IT solutions through clearer and more complete requirements definition. • Technology projects consistently fulfill their expected business objectives. • Assure efficiency and consistent quality for information technology activities throughout MWRA.
Summary of Scope/Approach	• Reorganize MIS Department: o Inventory existing employee skills and classifications. List roles and skills on hand. Consider skill set required to meet business needs. Use the gap for defining staff development activities. o Redesign the organization of the department. Create new roles and organizational hierarchy that will allow a focus on business objectives. Align existing employees with roles of best fit. • Establish consistent management of checklists, documents, training and other tools that will help staff effectively perform change management. • Establish responsibilities and skills required to develop consistent, accurate and standard business requirements. • Select a Software Development Lifecycle (SDLC) methodology and, if appropriate, implementation support tools. • Acquire necessary training. • Establish and maintain Authority-wide standards for technology procurements. • Determine training needs of technology staff outside MIS, and coordinate training and other activities to assure consistent software engineering, change management, and quality.

MIS Reorganization and Change Management	
Section Name	**Description**
Expected Deliverables	• New organizational chart and redefined roles and responsibilities. Tracking of employee skills and responsibilities. New policies and metrics for reliability and performance based management that center on customer focus, business needs, and cost justifications. • Use of lifecycle methodologies to identify issues during change planning and incorporate mitigation. • Integrated training process for all Authority technology employees, to ease staff transition to new responsibilities and business processes. • Consistent management and delivery of technology projects which achieve their anticipated business objectives.
Project Interdependencies	• Will depend on IT Governance for broad guidelines and strategic guidance.
Strategies Implemented	• MIS Organization. • IT Security. • IT Governance.

IT Infrastructure Upgrades	
Section Name	**Description**
Project Definition	Plan and coordinate upgrades to IT infrastructure elements, including networks, servers, storage, and other elements. Develop systems architecture as framework for infrastructure changes. Coordinate activities needed to support Enterprise Application Integration, data management, and application improvements. Implement recommended IT infrastructure changes that include enhancements to capacity and performance of networking and communications, storage, backups, server consolidation, disaster recovery, and integration approach and tools.
Expected Benefits	• Coordinated updates to existing and easier implementations of new systems. • Simplified system support and maintenance due to greater consistency in server hardware and operating system, reduction in number of servers and other infrastructure. • Improved consistency and performance of network communications among Authority facilities. • Reduced network traffic. • Improved availability and accessibility to data needed by Authority staff to do their jobs through reduction of file fragmentation and improved functionality to transfer large files. • Improved capabilities to manage email and individual file storage and backup. • Faster backup processes and expanded coverage of backups. • Improved service availability, stability, and robustness during routine operations. • Simplified sharing of data and process triggers among applications, reducing rekeying of duplicate information and support automated follow-up. • Access to data from multiple systems in near-real-time, through a common interface that utilizes the connectivity provided by the Enterprise Application Integration (EAI) framework. Elimination of many point-to-point integrations between systems. • Simplified development of complex reporting and analysis capabilities.
Summary of Scope/Approach	• Develop IT Systems Architecture: o Assess alternative architectures (including private cloud computing, virtualization, greater reliance on Web-based clients, etc.) for suitability. o Define standard IT systems architecture, including specifications for components, their arrangement, and relationships among

IT Infrastructure Upgrades	
Section Name	**Description**
Summary of Scope/Approach (cont.)	general computing, SCADA, and security environments. • Upgrade Network Infrastructure Elements: o Complete switch upgrades and other projects aimed at upgrading obsolescent network components. o Perform monitoring and baseline assessment of network infrastructure and traffic patterns. o Tune switches and other network components. o Add Active Directory servers to remaining sites. o Develop and implement network upgrade plan. o Upgrade all facility wiring to designated standards. • Upgrade File Storage Resources: o Expand Storage Area Network (SAN) to support new business needs. o Change policies and procedures for managing individual and team files. • Upgrade Backup Capabilities: o Evaluate need for tape backup versus alternative means for different record types. o Investigate alternative file backup mechanisms. o Plan and implement backup infrastructure improvements to meet expanded needs. o Implement improved backup capabilities to expand backup coverage. • Improve Server Management: o Assess application inventory to determine which can run virtual server environment. o Seek opportunities to standardize operating systems and hardware, for greater ease of support. o Develop specifications for server hardware and software, including ability to implement greater virtualization. o When replacing existing servers, assess benefits of virtualizing or consolidating multiple applications on shared, larger servers. Accelerate replacement of older servers. o For existing servers having reasonable expected remaining life, upgrade with additional memory and disk storage. • Enhance Fault Tolerance and Disaster Recovery Planning: o Evaluate existing Continuity of Operations and Disaster Recovery plans for enhancements to better support information technology elements. o Determine priorities for bringing business processes back into service. Establish priorities for network and applications, and for key staff and facilities.

IT Infrastructure Upgrades	
Section Name	**Description**
Summary of Scope/Approach (cont.)	o Perform risk assessments and audits. o Identify alternative backup sites and strategies and evaluate against risk assessments. o Develop recovery strategies for: critical data, servers, network, client devices, and essential peripherals. o Prepare an up−to−date inventory and documentation of the plan. Test the plan. Develop verification criteria and procedures. • Develop Enterprise Application Integration (EAI): o Utilize lessons learned from existing EAI explorations to design a consistent EAI architecture. o Adopt Service-Oriented Architecture (SOA). Select SOA toolkits and approaches that maximize ability to integrate existing and current applications. • Acquire required tools and training. o Retrofit current systems. Utilize the EAI framework to systematically extend integration across the Authority's data resources as part of other projects. • Continue integration of additional systems and data. Continue using the EAI framework to systematically integrate additional applications and data.
Expected Deliverables	• Architecture guidelines for new systems procurement or upgrades of existing systems. • Upgraded network components. • Improved performance and fault tolerance. • Increased storage capacity. • Greater file size allocations for staff. • Improved backup process, incorporating more file types • Reduced server count. • Enhanced IT Disaster Recovery Plan.
Project Interdependencies	• Link to Storage Upgrades and other projects that limit necessity for transferring large files across network. • Storage upgrades benefit from Network Improvements for moving files between PCs and SAN. • EAI supports Authority-wide data management and business intelligence. • EAI is prerequisite to GIS integrations and integration of processes, data, and applications. • Coordinate with Electronic Security Plan development activities.

IT Infrastructure Upgrades	
Section Name	**Description**
Strategies Implemented	• IT Infrastructure Upgrades. • MIS Organization. • IT Security. • IT Governance. • Applications Integration.

Email Upgrades	
Section Name	**Description**
Project Definition	Complete migration to Exchange 2010. Increase default attachment size. Substantially increase total email capacity. Establish procedures for managing PST files, including managing on local hard disks, archiving, and automated backups. Explore automation tools for managing email, including automated archiving, automated backup, legal holds, indexing and search.
Expected Benefits	• More manageable email system that better meets user needs. • Consistent ability to find email records when necessary. • Reduction of need to copy emails to paper for filing.
Summary of Scope/Approach	• Complete migration to Exchange 2010. • Change user profiles to increase default attachment size, total email volume size. • Develop and implement policies and procedures for individuals to better manage email within new configuration, including archiving and PST file usage. • Identify unmet business needs for better email management and acquire appropriate software to implement solutions.
Expected Deliverables	• Improved email infrastructure and service.
Project Interdependencies	• Depends on enhanced storage and backup, to increase technical capacity. • Benefits from Enterprise Content Management, to decrease necessity for large file attachments and retention of emails as primary documentation. • Coordinate with Electronic Security Plan development activities.
Strategies Implemented	• Email Upgrades • IT Governance • IT Infrastructure

Enterprise Data Management	
Section Name	**Description**
Project Definition	To achieve the maximum value for each element of information, it must be designed and managed for reusability across multiple applications within the Authority. This is achieved through a mixture of business and technical standards and practices, which must be implemented within the organization. Develop an Authority-wide data architecture that maximizes benefit from data capture and ongoing maintenance. Implement Authority-wide data modeling and management, to standardize data across multiple systems for a consistent view of the Authority across all business units. Identify "custodians" of Departmental data elements. Formalize and communicate standards and practices. Identify data quality standards and assign accountability for their satisfaction.
Expected Benefits	• Coordination of data usage, with decreased redundancy. • Increased ability to integrate multiple applications and share data. • Improved technical specifications for future applications. • Improved quality and timeliness of data resources.
Summary of Scope/Approach	• Document existing data resources. • Develop an Authority-wide data model, including a data dictionary, to capture information needs throughout the Authority and to guide the implementation and integration of new information management systems. • Define current and future (needed) data flows among data resources. • Pursue de-duplication efforts. • Develop virtual data warehouse approaches. • Define responsibilities for data stewardship by data resource within the department. • Define practices for data reuse and availability, including security, naming conventions, metadata, documentation of expected update frequency, documentation of expected quality and accuracy. • Develop planning process for identifying needs for additional data, and allocating resources to acquire. • Perform data development and acquisition. • Define and implement data quality standards. • Integrate data stewardship practices into all IT activities and maintenance projects as needed.

Enterprise Data Management	
Section Name	**Description**
Expected Deliverables	• Authority-wide Logical Data Model based on current and proposed systems and known needs. This is an implementation-independent definition of the entities of interest to the Authority, with their most important attributes. • Authority-wide Data Catalog. This catalog inventories the shareable data resources available within the Authority, with a summary of contents, name of contact for use, and an indication of how it is structured and implemented. • Authority-wide Data Dictionary. This provides definitions for entities and attributes from the logical model, in a readily-queriable format. • List of high-level problems or gaps in data availability. • Roles and responsibilities for data stewardship. • Individual and team assignments for executing roles and responsibilities. • Modified performance measures that incorporate roles and responsibilities. • Data acquisition and maintenance plan.
Project Interdependencies	• Prerequisite to extensive integrations, including GIS Integrations. • Data Governance will define policies, procedures, and business standards that are implemented through Enterprise Data Architecture. • Supports Enterprise Document Management, Enhanced Storage, and other projects through clarification of data to be managed. • Coordinate with Electronic Security Plan development activities.
Strategies Implemented	• MIS Organization. • IT Governance. • Integration. • Data Management.

User Data Management Improvements	
Section Name	**Description**
Project Definition	Implement secure capability for large file transfers and upgrade Authority-wide storage capabilities to better support individual user and work team data sharing.
Expected Benefits	• Increased data security due to consistent file management. • Improved work performance due to efficient data management practices.
Summary of Scope/Approach	• Establish secure method of transferring large files between Authority staff and external collaborators. • Increase file attachment size in MS Outlook. • Restructure disk storage allocations for work teams, and assist in file consolidation. • Develop user data management strategies to guide server and storage upgrades, etc.
Expected Deliverables	• Increased storage for user files. • FTP or similar file transfer solution.
Project Interdependencies	• Limited by current status of MS Outlook and Exchange upgrades, disk capacity on designated file servers. • Will provide strategic guidance of file size requirements for several elements of IT Infrastructure Upgrades.
Strategies Implemented	• Secure Large File Transfer. • IT Infrastructure.

Appendix C: Program Schedule

The list of recommended programs previously identified must each be executed in an organized and programmatic manner that reflects the program dependencies and the Authority's capacity constraints (i.e., the quantity of projects that can be reasonably implemented and absorbed by MWRA). This Technology Program implementation schedule is designed to reflect the MWRA users' ability to absorb new technology and related business process improvements, as well as the MIS Department's capacity to support these efforts.

The schedule below represents a high-level roadmap organized by quarter within each fiscal year for the next five years, plus the two quarters before the end of the current fiscal year. For each fiscal year, it is recommended that more detailed tactical plans, scopes of work, budgets, and schedules be developed for the Authority's technology improvement programs. These will be elaborated in project plans, budgets, and specific schedules for each program and its component tasks.

The implementation schedule below presents each program and the fiscal quarter in which it is scheduled to be active. The color coding indicates the Phase of the System Implementation Life Cycle which will be taking place, as follows:

Yellow – Plan, define, and design/select

Orange – Construct, deploy

Grey – Support, enhance

Blue – Multi-year deployments and/or enhancements of existing applications

The MWRA technology improvement program schedule is illustrated below.

Five Year Information Services Strategic Plan Schedule
Assumed start January, 2011; 5½ Years

		FY2012 Year 0		FY2013 Year 1				FY2014 Year 2				FY2015 Year 3				FY2016 Year 4				FY2017 Year 5			
		Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	Project	Jan	Apr	July	Oct	Jan	April	July	Oct	Jan	April	July	Oct	Jan	April	July	Oct	Jan	April	July	Oct	Jan	April
Applications	**Enterprise Content Management**																						
	Lawson Enhancements																						
	Version Upgrades, Workflow, & Add'l Functions																						
	Lawson/Infor 10 Upgrade & Add'l Modules																						
	Maximo Upgrade																						
	GIS Applications & Integration																						
	Mobile Integrations																						
	Enterprise Performance Management Enhancements																						
	PIMS Enhancements																						
ISP	**Information Security Program (ISP)**																						
	IT Security Program (ISP) Development																						
	Electronic Secuirty Plan Implementation																						
Organization	**IT Governance**																						
	Implement IT Governance																						
	Service Delivery Standards & Best Practices																						
	Manage Implementation Program																						
	MIS Reorganization & Change Management																						
	Reorganize MIS Department																						
	SDLC Implementation Approach																						
	Change Management																						
Technology	**IT Infrastructure Upgrades**																						
	IT Systems Architecture																						
	Network Upgrades																						
	Storage Upgrades																						
	Backup Upgrades																						
	Server Management																						
	Enterprise Applications Integration																						
	E-Mail Upgrades																						
	Enterprise Data Management																						
	User Data Management																						

	Plan, Define, Design
	Construct, Deploy
	Support, Enhance
	Multi-Year Deployments

Appendix D: Program Costs

The chart below presents high-level budget estimates by fiscal year for the implementation of the recommended technology improvement programs. Estimates have been made for hardware, software, and professional services. This breakdown of costs utilizes the following assumptions:

1. **Hardware** costs are split between Infrastructure Upgrades Program and other programs. If a hardware procurement will be of Authority-wide benefit, it is included in the Infrastructure Upgrade, but if it would probably not be required unless the specific Program is implemented, it is included in the program costing.
2. Applications **software** costs are shown as part of the Program which will require them. Server operating systems, shared database software and other software of Authority-wide utility are included in Infrastructure Upgrades.
3. **Professional services** in this context include all services not included in the purchase price of software or hardware. These services may include application configuration and implementation services, project management, specialized technical skills needed for implementation (such as database administration, business process reengineering, data migration, etc.), data capture, document conversion, staff augmentation, and any other skills or resources not provided by the Authority for the program. Note that these services may be for skills not available at the Authority, or for additional resources to meet peak demand for services the Authority would normally provide from its full-time staff.

These budget estimates are based upon the following assumptions:

Appropriateness of Technology Products. The technology product categories (i.e., the types of hardware and/or software) are appropriate to MWRA's business requirements. The products scale to the types of processes used by the Authority. They are designed to not be strained by the size of MWRA's business, nor are they over-featured for the Authority's requirements.

Cost Estimates. The cost estimates are order-of-magnitude (plus or minus 25%), and are based on Westin's knowledge of the amounts spent by similar-sized water utilities for comparable projects. Westin has attempted to make sure that the costs are representative of the technologies and services that MWRA is likely to implement, but future technologies could change these costs. In most instances, combinations of software and services may be required to implement a solution, and the project cost estimates have taken this into consideration.

Time Value of Money. Time value of money factors – such as the cost of funding or inflation – is not included in the budget estimates. ***Cost estimates are in Year 2011 dollars***.

Straight-line Budget Extensions. In defining these projects, the contracted professional services resources assume an expected duration of the project. To the extent that a project timeline is extended, the professional services expenditures can be expected to increase.

Outside Expenditures. These cost estimates reflect outside expenditures, including service and maintenance on COTS software products. Internal support expenditures for hardware and software are not included in these figures.

Possible Resource Sharing. Many of these projects have overlapping needs. To the extent that programs with overlapping hardware and software requirements are undertaken, it may be possible to incrementally reduce the amount of software and hardware acquired, and consequently reduce the total cost of the set of programs. These kinds of synergies will not be known until implementation efforts are

underway.

Internal Staff Requirements. Estimates of internal staff requirements to support these implementation programs are also provided. These include the involvement of MIS Department staff, subject matter experts from the business unit(s) implementing technology, and the Authority's Senior Management. The key to these positions is as follows:

- PM – Project Manager. Will manage implementation projects for the Authority.
- RM – Records Management. Will provide guidance and criteria for document and record series management within applications.
- AS – Application Support. Will provide ongoing support to users of application.
- Sec – Security Manager. Will provide guidance and criteria for security aspects of projects.
- Dir – MIS Director. Will provide executive management direction, coordination, and resource allocation within MIS for implementation efforts.
- IS – Infrastructure Support. Will provide ongoing support and systems administration for servers, network, and other IT infrastructure involved in implementation efforts.
- MM – MIS Management Team. Will provide direction, coordination, and resource allocation within MIS for implementation efforts.
- DS – Data Support. Will provide expertise in capturing, entering, managing, and interpreting data resources required for implementation efforts.
- SME – Subject Matter Expert. Will provide end-user business perspective and operational expertise to implementation team, to ensure applications and policies conform to and support business needs.
- Scrb – Data Scrub. Will provide detailed knowledge of business unit operations in order to correct any errors or omissions in data resources required for implementation efforts.
- GTm – GIS Team. Will provide technical skills and subject matter expertise in utilizing GIS data and software.
- KM – Key Department Managers. Will provide end-user business management perspective to implementation team, to ensure applications and policies support business needs and priorities.

APPLICATION PROGRAMS							
Programs	**FY 2012**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**FY 2017**	**Totals**
Enterprise Content Management Program							
Hardware				$250,000			$250,000
Software				$250,000			$250,000
Professional Services			$250,000	$750,000	$250,000	$250,000	$1,500,000
Program Total:			**$250,000**	**$1,250,000**	**$250,000**	**$250,000**	**$2,000,000**
MIS Staff			PM: 10% RM: 5%	PM: 25% RM: 10%	PM: 10% RM: 10%	PM: 10% RM: 5%	
Business Unit Staff			SME: 5%	SME: 25%	SME: 10%	SME: 5%	
Lawson Enhancement Program							
Hardware							-
Software		$150,000			$350,000		$500,000
Professional Services		$250,000	$250,000	$100,000	$500,000	$150,000	$1,250,000
Program Total:		**$400,000**	**$250,000**	**$100,000**	**$850,000**	**$150,000**	**$1,750,000**
MIS Staff		PM: 5% AS: 25%	PM: 5% AS: 5%		PM: 5% AS: 25%	PM: 5% AS: 5%	
Business Unit Staff		3 SMEs: 5% each	3 SMEs: 5% each		3 SMEs: 10% each	3 SMEs: 5% each	
Maximo Upgrade Program							
Hardware							-
Software		$250,000					$250,000
Professional Services	$50,000	$450,000	$200,000	$100,000	$100,000	$100,000	$1,000,000
Program Total:	**$50,000**	**$700,000**	**$200,000**	**$100,000**	**$100,000**	**$100,000**	**$1,250,000**
MIS Staff	PM: 5% AS: 20%	PM: 10% AS: 25%	PM: 5% AS: 5%				
Mobile Integrations Program							
Hardware				$50,000	$50,000		$100,000
Software				$50,000			$50,000
Professional Services							-
Program Total:				$100,000	$50,000		$150,000
MIS Staff				PM: 5% AS: 10%	PM: 10% AS: 10%		
Business Unit Staff				SME: 5%	SME: 5%		
Senior Management				Governance			

APPLICATION PROGRAMS (cont.)							
Programs	**FY 2012**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**FY 2017**	**Totals**
Enterprise Performance Management Enhancements							
Hardware						$75,000	$75,000
Software							-
Professional Services					$50,000	$75,000	$125,000
Program Total:					$50,000	$150,000	$200,000
MIS Staff					PM: 5% AS: 10%	PM: 5% AS: 10%	
Senior Management					Set KPIs	Governance	
Business Unit Staff	2 SMEs: 5% each	2 SMEs: 5% each Scrb: 25%	2 SMEs: 5% each				
GIS Applications and Integration Program							
Hardware							-
Software				$50,000			$50,000
Professional Services			$100,000	$100,000	$50,000	$50,000	$300,000
Program Total:			$100,000	$150,000	$50,000	$50,000	$350,000
MIS Staff			PM: 5% AS: 25%	PM: 5% AS: 25%	PM: 2% AS: 10%	PM: 2% AS: 10%	
Business Unit Staff			GTm: 25%	GTm: 25%	GTm: 10%	GTm: 10%	
Senior Management			Governance				
Enterprise Performance Management Enhancements							
Hardware						$75,000	$75,000
Software							-
Professional Services					$50,000	$75,000	$125,000
Program Total:					**$50,000**	**$150,000**	**$200,000**
MIS Staff					PM: 5% AS: 10%	PM: 5% AS: 10%	
Senior Management					Set KPIs	Governance	

APPLICATION PROGRAMS (cont.)							
Programs	**FY 2012**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**FY 2017**	**Totals**
PIMS Enhancement Program							
Hardware							-
Software							-
Professional Services*		$50,000	$50,000				$100,000
Program Total:		**$50,000**	**$50,000**				**$100,000**
MIS Staff		PM: 5% AS: 10%	PM: 5% AS: 10%				PM: 5% AS: 10%
Business Unit Staff		SME: 10%	SME: 10%				SME: 10%
Senior Management		Governance	Governance				Governance

I.T. SECURITY PROGRAMS							
Programs	**FY 2012**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**FY 2017**	**Totals**
IT Security Program							
Hardware		$20,000					$20,000
Software		$30,000					$30,000
Professional Services	$50,000	$125,000	$75,000				$250,000
Program Total:	**$50,000**	**$175,000**	**$75,000**				**$300,000**
MIS Staff	PM: 5% Sec: 25%	PM: 10% Sec: 25%	PM: 5% Sec: 25%	Sec: 25%	Sec: 25%	Sec: 25%	
Senior Management	Governance	Governance	Governance	Governance	Governance	Governance	
Electronic Security Planning (ESP)							
Hardware							
Software	$25,000	$75,000					$100,000
Professional Services	$100,000	$200,000					$300,000
Program Total:	**$125,000**	**$275,00**					**$400,000**
MIS Staff	PM: 25% Sec. 25%	PM: 25% Sec. 25%					
Senior Management	Governance	Governance	Governance	Governance	Governance	Governance	

ENTERPRISE TECHNOLOGY MANAGEMENT							
Programs	**FY 2012**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**FY 2017**	**Totals**
IT Governance Program							
Hardware							-
Software		$50,000	$50,000				$100,000
Professional Services **	$150,000	$300,000	$300,000	$200,000	$100,000	$50,000	$1,100,000
Program Total:	**$150,000**	**$350,000**	**$350,000**	**$200,000**	**$100,000**	**$50,000**	**$1,200,000**
MIS Staff	PM: 5% Dir: 10%	PM: 5% Dir: 10%	PM: 10% Dir: 5%	PM: 5% Dir: 5%	PM: 5% Dir: 5%	PM: 5% Dir: 5%	
Business Unit Staff	MM: 10%	MM: 10%	MM: 10%	MM: 5%	MM: 5%	MM: 5%	
Senior Management	Governance	Governance	Governance	Governance	Governance	Governance	

ENTERPRISE TECHNOLOGY MANAGEMENT (cont.)							
Programs	**FY 2012**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**FY 2017**	**Totals**
MIS Reorganization & Change Management							
Hardware							-
Software ***	$50,000	$100,000	$50,000	$25,000	$25,000		$250,000
Professional Services ****	$150,000	$350,000	$250,000	$200,000	$150,000	$150,000	$1,250,000
Program Total:	**$200,000**	**$450,000**	**$300,000**	**$225,000**	**$175,000**	**$150,000**	**$1,500,000**
MIS Staff	PM: 5% Dir: 10%	PM: 10% Dir: 10%	PM: 5% Dir: 2%	PM: 5% Dir: 2%	PM: 5% Dir: 2%	PM: 5% Dir: 2%	
Business Unit Staff	MM: 10%	MM: 10%	MM: 5%	MM: 5%	MM: 5%	MM: 5%	
Senior Management	Governance	Governance	Governance	Governance	Governance	Governance	

TECHNOLOGY PROGRAMS							
Programs	**FY 2012**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**FY 2017**	**Totals**
IT Infrastructure Upgrade Program							
Hardware		$1,800,000	$1,500,000	$900,000	$900,000	$900,000	$6,000,000
Software	$100,000	$250,000	$250,000	$250,000	$150,000		$1,000,000
Professional Services	$200,000	$100,000	$100,000	$50,000	$50,000		$500,000
Program Total:	**$300,000**	**$1,150,000**	**$1,850,000**	**$1,200,000**	**$1,100,000**	**$900,000**	**$7,500,000**
MIS Staff	PM: 10% IS: 10%	PM: 10% IS: 10%	PM: 5% IS: 10%	PM: 5% IS: 5%	PM: 5% IS: 5%		
Business Unit Staff	MM: 10%	MM: 5%	MM: 5%	MM: 5%	MM: 5%		
Senior Management	Governance	Governance	Governance	Governance	Governance		
Email Upgrade Program							
Hardware	$50,000						$50,000
Software	$25,000						$25,000
Professional Services	$75,000						$75,000
Program Total:	**$150,000**						**$150,000**
MIS Staff	PM: 5% IS: 10%						
Senior Management	Governance						

TECHNOLOGY PROGRAMS (cont.)							
Programs	**FY 2012**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**FY 2017**	**Totals**
Enterprise Data Management Program							
Hardware							-
Software			$250,000	$50,000			$300,000
Professional Services		$300,000	$480,000	$300,000	$120,000		$1,200,000
Program Total:		**$300,000**	**$730,000**	**$350,000**	**$120,000**		**$1,500,000**
MIS Staff		PM: 10% Dir: 5%	PM: 10% Dir: 2%	PM: 10% Dir: 2%	PM: 10%		
Business Unit Staff		MM: 10% DS: 10% KM: 5%	MM: 2% DS: 10% KM: 5%	DS: 10% KM: 5%	DS: 10%	DS: 10%	
Senior Management		Governance	Governance	Governance	Governance		
User Data Management Program							
Hardware	$40,000						$40,000
Software	$10,000						$10,000
Professional Services	$20,000						$20,000
Program Total:	**$70,000**						**$70,000**
MIS Staff	PM: 2%						
TOTAL							
Total Hardware	$90,000	$1,820,000	$1,500,000	$1,200,000	$950,000	$975,000	$6,535,000
Total Software	$205,000	$905,000	$600,000	$675,000	$525,000		$3,115,000
Total Professional Services	$795,000	$2,125,000	$2,055,000	$1,800,000	$1,370,000	$825,000	$8,970,000
Grand Total:	**$1,095,000**	**$4,850,000**	**$4,155,000**	**$3,675,000**	**$2,845,000**	**$1,800,000**	**$18,420,000**

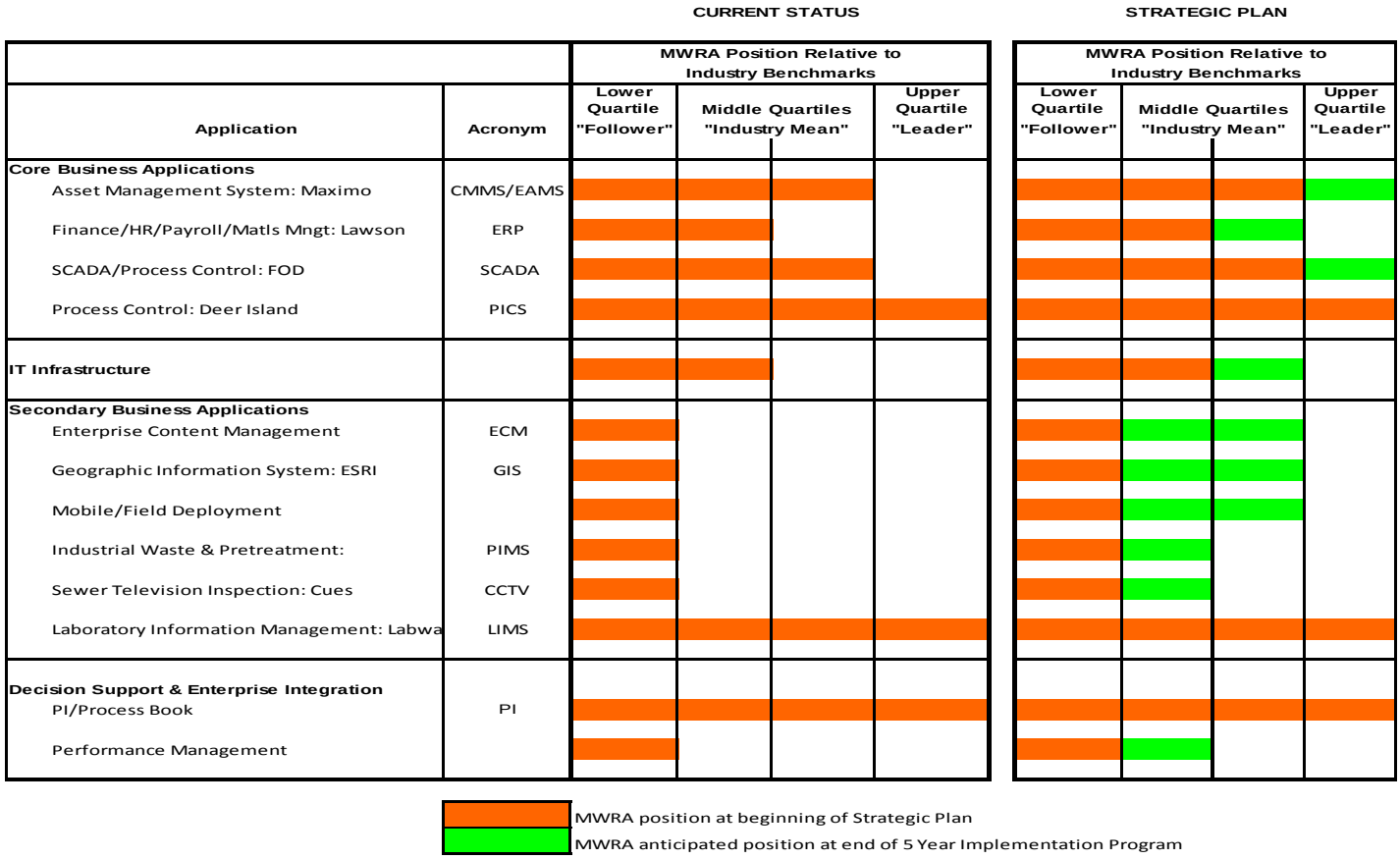
- **NOTES:**
- Please note that dollar distribution will change as schedules change.
- * CROMERR functionality is assumed to be provided by vendor as upgrade to product. This budget includes implementation support not provided by vendor or Authority staff.
- ** IT Governance involves both initial setup of standards and practices, and ongoing implementation/utilization of those practices. To support the additional projects that are required to implement this Strategic Plan, this also includes consultant support for program management.
- *** MIS Reorganization will require additional software support for configuration management and job tracking.
- **** MIS Reorganization involves an initial restructuring of the organization, but this must be followed by training and by implementation of service delivery and other IT standards of practice. This change management will require several years to institutionalize the new practices.

Appendix E: Industry Comparisons

Westin drew upon data from its national involvement in other water utilities' information technology programs to make a general industry comparison of MWRA's IT capabilities. The purpose was to evaluate MWRA's current business outcomes from using technology, and its alignment with other utilities' technology activities. This was used to identify where the Authority might adjust its efforts based on the experiences of those comparable utilities. The comparison with similar utilities considered the following four areas of technology in which utilities invest:

1. Core Business Applications – required by all water utilities to manage mission-critical business processes.
2. IT Infrastructure – the hardware, networking, and system software infrastructure including servers, end user devices, databases, and standard development tools.
3. Secondary Business Applications – specific applications which support a utility's operational business processes, and vary depending on the specific business needs of each Utility.
4. Decision Support and Authority-wide Integration – tools commonly used to facilitate integration, analysis, and management interpretation of data to support improvements in organization effectiveness and knowledge management.

The following table compares MWRA's current status with other progressive water utilities for applications, initiatives, and technologies in each of these four areas. In this subjective assessment, MWRA's capabilities are ranked in one of four quartiles in comparison with other water utilities nationally. To the right, Westin has predicted MWRA's position in five years, assuming that this MIS Strategic Plan is implemented, resulting in the anticipated benefits and outcomes.



The following summarizes the current ranking in each of the four areas of technology:

1. Core Business Applications – MWRA is an industry leader in using its process control and asset management systems; enhancements to its administrative applications can more efficiently and effectively support the Authority's business needs.
2. IT Infrastructure – The hardware, networking, and databases deliver good performance for most users, but will require upgrades to sustain that service level as the Authority applies additional technology to meet its business challenges.
3. Secondary Business Applications – The Authority's Laboratory system is exemplary, but MWRA has opportunities to enhance its use of technology in mobile deployment, geographic information systems (GIS), industrial waste, and document management.
4. Decision Support and Authority-wide Integration – MWRA's PI/Process Book deployment establishes an industry standard for supporting management decision-making, but proven technology is also available to integrate systems and improve compilation of Authority-wide performance data.

Note that it is not necessarily a goal for MWRA to be an industry leader in every one of the application areas.

The details of the Industry Comparison, including reasons for the current ranking and the recommended steps that are assumed to take place within the next 5 years to achieve the Authority's predicted ranking, are documented in the table below.

Application	Acronym	Current Quartile	Reasons for Current Status	Predicted Quartile in 5 Years	Steps to Achieve 5 Year Expectation
Core Business Applications:					
Asset Management System: Maximo	CMMS/EAMS	3	Foundation for industry-leading practices, even though 2 versions behind	4	Will be improved with current version, optional modules, more robust GIS integration, and enhanced mobile capabilities.
Finance/HR/Payroll/ERP: Lawson	ERP	2	Adequate now	3	Current version & additional modules will improve.
SCADA/Process Control: Deer Island	DITP SCADA	3	Very good system, which will be improved by committed HMI replacement; remote units are approaching obsolescence	4	Will be industry leader when upgrades to remote units are completed.

Application	Acronym	Current Quartile	Reasons for Current Status	Predicted Quartile in 5 Years	Steps to Achieve 5 Year Expectation
SCADA/Process Control: PICS	PICS	4	Very good system, although some components are approaching obsolescence	4	Commitment to replacements will keep this in the upper quartile.
IT Infrastructure		2	Meeting needs now	3	Upgrades will be necessary to support future plans.
Secondary Business Applications:					
Enterprise Content Management	ECM	1	Limited and obsolete applications	3	Plan to replace existing applications with Enterprise Content Management.
Geographic Information System: ESRI	GIS	1	Investment has been made in building a foundation for GIS	3	3rd quartile assumes providing viewer(s); "spatially enabling" Maximo, CCTV, PIMS, modeling, and other databases; and applications for scientific, environmental, and engineering analyses.
Mobile/Field Deployment		1	Limited deployment	3	3rd quartile assumes mobile deployment for DITP operators and maintenance; laboratory; and additional field operations maintenance and GIS access.

Application	Acronym	Current Quartile	Reasons for Current Status	Predicted Quartile in 5 Years	Steps to Achieve 5 Year Expectation
Industrial Waste & Pretreatment:	PIMS	1	Not meeting needs	2	PIMS "Cleanup Project" will address new regulations, scheduling, data integrity/quality control, enforcement documents, LIMS integration enhancements, GIS integration, automated bill generation, and reporting.
Sewer Television Inspection: Cues	CCTV	1	Limited integration	2	Will improve with mobile & GIS integration.
Laboratory Information Management: Labware	LIMS	4	Exemplary	4	Assume maintaining current software versions and enhancing data entry with mobile devices.
Decision Support & Enterprise Integration:					
PI/Process Book	PI	4	Exemplary	4	Assume upgrades to take advantage of emerging hardware platforms and software capabilities.
Performance Management		1	Primarily manual practices	2	Automate current manual practices, but not an Authority-wide solution.

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STAFF SUMMARY

TO: Board of Directors
FROM: Frederick A. Laskey, Executive Director
DATE: March 14, 2012
SUBJECT: Amendments to Capital Finance Management Policy

COMMITTEE: Administration, Finance & Audit

X VOTE
INFORMATION

Thomas J. Durkin, Treasurer
Matthew R. Horan, Deputy Treasurer
Preparer/Title

Rachel C. Madden
Director, Admin & Finance

In July 2010, the Commonwealth's Finance Advisory Board's (FAB) best management practices guidance required that all quasi-public and state level debt issuers, including MWRA, formally adopt a debt management policy. The Board of Directors first approved that policy on October 13, 2010. The FAB regulations further require that all issuers review their Policy and present it to their governing body for adoption every two years. After review by staff and Bond Counsel, there are few proposed changes to the Policy further described below.

RECOMMENDATION:

That in compliance with the Finance Advisory Board's regulations (976 CMR 2.04), the Board adopts the amendments to the Capital Finance Management Policy, including the inclusion of a Post Issuance Compliance Guide Regarding the Use of Tax-Exempt Bond Financed Property and Proceeds, substantially in the form attached hereto.

DISCUSSION:

In October 2010, the Board approved a Capital Finance Management Policy ("Policy") to provide a framework regarding the administration and internal policy for the issuance, management, and reporting on all debt obligations of MWRA. The issuance of MWRA debt is governed by the conditions set forth in the Enabling Act and the General Revenue Bond Resolution and all issuances require the approval of the Board. Once the debt has been issued these documents continue to provide direction on the use and investment of funds as well as continuing compliance requirements. The Policy is designed to be a distilled version of the General Revenue Bond Resolution, as well as to detail some of the procedural steps taken prior to and after the issuance of debt. The document contains many of MWRA's standard policies related to debt issuance including call options and refunding savings threshold.

A copy of the approved Policy was provided to the Commonwealth's Finance Advisory Board ("FAB") in 2010 to comply with its regulations (976 CMR 2.04). Beyond the initial submittal requirement, the FAB's regulations state that "Such policies shall be formally adopted at least every two years and the adopted policies or evidence that there has been no material changes to the most recently filed policies, shall be filed with the Board by March 31st of each even-numbered year beginning in 2012." To ensure compliance with the requirement, staff and MWRA's Bond Counsel reviewed the policy and have proposed a few minor changes.

The first change is related to the recent requirement from the Internal Revenue Service ("IRS") which requires that all municipal debt issuers declare whether or not they have written procedures to ensure compliance with Treasury regulations governing tax-exempt debt for the entire life of the bonds. The IRS also required written remediation procedures in case an event occurred which jeopardized the tax-exempt status of the bonds. After review of the MWRA's existing Policy and the IRS's published guidance, bond counsel proposed amending Section 5.2 (page 6) to enhance its compliance with the regulations. As part of the improvements to the Policy, Bond Counsel recommended the inclusion of a "Post Issuance Compliance Guide Regarding Use of Tax-Exempt Bond Financed Property and Proceeds" as an attachment to the Policy. The guide is based on the standard IRS boiler plate requirements and lays out the steps MWRA will take to ensure that it complies with the regulations. It also details the remediation steps to be taken if an event occurs which could result in the bonds losing their tax-exempt status. The next change to the Policy is to merely to reflect the inclusion of the biennial review requirements under the FAB's regulations (page 9) and the last is a minor typographical edit (page 8).

While this Policy will provide a framework for the management of MWRA's debt portfolio, it is not designed to replace the requirements found in the Enabling Act and General Revenue Bond Resolution. Acceptance of the amendments to this Policy will not constitute a change to the Authority's procedures for issuing debt and all new and refunding debt issuances will continue to require prior Board approval.

Massachusetts Water Resources Authority

Capital Finance Management Policy

1. Purpose

The purpose of the Capital Finance Management Policy is to provide a framework regarding administration and internal policy for the issuance, management, and reporting on all debt obligations of the Massachusetts Water Resources Authority.

2. General Policy

All debt obligations of the Authority will be issued in compliance with Chapter 372 of the Acts of 1984 of The Commonwealth of Massachusetts (Enabling Act), General and Supplemental Bond Resolutions, and all applicable state and federal laws governing the issuance of debt. As required by the Enabling Act, all new debt issuances must be presented to the Board of Directors for review, evaluation and approval prior to the transaction. It will be the Authority's policy to:

A. Undertake a multi-year approach to the planning of debt financings to borrow funds in a timely fashion to provide funding for the Authority's Capital Improvement Program (CIP) and other corporate purposes;

B. Assure the Authority's ability to access the capital markets through a strong credit rating and maintaining investor interest in the issuances; and

C. Achieve the lowest cost of borrowing while minimizing the risk of market fluctuations.

D. Manage its debt financings responsibly mindful of generational equity and long-term financial impacts.

3. Planning for Future Borrowings

The Authority will continually monitor its multi-year borrowing plan to reflect changes to the CIP, actual expenditures, and borrowings. The borrowing plan will assist in the development of the schedule for the sale of debt obligations over a three fiscal year cycle. It is understood that market conditions, changes in size and/or timing of capital projects, and other factors outside the control of the Authority may necessitate changes to the schedule for the sale of debt obligations. The borrowing plan is not a commitment by the Authority to sell debt obligations at such times.

4. Issuance Related Policies

4.1 Pre-Issuance Evaluation:

The Authority will review the various factors that impact the issuance of debt including legal, economic, financial and market conditions. All of these factors are continuously changing and any decisions related to the issuance of new debt should be done only after careful consideration of all the factors that impact the issuance. Some of the factors that should be considered include, but are not limited to, the following:

A. The legal constraints on the Authority's issuance of debt including debt capacity and the various other limitations included in the Enabling Act and in the General and Supplemental Bond Resolutions.

B. The availability of other funding sources including grant funds, loans through the Massachusetts Water Pollution Abatement Trust and pay-as-you go capital.

C. The condition of the municipal bond market, including current interest rates and the availability of different investor groups and the availability of alternatives to traditional tax-exempt financing.

D. Whether the new debt would be issued as Senior or Subordinate lien indebtedness, including a cost/benefit analysis of choosing one lien over the other and credit enhancement costs.

E. Type of debt obligations to be issued.

F. The nature of the projects and/or equipment to be financed.

4.2 Issuance Procedures

The Authority will issue long-term debt for the purposes of funding the CIP, refunding or restructuring outstanding debt and for other purposes authorized by the Authority's Enabling Act and permitted by the General Revenue Bond Resolution. All debt issuances will be presented to the Board of Directors for review and evaluation and will require its approval as required by the Enabling Act and General Bond Resolution. In general, the Authority will follow the procedures outlined below:

4.2.1 Long-Term Borrowings:

A. All new debt issuances will receive prior approval of the Board of Directors as required by the Enabling Act and General Bond Resolution.

B. The Authority will not issue debt in excess of its statutory debt cap.

C. The Authority will utilize long-term debt, as necessary, to permanently finance capital improvements to its infrastructure. Typical features of long-term fixed rate debt will be:

    a. The expected useful life of the projects to be financed will be taken into account in determining the appropriate maturity of the debt issue.

    b. In general, the Authority's debt will carry a call provision for maturities longer than 10 years, subject to market considerations.

D. The Authority will determine based on market conditions whether a competitive or negotiated sale would be more advantageous. Some factors impacting that decision include:

    a. Stability of bond prices and investor demand in the market;

    b. The complexity of the transaction and any issues which may impact investor demand for the bonds;

    c. Size of the transaction; and

    d. Importance of flexibility to adjust sizing and structuring to respond to investor demand which is particularly important for refunding transactions.

E. The Authority will manage its debt portfolio and financial position to obtain and maintain the highest credit rating possible. While high credit ratings generally reduce the Authority's cost of debt and market access, these rating considerations must be balanced with maintaining flexibility to meet its operational and capital needs.

F. Credit enhancements, such as bond insurance and letters of credit, will only be used when the anticipated present value savings in terms of reduced interest expense exceeds the cost of the enhancement.

G. To provide budget certainty the Authority typically issues fixed interest rate debt. However, it should be recognized that certain circumstances may merit the issuance of variable rate debt. Prior to the issuance of any variable rate debt, the savings and other

possible advantages over a comparable fixed rated borrowing will be evaluated and a comparative analysis presented to the Board of Directors as part of the approval process.

4.2.2 Refunding Transactions

The Authority will monitor its debt portfolio for opportunities to refund any outstanding debt when debt service savings will be realized. Generally the Authority considers a refunding transaction if the refunding will provide 4% or greater net present value savings to ensure there is sufficient savings to justify the issuance of new debt. At the direction of the Board, the Authority may refund or restructure existing debt to meet particular organizational and/or strategic needs when it is advantageous to do so.

4.2.3 Short-Term Borrowing

The Authority typically utilizes its short-term Tax-Exempt Commercial Paper (TECP) program to only finance assets during design and construction. The TECP generally will be permanently financed by long-term debt no later than six-months after the asset is placed into service. In some instances TECP may be used to refund outstanding debt as is provided for in the associated Supplemental Resolution and as directed by the Board.

4.2.4 Derivative Transactions

While the Authority does not anticipate entering into any additional derivatives (including Interest Rate Swaps, Caps, Collars, etc.), it may consider their use as a hedge against future interest rate risk when appropriate, but in no event will derivatives be used for speculative purposes. Further, the Authority will use derivatives only when it has a complete understanding of the derivative product and the potential risks associated with it. Derivative products will only be utilized when it can be demonstrated that their usage would provide significant debt service savings or mitigation of the risk of fluctuations in interest rates. Prior to entering into any derivative product the following criteria would be evaluated:

A. Are there sufficient counterparties to competitively bid on the derivative transaction;

B. Does the transaction hedged against create any new interest rate volatility and are such risks appropriate for the Authority and the transaction;

C. The basis risk and likelihood that the Authority will receive a rate that matches the rate paid on the hedged bonds;

D. The tax risk associated with any potential future changes to the federal tax code;

E. The termination risks associated with the derivative transaction including counterparty risk;

F. The creditworthiness of the proposed counterparty will be thoroughly evaluated and any downgrade and collateral provisions might be necessary to reduce risks;

G. Comply with all applicable statutory and regulatory requirements associated with the entering into of derivative transactions, including those of the Commonwealth's Finance Advisory Board; and

H. Any derivative transactions would be presented and evaluated by the Board of Directors prior to approval.

5. Bond Compliance

The Authority will maintain an adequate system of internal controls to provide compliance with applicable laws, rules, regulations, and covenants associated with outstanding debt.

5.1 General Resolution Compliance

The Authority will take all necessary steps to ensure compliance with its General Bond Resolution and all Supplemental Resolutions. Compliance with the General Bond Resolution includes but is not limited to:

A. Ensuring that all principal and interest accounts are funded in equal 1/12 installments for principal and 1/6 installments for semi-annual interest payments and that the accounts will be fully funded one month and one day prior to the payment date, as required by the General Bond Resolution.

B. Maintaining rolling coverage levels at a minimum level of 120% for senior debt service and 110% for subordinated debt service as required by the General Bond Resolution.

C. Maintaining reserve funds at the required levels and provide all annual certifications to Trustee.

D. Providing the Trustee with all required certifications related to coverage, budget, reporting and all other requirements included in the General Bond Resolution and the Enabling Act.

5.2 ~~Arbitrage Compliance~~Tax-Exempt Status Requirement Compliance

The Authority will comply with all relevant federal tax law provisions including without limitation arbitrage requirements, limitations on nongovernmental use of tax-exempt bond financed facilities, recordkeeping requirements, and remediation requirements with respect to nonqualified bonds.~~,~~ The Authority will take all appropriate actions to ensure that the interest paid on its tax-~~ ~~exempt debt obligations to investors ~~remain exempt from~~ maintains its ~~federal income~~ tax-exempt status. Additionally, the Authority will establish and maintain a sound arbitrage compliance program that incorporates strategies to limit negative arbitrage. Neither the Authority nor any other person under its control or direction will make any investment or other use of tax exempt bond proceeds in any manner which would cause the bonds to be private activity bonds or arbitrage bonds, or would otherwise cause the bonds to lose their tax-exempt status. In connection with the maintenance of such tax-exempt status, the Authority will utilize the procedures set forth in the Authority's Post Issuance Compliance Guide Regarding Use of Tax-Exempt Bond Financed Property and Proceeds included as Attachment A to this document.

5.3 Derivative Compliance

The Authority will routinely monitor all of its derivative transactions to ensure that all the terms of the agreements are being met. The counterparties will be routinely monitored and evaluated for termination risk and collateral requirements, if applicable. In addition, the agreements will be regularly monitored for basis, tax, and termination risk. The Authority will have the termination values of all existing agreements calculated on a weekly basis.

5.4 Debt Cap

The Authority will routinely examine its future borrowing needs, repayment schedules and capacity under the debt cap to ensure that it will be able to fund the CIP. The Authority will seek increases to the debt cap as necessary to meet the needs of the CIP.

5.5 Other Contractual Agreements

The Authority will comply with all of the terms and conditions contained within other contractual agreements associated with the issuance and maintenance of debt, including but not limited to the Standby Bond Purchase Agreements and Letters of Credit.

6. Continuing Disclosure Policy

The Authority will provide certain continuing disclosure pursuant to the provision of Rule 15c2-12(b)(5) under the Securities Exchange Act of 1934 (as amended, the "Rule"). Specifically, the Authority and its Trustee, U.S. Bank National Association., as Dissemination Agent (the "Dissemination Agent"), have entered into an existing Continuing Disclosure Agreement dated November 21, 1995. The Continuing Disclosure Agreement will transfer to any successor to U.S. Bank N.A. as Dissemination Agent.

6.1 Annual Continuing Disclosure

Pursuant to the Continuing Disclosure Agreement, the Authority will provide an annual filing not later than January 1 of each year to the Dissemination Agent, each nationally recognized municipal securities information repository, and any other public or private repository (currently, the Municipal Securities Rulemaking Board) or entity designated by the Commonwealth as a state information depository for the purpose of the Rule (State Depository). The annual filing will include or incorporate by reference the following information:

A. Quantitative information for, or as of the end of, the preceding fiscal year of the type presented in the Authority's most recent official statement including:

   a. Summary of revenues, expense, and fund deposits;

   b. Amount of outstanding indebtedness and debt limitation as of the end of the fiscal year;

   c. Summary table with respect to the coverage covenants in accordance with the General Bond Resolution; and

   d. Summary table showing the capital investments by major category during the preceding fiscal year.

B. Quantitative information for the current fiscal year of the type presented in the Authority's most recent official statement including:

   a. A summary table of the Authority's current water and wastewater charges by Local Body;

   b. The Current Expense Budget rate revenue requirement and percentage increase for water and wastewater over the prior fiscal year; and

c. Executive summaries of the Authority's most recently adopted Current Expense Budget and Capital Improvement Program.

C. The most recently available audited financial statements of the Authority, prepared in accordance with accounting ~~principals~~ principles generally accepted in the United States of America.

6.2 Reporting of Material Events

Pursuant to the Continuing Disclosure Agreement, whenever the Authority obtains knowledge of the occurrence of any event itemized in the Rule, the Authority will promptly notify the Dissemination Agent. The Dissemination Agent will file a notice of such occurrence with the Municipal Securities Rulemaking Board and the State Depository, if any. Currently, events covered under this reporting requirement include the following:

A. Principal and interest payment delinquencies;

B. Non-payment related defaults;

C. Unscheduled draws on debt service reserve reflecting financial difficulties;

D. Unscheduled draws on credit enhancements reflecting financial difficulties;

E. Substitution of credit or liquidity providers, or their failure to perform;

F. Receipt by the Authority of an adverse tax opinion or the occurrence of an event affecting the tax-exempt status of its bonds;

G. Modifications to the rights of any bond owners;

H. Bond Calls;

I. Defeasance of any series or portion of a bond series;

J. Release, substitution or sale of property securing repayment of any bonds; and

K. Rating changes.

7. Credit Rating

The Authority will attempt to maintain its current ratings while at the same time strive to enhance its overall credit quality. While high credit ratings generally

reduce the Authority's cost of debt and market access, credit ratings must be balanced with maintaining flexibility to meet its operational and capital needs.

8. Investment of Bond Proceeds

The security of the principal amount is regarded as the highest priority in handling the investment of bond proceeds. All other investment objectives are secondary to the maintenance of the principal amount. Each investment transaction shall seek to first ensure that capital losses are avoided.

Bond proceeds are only to be invested in permitted investments, as defined in the General Bond Resolution. Neither the Authority nor any other person under its control or direction will make any investment of bond proceeds in any manner which would cause the bonds to be private activity bonds or arbitrage bonds. The Authority will comply with all federal tax arbitrage regulations.

9. Budgeting Debt Service

The Authority will develop a debt service budget based on the known costs for all fixed rate transaction. For variable rate debt, the Authority will budget at the fixed principal amortization amounts, plus an assumed interest rate based on market conditions and historic interest rate trends. The annual debt service budget will also include assumptions for the planned borrowings which will include an assumed interest rate and principal amortization schedule.

10. Review of Policy

This policy should be reviewed by staff at least once every ~~three~~ two years. However, reviews may be made as often as deemed necessary. Pursuant to 976 CMR 2.04, by March 31 of every even year, starting in 2012 the Authority will send the Commonwealth's Finance Advisory Board a copy of any revisions to the Policy or notice that no significant changes have occurred.

Attachment A

MASSACHUSETTS WATER RESOURCES AUTHORITY

POST ISSUANCE COMPLIANCE GUIDE REGARDING USE OF TAX-EXEMPT BOND FINANCED PROPERTY AND PROCEEDS

March 2012

The purpose of this Post Issuance Compliance Guide Regarding Use of Tax-Exempt Bond Financed Property and Proceeds (the "Guide") of the Massachusetts Water Resources Authority (the "Authority") is to facilitate continuing compliance with the federal income tax requirements relating to the tax-exempt status of the Authority's outstanding tax-exempt note and bond issues. The Director of Administration and Finance of the Authority will act as the Tax Compliance Officer who will have the primary responsibility to monitor the Authority's compliance with federal tax requirements for the Issuer's bonds and notes, including without limitation consulting with the Authority's Bond Counsel regarding following the procedures set forth in this Guide. The tax requirements include both limitations on the private use of bond-financed facilities and arbitrage limitations under the Internal Revenue Code of 1986, as amended (the "Code"). Set forth below are the procedures that will be undertaken.

BOND-FINANCED PROPERTY

The Tax Compliance Officer will identify all outstanding tax-exempt obligations of the Issuer by reference to the listing of tax-exempt obligations (the "Obligations") in the audited financial statement for the fiscal year and any interim unaudited financial statements. The Tax Compliance Officer will from time to time review the existing books and records of the Authority that reflect the actual expenditure of proceeds of particular Obligations on specific projects (the "Bond-Financed Property"), and implement any necessary revisions to the recordkeeping procedures. The Tax Compliance Officer will maintain these books and records.

PRIVATE ACTIVITY LIMITATIONS

Private Activity Review

Reference should be made to the Private Activity Restrictions on Private Business Use and accompanying attachments, attached as Tab I, for further guidance on the Private Activity Limitations of Section 141 of the Code.

In order to demonstrate compliance with the Private Activity Limitations of the Code, the Tax Compliance Officer will make inquiry of knowledgeable persons as to the use of Bond-Financed Property by any non-governmental persons on a periodic basis (the "Tax Review"). A form of Private Business Use Questionnaire that can be utilized for this inquiry is attached at Tab II. (It is not necessary that the questionnaire actually be filled out by Authority personnel if the Tax Compliance Officer decides to use the questionnaire as a guide to making inquiries of appropriate Authority personnel as to potential private use of a Bond-Financed Property.) The Tax Compliance Officer will identify the potential occurrence of any of the events set forth below (a "Tax Event") with respect to any Bond-Financed Property. On or prior to the

occurrence of any Tax Event, the Tax Compliance Officer will consult with Bond Counsel for the Obligations to ascertain what effect, if any, a contemplated Tax Event may have on the tax-exempt of interest on the Obligations. In certain circumstances it may be necessary for the Authority to take a remedial action under Treasury Regulation Section 1.141-12 to preserve the tax-exempt status of interest on the Obligations. See Tab III regarding available remedial actions. Events that may trigger the necessity of a remedial action include without limitation the following:

Change of ownership of the financed property - the ownership of any portion of the Bond-Financed Property is transferred to anyone, prior to the earlier of the end of the expected economic life of the property, or the latest maturity date of any bond of the issue financing (or refinancing) the property.

Private business use of the Bond-Financed Property -- any portion of the Bond-Financed Property will be used by anyone other than a State or local governmental unit or members of the general public who are not using the property in the conduct of a trade or business. Examples of uses that can give rise to private business use include use by a person as an owner, lessee, purchaser of the output of facilities under a "take" or "take or pay" contract, purchaser or licensee of research, a manager or independent contractor under certain management or professional service contracts or any other arrangement that conveys special legal entitlements (*e.g.*, arrangement that conveys priority rights to the use or capacity of the financed property) for beneficial use of the property financed with proceeds of tax-exempt debt or special economic benefit.

Leases of the Bond Financed Property -- any portion of the Bond-Financed Property is to be leased, or otherwise subject to an agreement which gives possession of any portion of the Bond-Financed Property to anyone, other than a State or local governmental unit.

Private Loan of Bond Proceeds -- any portion of the proceeds of the bonds (including any investment earnings thereon) are to be loaned by the Issuer to any person other than a State or local government.

Management agreement or service agreement -- any portion of the Bond-Financed Property is to be used under a management contract or professional service contract (e.g., medical group), other than a contract for services that are solely incidental to the primary function of Bond-Financed Property, such as janitorial services or office equipment repair.

Naming rights agreements for the Bond-Financed Property -- any portion of the Bond-Financed Property will become subject to a naming rights or sponsorship agreement, other than a "brass plaque" dedication.

Research using the Bond-Financed Property -- any portion of the Bond-Financed Property will be used for the conduct of research under the sponsorship, or for the benefit of, any organization other than a State or local governmental unit.

In addition, the Tax Compliance Officer will undertake an annual Tax Review regarding the ownership and use of the Bond-Financed Property to determine whether any Tax Event has occurred since the later of the date of issue of the Obligations or the date of the last annual Tax Review. If a Tax Event has already occurred, the Tax Compliance Officer will contact Bond Counsel to determine the proper course of action.

Recordkeeping

The Internal Revenue Service has advised issuers of tax-exempt obligations that they have post-issuance recordkeeping responsibilities that are necessary to satisfy the Internal Revenue Service in the event of any future audit of the Obligations. See IRS FAQs on Record Retention, attached as Tab IV. These recordkeeping obligations include the following ones, which demonstrate compliance with the private activity limitations:

1. Information and records regarding any use of proceeds Obligations to make or finance a loan to any person other than a State or local governmental unit;

2. Information and records regarding the continued use and ownership of the Bond-Financed Property; and

3. Any use arrangements, affecting the Bond-Financed Property, which results in private business use of any portion of the Bond-Financed Property.

ARBITRAGE COMPLIANCE

The arbitrage restrictions imposed under the Code include restrictions on the investment of proceeds of tax-exempt obligations at an unrestricted yield and the rebate of excess investment earnings to the federal government, as more fully described in the Tax Certificates for each of the Obligations and the Arbitrage Letter of Instructions, attached at Tab V.

Arbitrage Review

For each issue of Obligations, the Tax Compliance Officer will maintain the Tax Certificate for such Obligations and the records described below under "Recordkeeping". For each issue of Obligations, the Tax Compliance Officer will establish a timeline for review of arbitrage-related issues as more fully described below.

Temporary Period

For all issues the Tax Compliance Officer will note the date of expiration of the three year temporary period for unrestricted investment of the proceeds of the Obligations. The three year temporary period runs from the date of issue of the original new money issue and is unaffected by note rollovers. Note, however, that the issuance of advance refunding bonds will terminate the three year temporary period of any issue that is advance refunded. For all Obligations which have unexpended proceeds held beyond the temporary period, the Tax Compliance Officer will assure that the proceeds are yield restricted. The relevant yield will be the yield on the original Obligations until those obligations are paid with the proceeds of another issue of Obligations (a "Refunding Issue"), at which time the relevant yield will be the yield on the Refunding Issue.

Yield restriction will be accomplished through either an actual investment below the relevant yield or the making of yield reduction payments, as described in Section 3(b) of the Arbitrage Letter of Instructions found in Tab V. The Tax Compliance officer will work with its auditor or other rebate consultant to make timely yield reduction payments.

Rebate

For each issue of Obligations the Tax Compliance Officer will note whether a rebate exception is available for the issue. The rebate exceptions include the small issuer exception of Section 148(f)(4)(D) of the Code and the spending exceptions described in section 4(a)(ii) of the Arbitrage Letter of Instructions found in Tab V. If the Obligation is expected to meet one of the three spending exceptions to rebate, the six-month exception, the 18-month exception or the 2-year construction exception, the Tax Compliance Officer will establish a timeline of six month intervals following the date of issue of the Obligations and note whether the spending requirements related to that exception are met at the end of each period.

If no rebate exception is expected to apply or if a spending requirement is not met, the Tax Compliance Officer will establish a timeline for rebate analysis for each issue of Obligations. For bond issues, the timeline will provide for a rebate analysis to be conducted every five years and when the bonds are discharged, as more fully described in Section 4 of the Arbitrage Letter of Instructions. For note issues the timeline will provide for a rebate analysis to be undertaken at the time of the retirement of the note issue. The Tax Compliance Officer will consult with its auditor or other rebate consultant and make timely filing of any rebate amount with the Internal Revenue Service, as more fully described in Section 4 of the Arbitrage Letter of Instructions.

Recordkeeping

In order to satisfy the arbitrage recordkeeping requirements, the Tax Compliance Officer shall create and maintain, or cause to be created and maintained, records of:

1. Purchases or sales of investments made with bond proceeds (including amounts treated as "gross proceeds" as a result being part of a sinking fund or pledge fund) and receipts of earnings on those investments;

2. The final allocation of the proceeds of the Obligations to expenditures;

3. Information and records showing that investments made with unspent proceeds of the Obligations after the expiration of the applicable temporary period were not invested in higher-yielding investments;

4. Information, if applicable, that will be sufficient to demonstrate to the Internal Revenue Service upon an audit of the Obligations that the Obligations have complied with one or more available spending exceptions to the arbitrage rebate requirement with respect of the Bonds;

5. Information and calculations, when applicable, that will be sufficient to demonstrate to the Internal Revenue Service, upon an audit of the Obligations, for which an exception to the arbitrage rebate requirement was not applicable, that the rebate

amount, if any, that was payable to the United States of America with respect to investments made with gross proceeds of the Obligations was calculated and timely paid with Form 8038-T timely filed with the Internal Revenue Service;

6. Information and records showing that investments held in yield-restricted advance refunding or defeasance escrows for Obligations, were not invested in higher-yielding investments.

Attachments

Tab I	Private Activity Restrictions on Private Business Use
Tab II	Private Business Use Questionnaire
Tab III	Remedial Actions
Tab IV	IRS FAQs on Record Retention
Tab V	Arbitrage Letter of Instructions

TAB I

SUMMARY OF

PRIVATE ACTIVITY RESTRICTIONS ON PRIVATE BUSINESS USE

GOVERNMENTAL BONDS

Introduction

The Internal Revenue Code of 1986, as amended (the "Code") limits the amount of proceeds of tax-exempt governmental bonds that can be used for the benefit of private businesses. Section 141 of the Code treats as a taxable private activity bond a bond issued as part of an issue that meets the private business use test and the private security or payment test, or the private loan test. The private business use test is met if the amount of proceeds of bonds that are used in a private business use is more than ten percent of total proceeds. The private security or payment test is met if the payment of debt service on more than 10 percent of the issue is directly or indirectly (i) secured by any interest in property used for a private business use or payments in respect of such property or (ii) derived from payments in respect of property or borrowed money used for a private business use. For purposes of Section 141, the term private business includes nonprofit, 501(c)(3) organizations as well as the federal government.

Private business use generally

Private business use can arise from almost any use of tax exempt bond financed property by anyone other than a state or local governmental unit ("Governmental Unit") or members of the general public who are not using the property in the conduct of a trade or business. Examples of uses which can give rise to private business use include use (a) by a person as (i) an owner, (ii) a lessee, (iii) a purchaser of the output of facilities under a "take and pay" or "take or pay" contract, (iv) a purchaser, sponsor or licensee of research and (v) a manager or independent contractor under certain management or professional service contracts, (b) pursuant to an arrangement that conveys (i) special legal entitlements (e.g., an arrangement that conveys priority rights to the use or capacity of the financed property) for beneficial use of the property financed with proceeds of tax exempt debt or (ii) other special economic benefits, (c) use by the United States government and its agencies and instrumentalities and (d) use by nonprofit corporations.

The purpose of this Summary is to assist employees of an Governmental Unit in recognizing uses, actions or other arrangements with respect to tax exempt bond financed property which may not comply with the requirements of the Internal Revenue Code of 1986, as amended, and which could jeopardize the tax exempt status of bonds issued to finance such property. It is not exhaustive and may not be relied upon as legal advice. Before any use, action or other arrangement described herein is commenced, such use, action or other arrangement should be reviewed by bond counsel to the Governmental Unit.

Leases of the Financed Property. Leases and certain other agreements which transfer possession of tax exempt financed property will result in a private business use if the party to whom the property is leased is not an Governmental Unit. Examples include leases of space for book stores and cafeterias.

Priority Rights. Arrangements that convey special legal entitlements (e.g., arrangements that convey priority rights to the use or capacity of the financed property) for control or beneficial use of property financed with proceeds of tax exempt debt are treated as private business uses. Examples of such arrangements are contracts with research companies to set aside space for the testing of new products or arrangements pursuant to which a person which is not an Governmental Unit is entitled to limit, or control charges for, access to all or a portion of tax-exempt bond financed property.

Naming Rights and Sponsorship Payments. Agreements which permit a private company or organization to make payments for the right to have its name or logo used in connection with property financed with tax exempt debt may result in private business use. The rules in this area continue to evolve but "qualified sponsorship payments" should not give rise to a private business use. A qualified sponsorship payment means any payment made by any person engaged in a trade or business with respect to which there is no arrangement or expectation that such person will receive any substantial return benefit other than the use or acknowledgement of the sponsor's name or logo in connection with the activities of the Governmental Unit. Such use or acknowledgement may not include advertising such person's products or services. The qualified sponsorship payment would not include (a) any payment that is contingent upon attendance at events or (b) any payment that entitles the payor to the use or acknowledgement of the payor's name or logo in regularly scheduled and printed material published by or on behalf of the Governmental Unit. This would allow donations in exchange for the usual "brass plaque" but call into question arrangements such as the right to name a facility of the Governmental Unit and control how that facility is referred to in publications and press releases.

Research Arrangements. Research conducted under the sponsorship or for the benefit of organizations other than Governmental Units, including research sponsored by any branch of the Federal government, can result in the private business use of any property financed with tax exempt debt which is used in the conduct of the research. The Internal Revenue Service has published guidance on the circumstances under which a research agreement does not result in private business use. The guidance for safe harbor research arrangements is set forth in Rev. Proc. 2007-47 (2007 IRB LEXIS 570; 2007-29 I.R.B. 108) attached hereto as Exhibit 1.

Management and Service Contracts. Both contracts for the management of property financed with tax exempt debt and certain contracts for the provision of services in connection with property financed with tax exempt debt can result in private business use. Contracts which may result in a private business use include management, service, or incentive payment contracts between the Governmental Unit and a service provider under which the service provider provides services involving all, a portion of, or any function of, a facility financed with tax exempt debt. For example, a contract for the provision of management services for an entire facility, and a contract for management services for a specific portion of a facility, such as a cafeteria are each treated as a management contract. However, contracts for services that are solely incidental to the primary function of the property financed with tax exempt debt, such as

janitorial services or office equipment repair, are not regarded as management or service contracts for this purpose. The Internal Revenue Service has published safe harbor guidance on the circumstances under which a management or service agreement does not result in private business use. The guidance is set forth in Rev. Proc. 97-13 (1997-1 C.B. 632; 1997 IRB LEXIS 14; 1997-5 I.R.B. 18, as modified by Rev. Proc. 2001-39, 2001 IRB LEXIS 229; 2001-28 I.R.B. 38) attached hereto as Exhibit 2. The chart below summarizes the safe harbor guidance:

Maximum Length of Contract[1]	Permitted Fee Arrangement[2]
Lesser of 15 years or 80% of the economic life of the property	95% periodic fixed fee with single, one time (stated dollar amount) incentive payment)
Lesser of 10 years or 80% of property life 5 years–cancelable by Governmental Unit upon reasonable notice at end of the third year	80% periodic fixed fee (i) at least 50% must be a periodic fixed fee, (ii) 100% capitation fee[3] or (iii) mixed capitation and periodic fixed fee
3 years cancelable upon reasonable notice by Governmental Unit at end of the second year	100% per unit fee or combination of per unit and periodic fixed fee
2 years cancelable upon reasonable notice by Governmental Unit at end of the first year	Percentage of fees charged or a combination of a per unit fee and a percentage of revenue or expense fee[4]

[1]Contract term includes any legally enforceable renewal right.
[2]No portion of the fee may be a net profits interest.
[3]A fixed amount per person for a given period of time.
[4]This option is restricted to contracts to provide services to third parties or contracts during a initial startup period of a facility.

Output Facilities. Occasionally an Governmental Unit will acquire facilities such as co-generation facilities. The sale of output (as distinguished from consumption of the output by the Governmental Unit) from an output type facility can result in a private business use.

Joint Ventures. Joint venture arrangements between an Governmental Unit and persons other than an Governmental Unit may result in private business use. These arrangements need to be examined to see if they are viewed as partnerships for federal tax purposes.

Exclusions from Private Business Use.

Incidental Uses. A very limited spectrum of incidental uses are not treated as private business uses if certain conditions are met. Those conditions are: (a) except for vending machines, pay telephones, kiosks and similar uses, the use must not involve the transfer to the private user of possession and control of space that is separated from the other areas of the facility by a physical

barrier; (b) the use must not be functionally related to another use of the facility by the same private user; and (c) such incidental uses may not, in the aggregate involve more that 2.5 percent of the facility. Examples of incidental uses include pay telephones, vending machines and advertising displays.

General Public Use. Use of facilities intended for general public use is not considered "use" by nongovernmental persons in a trade or business if such persons use the facilities in their trade or business on the same basis as other members of the public. Use of the financed facilities by organizations such as school groups, church groups, and fraternal organizations and numerous commercial organizations for a short period of time on a rate scale basis will not be considered use by nongovernmental persons in a trade or business if the rights of such a user are only those of a transient occupant rather than the full legal possessory interests of a lessee. Any arrangement that conveys priority rights to the use or capacity of the financed property will be treated a private business use.

Short Term Uses. Certain short term uses will not be treated as private use. Use by a nongovernmental person is not private use if either:

(i) (A) the term of the use under the arrangement, including all renewal options is not longer than 200 days, and (B) the use of the financed property under the same or similar arrangements is predominantly by natural persons who are not engaged in a trade or business.

(ii) (A) the term of the use under the arrangement, including all renewal options, is not longer than 100 days, and (B) the arrangement would be treated as general public use, except that it is not available for use on the same basis by natural persons not engaged in a trade or business because generally applicable and uniformly applied rates are not reasonably available to natural persons not engaged in a trade or business;

(iii) (A) the term of the use under the arrangement, including all renewal options, is not longer than 50 days; and (B) the arrangement is a negotiated arm's-length arrangement, and compensation under the arrangement is at fair market value. In addition, in each case the property must not be financed for the principal purpose of providing that property for use by that nonGovernmental Unit.

Qualified improvements. Proceeds of tax exempt bonds that provide a governmentally owned improvement to a governmentally owned building (including its structural components and land functionally related and subordinate to the building) are not used for a private business use if

(i) The building was placed in service more than 1 year before the construction or acquisition of the improvement is begun;

(ii) The improvement is not an enlargement of the building or an improvement of interior space occupied exclusively for any private business use;

(iii) No portion of the improved building or any payments in respect of the improved building secures payment of the tax exempt bonds; and

(iv) No more than 15 percent of the improved building is used for a private business use.

EXHIBIT 1

RESEARCH CONTRACT GUIDELINES

Rev. Proc. 2007-47 - Operating Guidelines for Research Agreements

(Also Part I, § § 103, 141, 145; 1.141-3, 1.145-2.)
June 26, 2007

SECTION 1. PURPOSE

The purpose of this revenue procedure is to set forth conditions under which a research agreement does not result in private business use under § 141(b) of the Internal Revenue Code of 1986 (the Code). This revenue procedure also addresses whether a research agreement causes the modified private business use test in § 145(a)(2)(B) of the Code to be met for qualified 501(c)(3) bonds. This revenue procedure modifies and supersedes Rev. Proc. 97-14, 1997-1 C.B. 634.

SECTION 2. BACKGROUND

.01 Private Business Use.

(1) Under § 103(a) of the Code, gross income does not include interest on any State or local bond. Under § 103(b)(1), however, § 103(a) does not apply to a private activity bond, unless it is a qualified bond under § 141(e). Section 141(a)(1) defines "private activity bond" as any bond issued as part of an issue that meets both the private business use and the private security or payment tests. Under § 141(b)(1), an issue generally meets the private business use test if more than 10 percent of the proceeds of the issue are to be used for any private business use. Under §141(b)(6)(A), private business use means direct or indirect use in a trade or business carried on by any person other than a governmental unit. Section 150(a)(2) provides that the term "governmental unit" does not include the United States or any agency or instrumentality thereof. Section 145(a) also applies the private business use test of §141(b)(1) to qualified 501(c)(3) bonds, with certain modifications.

(2) Section 1.141-3(b)(1) of the Income Tax Regulations provides that both actual and beneficial use by a nongovernmental person may be treated as private business use. In most cases, the private business use test is met only if a nongovernmental person has special legal entitlements to use the financed property under an arrangement with the issuer. In general, a nongovernmental person is treated as a private business user of proceeds and financed property as a result of ownership; actual or beneficial use of property pursuant to a lease, or a management or incentive payment contract; or certain other arrangements such as a take or pay or other output-type contract.

(3) Section 1.141-3(b)(6)(i) provides generally that an agreement by a nongovernmental person to sponsor research performed by a governmental person may result in private business use of the property used for the research, based on all the facts and circumstances.

(4) Section 1.141-3(b)(6)(ii) provides generally that a research agreement with respect to financed property results in private business use of that property if the sponsor is treated as the lessee or owner of financed property for Federal income tax purposes.

(5) Section 1.141-1(b) provides that the term "governmental person" means a State or local governmental unit as defined in § 1.103-1 or any instrumentality thereof. Section 1.141-1(b) further provides that governmental person does not include the United States or any agency or instrumentality thereof. Section 1.141-1(b) further provides that "nongovernmental person" means a person other than a governmental person.

(6) Section 1.145-2 provides that §§ 1.141-0 through 1.141-15 apply to qualified 501(c)(3) bonds under § 145(a) of the Code with certain modifications and exceptions. (7) Section 1.145-2(b)(1) provides that, in applying §§ 1.141-0 through 1.141-15 to § 145(a) of the Code, references to governmental persons include § 501(c)(3) organizations with respect to their activities that do not constitute unrelated trades or businesses under § 513(a).

.02 *Federal Government rights under the Bayh-Dole Act.*

(1) The Patent and Trademark Law Amendments Act of 1980, as amended, 35 U.S.C. § 200 et seq. (2006) (the "Bayh-Dole Act"), generally applies to any contract, grant, or cooperative agreement with any Federal agency for the performance of research funded by the Federal Government.

(2) The policies and objectives of the Bayh-Dole Act include promoting the utilization of inventions arising from federally supported research and development programs, encouraging maximum participation of small business firms in federally supported research and development efforts, promoting collaboration between commercial concerns and nonprofit organizations, ensuring that inventions made by nonprofit organizations and small business firms are used in a manner to promote free competition and enterprise, and promoting the commercialization and public availability of inventions made in the United States by United States industry and labor.

(3) Under the Bayh-Dole Act, the Federal Government and sponsoring Federal agencies receive certain rights to inventions that result from federally funded research activities performed by non-sponsoring parties pursuant to contracts, grants, or cooperative research agreements with the sponsoring Federal agencies. The rights granted to the Federal Government and its agencies under the Bayh-Dole Act generally include, among others, nonexclusive, nontransferable, irrevocable, paid-up licenses to use the products of federally sponsored research and certain so-called "march-in rights" over licensing under limited circumstances. Here, the term "march-in rights" refers to certain rights granted to the sponsoring Federal agencies under the Bayh-Dole Act, 35 U.S.C. § 203 (2006), to take certain actions, including granting licenses to third parties to ensure public benefits from the dissemination and use of the results of federally sponsored research in circumstances in which the original contractor or assignee has not taken, or is not expected to take within a reasonable time, effective steps to achieve practical application of the product of that research. The general purpose of these rights is to ensure the expenditure of Federal research funds in accordance with the policies and objectives of the Bayh-Dole Act.

SECTION 3. DEFINITIONS

.01 *Basic research*, for purposes of § 141 of the Code, means any original investigation for the advancement of scientific knowledge not having a specific commercial objective. For example,

product testing supporting the trade or business of a specific nongovernmental person is not treated as basic research.

.02 *Qualified user* means any State or local governmental unit as defined in § 1.1031 or any instrumentality thereof. The term also includes a § 501(c)(3) organization if the financed property is not used in an unrelated trade or business under § 513(a) of the Code. The term does not include the United States or any agency or instrumentality thereof.

.03 *Sponsor* means any person, other than a qualified user, that supports or sponsors research under a contract.

SECTION 4. CHANGES

This revenue procedure modifies and supersedes Rev. Proc. 97-14 by making changes that are described generally as follows:

.01 Section 6.03 of this revenue procedure modifies the operating guidelines on cooperative research agreements to include agreements regarding industry or federally sponsored research with either a single sponsor or multiple sponsors.

.02 Section 6.04 of this revenue procedure provides special rules for applying the revised operating guidelines under section 6.03 of this revenue procedure to federally sponsored research. These special rules provide that the rights of the Federal Government and its agencies mandated by the Bayh-Dole Act will not cause research agreements to fail to meet the requirements of section 6.03, upon satisfaction of the requirements of section 6.04 of this revenue procedure. Thus, under the stated conditions, such rights themselves will not result in private business use by the Federal Government or its agencies of property used in research performed under research agreements. These special rules do not address the use by third parties that actually receive more than non-exclusive, royalty-free licenses as the result of the exercise by a sponsoring Federal agency of its rights under the Bayh-Dole Act, such as its march-in rights.

SECTION 5. SCOPE

This revenue procedure applies when, under a research agreement, a sponsor uses property financed with proceeds of an issue of State or local bonds subject to § 141 or §145(a)(2)(B) of the Code

SECTION 6. OPERATING GUIDELINES FOR RESEARCH AGREEMENTS

.01 *In general.* If a research agreement is described in either section 6.02 or 6.03 of this revenue procedure, the research agreement itself does not result in private business use. In applying the operating guidelines under section 6.03 of this revenue procedure to federally sponsored research, the special rules under section 6.04 of this revenue procedure (regarding the effect of the rights of the Federal Government and its agencies under the Bayh-Dole Act) apply.

.02 *Corporate-sponsored research.* A research agreement relating to property used for basic research supported or sponsored by a sponsor is described in this section 6.02 if any license or

other use of resulting technology by the sponsor is permitted only on the same terms as the recipient would permit that use by any unrelated, non-sponsoring party (that is, the sponsor must pay a competitive price for its use), and the price paid for that use must be determined at the time the license or other resulting technology is available for use. Although the recipient need not permit persons other than the sponsor to use any license or other resulting technology, the price paid by the sponsor must be no less than the price that would be paid by any non-sponsoring party for those same rights.

.03 *Industry or federally-sponsored research agreements.* A research agreement relating to property used pursuant to an industry or federally-sponsored research arrangement is described in this section 6.03 if the following requirements are met, taking into account the special rules set forth in section 6.04 of this revenue procedure in the case of federally sponsored research —

(1) A single sponsor agrees, or multiple sponsors agree, to fund governmentally performed basic research;

(2) The qualified user determines the research to be performed and the manner in which it is to be performed (for example, selection of the personnel to perform the research);

(3) Title to any patent or other product incidentally resulting from the basic research lies exclusively with the qualified user; and

(4) The sponsor or sponsors are entitled to no more than a nonexclusive, royalty-free license to use the product of any of that research.

.04 *Federal Government rights under the Bayh-Dole Act.* In applying the operating guidelines on industry and federally-sponsored research agreements under section 6.03 of this revenue procedure to federally sponsored research, the rights of the Federal Government and its agencies mandated by the Bayh-Dole Act will not cause a research agreement to fail to meet the requirements of section 6.03, provided that the requirements of sections 6.03(2), and (3) are met, and the license granted to any party other than the qualified user to use the product of the research is no more than a nonexclusive, royalty-free license. Thus, to illustrate, the existence of march-in rights or other special rights of the Federal Government or the sponsoring Federal agency mandated by the Bayh-Dole Act will not cause a research agreement to fail to meet the requirements of section 6.03 of this revenue procedure, provided that the qualified user determines the subject and manner of the research in accordance with section 6.03(2), the qualified user retains exclusive title to any patent or other product of the research in accordance with section 6.03(3), and the nature of any license granted to the Federal Government or the sponsoring Federal agency (or to any third party nongovernmental person) to use the product of the research is no more than a nonexclusive, royalty-free license.

SECTION 7. EFFECT ON OTHER DOCUMENTS

Rev. Proc. 97-14 is modified and superseded.

SECTION 8. EFFECTIVE DATE

This revenue procedure is effective for any research agreement entered into, materially modified, or extended on or after June 26, 2007. In addition, an issuer may apply this revenue procedure to any research agreement entered into prior to June 26, 2007.

SECTION 9. DRAFTING INFORMATION

The principal authors of this revenue procedure are Vicky Tsilas and Johanna Som de Cerff of the Office of Associate Chief Counsel (Financial Institutions & Products). For further information regarding this revenue procedure, contact Johanna Som de Cerff at (202) 622-3980 (not a toll-free call).

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EXHIBIT 2

MANAGEMENT CONTRACT GUIDELINES

Rev. Proc. 97-13, 1997-1 C.B. 632--Management Contract Guidelines (Supersedes Rev. Proc. 93-19), as amended by Rev. Proc. 2001-39, 2001-2 C.B. 38

1997-1 C.B. 632; 1997 IRB LEXIS 14; 1997-5 I.R.B. 18; REV. PROV 97-13

(Also Part I, §§ 103, 141, 145; 1.141-3, 1.145-2.)

February 3, 1997 , amended July 9, 2001.

SECTION 1. PURPOSE

The purpose of this revenue procedure is to set forth conditions under which a management contract does not result in private business use under § 141(b) of the Internal Revenue Code of 1986. This revenue procedure also applies to determinations of whether a management contract causes the test in § 145(a)(2)(B) of the 1986 Code to be met for qualified 501(c)(3) bonds.

SECTION 2. BACKGROUND

.01 Private Business Use.

(1) Under § 103(a) of the 1986 Code, gross income does not include interest on any state or local bond. Under § 103(b)(1) of the 1986 Code, however, § 103(a) of the 1986 Code does not apply to a private activity bond, unless it is a qualified bond under § 141(e) of the 1986 Code. Section 141(a)(1) of the 1986 Code defines "private activity bond" as any bond issued as part of an issue that meets both the private business use and the private security or payment tests. Under § 141(b)(1) of the 1986 Code, an issue generally meets the private business use test if more than 10 percent of the proceeds of the issue are to be used for any private business use. Under § 141(b)(6)(A) of the 1986 Code, private business use means direct or indirect use in a trade or business carried on by any person other than a governmental unit. Section 145(a) of the 1986 Code also applies the private business use test of § 141(b)(1) of the 1986 Code, with certain modifications.

(2) Corresponding provisions of the Internal Revenue Code of 1954 set forth the requirements for the exclusion from gross income of the interest on state or local bonds. For purposes of this revenue procedure, any reference to a 1986 Code provision includes a reference to the corresponding provision, if any, under the 1954 Code.

(3) Private business use can arise by ownership, actual or beneficial use of property pursuant to a lease, a management or incentive payment contract, or certain other arrangements. The Conference Report for the Tax Reform Act of 1986, provides as follows:

The conference agreement generally retains the present-law rules under which use by persons other than governmental units is determined for purposes of the trade or business use test. Thus, as under present law, the use of bond-financed property is treated as a use of bond proceeds. As under present law, a person may be a user of bond proceeds and bond-financed property as a

result of (1) ownership or (2) actual or beneficial use of property pursuant to a lease, a management or incentive payment contract, or (3) any other arrangement such as a take-or-pay or other output-type contract. 2 H.R. Conf. Rep. No. 841, 99th Cong., 2d Sess. II-687-688, (1986) 1986-3 (Vol. 4) C.B. 687-688 (footnote omitted).

(4) A management contract that gives a nongovernmental service provider an ownership or leasehold interest in financed property is not the only situation in which a contract may result in private business use.

(5) Section 1.141-3(b)(4)(i) of the Income Tax Regulations provides, in general, that a management contract (within the meaning of § 1.141-3(b)(4)(ii)) with respect to financed property may result in private business use of that property, based on all the facts and circumstances.

(6) Section 1.141-3(b)(4)(i) provides that a management contract with respect to financed property generally results in private business use of that property if the contract provides for compensation for services rendered with compensation based, in whole or in part, on a share of net profits from the operation of the facility.

(7) Section 1.141-3(b)(4)(iii), in general, provides that certain arrangements generally are not treated as management contracts that may give rise to private business use. These are--

(a) Contracts for services that are solely incidental to the primary governmental function or functions of a financed facility (for example, contracts for janitorial, office equipment repair, hospital billing or similar services);

(b) The mere granting of admitting privileges by a hospital to a doctor, even if those privileges are conditioned on the provision of de minimis services, if those privileges are available to all qualified physicians in the area, consistent with the size and nature of its facilities;

(c) A contract to provide for the operation of a facility or system of facilities that consists predominantly of public utility property (as defined in § 168(i)(10) of the 1986 Code), if the only compensation is the reimbursement of actual and direct expenses of the service provider and reasonable administrative overhead expenses of the service provider; and

(d) A contract to provide for services, if the only compensation is the reimbursement of the service provider for actual and direct expenses paid by the service provider to unrelated parties.

(8) Section 1.145-2(a) provides generally that §§ 1.141-0 through 1.141-15 apply to § 145(a) of the 1986 Code.

(9) Section 1.145-2(b)(1) provides that in applying §§ 1.141-0 through 1.141-15 to § 145(a) of the 1986 Code, references to governmental persons include section 501(c)(3) organizations with respect to their activities that do not constitute unrelated trades or businesses under § 513(a) of the 1986 Code.

.02 *Existing Advance Ruling Guidelines.* Rev. Proc.. 93-19, 1993-1 C.B. 526, contains advance ruling guidelines for determining whether a management contract results in private business use under § 141(b) of the 1986 Code.

SECTION 3. DEFINITIONS

.01 *Adjusted gross revenues* means gross revenues of all or a portion of a facility, less allowances for bad debts and contractual and similar allowances.

.02 *Capitation fee* means a fixed periodic amount for each person for whom the service provider or the qualified user assumes the responsibility to provide all needed services for a specified period so long as the quantity and type of services actually provided to covered persons varies substantially. For example, a capitation fee includes a fixed dollar amount payable per month to a medical service provider for each member of a health maintenance organization plan for whom the provider agrees to provide all needed medical services for a specified period. *A fixed periodic amount may include an automatic increase according to a specified, objective, external standard that is not linked to the output or efficiency of a facility. For example, the Consumer Price Index and similar external indices that track increases in prices in an area or increases in revenues or costs in an industry are objective external standards*[1]. A capitation fee may include a variable component of up to 20 percent of the total capitation fee designed to protect the service provider against risks such as catastrophic loss.

.03 *Management contract* means a management, service, or incentive payment contract between a qualified user and a service provider under which the service provider provides services involving all, a portion of, or any function of, a facility. For example, a contract for the provision of management services for an entire hospital, a contract for management services for a specific department of a hospital, and an incentive payment contract for physician services to patients of a hospital are each treated as a management contract. See §§ 1.141-3(b)(4)(ii) and 1.145-2.

.04 *Penalties* for terminating a contract include a limitation on the qualified user's right to compete with the service provider; a requirement that the qualified user purchase equipment, goods, or services from the service provider; and a requirement that the qualified user pay liquidated damages for cancellation of the contract. In contrast, a requirement effective on cancellation that the qualified user reimburse the service provider for ordinary and necessary expenses or a restriction on the qualified user against hiring key personnel of the service provider is generally not a contract termination penalty. Another contract between the service provider and the qualified user, such as a loan or guarantee by the service provider, is treated as creating a contract termination penalty if that contract contains terms that are not customary or arm's-length that could operate to prevent the qualified user from terminating the contract (for example, provisions under which the contract terminates if the management contract is terminated or that place substantial restrictions on the selection of a substitute service provider).

[1] Added by Rev. Proc. 2001-39, section 4.01.

.05 *Periodic fixed fee* means a stated dollar amount for services rendered for a specified period of time. For example, a stated dollar amount per month is a periodic fixed fee. The stated dollar amount may automatically increase according to a specified, objective, external standard that is not linked to the output or efficiency of a facility. For example, the Consumer Price Index and similar external indices that track increases in prices in an area or increases in revenues or costs in an industry are objective external standards. Capitation fees and per-unit fees are not periodic fixed fees.

.06 *Per-unit fee* means a fee based on a unit of service provided specified in the contract or otherwise specifically determined by an independent third party, such as the administrator of the Medicare program, or the qualified user. For example, a stated dollar amount for each specified medical procedure performed, car parked, or passenger mile is a per-unit fee. Separate billing arrangements between physicians and hospitals generally are treated as per-unit fee arrangements. *A fee that is a stated dollar amount specified in the contract does not fail to be a per-unit fee as a result of a provision under which the fee may automatically increase according to a specified, objective, external standard that is not linked to the output or efficiency of a facility. For example, the Consumer Price Index and similar external indices that track increases in prices in an area or increases in revenues or costs in an industry are objective external standards.*[2]

.07 *Qualified user* means any state or local governmental unit as defined in § 1.103-1 or any instrumentality thereof. The term also includes a section 501(c)(3) organization if the financed property is not used in an unrelated trade or business under § 513(a) of the 1986 Code. The term does not include the United States or any agency or instrumentality thereof.

.08 *Renewal option* means a provision under which the service provider has a legally enforceable right to renew the contract. Thus, for example, a provision under which a contract is automatically renewed for one-year periods absent cancellation by either party is not a renewal option (even if it is expected to be renewed).

.09 *Service provider* means any person other than a qualified user that provides services under a contract to, or for the benefit of, a qualified user.

SECTION 4. SCOPE

This revenue procedure applies when, under a management contract, a service provider provides management or other services involving property financed with proceeds of an issue of state or local bonds subject to § 141 or § 145(a)(2)(B) of the 1986 Code.

SECTION 5. OPERATING GUIDELINES FOR MANAGEMENT CONTRACTS

.01 *In general.* If the requirements of section 5 of this revenue procedure are satisfied, the management contract does not itself result in private business use. In addition, the use of financed property, pursuant to a management contract meeting the requirements of section 5 of

[2] Added by Rev. Proc. 2001-39, section 4.02.

this revenue procedure, is not private business use if that use is functionally related and subordinate to that management contract and that use is not, in substance, a separate contractual agreement (for example, a separate lease of a portion of the financed property). Thus, for example, exclusive use of storage areas by the manager for equipment that is necessary for it to perform activities required under a management contract that meets the requirements of section 5 of this revenue procedure, is not private business use.

.02 *General compensation requirements.*

(1) *In general.* The contract must provide for reasonable compensation for services rendered with no compensation based, in whole or in part, on a share of net profits from the operation of the facility. Reimbursement of the service provider for actual and direct expenses paid by the service provider to unrelated parties is not by itself treated as compensation.

(2) *Arrangements that generally are not treated as net profits arrangements.* For purposes of § 1.141-3(b)(4)(i) and this revenue procedure, compensation based on--

(a) A percentage of gross revenues (or adjusted gross revenues) of a facility or a percentage of expenses from a facility, but not both;

(b) A capitation fee; or

(c) A per-unit fee is generally not considered to be based on a share of net profits.

(3) *Productivity reward.* For purposes of § 1.141-3(b)(4)(i) and this revenue procedure, a productivity reward equal to a stated dollar amount based on increases or decreases in gross revenues (or adjusted gross revenues), or reductions in total expenses (but not both increases in gross revenues (or adjusted gross revenues) and reductions in total expenses) in any annual period during the term of the contract, generally does not cause the compensation to be based on a share of net profits.

(4) *Revision of compensation arrangements.* In general, if the compensation arrangements of a management contract are materially revised, the requirements for compensation arrangements under section 5 of this revenue procedure are retested as of the date of the material revision, and the management contract is treated as one that was newly entered into as of the date of the material revision.

.03 *Permissible Arrangements.* The management contract must be described in section 5.03(1), (2), (3), (4), (5), or (6) of this revenue procedure.

(1) *95 percent periodic fixed fee arrangements.* At least 95 percent of the compensation for services for each annual period during the term of the contract is based on a periodic fixed fee. The term of the contract, including all renewal options, must not exceed the lesser of 80 percent of the reasonably expected useful life of the financed property and 15 years. For purposes of this section 5.03(1), a fee does not fail to qualify as a periodic fixed fee as a result of a one-time incentive award during the term of the contract under which compensation automatically increases when a gross revenue or expense target (but not both) is reached if that award is equal to a single, stated dollar amount.

(2) *80 percent periodic fixed fee arrangements.* At least 80 percent of the compensation for services for each annual period during the term of the contract is based on a periodic fixed fee. The term of the contract, including all renewal options, must not exceed the lesser of 80 percent of the reasonably expected useful life of the financed property and 10 years. For purposes of this section 5.03(2), a fee does not fail to qualify as a periodic fixed fee as a result of a one-time incentive award during the term of the contract under which compensation automatically increases when a gross revenue or expense target (but not both) is reached if that award is equal to a single, stated dollar amount.

(3) *Special rule for public utility property.* If all of the financed property subject to the contract is a facility or system of facilities consisting of predominantly public utility property (as defined in § 168(i)(10) of the 1986 Code), then "20 years" is substituted--

(a) For "15 years" in applying section 5.03(1) of this revenue procedure; and

(b) For "10 years" in applying section 5.03(2) of this revenue procedure.

(4) *50 percent periodic fixed fee arrangements.* Either at least 50 percent of the compensation for services for each annual period during the term of the contract is based on a periodic fixed fee or all of the compensation for services is based on a capitation fee or a combination of a capitation fee and a periodic fixed fee. The term of the contract, including all renewal options, must not exceed 5 years. The contract must be terminable by the qualified user on reasonable notice, without penalty or cause, at the end of the third year of the contract term.

(5) *Per-unit fee arrangements in certain 3-year contracts.* All of the compensation for services is based on a per-unit fee or a combination of a per-unit fee and a periodic fixed fee. The term of the contract, including all renewal options, must not exceed 3 years. The contract must be terminable by the qualified user on reasonable notice, without penalty or cause, at the end of the second year of the contract term.

(6) *Percentage of revenue or expense fee arrangements in certain 2-year contracts.* All the compensation for services is based on a percentage of fees charged or a combination of a per-unit fee and a percentage of revenue or expense fee. During the start-up period, however, compensation may be based on a percentage of either gross revenues, adjusted gross revenues, or expenses of a facility. The term of the contract, including renewal options, must not exceed 2 years. The contract must be terminable by the qualified user on reasonable notice, without penalty or cause, at the end of the first year of the contract term. This section 5.03(6) applies only to--

(a) Contracts under which the service provider primarily provides services to third parties (for example, radiology services to patients); and

(b) Management contracts involving a facility during an initial start-up period for which there have been insufficient operations to establish a reasonable estimate of the amount of the annual gross revenues and expenses (for example, a contract for general management services for the first year of operations).

.04 *No Circumstances Substantially Limiting Exercise of Rights.*

(1) *In general.* The service provider must not have any role or relationship with the qualified user that, in effect, substantially limits the qualified user's ability to exercise its rights, including cancellation rights, under the contract, based on all the facts and circumstances.

(2) *Safe harbor.* This requirement is satisfied if--

(a) Not more than 20 percent of the voting power of the governing body of the qualified user in the aggregate is vested in the service provider and its directors, officers, shareholders, and employees;

(b) Overlapping board members do not include the chief executive officers of the service provider or its governing body or the qualified user or its governing body; and

(c) The qualified user and the service provider under the contract are not related parties, as defined in § 1.150-1(b).

SECTION 6. EFFECT ON OTHER DOCUMENTS

Rev. Proc. 93-19, 1993-1 C.B. 526, is made obsolete on the effective date of this revenue procedure.

SECTION 7. EFFECTIVE DATE

This revenue procedure is effective for any management contract entered into, materially modified, or extended (other than pursuant to a renewal option) on or after May 16, 1997. In addition, an issuer may apply this revenue procedure to any management contract entered into prior to May 16, 1997.

DRAFTING INFORMATION

The principal author of this revenue procedure is Loretta J. Finger of the Office of Assistant Chief Counsel (Financial Institutions and Products). For further information regarding this revenue procedure contact Loretta J. Finger on (202) 622-3980 (not a toll-free call).

TAB II

PRIVATE BUSINESS USE QUESTIONNAIRE
GOVERNMENTAL BONDS

TO: [NAME]
[TITLE]

FROM:

DATE: [CURRENT DATE]

RE: Use of Tax-Exempt Bond-Financed Property

In order to maintain the tax exempt status of bonds which have been issued to finance facilities or equipment for the benefit of the Massachusetts Water Resources Authority (the "Authority"), the ownership and certain uses of the Bond-Financed Property must be monitored and recorded. In general, the ownership and use of the Bond-Financed Property must be monitored and recorded from the date of issue of the bonds until the earlier of the end of the expected life of the property, or the final maturity date of any bonds issued to finance the property. Because it is the Internal Revenue Service's position that records be maintained until 3 years after the final maturity date of any bonds issued to finance (or refinance) the property, staff will be asked to update these records for changes in the use or ownership of the property.

Attached is a schedule with a brief description of property financed with proceeds of tax exempt bonds. Our records indicate the property is located at [NAME OF FACILITY]. Please review your records and respond to each of the questions for the Bond-Financed Property listed, including both the present use of the property and any past uses of it. Please do not skip questions. If you are uncertain how to respond to particular question please provide a belief explanation in the space immediately following the question. If necessary one of my staff members will contact you for clarification. Please refer to Tab I-A, Private Activity Restrictions on Private Business Use, of the Post-Issuance Compliance Guide, for a brief description of types of private use.

We recognize that some of the requested information and records may not be available. However, your cooperation is necessary in order to collect as much of this information as possible.

SCHEDULE

USE OF TAX EXEMPT BOND BOND-FINANCED PROPERTY

Description of property:	[Description] (the "Bond-Financed Property")
Location:	[facility name]
Bond Issue	[name of bonds]
Survey Date	[current date]

PLEASE REVIEW APPENDIX A FOR APPLICABLE RULES ON PRIVATE USE

I. Familiarity with Uses.

1.1. My familiarity with, and/or the records with respect to, the uses made of the Bond-Financed Property, dates back to _____ [insert date].

1.2. For information on uses of the Bond-Financed Property prior to the date set forth in Section 1.1, I suggest contacting _____.

II. Ownership and Use of the Bond-Financed Property.

2.1. When was the Bond-Financed Property placed in service?_____

2.2. Is the Bond-Financed Property still owned by the Authority? Yes ☐ No ☐

2.3. If, no, on what day was the Bond-Financed Property disposed of? _____. What were the terms of the disposition?

2.4. Is the Bond-Financed Property still in use? Yes ☐ No ☐ If No, please explain when it stopped being used and what its current state is.

2.5. Is the Bond-Financed Property still being used for its original purpose? Yes ☐ No ☐ If No, please explain how it is being used.

III. Leases of the Bond-Financed Property.

3.1. Has any portion of the Bond-Financed Property been leased to or been the subject of a possessory interest, such as a license in, any person? YES ☐ NO ☐

3.2. If the answer to the preceding question is yes, describe the nature and the extent of all such interests, including the lease payments, and identify the persons or organizations to whom such interests have been given.

IV. Priority Rights.

4.1. Has any portion of the Bond-Financed Property been the subject of an arrangement with a person other than a Governmental Unit for priority use or for use of certain capacity of the Bond-Financed Property? YES ☐ NO ☐

4.2. If the answer to the preceding question is Yes, describe the nature and the extent of all such interests, including any payments, and identify the persons or organizations to whom such interests have been given.

4.3. Has any portion of the Bond-Financed Property been used in the testing of products under a contract with a person other than a Governmental Unit? YES ☐ NO ☐

4.4. If the answer to the preceding question is Yes, describe the nature and the extent of all such arrangements, and identify the persons or organizations with whom such arrangements have been entered into.

V. Naming Rights or Sponsorship Agreements.

5.1. Has any portion of the Bond-Financed Property been the subject of a contract or other arrangement with anyone pursuant to which the that person will make a payment to the Authority in return for the right to have its name or logo used in connection with the Authority or any portion thereof? YES ☐ NO ☐ If Yes, please provide details of the arrangement.

VI. Research.

6.1. Has any portion of the Bond-Financed Property been used in research sponsored by anyone other than a Governmental Unit? (Note that the federal government is not a Governmental Unit.) YES ☐ NO ☐

6.2. If Yes, please describe the nature and the extent of all such arrangements, and identify the persons or organizations with whom such arrangements have been entered into. Please attach a copy of any contract or arrangement relating to such research.

VII. Management Agreements and Service Agreements.

7.1. Has any portion of the Bond-Financed Property been used in connection with any type of service contract or management contract described below?

(a) A contract with a non-employee group, other than a Governmental Unit, to provide services to, or manage any function of, the Authority? YES ☐ NO. If Yes, identify the person or organization that is a party to the contract.

(b) A contract with an employee to provide services to, or manage any function of, the Authority, where such contract contains an incentive compensation arrangement? YES ☐ NO ☐ If Yes, identify the person or organization that is a party to the contract.

(c) A contract with a person other than a Governmental Unit to provide services, such as food services to the Authority? YES ☐ NO ☐ If Yes, identify the person or organization that is a party to the contract.

7.2. For each contract identified in Section 7.1 answer the following questions, which track the safe harbor requirements of Rev. Proc. 97-13. Identify the answer by the name of the contracting party. Attach a copy of the contract to this questionnaire response.

(a) What is or was the term of the contract/agreement, including all renewal options?

(b) Does the Authority have the option to cancel the contract/agreement without penalty or cause? YES ☐ NO ☐

(c) Is or was any of the compensation of the manager/service provider based on a share of net profits? YES ☐ NO ☐

(d) What is or was the annual compensation arrangement for the manager/service provider?

(e) Does the governing body of the Authority include the manager/service provider or any of its directors, officers, shareholders, or employees? YES ☐ NO ☐

(f) Does the governing body of the manager/service provider include any of the Authority's governing body, officers, or employees? YES ☐ NO ☐

(g) Is the chief executive officer of either the Authority or the manager/service provider a member of the governing body of the other? YES ☐ NO ☐

(h) Does the manager/service provider have any role or relationship with the Authority that might limit the Authority's ability to exercise its rights (including cancellation rights) under the contract? YES ☐ NO ☐ This would include a limitation on the Authority's right to compete with the service provider; a requirement that the Authority purchase equipment, goods, or services from the service provider; or a requirement that the Authority pay liquidated damages for cancellation of the contract.

(i) Will the members of the governing body of the Authority own any interest in the management company? YES ☐ NO ☐ .

VIII. Output Facilities.

8.1. Is any portion of the Bond-Financed Property an output type facility? YES ☐ NO ☐

8.2. If the answer to the preceding question is yes, has any of the output from those facilities been sold or been used to service facilities used in the trade or business of persons other than Governmental Units? YES ☐ NO ☐

IX. Joint Ventures.

9.1. Has any portion of the Bond-Financed Property been used in any joint venture arrangement with any person other than a Governmental Unit? YES ☐ NO ☐ If Yes, please provide details of the arrangement.

Date:_____

By:_____
Name:
Title:

TAB III

REMEDIAL ACTIONS

GOVERNMENTAL BONDS

Introduction

The Internal Revenue Code of 1986, as amended (the "Code") limits the amount of proceeds of tax-exempt governmental bonds that can be used for the benefit of private businesses. Section 141 of the Code treats as a taxable private activity bond a bond issued as part of an issue that meets the private business use test and the private security or payment test, or the private loan test. The private business use test is met if the amount of proceeds of bonds that are used in a private business use is more than ten percent of total proceeds. The private security or payment test is met if the payment of debt service on more than 10 percent of the issue is directly or indirectly (i) secured by any interest in property used for a private business use or payments in respect of such property or (ii) derived from payments in respect of property or borrowed money used for a private business use. For purposes of Section 141, the term private business includes nonprofit, 501(c)(3) organizations as well as the federal government.

Deliberate Action

The Regulations promulgated by the Internal Revenue Service ("IRS") under Section 141 of the Code, specifically provide that bonds will be treated as private activity bonds if the issuer takes a deliberate action subsequent to the issue date that causes the tests for a private activity bond to be met. An issuer cannot rely merely on its expectations on the date of issuance to avoid jeopardizing the status of its bonds as governmental bonds. A deliberate action is any action taken by an issuer, but not including an action, such as a condemnation, that would be treated as an involuntary or compulsory conversion under Section 1033 of the Code, or an action that is taken in response to a regulatory directive made by the federal government. A deliberate action is deemed to occur when the issuer enters into a binding contract with a nongovernmental person for use of the financed property that is not subject to any material contingencies. In most cases, material conditions to closing a transaction will be treated as material contingencies so that the date of deliberate action will be the date disposition proceeds are received.

Conditions to Remedial Action

Under the Regulations, in order to take a remedial action to preserve the tax-exempt status of interest on bonds, the following conditions must be met:

(1) *Reasonable expectations test.* The issuer must reasonably have expected on the issue date that neither the private business test nor the private loan test would be met. The period of time that has elapsed since the bonds were issued will be a factor in evaluating the reasonableness of expectations. Under certain conditions an expectation on the issue date to take a deliberate action that would cause one of the tests to be met (e.g., a sale of the project) will be disregarded if the issuer expected on the issue date that the financed property would be used for a qualified purpose for a substantial period before such action, the issuer is required to redeem all

nonqualifying bonds (without regard to the amount of disposition proceeds) within 6 months of the action, the redemption meets all the remedial action conditions (described below) and there was no arrangement on the date of issue with a nongovernmental person or a non-501 (c)(3) organization with respect to the activity;

(2) *Maturity not unreasonably long.* The term of the bond *issue* must not be longer than is reasonably necessary for the governmental purpose of the issue. This requirement is met under *a* safe harbor if the weighted average maturity of the bonds is not greater than 120 percent of the average reasonably expected economic life of the financed property as of the issue date.

(3) *Fair market value consideration.* The terms of any change in use or loan arrangement are bona fide and arms-length and the new user pays fair market value for the use of the financed property. For this purpose fair market value may take into account restrictions on the use of the financed property that serve a bona fide governmental purpose.

(4) *Disposition proceeds treated as gross proceeds for arbitrage purposes.* Any disposition proceeds must be treated as gross proceeds for arbitrage purposes. This will require that the issuer meet yield restriction or rebate requirements with respect to these funds. The issuer may treat the date of receipt of the proceeds as an issue date for purposes of eligibility for temporary periods and exemptions from rebate.

(5) *Proceeds expended on a governmental purpose.* Except where a redemption or defeasance remedial action is taken, the proceeds must have been expended on a governmental purposes before the date of the deliberate action.

Effect of Remedial Action

A remedial action is treated as curing a change in ownership or a private use or private loan of proceeds, thereby preserving the tax-exempt status of existing bonds. It does not cure a failure to meet the private payment or security interest limitation. In the case of advance refunding bonds, remedial action taken with respect to the refunding bonds proportionally reduces the amount of proceeds of the refunded bonds that is taken into account under the private business use or loan test. In other words, the remedial action taken with respect to the refunding bonds proportionally "cures" the refunded bonds.

Disposition Proceeds and Nonqualified Bonds

Generally, in order to take one of the remedial actions it is necessary to know what the disposition proceeds are and how much of the disposition proceeds are allocated to particular issues. Disposition proceeds arise in a sale, exchange or other disposition of bond-financed property. Disposition proceeds do not arise, however, in an installment sale arrangement and the bond proceeds remain allocated to the transferred property in that case. This distinction becomes important when determining what remedial action is appropriate.

In the case of property financed from different sources of funding, the disposition proceeds are first allocated to the outstanding bonds (both taxable and tax-exempt) that financed the property in proportion to the principal amount of the outstanding bonds. Disposition proceeds may not be

allocated to bonds that are no longer outstanding or to revenues if the disposition proceeds are not greater than the total principal amount of the outstanding bonds allocable to that property. Only amounts in excess of that total may be allocated to another source.

Under the Regulations, the amount of nonqualified bonds that arise from a deliberate action is a percentage of the outstanding bonds equal to the highest percentage of private business use in any one-year period commencing with the deliberate action. Allocations to nonqualified bonds must be made on a pro-rata basis except that for purposes of the redemption or defeasance remedial action the issuer may treat bonds with longer maturities as the nonqualified bonds. This treatment would be necessary, for example, where the bonds are required to be called in inverse order of maturity rather than pro rata.

Permitted Remedial Actions

Redemptions or Defeasance

The first remedial action is redemption or defeasance which is available in the case of a deliberate action taking the form of a sale, lease or nonqualified management contract or other action. This remedial action probably will be the most frequently used remedial action in sale transactions. Under this remedial action, other than in the case of an exclusively cash disposition, all nonqualified bonds must be redeemed within 90 days of the deliberate action. Proceeds of tax-exempt bonds may not be used to effect the redemption unless they are proceeds of qualified private activity bonds (e.g., exempt facility bonds) taking into account the purchaser's use. If the bonds are not currently redeemable, a defeasance escrow must be established for all nonqualified bonds within 90 days of the deliberate action and notice of defeasance must be furnished to the Commissioner of Internal Revenue within 90 days of the escrow establishment. Defeasance is only available as a remedial action, however, if the period between the issue date and the first call date is not more than 10½ years. Thus, for example, if a bond-financed building is leased to a private for-profit entity, all tax-exempt bonds that financed that building would have to be redeemed or defeased within 90 days.

In the case of a disposition, a sale, exclusively for cash, if the disposition proceeds are less than the amount of the nonqualified bonds, only an amount equal to the disposition proceeds must be used to redeem or defease a pro rata portion of the nonqualified bonds.

Alternative Use of Disposition Proceeds

In the case of a disposition exclusively for cash, the issuer may, in lieu of redeeming or defeasing bonds, expend the disposition proceeds on other qualifying facilities. The issuer must reasonably expect to expend the disposition proceeds within two years of the deliberate action and must treat the disposition proceeds as bond proceeds for purposes of Section 141. The issuer must not use such proceeds in a manner that would cause the private business tests or the private loan test to be met. Furthermore the issuer must not take any action subsequent to the date of deliberate action to cause either of these tests to be met. This requirement precludes the issuer from repeatedly taking advantage of the remedial action provisions with respect to the same bond issue. If the issuer does not use all of the disposition proceeds for an alternative use it must use the remaining proceeds to redeem or defease bonds as described above.

If the disposition proceeds are to be used by a 501(c)(3) organization, the nonqualified bonds must, in addition, be treated as reissued and must, beginning on the date of the deliberate action, meet all the requirements for qualified 501(c)(3) bonds. For example, this requires that a TEFRA hearing be held and approval obtained with respect to the new uses of proceeds before the date of the deliberate action.

Alternative Use of Facility

The third remedial action, alternative use of a facility, permits the bonds to remain outstanding if the facility is now used for a qualifying purpose and the nonqualified bonds are treated as reissued as of the date of deliberate action as qualified bonds, e.g., qualified 501(c)(3) bonds or qualified exempt facility bonds. The nonqualified bonds must satisfy all the requirements for that particular type of issue from the date of deliberate action, including the volume cap limitation of Section 146 of the Code, if applicable. The Regulations specifically provide, however, that the used property limitation of Section 147 will not apply. In the case of exempt facility bonds, and other non-501(c)(3) qualified bonds, the interest will be treated as a preference item for alternative minimum tax ("AMT") purposes (see discussion below). This remedial action is not available if the deliberate action involves a disposition to a purchaser who finances the purchase with tax-exempt bonds.

The Regulations provide that any disposition proceeds, including proceeds from an installment sale, must be used to pay debt service on the bonds on the next available payment date or within 90 days of receipt, be deposited into a defeasance escrow, yield restricted and used to pay debt service on the bonds on the next available payment date. The Regulations do not address under this remedial action alternative how to deal with the change in status of interest from non-AMT to AMT. This is addressed, however, in *Rev.* Proc. *97-15,* discussed below.

Rev. Proc. 97-15

Rev. Proc. 97-15 provides a program under which an issuer may request a closing agreement as a remedial action to prevent interest on outstanding bonds from being included in gross income or to prevent interest from being treated as an item of tax preference for AMT purposes as a result of a subsequent action. Closing agreements under this program will not resolve any other issue, nor will they preclude an examination by the IRS of any matters not addressed in the closing agreement. These closing agreements are not available with respect to an issue of outstanding bonds that is under examination by the IRS.

Closing Agreement as to Exclusion from Gross Income

A number of procedural and substantive conditions to obtaining a closing agreement are set forth in Rev. Proc. 97-15. In addition, in the case of a closing agreement that provides that interest will not be included in gross income, the issuer must agree to redeem the outstanding bonds at the next redemption date. The issuer also must pay a closing agreement amount equal to the sum of the present value amounts determined by multiplying the amount of interest accruing on the nonqualified bonds in each year by .29 and present valuing each such number from April 15 of the year after the interest accrues to the date on which the payment is sent to the IRS, using as

the discount rate the taxable applicable federal rate for a term equal to the period from the subsequent action to the redemption date.

Alternative Minimum Tax Closing Agreement

In the case of a closing agreement that provides that the interest will not be treated as an item of tax preference, among other conditions, the issuer must pay an amount equal to the sum of certain present value amounts. These amounts are determined by multiplying the principal amount of the nonqualified bonds that will be outstanding on January 1 in each calendar year beginning in the year of the subsequent action and ending the first calendar year in which the bonds will no longer be outstanding, by .0014 and present valuing each such number from April 15 of the year following each such calendar year to the date of payment to the IRS, using the applicable federal rate for the period specified in the closing agreement as the discount rate.

VCAP

The IRS has adopted procedures for its Voluntary Closing Agreement Program ("VCAP") under which issuers of tax exempt bonds can voluntarily resolve violations of the Code or Regulations on behalf of their bondholders or themselves through closing agreements with the IRS. These procedures are set forth in Internal Revenue Manual 7.2.3.1. If a deliberate action has occurred that cannot be remedied with a remedial action, a VCAP should be considered.

TAB IV

INTERNAL REVENUE SERVICE – TAX EXEMPT BONDS

TAX EXEMPT BOND FAQS REGARDING RECORD RETENTION REQUIREMENTS

During the course of an examination, IRS Tax Exempt Bonds (TEB) agents will request all material records and information necessary to support a municipal bond issue's compliance with section 103 of the Internal Revenue Code. The following information is intended solely to answer frequently asked questions concerning how the broad record retention requirements under section 6001 of the Code apply to tax-exempt bond transactions. Although this document provides information with respect to many of the concerns raised by members of the municipal finance industry about record retention, it is not to be cited as an authoritative source on these requirements. TEB recommends that issuers and other parties to tax-exempt bond transactions review section 6001 of the Code and the corresponding Income Tax Regulations in consultation with their counsel.

These frequently asked questions and answers are provided for general information only and should not be cited as any type of legal authority. They are designed to provide the user with information required to respond to general inquiries. Due to the uniqueness and complexities of Federal tax law, it is imperative to ensure a full understanding of the specific question presented, and to perform the requisite research to ensure a correct response is provided.

The freely available Adobe Acrobat Reader software is required to view, print, and search the questions and answers listed below.

1. Why keep records with respect to tax-exempt bond transactions?
2. Who may maintain records?
3. What are the basic records that should be retained?
4. Are these the only records that need to be maintained?
5. In what format must the records be kept?
6. How long should records be kept?
7. How does this general rule apply to refundings?
8. What happens if records aren't maintained?
9. Can a failure to properly maintain records be corrected?

10. Are there exceptions to the general rule regarding record retention for certain types of records?

Why keep records with respect to tax-exempt bond transactions?

Section 6001 of the Internal Revenue Code provides the general rule for the proper retention of records for federal tax purposes. Under this provision, every person liable for any tax imposed by the Code, or for the collection thereof, must keep such records, render such statements, make such returns, and comply with such rules and regulations as the Secretary may from time to time prescribe. Section 1.6001-1(a) of the Income Tax Regulations amplifies this general rule by providing that any person subject to income tax, or any person required to file a return of information with respect to income, must keep such books and records, including inventories, as are sufficient to establish the amount of gross income, deductions, credits, or other matters required to be shown by that person in any return of such tax or information.

The IRS regularly advises taxpayers to maintain sufficient records to support their tax deductions, credits and exclusions. In the case of a tax-exempt bond transaction, the primary taxpayers are the beneficial holders of the bonds. However, in most cases, the beneficial holders of tax-exempt bonds will not have any records to support their exclusion of the interest paid on those bonds. Instead, these records will generally be found in the bond transcript and the books and records of the issuer, the conduit borrower, and other participants to the transaction. Therefore, in order to ensure the continued exclusion of interest by the beneficial holders, it is important that the issuer, the conduit borrower and other participants retain sufficient records to support the continued exclusion being taken by the beneficial holders of the bonds. Pursuant to this statutory regime, IRS agents conducting examinations of tax-exempt bond transactions will look to these parties to provide books, records, and other information documents supporting the bonds continued compliance with federal tax requirements.

Additionally, in the case of many private activity bonds, the conduit borrowers are also primary taxpayers. For instance, the conduit borrower will generally deduct the interest indirectly paid on the bond issue through the loan documents. Conduit borrowers are also often entitled to claim depreciation deductions for bond-financed property. Consequently, conduit borrowers should maintain sufficient records to support their interest deductions, depreciation deductions or other tax deductions, exclusions or credits related to the tax-exempt bond issue.

Moreover, issuers and conduit borrowers should retain sufficient records to show that all tax-exempt bond related returns submitted to the IRS are correct. Such returns include, for example, IRS Forms 8038, 8038-G, 8038-GC, 8038-T, and 8038-R.

In addition to the general rules under section 6001, issuers and conduit borrowers are subject to specific recordkeeping requirements imposed by various other Code sections and regulations. For example, section 1.148-5(d)(6)(iii)(E) of the arbitrage regulations requires that an issuer retain certain records necessary to qualify for the safe harbor for establishing fair market value for guaranteed investment contracts and investments purchased for a yield restricted defeasance escrow.

Who may maintain records?

Read together, section 6001 of the Code and section 1.6001-1(a) of the Regulations apply to taxpayers and persons filing tax returns, including returns related to tax-exempt bond transactions (i.e., Forms 8038, 8038-G, 8038-GC, 8038-T, 8038-R, 8328, 8703). This encompasses several parties to the bond transaction including:

1. issuers as the party responsible for satisfying the filing requirements under section 149(e) of the Code;

2. conduit borrowers for deductions taken for payment of interest on outstanding bonds or depreciation of bond-financed facilities; and

3. bondholders, lenders, and lessors as recipients of exempt income from the interest paid on the bonds.

Since many of the same records may be examined to verify, for example, both the tax-exempt status of the bonds and the interest deductions of the conduit borrower, it is advisable for the bond documents to specify which party will bear the responsibility for maintaining the basic records relating to a bond transaction. Additional parties may also be responsible for maintaining records under contract with any of the parties named above. For example, a trustee may agree to maintain certain records pursuant to the trust indenture.

What are the basic records that should be retained?

Although the required records to be retained depend on the transaction and the requirements imposed by the Code and the regulations, records common to most tax-exempt bond transactions include:

> Basic records relating to the bond transaction (including the trust indenture, loan agreements, and bond counsel opinion);
>
> Documentation evidencing expenditure of bond proceeds;
>
> Documentation evidencing use of bond-financed property by public and private sources (i.e., copies of management contracts and research agreements);
>
> Documentation evidencing all sources of payment or security for the bonds; and
>
> Documentation pertaining to any investment of bond proceeds (including the purchase and sale of securities, SLGs subscriptions, yield calculations for each class of investments, actual investment income received the investment of proceeds, guaranteed investment contracts, and rebate calculations).

Are these the only records that need to be maintained?

No, the list above is very general and only highlights the basic records that are typically material to many types of tax-exempt bond financings. Each transaction is unique and may, accordingly, have other records that are material to the requirements applicable to that financing. The decision as to whether any particular record is material must be made on a case-by-case basis and could take into account a number of factors, including, for instance, the various expenditure exceptions. Moreover, certain records may be necessary to support information related to certain requirements applicable to specific types of qualified private activity bonds. With respect to single and multifamily housing bonds as well as small issue industrial development bonds, examples of such additional material records include:

Single Family Housing Bonds	Documents evidencing that at least 20% of proceeds were available for owner financing of targeted area residences.
	Documentation evidencing proper notification of each mortgagor of potential liability of the mortgage subsidy recapture tax.
Multi-Family Housing Bonds	Documentation evidencing that the facility is not used on a transient basis.
	Documentation evidencing compliance with the income set-aside requirements.
	Documentation evidencing timely correction, if any, of noncompliance with the income set-aside requirements.
Small Issue Industrial Development Bonds	Documentation evidencing compliance with the $10,000,000 limitation on the aggregate face amount of the issue.
	Documentation evidencing that no test-period beneficiary has been allocated more than $40,000,000 in bond proceeds.

In what format must the records be kept?

All records should be kept in a manner that ensures their complete access to the IRS for so long as they are material. While this is typically accomplished through the maintenance of hard copies, taxpayers may keep their records in an electronic format if certain requirements are satisfied.

Rev. Proc. 97-22, 1997-1 C.B. 652 provides guidance to taxpayers that maintain books and records by using an electronic storage system that either images their hardcopy (paper) books and records, or transfers their computerized books and records, to an electronic storage media. Such a system may also include reasonable data compression or formatting technologies so long as the requirements of the revenue procedure are satisfied. The general requirements for an electronic storage system of taxpayer records are provided in section 4.01 of Rev. Proc. 97-22. A summary of these requirements is as follows:

1. The system must ensure an accurate and complete transfer of the hardcopy books and records to the electronic storage system and contain a retrieval system that indexes, stores, preserves, retrieves, and reproduces all transferred information.

2. The system must include reasonable controls and quality assurance programs that (a) ensure the integrity, accuracy, and reliability of the system; (b) prevent and detect the unauthorized creation of, addition to, alteration of, deletion of, or deterioration of electronically stored books and records; (c) institute regular inspections and evaluations; and (d) reproduce hardcopies of electronically stored books and records that exhibit a high degree of legibility and readability.

3. The information maintained in the system must be cross-referenced with the taxpayer's books and records in a manner that provides an audit trail to the source document(s).

4. The taxpayer must maintain, and provide to the Service upon request, a complete description of the electronic storage system including all procedures relating to its use and the indexing system.

5. During an examination, the taxpayer must retrieve and reproduce hardcopies of all electronically stored books and records requested by the Service and provide the Service with the resources necessary to locate, retrieve, read and reproduce any electronically stored books and records.

6. The system must not be subject, in whole or in part, to any agreement that would limit the Service's access to and use of the system.

7. The taxpayer must retain electronically stored books and records so long as their contents may become material in the administration of federal tax law.

How long should records be kept?

Section 1.6001-1(e) of the Regulations provides that records should be retained for so long as the contents thereof are material in the administration of any internal revenue law. With respect to a tax-exempt bond transaction, the information contained in certain records support the exclusion from gross income taken at the bondholder level for both past and future tax years. Therefore, as long as the bondholders are excluding from gross income the interest received on account of their ownership of the tax-exempt bonds, certain bond records will be material. Similarly, in a conduit financing, the information contained in the bond records is necessary to support the interest deduction taken by the conduit borrower for both past and future tax years for its payment of interest on the bonds.

To support these tax positions, material records should generally be kept for as long as the bonds are outstanding, plus 3 years after the final redemption date of the bonds. This rule is consistent with the specific record retention requirements under section 1.148-5(d)(6)(iii)(E) of the arbitrage regulations.

Certain federal, state, or local record retention requirements may also apply.

How does this general rule apply to refundings?

For certain federal tax purposes, a refunding bond issue is treated as replacing the original new money issue. To this end, the tax-exempt status of a refunding issue is dependent upon the tax-exempt status of the refunded bonds. Thus, certain material records relating to the original new money issue and all material records relating to the refunding issue should be maintained until 3 years after the final redemption of both bond issues.

What happens if records aren't maintained?

During the course of an examination, TEB agents will request material records and information in order to determine whether a tax-exempt bond transaction meets the requirements of the Code and regulations. If these records have not been maintained, then the issuer, conduit borrower or other party may have difficulty demonstrating compliance with all federal tax law requirements applicable to that transaction. A determination of noncompliance by the IRS with respect to a bond issue can have various outcomes, including a determination that the interest paid on the bonds should be treated as taxable, that additional arbitrage rebate may be owed, or that the conduit borrower is not entitled to certain deductions.

Additionally, a conduit borrower who fails to keep adequate records may also be subject to an accuracy-related penalty under section 6662 of the Code on the underpayment of tax attributable to any denied deductions. Section 6662 of the Code imposes a penalty on any portion of an underpayment of tax required to be shown on a return that is attributable to one of several factors, including negligence or disregard of rules or regulations. Section 1.6662-3(b)(1) of the Regulations provides that negligence includes any failure by the taxpayer to keep adequate books and records or to substantiate items properly. Under section 6662(a) of the Code, the penalty is equal to 20 percent of the portion of the underpayment of tax attributable to the negligence. Section 6664(c)(1) provides an exception to the imposition of accuracy-related penalties if the taxpayer shows that there was reasonable cause for the underpayment and that the taxpayer acted in good faith.

Can a failure to properly maintain records be corrected?

Yes, a failure to properly maintain records can be corrected through the Tax Exempt Bonds Voluntary Closing Agreement Program (TEB VCAP). This program provides an opportunity for state and local government issuers, conduit borrowers, and other parties to a tax-exempt bond transaction to voluntarily come forward to resolve specific matters through closing agreements with the IRS. For example, the TEB Office of Outreach, Planning & Review has resolved arbitrage rebate concerns in cases where issuers have approached the IRS and reported a failure to retain sufficient records to determine, precisely, the correct amount of arbitrage rebate due on a bond issue. Notice 2001-60, 2001-40 I.R.B. 304 provides more information about this program including the procedures for submitting a VCAP request.

Are there exceptions to the general rule regarding record retention for certain types of records?

No, but TEB encourages members of the municipal finance industry to submit comments and suggestions for developing record retention limitation programs for specific types of bond

records, for specific classes of tax-exempt bond issues, or for specific segments of the bond industry. Comments can be submitted in writing to TEB and sent to the following address:

Internal Revenue Service (TE/GE)
Attention: Clifford J. Gannett, Director, TEB
T:GE:TEB, Rm. 583
1111 Constitution Ave., NW
Washington, DC 20224

You may also contact TEB by calling 202-283-2999 (not a toll-free call).

TAB V

ARBITRAGE LETTER OF INSTRUCTIONS

Re: MASSACHUSETTS WATER RESOURCES AUTHORITY

1. Definitions.

Capitalized terms not otherwise defined herein will have meanings given to them in sections 103, 141, 148, 149 and 150 of the Code and the Treasury Regulations promulgated thereunder.

"Authority" means the Massachusetts Water Resources Authority.

"Available Construction Proceeds" means, in general, an amount equal to the sum of (a) the issue price (within the meaning of sections 1273 and 1274 of the Code but without regard to accrued interest) of the Construction Issue, (b) investment earnings on a Reasonably Required Reserve or Replacement Fund allocable to the Construction Issue prior to the earlier of 2 years after the date of issue of the Obligations and the date that construction is substantially completed, and (c) the investment earnings on amounts described in (a) and (b), reduced by (i) the amount of the issue price deposited in a Reasonably Required Reserve or Replacement Fund and (ii) the amount of the issue price used to pay issuance costs. Available Construction Proceeds does not include (a) Sale Proceeds or Investment Proceeds derived from Payments under any Purpose Investment of the Construction Issue, (b) repayments of any Grants financed by the issue, (c) investment earnings on accrued interest, (d) amounts that are not Gross Proceeds as a result of the application of the Universal Cap under Treasury Regulations §1.148-6(b)(2) and (e), if the Authority has elected in its Tax Certificate, earnings with respect to any portion of a Reasonably Required Reserve or Replacement Fund allocable to the Construction Issue. For purposes of determining compliance with the spending requirements as of the end of each of the first three spending periods, Available Construction Proceeds includes the amount of future earnings that the Authority reasonably expected as of the date of issue of the Obligations.

"Bid Records" means: (i) a copy of the Guaranteed Investment Contract actually acquired or, in the case of Yield Restricted Defeasance Escrow Investments, a copy of the purchase agreement or confirmations for the investments; (ii) the receipt or other record of the amount actually paid by the Authority for the investments, including a record of any administrative costs paid by the Authority, and the certification of the provider as to administrative costs; (iii) either a written copy of each bid received or a written certification from the party receiving the bids which lists for each bid that is submitted, the name of the person and entity submitting the bid, the time and date of the bid, and the bid results; (iv) the bid solicitation form and, if the terms of the Guaranteed Investment Contract or purchase agreement deviated from the bid solicitation form or a submitted bid is modified, a brief statement explaining the deviation and stating the purpose for the deviation; and (v) in the case of Yield Restricted Defeasance Escrow Investments, a schedule showing the cost of the most efficient portfolio of SLGS, determined at the time the bids were required to be submitted pursuant to the terms of the bid specifications.

"Bona Fide Debt Service Fund" means a bona fide debt service fund as defined in Treasury Regulations §1.148-1, *i.e.*, one or more funds (including portions of funds, to the extent that amounts deposited therein are reasonably expected to be used to pay debt service on an issue of bonds) that are used primarily to achieve a proper matching of revenues and debt service within each Bond Year and that is depleted at least once a year except for a reasonable carryover amount (not to exceed the greater of (i) the earnings on the fund for the immediately preceding Bond Year or (ii) one-twelfth the principal and interest payments on the issue for the immediately preceding Bond Year).

"Bona Fide Solicitation" means a solicitation that meets all of the following requirements: (i) the bid specifications are in writing and are timely forwarded to potential providers; (ii) the bid specifications include all material terms of the bid, *i.e.*, all terms that may directly or indirectly affect the yield of the investment; (iii) the bid specifications include a statement notifying potential providers that submission of a bid is a representation that the potential provider did not consult with any other potential provider about its bid, that the bid was determined without regard to any other formal or informal agreement that the potential provider has with the Authority or any other person (whether or not in connection with the Bond issue), and that the bid is not being submitted solely as a courtesy to the Authority or any other person for purposes of satisfying the requirements that there be at least three bids from persons with no Material Financial Interest, at least one of whom is a reasonably competitive provider; (iv) all the terms of the bid specifications are commercially reasonable in that there is a legitimate business purpose for the term other than to increase the purchase price or reduce the yield of the investment; (v) in the case of a Guaranteed Investment Contract, the terms of the solicitation take into account the Authority's reasonably expected deposit and drawdown schedule for the amounts to be invested; (vi) all potential providers have an equal opportunity to bid and no potential provider is given the opportunity to review other bids before providing a bid; and (vii) at least three reasonably competitive providers are solicited for bids.

"Bond Year" means, in connection with the calculation of the Rebate Amount, each 1-year period (or shorter period from the date of issue) that ends at the close of business on the day in the calendar year that is selected by the Authority. If no day is selected by the Authority before the earlier of the final maturity date of the Obligations or the date that is 5 years after the issue date of the Obligations, each Bond Year ends at the close of business on the day preceding the anniversary of the date of issuance of the Obligations.

"Capital Expenditure" means any cost of a type that is properly chargeable to a capital account (or would be so chargeable with a proper election or with the application of the definition of Placed in Service under Treasury Regulations §1.150-2(c)) under general federal income tax principles.

"Code" means the Internal Revenue Code of 1986, as amended.

"Commingled Fund" means any fund or account containing both Gross Proceeds of an issue and amounts in excess of $25,000 that are not Gross Proceeds of that issue if the amounts in the fund or account are invested and accounted for collectively, without regard to the source of funds deposited in the fund or account. An open-end regulated investment company under section 851 of the Code, however, is not a Commingled Fund.

"Computational Base" means (i) for a Guaranteed Investment Contract, the amount of Gross Proceeds the Authority reasonably expects, as of the date the Guaranteed Investment Contract is acquired, to be deposited in the Guaranteed Investment Contract over the term of the Guaranteed Investment Contract; and (ii) for investments (other than Guaranteed Investment Contracts) to be deposited in a Yield Restricted Defeasance Escrow, the amount of Gross Proceeds initially invested in those investments.

"Computation Period" means the period between the computation dates described in Section 4(b) hereof. The first begins on the Issue Date of the Obligations and ends on the initial rebate Computation Date. Each succeeding Computation Period begins on the date immediately following the preceding rebate Computation Date and ends on the next rebate Computation Date.

"Construction Expenditures" mean construction expenditures as defined in Treasury Regulations §1.148-7(g), i.e., Capital Expenditures that are allocable to the cost of real property or "constructed personal property." In general, Construction Expenditures do not include expenditures for acquisitions of interests in land or other existing real property. Expenditures are not considered to be for the acquisition of an interest in existing real property, other than land, if the contract between the seller and the Authority requires the seller to build or install the property, but only to the extent that the property has not been built or installed at the time the parties enter into the contract. Constructed personal property means tangible personal property (or, if acquired pursuant to a single acquisition contract, properties) or "specially developed computer software" if: (a) a substantial portion of the property or properties is completed more than 6 months after the earlier of the date construction or rehabilitation commenced and the date the Authority entered into an acquisition contract; (b) based on the reasonable expectations of the Authority, if any, or representations of the person constructing the property, with the exercise of due diligence, completion of construction or rehabilitation (and delivery to the Authority) could not have occurred within that 6-month period; and (c) if the Authority itself builds or rehabilitates the property, not more than 75 percent of the capitalizable cost is attributable to property acquired by the Authority. Specially developed computer software means any programs or routines used to cause a computer to perform a desired task or set of tasks, and the documentation required to describe and maintain those programs, provided that the software is specially developed and is functionally related and subordinate to real property or other constructed personal property.

"Construction Issue" means, the portion (if any) of the Obligations determined to be a Construction Issue for purposes of the section 148(f)(4)(C) of the Code, Treasury Regulations §1.148-7(e) and Section 4 hereof. With respect to any issue refunded by the Obligations, or which is a part of a series of issues refunded by the Obligations, "Construction Issue" means the portion (if any) of the original obligations issued to finance an expenditure (the "original obligations") determined in the Tax Certificate with respect to original obligations to be a "Construction Issue" for purposes of the section 148(f)(4)(C) of the Code and Treasury Regulations §1.148-7(e).

"Controlled Group" means a group of entities controlled directly or indirectly by the same entity or group of entities. The determination of direct control is made on the basis of all the relevant facts and circumstances. One entity or group of entities generally controls another entity or group of entities if (i) the controlling entity possesses either (A) the right or power both

to approve and to remove without cause a controlling portion of the governing body of the controlled entity, or (B) the right or power to require the use of funds or assets of the controlled entity for any purpose of the controlling entity; and (ii) the rights or powers are discretionary and non-ministerial. If a controlling entity controls another entity under this test the controlling entity also controls all entities controlled, directly or indirectly, by the controlled entity or entities. However, an entity is not controlled by another entity if the putative controlled entity possesses substantial taxing, eminent domain, and police powers.

"De Minimis Amount" means: (i) in reference to original issue discount (as defined in section 1273(a)(1) of the Code) or premium on an obligation, an amount that does not exceed 2 percent multiplied by the stated redemption price at maturity; plus any original issue premium that is attributable exclusively to reasonable underwriter's compensation; and (ii) in reference to market discount (as defined in section 1278(a)(2)(A) of the Code) or premium on an obligation, an amount that does not exceed 2 percent multiplied by the stated redemption price at maturity.

"Fair Market Value" shall have the meaning set forth in Section 3(d) hereof.

"501(c)(3) Organization" means an organization that is described in section 501(c)(3) of the Code and is exempt from tax under section 501(a) of the Code.

"Fixed Rate Investment" means any investment whose yield is fixed and determinable on the issue date of the investment.

"Future Value" means such term as defined in Treasury Regulations section 1.148-3(c) or successor regulations applicable to the Obligations calculated based on the yield of the Obligations.

"Guaranteed Investment Contract" means, in general, any Nonpurpose Investment that has specifically negotiated withdrawal or reinvestment provisions and a specifically negotiated interest rate and includes any agreement to supply investments on two or more future dates (*e.g.*, a forward supply contract), debt service fund forward agreements and debt service reserve fund agreements (*e.g.*, agreements to deliver United States Treasury Obligations). The term "Guaranteed Investment Contract" does not include investments purchased for a yield restricted defeasance escrow, other than escrow float contracts and similar agreements which provide securities for the period of 90 days or less following the maturity of defeasance escrow securities.

"Governmental Unit" means a governmental unit within the meaning of section 150(a)(2) of the Code (*i.e.*, any state or division of a state with a substantial amount of sovereign powers) or instrumentality of a state or political subdivision thereof. The term Governmental Unit does not include the United States or any agency or instrumentality of the United States.

"Grant" means a grant as defined in Treasury Regulations §1.148-6(d)(4)(iii), *i.e.*, a transfer for a governmental purpose of money or property to a transferee that is not a Related Party to, or an agent of, the transferor. The transfer must not impose any obligation or condition (directly or indirectly) to repay any amount to the transferor. Obligations or conditions intended solely to assure expenditure of the transferred moneys in accordance with the governmental purpose of the transfer do not prevent a transfer from being a Grant.

"Gross Proceeds" means, except as otherwise indicated, gross proceeds as defined in Treasury Regulations §1.148-1, *i.e.*, any Proceeds and Replacement Proceeds of an issue.

"Investment Proceeds" means investment proceeds as defined in Treasury Regulations §1.148-1, *i.e.*, any amounts actually or constructively received from investing Proceeds of the Obligations.

"Investment Property" means any investment which is: (i) a "security" (as defined in section 165(g)(2)(A) or (B) of the Code), *i.e.*, a share of stock in a corporation or a right to subscribe for or to receive a share of stock in a corporation; (ii) an obligation other than a Tax-exempt Bond, unless such obligation is a "specified private activity bond" within the meaning of section 57(a)(5)(C) of the Code (*i.e.*, a Tax-exempt Bond other than an obligation the interest on which is subject to the alternative minimum tax imposed on individuals and corporations); (iii) any "annuity contract" (as defined in section 72 of the Code); (iv) any "investment-type property" (within the meaning of Treasury Regulations §1.148-1(b)), *i.e.*, any property (other than property described in (i), (ii), (iii) or (v)) that is held principally as a passive vehicle for the production of income, including for this purpose, production of income includes any benefit based on the time value of money; or (v) any residential rental property for family units not located within the jurisdiction of the Authority unless such property is acquired to implement a court ordered or approved housing desegregation plan. A prepayment for property or services is "investment-type property" if a principal purpose for prepaying is to receive an investment return from the time the prepayment is made until the time payment otherwise would be made. However, a prepayment will not be treated as "investment-type property" if it is made for a substantial business purpose other than investment return and (i) the prepayment is on substantially the same terms as are made by a substantial percentage of persons who are similarly situated but who are not beneficiaries of tax exempt financing, (ii) the prepayment is made within 90 days of the reasonably expected date of delivery to the Authority of all of the property or services for which the prepayment is made, (iii) the prepayment is made for maintenance, repair, or an extended warranty with respect to personal property (for example, automobiles or electronic equipment); or updates or maintenance or support services with respect to computer software; and the same maintenance, repair, extended warranty, updates or maintenance or support services, as applicable, are regularly provided to nongovernmental persons on the same terms or (iv) the prepayment is made to acquire a supply of natural gas or electricity within the meaning of Treasury Regulation §1.148-1(e)(2)(iii).

"Lowest Cost Bona Fide Bid" means, in the case of Yield Restricted Defeasance Escrow Investments, either the lowest cost bid for the portfolio or, if the Authority compares bids on an investment by investment basis, the aggregate cost of a portfolio comprised of the lowest cost bid for each investment. Any payment received by the Authority from a provider at the time a Guaranteed Investment Contract (*e.g.*, an escrow float contract) is purchased for a Yield Restricted Defeasance Escrow under a bidding procedure that meets the requirements of clause (iv) of the definition of Bona Fide Solicitation is taken into account in determining the lowest cost bid. The Lowest Cost Bona Fide Bid must not be greater than the cost of the most efficient portfolio comprised exclusively of SLGS determined at the time that bids are required to be submitted pursuant to the terms of the bid specifications. This cost comparison is not required to be made if SLGS are not available for purchase on the day the bids are required to be submitted because sales of those securities have been suspended.

"Material Financial Interest" shall have the meaning set forth in Section 3(d)(vi) hereof.

"Minor Portion" means, in general, a minor portion as defined in section 148(e) of the Code and Treasury Regulation §1.148-2(g), *i.e.*, the lesser of 5 percent of the Sale Proceeds of the Obligations or $100,000.

"Net Sale Proceeds" means Sale Proceeds, less the portion of the Sale Proceeds invested in a Reasonably Required Reserve or Replacement Fund under section 148(d) of the Code and as part of the Minor Portion.

"Nonconstruction Issue" means the Gross Proceeds of the Obligations other than the portion of Gross Proceeds of the Bonds meeting the requirements of section 148(f)(4)(C) of the Code, Treasury Regulations §1.148-7(e) and Section 4 hereof as a Construction Issue.

"Nonpurpose Investment" means an investment allocated to Gross Proceeds of the Obligations that is not acquired to carry out the governmental purpose of an issue, *i.e.*, all Investment Property acquired or otherwise allocated to Gross Proceeds of the Obligations, other than any purpose investment.

"Obligations" means any tax-exempt bonds or notes of the Authority

"Opinion of Counsel" means, an opinion of McCarter & English, LLP or other nationally recognized bond counsel experienced in matters relating to the exclusion of interest on state and local governmental Obligations from gross income for purposes of federal income taxation.

"Payment" means, in general, a payment as defined in Treasury Regulations §1.148-5(b), *i.e.*, amounts to be actually or constructively paid to acquire the investment. For purposes of calculating the Rebate Amount under Section 4 hereof "payment" means a payment as defined in Treasury Regulations §1.148-3(d), *i.e.*, (i) amounts actually or constructively paid to acquire a Nonpurpose Investment (or treated as paid to a Commingled Fund); (ii) for a Nonpurpose Investment that is first allocated to an issue on a date after it is actually acquired (*e.g.*, an investment that becomes allocable to Transferred Proceeds or to Replacement Proceeds) or that becomes subject to the rebate requirement on a date after it is actually acquired (*e.g.*, an investment allocated to a Reasonably Required Reserve or Replacement Fund for a construction issue at the end of the 2-year spending period), the value of that investment on that date; (iii) for a Nonpurpose Investment that was allocated to an issue at the end of the preceding computation period, the value of that investment at the beginning of the computation period; (iv) on the last day of each Bond Year during which there are amounts allocated to Gross Proceeds of the Obligations that are subject to the rebate requirement, and on the final maturity date of the Obligations, a computation credit in the amount provided under Treasury Regulation §1.148-3(d)(1)(iv); and (v) Yield Reduction Payments on Nonpurpose Investments made pursuant to Treasury Regulations §1.148-5(c).

"Placed in Service" means placed in service as defined in Treasury Regulations §1.150-2(c), *i.e.*, with respect to a facility, the date on which, based on all the facts and circumstances the facility has reached a degree of completion that would permit its operation at substantially its design level, and the facility is, in fact, in operation at such level.

"Plain Par Bond" means a qualified tender obligation or an obligation (i) that is issued with not more than a De Minimis Amount of original issue discount or premium; (ii) that is issued for a price that does not include accrued interest other than pre-issuance accrued interest; (iii) that bears interest from the issue date at a single, stated, fixed rate or that is a variable rate debt instrument under section 1275 of the Code, in each case with interest unconditionally payable at least annually; and (iv) that has a lowest stated redemption price that is not less than its outstanding stated principal amount.

"Plain Par Investment" means an investment that is an obligation (i) issued with not more than a De Minimis Amount of original issue discount or premium, or, if acquired on a date other than the issue date, acquired with not more than a De Minimis Amount of market discount or premium; (ii) issued for a price that does not include accrued interest other than pre-issuance accrued interest; (iii) that bears interest from the issue date at a single, stated, fixed rate or that is a variable rate debt instrument under section 1275 of the Code, in each case with interest unconditionally payable at least annually; and (iv) that has a lowest stated redemption price that is not less than its outstanding stated principal amount.

"Preliminary Expenditures" mean preliminary expenditures as defined in Treasury Regulations §1.150-2(f)(2), *e.g.*, architectural, engineering, surveying, soil testing, costs of issuance and similar costs that were incurred prior to commencement of acquisition, construction or rehabilitation of a project, other than land acquisition, site preparation and similar costs incident to commencement of construction.

"Present Value" is computed under the economic accrual method. For purposes of computing the value of Obligations and yield on the Obligations, Present Value is computed taking into account all the unconditionally payable Payments of principal, interest, and fees for a Qualified Guarantee to be paid on or after that date and using the yield on that Obligation as the discount rate, except that for purposes of Treasury Regulations §1.148-(6)(b)(2) (relating to the Universal Cap) these values may be determined by consistently using the yield on the entire issue of which such Obligations are a part. The Present Value of an investment on a date is equal to the Present Value of all unconditionally payable Receipts to be received from and Payments to be paid for the investment after that date, using the yield on the investment as the discount rate.

"Prior Issue" means an issue of Obligations all or a portion of the principal, interest, or call premium on which is paid or provided for with proceeds of a Refunding Issue.

"Proceeds" means, in general, any Sale Proceeds, Investment Proceeds, and Transferred Proceeds of an issue. However, Proceeds do not include (i) amounts actually or constructively received with respect to a Purpose Investment that are properly allocable to the yield on a Purpose Investment which is less than materially higher yield under Treasury Regulation §1.148-2(d) or (ii) Qualified Administrative Costs that may be recovered under Treasury Regulation §1.148-5(e).

"Purpose Investment" means an investment that is acquired to carry out the governmental purpose of an issue.

"Qualified Administrative Costs" mean, with respect to Nonpurpose Investments reasonable, direct administrative costs, other than carrying costs, such as separately stated brokerage or selling commissions, but not legal and accounting fees, recordkeeping, custody, and similar costs. General overhead costs and similar indirect costs of the Authority such as employee salaries and office expenses and costs associated with computing the Rebate Amount are not qualified administrative costs. In general, administrative costs with respect to Nonpurpose Investments are not reasonable unless they are comparable to administrative costs that would be charged for the same investment or a reasonably comparable investment if acquired with a source of funds other than Gross Proceeds of Tax-exempt Bonds. Qualified Administrative Costs of Nonpurpose Investments include all reasonable administrative costs, without limitation on indirect costs, incurred by a publicly offered regulated investment company (as defined in section 67(c)(2)(B) of the Code) or by a Commingled Fund in which the Authority and any Related Parties do not own more than 10 percent of the beneficial interest in the fund. A broker's commission or similar fee for a Guaranteed Investment Contract or a Yield Restricted Defeasance Escrow Investment which is paid on behalf of either the Authority or the provider is a Qualified Administrative Cost to the extent that (a) the amount of the fee that the Authority treats as a Qualified Administrative Cost does not exceed the lesser of (i) $36,000 or (ii) 0.2% of the Computational Base or, if more, $4,000, and (b) for any issue, the Authority does not treat as Qualified Administrative Costs more than $101,000 in broker's commissions or similar fees with respect to all Guaranteed Investment Contracts or Yield Restricted Defeasance Escrow Investments purchased with Gross Proceeds of the issue. All amounts referenced in the preceding sentence reflect adjustments as of 2011, and all amounts for future calendar years shall be increased by a cost of living adjustment as provided in Treasury Regulation §1.148-5(e)(3)(B)(3). Qualified Administrative Costs of a Purpose Investment means costs or expenses paid, directly or indirectly, to purchase, carry, sell, or retire the Purpose Investment, and except with respect to a Program Investment, costs of issuing, carrying, or repaying the issue, and any underwriters' discount.

"Qualified Guarantee" means a qualified guarantee as defined in Treasury Regulations §1.148-4(f).

"Qualified Hedge" means a qualified hedge as defined in Treasury Regulations §1.148-4(h)(2), *i.e.*, (i) a contract entered into primarily to reduce the Authority's risk of interest rate changes with respect to a borrowing; (ii) the contract contains no significant investment element; (iii) the contract is entered into between the Authority and a provider that is not a Related Party; (iv) the hedge covers all of one or more groups of substantially identical Obligations; (v) changes in the value of the contract are based primarily on interest rate changes; (vi) the contract does not hedge an amount larger than the Authority's risk with respect to interest rate changes on the hedged Obligations; (vii) the payments to the Authority under the contract correspond closely, in both time and amount, to the specific interest payments being hedged; (viii) payments under the contract do not begin to accrue under the contract on a date earlier than the issue date of the hedged Obligations and do not accrue longer than the hedged interest payments on the hedged Obligations; (ix) payments to the hedge provider are reasonably expected to be made from the same source of funds that, absent the hedge, would be reasonably expected to be used to pay principal and interest on the hedged Obligations; and (x) the contract is identified by the Authority on its books and records maintained for the hedged Obligations not later than three

days after the date on which the parties enter into the contract or the issue date of the hedged Obligations.

"Reasonable Retainage" means an amount not in excess of 5 percent of Available Construction Proceeds as of the end of the fourth spending period (or in the case of the *18-month Exception* set forth Treasury Regulations §1.148-7(d) and Section hereof, 5 percent of the Net Sale Proceeds on the date 18 months after the issue date) that is retained for reasonable business purposes relating to the property financed with the proceeds of the issue.

"Reasonably Required Reserve or Replacement Fund" means, in general, a reasonably required reserve or replacement fund as described in Treasury Regulations §1.148-2(f)(2).

"Receipt" means, except as otherwise provided with respect to the rebate requirement, a receipt as defined in Treasury Regulations §1.148-3(d), *i.e.*, amounts to be actually or constructively received from the investment, such as earnings and return of principal.

"Refunding Escrow" means one or more funds established as part of a single transaction or a series of related transactions, containing proceeds of a Refunding Issue and any other amounts to provide for payment of principal or interest on one or more Prior Issues. For this purpose, funds are generally not so established solely because of (i) the deposit of Proceeds of an issue and Replacement Proceeds of the Prior Issue in an escrow more than 6 months apart, or (ii) the deposit of Proceeds of completely separate issues in an escrow.

"Refunding Issue" means, a refunding issue as defined in Treasury Regulations §1.150-1(d). In general, a Refunding Issue means an issue (or the portion of an issue treated as a separate Refunding Issue under Treasury Regulations §1.148-9(h)), the proceeds of which are used to pay principal, interest, or redemption price on another issue.

"Related Party" means, in reference to a Governmental Unit or a 501(c)(3) Organization, any member of the same Controlled Group, and, in reference to any person that is not a Governmental Unit or 501(c)(3) Organization, a related person (as defined in section 144(a)(3) of the Code).

"Replacement Proceeds" means replacement proceeds as defined in Treasury Regulation §1.148-1(c).

"Sale Proceeds" means any amounts actually or constructively received from the sale of an issue, including amounts used to pay underwriter's discount or compensation and accrued interest other than pre-issuance accrued interest.

"SLGS" means State and Local Government Series Securities purchased from the United States Department of Treasury, Bureau of Public Debt.

"Substantial Beneficiary" of the obligations means the Authority, any related party to the Authority and the State in which the Authority is located.

"Tax-exempt Bond" means any obligation of a State or political subdivision thereof under section 103(c)(1) of the Code (including financing leases and any other arrangements,

however labeled) the interest on which is excludable from gross income under section 103(a) of the Code. Tax-exempt Bond includes an interest in a regulated investment company to the extent that at least 95 percent of the income to the holder of the interest is interest that is excludable from gross income under section 103(a) of the Code.

"Tax Certificate" means, with respect to each issue of Obligations, the Authority's Tax Certificate delivered as part of the record of proceedings with respect to the issuance of the Obligations for the purpose of complying with Treasury Regulation §1.148(2)(b).

"Transferred Proceeds" means transferred proceeds as defined in Treasury Regulation §1.148-9.

"Universal Cap" means, on any date, either (i) the present value of the Obligations determined by taking into account all unconditionally payable payments of principal, interest and fees for a Qualified Guarantee to be paid on or after that date, using the yield on the Obligations as the discount rate, or (ii) in the case of any Obligations which are Plain Par Bonds, the outstanding stated principal amount of such Obligations, plus accrued unpaid interest.

2. Allocation and Accounting.

(a) *In General.* Except as otherwise provided in this Section 2, the Authority may use any reasonable accounting method for purposes of accounting for Gross Proceeds, investments, and expenditures, provided the accounting method is consistently applied. An accounting method means both the overall method used to account for Gross Proceeds of an issue (*e.g.*, the cash method or a modified accrual method) and the method used to account for or allocate any particular item within that overall accounting method (*e.g.*, accounting for investments, expenditures, allocations to and from different sources, and particular items of the foregoing). Consistently applied means applied uniformly within a fiscal period and between fiscal periods to account for Gross Proceeds of an issue and any amounts that are in a Commingled Fund. An accounting method will not fail to be reasonable and consistently applied solely because a different accounting method is used for a bona fide governmental purpose to consistently account for a particular item.

(b) *Allocation of Gross Proceeds to the Obligations.* (i) In General. Gross Proceeds will be allocated to the Obligations as Proceeds until those amounts are properly allocated to an expenditure for a governmental purpose or are allocated to Transferred Proceeds of another issue, or cease to be allocated to the Obligations under the Universal Cap.

(i) *Universal Cap.* The Universal Cap provides an overall limitation on the amount of Gross Proceeds allocable to an issue. Except as provided in Section 2(b)(iii), unless the application of the Universal Cap would not result in a reduction or reallocation of Gross Proceeds of the Obligations on a date the Authority will determine or cause to be determined the Universal Cap with respect to the Obligations (A) as of the first day of each Bond Year, beginning with the first Bond Year that commences after the second anniversary of the date hereof, and (B) as of each date that, but for application of

the Universal Cap, Proceeds of a refunded issue would become Transferred Proceeds of the Obligations but need not determine the Universal Cap in the Bond Year in which that date occurs.

(ii) If the Authority reasonably expects, as of the issue date of the Obligations that the Universal Cap will not reduce the amount of Gross Proceeds allocable to the Obligations during the term of the Obligations, the Universal Cap need not be calculated on any date on which: (A) no Replacement Proceeds are allocable to the Obligations, other than Replacement Proceeds in a Bona Fide Debt Service Fund or a Reasonably Required Reserve or Replacement Fund; (B) the Net Sale Proceeds of the Obligations qualified for one of the temporary periods provided in Treasury Regulations §1.148-2(e)(2), (e)(3), or (e)(4), and those Net Sales Proceeds are in fact allocated to expenditures prior to the expiration of the longest applicable temporary period; or the Net Sale Proceeds of the Obligations were deposited in a Refunding Escrow and expended as originally expected; (C) the Obligations do not refund an issue that, on any transfer date, has unspent proceeds allocable to it; (D) none of the Obligations are retired prior to the date on which those Obligations are treated as retired in computing the yield on the Obligations; and (E) no Proceeds of the Obligations are invested in "qualified student loans" or "qualified mortgage loans" (as defined in Treasury Regulations §1.150-1).

(iii) If the value of all Nonpurpose Investments allocated to the Gross Proceeds of the Obligations exceeds the Universal Cap on a date as of which the Universal Cap is determined such Nonpurpose Investments allocable to Gross Proceeds of the Obligations necessary to eliminate that excess will cease to be allocated to the Obligations, in the following order of priority: (A) Nonpurpose Investments allocable to Replacement Proceeds; (B) Nonpurpose Investments allocable to Transferred Proceeds; and (C) Nonpurpose Investments allocable to Sale Proceeds and Investment Proceeds.

For this purpose Nonpurpose Investments may be valued (i) in the case of a Plain Par Investment at its principal amount plus any accrued unpaid interest on that date; (ii) in the case of fixed rate investments, at its Present Value on that date; or (iii) in the case of any other investment, at its Fair Market Value.

(c) *Allocations to Expenditures.* (i) *In General.* Reasonable accounting methods for allocating funds from different sources to expenditures for the same governmental purpose include any of the following methods if consistently applied: a specific tracing method; a Gross Proceeds spent first method; a first-in, first-out method; or a ratable allocation. An allocation of Gross Proceeds of an issue to an expenditure must involve a current outlay of cash for a governmental purpose of the issue. A current outlay of cash means an outlay reasonably expected to occur not later than 5 banking days after the date as of which the allocation of Gross Proceeds to the expenditure is made. A payment of Gross Proceeds to a Related Party of the Authority is not an expenditure of those Gross Proceeds. Gross Proceeds paid to the Related Party are expended only when the Gross Proceeds are properly allocable to an expenditure by the Related Party.

(ii) *Expenditures for Working Capital Purposes.* Except as otherwise provided in Section 2(c)(iii), Proceeds of the Obligations and Replacement Proceeds of the Obligations that are allocated to the payment of expenditures or to the reimbursement of expenditures other than expenditures that are (A) Capital Expenditures; (B) Qualified Administrative Costs; (C) fees for Qualified Guarantees of the issue or payments for a Qualified Hedge; (D) interest on the Obligations for a period commencing on the issue date and ending on the date that is the later of three years from the issue date or one year after the date on which the Projects are Placed in Service; (E) a Rebate Amount or Yield Reduction Payment paid to the United States; (F) costs that are directly related to Capital Expenditures financed by the issue that, in total, do not exceed 5 percent of the Sale Proceeds of the Obligations; (G) principal or interest on the Obligations paid from unexpected excess Sale Proceeds or Investment Proceeds; (H) principal or interest on the Obligations paid from investment earnings on a reserve or replacement fund that are deposited in a Bona Fide Debt Service Fund; (I) to pay for extraordinary, nonrecurring items that are not customarily payable from current revenues, such as casualty losses or extraordinary legal judgments in amounts in excess of reasonable insurance coverage; (J) for payment of principal, interest, or redemption prices on a Prior Issue; and (K) for a crossover Refunding Issue, interest on that issue will be treated as spent to the extent that those working capital expenditures exceed available amounts (as defined in Treasury Regulations §1.148-6(d)(3)(iii)) as of that date.

(iii) *Commingled Investment Earnings.* Notwithstanding Subsection 2(c)(ii), investment earnings on Sale Proceeds of the Obligations (other than investment earnings held in a Refunding Escrow) may be allocated to expenditures other than expenditures described in Subsection 2(c)(ii), if the investment earnings are commingled for the purpose of accounting for expenditures with substantial tax or other substantial revenues from operations of the Authority and they are reasonably expected to be allocated (using any reasonable, consistently applied accounting method) to expenditures for governmental purposes of the Authority within a period not to exceed six months from the date of the commingling.

(d) *Allocations of Gross Proceeds to Investments.* Upon the purchase or sale of a Nonpurpose Investment, Gross Proceeds of an issue will not be allocated to a Payment for that Nonpurpose Investment in an amount greater than, or to a Receipt from that Nonpurpose Investment in an amount less than, the Fair Market Value of the Nonpurpose Investment (adjusted to take into account Qualified Administrative Costs allocable to the investment) as of the purchase or sale date.

(e) *Allocation of Investments Held by a Commingled Fund.* (i) *In General.* All Payments and Receipts (including deemed Payments and Receipts) on investments held by a Commingled Fund must be allocated among the different "investors" in the fund not less frequently than as of the close of each fiscal period. This allocation must be based on a consistently applied reasonable, ratable allocation method. Reasonable ratable allocation methods include, methods that allocate these items in proportion to either (A) the average daily balances of the amounts in the Commingled Fund from different "investors" during a fiscal period; or (B) the average of the beginning and ending balances of the amounts in the Commingled Fund from different investors for a fiscal

period that does not exceed one month. For purposes of this Subsection 2(e), the term "investor" means each different source of funds invested in a Commingled Fund. A Commingled Fund may use any consistent fiscal period that does not exceed three months.

(i) *Expenditures from a Commingled Fund.* If a ratable allocation method is used to allocate expenditures from the Commingled Fund, the same ratable allocation method must be used to allocate Payments and Receipts on investments in the Commingled Fund under this Subsection.

(ii) *Common Reserve Funds, Replacement Funds or Sinking Funds.* If a Commingled Fund serves as a common reserve fund, replacement fund, or sinking fund for two or more issues, investments held by that Commingled Fund must be allocated ratably (after any reallocations of Proceeds under Section 2(b)) among the issues served by the Commingled Fund according to (A) the relative values of the bonds of those issues (as determined under Treasury Regulations §1.148-4(e)); (B) the relative amounts of the remaining maximum annual debt service requirements on the outstanding principal amounts of those issues; or (C) the relative original stated principal amounts of the outstanding issues. Such allocations must be made at least every three years and as of each date that an issue first becomes secured by the Commingled Fund. If relative original principal amounts are used to allocate, allocations must also be made on the retirement of any issue secured by the Commingled Fund.

3. **Yield and Valuation of Investments.** (a) *Mark-to-Market Requirement.* If Gross Proceeds of the Obligations are invested in a Commingled Fund in which the Authority and any Related Party own more than 25 percent of the beneficial interests in the Commingled Fund, the Commingled Fund must treat all its investments as if sold at Fair Market Value either on the last day of the fiscal year or the last day of each fiscal period unless (i) the remaining weighted average maturity of all investments held by the Commingled Fund during the fiscal year does not exceed 18 months, and the investments held by the Commingled Fund during that fiscal year consist exclusively of Obligations, or (ii) the Commingled Fund operates exclusively as a reserve fund, sinking fund, or replacement fund for two or more issues of the same issuer. The net gains or losses from any such deemed sales of investments must be allocated to all investors of the Commingled Fund during the period since the last allocation. For purposes of this Subsection the "fiscal year" of a Commingled Fund is the calendar year unless the Commingled Fund adopts another "fiscal year".

(a) *In General.* Yield on an investment, the Present Value of an investment and the Fair Market Value of an investment allocated to the Obligations will be computed under the economic accrual method, using the same compounding interval and financial conventions used to compute the yield on the Obligations. Except as otherwise provided in this Section 3, the yield on an investment allocated to the Obligations is the discount rate that, when used in computing the Present Value as of the date the investment is first allocated to the issue of all unconditionally payable Receipts from the investment, produces an amount equal to the Present Value of all unconditionally payable Payments for the investment. The Present Value of an investment on a date is equal to the Present Value of all unconditionally payable Receipts to be received from and Payments to be

paid for the investment after that date, using the yield on the investment as the discount rate. The yield on a variable rate investment is determined in a manner comparable to the determination of the yield on a variable rate issue of Tax-exempt Bonds for purposes of section 148 of the Code. For purposes of the Investment Limitation under paragraph 15 of the Tax Certificate, the yield on investments made with Sale Proceeds of the Obligations or investment earnings thereon that are subject to yield restriction will be computed separately from the yield on investments not subject to yield restriction.

(b) *Yield Reduction Payments to the United States.* The yield on any investments allocable to Sale Proceeds of the Obligations or investment earnings thereon that qualified for one of the temporary periods described in the Tax Certificate, other than Replacement Proceeds, may be calculated by taking into account any amount paid to the United States in accordance with this Section 3(b), including any Rebate Amount, as a Payment for that investment that reduces the yield on that investment. The yield on any investments allocable to Sale Proceeds may be calculated by taking into account any "Yield Reduction Payments," as described in this Section 3(b) (including any Rebate Amount) as a Payment for that investment that reduces the yield on that investment. Yield Reduction Payments include payments paid to the United States at the same time and in the same manner as rebate amounts are required to be paid except:

(i) No Yield Reduction Payments are required to be paid until 60 days after the date on which the issue is no longer outstanding; and

(ii) For Yield Reduction Payments paid prior to the date on which the Obligations are retired, the Authority need not pay more than 75 percent of the amount otherwise required to be paid as of the date to which the payment relates.

(c) *Valuation of Investments.* The value of an investment (including a Payment or Receipt on the investment) on a date will be determined using one of the following valuation methods consistently for all purposes of section 148 of the Code to that investment on that date:

(i) A Plain Par Investment may be valued at its outstanding stated principal amount, plus any accrued unpaid interest on that date.

(ii) A Fixed Rate Investment may be valued at its Present Value on that date.

(iii) Any investment may be valued at its Fair Market Value on that date.

(d) *Fair Market Value.* (i) *In General.* The Fair Market Value of an investment is the price at which a willing buyer would purchase the investment from a willing seller in a bona fide, arm's-length transaction. Fair Market Value generally is determined on the date on which a contract to purchase or sell the Nonpurpose Investment becomes binding. Except as otherwise provided in this Section, an investment that is not of a type traded on an established securities market, within the

meaning of section 1273 of the Code, will not be considered acquired or disposed of for a price that is equal to its Fair Market Value.

(i) *Direct United States Treasury Obligations.* The Fair Market Value of a United States Treasury obligation that is purchased directly from the United States Treasury is its purchase price.

(ii) *Certificate of Deposit.* The purchase price of a certificate of deposit that has a fixed interest rate, a fixed payment schedule, and a substantial penalty for early withdrawal may be treated as its Fair Market Value on the purchase date if the yield on the certificate of deposit is not less than the yield on reasonably comparable direct Obligations of the United States and the highest yield that is published or posted by the provider to be currently available from the provider on reasonably comparable certificates of deposit offered to the public.

(iii) *Guaranteed Investment Contracts.* The purchase price of a Guaranteed Investment Contract is treated as its Fair Market Value on the purchase date if: (A) the Authority makes a Bona Fide Solicitation for a specified Guaranteed Investment Contract; (B) the Authority receives at least three bids from providers for the specified Guaranteed Investment Contract that the Authority solicited under a Bona Fide Solicitation that have no Material Financial Interest in the issue, at least one of whom is a reasonably competitive provider, *i.e.*, a provider that has an established industry reputation as a provider of Guaranteed Investment Contracts; (C) the Authority purchases the highest-yielding Guaranteed Investment Contract for which a qualifying bid is made (determined net of broker's fees); (D) the obligor on the Guaranteed Investment Contract provides a written certification specifying all amounts that it is paying (or expects to pay) to third parties in connection with supplying the Guaranteed Investment Contract; and (E) the Authority retains the Bid Records with the bond documents until three years after the last outstanding Obligation is redeemed.

(iv) *Yield Restricted Defeasance Escrow Investment.* The purchase price of a Yield Restricted Defeasance Escrow Investment is treated as its Fair Market Value on the purchase date if: (A) the Authority makes a Bona Fide Solicitation for the purchase of the investment; (B) the Authority receives at least three bids from providers that the Authority solicited under a Bona Fide Solicitation that have no Material Financial Interest in the issue, at least one of whom is a reasonably competitive provider, *i.e.*, a provider that has an established industry reputation as a provider of the type of investment being purchased; (C) the winning bid is the Lowest Cost Bona Fide Bid (including any broker's fees); (D) the provider of the investments certifies the administrative costs that it is paying (or expects to pay) to third parties in connection with supplying the investments; and (E) the Authority retains the Bid Records with the bond documents until three years after the last Obligation is redeemed.

(v) *Material Financial Interest.* For purposes of paragraphs (iv) and (v) the following persons or entities are deemed to have a Material Financial Interest in the issue: (A) the lead underwriter in a negotiated underwriting transaction until 15 days after the issue date; (B) any entity acting as a financial advisor with respect to the

purchase of the investment at the time the bid specifications are forwarded to potential providers; and (C) a Related Party to a provider that has a Material Financial Interest in the issue.

(vi) *Bidding.* If the Authority invests any Gross Proceeds of the Obligations in a Guaranteed Investment Contract or purchases with Gross Proceeds Yield Restricted Defeasance Escrow Investments, it will conduct, or will have conducted on its behalf, a Bona Fide Solicitation. The Authority will require the agent to certify as to the bidding process as set forth in the form of Certificate of Bidding Agent to be furnished by Bond Counsel, in the case of a Guaranteed Investment Contract or in the case of Yield Restricted Defeasance Escrow Investments. If the bidding process is not conducted through an agent, the Authority itself will provide a similar certificate. The Authority will file such certification together with the Bid Records, with the documents relating to the Obligations. If the Authority wishes to invest Gross Proceeds of the Obligations in Certificates of Deposit it will obtain from the provider a certification that the Certificate of Deposit has a fixed rate, a fixed payment schedule and a substantial penalty for early withdrawal, and the yield on the certificate of deposit is not less than (A) the yield on reasonably comparable direct Obligations of the United States and (B) the highest yield published by the provider and currently available from the provider on reasonably comparable certificates of deposit offered to the public.

(e) *Administrative Costs.* Except for Qualified Administrative Costs, costs or expenses paid, directly or indirectly, to purchase, carry, sell, or retire investments will not increase Payments made for investments and will not reduce Receipts from Investments. Qualified Administrative Costs will increase the Payments for, or decrease the Receipts from, investments.

(f) *Record Keeping.* The Authority will keep, or cause to be kept, accurate records of the status of compliance of the Obligations with respect to compliance with the expenditure requirements at the end of each 6-month period described in Section 4(a)(ii)(C) hereof. The Authority will keep, or cause to be kept, accurate records of each investment it makes in Investment Property acquired, directly or indirectly, with Gross Proceeds of the Obligations (other than revenues in a Bona Fide Debt Service Fund) and each expenditure it makes with Gross Proceeds of the Obligations. Such records will include all of the information necessary to compute the yield on each investment in Investment Property to the Authority, *e.g.*, purchase price, nominal interest rate, dated date, maturity date, type of property, frequency of periodic payments, period of compounding, yield to maturity, amount actually or constructively received on disposition, disposition date and evidence of the Fair Market Value of such property on the purchase date and disposition date (or deemed purchase or disposition date) for each item of such Investment Property.

4. Rebate Requirement.

(a) *Calculation of the Rebate Amount.* In general, the Rebate Amount, as of any date is the excess of the "future value", as of that date, of all Receipts on Nonpurpose Investments allocated to the Obligations over the "future value", as of that date, of all

Payments on Nonpurpose Investments allocated to the Obligations. The "future value" of a Payment or Receipt at the end of any period is determined using the economic accrual method and equals the value of that Payment or Receipt when it is paid or received (or treated as paid or received), plus interest assumed to be earned and compounded over the period at a rate equal to the yield on the Obligations, using the same compounding interval and financial conventions used to compute the yield on the Obligations. Amounts earned on certain Gross Proceeds of the Obligations either may not, or are not required to be, taken into account in determining the Rebate Amount. The earnings on Gross Proceeds excepted from the calculation of the Rebate Amount include the following:

(i) *Bona Fide Debt Service Fund.* Amounts earned on a Bona Fide Debt Service Fund for the Obligations and amounts earned on such amounts may not be taken into account if the gross earnings on the Bona Fide Debt Service Fund for the Bond Year is less than $100,000.

(ii) *Spending Exceptions.* Earnings with respect to certain Gross Proceeds described in 4(a)(ii) of this Section are not required to be taken into account in determining the Rebate Amount if requirements of 4(a)(ii)(B), 4(a)(ii)(C) or 4(a)(ii)(D) of this Section are met with respect to such Gross Proceeds.

(A) *Special Rules.* For purposes of 4(a)(ii) of this Section the following special rules will apply.

(I) If any portion of the Obligations is treated as a separate Refunding Issue under Treasury Regulations §1.148-9(h), that portion is treated as a separate issue.

(II) The only spending exception applicable to a Refunding Issue is the *6-month Exception.*

(III) Solely for purposes of determining whether or not the expenditure requirement has been met under the *6-month Exception* for a Refunding Issue, proceeds of the refunded issue that become Transferred Proceeds of the Refunding Issue are, in general, not treated as "gross proceeds" of the Refunding Issue and need not be spent for the Refunding Issue to satisfy that spending exception. However, Transferred Proceeds of the Refunding Issue that were from excluded "gross proceeds" of the refunded issue under the special definition of "gross proceeds" described in 4(a)(ii)(A)(IX) of this Section, and Transferred Proceeds from any prior taxable issue, are treated as "gross proceeds" of the Refunding Issue under the *6-month Exception* unless those Transferred Proceeds are used in a manner that causes those amounts to be excluded from gross proceeds under the special definition described in 4(a)(ii)(A)(IX) of this Section. Transferred Proceeds excluded from Gross Proceeds for purposes of

determining whether or not the expenditure requirement has been met are subject to rebate as proceeds of the Refunding Issue unless an exception to rebate applied to those proceeds as proceeds of the refunded issue.

(IV) Proceeds of the refunded issue, which for other purposes become Transferred Proceeds of the Obligations, continue to be treated as unspent proceeds of the refunded issue for purposes of applying the spending exceptions to an issue refunded by the Obligations.

(V) If the refunded issue satisfies one of the spending exceptions, the proceeds of the refunded issue that are excepted from rebate under that spending exception are not subject to rebate either as proceeds of the refunded issue or as Transferred Proceeds of the Obligations.

(VI) Expenditures for the governmental purpose of an issue include payments for interest, but not principal, on the issue, and for principal or interest on another issue of obligations. The preceding sentence does not apply for purposes of the *18-month Exception* and *2-year Construction Exception* if those payments cause the issue to be a Refunding Issue.

(VII) Any failure to satisfy the final spending requirement of the *18-month Exception* or the *2-year Construction Exception* described in 4(a)(ii)(D) of this Section is disregarded if the Authority exercises due diligence to complete the Project and the amount of the failure does not exceed the lesser of (1) 3 percent of the Issue Price of the Nonconstruction Issue in the case of the *18-month Exception* or the Construction Issue in the case of the *2-year Construction Exception* or (2) $250,000.

(VIII) For purposes of this Section only, a Reasonably Required Reserve or Replacement Fund also includes any fund to the extent described in Treasury Regulations §1.148-5(c)(3)(i)(E) or (G).

(IX) Solely for purposes of determining whether the expenditure requirements with respect to the *6-month Exception* (as described in Section 4(a)(ii)(B)(I)) and the *18-month Exception* (as described in Section 4(a)(ii)(C)(I)) have been met, "gross proceeds" does not include (1) amounts in a Bona Fide Debt Service Fund; (2) amounts in a Reasonably Required Reserve or Replacement Fund (as defined for purposes of this Section); (3) amounts that, as of the date the Bonds are issued, are not reasonably expected to be Gross Proceeds but that become Gross

Proceeds after the end of the 6-month spending period (or the 1-year spending period in the case of the Minor Portion) and the third spending period in the case of the *18-month Exception*; and (4) amounts representing repayments of Grants financed by the Bonds (if any).

(B) *6-month Exception.* Earnings with respect to Gross Proceeds of a Nonconstruction Issue or the Refunding Issue (treated as separate issues) during the 6-month period beginning on the date of issue of the Obligations (the "6-month spending period") and earnings with respect to an amount of Gross Proceeds of the Obligations not in excess of the Minor Portion during the 1-year period beginning on the date of issue of the Obligations (the "1-year spending period") need not be taken into account if:

(I) The "gross proceeds" (as defined in this Section) of the respective issue are allocated to expenditures for the governmental purposes of the issue within the 6-month spending period, other than Gross Proceeds not in excess of the Minor Portion and such Minor Portion is allocated to expenditures for the governmental purposes of the issue within the 1-year spending period; and

(II) The rebate requirement is met for amounts not required to be spent within the 6-month spending period (excluding earnings on a Bona Fide Debt Service Fund) or the 1-year spending period for the Minor Portion.

(C) *18-month Exception.* Earnings with respect to Gross Proceeds of the New Money Portion of the Obligations need not be taken into account if:

(I) The "gross proceeds" (as defined in this Section) are allocated to expenditures for a governmental purpose of the New Money Portion of the Obligations in accordance with the following schedule: (1) at least fifteen percent (15%) within 6 months; (2) at least sixty percent (60%) within 12 months; and (3) one hundred percent (100%) within 18 months (the "third spending period"). The New Money Portion of the Obligations will not be regarded as failing to satisfy the spending requirement for the third spending period as a result of a Reasonable Retainage if the Reasonable Retainage is allocated to expenditures within 30 months of the issue date.

(II) The rebate requirement is met for all amounts not required to be spent in accordance with the 18-month expenditure schedule (other than earnings on a Bona Fide Debt Service Fund).

(III) All of the "gross proceeds" (as defined in this Section) of the New Money Portion of the Obligations qualify for the initial temporary period under Treasury Regulations §1.148-2(e)(2).

(IV) No portion of the New Money Portion of the Obligations is treated as meeting the exception from the rebate requirement for certain proceeds used to finance construction expenditures as provided in section 148(f)(4)(C) of Code and Treasury Regulations 1.148-7(e), as described in (D) of this Section.

(D) *2-year Construction Exception.* Amounts earned on Gross Proceeds which are Available Construction Proceeds of a Construction Issue are not required to be taken into account if Available Construction Proceeds of the Construction Issue are allocated to expenditures for the governmental purposes of the Construction Issue in accordance with the following schedule: (I) 10 percent or more within six months after the date of issue of the New Money Portion of the Obligations; (II) 45 percent or more within 1 year after the date of issue of the New Money Portion of the Obligations; (III) 75 percent or more within 18 months after the date of issue of the New Money Portion of the Obligations; and (IV) 100 percent within 2 years after the date of issue of the New Money Portion of the Obligations (the "fourth spending period"). The Construction Issue will not be regarded as failing to satisfy the spending requirement for the fourth spending period as a result of unspent amounts for Reasonable Retainage if those amounts are allocated to expenditures within 3 years of the issue date.

(b) *Computation Dates.* The Computation Date for the calculation of the Rebate Amount required by this Section 4 for Obligations with a term of less than five years will be the latest of: (i) the date that the Obligations are discharged; (ii) 8 months after the date the Obligations were issued; or (iii) the date the Authority no longer reasonably expects that any of the spending exceptions under Treasury Regulations §1.148-7 (as described in 4(a)(ii) of this Section) will apply to the Obligations. The Computation dates for the calculation of the Rebate Amount required by this Section 4 for Obligations with a term of five years or more will be: (i) a date selected by the Authority which is no later than 5 years after the issue date of the Obligations, (ii) each fifth year thereafter, and (iii) the date that the last of the Obligations are discharged (*i.e.*, the date of the retirement of the last maturity of the Obligations).

(c) *Rebate Payments.* The Authority will pay the Rebate Amount to the United States no later than 60 days after the Computation Date. Payment of a Rebate Amount will be filed with the Internal Revenue Service Center, Ogden, Utah 84201. Payment of a Rebate Amount will be accompanied by Form 8038-T.

MASSACHUSETTS WATER RESOURCES AUTHORITY
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WASTEWATER POLICY & OVERSIGHT COMMITTEE MEETING

Chair: J. Foti
Vice-Chair: J. Walsh
Committee Members:
J. Carroll
M. Gove
J. Hunt
A. Pappastergion
M. Turner

to be held on

Wednesday, March 14, 2012

Location:** **Waterworks Museum
2450 Beacon St.
Boston, MA 02467

Time: Immediately following AF&A Comm.

AGENDA

A. Information

1. I/I Local Financial Assistance Program Update

B. Approvals

1. Final CSO Annual Progress Report 2011

C. Contract Awards

1. Alewife Brook CSO Improvements Design, Construction Administration and Resident Inspection Services: Fay, Spofford & Thorndike, LLC, Contract 6952
2. Brookline Overflow Conduit/MWR010 CSO Cleaning: National Water Main Cleaning Company, Contract 7077C
3. Aeration Efficiency Improvement - Clinton Wastewater Treatment Plant: R.H. White Construction Co., Inc., Contract 7278

***Note Chestnut Hill location (map attached to blue Board agenda). There are numerous ways to get to the Waterworks Museum; use these links to find the best route from your location: http://www.waterworksmuseum.org/plan-your-visit http://www.waterworksmuseum.org/directionsmaps.**

WW(i)
3/14/12

MASSACHUSETTS WATER RESOURCES AUTHORITY

Meeting of the
Wastewater Policy and Oversight Committee

February 15, 2012

A meeting of the Wastewater Policy and Oversight Committee was held on February 15, 2012 at the Authority headquarters in Charlestown. Chairman Foti presided. Present from the Board were Messrs. Carroll, Cotter, Foti, Hunt, Gove, Mannering, Pappastergion and Walsh. Among those present from the Authority staff were Fred Laskey, Steve Remsberg, Mike Hornbrook, Dave Kubiak, and Bonnie Hale. The meeting was called to order at 11:20 a.m.

Information

Draft CSO Annual Progress Report for 2011

Staff gave a presentation highlighting accomplishments in various CSO projects during 2011. Mr. Hunt inquired how MWRA's CSO Plan compared to other cities and staff indicated that they would collect such information and report back.

Contract Awards

*Alewife Brook Pump Station Rehabilitation: Fay, Spofford & Thorndike, LLC, Contract 7034

Staff summarized the work to be performed as part of this project. The Committee recommended approval of the contract award (ref. agenda item B.1).

The meeting adjourned at 11:40 a.m.

* Approved as recommended at February 15, 2012 Board of Directors meeting.

Item A.1
3/14/12

STAFF SUMMARY

TO: Board of Directors
FROM: Frederick A. Laskey, Executive Director
DATE: March 14, 2012
SUBJECT: I/I Local Financial Assistance Program Update

COMMITTEE: Wastewater Policy & Oversight

X INFORMATION
___ VOTE

Jon F. Szarek, Project Manager
Carl H. Leone, Senior Program Manager
Preparer/Title

Michael J. Hornbrook
Chief Operating Officer

RECOMMENDATION:

For information only. All 43 member sewer communities have participated in MWRA's $260.75 million Infiltration/Inflow Local Financial Assistance (grant/loan) Program. Through the February 2012 distribution, a total of $214 million has been distributed to member communities to fund 420 local sewer rehabilitation projects. Community loans are repaid to MWRA over a five-year period. All scheduled community loan repayments have been made, a total of nearly $110 million. Fifteen communities have received their entire funding allocation.

BACKGROUND:

MWRA's Infiltration/Inflow (I/I) Local Financial Assistance Program was initiated in May 1993 to provide funding to member sewer communities to perform I/I reduction and sewer system rehabilitation projects within their locally-owned collection systems. The program goal is to assist member communities in improving local sewer system conditions to reduce I/I and ensure ongoing repair/replacement of the collection system. This program is a critical component of MWRA's Regional I/I Reduction Plan.[1] Specifically, local sewer system rehabilitation projects are intended to at least offset ongoing collection system deterioration to prevent a net increase in regional I/I. In the long-term, system rehabilitation should result in lower I/I, which will allow for future increases in sanitary flows (residential, commercial, industrial, and institutional) without a net increase in total wastewater flow. The program fosters efficient operation and maintenance of local sewer systems.

Program funds are allocated among the 43 MWRA sewer communities based on respective shares of overall MWRA wholesale sewer charges. Financial assistance is distributed for approved projects as a 45 percent grant and a 55 percent interest-free loan. The loan portion is repaid to MWRA over a five-year period.

[1] As required by the National Pollutant Discharge Elimination System (NPDES) Permit for the Deer Island Treatment Plant, MWRA's Regional Infiltration/Inflow Reduction Plan was approved by the Board in May 2001 and approved by MassDEP in November 2002.

DISCUSSION:

The Board has approved a total program budget of $260.75 million (from FY93 to FY18) covering seven separate funding phases. The program's eighth phase is scheduled to begin in FY14 (July 2013) and is included as a future cost ($40 million in grants/loans) in the approved FY12 and proposed FY13 CIPs. Attachment 1 provides a summary of funds allocated, distributed, and remaining for each member community for the first seven phases of the program. A total of $214 million in funding has been distributed to fund 420 local I/I reduction and sewer system rehabilitation projects. Distribution of the remaining $47 million in funds has been approved through FY18.

Funding has been provided to local communities for eligible I/I reduction projects including planning, design, construction, and engineering services during construction. These projects generally take one to three years to complete. Seventy-three percent of the funds distributed to date have financed local construction projects. The table below details funds distributed by project phase for both completed and ongoing projects.

PROJECT PHASE	COMPLETED PROJECTS ($ millions)	ONGOING PROJECTS ($ millions)	TOTAL ($ millions)
Planning/Study:	$ 31.8	$ 3.5	$ 35.3 (17%)
Design:	8.1	3.5	11.6 (5%)
Construction:	134.4	22.0	156.4 (73%)
Eng. Services During Const.:	9.6	1.3	10.9 (5%)
TOTAL	$ 183.9 (86%)	$ 30.3 (14%)	$ 214.2 (100%)

Sunset Provisions

In 2004, the program was modified by the addition of sunset provisions for the grant portion of community financial assistance allocations. On the sunset date, any undistributed grant portion of financial assistance funds will no longer be available for use by the member community. The undistributed grant portion will be removed from the community allocation and the total program budget. The loan portion, as allocated under all phases, will remain available throughout the term of the program. The sunset dates were recommended by MWRA's Advisory Board and approved by MWRA's Board of Directors. The sunset dates for Funding Phases 3 and 4 have passed. Communities utilized all available grant/loan funds for eligible I/I reduction projects. For Funding Phase 5, the sunset date is June 30, 2012 (see below). For the sixth and seventh funding phases, no sunset dates have been established. These grant/loan funds are approved for distribution through FY18.

Funding Phase	Sunset Date	Total Grant Portion	Undistributed Grant Portion	Number of Communities Impacted
5	June 30, 2012	$18 million	$0.72 million	5

There is only one remaining financial assistance distribution (May 2012) scheduled prior to the sunset date for Phase 5 grant funds. Staff are working cooperatively with five communities that may be impacted by the sunset provision to approve a financial assistance application for the May 2012 distribution: Belmont, Holbrook, Natick, Somerville, and Watertown.

Estimated I/I Removal

The estimated average daily flow reduction associated with completed local I/I reduction projects that have received MWRA financial assistance is about 81 million gallons per day (mgd). This flow reduction "ballpark" figure is based on the communities' (or their consultants') peak I/I reduction estimates, which have been prorated by MWRA staff to estimate an annual average I/I reduction. The estimated I/I reduction represents groundwater and stormwater that no longer enter the collection system at the point of repair. Regional wastewater flow reductions resulting from specific local I/I reduction projects are difficult to substantiate through end-of-the-collection-system meter data, due to factors noted below:

- Wastewater flows within the collection system vary dramatically due to changes in precipitation. For example, annual average daily flow for MWRA's system varies up to 80 mgd from year to year. Small flow reductions for individual projects (typically less than one mgd) are dwarfed by regional flow fluctuations;

- Sewer capacity gained by elimination of I/I in one subsystem may, in some cases, allow for other I/I to enter the collection system at a different location, resulting in less net flow reduction at the end of the collection system;

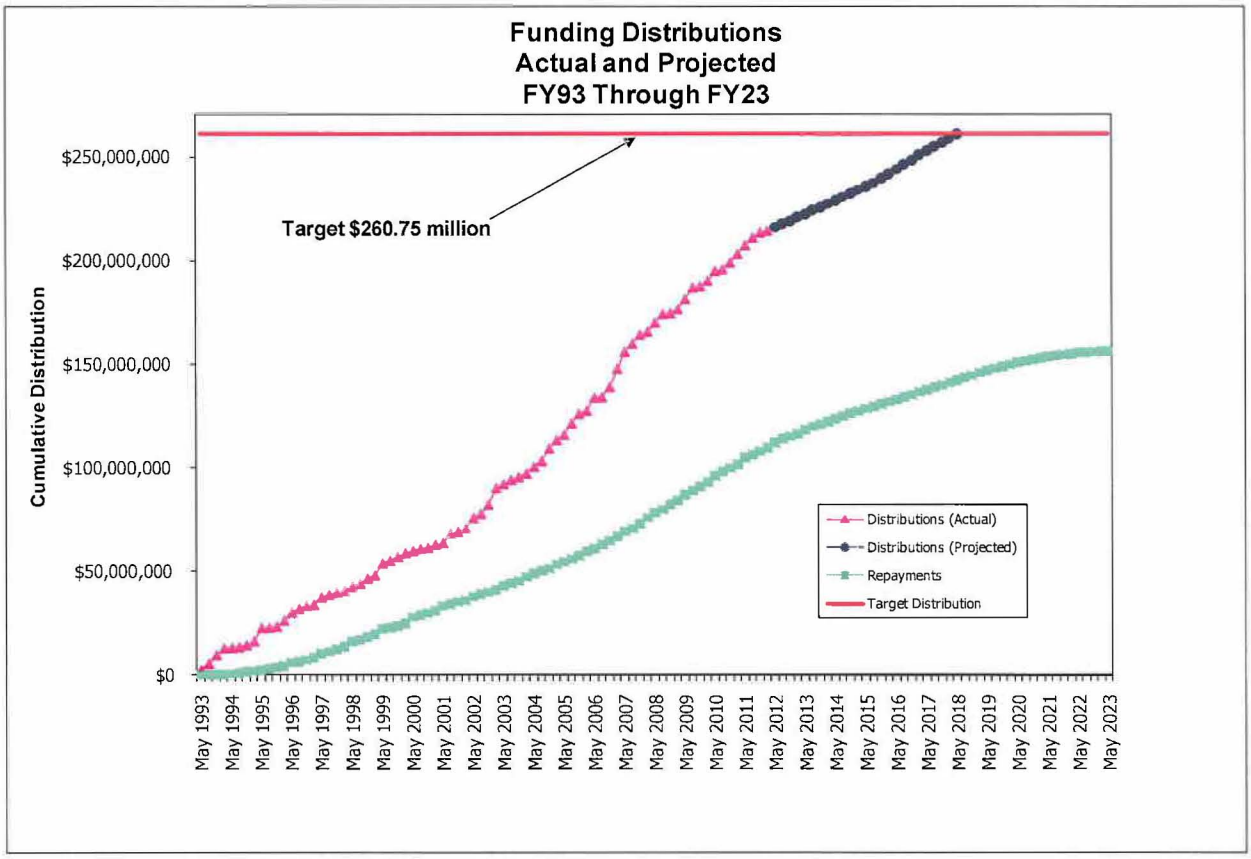
- MWRA's numerous pumping and interceptor upgrades, as well as combined sewer overflow and system optimization projects result in an increase in the capture and treatment of wastewater flow and the reduction of raw sewage discharges. When reviewing end-of-the-collection system meter data, these increased flows to the Deer Island Treatment Plant offset upstream I/I reductions; and,

- Over the last 20 years sewered population in the service area has increased by about 150,000 leading to an increase in sanitary sewage. Conversely, during the same 20 year period, per capita water use returned to the sewer system has decreased due to installation of low-flow plumbing fixtures and appliances leading to a decrease in sanitary sewage.

Taking these factors into account, long-term metering records will continue to be analyzed to monitor regional wastewater flow trends. Attachment 2 provides a graph of long-term (23 years) regional flow data for the Deer Island Treatment Plant collection system. The 23-year average daily flow for the total system was 367 mgd and the average annual rainfall over those 23 years was 49 inches. Over the last three years (2009/2010/2011), the average daily flow has averaged 352 mgd; however, the three-year rainfall has been well above average at 55 inches. During the 23-year period of record, the regional wastewater flow trend is modestly declining while the annual rainfall trend is modestly increasing. The declining wastewater flow and the increase in annual rainfall is highlighted in Attachment 3, which displays the five-year running averages (flow and rainfall) as a means of smoothing the annual variability in the data.

BUDGET/FISCAL IMPACT:

The FY12 CIP includes a budget of $122,585,000 for the grant portion of MWRA's I/I Local Financial Assistance to the communities (loans are offset by repayments). The FY12 CIP includes future funds for the Program's Phase 8 ($18 million in grants and $22 million in loans) planned to begin in FY14. Community loan repayments are deposited into MWRA's construction fund. The graph below presents grant and loan distributions and loan repayments (actual through February 2012 and projected for future years).



MBE/WBE PARTICIPATION:

MBE/WBE participation goals are included in the Financial Assistance Program agreements.

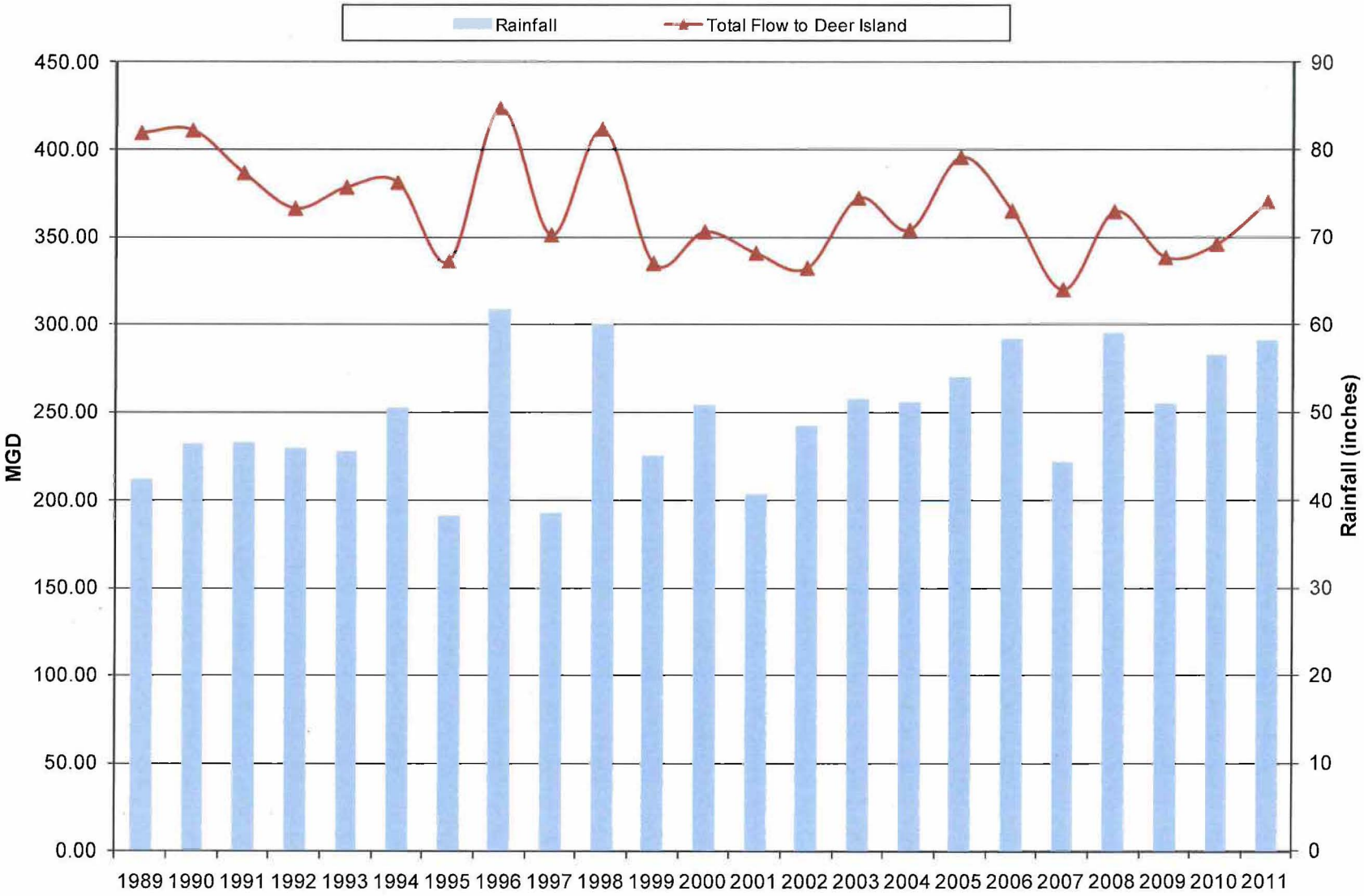
ATTACHMENTS:

Attachment 1 – Funding Summary
Attachment 2 – Long-Term Regional Flow Data
Attachment 3 – Long-Term Regional Flow Data - 5 Year Running Average

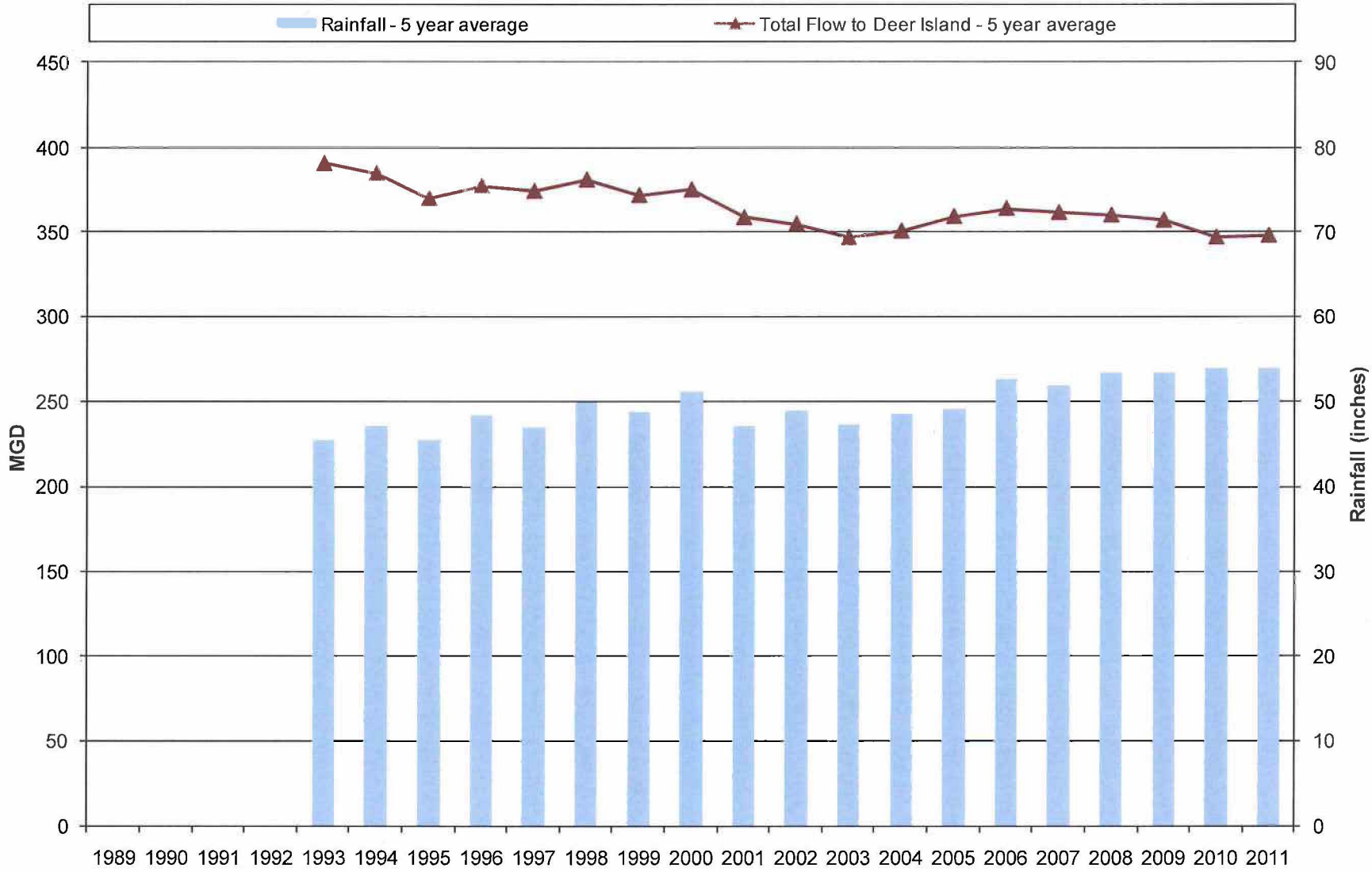
ATTACHMENT 1
MWRA I/I LOCAL FINANCIAL ASSISTANCE PROGRAM
FUNDING SUMMARY AS OF FEBRUARY 2012

Community	Total Allocations (Phases 1/2/3/4/5/6/7)	Total Distributions (Phases 1/2/3/4/5/6/7)	Percent Distributed	Funds Remaining
Arlington	$4,893,000	$4,893,000	100%	$0
Ashland	$1,126,500	$930,500	83%	$196,000
Bedford	$1,999,600	$1,691,600	85%	$308,000
Belmont	$2,992,100	$1,974,999	66%	$1,017,101
Boston	$74,278,200	$58,761,001	79%	$15,517,199
Braintree	$4,581,000	$3,109,000	68%	$1,472,000
Brookline	$7,400,200	$5,112,200	69%	$2,288,000
Burlington	$2,845,800	$2,845,800	100%	$0
Cambridge	$13,547,100	$9,777,055	72%	$3,770,045
Canton	$2,353,900	$1,645,900	70%	$708,000
Chelsea	$3,605,100	$3,605,100	100%	$0
Dedham	$3,441,000	$3,441,000	100%	$0
Everett	$4,525,500	$3,141,500	69%	$1,384,000
Framingham	$7,015,000	$5,003,000	71%	$2,012,000
Hingham	$885,500	$589,500	67%	$296,000
Holbrook	$920,600	$496,600	54%	$424,000
Lexington	$4,159,300	$4,159,300	100%	$0
Malden	$6,725,900	$4,593,900	68%	$2,132,000
Medford	$6,914,600	$4,794,600	69%	$2,120,000
Melrose	$3,385,300	$2,845,300	84%	$540,000
Milton	$3,251,500	$3,251,500	100%	$0
Natick	$3,194,600	$1,912,700	60%	$1,281,900
Needham	$3,746,600	$2,892,150	77%	$854,450
Newton	$11,925,400	$11,565,400	97%	$360,000
Norwood	$3,939,400	$3,355,399	85%	$584,001
Quincy	$11,125,000	$11,125,000	100%	$0
Randolph	$3,370,800	$2,810,900	83%	$559,900
Reading	$2,520,100	$2,520,100	100%	$0
Revere	$5,502,900	$5,502,900	100%	$0
Somerville	$8,767,800	$5,723,790	65%	$3,044,010
Stoneham	$2,867,900	$2,867,900	100%	$0
Stoughton	$2,696,900	$2,696,900	100%	$0
Wakefield	$3,396,900	$2,850,000	84%	$546,900
Walpole	$2,083,000	$1,759,000	84%	$324,000
Waltham	$7,808,400	$7,808,400	100%	$0
Watertown	$3,653,800	$2,041,800	56%	$1,612,000
Wellesley	$3,275,700	$2,487,547	76%	$788,153
Westwood	$1,425,300	$1,425,300	100%	$0
Weymouth	$6,505,900	$5,349,300	82%	$1,156,600
Wilmington	$1,388,000	$1,388,000	100%	$0
Winchester	$2,424,000	$1,731,000	71%	$693,000
Winthrop	$1,926,400	$1,367,300	71%	$559,100
Woburn	$6,358,500	$6,358,500	100%	$0
Totals	$260,750,000	$214,201,641	82%	$46,548,359

ATTACHMENT 2
MWRA Long-Term Regional Flow Data
NOAA Rainfall Average at Three Local Sites (Logan, Blue Hills, Reading)



ATTACHMENT 3
MWRA Long-Term Regional Flow Data
5-year Running Averages
5 year running NOAA Rainfall Average at Three Local Sites (Logan, Blue Hills, Reading)



wws 8.1
IX A.2
3/14/12

STAFF SUMMARY

TO: Board of Directors
FROM: Frederick A. Laskey, Executive Director
DATE: March 14, 2012
SUBJECT: Final CSO Annual Progress Report 2011

COMMITTEE: Wastewater Policy & Oversight

___ INFORMATION
_X_ VOTE

David A. Kubiak, Sr. Program Manager
Jae R. Kim, Chief Engineer
Preparer/Title

Michael J. Hornbrook
Chief Operating Officer

RECOMMENDATION:

To authorize staff to submit the *Combined Sewer Overflow Annual Progress Report 2011* to the Federal District Court by March 15, 2012, in compliance with Schedule Seven of the Boston Harbor Case, in the form attached.

DISCUSSION:

Staff have completed and are prepared to submit the final *Combined Sewer Overflow Annual Progress Report 2011* (the "Annual Report"), which was presented to the Board in draft form on February 15, 2012. Schedule Seven requires MWRA to file the Annual Report with the Federal District Court by March 15, 2012.

This final version of the Annual Report does not differ substantially from the draft report presented to the Board last month. Copies of the draft report were also provided to the Boston Water and Sewer Commission, the cities of Cambridge, Chelsea and Somerville, the Town of Brookline, and MWRA's Advisory Board for review and comment. Staff have updated design and construction progress where new information has become available. In all cases, the additional progress made and reported is consistent with MWRA project plans and schedules.

Staff plan to submit the Annual Report to the Federal Court and the Court Parties on March 15, 2012, with the MWRA Quarterly Compliance and Progress Report.

BUDGET/FISCAL IMPACT:

The FY12 CIP and Proposed FY13 CIP include $857,089,296 and $860,682,679, respectively, for the CSO Control Program, including planning, design, construction, land and easement acquisition, and permitting. Spending in CY11 brought MWRA's total capital expenditure for the CSO Control Program to $776 million, 90% of the total CSO Program budget in the Proposed FY13 CIP.

MBE/WBE PARTICIPATION:

MBE and WBE participation requirements are included in the various design and construction contracts managed by MWRA and the CSO communities.

Massachusetts Water Resources Authority

Combined Sewer Overflow Control Plan

L Street Beach, South Boston, August 12, 2011

Annual Progress Report 2011

March 2012

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Michael J. Hornbrook, Chief Operating Officer

Prepared by: David A. Kubiak, P.E.
Nadine S. Smoske

Table of Contents

1. INTRODUCTION

The Massachusetts Water Resources Authority (MWRA) files this Combined Sewer Overflow Annual Progress Report for 2011 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 2011 and through the quarterly period December 16, 2011, to March 15, 2012, and discusses issues that may affect MWRA's ability to complete the CSO projects on schedule. Like previous annual CSO reports, it also presents updated information on the scope, goals, benefits and costs of the Long-Term Control Plan and its projects, as well as information on plan-wide progress to date and benefits achieved, including reductions in CSO discharges and impacts, as well as 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 is comprised of 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 maps the locations of the 35 projects and presents the general implementation status of each project. Figure 2 summarizes the scope, schedule and predicted benefits of the system-wide Long-Term Control Plan. MWRA is also required 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 (BOS070) and the Charles River Basin outfalls related to MWRA's Cottage Farm CSO Facility (MWR201, CAM005, CAM007, CAM009 and CAM011), certain MWRA member communities with CSOs (the "CSO communities") are implementing system improvements that supplement the 35 stipulated projects and are necessary to meet the required levels of control. These are also discussed in this report.

2. CSO CONTROL PROGRESS AND ACCOMPLISHMENTS

2.1 2011 Progress Highlights

MWRA and its CSO communities continued to implement the Long-Term CSO Control Plan and meet 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, 2008[1] (the "Second CSO Stipulation"). In 2011, MWRA and the CSO communities attained substantial completion of two of the CSO projects, bringing the total number of completed projects to 29 of the 35 projects in the Long-Term Control Plan. Four of the remaining six projects are well into construction, and the last two projects are scheduled to move into design by April 2012, in compliance with Schedule Seven. Since the beginning of the program, CSO discharges have been eliminated or virtually eliminated (i.e. 25-year storm level of control) at 37 of the 84 outfalls addressed in the Long-Term Control Plan. These include several outfalls the CSO communities have closed, or have closed on a test basis, that are in addition to the outfalls

[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."


ALEWIFE BROOK PUMP STATION
MEDFORD
MALDEN
REVERE
EVERETT
CHELSEA
SOMERVILLE
CAMBRIDGE
BROOKLINE
BOSTON
SOM004
SOM002A/003
SOM002
SOM001
SOM001A
CAM002
CAM401B
CAM400
CAM001
CAM401A
CAM004
MWR003
ALEWIFE BROOK
NEW CHANNEL
SOMERVILLE BAFFLE MANHOLE SEPARATION
CAMBRIDGE / ALEWIFE BROOK SEWER SEPARATION
SOM006
SOM007
SOM007A/MWR205A
UPPER MYSTIC RIVER
SOMERVILLE MARGINAL CSO FACILITY
MWR205
SOMERVILLE MARGINAL UPGRADE
CHARLESTOWN DELAURI PUMP STATION
CHARLESTOWN HYDRAULIC RELIEF
MYSTIC RIVER/CHELSEA CREEK
CHELSEA BRANCH SEWER RELIEF
CHELSEA TRUNK SEWER RELIEF
CHELSEA CREEK HEADWORKS
CHE008
CHELSEA CREEK
CHELSEA OUTFALL REPAIRS
CONSTITUTION BEACH SEWER SEPARATION
CHE004
CHE003
CHE002
BOS015
BOS013
BOS014
East Boston Branch Sewer
East Boston Caruso Pump Station
Constitution Beach CSO Facility
CONSTITUTION BEACH
BOS002/MWR207
BOS017
BOS019 STORAGE CONDUIT
BOS012
BOS019
BOS010
PRISON POINT UPGRADE
SOM009 (TO PRISON PT)
CAMBRIDGE HYDRAULIC RELIEF
CAM005
CAM007
CAM009
CAM011
UPPER CHARLES RIVER
PRISON POINT CSO FACILITY
PRISON POINT OPTIMIZATION
BOS028
SOM010
MWR203
BOS009
EAST BOSTON BRANCH SEWER RELIEF
UPPER INNER HARBOR
BOS049
BOS050
BOS052
CAM017
BOS057
BOS058
BOS060
BOS062
BOS064
BOS065
BOS072
BOS073
BOS068
BOS070
BOS006
BOS007
BOS004
BOS005
BOS003
LOWER INNER HARBOR
BOS033
BOS032
COTTAGE FARM BROOKLINE CONNECTION AND IN-FLOW CONTROLS
COTTAGE FARM UPGRADE
COTTAGE FARM CSO FACILITY
LOWER CHARLES RIVER
MWR022
MWR021
MWR020
MWR023
MWR019
MWR018
MWR201
MWR010
BOS042
Stony Brook Conduit
BULFINCH TRIANGLE SEWER SEPARATION
BACK BAY FENS
BROOKLINE SEWER SEPARATION
BOS046
WARD STREET HEADWORKS
UNION PARK DETENTION/ TREATMENT FACILITY
UNION PARK PUMP STATION
DESIGNATED CHANNEL SEWER SEPARATION
FORT POINT CHANNEL SEWER SEPARATION AND SYSTEM OPTIMIZATION
RESERVED CHANNEL
BOS080
BOS076
BOS079
BOS078
NORTH DORCHESTER BAY STORAGE TUNNEL & RELATED FACILITIES
PLEASURE BAY STORM DRAIN IMPROVEMENTS
COLUMBUS PARK HEADWORKS
BOS081
BOS082
BOS083
BOS084
BOS085
BOS086
BOS087
NORTH DORCHESTER BAY
STONY BROOK SEWER SEPARATION
MORRISSEY BOULEVARD STORM DRAIN
Thompson Island
FOX POINT UPGRADE
BOS089/MWR209
FOX POINT CSO FACILITY
BOS088
SOUTH DORCHESTER BAY
COMMERCIAL POINT UPGRADE
COMMERCIAL POINT CSO FACILITY
BOS090/MWR211
SQUANTUM PUMP STATION
SOUTH DORCHESTER BAY SEWER SEPARATION
NEPONSET RIVER
NEPONSET SEWER SEPARATION
BOS093
BOS095
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

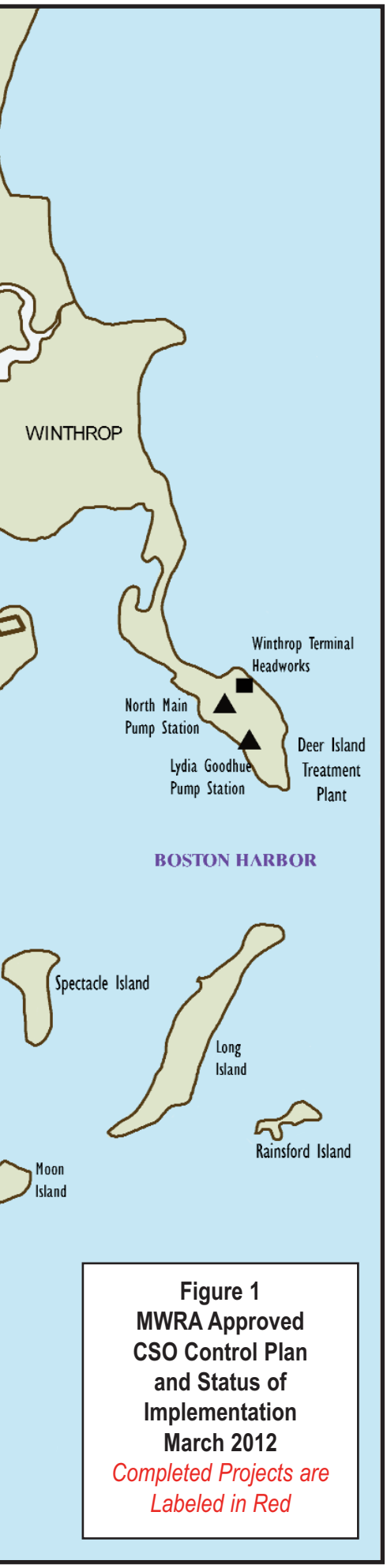


Figure 1
MWRA Approved CSO Control Plan and Status of Implementation
March 2012
Completed Projects are Labeled in Red

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

In Construction[2]	
Brookline Sewer Separation	2013
CAM004 Outfall and Wetland Basin*	2013
Reserved Channel Sewer Separation	2015
CAM004 Sewer Separation *	2015

Future Start - (2012)	
SOM01A Interceptor Connection Relief/Floatables Controls*	2014
MWR003 Gate Rindge Ave. Siphon Relief and SOM01A*	2015

(1) Actual or Scheduled construction completion
(2) For each project, at least one construction contract is completed or underway
** Part of Alewife Brook CSO Control Plan*

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

BENEFITS

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

CSO CONTROL PROJECTS

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

PROGRAM SCHEDULE

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

COSTS
Planning, Design & Construction
$860.7 Million
Net Annual O&M
$1.5 Million

Note: As of March 15, 2012, CSO discharge has been eliminated at 33 of the 34 outfalls recommended to be closed. One of the 34 outfalls will be closed with completion of the CAM004 sewer separation project, and four additional outfalls have been closed by the BWSC and the City of Cambridge.

MWRA recommended be closed in the Long Term Control Plan. Projects completed to date have greatly reduced CSO discharge and have contributed to significant water quality improvement for Boston Harbor, the beaches of South Boston and other area waters. MWRA spent $44.9 million in 2011 to implement CSO projects and fund the eligible CSO work performed by Boston Water and Sewer Commission (BWSC), the Town of Brookline and the City of Cambridge. Of this amount, $41.3 million (92%) was construction related. Two miles of new pipe, including more than 6,000 linear feet of sanitary sewer and nearly 4,000 linear feet of storm drain in the communities of Boston, Brookline and Cambridge were installed as part of the project work described below.

Highlights of the CSO control progress achieved in 2011 include:

- Completion of the $270 million North Dorchester Bay CSO storage tunnel and related facilities and commencement of operations on May 4, 2011, prior to the start of last year's swimming season. On June 23, 2011, MWRA commemorated the completion and start-up with elected officials, Federal Court and regulatory authorities, environmental advocates, and South Boston residents, all of whom, through years of hard work and coordination, contributed to the project's successful outcome and long-term environmental protections. Successful operation of the tunnel is the culmination of nearly 20 years of planning, design and construction during which MWRA had to overcome siting, regulatory and construction challenges to now have in place major new infrastructure and wet-weather operating protocols that bring substantial environmental pollution control and water quality improvement to the beaches of South Boston while avoiding long-term impacts to the South Boston community.

Judge Stearns, Mayor Menino, Secretary Sullivan, Senator Hart, members of the Board of Directors and other dignitaries at the opening ceremonies on June 23, 2011

The work involved five major MWRA and BWSC construction contracts, including the 10,830-foot long (2-mile long), 17-foot diameter tunnel and associated CSO and stormwater diversion structures and gates that; the pumping station located at Massport's Conley Terminal adjacent to the downstream end of the tunnel and related 24-inch diameter force main that remove stored flows from the tunnel after each storm; the below-ground tunnel ventilation building behind the State Police Barracks on Day Boulevard, adjacent to the upstream end of the tunnel; the BWSC Morrissey Boulevard storm drain necessary to achieve a 5-year level of stormwater control for the beaches; and the Pleasure Bay storm drain improvements that eliminated stormwater discharges to Pleasure Bay Beach. Since start-up on May 4, the storage tunnel and related facilities have consistently performed as intended for their full environmental function and benefit, preventing 197 million gallons of CSO and separate stormwater from discharging to the Bay during more than 60 rainfall events and sending the stored flows to the interceptor system at the end of each storm, for treatment at Deer Island.

On February 13, 2012, MWRA received a 2012 Operations and Environmental Performance Award from the National Association of Clean Water Agencies (NACWA) for the North Dorchester Bay CSO Storage Tunnel and Related Facilities. NACWA's National Environmental Achievement Awards Program recognizes individuals and agencies for outstanding contributions to environmental protection and the clean water community.

- Completion of the City of Cambridge's $5.4 million CAM400 Common Manhole Separation project on March 30, 2011. With completion of this project, one of six in MWRA's long-term control plan for the Alewife Brook, the City of Cambridge lowered stormwater flows to its combined sewer system and MWRA's interceptors and closed Outfall CAM400, eliminating approximately 0.6 million gallons of CSO a year.

- Commencement of the City of Cambridge's $16.1 million construction contract for the CAM004 stormwater outfall and wetland basin. The project, one of six in the long-term control plan for Alewife Brook, will provide detention and wetlands treatment to the stormwater flows that will be removed from the combined sewer system by the CAM004 sewer separation project, for control of CSO discharges to Alewife Brook. The contract is approximately 40% complete.

- Continued progress by Cambridge with final design of the CAM004 Sewer Separation project. Cambridge plans to issue Notice to Proceed with the first of three remaining construction contracts by September 2012, in compliance with Schedule Seven.

- Commencement of the Town of Brookline's $16.6 million second (and final) construction contract to complete the Brookline sewer separation project. The contract, which is approximately 60%

complete, is intended to reduce CSO discharges at MWRA's Cottage Farm CSO Facility and includes 3,790 linear feet of storm drain and 1,290 linear feet of sanitary sewer by open trench method and 4,550 linear feet of sanitary sewer by microtunneling.

- Substantial completion of two construction contracts associated with BWSC's $62.3 million Reserved Channel sewer separation project (in addition to a contract BWSC completed in 2010) and continued construction progress with two other Reserved Channel contracts. All construction and design work is on schedule for completion of the project by December 2015, in compliance with Schedule Seven.

- Substantial completion of BWSC's $6.0 million construction contract for relocation of CSO regulator RE-070/11-2 and sewer separation in a portion of the South Bay area associated with BWSC's Lower Dorchester Brook Sewer. The work is partially funded by MWRA and is intended to lower CSO discharges to BWSC's Dorchester Brook Conduit and help attain the level of CSO control in MWRA's long-term control plan for Fort Point Channel.

- Advertisement of the MWRA contract that will move the last two CSO projects in the Long-Term Control Plan into design: the control gate and floatables control at Outfall MWR003 and MWRA Rindge Avenue siphon relief project and the interceptor connection relief and floatables control at outfall SOM01A project. Both projects are part of MWRA's CSO plan for Alewife Brook.

- In April 2011, the Federal District Court allowed MWRA's motion to remove construction of the Charles River Valley/South Charles River Relief Sewer Gate Controls and Additional Interceptor Connections project from the Long-Term Control Plan and Schedule Seven, after MWRA demonstrated to EPA through extensive hydraulic evaluations that the project would not provide additional CSO control for the Charles River and would add a significant risk for system flooding.

2.2 Projects Completed in 2011

For a full listing and description of all completed CSO projects, see Chapter 6.

North Dorchester Bay CSO Storage Tunnel and Related Facilities

On May 4, 2011, MWRA completed the North Dorchester Bay CSO storage tunnel and related facilities (Figure 3), which include the 10,830-foot long (2-mile long), 17-foot diameter tunnel that can hold up to a total 19 million gallons of CSO and stormwater flow; CSO and stormwater diversion structures and gates that direct flows into the tunnel at each outfall; a tunnel-dewatering pump station located at Massport's Conley Terminal adjacent to the downstream end of the tunnel (and related 24-inch diameter force main); a below-ground tunnel ventilation and odor control building behind the State Police Barracks on Day Boulevard, adjacent to the upstream end of the tunnel. BWSC completed another component of the North Dorchester Bay CSO control plan, the Morrissey Boulevard storm drain, in July 2009, pursuant to the CSO Memorandum of Understanding and Financial Assistance Agreement with MWRA, by which BWSC maintains ownership.

MWRA monitors and records water surface elevations within the CSO and stormwater diversion structures and the tunnel. Once each storm ends and flows in the sewer system subside, the pumping station at Conley Terminal pumps the stored flow from the tunnel to the local sewer system for transport to the Deer Island

Figure 3
North Dorchester Bay CSO Storage Tunnel and Related Facilities

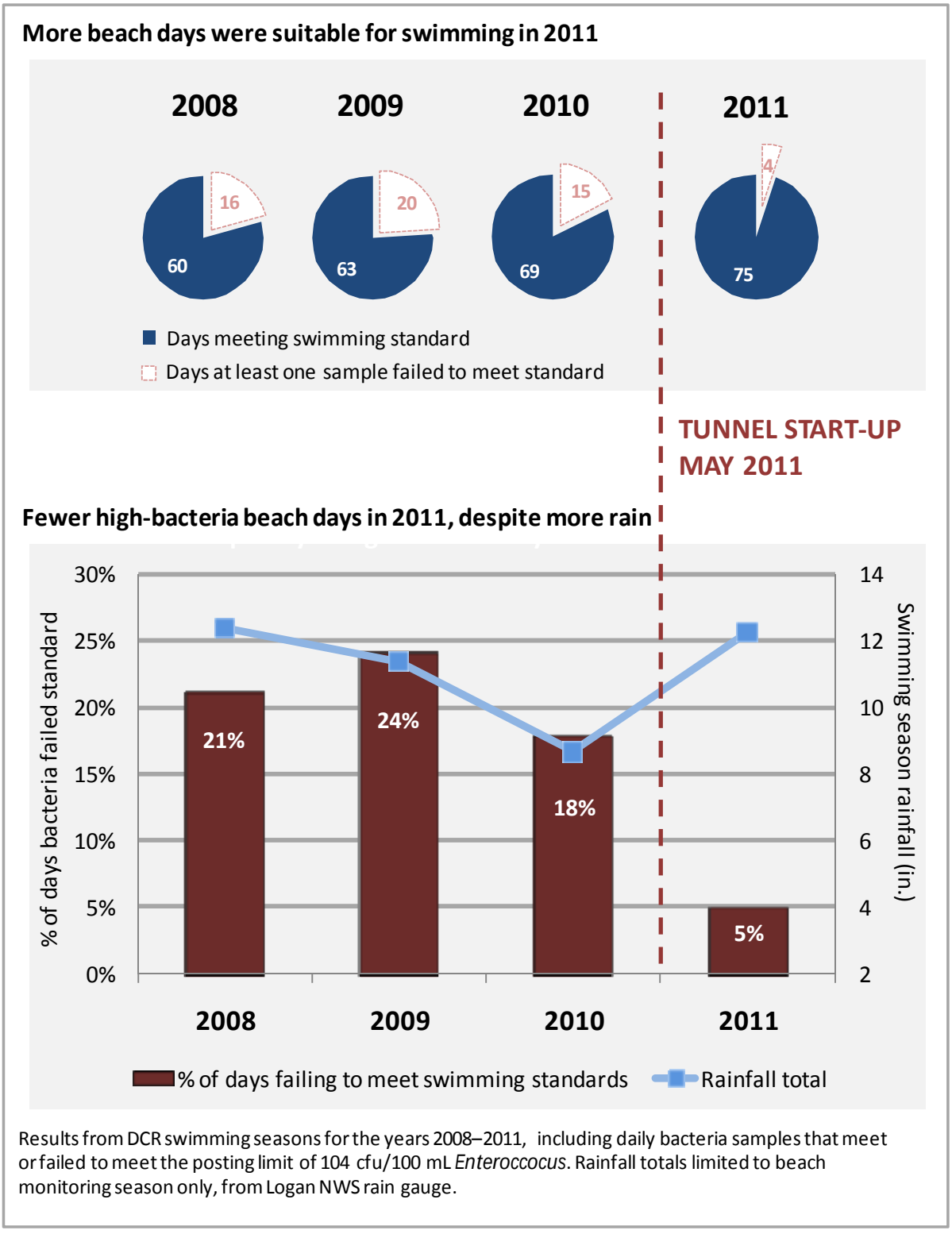
Treatment Plant. Since bringing the project on-line on May 4, 2011, the storage tunnel and related facilities have prevented 197 million gallons of CSO and separate stormwater from discharging to the Bay during more than 60 rainfall events. The largest volume of CSO and stormwater stored to date during any single storm was 9.84 million gallons, slightly more than half the design storage volume, during the storm of December 7-8, 2011. With the sole exception of Hurricane Irene on August 27-29, 2011, when separate stormwater flows were allowed to discharge to the Bay and to Savin Hill Cove via the Morrissey Boulevard storm drain, MWRA directed all flows to the tunnel and prevented any discharge of CSO, stormwater or dry weather flow (e.g., groundwater infiltration) from the five remaining outfalls to the South Boston beaches.

North Dorchester Bay CSO Storage Tunnel Dewatering Pump Station, Conley Terminal, South Boston

Water quality test results (see Figure 4) show markedly improved conditions along the beaches of South Boston. While the 2011 swimming season – the first to benefit from the operating storage tunnel – had a high number of rain events and a high total rainfall amount relative to previous years, the number of days that daily sample results showed a violation of the bacteria standard plummeted from a seasonal average of 17 in years 2008, 2009 and 2010 to 4 in 2011.

During the swimming season (approximately 85 days from early June into September), the Massachusetts Department of Conservation and Recreation (DCR) performs daily water quality sampling at five locations along the South Boston beaches (McCormack Bathhouse, I Street, M Street, City Point and Pleasure Bay), and an exceedance of the bacteria standard triggers a site-specific beach posting. While a South Boston beach may be posted due to an elevated bacteria count at one sampling location, simultaneous samples at the other South Boston beaches may meet bacteria limits, allowing those beaches to remain open for safe swimming. Notwithstanding the four days in the 2011 swimming season when one or more beach locations were posted, water quality conditions along all beaches are generally excellent. Daily water quality samples collected in the 2011 swimming season met the swimming standard 95% of the time at Pleasure Bay Beach, 97% of the time at I Street Beach, and 99% of the time at McCormack Bathhouse, M Street Beach and City Point Beach. The causes of the few remaining bacteria exceedances are unknown (overland runoff, bird and dog feces, and boat or other illicit discharges are just a few of the possible suspects), but the high counts can no longer be attributed to the CSO and stormwater outfalls.

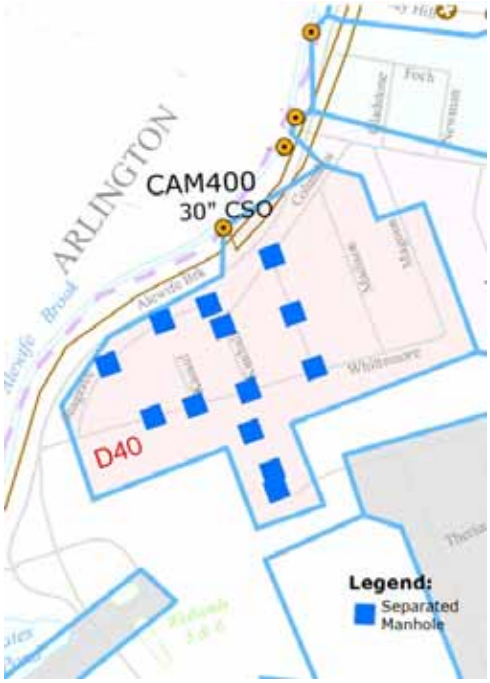
Figure 4
Change to South Boston Beaches Water Quality Following Tunnel Start-Up



Results from DCR swimming seasons for the years 2008–2011, including daily bacteria samples that meet or failed to meet the posting limit of 104 cfu/100 mL *Enteroccocus*. Rainfall totals limited to beach monitoring season only, from Logan NWS rain gauge.

CAM400 Common Manhole Separation

On March 30, 2011, the City of Cambridge attained substantial completion of the $3.9 million construction contract that included two of the six projects that comprise the long-term CSO control plan for Alewife Brook: the CAM400 common manhole separation project and the project that included interceptor connection relief and floatables controls at CAM002 and CAM401B and floatables control at CAM001, which the contractor substantially completed in October 2010 in compliance with an interim contract milestone. Cambridge included both projects in one construction contract in part because the projects were located in the same general area near the intersection of Alewife Brook Parkway and Massachusetts Avenue and involved similar sewer and storm drain work.



The CAM400 manhole separation work was performed in the residential area 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. While this area was already primarily served by separated storm drain and sanitary sewer pipes, Cambridge's contractor replaced 13 manholes that historically provided common access to these systems with separate storm drain and sanitary sewer manholes, removing the ability for flows in one system to enter the other system, especially in large storms. The work also included a limited amount of new storm drain and sanitary sewer installation and rehabilitation. With the systems fully separated, Cambridge was able to permanently close the sole regulator that had allowed mixed sanitary and stormwater flows to be discharged to Alewife Brook through Outfall CAM400, which now serves as a separate stormwater-only outfall.

2.3 Ongoing Design and Construction Progress

Alewife Brook CSO Control Plan/Cambridge Sewer Separation

The Alewife Brook CSO control plan is intended to minimize CSO flows to the Alewife Brook primarily by separating combined sewer systems in parts of Cambridge, while also upgrading hydraulic capacities at local connections to the MWRA interceptors. Cambridge is also constructing a new stormwater outfall and a wetland basin to accommodate the separated stormwater flows, prevent any increase in flooding along Alewife Brook, and provide a level of stormwater treatment. The design and construction work for four of the six projects that comprise the approved Alewife Brook CSO control plan is managed by the City of Cambridge with MWRA funding under a Memorandum of Understanding and Financial Assistance Agreement. Cambridge began construction of the CAM004 sewer separation plan in July 1998, in accordance with the recommended plan in the 1997 Facilities Plan/EIR and in compliance with the original set of milestones for this project in a previous court schedule. Cambridge completed all four of the construction contracts it awarded at that time, and the completed work significantly reduced CSO discharges to the Alewife Brook. Pre- and post-construction hydraulic model simulations showed that CSO discharges were reduced from 63 activations and 50 million gallons annual volume in a typical year to 25 activations and 33 million gallons with these completed contracts.

In 2000, MWRA and Cambridge suspended further design work and construction contract awards related to the 1997 plan, because new field information showed that conditions in the Cambridge combined sewer system were markedly different from conditions assumed in 1997. MWRA and Cambridge determined that a considerably greater scope of work would be necessary to meet the 1997 CSO control goals for Alewife Brook. In April 2001, MWRA and Cambridge submitted a Notice of Project Change to the Massachusetts Environmental Policy Act (MEPA) Office for public review recommending an expanded and much more costly sewer separation plan. The Secretary of Environmental Affairs' Certificate on the Notice of Project Change, issued in June 2001, required MWRA and Cambridge to prepare a document responding to all public comments, including comments related to the feasibility of obtaining necessary federal and state permits and other approvals to build the project. In May 2003, MWRA and the City of Cambridge submitted a "Response to Comments" document to MEPA, addressing all public comments. The Response to Comments document and supporting planning and engineering investigations took two years to complete and involved extensive interactions with regulatory agencies, community officials in Arlington, Belmont and Cambridge, the Department of Conservation and Recreation (DCR) and the public.

The Response to Comments document also presented a final project plan that incorporated adjustments made during the public review process to address the various concerns that had been raised. Of greatest significance were adjustments Cambridge made to the proposed stormwater conveyance system and wetland basin (Figure 5) to ensure that the stormwater flows generated by the sewer separation work would have no adverse impact on Alewife Brook flood elevations and that the wetland basin would contribute to the ecological and recreational goals in DCR's Master Plan for the Alewife Reservation. The primary CSO-related purpose of the CAM004 stormwater outfall and wetland basin is to deliver the separated stormwater flows to the Little River and Alewife Brook without causing an increase in Alewife Brook flood levels or pollutant loadings. The project involves the construction of a new 4-foot by 8-foot box culvert storm drain to convey the separated stormwater to a new 10.3 acre-foot wetland in the Alewife Brook Reservation.

Figure 5: Rendering of Alewife Wetland Basin

The basin will provide detention storage and the control of pollutants associated with urban stormwater by natural processes in the constructed wetland system. In addition to these functional objectives, the design of the basin incorporates other "green technology" attributes that are intended to provide or enhance plant and wildlife habitat, natural flood control, wetlands treatment, and recreational and educational benefits, consistent with DCR's Alewife Brook Reservation Greenway Master Plan.

The revised CSO control plan for the Alewife Brook comprises six component projects (Table 1), each with its own design and construction milestones in Schedule Seven (Table 2). The location of projects is shown in Figure 6. Together, these projects are predicted to reduce annual CSO volume to the Alewife Brook by 85% in a typical year, from 50 million gallons in 1997 to 7.3 million gallons. CSO activations in a typical year will be reduced from 63 in 1997 to seven. MWRA hydraulic model and water quality model simulations predict that the recommended control levels will comply with Class B (fishing and swimming) water quality criteria 98.5 percent of the time.

Table 1: Alewife Brook CSO Control Plan Project Components

Project	Capital Cost[(1)] (millions)	Cambridge Contract No.	Benefit
CAM004 Stormwater Outfall and Wetland Basin	$25.3	12	Convey stormwater flows to wetland system for attenuation and treatment.
CAM004 Sewer Separation[(2)]	78.2	8A,8B, 9	Remove large quantities of stormwater from the sewer system; eliminate CSO at Outfall CAM004.
CAM400 Manhole Separation	5.0	4/13	Remove stormwater from the sewer system; eliminate CSO at Outfall CAM400.
Interceptor Connection Relief and Floatables Control	3.5		Upgrade connections between Cambridge and MWRA systems to provide relief; add floatables control.
MWR003 Control Gate and Rindge Ave. Siphon Relief	3.1	MWRA Contracts	Optimize hydraulic conveyance; minimize overflows while controlling system flooding in large storms.
SOM01A Connection with Floatables	1.1		Upgrade connection and provide floatables control
Total Cost	$116.2		

(1) Includes MWRA and City of Cambridge cost shares, based on latest design and construction cost estimates.

(2) Also includes initial construction contracts completed by Cambridge by 2002.

Revised Project Schedules and New Court Milestones

Design and construction milestones for the revised Alewife Brook projects were added to the court schedule in 2006 in accordance with and as part of the agreement MWRA reached with the U.S. Environmental Protection Agency, Region 1 (EPA) and Massachusetts Department of Environmental Protection (DEP) on a revised regional long-term CSO control plan (see Chapter 5). MWRA and Cambridge were unable to meet the new milestones due to a citizens' appeal of a Superseding Order of Conditions issued pursuant to the Wetlands Protection Act by DEP for the CAM004 stormwater outfall and wetland basin. The appeal process commenced in April 2005 and concluded in May 2009.

Although the appeal was still ongoing in October 2008, Cambridge resumed design of CAM004 stormwater outfall and wetland basin and commenced design of CAM400 common manhole separation and interceptor connection relief and floatables control at CAM002 and CAM401B, and floatables control at CAM001. Cambridge was able to move forward with the single construction contract that combined the CAM400 manhole separation project and the interceptor relief and floatables controls at CAM002 and CAM401B and floatables control at CAM001 project in January 2010, and completed all work in March 2011.

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 (Contract 12)			Apr 11	Apr 11	Apr 13	Apr 13
CAM004 Sewer Separation	Jan 97	Jan 97	Jul 98 Sep 12	Jul 98 Sep 12	Dec 15	Dec 15
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	Sep 13	Jun 14	Jun 14

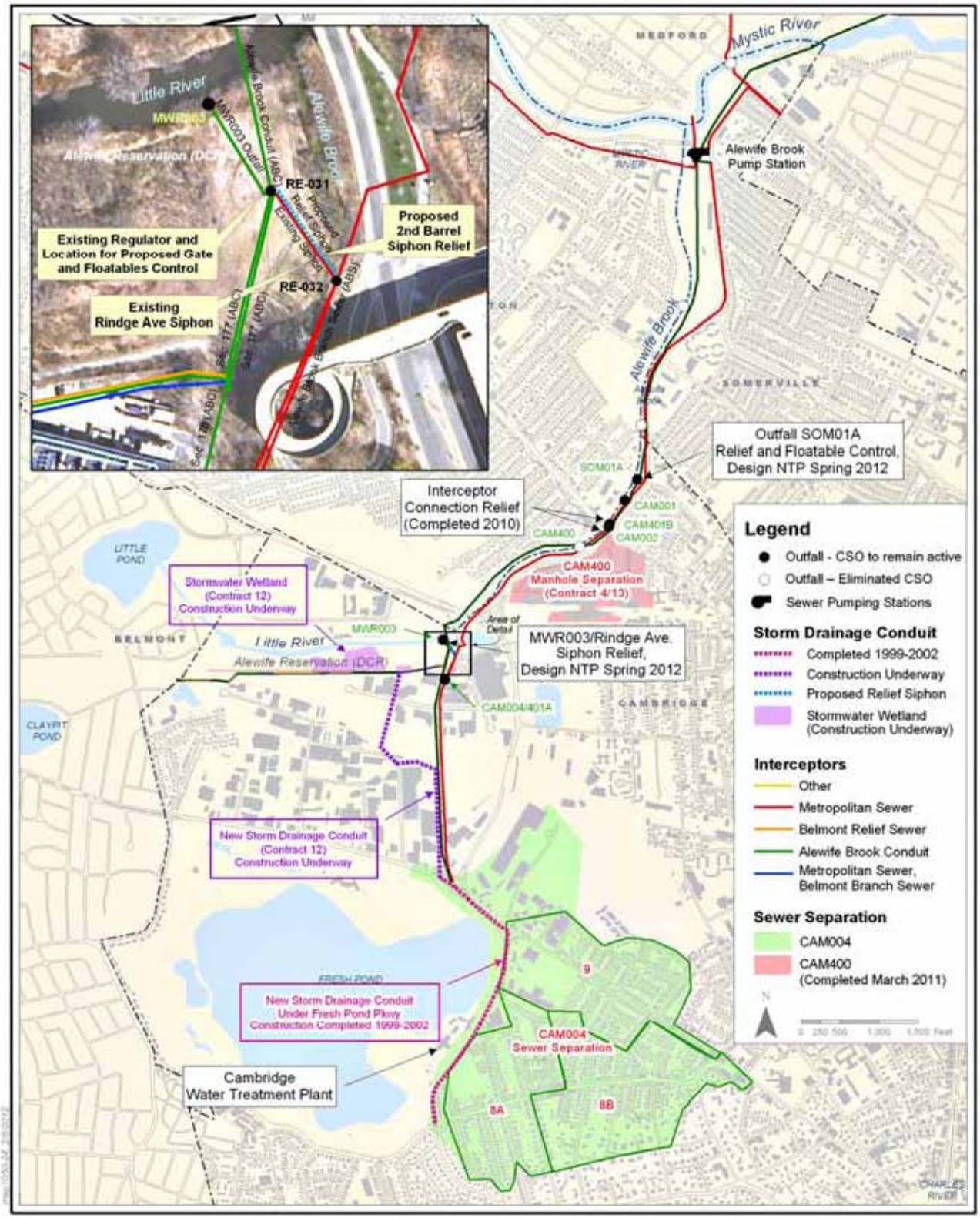
***** Cambridge met reported project schedules that were revised due to citizens' appeals of the wetlands permit for Contract 12.

However, Cambridge was unable to proceed with construction of the CAM004 wetland basin and stormwater outfall due to difficulties in obtaining easements and rights of entry from private and public land owners. Cambridge was able to issue a Limited Notice to Proceed with construction on April 26, 2011, which authorized the contractor to proceed with all work of the contract except the work on the parcels where easements and rights of entry had not yet been secured. After obtaining fully executed easements and rights of entry for the remaining properties on May 5, 2011, Cambridge was able to issue the full notice to proceed with construction of CAM004 stormwater outfall and wetland basin on May 23, 2011.

With an assurance of the construction schedule for the CAM004 stormwater outfall and wetland, MWRA filed a motion with the Court on July 13, 2011, proposing new court milestones for the Alewife projects. The Court allowed the motion on July 14, 2011, and incorporated the milestones into Schedule Seven on September 15, 2011.

DCR Alewife Brook Reservation

Figure 6
Alewife Brook CSO Control



In Schedule Seven, the construction milestones for the CAM004 stormwater outfall and detention basin (Contract 12 – commence construction April 2011; complete construction April 2013) maintains the original two-year construction duration. The construction schedule for CAM004 sewer separation (commence construction September 2012; complete construction December 2015) maintains the December 2015 completion date for the Alewife Brook long-term CSO control plan. The schedules for the MWRA-managed control gate/floatables control at Outfall MWR003 and MWRA Rindge Avenue Siphon relief project and the interconnection relief and floatables control at Outfall SOM01A project (commence design April 2012; commence construction August 2014/September 2013; complete construction October 2015/June 2014) allow MWRA to incorporate into the design of these projects the final design and early construction information from the CAM004 sewer separation project.

Progress in 2011 and Ongoing Work

The City of Cambridge issued a Limited Notice to Proceed with construction of the CAM004 stormwater outfall and wetland basin on April 26, 2011, and a Full Notice to Proceed on May 23, 2011. In the area where the stormwater wetland basin is to be constructed, Cambridge's contractor completed the placement of an 8-inch gas line, a 36-inch electric bundle, three 4-inch telecommunication conduits and City of Cambridge 10-inch water main and 12-inch sewer force main. The contractor also cleared the 3.4-acre area to be used for the wetland basin, commenced excavation of the basin, and completed the wetland basin outlet structure, the perimeter berm surrounding the basin and the French drain system. Deeper excavation and shaping of the basin is in progress.

Launching Electric Bundle into Pit

Perimeter Berm at Future Wetland Basin

Stormwater Diversion Structure

The contractor also continues with construction of the new storm drain box conduit and associated special structures that will ultimately convey separated stormwater flows to the basin. The contractor has completed major sections of the box conduit, including the section that crosses beneath MBTA's high speed commuter rail tracks and sections on and near Fawcett Street. Construction of a large concrete stormwater diversion structure, the relocation of an 18-inch sewer behind 70 Fawcett Street, and the relocation of water mains and sanitary sewers on Wheeler Street are all complete. The Contractor expects to complete a special structure that allows the conduit to pass over existing MWRA interceptor sewers, along with the connection from this structure to the forebay of the wetland basin, this month. Further south, the Contractor will soon commence installation of the box conduit section between the railroad tracks and Cambridge Park Drive. Overall, the contract is approximately 40% complete.

In the meantime, work on the design of the remaining three construction contracts to complete the CAM004 sewer separation project (Cambridge contracts 8A, 8B and 9) is also progressing. The project involves the separation of sewers upstream of Outfall CAM004 in the Huron Avenue and Concord Avenue neighborhoods, east of Fresh Pond. The removal of large volumes of stormwater from the Cambridge sewers upstream of Outfall CAM004 will greatly reduce CSO discharges (greater than 85% annual volume reduction) at the several outfalls along Alewife Brook and will allow Cambridge to close Outfall CAM004.

In December 2011, Cambridge's design consultant submitted a report on the intensive field investigations it conducted for these contracts. Final design of Contract 8A is approximately 60% complete, and Cambridge plans to advertise the construction contract for bids in early summer 2012 and issue the Notice to Proceed with Contract 8A by September 2012, in compliance with Schedule Seven. Cambridge also plans to commence final design of contracts 8B and 9 in March 2012 and March 2013, respectively, and issue notices to proceed with the construction contracts sequentially thereafter, on a schedule that will enable all sewer separation work to be complete by December 2015, in compliance with Schedule Seven. Cambridge plans to conduct community outreach and field investigations, such as TV inspection and pipeline assessment, specific to the Contract 8B area this spring.

Control Gate and Floatables Control at Outfall MWR003 and MWRA Rindge Avenue Siphon Relief Interceptor Connection Relief and Floatables Control at Outfall SOM01A

While the City of Cambridge is implementing four of the six projects in the Alewife Brook CSO control plan, MWRA will design and construct the remaining two projects. These projects include an automated hydraulic relief gate at the overflow weir associated with MWRA's Outfall MWR003 and floatables control for this outfall, along with relief of the 30-inch diameter MWRA siphon associated with Outfall MWR003, and hydraulic relief and floatables control for the City of Somerville's Tannery Brook connection to MWRA's interceptor system at Outfall SOM01A (see Figure 6, page 15). The design of these two projects will consider updated system performance conditions, the level of stormwater inflow removal that is planned to be achieved from Cambridge's CAM004 sewer separation project, now in design, and the remaining hydraulic performance needs of the MWRA's Alewife Brook interceptor system.

MWRA plans to award one design contract that will include both projects. On November 2, 2011, MWRA advertised the Request for Qualifications and Proposals with a detailed engineering scope for design and engineering services during construction. MWRA is reviewing the several proposals that were submitted by interested firms by the deadline of January 13, 2012. MWRA plans to award the design contract and issue Notice to Proceed by April 2012, in compliance with Schedule Seven.

Brookline Sewer Separation

	Court Milestone	Project Schedule
Commence Design	November 2006	November 2006
Commence Construction	November 2008	November 2008
Complete Construction	July 2013	July 2013

The $25.4 million Brookline sewer separation project includes two construction contracts managed by the Town of Brookline with MWRA funding support and an outfall rehabilitation contract managed by MWRA. The project is providing separate sanitary sewers and storm drains for approximately 72 acres of the Town of Brookline that were served by local combined sewers tributary to MWRA's Charles River Valley Sewer (see Figure 7). The project goal is to reduce treated CSO discharges to the Charles River at MWRA's Cottage Farm Facility and generally relieve wet-weather hydraulic surcharge conditions in the Town and MWRA systems that can contribute to Charles River CSO discharges at other, untreated outfalls.

The project was recommended by MWRA and approved by EPA and DEP in March 2006 as part of a broader agreement on the Long-Term Control Plan that proposed to increase the level of CSO control for the Charles River Basin above the level MWRA had recommended in the 1997 CSO Facilities Plan. MWRA and the Town of Brookline executed a CSO Memorandum of Understanding and Financial Assistance Agreement in July 2006 by which Brookline agrees to manage design and construction of the sewer separation work and own the constructed facilities (new sewer and storm drains) and ensure that CSO control goals and other project performance objectives are met. MWRA is funding the Town's design and construction related work pursuant to the eligibility terms of the agreement. MWRA is also managing the cleaning and rehabilitation of Outfall MWR010, which will be used to convey the large volumes of stormwater removed from Brookline's combined sewer system to the Charles River Basin.

Progress in 2011 and Ongoing Work

Brookline completed the $1.4 million first construction contract ("Phase I") in January 2010, which involved the installation of 5,658 linear feet of storm drain in secondary streets on the north and south sides of Beacon Street. Brookline issued the Notice to Proceed with the $16.6 million second construction contract ("Phase II") on January 19, 2011. Phase II (see project work areas in Figure 8) includes the installation of 3,790 linear feet of storm drain and 1,290 linear feet of sanitary sewer by open trench method and 4,550 linear feet of sanitary sewer by microtunneling. The contract involves micro-tunneling large diameter sewers at significant depths along Beacon and Monmouth Streets; installing and/or rehabilitating smaller-diameter sewers along Beacon, Monmouth and St. Mary's Streets; installing storm drains along the same streets; and converting a large-diameter combined sewer along St. Mary's Street to a storm drain. As part of this project, Brookline is constructing several large, special structures that will connect the new town sewers to existing town laterals and to MWRA's interceptor system, including MWRA's Charles River Valley Sewer and South Charles Relief Sewer.

Figure 7: Brookline Sewer Separation Project

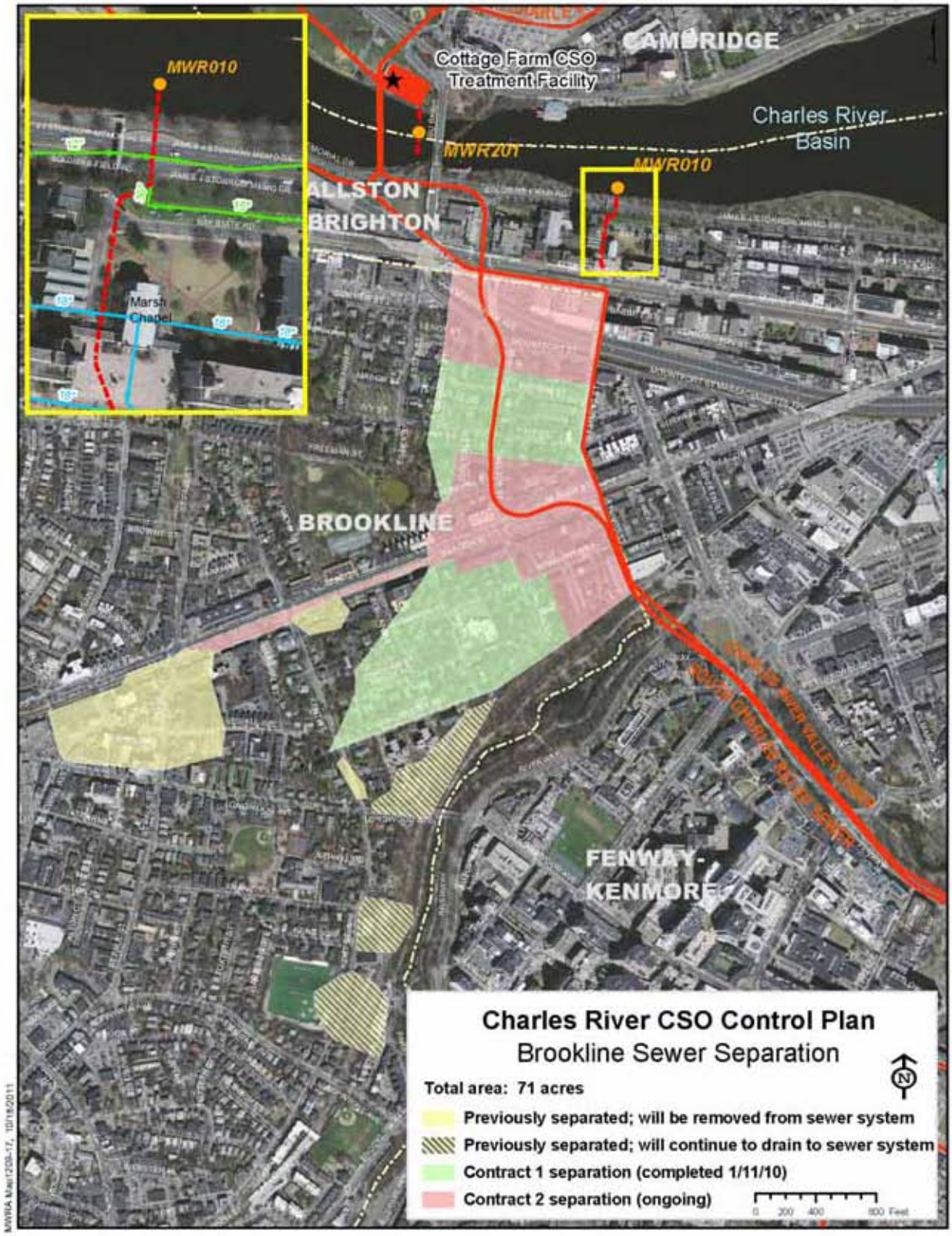


Figure 8: Brookline Sewer Separation Phase II Project Areas

Phase II is approximately 60 percent complete. Brookline's contractor completed both the 490-foot long microtunneling portion and the 180-foot long open cut portion of a new 57-inch diameter sewer on Monmouth Street, as well as the microtunneling installation of 1,480 linear feet of 18-inch diameter sanitary sewer along St. Mary's Street and along Beacon Street from Carlton Street to St. Mary's Street. More recently, the contractor completed the microtunneling installation of 2,240 linear feet of 48-inch diameter sanitary sewer on Beacon Street between Carlton and Kent streets and the open-cut installation of 90 linear feet of 12-inch diameter drain in Carlton Street between Beacon and Churchill streets. The contractor completed the 140 linear feet of 48-inch sewer micro tunneling under the MBTA tracks on Beacon Street at Carlton Street, while keeping the MBTA C-line trains under normal operation, this required significant coordination with the MBTA. The contractor has also completed the installation of 650-linear feet of 42-inch diameter storm drain on Beacon Street (inbound) between Carlton and St. Mary's streets and has commenced the installation of a 12-inch diameter sewer and 30-inch diameter storm drain in St Mary's Street from Beacon to Monmouth streets.

The contractor has essentially completed special structures 3, 4 and 5, with only invert construction remaining, which the contractor plans to perform this spring. In the meantime, the contractor has backfilled these structures. Structures No. 1 and 2 will be constructed later in the contract schedule. Work on the contract was temporarily suspended during the winter of 2012, but is scheduled to resume in mid-March with new pipe installation along the southern end of St. Mary's Street (near Beacon Street), as well as the lining of a 48-inch sewer on Beacon Street between special structures 3 and 4. Brookline expects the contractor to substantially complete Phase II, and therefore the overall sewer separation project, ahead of the July 2013 milestone in Schedule Seven.

Sewer separation work typically involves miles of pipe installation along all or most streets in a community or neighborhood, in both residential and commercial areas. The pipe sizes can be large, and deep excavations are sometimes required to install the new pipes low enough to be able to tie building sewers or storm drain laterals into them. Because the areas of Brookline being separated are primarily at the downstream end of the Town's sewer system, the new pipes must be installed even deeper, as deep as 30 feet. To mitigate the impacts that open-cut trench work would have on car, trolley and pedestrian travel and commercial parking along Brookline's busy commercial streets, most notably Beacon Street, Brookline chose to perform much of the pipe installation with the microtunneling method, as MWRA had done with the East Boston Branch Sewer Relief project.

A detailed description of the microtunneling operation on the Brookline sewer separation project (along with the photo at right) can be found in the January 20, 2012 issue of *Trenchless Technology* magazine, at http://www.trenchlessonline.com/index/webapp-stories-action/id.2072/title.microtunneling-in-brookline,-mass.

MWRA continues to move forward with cleaning of CSO Outfall MWR010 to ensure that the outfall has adequate capacity to convey Brookline's separated stormwater to the Charles River Basin. The outfall, a CSO discharge location permitted to MWRA, will also continue to carry some BWSC stormwater and infrequent CSO discharges from MWRA's Charles River Valley Sewer and BWSC combined sewers. The outfall crosses Boston University property from Commonwealth Avenue, then crosses beneath Storrow Drive and the Esplanade to the Charles River. MWRA received construction bids for the cleaning on February 23, 2012, and plans to award the contract in March. By agreement with Boston University, MWRA plans to issue Notice to Proceed with the construction contract in June 2012. MWRA expects the contract work to be substantially complete by August 2012, in advance of the Town of Brookline's completion of sewer separation.

Reserved Channel Sewer Separation

	Court Milestone	Project Schedule
Commence Design	July 2006	July 2006
Commence Construction	May 2009	May 2009
Complete Construction	December 2015	December 2015

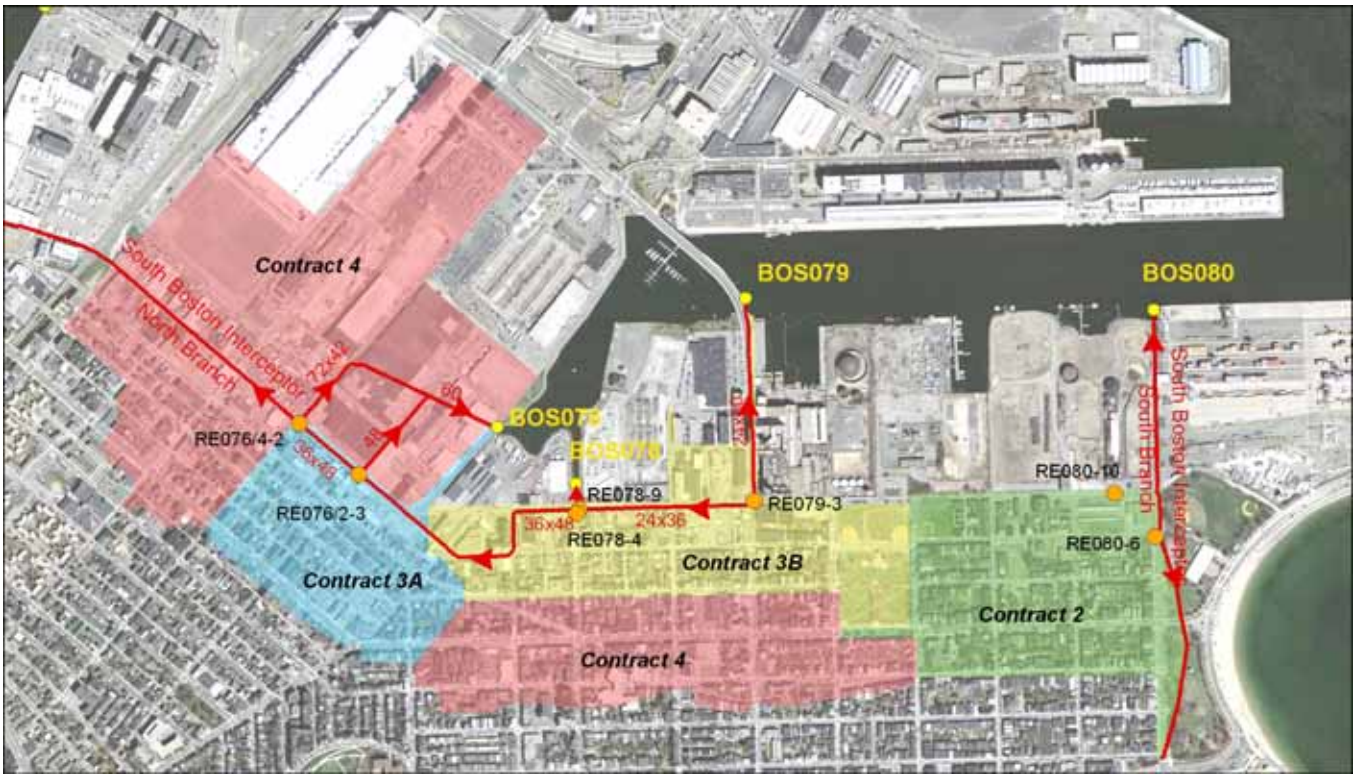
The $62.3 million Reserved Channel Sewer Separation project is intended to minimize CSO discharges and impacts to the Reserved Channel by separating combined sewer systems in a portion of South Boston tributary to CSO Outfalls BOS076, BOS078, BOS079 and BOS080 (see Figure 9). Implementation of the approved 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 form 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 rehabilitating and/or upgrading the four CSO outfalls to ensure they have the capacity to deliver the separated stormwater flows, as well as remaining, infrequent CSO flows, to the Reserved Channel for the long term.

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

MWRA and BWSC added this project to their CSO Memorandum of Understanding and Financial Assistance Agreement in June 2006. BWSC is responsible for managing design and construction of the project and ensuring that CSO control goals and other project objectives are met, and it will own the new storm drains and upgraded sewers. MWRA is funding design and construction costs pursuant to the eligibility terms of the agreement. BWSC commenced design in July 2006, in compliance with Schedule Seven. The design work and construction contracts for the Reserved Channel sewer separation project follow an approach similar to the South Dorchester Bay and Stony Brook sewer separation projects, with multiple design packages and construction contracts sequenced over several years.

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). In October 2010, BWSC attained substantial completion of the $6.9 million first construction contract, which involved the installation of 8,380 linear feet of storm drain, approximately 3,960 linear feet of minor drain (up to 8-inch diameter), and 3,370 linear feet of sanitary sewer to separate combined sewers in a 55-acre area of South Boston approximately bounded by East First Street, Farragut Road, East Fourth Street and N Street. The work removed stormwater from the local sewers tributary to the upstream end of BWSC's South Boston Interceptor, South Branch ("SBI-SB"), with the benefits of 1) reducing CSO overflows to the Reserved Channel at Outfall BOS080 and 2) reducing surcharging within the SBI-SB and 3) reducing CSO discharges from the SBI-SB, which are now captured by the North Dorchester Bay CSO storage tunnel.

Figure 9. Reserved Channel Sewer Separation Contracts



Construction Contracts		% Complete	Construction Dates
Contract 1	Outfall Rehabilitation	100%	2010-2011
Contract 2	Sewer Separation	100%	2009-2011
Contract 3A	Sewer Separation	55%	2010-2012
Contract 3B	Sewer Separation	20%	2010-2013
Contract 4	Sewer Separation		2012-2014
Contract 5	Sewer Cleaning/Lining		2013-2014
Contract 6	Downspout Disconnections		2012-2014
Contract 7	Paving	100%	2010-2012
Contract 8	Paving		2012-2015

Progress in 2011 and Ongoing Work

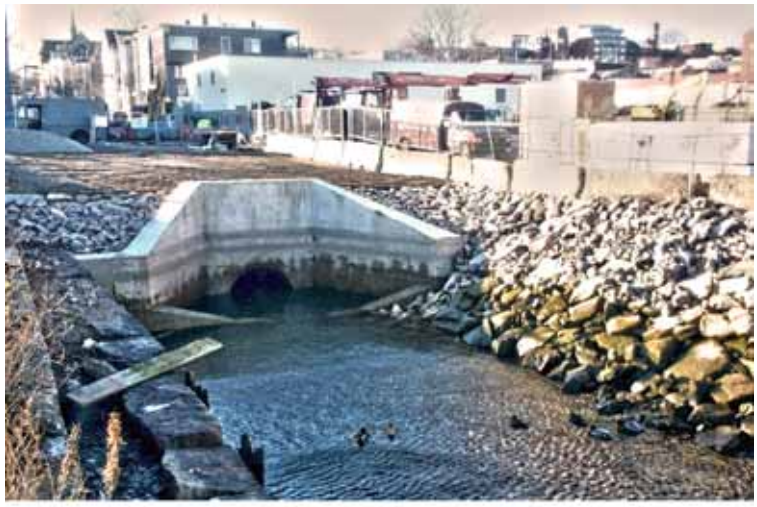
BWSC has continued to make substantial progress with design and construction activities on a schedule that calls for completion of all work by December 2015, in compliance with Schedule Seven. The following describes the progress of each construction contract.

- In December 2011, BWSC attained substantial completion of the $4.0 million second construction contract (Contract 1), with only punch list items and site restoration work remaining, including the installation of bar racks at the outfalls. 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. The work varied at the outfalls, as-needed, and primarily included outfall pipe repair and cleaning, installation of large-diameter storm drain connections from the new storm drains in East First Street to the outfalls, installation of new tide gates, and construction of new headwalls and other shoreline protection. The contract also includes extensive surface restoration work.

Placement of tidegate chamber at Outfall 076 on Papas Way

Bridge guard rail and outfall headwall construction on Papas Way



Completed Rehabilitation of Outfall BOS078

- BWSC issued Notice to Proceed with the $9.9 million Contract 3A in December 2010, and the contract is approximately 55% complete. It involves sewer separation in a 33-acre area of South Boston approximately bounded by West First Street, G Street, West Broadway and E Street. Contract 3A includes the installation of 9,000 linear feet of storm drain and 3,375 linear feet of sanitary sewer to separate combined sewers in an area tributary to Outfall BOS076, as well as 8,650 linear feet of replacement water main to remove conflicts with the planned storm drains. The contract also includes the installation of 22 new catch basins and the disconnection of 76 existing catch basins from the sewer system and reconnection to the new drains. The contractor has completed Special Drain Manhole A at West First and E streets, as well as 3,300 linear feet (79%) of the planned large storm drains and sewers (24-inch to 84-inch diameter). The contract completion date is July 31, 2013.

42" sewer and 16" water main installation on West First Street

Installation of Special Manhole C at West First Street and F Street

- On April 1, 2011, BWSC issued the Notice to Proceed with the $10.9 million Contract 3B for sewer separation in a 66-acre area of South Boston approximately bounded by East First Street, N Street, East Third Street and Dorchester Street, and including Elkins Street and Summer Street to the edge of the Reserved Channel, and the contract is approximately 10% complete. Contract 3B includes 10,730 linear feet of new storm drain and 4,240 linear feet of new sanitary sewer to separate the combined sewers in a 66-acre area tributary to outfalls BOS078 and BOS079, as well as 10,900 linear feet of replacement water main to remove conflicts with the planned storm drains. Fourteen new catch basins will be installed, and 120 existing catch basins will be disconnected from the sewer system and reconnected to new storm drains. While most of the completed work to date has involved the relocation of water mains, the contractor has commenced work to install 860 linear feet of 60-inch storm drain, Special Structure A, and new sewer manholes in East First Street. The contract completion date is December 30, 2014.

- BWSC has attained substantial completion of the $1.2 million Contract 7, the first of two planned pavement restoration contracts in April 2012. The contractor placed more than 18,700 square yards of pavement for permanent trench repair and more than 16,400 linear feet of pavement markings.

- BWSC has completed design work for the estimated $12.9 million Contract 4, the last of the major sewer separation contracts for this project, and expects to issue Notice to Proceed by August 2012. Contract 4 will separate sewers in a large area west of Reserved Channel that is tributary to Outfall BOS076, and in a large area south of Reserved Channel, along and near East Broadway that is tributary to Outfall BOS 078. The contract estimated completion date is December 2014.

- BWSC has completed design work for the estimated $11.3 million Contract 8, the second of the two pavement restoration contracts, and expects to issue Notice to Proceed by June 2012. The paving contract will encompass the Contract 3A, 3B, and 4 areas and will be completed in 2015.

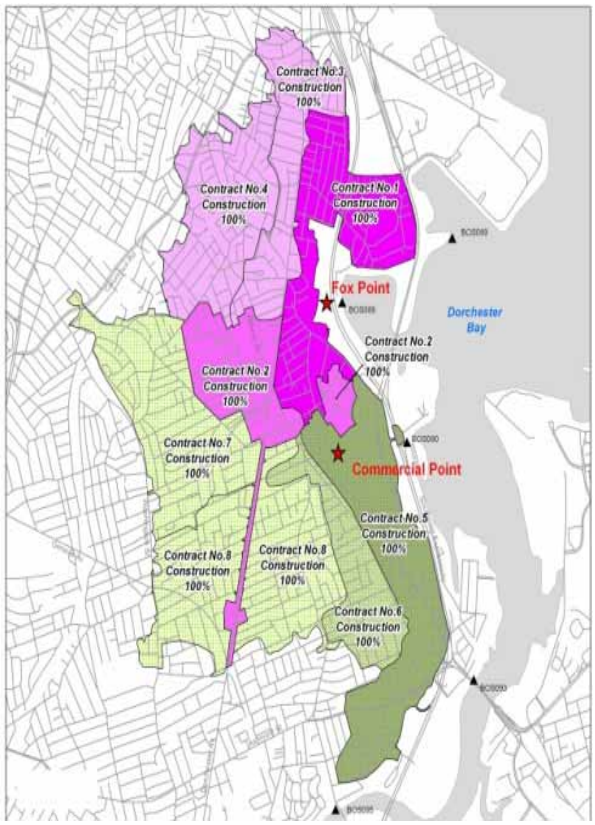
BWSC has had to redesign portions of work within contracts 3A and 3B to avoid utility conflicts found during construction. BWSC is coordinating with NStar, National Grid, Verizon and Comcast to resolve the conflicts and expects to issue associated change orders to the two construction contracts. BWSC also continues work on the remaining project design activities. BWSC plans to award the remaining three construction contracts for this project (Contract 5 – sewer cleaning and relining, and Contract 6 – downspout disconnections, in 2013 and complete all work by December 2015, in compliance with Schedule Seven.

2.4 Other CSO Control Improvements

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

South Dorchester Bay Inflow Removal

BWSC continues to investigate whether additional stormwater removal (i.e. disconnection of undocumented sources of inflow/infiltration) can be achieved in sewer systems tributary to the Dorchester Interceptor. These investigations follow BWSC's substantial completion of the $118.7 million South Dorchester Bay Sewer Separation project in 2007. The purpose of the 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 by sending excess flows to the outfalls. 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. In November 2010, BWSC awarded a design contract to identify sources of stormwater inflow/infiltration in the Dorchester Interceptor system through a combination of record plan reviews and field investigations, including a flow metering program. BWSC expects to receive a report in 2012 with the results of these investigations and the consultant's conclusions and recommendations. BWSC and MWRA will coordinate in reviewing these findings and with the goal of setting a construction plan and schedule for implementation.



Lower Dorchester Brook Sewer Improvements

On August 16, 2010, BWSC issued Notice Proceed with a $6.0 million construction contract for relocation of CSO regulator RE-070/11-2 and sewer separation in a portion of the South Bay area associated with BWSC's Lower Dorchester Brook Sewer (see Figure 10). The work is partially funded by MWRA and is intended to lower CSO discharges to BWSC's Dorchester Brook Conduit and help attain the level of CSO control in MWRA's long-term control plan for Fort Point Channel. The work includes relocating CSO regulator RE-070/11-2 and separating combined sewers in a limited area tributary to the new regulator. Relocating the regulator will allow stormwater flows in already separated drainage systems that now tie back into the sewer system to be redirected to the Dorchester Brook Conduit and Fort Point Channel, providing relief to the combined sewer system and reducing CSO discharges. Completion of the work was delayed due to structural problems that were found along an upstream section of the Lower Dorchester Brook Sewer, which feeds flows to the regulator. With completion of the repair work, the contractor made the final pipe connections from the Lower Dorchester Brook Sewer to the new regulator chamber, permanently sealed the

old regulator, and attained substantial completion in February 2012. BWSC is now developing a post-construction flow monitoring program that will help confirm the remaining level of CSO discharge to the Dorchester Brook Conduit and Fort Point Channel and whether long-term levels of control have been met.

East Boston Sewer Separation

In 2006, EPA and DEP approved a revised recommended level of control for CSO discharges to Boston Inner Harbor and the Chelsea Creek at outfalls BOS003-014 along the East Boston waterfront. At the same time, EPA and DEP approved a revised schedule for the East Boston Branch Sewer Relief project, which was subsequently accepted by the Federal Court and incorporated as revised design and construction milestones in Schedule Seven. At that time, MWRA reported that BWSC intended to pursue a long-term, phased program of sewer separation in East Boston that was expected to close additional CSO outfalls and achieve higher levels of control. MWRA's Long-Term Control Plan did not specifically account for this sewer

separation and had assumed that these outfalls would remain active. In 2009, BWSC completed sewer separation projects in portions of East Boston and permanently closed outfalls BOS006 and BOS007 to CSO discharges (see Figure 1 on page 2 for outfall locations). MWRA completed construction of the East Boston Branch Sewer Relief project in July 2010.

BWSC recently completed an additional sewer separation project in the area tributary to Outfall BOS004. The project has resulted in the removal of substantial quantities of stormwater from the area combined sewers and has reduced CSO discharges at Outfall BOS004. BWSC and MWRA plan to perform additional hydraulic analyses to determine whether Outfall BOS004 can be closed.

Other Community System Improvements

The CSO communities have planned or are currently implementing other infrastructure improvements that are expected to reduce CSO discharge quantity or improve discharge quality. While these projects contribute on the local level to flood control and service improvement, they also provide some relief to the combined sewer interceptor system that is expected, over time, to help reduce CSO discharges. The following are a few examples.

- In addition to the work in East Boston, BWSC is planning sewer separation work in other areas of the City, including projects in the Fenway, the South End and Roxbury.

- The City of Cambridge continues to make progress implementing the phased construction contracts that involve separation of sewers and common manholes in the Cambridgeport area, together with the installation of new storm drain outfalls to the Charles River Basin. This work will remove large quantities of stormwater from the city sewers that convey flows to MWRA's North Charles Relief Sewer and contribute to overflows to MWRA's Cottage Farm Facility in large storms. Cambridge also continues to pursue sewer separation work in other areas tributary to the MWRA's Charles River interceptors and Cottage Farm, which the City has been performing in phases for many years. The work allowed Cambridge to close outfalls CSO outfalls CAM009 and CAM011 several years ago.

- The City of Chelsea recently completed sewer separation work tributary to MWRA's Chelsea Branch Relief Sewer, which should reduce overflow to the Chelsea Creek at Outfall CHE008, and has plans to continue phased sewer separation that should reduce burdens on the MWRA interceptors and further relieve overflow conditions at CHE008. Within the drainage area tributary to Outfall CHE008, Chelsea has completed sewer separation work along Crescent Avenue, is 95% complete with sewer separation along Washington Avenue, and will soon commence design work to separate combined sewers along Broadway.

- The City of Somerville is currently pursuing the rehabilitation of sewers in the area of Assembly Square, in response to the discovery of sewer pipe structural problems that posed a potential threat to the quality of discharges to the Mystic River from MWRA's Somerville-Marginal Conduit.

2.5 MWRA CSO Spending in 2011

MWRA spent $44.9 million in 2011 to implement CSO projects and fund the eligible CSO work of BWSC, Cambridge and Brookline. Of this amount, $41.3 million (92%) was related to construction activities, including $12.6 million to complete the North Dorchester Bay tunnel and related facilities, and $16.3 million for Brookline sewer separation, $10.0 million for Reserved Channel sewer separation and $6.3 million for Cambridge sewer separation at Alewife Brook.

Capital Spending on CSO Control in 2011

Construction:	$33.4 million
Engineering Services During Construction:	7.1 million
Land/Easement/Permits (for construction):	0.8 million
Subtotal Construction Related:	***$41.3 million***
Design:	3.6 million
Total CSO Capital Spending in CY11:	**$44.9 million**

Spending in 2011 brought MWRA's total capital expenditure for the CSO control program to $776 million (90%) of the $860.7 million CSO budget in the Proposed FY13 Capital Improvement Program (CIP). With only six of the 35 projects not yet completed, CSO program activity and spending will continue to slowly wind down from the highest calendar year spending of $128.1 million in 2008. The Proposed FY13 CIP estimates fiscal year spending on CSO control of $50 million in FY12 (July 1, 2011 thru June 30, 2012), $29 million in FY13, $20 million in FY14, $4.6 million in FY15 and $1.2 million in FY16, during which the last of the CSO projects are scheduled to be completed.

3. STATUS OF PLAN IMPLEMENTATION AND BENEFITS ACHIEVED

3.1 Completed Work and Associated CSO Control

Through 2011, MWRA spent $776 million of the total MWRA budget of $860.7 million for CSO control in the Proposed FY13 CIP. With the cooperation of its CSO communities, MWRA has completed 29 of the 35 CSO projects, and 4 projects are currently in construction or design (see Figure 1 on pages 2-3 and Table 3). Since 1987, when MWRA assumed responsibility for developing and implementing a regional CSO control plan, improvements to MWRA's wastewater transport and treatment systems have produced huge reductions in CSO discharges and dramatic improvement in water quality in many areas. These wastewater system improvements included MWRA's $3.8 billion investment in the new Deer Island Treatment Plant and associated conveyance systems and the 29 CSO projects completed to date. Estimated average annual volume of CSO discharge has dropped from 3.3 billion gallons in 1988 to 514 million gallons today (an 84% reduction) with 82% of the current discharge volume receiving treatment at MWRA's four long-term CSO facilities. Figure 11 shows this reduction for each receiving water segment (see Figure 12 for an identification of the water segments currently or formerly affected by CSO).

CSO discharges have been eliminated or virtually eliminated (i.e. 25-year storm level of control) at 37 of the 84 outfalls addressed in the Long-Term Control Plan. Only one outfall recommended to be closed in MWRA's Long-Term Control Plan remains active. Outfall CAM004 is scheduled to be closed with completion of the CAM004 sewer separation project in December 2015.

With completion of the CAM400 common manhole separation project in March 2011, the City of Cambridge closed Outfall CAM400 at Alewife Brook to CSO discharges and converted it to a stormwater-only outfall. With completion of the North Dorchester Bay CSO storage tunnel and related facilities in May 2011, MWRA permanently closed two of the seven CSO outfalls that were active and eliminated CSO discharges at the remaining six outfalls up to the 25-year storm. CSO discharges to the Neponset River (and Tenean Beach), South Dorchester Bay (and Malibu and Savin Hill beaches), and Constitution Beach were eliminated several years ago with completion of CSO projects in those areas.

Table 3: Status of CSO Project Implementation, March 15, 2012

MWRA CONTRACT	CSO PROJECTS IN SCHEDULE SEVEN	IN DESIGN	IN CONSTRUCITON	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	X	
Bulfinch Triangle Sewer Separation				X
Brookline Sewer Separation			X	
Somerville Baffle Manhole Separation				X
Cambridge/Alewife Brook Sewer Separation	CAM004 Outfall and Wetland Basin		X	
	CAM004 Sewer Separation	X	X*	
	CAM400 Manhole Separation			X
	Interceptor Connection Relief/Floatables at CAM001, CAM002, and CAM401B			X
	MWR003 Gate and Rindge Ave. Siphon Relief	Start 4/12		
	Interceptor Connection Relief/Floatables at SOM01A	Start 4/12		
Region-wide Floatables Control and Outfall Closings				X

* In 1997-2002, Cambridge completed design and construction of four initial contracts to separate the CAM004 tributary area.

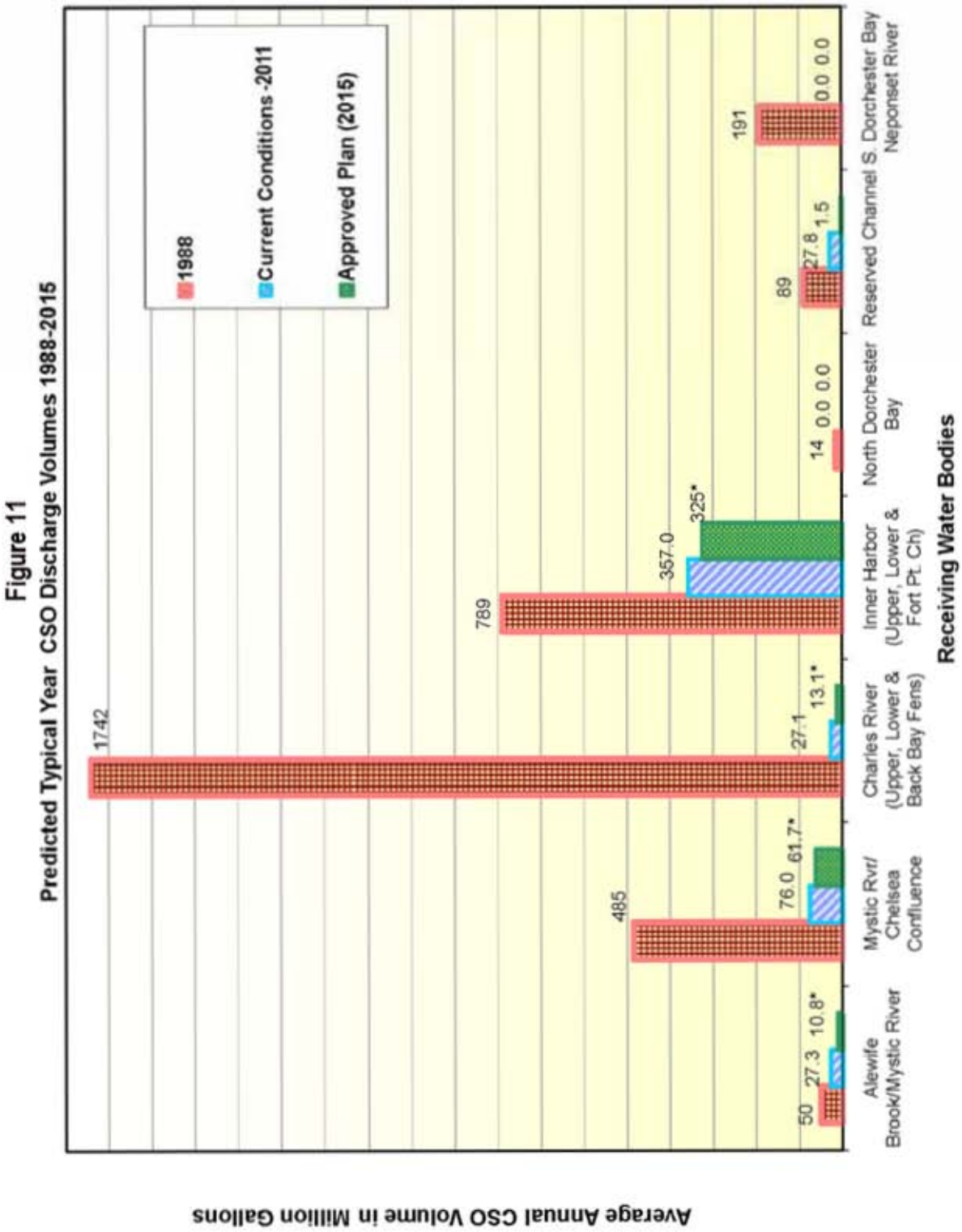


Figure 11
Predicted Typical Year CSO Discharge Volumes 1988-2015
1988
Current Conditions -2011
Approved Plan (2015)
Average Annual CSO Volume in Million Gallons
Receiving Water Bodies
Alewife Brook/Mystic River
Mystic Rvr/ Chelsea Confluence
Charles River (Upper, Lower & Back Bay Fens)
Inner Harbor (Upper, Lower & Fort Pt. Ch)
North Dorchester Bay
Reserved Channel
S. Dorchester Bay Neponset River
50
27.3
10.8*
485
76.0
61.7*
1742
27.1
13.1*
789
357.0
325*
14
0.0
0.0
89
27.8
1.5
191
0.0
0.0

Figure 12: Boston Harbor and its Tributaries

The 37 closed outfalls include several the CSO communities have eliminated, or have closed on a test basis, that were in addition to those recommended for closure in MWRA's Long Term Control Plan. These include two outfalls BWSC eliminated in East Boston (outfalls BOS006 and BOS007). The City of Cambridge continues to evaluate hydraulic conditions associated with two additional outfalls (Charles River Basin outfalls CAM009 and CAM011) it closed in 2007 on an interim basis pending the outcome of hydraulic impact evaluations.

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 benefit of these complementary pollution control programs is 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 27 million gallons today, a greater than 98% reduction. Approximately 86% of this remaining overflow is treated at MWRA's Cottage Farm CSO facility.

These improvements are the result of major wastewater system projects, most notably the new Deer Island Wastewater Treatment Plant and related conveyance and pumping systems, as well as the CSO control projects completed to date. MWRA and the CSO communities along the Charles River completed a set of improvements in the late 1980s that eliminated dry weather sewage overflows at CSO outfalls. They also

completed a set of system optimization projects in the mid-1990s that maximized the existing system's hydraulic performance and lowered CSO discharges. MWRA and the communities have also completed 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) and Bulfinch Triangle Sewer Separation (2010).

In the same period, communities along the Charles River have continued programs aimed at reducing pollution in separate stormwater discharges, including identifying and removing illicit sewer connections or cross connections to their storm drain systems. The CSO and stormwater related improvements, together with sanitary sewer overflow control programs in upstream communities (above the Watertown Dam), have resulted in significant and steady water quality improvement to the Charles River Basin during dry and wet weather conditions, as shown in Figure 13.

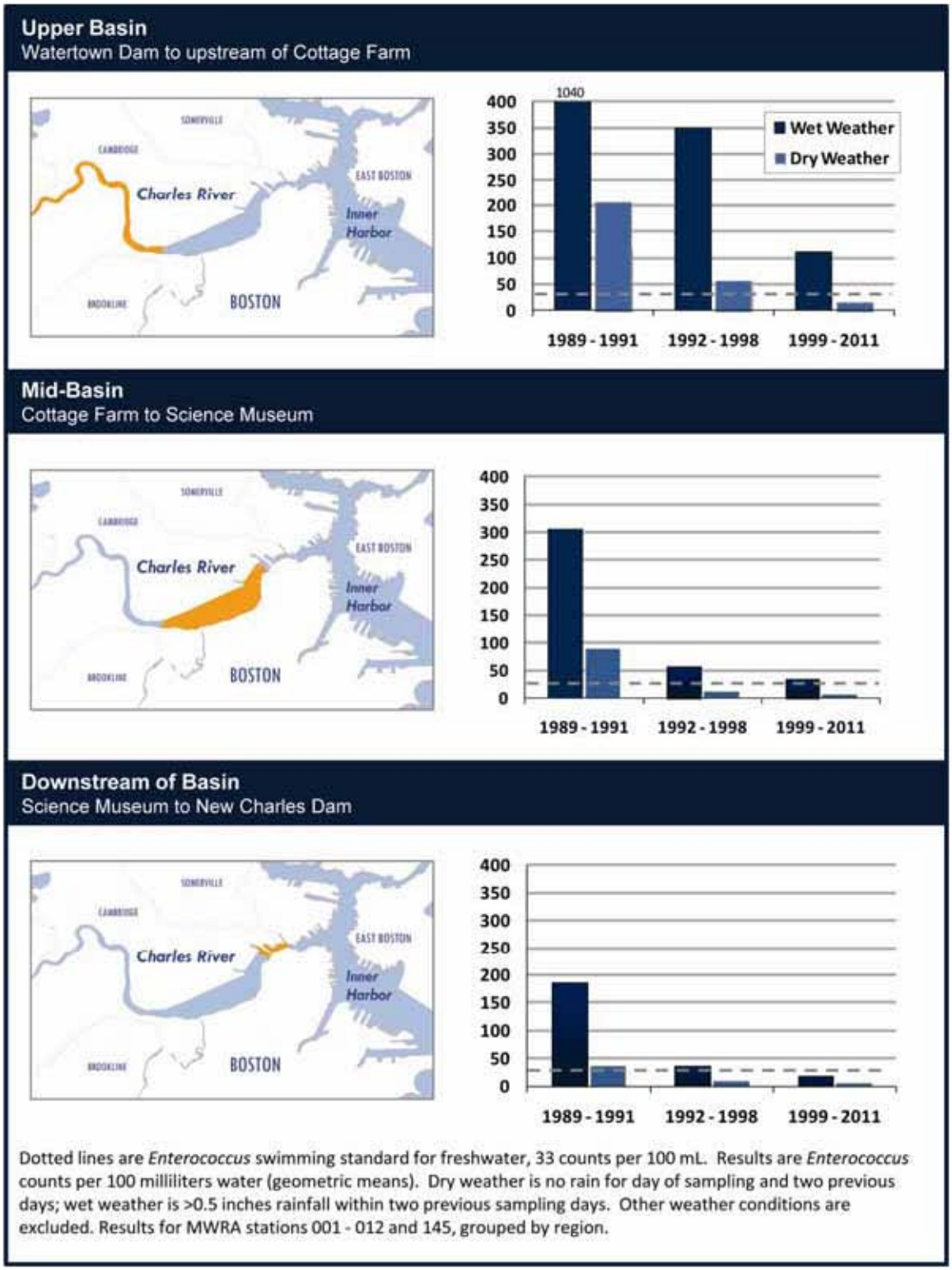
The Charles River Watershed Association (CRWA) has been the primary steward of water quality improvement since before the early days of CSO planning. Since 1965, CRWA has figured prominently in major clean-up and watershed protection efforts, working with MWRA, other government agencies and officials, and citizen groups from 35 Massachusetts watershed towns from Hopkinton to Boston. These initiatives have helped guide the last four decades of water quality improvement in the watershed and fundamentally change approaches to water resource management. From the benefits achieved through the leadership of CRWA and the pollution control efforts of MWRA and watershed communities, the Charles River was selected the 2011 winner of the Theiss International Riverprize by the International River Foundation. CRWA accepted the award, which is the largest and most prestigious environmental prize in the world. The CRWA press release noted "the Charles River is now safe for boating 90 percent of the time due to the dramatic improvements in water quality, and well over a million people enjoy the river and its parklands each year."

Figure 14 shows similar water quality (i.e. average bacteria concentration) improvement over time in the Neponset River. CSO discharges were eliminated in 2000 with completion of the Neponset River sewer separation project. Prior to the project, CSO flows were discharged at two BWSC outfalls in the Granite Street area. Water quality data show improvement after 2000 in the Granite Avenue area, but also in the stretch of the river immediately upstream. Average bacteria level continues to meet water quality standards at the mouth of the Neponset River, where there is considerable dilution with the waters of South Dorchester Bay.

CSO discharges to South Boston beaches were cut almost in half with the improvements to pumping capacity at Deer Island from 1989 to 2000. 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 15. Improvement was greatest in the Upper Inner Harbor and in Chelsea Creek, which had more serious wet weather pollution problems.

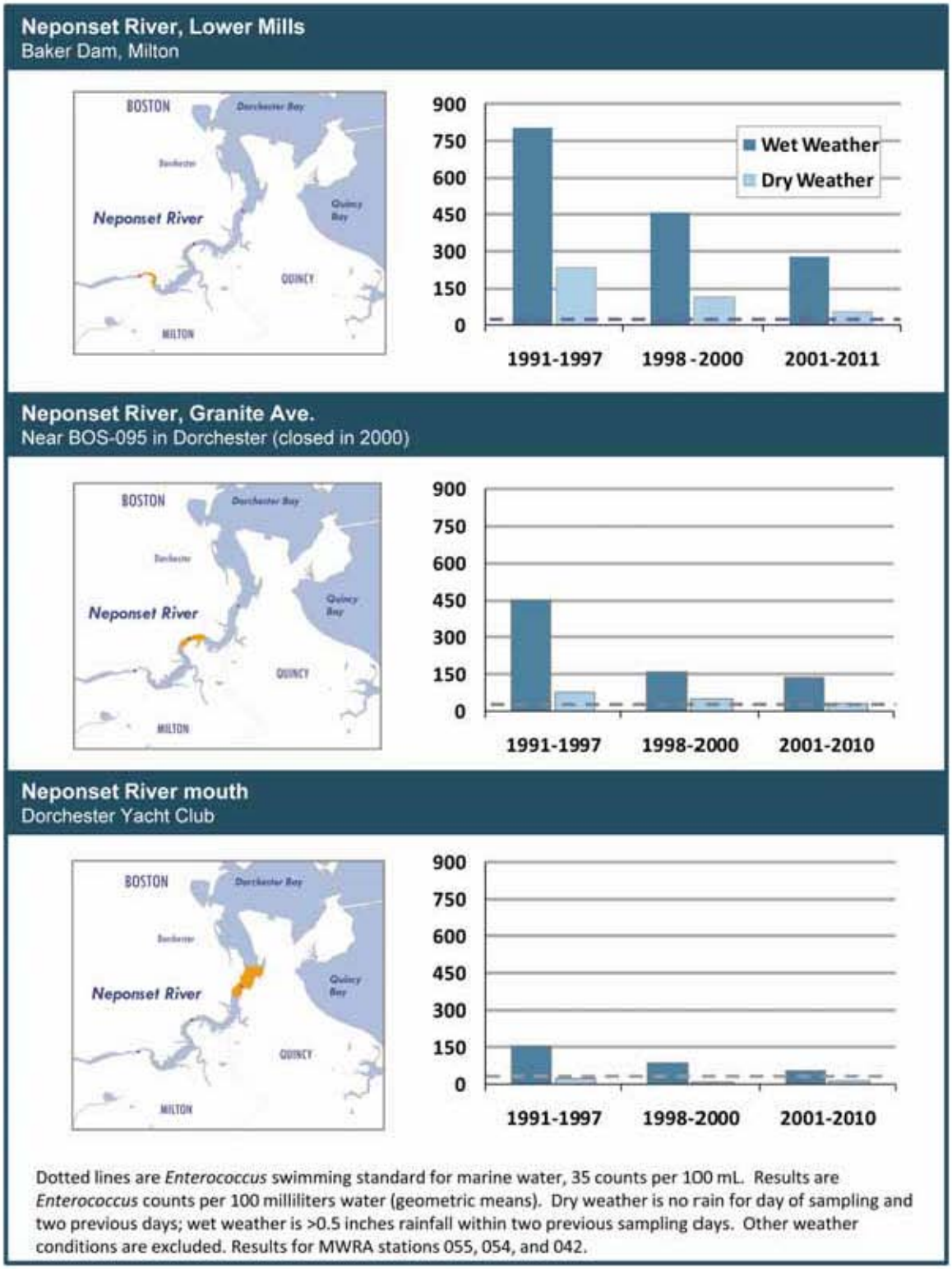
Bacteria data in Figure 16 show that water quality conditions improved greatly with the significant increase in wastewater transport and treatment capacity (delivery to the Deer Island Treatment Plant) in the period 1989 to 1991. This increase in delivery capacity greatly reduced CSO discharges at most 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. The time periods shown in Figure 16 correspond to improvements in MWRA's wastewater transport and treatment systems and the implementation of CSO controls that could affect water quality in the Inner Harbor, as follows.

Figure 13
Change in Lower Charles River Water Quality Over Time
Enterococcus bacteria counts, 1989 – 2011



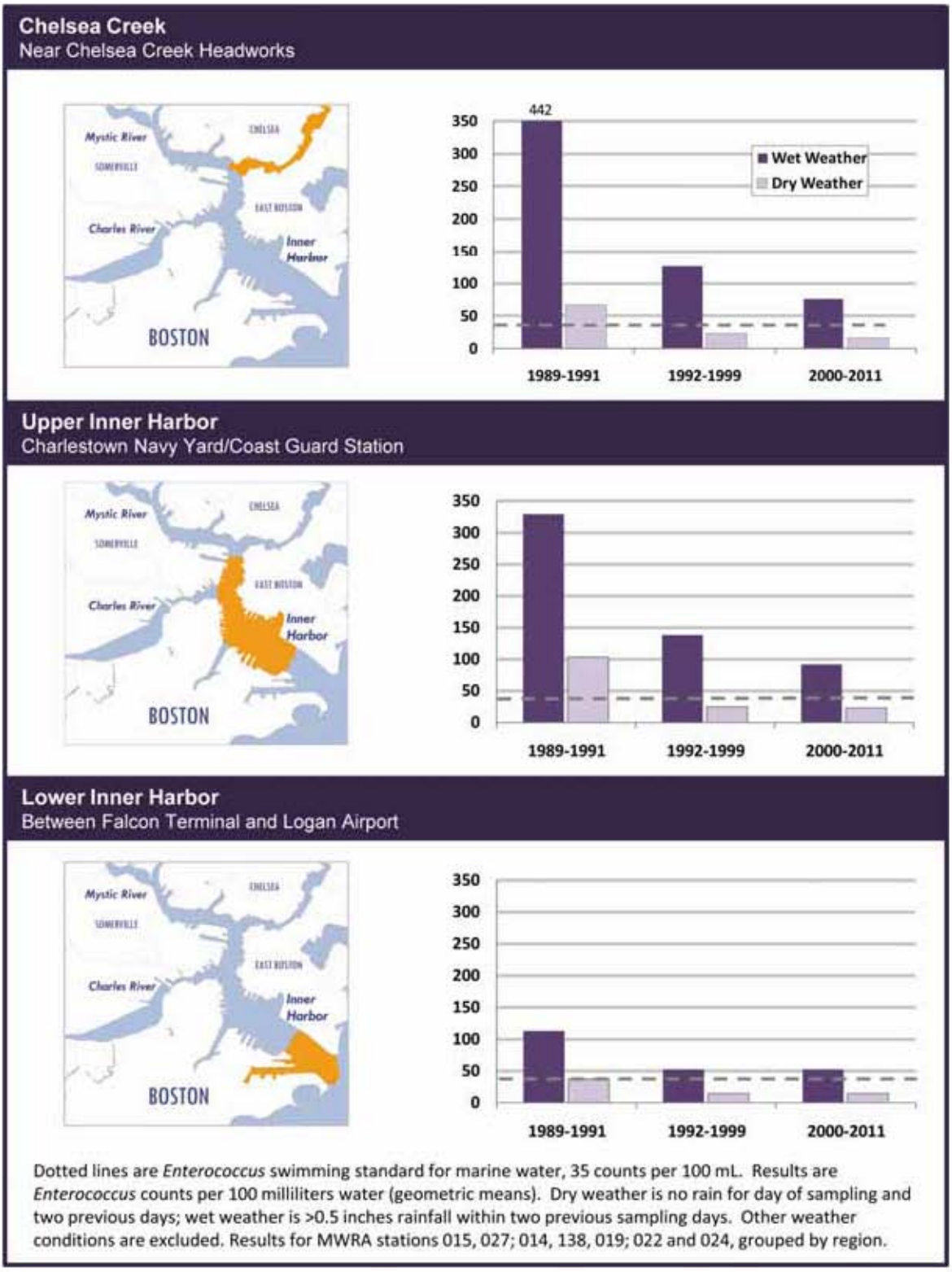
Dotted lines are *Enterococcus* swimming standard for freshwater, 33 counts per 100 mL. Results are *Enterococcus* counts per 100 milliliters water (geometric means). Dry weather is no rain for day of sampling and two previous days; wet weather is >0.5 inches rainfall within two previous sampling days.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

Figure 14
Change in Lower Neponset River Water Quality Over Time
Enterococcus bacteria counts, 1991 - 2011



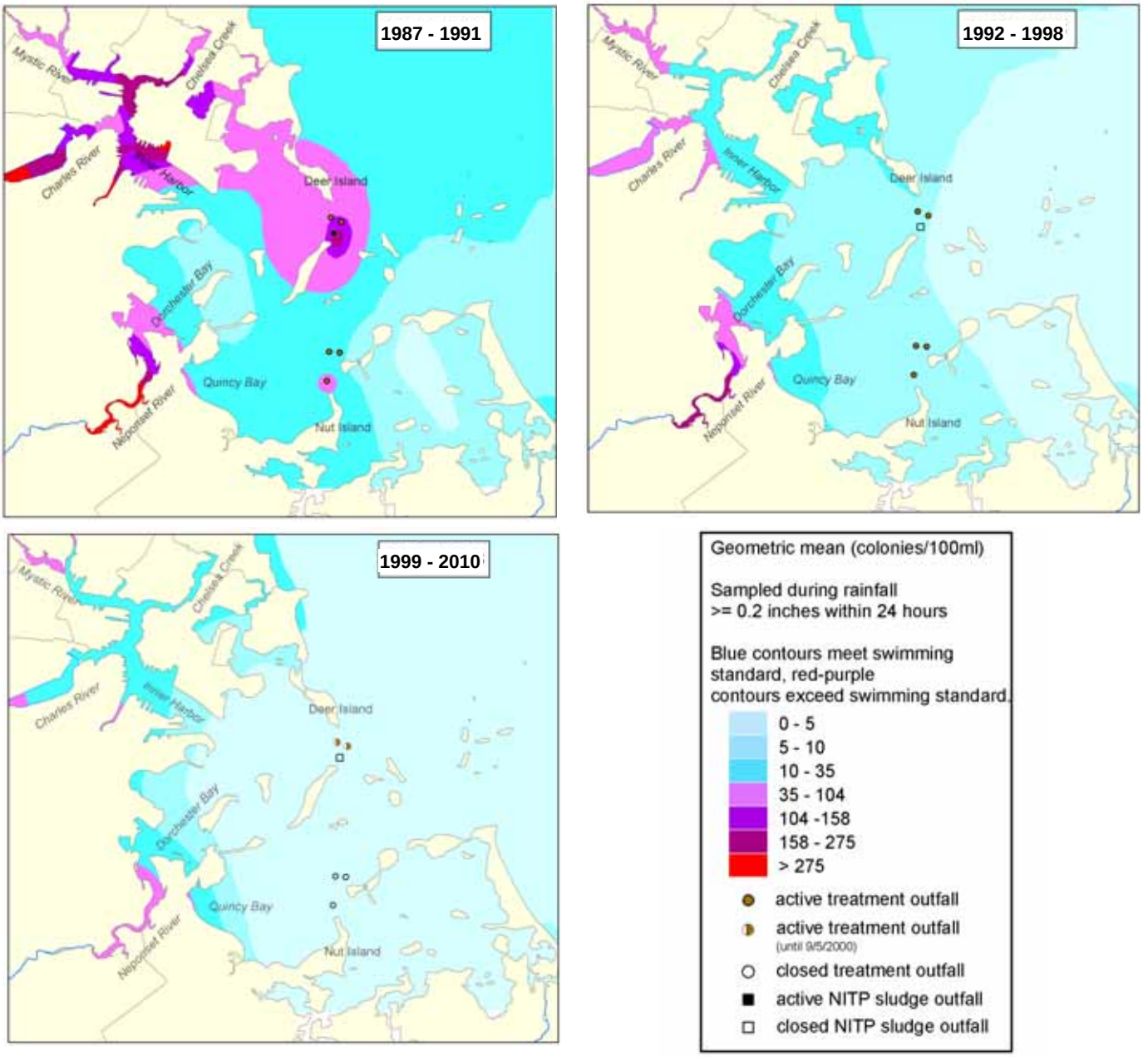
Dotted lines are *Enterococcus* swimming standard for marine water, 35 counts per 100 mL. Results are *Enterococcus* counts per 100 milliliters water (geometric means). Dry weather is no rain for day of sampling and two previous days; wet weather is >0.5 inches rainfall within two previous sampling days.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

Figure 15
Change in Inner Harbor Water Quality Over Time
Enterococcus bacteria counts, 1989 – 2011



Dotted lines are *Enterococcus* swimming standard for marine water, 35 counts per 100 mL. Results are *Enterococcus* counts per 100 milliliters water (geometric means). Dry weather is no rain for day of sampling and two previous days; wet weather is >0.5 inches rainfall within two previous sampling days. Other weather conditions are excluded. Results for MWRA stations 015, 027; 014, 138, 019; 022 and 024, grouped by region.

Figure 16
Changes in Boston Harbor *Enterococcus* Counts in Wet Weather



Contours show the geometric means of *Enterococcus* data collected when more than 0.2 inches of rain fell in the previous 24 hours. Blue areas meet the EPA geometric mean standard and red-purple areas exceed the standard.

1987 - 1991 This period shows data collected prior to when the Boston Harbor project and CSO plans began, through the last year that sludge was discharged (1991). In wet weather, areas affected by the discharge of sewage and sludge from the Deer Island Treatment Plant and Nut Island Treatment plant, and most of the Inner Harbor and tributary rivers, failed to meet the standard.

1992 – 1998 Data from these years reflect the effects of CSO upgrades, the ending of sludge discharge, full pumping at DITP, improved primary and beginning secondary treatment at DITP. Most of the harbor meets standards except for the tributary rivers, Fort Point Channel and along Wollaston Beach.

1999 – 2010 The current period shows continued improvement due to the closure of 22 CSO outfalls, upgrades of CSO facilities, ending of harbor treatment plant effluent discharges as the new outfall began operating in 2000, and local efforts to abate stormwater pollution.

1987-1991: In this period, MWRA and the CSO communities were eliminating dry weather overflows and implementing other early pollution controls at CSO outfalls. MWRA was completing the "fast-track" pumping improvements at Deer Island and other major wastewater transport improvements that greatly increased the rate and reliability of wet weather flow conveyance to the Deer Island Treatment Plant. Reliable pumping capacity at MWRA's North Main Pump Station on Deer Island increased from about 450 million gallons per day (mgd) in 1988 to more than 700 mgd in 1991. MWRA also ceased the discharge of scum and sludge to Boston Harbor in 1989 and 1991, respectively.

1992-1998: MWRA and the CSO communities implemented the CSO Nine Minimum Controls, including system optimization projects (primarily raising overflow weirs) at more than 100 CSO regulators, and also improved inspection and maintenance programs.

1999-2011: MWRA completed several CSO control projects that reduced or eliminated CSO discharges at outfalls to Boston Inner Harbor and its tributaries, Charles River, Mystic River and Chelsea Creek (see Figure 1, on pages 2-3). In the same period, efforts were underway by many communities along these waters to control separate urban stormwater pollution.

4. REGULATORY AND COURT SCHEDULE COMPLIANCE ACTIVITY

4.1 Regulatory Compliance Activities

In 2011, MWRA continued to respond to the CSO-related requirements and conditions in its NPDES Permit and in the CSO variances for the Alewife Brook/Upper Mystic River and the Lower Charles River Basin (see Section 5.1 for more information about CSO variances). Examples of MWRA's compliance responses include:

- In compliance with the Alewife Brook/Upper Mystic River variance, every April MWRA and the cities of Cambridge and Somerville issue a 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 a notice of a CSO discharge at the Cottage Farm facility to local regulatory agencies, health agents, community rowing and boat houses within 24-hours of a discharge. In compliance with the Alewife Brook/Upper Mystic River variance, the City of Cambridge issues a notice of CSO discharge to the Alewife Brook within 24 hours of an activation, 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 impacted by CSO, collected water quality data throughout the year, and reported the results to EPA and DEP.

- MWRA reported its estimates of CSO discharges at every active outfall during calendar year 2010 (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 and updates its collection system hydraulic model and produces estimates of CSO activations and discharge volume at all active outfalls for the previous calendar year. MWRA submitted the CSO discharge estimates for 2010 to EPA and DEP on May 11, 2011. For 2010, estimates were reported at the 56 outfalls that were active that year. MWRA has commenced the model updates for calendar year 2011 estimates and plans to model the 2011 storms and report the CSO discharge estimates by April 30, 2012.

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

For 2010, MWRA modeled each of the 95 rainfall events that occurred that year, as recorded at MWRA 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. The report includes the number of CSO activations and the total discharge volume for the year at each outfall.

In addition to modeling all of the actual rainfall events for the previous calendar year, MWRA also models the "typical year" with the updated model conditions. This allows MWRA to compare the updated system performance against the levels of control in the Long-Term Control Plan and to track progress toward the CSO control goals, which are based on the typical year that was approved by EPA and DEP for CSO performance measurement. Of course, no year is "typical." Every year is either wetter (more rainfall events, higher total rainfall amount or higher rainfall intensities) or a drier than the typical year. To be able to understand and explain the estimated discharges for each calendar year, which can vary greatly from typical year predictions, MWRA performs a detailed review of the storms to be able to compare the characteristics of the year's actual storms to the characteristics of the storms in the typical year.

4.3 Compliance with Remaining Court Milestones

Schedule Seven in the Federal Court Order includes four CSO milestones in 2012 and 15 CSO milestones in 2013 and beyond. The last CSO milestone date in the Federal Court Order is December 2020, and the last project construction completion milestone is December 2015. Table 4 lists the remaining milestones and summarizes MWRA's plans for compliance.

Table 4: Remaining Schedule Seven Milestones and Corresponding Compliance Plans

Milestone Date	Milestone Description	Project Schedule
2012		
Mar 2012 (and every March thru Mar 2016)	*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.*	MWRA filed the Annual Report for 2011 with the Court on March 15, 2012, and plans to file annual reports by March 15 each year through 2016.
Apr 2012	*MWRA to commence design of control gate and floatables control at outfall MWR003, and MWRA Rindge Avenue Siphon relief.*	MWRA issued the Notice to Proceed with the single design contract that includes the control gate and floatables control at outfall MWR003, the MWRA Rindge Avenue Siphon, and interceptor connection relief and floatables control at outfall SOM01A on [DATE].
	MWRA to commence design of interceptor connection relief and floatables control at outfall SOM01A.	
Sep 2012	*MWRA, in cooperation with Cambridge, to commence construction of CAM004 sewer separation.*	The City of Cambridge's design activities are on schedule for commencement of the first of three planned construction contracts for CAM004 sewer separation by September 2012.
2013		
Mar 2013	Submit Annual Report	See Mar 2012
Apr 2013	*MWRA, in cooperation with Cambridge, to complete construction of CAM004 stormwater outfall and detention basin.*	The City of Cambridge's construction activities are on schedule for substantial completion of the CAM004 stormwater outfall and basin by April 2013.
Jul 2013	*MWRA, in cooperation with BWSC, to complete construction of Bulfinch Triangle sewer separation.*	BWSC completed construction of the Bulfinch Triangle sewer separation project in July 2010.
	MWRA, in cooperation with Brookline, to complete construction of Brookline sewer separation.	The Town of Brookline's construction activities are on schedule for completion of the sewer separation project by July 2013.
Sep 2013	*MWRA to commence construction of interceptor connection relief and floatables control at outfall SOM01A.*	MWRA's design contract (see Apr 2012) calls for commencement of construction of the SOM01A work by September 2013.
2014		
Mar 2014	Submit Annual Report	See Mar 2012
Jun 2014	*MWRA to complete construction of interceptor connection relief and floatables control at outfall SOM01A.*	MWRA's design and construction schedules for this project call for substantial completion by June 2014.
Aug 2014	*MWRA to commence construction of control gate and floatables control at outfall MWR003, and MWRA Rindge Avenue Siphon relief.*	MWRA's design contract (see Apr 2012) calls for commencement of construction of the outfall MWR003 and Rindge Avenue Siphon work by August 2014.
2015		
Mar 2015	Submit Annual Report	See Mar 2012
Oct 2015	*MWRA to complete construction of control gate and floatables control at outfall MWR003, and MWRA Rindge Avenue Siphon relief.*	MWRA's design and construction schedules for this project call for substantial completion by October 2015.

Continued, next page.

Milestone Date	Milestone Description	Project Schedule
Dec 2015	*MWRA, in cooperation with Cambridge, to complete construction of CAM004 sewer separation.*	The City of Cambridge's design and construction schedules for this project call for substantial completion by December 2015.
	MWRA, in cooperation with BWSC, to complete construction of Reserved Channel sewer separation.	BWSC plans to complete the last of nine construction contracts for this project by December 2015. Three construction contracts are substantially complete and two are well underway.
Beyond 2015		
Mar 2016	Submit Annual Report	See Mar 2012
Jan 2018	*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).*	MWRA's Capital Improvement Program includes a three-year performance assessment of its Long-Term Control Plan beginning in January 2018.
Dec 2020	*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.*	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.

5. DESCRIPTION OF THE LONG-TERM CONTROL PLAN

5.1 Regulatory Background

Long-Term Control Plan Approval

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

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

The United States and MWRA also agreed to withdraw their February 27, 1987 Stipulation of the United States and the Massachusetts Water Resources Authority on Responsibility and Legal Liability for Combined Sewer Overflows and replace it with a second CSO stipulation that would require MWRA to implement the CSO requirements set forth in the Court Schedule and to meet the levels of control described in MWRA's

Long-Term Control Plan. The documents that recommend MWRA's Long-Term Control Plan, including the 1997 Final CSO Facilities Plan/EIR as amended by subsequent notices of project change and supplemental plans, are identified in the March 15, 2006 Second Stipulation of the United States and the Massachusetts Water Resources Authority on Responsibility and Legal Liability For Combined Sewer Overflows, amended on May 7, 2008.

Variances to Water Quality Standards

On August 26, 2010, DEP issued Final Determinations to extend the CSO-related variances to the water quality standards for Alewife Brook/Upper Mystic River and the Lower Charles River/Charles River Basin. The variance extensions have three-year terms ending in 2013. The variances apply only to the permitted CSO outfalls to these receiving waters and do not otherwise modify Class B water quality standards. In accordance with the variances, CSO discharges from permitted outfalls are not required to meet effluent limits based on the Class B criteria when flow in the collection system exceeds the system's conveyance capacity as a result of precipitation or snow melt. Through its continued implementation of the Nine Minimum Controls, MWRA maintains the conveyance capacity of its collection system and has improved the handling of wet weather flows through system optimization efforts, most recently through improvements to the operation of influent gates at the Prison Point and Cottage Farm CSO treatment facilities implemented in the last few years. The variances require continued implementation of CSO long term control measures consistent with MWRA's Long-Term Control Plan.

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

5.2 Scope, Benefits and Cost of the Approved Plan

The approved Long-Term Control Plan is identified in Table 5 for each receiving water segment. The CSO control costs by receiving water segment and the total plan cost of $860.7 million (in December 2012 dollars)[2] are from MWRA's Proposed FY13 CIP.

MWRA's Long-Term Control Plan is predicted to reduce annual CSO discharge volume in a typical year from 3.3 billion gallons in 1988 to 0.4 billion gallons in 2015, an 88% reduction. Of the remaining discharge volume, 93% will receive treatment at MWRA's four CSO facilities: Cottage Farm, Prison Point, Somerville Marginal and Union Park. The overall performance goals of this approved plan measured as average annual volume of CSO discharge to each receiving water segment are presented in Table 5 and in Figure 11 on page 31. The Long-Term Control Plan also calls for closing 34 of the 84 CSO outfalls addressed in the plan (33 are now closed, one remains to be closed, and 4 others have been closed by BWSC and the City of Cambridge).

[2] MWRA's Proposed FY13 CIP anticipates a total spending for CSO control of $867 million, including escalation to the midpoint of construction and contingency, to complete the plan on schedule.

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	• Cambridge/Alewife Sewer Separation • MWR003 Gate and Rindge Siphon Relief • Interceptor Connections/Floatables • Relief Connection/Floatables Control at Outfall SOM01A • Somerville Baffle Manhole Separation • Cambridge Floatables Control (portion)	61.5
Mystic River/Chelsea Creek Confluence and Chelsea Creek	4 untreated and 39 treated @ Somerville Marginal	0.6 60.6	• 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)	77.8
Charles River (including Stony Brook and Back Bay Fens)	3 untreated and 2 treated @ Cottage Farm	6.8 6.3	• 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 • Bulfinch Triangle Sewer Separation • MWRA Outfall Closings and Floatables Control • Cambridge Floatables Control (portion)	90.5
Inner Harbor	6 untreated and 17 treated @ Prison Point	9.1 243.0	• Prison Point CSO Facility Upgrade • Prison Point Optimization • BOS019 Storage Conduit • East Boston Branch Sewer Relief (portion)	61.8
Fort Point Channel	3 untreated and 17 treated @ Union Park	2.5 71.4	• Union Park Treatment Facility • BOS072-073 Sewer Separation and System Optimization • BWSC Floatables Control • Lower Dorchester Brook Sewer Modifications	62.6
Constitution Beach	Eliminate		• Constitution Beach Sewer Separation	3.8
North Dorchester Bay	Eliminate		• N. Dorchester Bay Storage Tunnel and Related Facilities • Pleasure Bay Storm Drain Improvements • Morrissey Blvd Storm Drain	260.8[3]
Reserved Channel	3 untreated	1.5	• Reserved Channel Sewer Separation	62.3
South Dorchester Bay	Eliminate		• Fox Point CSO Facility Upgrade (interim improvement) • Commercial Pt. CSO Facility Upgrade (interim improvement) • South Dorchester Bay Sewer Separation	126.8
Neponset River	Eliminate		• Neponset River Sewer Separation	2.4
Regional			• Planning, Technical Support and Land Acquisition	50.5
TOTAL **Treated**		**413.3** **384.8**		**860.7**

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

(2) From MWRA's Proposed FY13 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," below.

Schedule Seven requires MWRA to undertake a three-year, system-wide performance assessment commencing in January 2018 to verify attainment of the level of CSO control at every outfall in accordance with the plan and in compliance with water quality standards. Schedule Seven also requires MWRA to submit a report on the results of the performance assessment by December 2020. It is at that time that EPA and DEP propose to make final decisions regarding water quality standards for the Charles River and Alewife Brook.

If additional CSO control beyond the levels of control in MWRA's long-term plan is deemed by EPA and DEP to be warranted at any outfall, remediation will be the individual responsibility of the respective discharge permittee: MWRA, BWSC, Cambridge or Somerville.

5.3 Project Schedules

Most of the CSO projects are complete, and the remaining projects are on schedules that are in accordance with the milestones set forth in Schedule Seven. Table 6 presents the schedules for implementing the 35 projects in the Long-Term Control Plan. Comparisons of the schedules of projects not yet completed to respective milestones in Schedule Seven are included within the project reports in Section 2.4.

5.4 Capital Budget and Spending Projections

As shown in Figure 17, the total cost of the CSO plan (planning, design and construction) rose from $398 million when MWRA issued the Final CSO Conceptual Plan in 1994, to $487 million when EPA and DEP approved the Final CSO Facilities Plan and Environmental Impact Report in 1997, to $860.7 million in MWRA's Proposed FY13 CIP (in December 2012 dollars). With escalation of the CIP budget estimate to the mid-point of construction and contingency, MWRA projects that it will spend a total $867.0 million to complete the plan on its current schedule.

In the Proposed FY13 CIP, projected spending on the CSO control plan in FY12 and beyond totals $106.0 million, which is 5% of total projected capital spending by MWRA and 10% of wastewater related capital spending. As shown in Figure 18, annual spending on CSO control escalated greatly several years ago due mainly to higher construction activity and peaked in FY08 at $110.5 million. With only six projects remaining to be implemented, CSO program activity and spending will continue to wind down over the next several years. CSO capital spending is estimated to be $50 million in FY12, $29 million in FY13, $20 million in FY14, and $4.6 million in FY15 and $1.2 million in FY16, the year in which the last of the CSO projects are scheduled to be complete.

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 will be minor after December 2015 when the last two CSO projects, BWSC's Reserved Channel sewer separation and Cambridge's Alewife Brook CAM004 sewer separation, are scheduled to be complete.

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		224.7	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		85.7	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		<0.1	Mar-06	Mar-07	Apr-08
South Dorchester Bay Sewer Separation		118.9	Jun-96	Apr-99	Jun-07
Stony Brook Sewer Separation		44.3	Jul-98	Jul-00	Sep-06
Neponset River Sewer Separation		2.4		Apr-96	Jun-00
Constitution Beach Sewer Separation		3.8	Jan-97	Apr-99	Oct-00
Fort Point Channel Conduit Sewer Separation		12.0	Jul-02	Mar-05	Mar-07
Morrissey Boulevard Storm Drain		32.9	Jun-05	Dec-06	Jul-09
Reserved Channel Sewer Separation		62.3	Jul-06	May-09	Dec-15
Bulfinch Triangle Sewer Separation		10.0	Nov-06	Sep-08	Jul-10
Brookline Sewer Separation		25.4	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	12.4		Apr-11	Apr-13
	CAM004 Sewer Separation	38.0	Jan-97	Sep 12	Dec-15
	CAM400 Manhole Separation	3.3	Oct-08	Jan 10	Mar-11
	Interceptor Connection Relief/Floatables	3.5	Oct-08	Jan 10	Oct-10
	SOM01A Connection with Floatables	1.1	Apr-12	Sep-13	Jun-14
	MWR003 Gate and Rindge Ave. Siphon	3.1	Apr-12	Aug-14	Oct-15
Region-wide Floatables Control and Outfall Closings		1.1	Sep-96	Mar-99	Dec-07
Planning & Support		50.5			
Total Cost		**860.7**			

[1] From MWRA Proposed FY13 Capital Improvement Program.

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

[3] Costs in "Planning & Support," below.

Figure 17
CSO Capital Budget History (CIP)

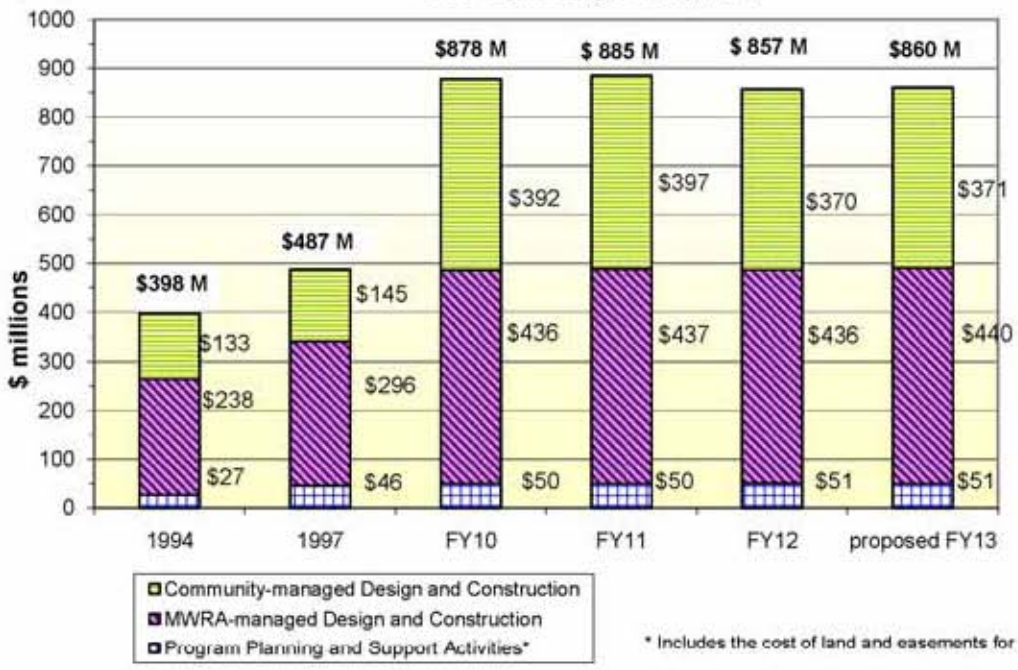
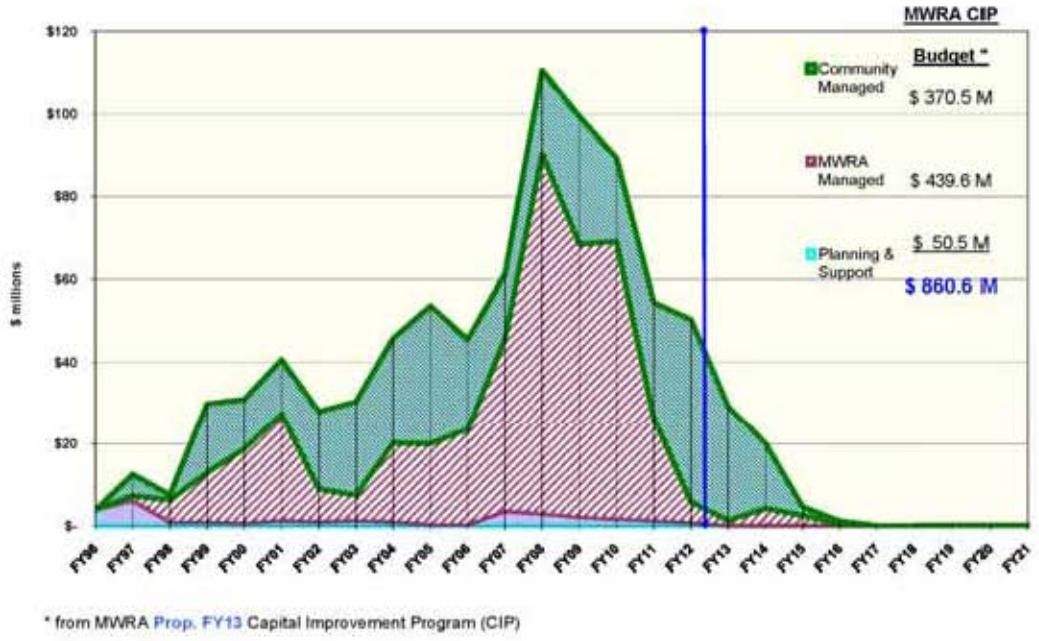


Figure 18
MWRA CSO Program Capital Budget and Spending (1996-2021)



* from MWRA Prop. FY13 Capital Improvement Program (CIP)

5.5 Cost Risk

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 complexities presented 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, and utilities and other subsurface obstructions, and traffic management, are the key contributors to a continuing level of risk during construction.

Subsurface conditions and related engineering requirements are not known until detailed subsurface exploration programs have been conducted, usually during preliminary design. Utilities and utility conflicts are also determined when the layout of new facilities and pipelines is set. For sewer separation projects, the quantity and specific sources of stormwater inflow that must be removed from the existing combined sewer system and carried in a new storm drain system are determined only with intensive field investigations and hydraulic modeling evaluations. These kinds of design investigations are continuing with the BWSC Reserved Channel sewer separation project and will also be underway over the next few years by the City of Cambridge for the CAM004 sewer separation project and by MWRA for the Outfall MWR003, MWRA Rindge Avenue Siphon relief, and Interconnection Relief and Floatables Control at Outfall SOM01A project.

On the construction side, there is cost risk associated with the Reserved Channel Sewer Separation and Brookline Sewer Separation contracts, because subsurface conditions, including utility conflicts and the need for protection of utilities, weigh heavily in construction progress.

6. COMPLETED CSO PROJECTS

1. SOMERVILLE BAFFLE MANHOLE SEPARATION

Receiving Water:
Alewife Brook, Upper Mystic River

Completed:
1996

Capital Cost:
$400,000

Description:
Separated common manholes connecting local sewer and storm drain systems. City of Somerville performed design and construction with MWRA financial assistance.

CSO Control

Water Quality Benefit:
Eliminated CSO discharges at three City of Somerville outfalls.

CSO Outfalls:
SOM001, SOM006, SOM007

Frequency of Discharge (typical year):
Before project: 2
With project: Eliminated

Annual Discharge Volume (typical year):
Before project: 0.04 million gallons
With project: Eliminated

CSO Reduction by Volume: 100%

2. CONSTITUTION BEACH SEWER SEPARATION

MWRA decommissioned its Constitution Beach CSO Facility after CSO flows were eliminated by BWSC sewer separation.

Receiving Water:
Boston Harbor/Constitution Beach

Completed:
2000

Capital Cost:
$3,769,000

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.

CSO Control

Water Quality Benefit:
Eliminated CSO discharges to Constitution Beach to comply with Class B water quality standards.

CSO Outfalls:
MWR207(BOS002)

Frequency of Discharge (typical year):
Before project: 16 (treated)
With project: Eliminated

Annual Discharge Volume (typical year):
Before project: 1.35 million gallons
With project: Eliminated

CSO Reduction by Volume: 100%

Completed CSO Projects (continued)

3. HYDRAULIC RELIEF AT OUTFALL CAM005
4. HYDRAULIC RELIEF AT OUTFALL B0S017

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:

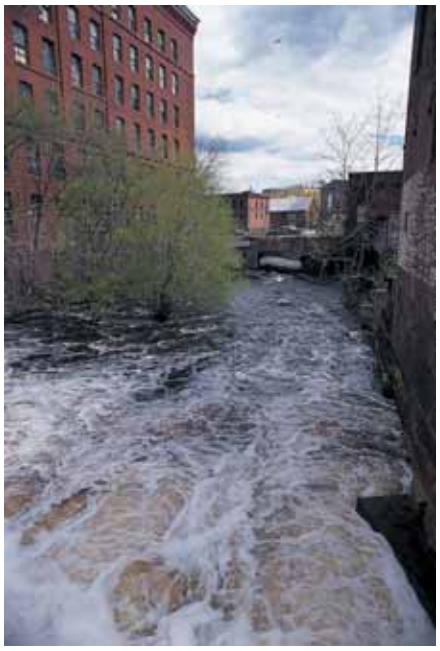
Frequency of Discharge (typical year):
Before project: 18
With project: 1

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



Receiving Water:
Neponset River

Completed:
2000

Capital Cost:
$2,445,000

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.

CSO Control

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).

CSO Outfalls:
BOS093, BOS095

Frequency of Discharge (typical year):
Before project: 17
With project: Eliminated

Annual Discharge Volume (typical year):
Before project: 5.8 million gallons
With project: Eliminated

CSO Reduction by Volume: 100%

6. CHELSEA TRUNK SEWER REPLACEMENT
7. CHELSEA BRANCH SEWER RELIEF
8. CHE008 OUTFALL REPAIRS

Receiving Water:
Mystic River/Chelsea Creek Confluence
Chelsea Creek

Completed:
2000-2001

Capital Cost:
$29,778,000

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.

CSO Control

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

CSO Outfalls:
CHE002, CHE003, CHE004, CHE008

Frequency of Discharge (typical year):
Before project: 8
With project: 4

Annual Discharge Volume (typical year):
Before project: 9.0 million gallons
With project: 0.6 million gallons

CSO Reduction by Volume: 93%

Completed CSO Projects (continued)

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

Receiving Water:
Lower Charles River Basin
Upper Inner Harbor
Upper Mystic River
Mystic River/Chelsea Creek Confluence
South Dorchester Bay

Completed:
2001

Capital Cost:
$22,261,000

Description:
Upgraded chlorine disinfection systems, added dechlorination systems, process control and safety improvements.

CSO Control

Water Quality Benefit:
Upgrade treatment to meet Class B water quality criteria, including residual chlorine limits.

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)

These projects improved treatment performance, with no effect on discharge frequency or volume.

14. PLEASURE BAY STORM DRAIN IMPROVEMENTS

Receiving Water:
North Dorchester Bay

Completed:
2006

Capital Cost:
$3,195,000

Description (cont):
Constructed a new storm drain system to relocate stormwater dischargers from Pleasure Bay to Reserved Channel.

CSO Control

Water Quality Benefit:
Eliminated storm water discharges to Pleasure Bay Beach.

Completed CSO Projects (continued)

15. STONY BROOK SEWER SEPARATION

Receiving Water:
Lower Charles River Basin

Completed:
2006

Capital Cost:
$44,332,000

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.

CSO Control

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

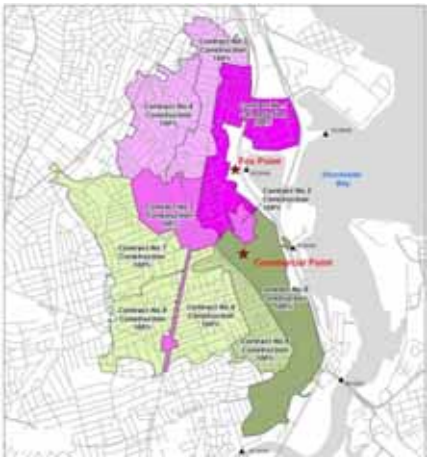
CSO Outfalls:
MWR023 (Stony Brook Conduit)

Frequency of Discharge (typical year):
Before project: 22
With project: 2

Annual Discharge Volume (typical year):
Before project: 44.5 million gallons
With project: 0.13 million gallons

CSO Reduction by Volume: 99.7%

16. SOUTH DORCHESTER BAY SEWER SEPARATION



Receiving Water:
South Dorchester Bay

Completed:
2007

Capital Cost:
$118,913,000

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.

CSO Control

Water Quality Benefit:
Eliminated CSO discharges to Savin Hill, Malibu and Tenean beaches, in compliance with Class B water quality standards.

CSO Outfalls:
MWR209 (BOS088/BOS089)
MWR211 (BOS090)

Frequency of Discharge (typical year):
Before project: 20 (treated)
With project: Eliminated

Annual Discharge Volume (typical year):
Before project: 30 million gallons
With project: Eliminated

CSO Reduction by Volume: 100%

Completed CSO Projects (continued)

17. FORT POINT CHANNEL SEWER SEPARATION

Receiving Water:
Fort Point Channel

Completed:
2007

Capital Cost:
$12,047,000

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.

CSO Control

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

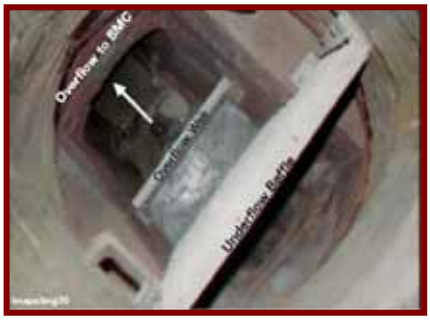
CSO Outfalls:
BOS072, BOS073

Frequency of Discharge (typical year):
Before project: 9
With project: 0

Annual Discharge Volume (typical year):
Before project: 3.0 million gallons
With project: 0.0

CSO Reduction by Volume: 100%

18. REGIONWIDE FLOATABLES CONTROL
19. MWRA FLOATABLES CONTROL AND OUTFALL CLOSING PROJECTS



Receiving Water:
Region-wide

Completed:
2007

Capital Cost:
$1,216,000

Description:
Installed underflow baffles for floatables controls and closed several regulators and outfalls.

In March 2000, MWRA closed Outfalls MWR021 and MWR022 to CSO discharges.

CSO Control

Water Quality Benefit:
Complies with EPA Policy Nine Minimum Controls requirement to control solid and floatable material. Eliminated CSO discharges at certain outfalls.

CSO Outfalls:
Various outfalls system-wide.

CSO Control:
The floatables controls do not affect CSO discharge frequency or volume.

Completed CSO Projects (continued)

20. UNION PARK DETENTION/TREATMENT FACILITY

Receiving Water:
Fort Point Channel

Completed:
2007

Capital Cost:
$49,584,000

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.

CSO Control

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.

CSO Outfall:
BOS 070

Frequency of Discharge (typical year):
Before project: 25 (untreated)
With project: 17 (treated)

Annual Discharge Volume (typical year):
Before project: 132.0 million gallons
With project: 71.4 million gallons/year

CSO Reduction by Volume: 46%

21. BOS019 CSO STORAGE CONDUIT

Receiving Water:
Upper Inner Harbor (Little Mystic Channel)

Completed:
2007

Capital Cost:
$14,288,000

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.

CSO Control

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

CSO Outfall:
BOS019

Frequency of Discharge (typical year):
Before project: 13
With project: 2

Annual Discharge Volume (typical year):
Before project: 4.4 million gallons
With project: 0.6 million gallons

CSO Reduction by Volume: 86%

Completed CSO Projects (continued)

22. PRISON POINT CSO FACILITY OPTIMIZATION

Receiving Water:
Upper Inner Harbor

Completed:
2008

Capital Cost:
$50,000

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

CSO Control

Water Quality Benefit:
Reduces treated CSO discharges to Upper Inner Harbor.

CSO Outfall:
MWR203 (Prison Point Facility)

Frequency of Discharge (typical year):
Before project: 30 (treated)
With project: 17 (treated)

Annual Discharge Volume (typical year):
Before project: 335 million gallons
With project: 243 million gallons

CSO Reduction by Volume: 27%
(with Bulfinch Triangle Sewer Separation)

23. COTTAGE FARM BROOKLINE CONNECTION AND INFLOW CONTROLS

Receiving Water:
Lower Charles River Basin

Completed:
2009

Capital Cost:
$3,000,000

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").

CSO Control

Water Quality Benefit:
Minimizes treated CSO discharges from the Cottage Farm CSO Facility to the Lower Charles River Basin.

CSO Outfall:
MWR201 (Cottage Farm Facility)

Frequency of discharges (typical year):
Before project: 7 (treated)
With project: 7 (treated)

Annual Discharge Volume (typical year):
Before project: 44.5 million gallons
With project: 24.0 million gallons

CSO Reduction by Volume: 46%

Completed CSO Projects (continued)

24. MORRISSEY BOULEVARD STORM DRAIN

Receiving Water:
North Dorchester Bay

Completed:
2009

Capital Cost:
$32,899,000

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.

CSO Control

Water Quality Benefit:
Maximizes level of stormwater control along the South Boston beaches by redirecting some stormwater to Savin Hill Cove in large storms.

25. EAST BOSTON BRANCH SEWER RELIEF

Receiving Water:
Boston Harbor and Chelsea Creek

Completed:
2010

Capital Cost:
$85,709,000

Description:
Upgraded MWRA's 115-year-old interceptor system serving most of East Boston, using a combination of construction methods: microtunneling, pipe-bursting, open-cut excavation and pipe relining.

CSO Control

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

CSO Outfalls:
BOS003, BOS004, BOS005, BOS009, BOS010, BOS012, BOS013, BOS014 (BOS006 and BOS007 closed by BWSC)

Frequency of discharges (typical year):
Before project: 31
With project: 6

Annual Discharge Volume (typical year):
Before project: 41.0 million gallons
With project: 8.6 million gallons

CSO Reduction by Volume: 79%

Completed CSO Projects (continued)

26. BULFINCH TRIANGLE SEWER SEPARATION

Receiving Water:
Boston Inner Harbor and Lower Charles River Basin

Completed:
2010

Capital Cost:
$9,986,000

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.

CSO Control

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.

CSO Outfalls:
MWR203 (Prison Point Facility) and BOS049

Frequency of discharges (typical year):
Before project: 18 (treated)
With project: 17 (treated)

Annual Discharge Volume (typical year):
Before project: 281.5 million gallons
With project: 243.0 million gallons

CSO Reduction by Volume: 14%

27. INTERCEPTOR CONNECTION RELIEF AND FLOATABLES CONTROL AT CAM002 AND CAM401B AND FLOATABLES CONTROL AT CAM001

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.

Receiving Water:
Alewife Brook

Completed:
2010

Capital Cost:
$3,500,000

Description:
Upgraded the hydraulic capacities of City of Cambridge connections to MWRA interceptors and installed underflow baffles for floatables control.

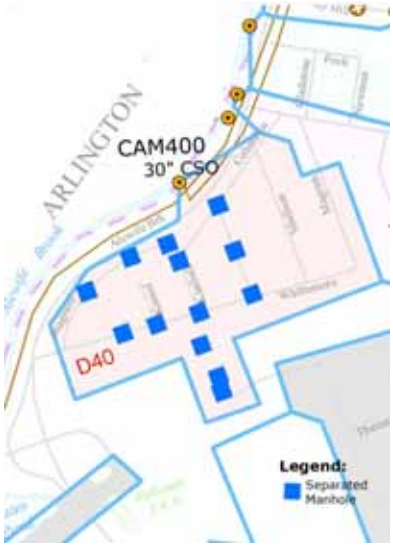
CSO Control

Water Quality Benefit:
Together with other Alewife Brook CSO projects (not yet complete), minimizes CSO discharges and their impacts to meet 98% compliance with Class B water quality standards.

CSO Outfalls:
CAM002, CAM401B, CAM001

Completed CSO Projects (continued)

28. CAM400 COMMON MANHOLE SEPARATION



Receiving Water:
Alewife Brook

Completed:
March 2011

Capital Cost:
$3,300,000

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

CSO Control

Water Quality Benefit:

Eliminated CSO discharges to Alewife Brook at Outfall CAM400.

CSO Outfalls:
CAM400

Frequency of Discharge (typical year)
Before project: 8
After project: 0

Annual Discharge Volume (typical year)
Before project: 0.63 million gallon
After project: 0

CSO Reduction by Volume: 100%

29. NORTH DORCHESTER BAY STORAGE TUNNEL & RELATED FACILITIES

Receiving Water:
North Dorchester Bay

Capital Cost:
$237,241,000
(not including the cost of Morrissey Boulevard storm drain (Project 24))

Completed: May 2011

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.

CSO Control

Water Quality Benefit:
Eliminated CSO and separate stormwater discharges up to the 25-year storm and 5-year storm, respectively.

CSO Outfalls:
BOS081 BOS083 BOS085 BOS087
BOS082 BOS084 BOS086

Frequency of Discharge (typical year)
CSO: Before project: 17
After project: 0
Stormwater: Before project: 93
After project: 0

Annual Discharge Volume (typical year)
CSO: Before project: 8.6 million gals
After project: 0
Stormwater: Before project: 144 million gals
After project: 0

CSO Reduction by Volume: 100%
Stormwater Reduction by Volume: 100%

The End

WWC.1
IX B.1
3/14/12

STAFF SUMMARY

TO: Board of Directors
FROM: Frederick A. Laskey, Executive Director
DATE: March 14, 2012
SUBJECT: Alewife Brook CSO Improvements Design, Construction Administration and Resident Engineering Services
Fay, Spofford & Thorndike LLC
Contract 6952

COMMITTEE: Wastewater Policy & Oversight

___ INFORMATION
_X_ VOTE

Rachel C. Madden, Director
Administration and Finance

Jeremy R. Hall, Project Manager
David A. Kubiak, Sr. Program Manager
Jae R. Kim, Chief Engineer
Preparer/Title

Michael J. Hornbrook
Chief Operating Officer

RECOMMENDATION:

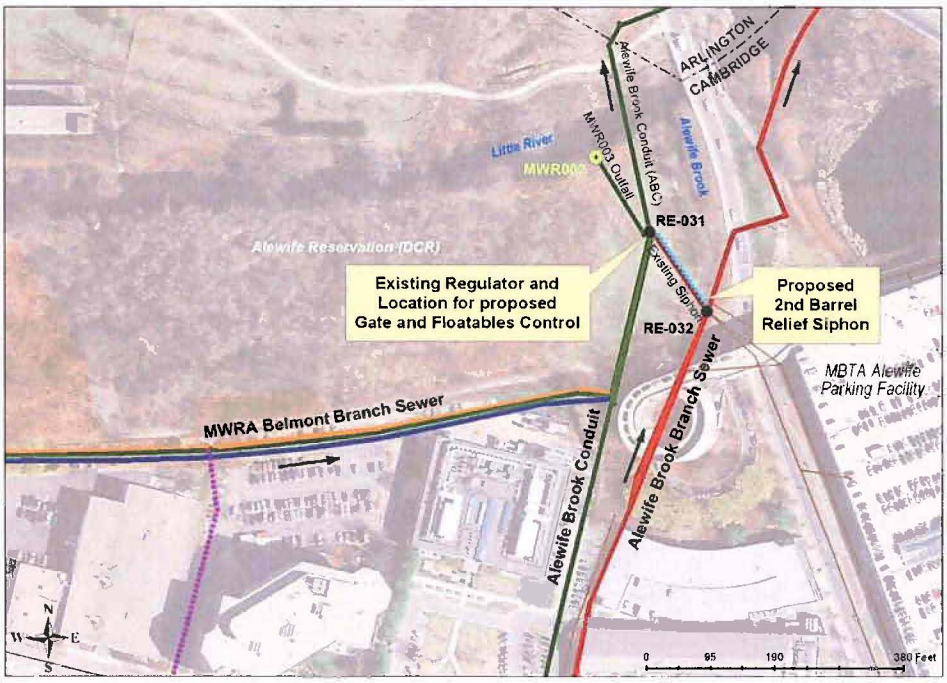
To approve the recommendation of the Consultant Selection Committee to select Fay, Spofford & Thorndike LLC to provide design, construction administration and resident engineering services for Alewife Brook CSO Improvements, and to authorize the Executive Director, on behalf of the Authority, to execute said contract with Fay, Spofford & Thorndike LLC in an amount not to exceed $1,456,244, for a contract term of 53 months from the Notice to Proceed.

DISCUSSION:

Under Contract 6952, the Consultant will provide design services for two CSO control projects along MWRA's Alewife Brook Sewer and Alewife Brook Conduit interceptors to improve hydraulic conditions and control CSO discharges to Alewife Brook (see Attachment 1 for map of Alewife Brook CSO control plan). These are the last two of the 35 projects in MWRA's approved Long-Term CSO Control Plan to move into design. In accordance with the Long-Term CSO Control Plan, the two projects are intended to provide an automated overflow control gate at Outfall MWR003, relief of MWRA's Rindge Avenue Siphon that conveys combined sewer overflow to Outfall MWR003, enlargement and structural improvement of the connection between the City of Somerville's Tannery Brook Conduit and MWRA's Alewife Brook Conduit, and control of floatable materials in CSO discharges at Outfall MWR003 and at the outfall associated with the Tannery Brook Conduit connection (Outfall SOM01A).

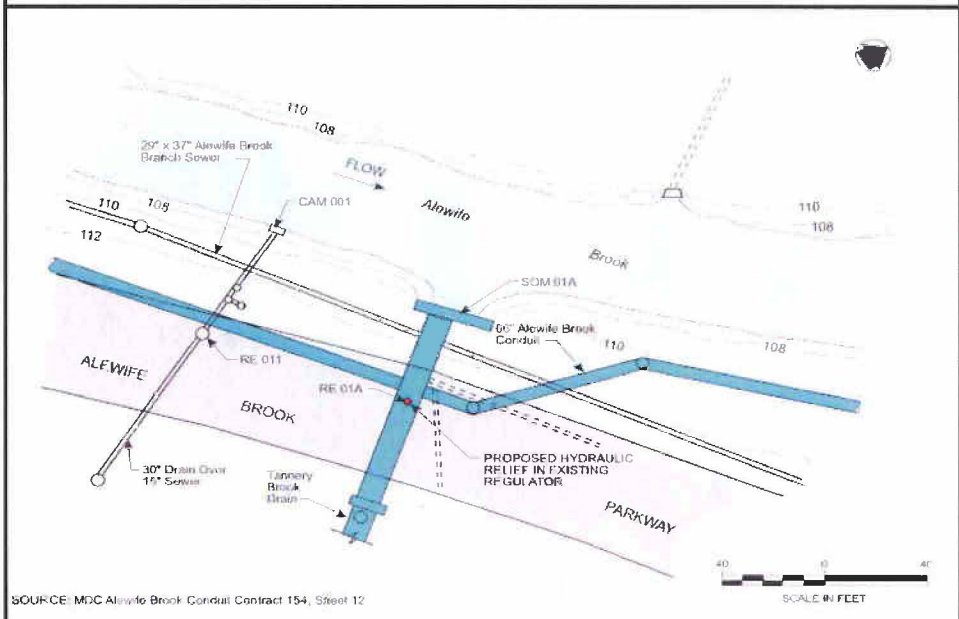
As part of preliminary design, the Consultant will assess the hydraulic performance of MWRA's Alewife Brook interceptor system and hydraulically related CSO regulators and outfalls for existing conditions, for future planned conditions with the CSO improvements already being implemented by the City of Cambridge, and for design alternatives in the Contract 6952 scope.

The hydraulic assessments will consider conveyance capacity, hydraulic profile, surcharging, and overflows. The Consultant will evaluate the hydraulic relief currently provided by CSO regulators and MWRA operational protocols in large storms and will evaluate and design the Alewife Brook CSO improvements to meet long-term CSO control requirements, minimize system surcharging and flooding in large storms, and generally improve hydraulic conditions and sewer service.



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

Schedule Seven Milestones	
Commence Design	Apr 12
Commence Construction	Aug 14
Complete Construction	Oct 15



SOURCE: MDC Alewife Brook Conduit Contract 154, Sheet 12

Interceptor Connection Relief and Floatables Control at Outfall SOM01A

Schedule Seven Milestones	
Commence Design	Apr 12
Commence Construction	Sep 13
Complete Construction	Jun 14

Procurement Process

MWRA utilized a one-step/one-envelope RFQ/P process. Criteria were weighted as follows: Cost - 50 points; Qualifications and Key Personnel - 15 points; Technical Approach – 10 points; Past Performance on Authority Projects - 8 points; Experience/Past Performance on Similar Non-Authority Projects - 7 points; Capacity/Organization and Management Approach – 5 points; and MBE/WBE Participation - 5 points.

On January 13, 2012, MWRA received proposals from Dewberry-Goodkind, Fay Spofford & Thorndike LLC, Louis Berger Group, PEER Consultants, and Tetra Tech. The proposal costs are presented below.

	Proposed Contract Cost	Level of Effort	Cost per Hour
Louis Berger Group	$1,100,757*	7,862 hours	$140/hour
Fay, Spofford & Thorndike, LLC	$1,456,244	13,115 hours	$111/hour
PEER Consultants	$1,460,604*	12,113 hours	$120/hour
Tetra Tech	$1,546,576	13,441 hours	$115/hour
Dewberry-Goodkind	$1,920,485	15,761 hours	$121/hour

*Reflects corrections made due to mathematical errors made in the cost proposal

The Selection Committee scored and ranked the proposals as follows:

	Total Points	Order of Preference* Total Score	Final Ranking
Fay, Spofford & Thorndike, LLC	319	5	1
Louis Berger Group	299.4	7	2
Tetra Tech	254	13	3
PEER Consultants	231.8	16	4
Dewberry-Goodkind	214	19	5

*Order of Preference represents the sum of the individual Selection Committee members' rankings where the firm receiving the highest number of points is assigned a "1"; the firm receiving the next highest number of points is assigned a "2," and so on.

Fay, Spofford & Thorndike's (FST) proposal was ranked first by the Selection Committee. FST's price was the second lowest and it included substantial discounts. FST capped all salaries at $47/per hour for the entire term of the contract, discounted its fixed and percentage fees, and also discounted its indirect cost rates for both office and field. FST's proposal included 13,115 hours, making the firm's cost per hour the lowest among all proposers with the hours distributed appropriately among the various labor classifications. FST included a highly qualified team with relevant solid past performance and a strong technical approach that demonstrated a thorough understanding of the project scope.

Louis Berger Group was the second-ranked firm with the lowest total cost and the highest cost per hour ($140). The firm's level of effort included only 7,862 hours, approximately 40% fewer hours than the average of all proposers. The Selection Committee did not think that Louis Berger could perform the project for the level of effort proposed, which reflected the firm's lack

of project understanding and lack of MWRA and Massachusetts public bidding experience. In a follow-up communication with representatives of the firm, they confirmed that they had seriously underestimated the level of effort required for this project. The Selection Committee was in agreement that Louis Berger's proposal did include a qualified project team with relevant past experience.

Tetra Tech was ranked third. The Selection Committee members noted the number of salary waiver requests, which contributed to a higher average hourly rate. The proposed project team included some very qualified key people with related experience, but the firm's technical approach was considered average and lacking details.

PEER Consultants was the fourth-ranked firm. PEER's proposal was very difficult to review. Allowances were omitted and the cost tables included multiple errors and were not formatted correctly, making the cost analysis very difficult to complete. As a result, these errors seriously impeded the Selection Committee's ability to analyze the cost proposal. The Selection Committee was in agreement that PEER's proposal did not demonstrate adequate qualifications to perform this project. Past Performance on non-MWRA projects did not include projects that were similar to the work to be performed on this contract.

Dewberry-Goodkind was ranked fifth. Dewberry's proposed price was the highest of the five proposals with the second highest cost per hour. The proposal contained errors in the cost tables, and it was difficult to evaluate the labor rates, which varied throughout the tables. The Selection Committee noted that the proposed key personnel have performed well on MWRA task order-type assignments. The Selection Committee expressed some concern about the ability to manage the eight subconsultants proposed on the project team. Overall, the cost was so high that Committee members could not favorably review Dewberry-Goodkind's proposal.

MWRA staff met with representatives of FST to discuss the firm's proposal and were assured that the firm understands the project and has the ability to complete the work at the proposed level of effort and cost. Based on the final ranking and the subsequent follow-up discussions with the selected firm, staff recommend the award of Contract 6952 to FST in an amount not to exceed $1,456,244.

BUDGET/FISCAL IMPACT:

The FY12 CIP includes a budget of $1,227,316 for Contract 6952. The contract award is $1,456,244, or $228,928 over budget. This amount will be covered within the five-year spending cap.

MBE/WBE PARTICIPATION:

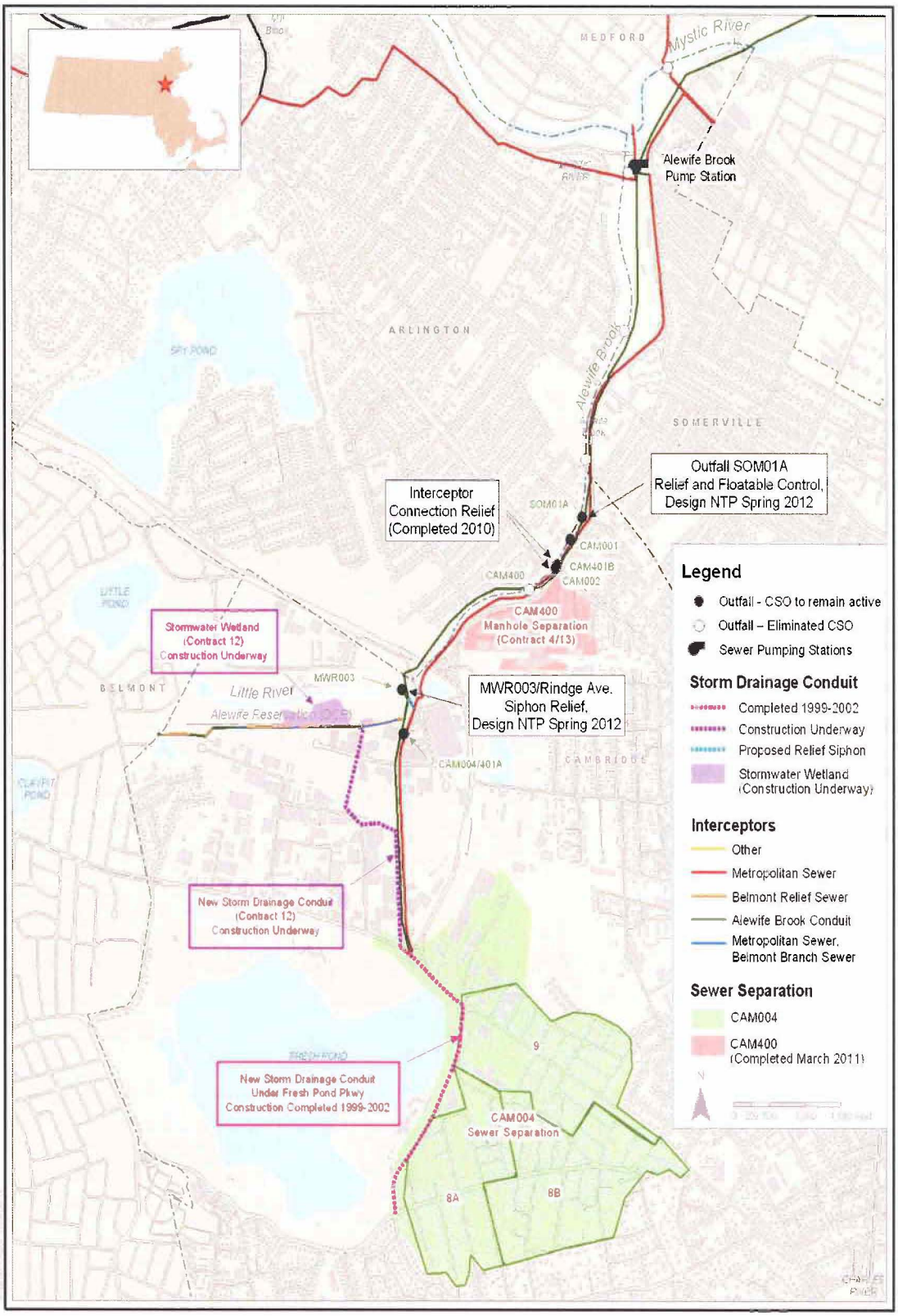
The minimum MBE and WBE participation requirements for this project were established at 7.18% and 5.77%, respectively. FST has committed to 7.59% MBE and 5.97% WBE participation.

ATTACHMENT:

Map of Alewife Brook CSO Control Plan

Attachment 1

Alewife Brook CSO Control



WWC.2
IV B.2
3/14/12

STAFF SUMMARY

TO: Board of Directors
FROM: Frederick A. Laskey, Executive Director
DATE: March 14, 2012
SUBJECT: MWRA's Brookline Overflow Conduit/MWR010 Combined Sewer Overflow Outfall Cleaning
National Water Main Cleaning Company
Contract 7077C

COMMITTEE: Wastewater Policy & Oversight

___ INFORMATION
X VOTE

Rachel C. Madden, Director
Administration and Finance

Stephen Cullen, Director, W.W. Operations & Maintenance
John P. Vetere, Deputy Chief Operating Officer
Preparer/Title

Michael J. Hornbrook
Chief Operating Officer

RECOMMENDATION:

To approve the award of Contract 7077C, MWRA's Brookline Overflow Conduit/MWR010 Combined Sewer Overflow Outfall Cleaning, to the lowest responsible and eligible bidder, National Water Main Cleaning Company, and authorize the Executive Director, on behalf of the Authority, to execute said contract in the bid amount of $1,134,890.70, for a contract term of 183 calendar days from the Notice to Proceed.

DISCUSSION:

MWRA's Brookline Overflow Conduit (CSO Outfall MRW010) begins at Commonwealth Avenue as a 96-inch by 96-inch box conduit that extends north around Boston University's chapel, then runs through the campus where it transitions to a 90-inch-diameter conduit passing under Storrow Drive and a portion of the Charles River to its discharge location in the Charles River (see project map attached). The existing conduit mostly conveys storm water to the Charles River from connecting tributary areas in Boston and the BU campus. During large rain events, CSO regulators owned by MWRA and BWSC can also be overtopped, resulting in a CSO discharge through Outfall MWR010 to the Charles River. MWRA's model predicts that the CSO discharges occur only in storms greater than the two-year storm.

MWRA is working in conjunction with the Town of Brookline to perform sewer separation work on approximately 72 acres where there are remaining combined sewers. This is one of 35 projects in MWRA's approved Long-Term CSO Control Plan. The schedule of the Brookline Sewer Separation is driven by milestones in Schedule 7 of the Federal Court Case, which

requires the separation work to be completed by July 2013. A major and final component of the Brookline Sewer Separation project includes the conversion of Brookline's 84-inch by 89-inch Saint Mary's Street drain from a combined sewer to one that carries storm water only. This final step requires abandoning Brookline's 18-inch public connection to MWRA's Charles River Valley Sewer at the intersection of Saint Mary's Street and Commonwealth Avenue, reconfiguring MWRA and Boston CSO regulators, and providing a clear path for future separate storm water coming down Saint Mary's Street to discharge into Outfall MWR010 for conveyance to the Charles River.

Past engineering assessments and inspections have revealed sedimentation issues within Outfall MWR010. The addition of storm water from the Brookline Sewer Separation project will greatly increase the capacity requirements making it necessary for MWRA to clean Outfall MWR010. Given MWRA's ownership of the conduit and permitted CSO discharge, with the Town of Brookline's concurrence, MWRA assumed responsibility for the design and implementation of this portion of the sewer separation project.

A diver inspection was performed in June 2010 to collect sediment samples and depths of sediment throughout the conduit and to evaluate the condition of the conduit. The conduit was found to be in good condition with sediment samples showing low contaminant levels, which staff expect will permit disposal of at a landfill accepting non-hazardous materials. Large portions of the conduit were found to be almost half full of sediment.

Under Contract 7077C, approximately 660 feet of Outfall MWR010 will be cleaned and approximately 470 cubic yards of sediment will be removed. The major staging area for the cleaning operation will be between the BU Chapel and Storrow Drive, with a smaller support area in front of the chapel. From the major staging area, divers will be used to clean the outfall to its discharge location in the Charles River. The portion of the outfall extending towards Commonwealth Avenue will be cleaned using man entry with vacuum excavation. Installation of stop logs and potential diversion of storm water will be performed from a manhole on Commonwealth Avenue, along with some minor sediment removal operations.

The contract specifications take into consideration the requirements of working on an active university campus, which include but are not limited to timing constraints, access, odor, and noise. This includes nighttime work hours limited to between 9:00 P.M. and 7:00 A.M. whenever sedimentation removal work is performed. MWRA staff worked directly with Boston University staff to develop a license agreement to permit MWRA's use of necessary property outside of MWRA's existing sewer easement.

Procurement Process

Contract 7077C, was advertised and competitively bid in accordance with Massachusetts General Laws, Chapter 30. A site visit, held on February 8, 2012, was attended by the following contractors: Brenford Environmental Systems, DeAngelo Brothers, Inc., DeFelice Contractors, J. F. White, National Water Main Cleaning Company, and R. Zoppo.

On February 23, 2012, one bid was received as follows:

National Water Main Cleaning Company	$1,134,890.70
Engineer's Estimate	*$1,196,324.00*

Other contractors that attended the site visit were contacted to determine why they did not submit bids on this project. Responses included: concern over the sensitive, high profile work area requiring significant construction constrains; the size and complexity of the project being beyond the contractor's typical focus; and commitments to other projects coinciding with the required short contract term that this work must be performed. It should be noted that one of the contractors contacted informed MWRA that it intended to work with National Water Main Cleaning Company as a subcontractor.

National Water Main Cleaning Company's bid is 5.1% lower than the Engineer's Estimate. After discussions with the Contractor to go over the various elements of the bid, MWRA staff and the design engineer have determined that the bid includes all components of the work, is reasonable, complies with the requirements of the bid documents, and includes the payment of prevailing wages.

References were checked and found to be favorable. Staff are of the opinion that National Water Main Cleaning Company possesses the skill, ability, and integrity necessary to complete the work under this contract at the price bid, within the required time constraints, and is qualified to do so. Therefore, staff recommend the award of this contract to National Water Main Cleaning Company as the lowest responsible and eligible bidder.

BUDGET/FISCAL IMPACT:

The FY12 CIP includes a budget of $22,071,276 for Brookline Sewer Separation Construction under Contract 7077 in which $3,000,000 was included for Cleaning of the Brookline Overflow Conduit/MWR010 CSO Outfall under Contract 7077C.

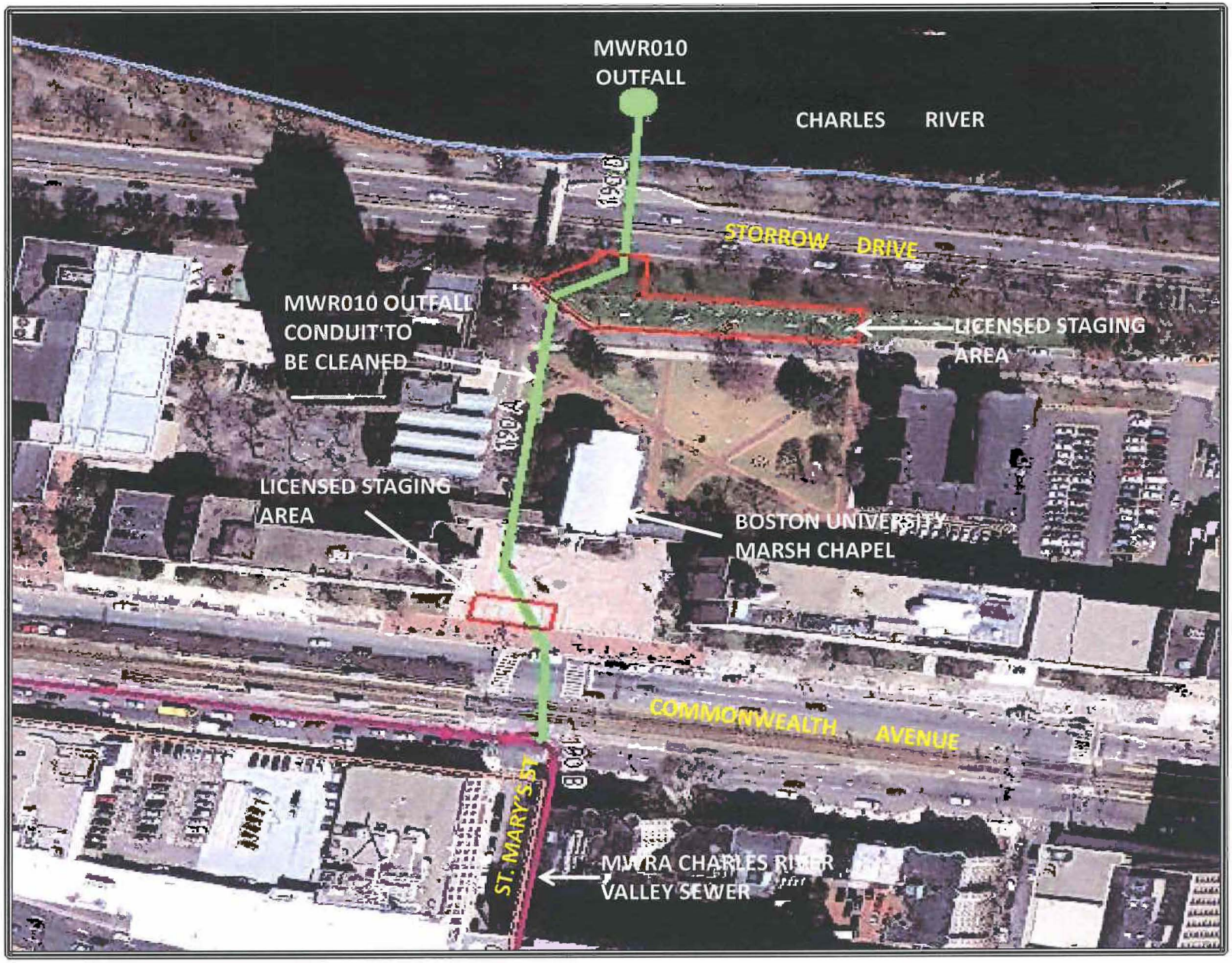
MBE/WBE PARTICIPATION:

The MBE and WBE participation requirements for this project were established at 10.0% and 6.9%, respectively. The Affirmative Action & Compliance Unit has reviewed the bids and has determined that National Water Main Cleaning Company's bid is responsive to those requirements.

ATTACHMENT:

Project Map of MWRA's Brookline Overflow Conduit/MWR010 Outfall Cleaning

Project Map: Contract 7077C, MWRA's Brookline Overflow Conduit/MWR010 CSO Outfall Cleaning



WWSC3
IX B3
3/14/12

STAFF SUMMARY

TO: Board of Directors
FROM: Frederick A. Laskey, Executive Director
DATE: March 14, 2012
SUBJECT: Clinton Aeration Efficiency Improvement - Clinton Wastewater Treatment Plant
R.H. White Construction Co., Inc.
Contract 7278

COMMITTEE: Wastewater Policy & Oversight

____ INFORMATION
__X__ VOTE

Rachel C. Madden, Director
Administration and Finance

Daniel K. O'Brien, Director, Deer Island WWTP
Richard Adams, Manager, Engineering Services
Preparer/Title

Michael J. Hornbrook
Chief Operating Officer

RECOMMENDATION:

To approve the award of Contract 7278, Clinton Aeration Efficiency Improvement - Clinton Wastewater Treatment Plant, to the lowest responsible and eligible bidder, R.H. White Construction Co., Inc., and to authorize the Executive Director, on behalf of the Authority, to execute said contract in the bid amount of $1,840,000, for a contract term of 365 calendar days from the Notice to Proceed.

BACKGROUND:

The Clinton Wastewater Treatment Plant provides advanced wastewater treatment services to approximately 23,000 people in the Town of Clinton and the Lancaster Sewer District prior to discharging the treated effluent to the South Nashua River. The plant utilizes three 4-million-gallons-per-day (mgd) influent lift pumps to process a designed-maximum 12 mgd of wastewater. The average plant flow is 3.1 mgd. The original treatment plant was constructed in 1955-56.

During the period from 1989 to 1992, the treatment plant was expanded and upgraded to include six new aeration tanks with mechanical aerators for activated sludge treatment. Currently, these six mechanical aerators, one in each basin, aerate the secondary "mixed liquor" in the six secondary aeration tanks (see picture of active aerator in Basin 5 on the following page). Each mechanical aerator consists of a two-speed drive motor, rotating cone, mist shield, and draft tube (see Attachment 1). The aerator drive motor operates at approximately 57 horsepower (43KW) at high speed and 42 horsepower (31KW) at low speed. Only three tanks are needed at any given time, so if one bank of tanks is out of service, operators can change over to the other bank.

After more than 20 years of service, the mechanical aerator system is nearing the end of its expected serviceable life. Fay, Spofford and Thorndike, LLC (FST) performed a study of the plant's processes, systems, and equipment to determine if better methods and/or more efficient equipment could be utilized to perform the required mixing in the aeration tanks.

Aerator Assembly in Basin 5

FST's report recommended that MWRA install a fine bubble diffuser system in the secondary aeration tanks to replace the mechanical mixers, to obtain a better oxygen transfer rate while reducing electricity consumption. The recommended aeration system will consist of a diffused aeration grid at the bottom of each aeration basin tank. Air supply to the grid system is supplied from five blowers that will be mounted on the top of the aeration tanks. Each blower will be controlled by a variable frequency drive (VFD) to maximize efficiency of the oxygen transfer process. Staff estimate that the new aeration system will reduce the plant's average energy consumption by 40%, which translates to $60,000 per year in savings. In addition, National Grid is offering MWRA a $177,000 rebate upon completion of this project, based on the expected reduction in energy consumption. The Engineer's construction estimate for this rebate-eligible portion of the project, is $760,000, which equates to a 9.7-year payback period.

DISCUSSION:

Contract 7278 includes the replacement of three mechanical aerators in Aeration Basins 4 through 6. The existing mechanical aerators in Basins 1 through 3 will remain in place for redundancy purposes. The contract also includes the installation of four, 30-horsepower submersible pumps – two at the influent station and two at the intermediate lift station. These pumps will provide redundancy to the existing pumping system to avoid potential catastrophic plant flooding as nearly occurred in the major rain events during spring 2010. (It should be noted that MWRA applied for FEMA reimbursement for these new pumps, but the application was denied.) Each of these pumps will be controlled by a separate VFD and control system – an energy-saving feature currently not in place for the existing pumps. Plant staff will likely use the new pumps as the primary "duty" pumps since they will have the more cost-efficient VFD controls, and also, to minimize run hours on the older pumps; the existing pumps will still be needed at higher flows. The additional pumping capacity will also allow the plant to avoid the need to rent portable pumps during emergency or anticipated extreme-high-flow wet weather events.

Procurement Process

Contract 7278 was advertised and bid in accordance with Chapter 149 of Massachusetts General Laws; five bids were received and opened on January 10, 2012 with the following results:

Contractors	**Bid Price**
Engineer's Estimate	*$1,746,000*
NUWATER, Inc.	$1,822,250
R.H. White Construction Co., Inc.	$1,840,000
Bay State Regional Contractors, Inc.	$1,858,000
WES Construction Corp.	$2,352,750
Waterline Industries Corp.	$2,477,477

FST and MWRA staff reviewed NUWATER's bid and the bid was also discussed in an interview with representatives of the company. Although certified by the Division of Capital Asset Management (DCAM) to perform this type of work, it appears that NUWATER only has two full-time employees, the president of the company, who would assume the role of project manager on this project, and a vice president, who would serve as the site supervisor. During the interview with NUWATER, MWRA staff and FST learned that the company did not include the cost for a full-time Quality Control Manager in its bid price. This was a requirement of the specification and carried an associated estimated cost of approximately $100,000. Staff also learned that the vice president (the proposed site supervisor) has no electrical training. This would make oversight of the electrical filed subcontractor risky, at best.

Reference checks were performed and it was determined that NUWATER received a failing rating of 69 on the DCAM evaluation for its last project. This reference indicated that delays on the project were caused due to NUWATER's inability to complete the project on time and to complete punchlist items on a timely basis. Several other past references similarly indicated that NUWATER did not complete projects on a timely basis. Two references cited poor management oversight of the projects.

MWRA staff were very concerned that NUWATER would have difficulty in successfully completing this project on schedule based on the past track record of the company. If this project is not completed on time, it could mean MWRA's loss of a $177,000 utility rebate.

For these reasons, MWRA has determined that NUWATER is not qualified to perform the work under this contract.

MWRA staff and FST reviewed R.H. White's bid, which is only approximately 5.4% higher than the Engineer's Estimate. The bids of the three lowest bidders are only 2% apart from each other, which staff believe is an indication that the scope of work in the contract bid documents was clear.

Staff and FST have determined that R.H. White's bid meets all of the requirements of the specifications. Based upon subsequent discussions with R.H. White, MWRA staff and FST have determined that the bid price is reasonable, complete and includes the payment of prevailing wage rates.

References were checked for R.H. White and found to be favorable. Staff are of the opinion that R.H. White possesses the skill, ability, and integrity necessary to successfully complete the work under this contract and is qualified to do so. Therefore, staff recommend the award of this contract to R.H. White Construction Co., Inc. as the lowest responsible and eligible bidder.

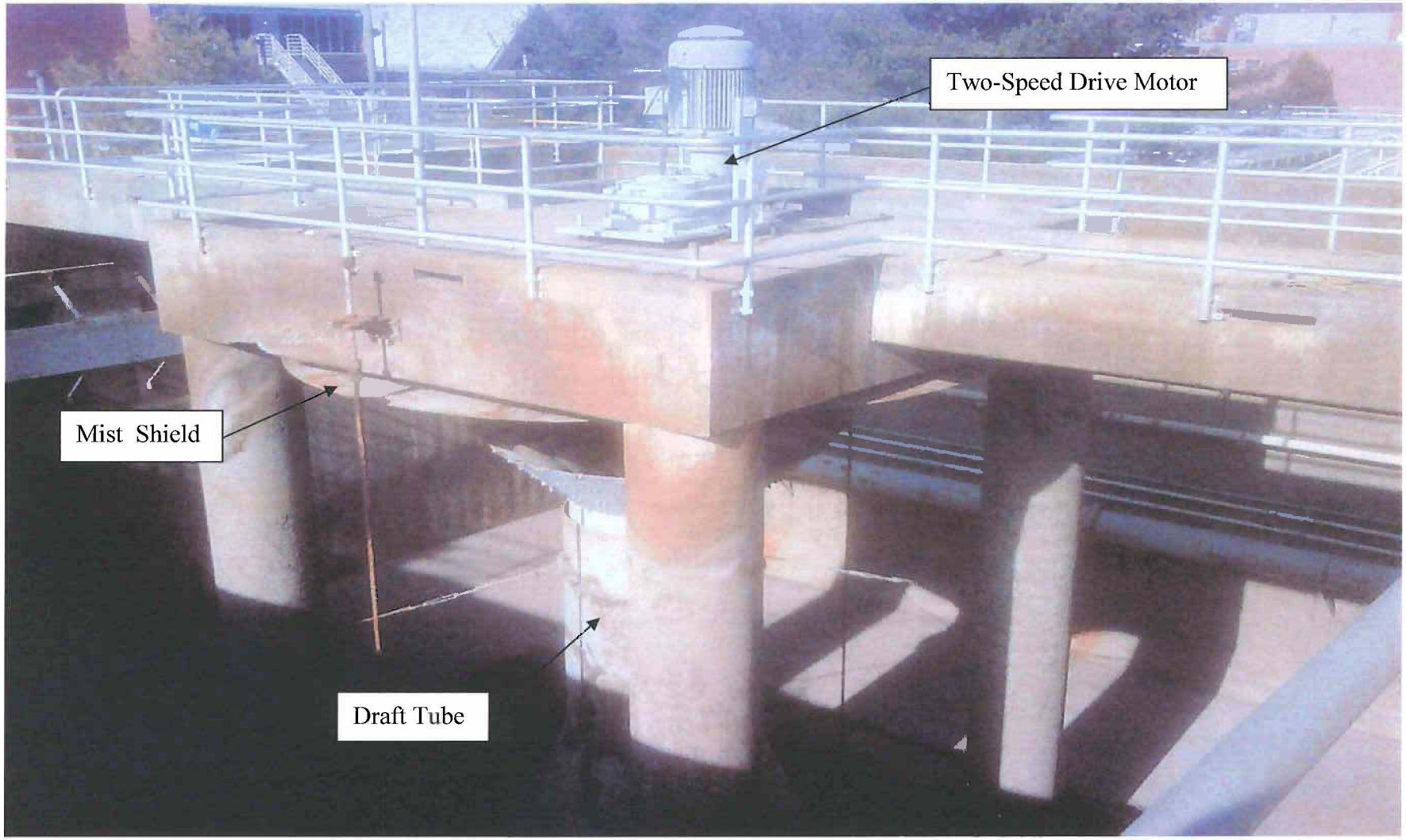
BUDGET/FISCAL IMPACT:

The FY12 CIP contains a budget of $750,000 and was updated to $1,746,000 in the Proposed FY13 CIP for Contract 7278; the recommended award amount is $1,840,000. The budget for this project increased significantly due to changes in the scope of work that were made during design, including a new pre-cast building to house the controls for the aerators and pumps, modifications to the existing fire protection system, and additional infrastructure (e.g., ductbanks for future expansion of the plant's control system) that was not included in the original estimate.

MBE/WBE PARTICIPATION:

There are no MBE or WBE participation requirements required for this contract due to the limited opportunities for subcontracting.

ATTACHMENT 1
(Aerator Assembly in Empty Basin 2)



MASSACHUSETTS WATER RESOURCES AUTHORITY
Charlestown Navy Yard
100 First Avenue, Building 39
Boston, MA 02129

Frederick A. Laskey
Executive Director

Telephone: (617) 242-6000
Fax: (617) 788-4899
TTY: (617) 788-4971

WATER POLICY AND OVERSIGHT COMMITTEE MEETING

Chair: J. Hunt
Vice-Chair: V. Mannering
Committee Members:
J. Barrera
J. Carroll
J. Foti
M. Gove
A. Pappastergion
J. Walsh

to be held on

Wednesday, March 14, 2012

Location: Waterworks Museum
2450 Beacon St.
Boston, MA 02467

Time: Immediately following Wastewater Comm.

AGENDA

A. Information

1. Local Pipeline and Water System Assistance Program Update
2. Draft Policy and Guidelines for Authorized Public Access to Water Supply Lands under the Care and Control of MWRA

B. Contract Amendments/Change Orders

1. Ultraviolet Disinfection Facilities, Carroll Water Treatment Plant: Daniel O'Connell's Sons, Inc., Contract 6924, Change Order 4

***Note Chestnut Hill location (map attached to blue Board agenda). There are numerous ways to get to the Waterworks Museum; use these links to find the best route from your location: http://www.waterworksmuseum.org/plan-your-visit http://www.waterworksmuseum.org/directionsmaps.**

W(i)
3/14/12

MASSACHUSETTS WATER RESOURCES AUTHORITY

Meeting of the
Water Policy and Oversight Committee

February 15, 2012

A meeting of the Water Policy and Oversight Committee was held on February 15, 2012 at the Authority headquarters in Charlestown. Chairman Hunt presided. Present from the Board were Messrs. Carroll, Cotter, Foti, Gove, Mannering, Pappastergion and Walsh. Among those present from the Authority staff were Fred Laskey, Steve Remsberg, Carl Leone, Jae Kim, Jorge Silva and Bonnie Hale. The meeting was called to order at 11:40 a.m.

Information

Update on Watershed Forestry Program - Presentation

Staff from the Division of Water Supply Protection gave a presentation on the Watershed Forest Management program. There was related discussion of a campaign seeking to ban logging altogether around the Quabbin Reservoir by a group called Environmental Massachusetts, efforts by DWSP to counter erroneous and misleading claims being made by that organization, and frustration regarding the long delay in the issuance of the Science & Technical Advisory Committee's Report on Forestry which was preventing the formulation of updated forestry regulations and future projects.

Contract Awards

*Community Leak Detection Task Order Services: W293, New York Leak Detection, Inc., W293A, Water & Waste Pipe Testing, Inc., W293B, Liston Utility Services, W293C, ADS Environmental Services, and W293D, Heath Consultants

Staff summarized how the procurement was structured, and the Committee recommended approval of the above five contracts (ref. agenda item B.1).

*Oakdale Facility – Phase 1A Upgrade: Ewing Electrical Co., Inc., Contract 7230

The Committee recommended approval of the contract award (ref. agena item B.2).

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* Approved as recommended at February 15, 2012 Board of Directors meeting.

Contract Amendments/Change Orders

*Lynnfield/Saugus Pipeline Project: Albanese Brothers, Inc., Contract 6584, Change Order 12

The Committee recommended approval of Change Order 12 (ref. agenda item C.1).

*Installation of Second Gaseous Oxygen Line, Carroll Water Treatment Plant: William M. Collins Co., Contract 7085A, Change Order 2

The Committee recommended approval of Change Order 2 (ref. agenda item C.2).

* Approved as recommended at February 15, 2012 Board of Directors meeting.

3 A.1
3/14/12

STAFF SUMMARY

TO: Board of Directors
FROM: Frederick A. Laskey, Executive Director
DATE: March 14, 2012
SUBJECT: Local Pipeline and Water System Assistance Program Update

COMMITTEE: Water Policy & Oversight

X INFORMATION
____ VOTE

Elaine M. Donahue, Project Manager
Carl H. Leone, Senior Program Manager
Preparer/Title

Michael J. Hornbrook
Chief Operating Officer

RECOMMENDATION:

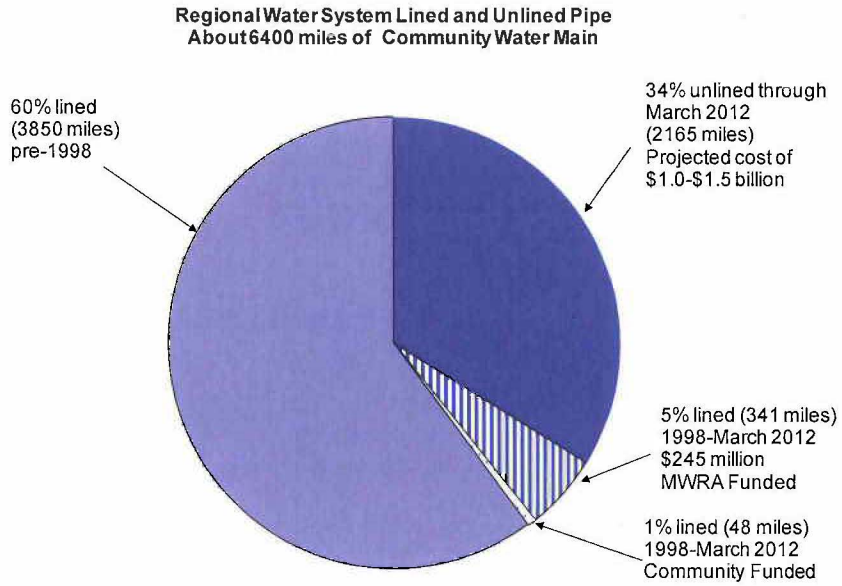
For information only. Thirty-seven of the 45[1] eligible member water communities have participated in MWRA's $467 million Local Pipeline and Water System Assistance Program. Through March 2012, $216 million in interest-free loans has been distributed to member communities to finance 258 projects that will help maintain high water quality in local distribution systems. Community loans are repaid to MWRA over a ten-year period. All scheduled community loan repayments have been made, a total of more than $111 million.

BACKGROUND:

The Phase 1 - Local Pipeline Assistance Program (LPAP) began in FY01 and is approved through FY13. It provides $257 million in interest-free loans to water system communities for water main replacement or cleaning and lining projects. The Phase 2 - Local Water System Assistance Program (LWSAP) commenced in FY11 and is approved through FY20. This expansion of the water loan program has added $210 million in interest-free loans for member water communities (including a $10 million allocation specifically for the three Chicopee Valley Aqueduct communities). MWRA's goal in providing financial assistance to member communities is to improve local water systems to help maintain high quality water as it passes from MWRA's facilities through local pipelines to customers' taps. Continued improvement of local water systems is a critical element of MWRA's Integrated Water Supply Improvement Program. Older water mains, particularly those constructed of unlined cast-iron pipe, need to be replaced or cleaned and lined to prevent tuberculation (rust build-up), loss of disinfectant residual, and potential bacteria growth.

[1] MWRA has a total of 50 water communities (with Dedham/Westwood Water District counted as one), of which 45 are allocated loan funds under the Local Water System Assistance Program. The five ineligible water communities have special case considerations; these include: Clinton, Leominster (emergency only), and Worcester (emergency only), that receive untreated water from the Wachusett Reservoir; Cambridge, that receives water on an emergency-only basis; and Lynn, that receives water for the GE plant only. Under the initial Local Pipeline Assistance Program, the three Chicopee Valley Aqueduct (CVA) communities (Chicopee, South Hadley FD#1, and Wilbraham) were not allocated loan funds.

To date, approximately 34 percent of locally-owned distribution systems remain unlined, representing a regional need of approximately $1.0–1.5 billion for future water main rehabilitation, as depicted in the pie chart below.



DISCUSSION:

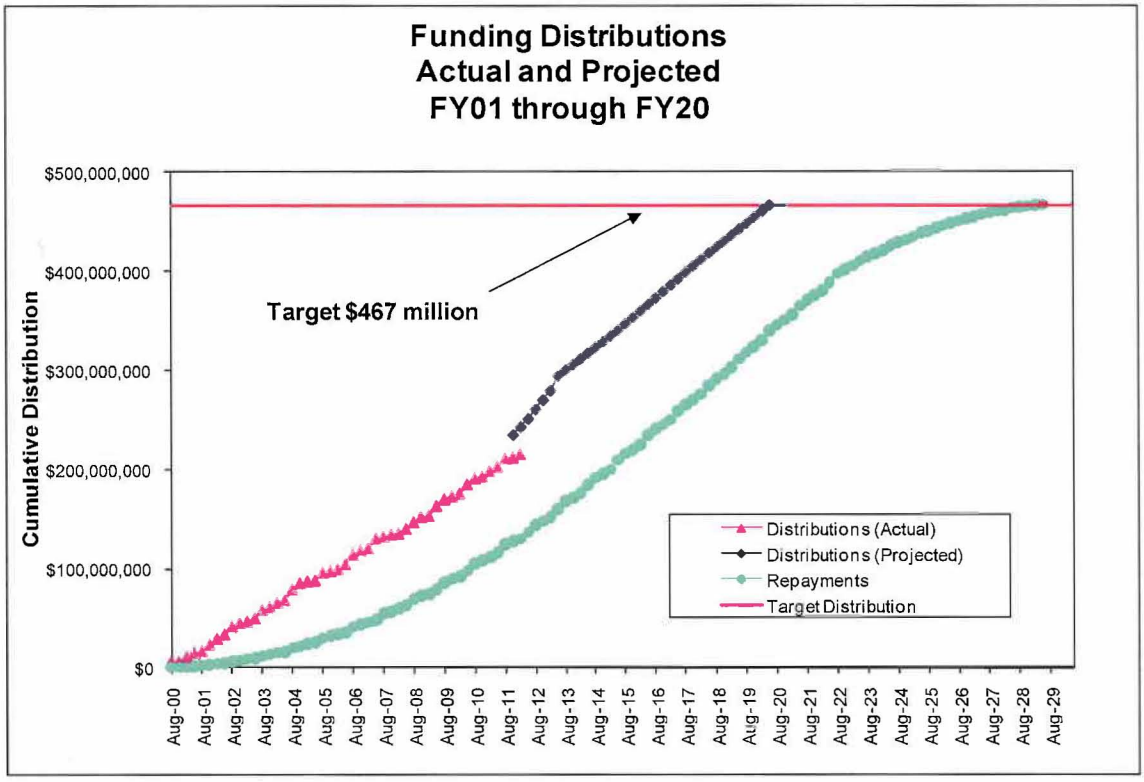
Local Pipeline and Water System Assistance Program loan funds are allocated to member water communities as listed on Attachments 1 and 2. MWRA's partially supplied communities received pro-rated shares based on their percentage use of MWRA water. Attachment 3 provides individual statistics for the total miles of lined and unlined water main in each member water community.

The Phase 1 - LPAP is scheduled to conclude at the end of FY13 (June 2013). Currently, 34 of the 42 eligible communities have participated in the Phase 1 loan program and 20 communities have utilized their entire loan allocation. Timing for completion of the Phase 1 water loan program was discussed at two MWRA Advisory Board Operation Committee meetings held on March 17, 2011 and November 17, 2011. Based on discussion at those meetings, as well as data developed from a survey of all communities with remaining LPAP funds, no recommendation was put forward to extend the Phase 1 water loan program completion date. Thus, at the end of June 2013, undistributed Phase 1 LPAP water loan funds will no longer be available for community use. Communities will continue to have the ability to borrow interest-free loans under the Phase 2 - Local Water System Assistance Program through FY20.

The Phase 2 - LWSAP began in FY11 and through the first seven quarterly loan distributions $14.6 million has been distributed to 14 member communities to fund local water projects. As water loan distributions under Phase 1 come to a conclusion, loan distributions under Phase 2 are ramping-up. The majority of financial assistance loans under Phase 2 LWSAP have continued to fund replacement/rehabilitation of unlined water mains (74 percent). In addition, some communities are initiating system efficiency projects (Tier Two Projects) including, meter replacement/meter reading, booster pump station replacement, and hydrant and valve upgrades.

BUDGET/FISCAL IMPACT:

The FY12 CIP includes an overall net budget of zero dollars for these programs because community loans are offset by repayments over time. However, depending on the timing and level of community loan requests, the annual spending variance can fluctuate significantly; thus causing under or overspending (versus budget) for any particular year. The graph below presents loan funding distributions (actual and projected) and corresponding repayments for the program - FY01 through FY20.



Currently, the program has a remaining balance of $251 million in future community loans (through FY20) and a remaining balance of $356 million in future repayments (through FY30). As community loans are repaid, the funds are deposited into MWRA's construction fund. MWRA's exposure for FY12 to make community water loans "interest free" is estimated at $3.44 million based on a commercial paper interest rate of 3.25 percent. This expense is included in the Debt Service portion of the CEB under a separate line item.

MBE/WBE PARTICIPATION:

MBE/WBE goals for community projects are established in the Program Guidelines.

ATTACHMENTS:

Attachment 1 – Phase 1 - LPAP Allocation and Fund Utilization by Community
Attachment 2 – Phase 2 - LWSAP Allocation and Fund Utilization by Community
Attachment 3 – Lined and Unlined Pipe by Community

ATTACHMENT 1
PHASE 1 - MWRA LOCAL PIPELINE ASSISTANCE PROGRAM
ALLOCATION AND FUND UTILIZATION BY COMMUNITY
THROUGH MARCH 2012

Community	Community Total Allocation	Funds Distributed Thru Mar 12	Percent Distributed	Funds Currently Available
Arlington	$9,723,620	$5,249,000	54%	$4,474,620
Bedford*	$1,018,610	$1,018,610	100%	$0
Belmont	$4,213,570	$4,213,570	100%	$0
Boston	$61,571,330	$61,571,330	100%	$0
Brookline	$625,090	$0	0%	$625,090
Canton*	$2,080,380	$0	0%	$2,080,380
Chelsea	$5,023,870	$3,173,119	63%	$1,850,752
Dedham/Westwood* ##	$7,500	$7,500	100%	$0
Everett	$5,429,020	$4,775,579	88%	$653,441
Framingham	$8,681,800	$5,184,460	60%	$3,497,340
Lexington	$1,539,570	$1,539,570	100%	$0
Lynnfield WD	$320,000	$320,000	100%	$0
Malden	$10,244,520	$10,244,520	100%	$0
Marblehead	$6,320,350	$0	0%	$6,320,350
Marlborough*	$1,166,200	$450,000	39%	$716,200
Medford	$9,723,620	$4,845,448	50%	$4,878,172
Melrose	$6,586,590	$6,586,590	100%	$0
Milton	$6,771,800	$6,771,800	100%	$0
Nahant	$1,331,210	$936,242	70%	$394,968
Needham*	$1,286,520	$257,304	20%	$1,029,216
Newton	$25,860,190	$25,860,190	100%	$0
Northborough*	$97,180	$0	0%	$97,180
Norwood	$5,139,630	$5,139,630	100%	$0
Peabody*	$838,030	$838,030	100%	$0
Quincy	$15,835,600	$15,835,600	100%	$0
Reading ###	$1,916,000	$1,916,000	100%	$0
Revere	$5,371,140	$1,000,000	19%	$4,371,140
Saugus	$9,029,070	$9,029,070	100%	$0
Somerville	$9,480,530	$7,584,424	80%	$1,896,106
Southborough	$81,030	$0	0%	$81,030
Stoneham	$1,736,360	$1,360,800	78%	$375,560
Stoughton* #	$4,480,000	$0	0%	$4,480,000
Swampscott	$5,602,660	$5,602,660	100%	$0
Wakefield*	$2,524,950	$0	0%	$2,524,950
Waltham	$13,636,210	$1,716,518	13%	$11,919,692
Watertown	$1,736,360	$1,736,360	100%	$0
Wellesley*	$1,279,280	$1,231,526	96%	$47,754
Weston	$127,330	$127,330	100%	$0
Wilmington* ####	$73,000	$0	0%	$73,000
Winchester*	$665,190	$665,190	100%	$0
Winthrop	$4,167,260	$877,600	21%	$3,289,660
Woburn*	$3,454,330	$3,454,330	100%	$0
TOTAL	**$256,796,500**	**$201,119,900**	**78%**	**$55,676,601**

*** Partially Served Communities**

 # Stoughton's total allocation is for eight years; the Town was not an MWRA member water community for the first two years of the Program.

Dedham/Westwood's total allocation is for five years; the Town was not an MWRA member water community for the first five years of the Program.

Reading's total allocation is for five years; FY06 and FY07 as a partially supplied MWRA water community at $142,000/year and FY08, FY09, and FY10 as a fully supplied MWRA water community at $544,000/year.

Wilmington's total allocation is for one year - FY10.

ATTACHMENT 2

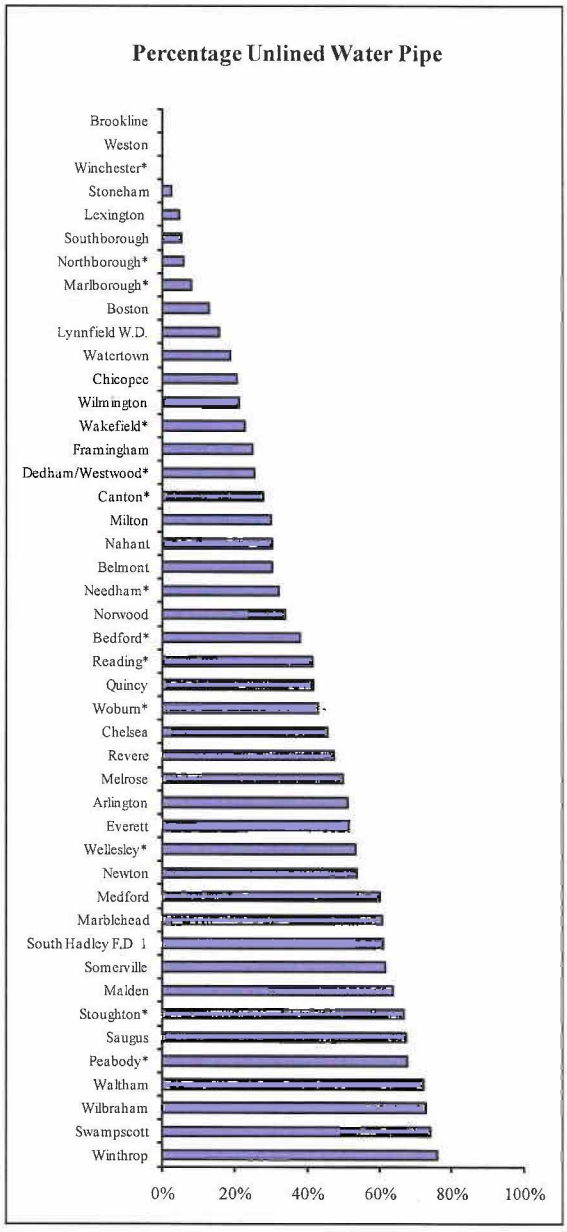
PHASE 2 - MWRA LOCAL WATER SYSTEM ASSISTANCE PROGRAM
ALLOCATION AND FUND UTILIZATION BY COMMUNITY
THROUGH MARCH 2012

Community	Community Total Allocation	Community Annual Allocation	Allocation To Date (Year 2)	Funds Distributed Thru Mar 12	Percent Distributed (Year 2)	Total Remaining Funds	Funds Currently Available
Arlington	$6,225,000	$622,500	$1,245,000		0%	$6,225,000	$1,245,000
Bedford *	$2,418,000	$500,000	$1,000,000		0%	$2,418,000	$1,000,000
Belmont	$3,477,000	$500,000	$1,000,000	$1,000,000	100%	$2,477,000	$0
Boston	$38,754,000	$3,875,400	$7,750,800	$4,014,130	52%	$34,739,870	$3,736,670
Brookline	$3,426,000	$500,000	$1,000,000		0%	$3,426,000	$1,000,000
Canton *	$3,216,000	$500,000	$1,000,000	$410,000	41%	$2,806,000	$590,000
Chelsea	$3,814,000	$500,000	$1,000,000		0%	$3,814,000	$1,000,000
Dedham/Westwood *	$503,000	$503,000	$503,000	$503,000	100%	$0	$0
Everett	$4,672,000	$500,000	$1,000,000	$500,000	50%	$4,172,000	$500,000
Framingham	$7,357,000	$735,700	$1,471,400		0%	$7,357,000	$1,471,400
Lexington	$3,024,000	$500,000	$1,000,000		0%	$3,024,000	$1,000,000
Lynnfield Water Dist.	$1,396,000	$500,000	$1,000,000		0%	$1,396,000	$1,000,000
Malden	$7,272,000	$727,200	$1,454,400		0%	$7,272,000	$1,454,400
Marblehead	$4,237,000	$500,000	$1,000,000		0%	$4,237,000	$1,000,000
Marlborough *	$1,917,000	$500,000	$1,000,000		0%	$1,917,000	$1,000,000
Medford	$6,959,000	$695,900	$1,391,800		0%	$6,959,000	$1,391,800
Melrose	$3,988,000	$500,000	$1,000,000		0%	$3,988,000	$1,000,000
Milton	$4,123,000	$500,000	$1,000,000		0%	$4,123,000	$1,000,000
Nahant	$1,490,000	$500,000	$1,000,000	$884,000	88%	$606,000	$116,000
Needham *	$794,000	$500,000	$794,000		0%	$794,000	$794,000
Newton	$13,602,000	$1,360,200	$2,720,400		0%	$13,602,000	$2,720,400
Northborough *	$1,048,000	$500,000	$1,000,000		0%	$1,048,000	$1,000,000
Norwood	$4,395,000	$500,000	$1,000,000	$1,000,000	100%	$3,395,000	$0
Peabody *	$1,089,000	$500,000	$1,000,000		0%	$1,089,000	$1,000,000
Quincy	$10,505,000	$1,050,500	$2,101,000	$2,101,000	100%	$8,404,000	$0
Reading	$4,146,000	$500,000	$1,000,000	$134,000	13%	$4,012,000	$866,000
Revere	$5,034,000	$503,400	$1,006,800		0%	$5,034,000	$1,006,800
Saugus	$6,621,000	$662,100	$1,324,200	$881,750	67%	$5,739,250	$442,450
Somerville	$7,419,000	$741,900	$1,483,800		0%	$7,419,000	$1,483,800
Southborough	$1,512,000	$500,000	$1,000,000		0%	$1,512,000	$1,000,000
Stoneham	$2,339,000	$500,000	$1,000,000	$1,000,000	100%	$1,339,000	$0
Stoughton*	$2,506,000	$500,000	$1,000,000		0%	$2,506,000	$1,000,000
Swampscott	$3,755,000	$500,000	$1,000,000	$249,468	25%	$3,505,532	$750,532
Wakefield *	$2,325,000	$500,000	$1,000,000	$1,000,000	100%	$1,325,000	$0
Waltham	$10,293,000	$1,029,300	$2,058,600		0%	$10,293,000	$2,058,600
Watertown	$2,978,000	$500,000	$1,000,000		0%	$2,978,000	$1,000,000
Wellesley *	$2,350,000	$500,000	$1,000,000		0%	$2,350,000	$1,000,000
Weston	$1,625,000	$500,000	$1,000,000		0%	$1,625,000	$1,000,000
Wilmington *	$611,000	$500,000	$611,000		0%	$611,000	$611,000
Winchester *	$882,000	$500,000	$882,000		0%	$882,000	$882,000
Winthrop	$3,312,000	$500,000	$1,000,000		0%	$3,312,000	$1,000,000
Woburn *	$2,591,000	$500,000	$1,000,000		0%	$2,591,000	$1,000,000
Chicopee	$7,153,000	$715,300	$1,430,600	$935,000	65%	$6,218,000	$495,600
South Hadley F.D. 1	$1,538,000	$500,000	$1,000,000		0%	$1,538,000	$1,000,000
Wilbraham	$1,309,000	$500,000	$1,000,000		0%	$1,309,000	$1,000,000
TOTAL	**$210,000,000**	**$29,222,400**	**$57,228,800**	**$14,612,348**		**$195,387,652**	**$42,616,452**

* Partially Served Communities

ATTACHMENT 3
MWRA LOCAL PIPELINE AND WATER SYSTEM ASSISTANCE PROGRAMS
LINED AND UNLINED PIPE BY COMMUNITY
THROUGH MARCH 2012

Community	Total Miles of Pipe	Miles of Lined Pipe	Miles of Unlined Pipe	Percent Unlined
Arlington	132	64	67	51%
Bedford*	85	52	32	38%
Belmont	88	61	27	30%
Boston	1009	879	130	13%
Brookline	140	140	0	0%
Canton*	121	87	34	28%
Chelsea	59	32	27	46%
Chicopee	262	209	54	21%
Dedham/Westwood*	190	141	49	26%
Everett	68	33	35	51%
Framingham	274	206	68	25%
Lexington	157	150	7	5%
Lynnfield W.D.	29	25	5	16%
Malden	118	43	75	64%
Marblehead	80	31	48	61%
Marlborough*	168	154	14	8%
Medford	120	48	72	60%
Melrose	80	40	40	50%
Milton	138	97	41	30%
Nahant	23	16	7	30%
Needham*	133	90	43	32%
Newton	319	148	170	53%
Northborough*	65	61	4	6%
Norwood	118	78	40	34%
Peabody*	170	55	115	68%
Quincy	238	139	99	42%
Reading*	110	65	45	41%
Revere	91	48	43	47%
Saugus	125	41	84	67%
Somerville	120	46	74	61%
South Hadley F.D. 1	82	32	50	61%
Southborough	87	82	5	5%
Stoneham	78	76	2	3%
Stoughton*	148	49	99	67%
Swampscott	55	14	41	74%
Wakefield*	114	88	26	23%
Waltham	157	44	113	72%
Watertown	80	65	15	19%
Wellesley*	136	64	73	53%
Weston	105	105	0	0%
Wilbraham	74	20	54	73%
Wilmington	126	99	27	21%
Winchester*	105	105	0	0%
Winthrop	45	11	34	76%
Woburn*	182	104	78	43%
TOTAL	6,404	4,239	2,165	34%



* Partially Served Communities

W/A.2
3/14/12

STAFF SUMMARY

TO: Board of Directors
FROM: Frederick A. Laskey, Executive Director
DATE: March 14, 2012
SUBJECT: Draft Policy and Guidelines for Authorized Public Access to Water Supply Lands under the Care and Control of MWRA

At the November 16, 2011 Board of Directors meeting, Secretary Sullivan announced the formation of a Public Access Committee to review the possibility of opening up certain Water Supply Lands, particularly along aqueducts no longer in active service, for public use as trails. Board members Barrera, Hunt and Walsh volunteered to participate on the committee, with participation from Executive Office of Energy and Environmental Affairs and MWRA staff.

MWRA staff was charged with preparing draft Guidelines under which such lands could be made available to neighboring communities for public use, while ensuring the continued protection of these lands.

COMMITTEE: Water Policy and Oversight

__ INFORMATION
_X_ VOTE

Michael J. Hornbrook
Chief Operating Officer

Thomas H. Lindberg, Community Relations Manager
Preparer/ Title

Kevin A. McCluskey
Director of Public Affairs

RECOMMENDATION:

That the Board of Directors approve the attached Policy and Guidelines for Authorized Public Access to Water Supply Lands under the Care and Control of MWRA for the purpose of authorizing the Executive Director and/or designee to enter into revocable agreements with local communities, public agencies and/or non-profits to allow certain limited public access activities to be permitted on MWRA-controlled water supply lands, consistent with good water supply practices.

DISCUSSION:

MWRA has care and control of thousands of acres of Commonwealth lands, including 220 miles of aqueduct right-of-ways that were acquired for water supply purposes over the last one hundred and seventy years. As the MWRA proceeded with the construction of the new water treatment plant, covered storage facilities and the deep rock tunnel, all part of the Integrated Water Supply Improvement Program (IWSIP), it was anticipated that local communities would request increased public access to these emergency back-up facilities. MWRA has official agreements with a few communities to date, but does not have an approved Board policy.

These agreements would preserve the Authority's primary water supply interest in the land while allowing host communities to officially partner with MWRA to become better stewards of MWRA land within their communities. These partnerships would give the MWRA the opportunity to focus limited staff resources on the active system, while enhancing system safety and security by better controlling inappropriate public access activities, without unfairly burdening ratepayer resources.

Authorized Public Access

Currently, MWRA has a mix of authorized and unauthorized public access to waterworks lands. The Towns of Framingham and Natick have been granted 8M permits and Weston has a Memorandum of Agreement allowing certain passive public access activities on MWRA lands. MWRA also has some areas where waterworks lands have activities that are unauthorized and, in some cases, inappropriate uses of water supply lands that staff work to eliminate. For example, MWRA staff removed a deer hunting stand along the Hultman Aqueduct near the Shaft L site and teen encampments at various locations. MWRA prohibits the use of unauthorized motor vehicles on MWRA aqueducts as they cause significant erosion of the bermed soils protecting the infrastructure.

MWRA will continue to address all unauthorized uses either by permitting acceptable uses of water supply lands that are not part of the active water supply system or continuing to enforce the prohibition of uses considered to be detrimental to water supply infrastructure. Existing Agreements authorizing public access uses include The Weston Reservoir MOA, and 8(m) permits with the Towns of Natick and Framingham.

Pending Agreements

MWRA staff is currently working with stakeholders on a trail through MWRA's Southborough/ Fayville Dam area which is intended to complete the Bay Circuit Trail in the area of Southborough and Framingham. A portion of the trail is proposed to be located on a ridge at the northern edge of the MWRA/Route 30 site, in a location that is not required for MWRA activities and would not interfere with maintenance or security of the buildings or personnel at that location. MWRA staff is recommending that an 8M permit be issued for the Bay Circuit Trail Association though the Route 30 property. Portions of the Weston, Sudbury and Wachusett Aqueduct rights-of-way have been identified by communities, including Newton, Wellesley, Needham, Framingham, Natick, Sherborn, Berlin, Northborough, Southborough, Marlborough, Westborough, Wayland and Sherborn, as having the best potential to link existing green spaces, parks or schools within each community. While these surface aqueducts provide an important role in back-up water supply, they are removed from active service and provide an opportunity for MWRA to clearly define appropriate public uses while partnering with host communities in authorizing and controlling public access to Commonwealth lands.

It should be noted that many locations are being used by local communities and abutters, but their use to date is unauthorized. Authorizing and permitting public use as an MWRA policy would provide MWRA with more control over the public access activities while enhancing its role as the public steward of Commonwealth lands.

MWRA Liability

Staff has researched and analyzed liability issues involving public access and MWRA has over ten years' experience in operating the Deer Island and Nut Island Public Access Areas. These

experiences uniformly conclude that MWRA's liability to the public is limited by the Massachusetts Public Recreation Statue (M.G.L. c.21, 17C). This statute provides that a landowner who permits the public to use its land for recreational purposes without charging a fee shall not be liable to any member of the public who uses the land for those purposes in the absence of willful, wanton, or reckless conduct.

Commonwealth Land

MWRA has care and control of Commonwealth of Massachusetts acquired properties that include both fee (ownership) and easement interests. MWRA can only permit uses of those lands for other than water supply purposes on property owned in fee. Easements allow MWRA to operate and maintain the water supply infrastructure only, as the underlying fee interest is held by another entity, typically a private property owner.

Sudbury Aqueduct		
	Length (ft)	Length (miles)
Boston	1211.1	0.2
Framingham	16618.1	3.1
Natick	14455.7	2.7
Needham	11138.5	2.1
Newton	19253.8	3.6
Sherborn	10611.6	2.0
Wellesley	18582.6	3.5
TOTAL:	91871.3	17.4
Wachusett Aqueduct		
	Length (ft)	Length (miles)
Berlin	17661.8	3.3
Clinton	4251.3	0.8
Marlborough	242.4	0.0
Northborough	24884.4	4.7
TOTAL:	47039.9	8.9
Weston Aqueduct		
	Length (ft)	Length (miles)
Framingham	27907.8	5.3
Southborough	858.5	0.2
Wayland	22685.6	4.3
Weston	14068.9	2.7
TOTAL:	65520.8	12.4

BUDGET/FISCAL IMPACT:

While there are some quantifiable, nominal costs to MWRA in staff time and coordination efforts in partnering with host communities to allow public access to MWRA lands, the agreements to date and all future agreements would require the permittee to undertake the costs and responsibilities of maintaining the permitted land and trails, including appropriate signage, as well as safety and emergency planning in conjunction with local police and fire departments and other appropriate agencies.

ATTACHMENTS:

Policy and Guidelines for Authorized Public Access to Water Supply Lands under the Care and Control of MWRA

GUIDELINES FOR PUBLIC ACCESS

To Commonwealth Lands under the Care and Control of MWRA

GOAL

To protect and preserve existing lands under the care and control of MWRA for water supply purposes, while authorizing and permitting public access consistent with good water supply practices. MWRA recognizes the importance of public access and public involvement in their facilities as a means of improving their own performance in facilities maintenance and building support from their ratepayers, without unfairly burdening the ratepayer.

POLICY

It is the policy of MWRA to work with communities, open space and environmental stakeholders and the public to authorize site specific public access upon Commonwealth lands under the care and control of MWRA. This public access policy refers to the MWRA controlled aqueduct rights-of-way for Weston Aqueduct, Wachusett Aqueduct, Sudbury Aqueduct, and the Cochituate Aqueduct along with lands surrounding MWRA's Weston and Norumbega distribution reservoirs. This policy does not refer to sections of these aqueducts for which an easement over private property is held by MWRA and the Commonwealth of Massachusetts.

The completion of MWRA's Integrated Water Supply Improvement Program (IWSIP) identified the need to plan for the management of lands and facilities (aqueducts, distribution facilities and reservoirs) that were required to remain part of the regional water system, but whose status was now down-graded to emergency back-up. These facilities would continue to be managed and maintained by MWRA, however, given that scarce staff resources are now directed to properly managing the new facilities, the opportunity to work more closely with host communities and non-profits to continue to protect the water supply land has always been a planning and operations goal.

MWRA in cooperation with MAPC and the communities in metro-west published a study on the feasibility of authorized public access to retired aqueduct right-of-way s in July 1998. The Beals & Thomas Study indentified portions of aqueduct right-of-ways where MWRA controlled lands could be incorporated into local open space plans. The report included discussion of the types of appropriate uses (walking, running, hiking, dog walking) and the legal, jurisdictional and management issues that would were be required to establish such a policy. Biking could be permitted, as long as the existing soils covering the top of and side slopes of the aqueduct (generally 3-5 feet) pipeline are protected from erosion. Stone dust gravel or other treatments may be required.

In the intervening years, MWRA has formal agreements with a few host communities, in the form of 8M permits and an MOA. It is important to note that each location has unique characteristics and flexibility to meet those conditions is requested.

MWRA has identified the following as required standards.

GENERAL PUBLIC ACCESS PERMIT CONDITIONS

I. MWRA Protections

MWRA retains care and control of all lands and structures for purpose of supplying potable water to metropolitan Boston, no public access activity can supersede this legislative mandate.

MWRA will work with the permittees and other stakeholder on a standard signage plan that includes interpretative signage to educate the public about the water system and its history, similar to the program used for the Deer Island and Nut Island Public Access Areas.

MWRA has the right to review and approve all of the permittee's work including plans and specifications including requiring written approval, not unreasonably withheld by MWRA.

MWRA may enter upon any permitted location to carry out inspection, maintenance, repair and replacement of its property, including heavy equipment.

MWRA may revoke the permit at any time and the permit is not assigned or transferable.

Permitted activity should not create additional workload for MWRA nor increase the current maintenance workload of MWRA. Agreements should transfer as much routine maintenance as feasible to the permittee.

MWRA will work with permittee on emergency closure procedures for a water supply emergency.

MWRA is released from any and all claims, suits, and cause of action including loss, damage or destruction of property, for personal injury or death of any consultant, contractor, employee or agent of either the permittee or by any entity acting by or through the permittee.

II. Permittee Requirements

Permittee shall develop a Safety and Emergency Response Plan in conjunction with local police and fire departments, including police patrols (if required).

Permittee will be required to clear any and all trees, tree limbs, and brush on the permitted property that in the Permittee's determination, interfere with its desired use. Permittee shall repair any damage resulting from trail use that compromises MWRA interests in the land.

Permittee shall be responsible for the development and operation of the trail system, including coordination with abutting property owners and other stakeholders.

Permittee shall cooperate with surrounding municipalities or other public entities in developing a regional passive recreational plan for MWRA lands in the area.

Permittee shall be responsible for collection and removal of trash.

No motor operated vehicles (e.g. dirt bikes, ATVs etc.) will be permitted.

Permittee shall post signage (standards and approval developed by MWRA) acknowledging the trail as MWRA land, including phone numbers for emergency contact and highlighting rules of land use.

w B.1
IX C.1
3/14/12

STAFF SUMMARY

TO: Board of Directors
FROM: Frederick A. Laskey, Executive Director
DATE: March 14, 2012
SUBJECT: Ultraviolet Disinfection Facilities
John J. Carroll Water Treatment Plant
Daniel O'Connell's Sons, Inc.
Contract 6924, Change Order 4

COMMITTEE: Water Policy & Oversight

____ INFORMATION
_X_ VOTE

Charles Scott, Construction Coordinator
A. Navanandan, P.E., Director, Construction
Preparer/Title

Michael J. Hornbrook
Chief Operating Officer

RECOMMENDATION:

To authorize the Executive Director, on behalf of the Authority, to approve Change Order 3 to Contract 6924, Ultraviolet Disinfection Facilities, with Daniel O'Connell's Sons, Inc., for an amount not to exceed $91,782.93, increasing the contract amount from $29,646,029.44 to $29,737,812.37, with no increase in contract term.

Further, to authorize the Executive Director to approve additional change orders as may be needed to Contract 6924 in an amount not to exceed the aggregate of $250,000, in accordance with the Management Policies and Procedures of the Board of Directors.

DISCUSSION:

On April 13, 2011, the Board approved the award of Contract 6924 to Daniel O'Connell's Sons, Inc. to construct a UV disinfection system at the Carroll Water Treatment Plant (CWTP) to bring the plant into compliance with the new Long-Term 2 Enhanced Surface Water Treatment Rule. The contract includes a milestone of February 14, 2014, by which time the UV system must be in service; this is six weeks prior to the April 1, 2014 compliance date in the Long-Term 2 Enhanced Surface Water Treatment Rule. The contract expiration date is March 11, 2015.

This Change Order

Change Order 4 consists of the following 3 items. Staff are compiling a list of all change order items that have resulted from an error or omission on the part of the Design Consultant, AECOM, and will notify AECOM, in writing, of the current status of these findings and of MWRA's intention to seek appropriate cost recovery.

Furnish and Install a Viton Gasket and Caulking
Between the 316 Stainless Steel Collars and Slide Gate Wall Openings $45,316.44

The wall openings for slide gates on the A-side and B-side UV reactors are 120 inches by 120 inches. The contract specifications require the installation of a 316 stainless steel collar around the openings. However, the contract drawings omitted the necessary gaskets and accompanying grouting that must be installed between the collars and the concrete walls to provide a watertight seal.

The PCO for this item has been identified by MWRA staff as a design omission. MWRA will seek appropriate cost recovery for this item. The Design Engineer, AECOM, MWRA staff, and the Contractor have agreed to a lump sum amount of $45,316.44 for this additional work.

Disconnect/Reconnect Power and Communications
Conduits and Cable in lieu of Specified Conduit and Cable Routings $36,216.94

The contract documents indicate that the existing conduits and wiring between the Post-Treatment Building and the Dewatering Pump Station are to be removed prior to moving the carbon dioxide tank and then reinstalled in the same location at an unspecified later time. The existing conduits and wiring are above the proposed B-side UV Room and cannot be reinstalled in the same place as it is directly above the open excavation, which will remain open for more than a year. The Dewatering Pump Station cannot be out of service for an extended period since it is needed each time the CWTP goes to half-plant operation for maintenance. Therefore, the Contractor must re-route the conduits and wiring between the carbon dioxide tanks to the Dewatering Pump Station.

The PCO for this item has been identified by MWRA staff as a design omission. MWRA will seek appropriate cost recovery for this item. AECOM, MWRA staff, and the Contractor have agreed to a lump sum amount of $36,216.94 for this additional work.

Furnish and Install Power, Control Wiring,
and Conduit for Two Sample Recycle Duplex Sump Pumps $10,249.55

The Design Engineer omitted the electrical power, control wiring, and conduit for the recycle duplex sump pumps in UV Rooms A and B. Without these, the pumps will not have power and control signals necessary for the pumps to function.

The PCO for this item has been identified by MWRA staff as a design omission. MWRA will seek appropriate cost recovery for this item. AECOM, MWRA staff, and the Contractor have agreed to a lump sum of $10,249.55 for this additional work.

The Contractor has proceeded with the work under this change order at its own risk.

CONTRACT SUMMARY:

	Amount	Time	Dated
Original Contract:	$29,413,382.00	1,420 Days	04/21/11
Change Orders:			
Change Order 1*	$18,742.37	0 Days	12/16/11
Change Order 2*	$13,791.51	0 Days	12/27/11
Change Order 3*	$200,113.56	0 Days	Pending
Change Order 4	$91,782.93	0 Days	Pending
Total of Change Orders:	$324,430.37	0 Days	
Adjusted Contract:	$29,737,812.37	1,420 Days	

*Approved under delegated authority

If Change Order 4 is approved, the cumulative value of all change orders to this contract will be $324,430.37 or 1.1% of the original contract amount. Work on this contract is approximately 16.9% complete. There is currently approximately $200,000 in additional change order work that MWRA staff, AECOM and the Contractor are negotiating to determine final pricing.

BUDGET/FISCAL IMPACT:

The FY12 CIP contains a budget of $29,413,382 for Contract 6924. Including this change order for $91,782.93 the adjusted subphase total is $29,737,812.37 or $324,430.37 over budget. This amount will be covered within the five-year spending cap.

MBE/WBE PARTICIPATION:

The MBE/WBE participation requirements for this project are 7.24% and 3.6%, respectively. These goals will remain unchanged through Change Order 4.

MASSACHUSETTS WATER RESOURCES AUTHORITY
Charlestown Navy Yard
100 First Avenue, Building 39
Boston, MA 02129

Frederick A. Laskey
Executive Director

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PERSONNEL & COMPENSATION COMMITTEE MEETING

Chair: K. Cotter
Vice-Chair: J. Barrera
Committee Members:
J. Foti
V. Mannering
J. Walsh

to be held on

Wednesday, March 14, 2012

Location: Waterworks Museum
2450 Beacon St.
Boston, MA 02467

Time: Immediately following Water Comm.

A. Approvals

1. PCR Amendments – March 2012

2. Extension of Employment Contract, Senior Engineering Aide, Operations Engineering

***Note Chestnut Hill location (map attached to blue Board agenda). There are numerous ways to get to the Waterworks Museum; use these links to find the best route from your location: http://www.waterworksmuseum.org/plan-your-visit http://www.waterworksmuseum.org/directionsmaps.**

P.C.(i)
3/14/12

MASSACHUSETTS WATER RESOURCES AUTHORITY

Meeting of the
Personnel and Compensation Committee

February 15, 2012

A meeting of the Personnel and Compensation Committee was held on February 15, 2012 at the Authority headquarters in Charlestown. Chairman Cotter presided. Present from the Board were Messrs. Carroll, Foti, Gove, Hunt, Mannering, Pappastergion and Walsh. Among those present from the Authority staff were Fred Laskey, Steve Remsberg, Patterson Riley, Bob Donnelly, and Bonnie Hale. The meeting was called to order at 12:20 p.m.

Information

Organizational Changes within MWRA

Staff described the proposed reorganization of the Public Affairs Department and Executive Office, and there was general discussion and question and answer.

Approvals

*Approval of the MWRA Affirmative Action Plan

The Committee recommended approval of the 2012 Affirmative Action Plan (ref. agenda item B.1).

*PCR Amendments – February 2012

The Committee recommended approval of amendments to the Position Control Register (ref. agenda item B.2).

*Appointment of Director of Public Affairs

The Committee recommended approval of the appointment of Kevin McCluskey to the above position (ref. agenda item B.3).

The meeting adjourned at 12:25 p.m.

* Approved as recommended at May 12, 2010 Board of Directors meeting.

PA.1
IV A.3
3/14/12

STAFF SUMMARY

TO: Board of Directors
FROM: Frederick A. Laskey, Executive Director
DATE: March 14, 2012
SUBJECT: March PCR Amendments

COMMITTEE: Personnel and Compensation

Robert Donnelly, Director of Human Resources
Joan C. Carroll, Manager, Compensation
Preparer/Title

____ INFORMATION
__X__ VOTE

Rachel C. Madden
Director, Administration & Finance

RECOMMENDATION:

To approve the amendment to the Position Control Register (PCR) included in the attached chart[1].

DISCUSSION:

The PCR amendment included in this package reflects organizational changes aimed at improving the cost-effectiveness, structural soundness and staffing patterns in the Operations Division.

The amendment is:

1. A grade and title change for a filled position (Principal Clerk) in the Facilities Management unit in the Operations Division (Chelsea Facility) to reflect assumption of new responsibilities.

This amendment results in an upgrade to a filled position and requires Personnel and Compensation Committee and Board approval.

BUDGET/FISCAL IMPACT:

The annualized budget impact of this PCR amendment will be a cost of $1,913. Staff will ensure that the cost increase associated with this PCR amendment will not result in spending over the approved FY12 Wages and Salaries budget.

ATTACHMENTS:

New/Old Job Descriptions

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[1] The Position Control Register lists all regular positions in this fiscal year's Current Expense Budget. Any changes to positions during the year are proposed as amendments to the PCR. The Personnel and Compensation Committee of the Board of Directors must approve all PCR amendments. In addition, any amendments resulting in an upgrade of a position by more than one grade level or increasing a position's annual cost by $10,000 or more must be approved by the Board of Directors after review by the Personnel and Compensation Committee.

MASSACHUSETTS WATER RESOURCES AUTHORITY
POSITION CONTROL REGISTER AMENDMENTS
FISCAL YEAR 2012

PCR AMENDMENTS REQUIRING PERSONNEL COMMITTEE APPROVAL - March 14, 2012

PCR AMENDMENTS REQUIRING BOARD APPROVAL - March 2012

Number	Current PCR #	V/F	Type	Current Title	UN	GR	Amended Title	UN	GR	Current/Budget Salary	Estimated New Salary	Estimated Annual $ Impact	Reason For Amendment
B6	Operations Policy & Administration 5910010	F	T,G	Principal Clerk	1	12	Secretary II	1	14	$41.375	$43.288 - $43.288	$1,913 - $1,913	To reflect the assumption of new responsibilities
				BOARD TOTAL =	1						**SUBTOTAL:**	$1,913 - $1,913	
				GRAND TOTAL =	1						**TOTAL ESTIMATED COSTS:**	$1,913 - $1,913	

Legend
V = Vacant position, F = Filled position
T = Title change, L = Location change; transfer to another Cost Center, G = Grade Change, SA= Salary Adjustment, E = Elimination

P A.2
IV A.4
3/14/12

STAFF SUMMARY

TO: Board of Directors
FROM: Frederick A. Laskey, Executive Director
DATE: March 14, 2012
SUBJECT: Extension of Employment Contract, Senior Engineering Aide, Operations Engineering

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COMMITTEE: Personnel and Compensation

___ INFORMATION
_X_ VOTE

John P. Vetere, Deputy Chief Operating Officer
Mark Johnson, Director, Metropolitan Operations
Preparer/Title

Michael J. Hornbrook
Chief Operating Officer

RECOMMENDATION:

To approve the extension of an employment contract for Mr. William Slavin, Senior Engineering Aide, Operations Engineering, for a period of one year, from March 16, 2012 to March 15, 2013, at the current hourly rate of $25.28, for a total annual compensation amount not to exceed $45,504.

DISCUSSION:

Mr. William Slavin was hired as a contract employee on March 14, 2011 to provide assistance to Operations engineering and inspection staff for various projects. Over the last year, Mr. Slavin has worked on a variety of tasks primarily with Water Inspection Program staff. He has provided needed assistance taking field measurements and assisting in survey work of MWRA water structures to help with updating detail records. He also has assisted in performing metering tests, leak detection, and water quality sampling. Mr. Slavin has satisfactorily performed all of these tasks since his contract began.

The Operations Division recommends that Mr. Slavin's contract be extended for another year in order to continue to reduce the backlog in updating water pipeline and valve field information and to address several other record documentation needs that have been identified. Mr. Slavin will be helping to check operation and maintenance manuals in all water facilities to make sure they are up to date and that all equipment changes have been accounted for; reviewing the facility handbooks used by operations, maintenance, and engineering staff to ensure that they are up to date and ready for reference; and updating the operations engineering library of water facility and pipeline manuals and reports including new additions, cataloging, incorporating Maximo equipment numbers, and improving the card system for withdrawing items. Extending Mr. Slavin's contract will allow a dedicated focus on developing a more organized and accessible reference information center for Metropolitan water facilities and pipelines.

Mr. Slavin has 17 years of past experience in civil engineering and surveying acquired from working for the Towns of Sudbury and Watertown. He has performed a variety of functions including leading survey crews, inspecting construction projects for compliance with plans and specifications, drafting plans for building departments, supervising road construction crews, and designing road work projects. Mr. Slavin has an Associate's Degree in Civil Engineering from the University of Massachusetts, Lowell.

BUDGET/FISCAL IMPACT:

There are sufficient funds to cover this contract extension in the Operations Division's FY12 and Proposed FY13 Current Expense Budgets.

MASSACHUSETTS WATER RESOURCES AUTHORITY
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Frederick A. Laskey
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BOARD OF DIRECTORS' MEETING

to be held on

Wednesday, March 14, 2012

*Location: **Waterworks Museum***
2450 Beacon St.
Boston, MA 02467

Time: 1:00 p.m.

AGENDA

I. APPROVAL OF MINUTES

II. REPORT OF THE CHAIR

III. REPORT OF THE EXECUTIVE DIRECTOR

IV. BOARD ACTIONS

A. Approvals

1. Amendments to Capital Finance Management Policy (ref. AF&A B.1)
2. Final CSO Annual Progress Report 2011 (ref. WW B.1)
3. PCR Amendments – March 2012 (ref. P A.1)
4. Extension of Employment Contract, Senior Engineering Aide, Operations Engineering (ref. P A.2)

***Note Chestnut Hill location (map attached to blue Board agenda). There are numerous ways to get to the Waterworks Museum; use these links to find the best route from your location: http://www.waterworksmuseum.org/plan-your-visit http://www.waterworksmuseum.org/directionsmaps.**

B. **Contract Awards**

1. Alewife Brook CSO Improvements Design, Construction Administration and Resident Inspection Services: Fay, Spofford & Thorndike, LLC, Contract 6952 (ref. WW C.1)

2. Brookline Overflow Conduit/MWR010 CSO Cleaning: National Water Main Cleaning Company, Contract 7077C (ref. WW C.2)

3. Aeration Efficiency Improvement - Clinton Wastewater Treatment Plant: R.H. White Construction Co., Inc., Contract 7278 (ref. WW C.3)

C. **Contract Amendments/Change Orders**

1. Ultraviolet Disinfection Facilities, Carroll Water Treatment Plant: Daniel O'Connell's Sons, Inc., Contract 6924, Change Order 4 (ref. W B.1)

V. CORRESPONDENCE TO THE BOARD

VI. OTHER BUSINESS

VII. EXECUTIVE SESSION

A. Collective Bargaining:

1. Ratification of Collective Bargaining Agreements

B. Real Estate:

1. Watershed Land Acquisition Approval

C. Litigation:

1. Trial of William A. Davison, Mary J. Davison, and Paul W. DiMaura, Trustees of Heather Realty Trust v. MWRA, Suffolk Superior Ct., Civil Action No. 08-1525B

2. Thomas J. McNaught vs. MWRA, MCAD Docket Nos. 05-BEM-00320 and 08-BEM-03647

D. Security:

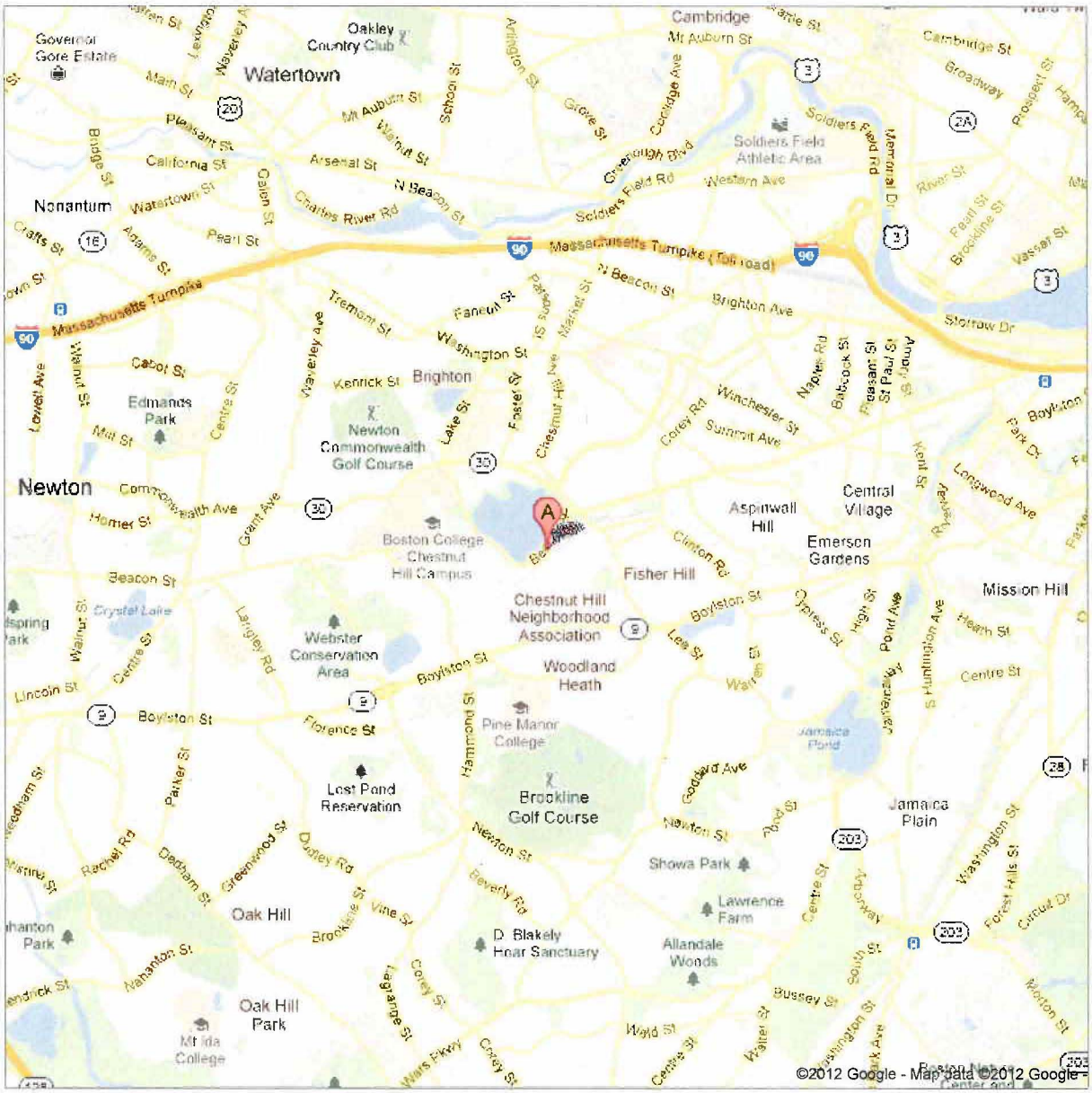
1. Participation in National Cyber Drill

VIII. ADJOURNMENT

***Note Chestnut Hill location (map attached to blue Board agenda). There are numerous ways to get to the Waterworks Museum; use these links to find the best route from your location: http://www.waterworksmuseum.org/plan-your-visit http://www.waterworksmuseum.org/directionsmaps.**

Google

Address **2450 Beacon St**
Boston, MA 02467



I.
3/14/12

MASSACHUSETTS WATER RESOURCES AUTHORITY

Meeting of the Board of Directors

February 15, 2012

A meeting of the Board of Directors of the Massachusetts Water Resources Authority was held on February 15, 2012 at the Authority headquarters in Charlestown. Vice-Chair Carroll presided. Present from the Board were Messrs. Barrera, Cotter, Foti, Hunt, Mannering, Pappastergion and Walsh. Ms. Turner and Messrs. Gove and Sullivan were absent. Among those present from the Authority staff were Frederick Laskey, Executive Director, Steven Remsberg, General Counsel, Michael Hornbrook, Chief Operating Officer, Rachel Madden, Director of Administration and Finance, and Bonnie Hale, Assistant Secretary. The meeting was called to order at 1:10 p.m.

APPROVAL OF MINUTES

Upon a motion duly made and seconded, it was

Voted to approve the minutes of the Board of Directors' meeting of January 18, 2012, as presented and filed with the records of the meeting.

REPORT OF THE EXECUTIVE DIRECTOR

Mr. Laskey reported on various matters, including MWRA's receipt of an award from National Association of Clean Water Agencies, the specific requirements of the State Authority Accountability and Transparency Act, the results of a recent energy procurement, and a proposal to hold an upcoming Board of Directors' meeting at the Waterworks Museum.

BOARD ACTIONS

APPROVALS

Proposed FY13 Current Expense Budget

Upon a motion duly made and seconded, it was

Voted to approve transmittal of the FY13 Proposed Current Expense Budget, as presented and filed with the records of the meeting, to the MWRA Advisory Board for its 60 day review and comment period.

Approval of the Sixty-Second Supplemental Resolution

Upon a motion duly made and seconded, it was

Voted to adopt the Sixty-Second Supplemental Resolution authorizing the issuance of up to $450,000,000.00 of Massachusetts Water Resources Authority General Revenue Bonds and Massachusetts Water Resources Authority General Revenue Refunding Bonds and the supporting Issuance Resolution.

Approval of the Sixty-Third Supplemental Resolution

Upon a motion duly made and seconded, it was

Voted to adopt the Sixty-Third Supplemental Resolution authorizing the issuance of up to $55,000,000.00 of Massachusetts Water Resources Authority Subordinated General Revenue Bonds and the supporting Issuance Resolution.

Approval of the MWRA Affirmative Action Plan

Upon a motion duly made and seconded, it was

Voted to approve the Massachusetts Water Resources Authority's Affirmative Action Plan effective for a one-year period from January 1, 2012 through December 31, 2012, as presented and filed with the records of the meeting.

PCR Amendments – February 2012

Upon a motion duly made and seconded, it was

Voted to approve amendments to the Position Control Register, as presented and filed with the records of the meeting.

Appointment of Director of Public Affairs

Upon a motion duly made and seconded, it was

Voted to approve the Executive Director's recommendation to appoint Kevin A. McCluskey to the position of Director of Public Affairs (Non-Union, Grade 15) at an annual salary of $109,500.00 to be effective on the date designated by the Executive Director.

CONTRACT AWARDS

Alewife Brook Pump Station Rehabilitation: Fay, Spofford & Thorndike, LLC, Contract 7034

Upon a motion duly made and seconded, it was

Voted to approve the recommendation of the Consultant Selection Committee to select Fay, Spofford & Thorndike, LLC to provide design, construction administration, and resident engineering services for the Alewife Brook Pump Station Rehabilitation project and to authorize the Executive Director, on behalf of the Authority, to execute Contract 7034 with Fay, Spofford & Thorndike, LLC in an amount not to exceed $1,558,446.39 for a term of 1,703 calendar days from the Notice to Proceed.

Community Leak Detection Task Order Services: W293, New York Leak Detection, Inc., W293A, Water & Waste Pipe Testing, Inc., W293B, Liston Utility Services, W293C, ADS Environmental Services, and W293D, Heath Consultants

Upon a motion duly made and seconded, it was

Voted to approve the recommendation of the Consultant Selection Committee to select the following contractors to provide leak detection task order services for MWRA's member communities and to authorize the Executive Director, on behalf of

the Authority, to execute the following five separate task order contracts, each for a term of three years from March 1, 2012 through February 28, 2015: Contract W293, Comprehensive Listening Surveys, with New York Leak Detection, Inc., in an amount not to exceed $200,000.00; Contract W293A, Comprehensive Listening Surveys, with Water & Waste Pipe Testing, Inc., in an amount not to exceed $200,000.00; Contract W293B, Leak Correlation Surveys, with Liston Utility Services, in an amount not to exceed $200,000.00; Contract W293C, Leak Correlation Surveys, with ADS Environmental Services, in an amount not to exceed $200,000.00; and Contract W293D, Comprehensive Listening Surveys and Leak Correlation Surveys, with Heath Consultants, Inc., in an amount not to exceed $400,000.00.

Oakdale Facility – Phase 1A Upgrade: Ewing Electrical Co., Inc., Contract 7230

Upon a motion duly made and seconded, it was

Voted to approve the award of Contract 7230, Oakdale Facility – Phase 1A Upgrade, to the lowest responsible and eligible bidder, Ewing Electrical Co., Inc. and authorize the Executive Director, on behalf of the Authority, to execute said contract in the bid amount of $2,204,318.00 for a term of 454 days from the Notice to Proceed.

CONTRACT AMENDMENTS/CHANGE ORDERS

Lynnfield/Saugus Pipeline Project: Albanese Brothers, Inc., Contract 6584, Change Order 12

Upon a motion duly made and seconded, it was

Voted to authorize the Executive Director, on behalf of the Authority, to approve Change Order No. 12 to decrease the amount of Contract No. 6584 with Albanese Brothers, Inc., Lynnfield/Saugus Pipeline Project, by a net credit amount not to exceed $67,036.70; and to authorize the Executive Director to approve additional change orders as may be needed to Contract No. 6584 in amounts not to exceed the

aggregate of $250,000.00, in accordance with the Management Policies of the Board of Directors.

Installation of Second Gaseous Oxygen Line, Carroll Water Treatment Plant: William M. Collins Co., Inc., Contract 7085A, Change Order 2

Upon a motion duly made and seconded, it was

Voted to authorize the Executive Director, on behalf of the Authority, to approve Change Order No. 2 to increase the amount of Contract No. 7085A with William M. Collins Co., Inc., Installation of Second Gaseous Oxygen Line, Carroll Water Treatment Plant, in a lump sum amount of $298,981.25.

EXECUTIVE SESSION

It was moved to enter executive session to discuss litigation and collective bargaining.

Upon a motion duly made and seconded, it was, upon a roll call vote in which the members were recorded as follows:

Yes	No	Abstain
Barrera		
Cotter		
Foti		
Hunt		
Mannering		
Pappastergion		
Walsh		
Carroll		

Voted to enter executive to discuss strategy with respect to litigation and collective bargaining, in that such discussions in open session may have a detrimental effect on the litigating and negotiating position of the Authority.

It was noted that the meeting would return to open session solely for the consideration of adjournment.

* * * *

EXECUTIVE SESSION

* * * *

The meeting returned to open session at 1:45 p.m. and adjourned.