Massachusetts Water Resources Authority

Metropolitan Tunnel Redundancy Program Update
Hydraulics
and
Program Support Services Organization

April 17, 2019
Hydraulic Objectives for Proposed Tunnel

• Provides redundancy for entire metropolitan tunnel system

• Provides normal water service and fire protection if existing tunnel system is out of service

• Designed to meet high day demand. No seasonal restrictions

• Provides ability to perform maintenance on existing tunnels year-round

• Avoids activation of emergency reservoirs

• No boil order!
Hydraulic Model Update

• Adding all proposed CIP Water Projects
  – New pipelines
  – Rehabilitated pipelines

• Population and Employment Projections
  – 2040 and beyond

• Potential System Expansion

• Temporary Loss of Local Sources (Drought/Emergency)

• Water age/quality
Existing System – High Day Demand 265 mgd East of Norumbega

- High Day Demand 265 mgd
- East of Norumbega
- WASMs: 54 mgd
- Shaft 6: Newton 13 mgd
- Shaft 7: Brighton 12 mgd
- Shaft 6 (Wellesley/Needham) Nourmbega Covered Storage
- WASM 3
- City Tunnel
- City Tunnel Extension
- Dorchester Tunnel
- Southern Spine
- Surface Mains
- Hultman Aqueduct/MWWST
Existing System – High Day Demand 265 mgd East of Norumbega

- WASM 3
- City Tunnel
- City Tunnel Extension
- Dorchester Tunnel
- Southern Spine Surface Mains

Covered Storage

Norumbega Covered Storage

Hultman Aqueduct/MWWST

Shaft 6 (Newton)

Shaft 7 (Brighton)

79 mgd

13 mgd

12 mgd

54 mgd WASMs

265 mgd

180 mgd

Waltham

Wellesley

Shaft 6 (Wellesley/Needham)

Shaft 7

9 mgd

22 mgd

265 mgd

180 mgd

54 mgd WASMs

76 mgd

9 mgd

Shaft 7

Shaft 6

Newton

Brighton

Norumbega
Existing System – High Day Demand 265 mgd East of Norumbega

- 265 mgd – East of Norumbega
- WASMs: 54 mgd
- Shaft 6: 13 mgd (Shaft 7: 12 mgd) Newton to Brighton
- Shaft 6/Shaft 7: 180 mgd
- Shaft 6/Shaft 7: 9 mgd (Wellesley/Needham) to Newton
- Shaft 6/Shaft 7: 22 mgd
- Shaft 6/Shaft 7: 76 mgd
- Shaft 6/Shaft 7: 79 mgd
- Shaft 6/Shaft 7: 19 mgd

Key Locations:
- WASM 3
- City Tunnel
- City Tunnel Extension
- Dorchester Tunnel
- Southern Spine
- Surface Mains
- Hultman Aqueduct/MWWST
- Norumbega Covered Storage
Redundant Tunnel – Existing Tunnel Offline – High Day 265 mgd
East of Norumbega
Redundant Tunnel – Existing Tunnel Offline – High Day 265 mgd
East of Norumbega

Proposed 10-ft Northern Tunnel

Proposed 10-ft Southern Tunnel

WASM 3

265 mgd

91 mgd WASMs

47 mgd

15 mgd

24 mgd

14 mgd

28 mgd

Gillis and Spot Pond Pump Stations

Southern Spine Surface Mains
Redundant Tunnel – Existing Tunnel Offline – High Day 265 mgd East of Norumbega

- Existing Tunnel Offline
- High Day 265 mgd
- East of Norumbega

- Proposed 10-ft Northern Tunnel
- Proposed 10-ft Southern Tunnel

- Gillis and Spot Pond Pump Stations
- Surface Mains
- Pump Stations

- WASM 3
- WASM 47 mgd
- WASM 91 mgd

- 265 mgd
- 93 mgd
- 15 mgd
- 28 mgd
- 14 mgd
- 24 mgd
- 47 mgd
- 66 mgd
- 93 mgd
- 91 mgd WASMs
Redundant Tunnel Supply to the South – Existing Tunnel Off Line

- Proposed 10-ft Northern Tunnel
- Proposed 10-ft Southern Tunnel
- Boston/Brookline North of 7C - 41 mgd
- Boston/Milton/Quincy South of 7C - 28 mgd
- Boston/Milton/Quincy South of 7C - 28 mgd
- Needham/Wellesley - 9 mgd
- Newton St Pump Station
- Hyde Park Pump Station
- Southern Extra High - 15 mgd
- Boston/Brookline - 84 mgd
- Boston/Brookline North of 7C - 41 mgd
- Boston/Brookline - 14 mgd
- Boston/Brookline - 27 mgd
- Boston/Brookline - 28 mgd
- Boston/Brookline - 91 mgd WASMs
- 265 mgd
- 93 mgd
- 84 mgd
- 66 mgd
- 91 mgd WASMs
Next Steps – Preliminary Design Phase

• Evaluate future demands and drought/emergency scenarios

• Determine potential refinements to tunnel concept
  – Diameter
  – Connection Points

• Evaluate future improvements to accommodate potential demands
Program Support Services Contract Organization

MWRA

Program Support Services (PSS)

Prelim Design Engineer (DE)

Final Design Engineer (DE)
(two or more)

Construction Manager (CM)
Program-Wide Support Services

- Program-wide planning
- Risk management planning
- Quality management
- Design criteria and standardization
- Independent design review
- Design and Construction package planning
- Critical path scheduling, and
- Budget planning and management
• Industry leaders in....
  – Risk management
  – Project delivery for large complex tunnel programs

• Most have over 25 years of experience and master’s degrees

• Locally based

• Past MWRA Tunnel experience includes...
  – Boston Harbor Project
  – MetroWest Water Supply Tunnel
  – Braintree-Weymouth Tunnel
Resident Engineering and Inspection Services for Towable Generator Docking Stations
Contract 7024

April 17, 2019
• Towable generator for back up power during extended utility outage

• The docking stations enable quick connection

• Currently it requires a facility power shutdown and a crew of four 6 hours to connect
## Project Location

<table>
<thead>
<tr>
<th>Wastewater Facilities</th>
<th>Water Pump Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Braintree-Weymouth PS in Quincy, MA</td>
<td>7. Brattle Ct. in Arlington, MA</td>
</tr>
<tr>
<td>2. Caruso PS in Boston, MA</td>
<td>8. Commonwealth Ave. PS in Newton, MA</td>
</tr>
<tr>
<td>3. Framingham PS in Framingham, MA</td>
<td>9. Hyde Park PS in Boston, MA</td>
</tr>
<tr>
<td>5. Nut Island Headworks in Quincy, MA</td>
<td></td>
</tr>
<tr>
<td>6. Quincy PS in Quincy, MA</td>
<td></td>
</tr>
</tbody>
</table>
MWRA’s 1 Megawatt Towable Generator

WRA-467
Docking Station, to be wired to the Electrical Switchgear

New Panel to be installed with Plug In Wire Connections

Direct Wiring to Switchgear
Contract 7024 – Procurement

- Provide for Resident Engineer services to support construction

<table>
<thead>
<tr>
<th>PROPOSER</th>
<th>FINAL RANKING</th>
<th>PROPOSED CONTRACT COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arcadis U.S., Inc.</td>
<td>1</td>
<td>$209,063.30</td>
</tr>
<tr>
<td>Engineer's Estimate</td>
<td>-</td>
<td>$189,784.00</td>
</tr>
</tbody>
</table>

- Staff Recommend Award of Contract 7024 to Arcadis U.S., Inc. in the amount of $209,063.33

- Construction Contract Awarded to Fall River Electric, Inc. via delegated authority
MWRA Retirement System Update

April 17, 2019
• Retirement System was created in MWRA’s Enabling Act in 1984
• Three members expanded to five in 2006
  – Secretary of MWRA Board of Directors – Andrew Pappastergion
  – Appointment by MWRA Board of Directors – Thomas Durkin
  – Elected by membership – James Flemming
  – Elected by membership – Kevin McKenna
  – Non-member elected by four – Frank Zecha
<table>
<thead>
<tr>
<th>Statistics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Retired participants and beneficiaries</td>
<td>582</td>
</tr>
<tr>
<td>Number of Inactive vested participants</td>
<td>42</td>
</tr>
<tr>
<td>Number of inactive participants due a refund of employee contributions</td>
<td>64</td>
</tr>
<tr>
<td>Number of active participants</td>
<td>1,100</td>
</tr>
</tbody>
</table>

*as of 1/1/2018*

| Number of MWRA employees in State (MDC) Retirement System                | 43    |

*as of 3/11/2019*
Funding Ratios of Massachusetts Retirement Systems

based on PERAC Investment report 2017

Springfield

State

MWRA
Top 20 Funded Massachusetts Retirement Systems

based on PERAC Investment report 2017

- MWRA
- LEOMINSTER
- MASSPORT
- GREATER LAWRENCE
- MINUTEMAN REGIONAL
- SHREWSBURY
- DEDHAM
- LEXINGTON
- CONCORD
- NORTH ATTLEBORO
- BERKSHIRE COUNTY
- WATERTOWN
- MILTON
- CAMBRIDGE
- WINTHROP
- NORWOOD
- WINCHESTER
- MHFA
- MONTAGUE
- MARLBOROUGH

Funding Ratio:

- 70%
- 75%
- 80%
- 85%
- 90%
- 95%
- 100%
Investment Consultant

• New England Pension Consultants
  – Makes recommendations on asset allocations
  – Facilitates competitive procurement of investment manager services
  – Monitors and reports on investment performance
Fees

• Fees are paid to the investment managers based on complexity
  – Index Fund Manager e.g. Rhumbline S&P 500 Index Fund
    • Replicate index
    • 0.05%
  – Private Equity Manager e.g. Foundry Venture Capital 2007, L.P.
    • Develop expertise in specific industry
    • Search for opportunities to invest
    • Mentor entrepreneurs / serve on corporate board
    • 2.0% plus 20% on profit after 8% return hurdle
Frequency Distribution of Retirement Systems' Fees Paid

based on 2016 PERAC Schedule 7 report
Asset Classes

- Domestic Equity
  - Large Cap
    - S&P 500, Russell 1000 Value, Russell 1000 Growth
  - Small Cap
    - Russell 2000 Value, Russell 2000 Growth
Asset Classes

• International Equity
  – MSCI ACWI ex USA, MSCI EAFE Small Cap

BAXTER INVESTMENT MANAGEMENT
Trusted Investors Since 1924
Asset Classes

• Emerging Markets Equity
  – MSCI Emerging Markets
• Fixed Income
  – BBgBarc US Aggregate TR and BBgBarc US High Yield TR, BBgBarc US TIPS TR
Asset Classes

• Hedge Funds
  – HFRI Fund of Funds Composite Index
Asset Classes

- Real estate
  - NCREIF Property Index
• Private Equity
  – Cambridge Associates US All PE and NASDAQ W/O Income
Asset Classes

• Private Equity Cont.
  – Cambridge Associates US All PE and NASDAQ W/O Income

[Logos of Kayne Anderson, J.F. Lehman & Company, Park Square, and IRONSIDES Partners LLC]
Asset Classes

• Balanced
  – 65% MSCI ACWI (Net) / 35% BBgBarc Aggregate, PIMCO All Asset Index, 60% MSCI ACWI (Net) / 40% FTSE WGBI and ICE BofAML 91 Days T-Bills TR
Asset Allocation

2012

- Fixed Income: 28%
- U.S. Equity-Large Cap: 18%
- U.S. Equity-Small Cap: 8%
- Hedge Fund: 10%
- Balanced: 10%
- Private Equity: 5%
- Emerging Markets Equity: 0%
- International Equity: 14%
- Real Estate: 7%
Asset Allocation

2013

- Fixed Income: 28%
- Hedge Fund: 9%
- Real Estate: 6%
- Private Equity: 9%
- Emerging Markets Equity: 0%
- U.S. Equity-Small Cap: 7%
- U.S. Equity-Large Cap: 17%
- International Equity: 14%
- Balanced: 10%
Asset Allocation

2014

- Balanced: 16%
- U.S. Equity-Large Cap: 12%
- U.S. Equity-Small Cap: 6%
- International Equity: 12%
- Emerging Markets Equity: 5%
- Fixed Income: 25%
- Hedge Fund: 9%
- Real Estate: 6%
- Private Equity: 9%
Asset Allocation

2015

- Fixed Income: 22%
- U.S. Equity-Large Cap: 14%
- U.S. Equity-Small Cap: 6%
- Hedge Fund: 9%
- Real Estate: 7%
- Private Equity: 9%
- Balanced: 16%
- Emerging Markets Equity: 5%
- International Equity: 12%
Asset Allocation

2016

- Fixed Income: 22%
- Emerging Markets Equity: 5%
- Hedge Fund: 9%
- Real Estate: 7%
- Private Equity: 9%
- Balanced: 16%
- U.S. Equity-Large Cap: 14%
- U.S. Equity-Small Cap: 6%
- International Equity: 12%
Asset Allocation

2018

- Fixed Income: 22%
- Emerging Markets Equity: 4%
- International Equity: 15%
- U.S. Equity-Small Cap: 6%
- U.S. Equity-Large Cap: 15%
- Balanced: 15%
- Hedge Fund: 5%
- Real Estate: 8%
- Private Equity: 10%
Asset Allocation

2019

- Private Equity: 10%
- Balanced: 12%
- Real Estate: 10%
- U.S. Equity-Large Cap: 16%
- Hedge Fund: 5%
- U.S. Equity-Small Cap: 6%
- Fixed Income: 21%
- Emerging Markets Equity: 5%
- International Equity: 15%
Historic Performance

MWRA Retirement System Investment Performance Review

8% Actuarial Assumed Rate of Return 1986-2014

Annualized Rolling Rate of Return

7.75% Actuarial Assumed Rate of Return 2015 - 2016

7.50% Actuarial Assumed Rate of Return 2017 - 2018

Annual % Return


-25 -20 -15 -10 -5 0 5 10 15 20 25 30
<table>
<thead>
<tr>
<th>System</th>
<th>1yr</th>
<th>5yr</th>
<th>10yr</th>
<th>32yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>MWRA Employees’ Retirement System</td>
<td>15.05%</td>
<td>8.60%</td>
<td>6.54%</td>
<td>8.27%</td>
</tr>
<tr>
<td>PENSION RESERVES INVESTMENT MANAGEMENT BOARD</td>
<td>17.69%</td>
<td>9.89%</td>
<td>5.57%</td>
<td>9.69%</td>
</tr>
</tbody>
</table>
Sharpe Ratio

Measures how an investor is compensated for the risk taken

<table>
<thead>
<tr>
<th></th>
<th>Investment A</th>
<th>Investment B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Return in Excess of Risk-Free return</td>
<td>4.8%</td>
<td>6.5%</td>
</tr>
<tr>
<td>Volatility measured by Standard Deviation</td>
<td>8.0%</td>
<td>12.0%</td>
</tr>
<tr>
<td>Sharpe Ratio</td>
<td>.594</td>
<td>.542</td>
</tr>
</tbody>
</table>

Preferred
Performance among peers

10yr Return

10yr Standard Deviation

10yr Sharpe Ratio

MWRA
Performance among peers

10 Years Ending December 31, 2018

MWRA
January 1, 2019 Valuation Report Expected

- Assumed Rate of Return 7.50%
- COLA Base $13,000
- Time to Full Funding 2026
History of Retirement System Funding Schedules

Indicates actual amount budgeted

Annual Required Contribution

Fiscal Year


$0 $2,000,000 $4,000,000 $6,000,000 $8,000,000 $10,000,000 $12,000,000 $14,000,000 $16,000,000
Massachusetts Water Resources Authority Retirement System; Water/Sewer

Credit Profile
Massachusetts Wtr Res Auth Retirement Sy

Long Term Rating
AAA/ Stable

Christopher P. Merrill
Executive Director/CEO

Certificate of Achievement for Excellence in Financial

STANDARD & POOR’S

Government Finance Officers Association

Public Pension Coord
Public Pension Staff For Funding and A 2018

Concentration
Compliance with New NPDES Permit
Phosphorus Limits
Clinton Wastewater Treatment Plant

April 17, 2019
Clinton Advanced Wastewater Treatment Plant

- Serves Town of Clinton and Lancaster Sewer District
- Design Capacity: 3.01 MGD
- Peak Capacity: 12 MGD
- Designed for Advanced Treatment
  - Nitrogen and Phosphorus removal
- New Phosphorus Limits
  - Effective April 1, 2019
    - Summer: 0.15 mg/L
    - Winter: 1.00 mg/L
- Designed by Stantec

- Constructed by Daniel O’Connell’s Sons

- Utilizes chemical flocculation and filtration using disc filters

- Substantially complete May 2018

- Optimization / Testing
Disc Filters
Performance to Date

• Effective April 1, 2019
  – Summer limit: 0.15 mg/L
  – Performance: 0.03-0.09 mg/L range
    0.05 mg/L average

• Effective November 1, 2019
  – Winter: 1.00 mg/L
Operation and Maintenance of the Fore River Pelletizing Plant

April 17, 2019
• Located in Fore River Shipyard

• Designed, constructed and owned by MWRA
  – Total cost - $133 million

• FY19 annual budget - $13,292,288

• Contract operation and maintenance
    • Amendment 1 Negotiated Extension
• Responsible for developing markets for pellets
  – Land Application
  – Fertilizer Blenders
  – Alternate Fuels
  – Bay State Fertilizer Program

• Maintain Facility and Equipment
  – Returning fully operable plant at the end of contract
Step 1: Condition Assessment
• Facility is in excellent condition
  – 20+ year life remaining
  – No major capital replacements planned

Step 2: Residuals Technology Assessment
• Changes in technology/equipment not recommended

Step 3: Review of contract terms at other facilities
Existing Contract With NEFCo

Pellet Plant O&M Costs

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Cost (including capital)</th>
<th>Cost per Ton</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>$16.00</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>$15.00</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>$14.50</td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>$15.00</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>$13.00</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>$13.00</td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>$13.00</td>
<td></td>
</tr>
</tbody>
</table>

Note: The graph shows the trend of Total Cost (including capital) and Cost per Ton from 2012 to 2018.
Contract Provisions

- 15-year term
- 92.5 dry ton per day baseline for fixed fee
  - additional fee for excess quantities
- 90% solids capture
- Specific line items subject to market indices
- Quarterly maintenance summary reports
- Staffing – minimum wage and licensing requirements
Contract Provisions (cont.)

- Capital Program
  - Initially identified by MWRA, Long term – contractor defined
  - Contractor responsible for Design, ESDC, and REI

- Company threshold requirements
  - Financially stable
  - Proven past experience and performance
  - Excellent safety record
Regulatory Challenges

• Mass Dept of Agriculture: Plant nutrient regulations
  — Restrict land application of phosphorous-containing fertilizer
  — May impact future sales of MWRA pellets

• Per- and polyfluorinated substances (PFAS): emerging contaminants
  — 70 parts per trillion limit in drinking water
  — No limit in biosolids, but gathering data
    - MaDEP: including data gathering in permit requirements
    - Maine DEP: moratorium on land application while gathering data
      o Suggested “screening concentrations”
Technical Assistance Consulting Services
Deer Island
Contract 7503

April 17, 2019
Consultant Activities

Contract 7503 has provided the following services:

• Internal and external chemical tank inspections
• Mechanical/Electrical system upgrades
• Roof replacement for multiple buildings
• Corrosion evaluation on various process equipment
• Miscellaneous upgrades at the Clinton Wastewater Treatment Plant
• *Engineering Services During Construction For Contract 7428 Gravity Thickener Rehabilitation*
Contract 7428 Project Overview

- Fiberglass dome covers
- Replace mechanical Mechanisms
- Concrete remediation and coating
Project Overview (continued)

Collapsed Fiberglass Dome Cover

New Fiberglass Dome Cover
Project Overview (continued)

Existing Interior GT Walls

Repaired Walls
Project Overview (continued)

Mechanical Equipment

Interior of GT
Evolving Scope

• Initially scope included six identical units and standard details
• After design commenced several highly technical complexities arose:
  – Fiberglass dome design required specialized technical disciplines
    (e.g. complex Finite Material Element Analysis, Changes in the
    fiberglass industry)
  – Specialized coatings and concrete preparation
  – Welding techniques and inspections
• Increase in scope (walkways, additional valves to Digested Sludge/Gas
  tank, controls, etc.)
Contract 7503 – Technical Assistance Consultant Services

- Extend Contract Term by 639 days
- No additional cost to contract
- Estimated cost to complete Engineering Services During Construction is $279,000
- There are sufficient funds remaining in the contract for this work
CSO Post-Construction Monitoring and Performance Assessment
AECOM Technical Services, Inc.
Contract 7572, Amendment 1

April 17, 2019
• Demonstrate whether CSO activations and volumes are consistent with the Long Term Control Plan

• Demonstrate whether Water Quality Standards are met at remaining CSOs to the Charles River and Alewife Brook/Upper Mystic River
Completed and Continuing Work

- CSO structure inspections
- Temporary metering at all potentially active CSO regulators
- Collection of rainfall data
- Quantification of CSO discharges from meter data, and correlation to rainfall
- Site specific CSO discharge investigations
- Hydraulic model updates and improved model calibration using 2018 meter data
- First of five planned semiannual progress reports issued November 2018
Coordination with Regulatory Agencies

- EPA and DEP
  - Meetings
  - Submission of Semiannual Reports
  - Submission of Draft WQ Analysis Plan
### Water Quality Standards Compliance

<table>
<thead>
<tr>
<th>Receiving Water</th>
<th>Water Quality Standard</th>
<th>Required Level of CSO Control</th>
<th>MWRA's Progress to Attainment</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Dorchester Bay</td>
<td>SB</td>
<td>Prohibited</td>
<td>Achieved - CSOs eliminated</td>
</tr>
<tr>
<td>South Dorchester Bay</td>
<td>SB</td>
<td>Prohibited</td>
<td>Achieved - CSOs eliminated</td>
</tr>
<tr>
<td>Neponset River Estuary</td>
<td>SB</td>
<td>Prohibited</td>
<td>Achieved - CSOs eliminated</td>
</tr>
<tr>
<td>Constitution Beach</td>
<td>SB</td>
<td>Prohibited</td>
<td>Achieved - CSOs eliminated</td>
</tr>
<tr>
<td>Boston Inner Harbor</td>
<td>SB(cso)</td>
<td>Approved LTCP*</td>
<td>Verification of attainment of LTCP levels of control is now underway</td>
</tr>
<tr>
<td>Muddy River</td>
<td>B(cso)</td>
<td>Approved LTCP*</td>
<td></td>
</tr>
<tr>
<td>Charles River Basin</td>
<td>B(variance)</td>
<td>Approved LTCP**</td>
<td></td>
</tr>
<tr>
<td>Alewife Brook/Upper Mystic River</td>
<td>B(variance)</td>
<td>Approved LTCP**</td>
<td></td>
</tr>
</tbody>
</table>

* **Approved** Level of Control. Remaining CSO discharges comply with Class B or SB ("fishable/swimmable") standards at least 98% of the time (Typical Year).

** Minimum Level of Control. Remaining CSO discharges comply with Class B or SB ("fishable/swimmable") standards at least 98% of the time (Typical Year).
The performance assessment shall include an evaluation of impacts to Water Quality from remaining CSOs in Variance waters.

Remaining CSOs shall not preclude attainment of Massachusetts Water Quality Standards.
Receiving Water Quality Assessment

• AECOM Amendment Services (Water Quality Modeling)
  – Update and calibrate receiving water quality models
  – Assess updated water quality conditions, including remaining CSO impacts
  – Run model simulations of CSO control scenarios

• MWRA In-House Activities (Water Quality Data Collection)
  – Continue in-stream sampling, with emphasis in Charles and Alewife/Upper Mystic
  – Conduct updated CSO and stormwater sampling
  – Coordinate data and data collection with communities and USGS
Contract 7572 Amendment 1

- Add Receiving Water Quality Modeling of Charles River and Alewife Brook/Upper Mystic River - $558,363

- Extend Temporary CSO Metering at 36 Locations - $317,109

- Purchase CSO Meters Associated with MWRA Outfalls - $56,018

- Time extension of 12 months

- Total amendment: $931,490 (from $2,921,215 to $3,852,705)