Presentation to the

FY2018 PRIORITIES AND CHALLENGES

Frederick A. Laskey
Executive Director

September 21, 2017
CSO Post-Construction Monitoring and Assessment
• 35 CSO projects designed and constructed in 20 years

• $910.6 million total

• Reduces system-wide CSO discharge volume in a typical year by 88%, with 93% of remaining volume treated at MWRA’s CSO facilities
Of the 184 CSO related milestones in Schedule Seven, there are two milestones left:

January 2018: Commence 3-year performance assessment, including post-construction monitoring

December 2020: Submit results of 3-year performance assessment to EPA and DEP to demonstrate attainment of long-term levels of CSO control, including as to frequency and volume of discharge
• Extensive metering of system conditions and CSO discharges

• Hydraulic modeling

• CSO performance assessments: Are CSO discharges meeting court mandated levels of control?

• Receiving water quality monitoring for bacteria and other pollutants

• Water quality assessments: Do remaining CSO water quality impacts meet water quality standards?
Locations in the Harbor’s tributary rivers and near shore in the harbor; current focus on the Charles and Mystic Rivers

Sampling for bacteria (Enterococcus and E. coli/fecal coliform; physical data (temp, pH, DO, conductivity) collected by YSI sonde; Secchi depth
## Post-Construction Monitoring and Assessment Schedule

<table>
<thead>
<tr>
<th>Activity</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultant contract award</td>
<td>October 2017</td>
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<tr>
<td>Overflow metering</td>
<td>April 2018 through June 2020</td>
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<tr>
<td>Semiannual assessment reports</td>
<td>September 2018 through September 2020</td>
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<tr>
<td>Annual water quality reports</td>
<td>July 2018 through July 2020</td>
</tr>
<tr>
<td>Final system assessment report</td>
<td>December 2020</td>
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<td>Final water quality report</td>
<td>December 2020</td>
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</tbody>
</table>
Water System Redundancy
Wachusett Aqueduct Pumping Station

Pumping Station

Carroll WTP

Norumbega Covered Storage
Progress on Wachusett Aqueduct Pump Station Construction

Project is currently 62% complete
Flow into Wachusett Aqueduct Pumping Station

- Wachusett Reservoir
- Wachusett Aqueduct
- Wachusett Aqueduct Pumping Station Wet Well
- To Carroll WTP
- Constant Overflow to Forebay
Flow Into and Out of the Pump Station

- Flow from Wachusett Aqueduct with overflow to Forebay
- Pumps start to Carroll
- Flow from Wachusett Aqueduct with Overflow to Forebay
- Pumps start at a flow less than in Aqueduct
- Discharge to header
- 84” control valve (BFV-4A) controls flow to Carroll
• Vertical turbine pumps
• Overflow Channel
• Intake Channel and wet wells
Wachusett Aqueduct Pump Station Pumps
The project consists of four contracts:

- 7066 in Reading was completed in May 2015
- 7471 in Reading is 98.5% complete
- 7478 in Stoneham is 43% complete
- 7067 in Stoneham is just starting
The project consists of three contracts:

- 6454 in Boston is 64% complete

- 7504 in Dedham (north) was awarded and is about to begin

- 7505 in Dedham (south) advertisement expected late fall
Southern Extra High Redundancy Project
Long-Term Redundancy for Metropolitan Tunnel System: Status

- Staff are currently developing the first contract for Preliminary Design/Geotech/MEPA Review
- Staffing will follow a program management-type model
Program Management-Type Model

MWRA

- Preliminary Design Phase 1 Geotech MEPA Review
- Final Design Engineer (Phase 2 Geotech Final Design ESDC)

Construction Packages

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<tbody>
<tr>
<td>1</td>
<td>Metropolitan Tunnel Redundancy</td>
<td>Fri 3/8/18</td>
<td>Thu 11/22/25</td>
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<td>2</td>
<td>Preliminary Design/Geotech/MEPA Review</td>
<td>Fri 3/9/18</td>
<td>Tue 3/17/20</td>
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<td>3</td>
<td>Final Design/ESDC</td>
<td>Wed 3/18/20</td>
<td>Tue 11/6/20</td>
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<td>4</td>
<td>Construction Management</td>
<td>Fri 3/9/18</td>
<td>Thu 11/22/25</td>
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<td>5</td>
<td>Construction - North</td>
<td>Fri 3/31/23</td>
<td>Fri 10/26/29</td>
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<td>6</td>
<td>Construction - South</td>
<td>Thu 4/4/24</td>
<td>Thu 11/22/25</td>
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Corrosion Control
Waltham Bridge Pipeline

- Original pipe was 77 years old
- New Pipe was Installed in 2004 with coating and insulation
Causes of Corrosion

- Soil properties
- Electrochemical reactions with other nearby dissimilar metals
- High levels of hydrogen sulfide
- In storage tanks, reaction at the interface between the water and the interior surface of the tank wall
- Effects of stray currents from other structures in the vicinity
Typical Test Stations and Rectifier Units

57-42-CTS1

57-43-RFT5
Corrosion Mitigation

Tape wrapped steel pipe reducer
WASM 3 Connection, Arlington

Passive Sacrificial Anode System Installation
Section 80 in Weston

Anode

Wire Lead to Test Station
In-house Cathodic Protection Replacement

Welding Leads to Pipeline

Testing Cathodic Protection Station
In-house Cathodic Protection Replacement

Coke Backfill Material Ready for Placement

5 Foot Anode Prior to Installation
Cyber Security
• MWRA has been very aggressive in implementing computer technology to modernize operations across the agency

• Virtually every function - big and small - is now dependent on IT

• But it comes with the risk of cyber attacks that could cripple parts, if not all, of the operation
Data Breaches are Reported More and More Often

- Equifax
- Target
- Sony Pictures
- Children’s Hospital
- And more…
Total Events per month:
  • 553 million total
    • 47 suspicious events
    • 27 actionable events

Email Filtering per month:
  – 1,700,000 messages received
    • 72% blocked, < 1% Quarantined
Financial Issues
Retirement System Funding

**MWRA Employee Retirement System**

**Asset Allocation Considerations**

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Current Target</th>
<th>Mix A</th>
<th>Mix B</th>
<th>7.75% Mix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Cap Equities</td>
<td>15%</td>
<td>15%</td>
<td>16%</td>
<td>10%</td>
</tr>
<tr>
<td>Small/Mid Cap Equities</td>
<td>6%</td>
<td>6%</td>
<td>6%</td>
<td>4%</td>
</tr>
<tr>
<td>Int'l Equities (Unhedged)</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>16%</td>
</tr>
<tr>
<td>Int'l Sm Cap Equities (Unhedged)</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>11%</td>
</tr>
<tr>
<td>Emerging Int'l Equities</td>
<td>4%</td>
<td>4%</td>
<td>4%</td>
<td>7%</td>
</tr>
<tr>
<td><strong>Total Equity</strong></td>
<td><strong>40%</strong></td>
<td><strong>40%</strong></td>
<td><strong>41%</strong></td>
<td><strong>48%</strong></td>
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<tr>
<td>Core Bonds</td>
<td>9%</td>
<td>8%</td>
<td>8%</td>
<td>10%</td>
</tr>
<tr>
<td>TIPS</td>
<td>4%</td>
<td>6%</td>
<td>8%</td>
<td>0%</td>
</tr>
<tr>
<td>Diversified Fixed Income</td>
<td>8%</td>
<td>8%</td>
<td>8%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Total Fixed Income</strong></td>
<td><strong>21%</strong></td>
<td><strong>22%</strong></td>
<td><strong>24%</strong></td>
<td><strong>10%</strong></td>
</tr>
<tr>
<td><strong>Total Global Asset Allocation</strong></td>
<td><strong>14%</strong></td>
<td><strong>15%</strong></td>
<td><strong>15%</strong></td>
<td><strong>0%</strong></td>
</tr>
<tr>
<td>Real Estate</td>
<td>7%</td>
<td>8%</td>
<td>10%</td>
<td>16%</td>
</tr>
<tr>
<td>Hedge Funds</td>
<td>9%</td>
<td>5%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Private Equity</td>
<td>9%</td>
<td>10%</td>
<td>10%</td>
<td>26%</td>
</tr>
<tr>
<td><strong>Total Alternatives</strong></td>
<td><strong>25%</strong></td>
<td><strong>23%</strong></td>
<td><strong>20%</strong></td>
<td><strong>42%</strong></td>
</tr>
</tbody>
</table>

**Expected Return 5-7 yrs**
- 6.6%
- 6.6%
- 6.6%
- 7.75%

**Standard Dev**
- 12.4%
- 12.5%
- 12.5%
- 16.8%

**Sharpe Ratio (5-7 years)**
- 0.39
- 0.39
- 0.39
- 0.36

**Expected Return 30 yrs**
- 7.6%
- 7.6%
- 7.6%
- 8.6%

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The MWRA Board has always been active in ensuring the portfolio asset allocation meets the Plans goals and objectives

- As a result, the asset allocation has been reviewed and adjusted as needed to position the portfolio to best take advantage of current opportunities

Based on recent discussions, we have provided two potential mixes which look to reorganize the hedge fund allocation

- Both sample mixes look to either reduce or eliminate the hedge fund allocation in favor of more direct exposure throughout the portfolio
- Mix A reduces the hedge fund target to 5% from the current target of 9%
- Mix B eliminates hedge funds entirely

By reallocating the funds across different asset classes, both mixes are able to achieve a similar risk adjusted returns

For reference, we have also profiled a portfolio targeting a 7.75% return. This results in a portfolio that has a vastly different structure and risk profile than the current approach
## CHART 16

Funding Schedule – Fully Funded by June 30, 2024 with amortization payments calculated to increase 4.5% per year

<table>
<thead>
<tr>
<th>Fiscal Year Ended June 30</th>
<th>Employer Normal Cost</th>
<th>Amortization Payment</th>
<th>Total Plan Cost: (2) + (3)</th>
<th>Unfunded Actuarial Accrued Liability at Beginning of Fiscal Year</th>
<th>Percent Increase in Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>$2,804,146</td>
<td>$473,223</td>
<td>$3,277,369</td>
<td>$18,666,103</td>
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</tr>
<tr>
<td>2019</td>
<td>2,906,001</td>
<td>5,056,790</td>
<td>7,962,791</td>
<td>28,301,078</td>
<td>142.96%</td>
</tr>
<tr>
<td>2020</td>
<td>3,011,471</td>
<td>8,317,463</td>
<td>11,328,934</td>
<td>39,330,039</td>
<td>42.27%</td>
</tr>
<tr>
<td>2021</td>
<td>3,120,682</td>
<td>11,428,289</td>
<td>14,548,971</td>
<td>43,834,937</td>
<td>28.42%</td>
</tr>
<tr>
<td>2022</td>
<td>3,233,765</td>
<td>13,067,947</td>
<td>16,301,712</td>
<td>38,119,957</td>
<td>12.05%</td>
</tr>
<tr>
<td>2023</td>
<td>3,350,853</td>
<td>13,656,004</td>
<td>17,006,857</td>
<td>26,930,911</td>
<td>4.33%</td>
</tr>
<tr>
<td>2024</td>
<td>3,472,089</td>
<td>14,270,525</td>
<td>17,742,614</td>
<td>14,270,525</td>
<td>4.33%</td>
</tr>
</tbody>
</table>

Notes: Assumes contribution of budgeted amount for fiscal year 2018.
Recommended contributions are assumed to paid on July 1.
Item (2) reflects 3.0% growth in payroll as well as a 0.15% adjustment to total normal cost to reflect the effects of mortality improvement due to the generational mortality assumption.
Projected normal cost does not reflect the future impact of pension reform for new hires.
Amortization payments are calculated to increase at 4.50% per year.
Unfunded actuarial accrued liability reflects deferred investment losses. Recognizing deferred investment losses means the System is anticipating investment losses on an actuarial basis.

🌟 Segal Consulting
Time to Start Planning the FY2019-2024 CIP Spending Cap

**Historical Cap Spending**

- **FY04-08 CAP**: $1,134.5
- **FY09-13 CAP**: $1,143.9
- **FY14-18 CAP**: $791.7
- **FY19-23 CAP (Estimated)**: $1,419.4

* FY18 Estimated

**Budget** vs **Actuals**