Massachusetts Water Resources Authority

Board of Directors Report
On
Key Indicators of MWRA Performance
For
First Quarter FY2015

Frederick A. Laskey, Executive Director
Michael J. Hyndman, Chief Operating Officer
December 17, 2014
Deer Island Electrical Pricing

Total Unit Electricity Pricing
(includes spot energy price, ancillary costs, and NSTAR's transmission & distribution costs)
Deer Island Cost of Electricity

Total Cost of Electricity

Electricity Purchased ($)

<table>
<thead>
<tr>
<th>Month</th>
<th>FY14 Total Energy Purchased</th>
<th>FY15 Total Energy Purchased</th>
<th>FY15 Energy Purchased Budget</th>
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<td>J</td>
<td>1,700,000</td>
<td>1,750,000</td>
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</table>
Green Energy
Field Operations
Renewable Electricity Generation
Workforce Management Through October 2014

Filled Position Tracking

- Target
- Filled

Positions Filled by Hires/Promotions FY15 (YTD)

- Hires (12)
- Promotions/Transfers (42)

Filled Positions FY15 (YTD)

- FY11: 48
- FY12: 42
- FY13: 47
- FY14: 51
- FY15: 48

Promotions:

- FY11: 30
- FY12: 27
- FY13: 82
- FY14: 111
- FY15: 42

Projected Promotion:

- FY11: 12

Projected New Hi res:

- FY11: 12

N D J F M A M J J A S O

29% 71%
FY16 Proposed Capital Improvement Budget

December 17, 2014
 MWRA continues to focus on Asset Protection and Long Term Redundancy initiatives; 

 MWRA continues to reduce debt levels, paying more principal than interest; and 

 FY16 Proposed CIP meets all Cap requirements.
Historic and Projected Capital Improvement Spending

- **FY05-14**: Average $162M/year
- **FY15-18**: Average $155M/year

### CIP Historical and Projected Spending

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
<th>Projected</th>
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<tbody>
<tr>
<td>FY05</td>
<td>$0</td>
<td>$100</td>
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<tr>
<td>FY06</td>
<td>$14</td>
<td>$172</td>
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<td>FY07</td>
<td>$26</td>
<td>$211</td>
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<td>FY08</td>
<td>$54</td>
<td>$319</td>
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<tr>
<td>FY09</td>
<td>$68</td>
<td>$315</td>
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<tr>
<td>FY10</td>
<td>$68</td>
<td>$158</td>
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<tr>
<td>FY11</td>
<td>$107</td>
<td>$138</td>
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<td>FY12</td>
<td>$124</td>
<td>$146</td>
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<td>FY13</td>
<td>$119</td>
<td>$155</td>
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<td>FY14</td>
<td>$148</td>
<td>$178</td>
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<td>FY15</td>
<td>$194</td>
<td>$196</td>
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<tr>
<td>FY16</td>
<td>$304</td>
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</table>

Millions
## FY14-18 Base-Line Cap as Compared with FY16 Proposed Spending

<table>
<thead>
<tr>
<th></th>
<th>FY14</th>
<th>FY15</th>
<th>FY16</th>
<th>FY17</th>
<th>FY18</th>
<th>Total FY14-18</th>
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<tbody>
<tr>
<td><strong>Projected Expenditures</strong></td>
<td>$142.5</td>
<td>$147.6</td>
<td>$149.3</td>
<td>$141.8</td>
<td>$136.8</td>
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<td><strong>Contingency</strong></td>
<td>7.6</td>
<td>9.5</td>
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<td>9.8</td>
<td>9.3</td>
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<tr>
<td><strong>Inflation on Unawarded Construction</strong></td>
<td>0.8</td>
<td>4.2</td>
<td>8.4</td>
<td>11.1</td>
<td>13.5</td>
<td>37.9</td>
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<tr>
<td>Less: Chicopee Valley Aqueduct Projects</td>
<td>(5.0)</td>
<td>(2.2)</td>
<td>(1.4)</td>
<td>(1.3)</td>
<td>(0.4)</td>
<td>(10.3)</td>
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<tr>
<td><strong>FY14-18 Base-Line Cap</strong></td>
<td>$145.8</td>
<td>$159.1</td>
<td>$166.4</td>
<td>$161.3</td>
<td>$159.1</td>
<td>$791.7</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>FY14</th>
<th>FY15</th>
<th>FY16</th>
<th>FY17</th>
<th>FY18</th>
<th>Total FY14-18</th>
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<tbody>
<tr>
<td><strong>Projected Expenditures</strong></td>
<td>$102.2</td>
<td>$108.1</td>
<td>$147.1</td>
<td>$177.6</td>
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<td>0.0</td>
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<td>10.8</td>
<td>11.6</td>
<td>35.9</td>
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<tr>
<td><strong>Inflation on Unawarded Construction</strong></td>
<td>0.0</td>
<td>0.0</td>
<td>1.4</td>
<td>5.5</td>
<td>9.2</td>
<td>16.1</td>
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<tr>
<td>Less: I/I Program</td>
<td>0.0</td>
<td>(11.2)</td>
<td>(16.9)</td>
<td>(18.9)</td>
<td>(18.1)</td>
<td>(65.1)</td>
</tr>
<tr>
<td>Less: Water Loan Program</td>
<td>0.0</td>
<td>1.6</td>
<td>2.2</td>
<td>2.5</td>
<td>(0.1)</td>
<td>6.1</td>
</tr>
<tr>
<td>Less: Chicopee Valley Aqueduct Projects</td>
<td>(5.6)</td>
<td>(1.5)</td>
<td>(0.0)</td>
<td>(0.1)</td>
<td>(0.2)</td>
<td>(7.3)</td>
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<tr>
<td><strong>FY16 Proposed FY14-18 Spending</strong></td>
<td>$96.6</td>
<td>$102.3</td>
<td>$141.9</td>
<td>$177.5</td>
<td>$189.2</td>
<td>$707.5</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>FY14</th>
<th>FY15</th>
<th>FY16</th>
<th>FY17</th>
<th>FY18</th>
<th>Total FY14-18</th>
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</thead>
<tbody>
<tr>
<td><strong>Projected Expenditures</strong></td>
<td>($40.3)</td>
<td>($39.4)</td>
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<td>$35.8</td>
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<td><strong>Contingency</strong></td>
<td>(7.6)</td>
<td>(4.2)</td>
<td>(1.9)</td>
<td>1.1</td>
<td>2.3</td>
<td>(10.2)</td>
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<tr>
<td><strong>Inflation on Unawarded Construction</strong></td>
<td>(0.8)</td>
<td>(4.2)</td>
<td>(7.0)</td>
<td>(5.6)</td>
<td>(4.2)</td>
<td>(21.8)</td>
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<td>Less: I/I Program</td>
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<td>(16.9)</td>
<td>(18.9)</td>
<td>(18.1)</td>
<td>(65.1)</td>
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<tr>
<td>Less: Water Loan Program</td>
<td>0.0</td>
<td>1.6</td>
<td>2.2</td>
<td>2.5</td>
<td>(0.1)</td>
<td>6.1</td>
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<tr>
<td>Less: Chicopee Valley Aqueduct Projects</td>
<td>(0.6)</td>
<td>0.7</td>
<td>1.4</td>
<td>1.3</td>
<td>0.2</td>
<td>3.0</td>
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<tr>
<td><strong>FY14-18 Cap ($ Change)</strong></td>
<td>($49.2)</td>
<td>($56.7)</td>
<td>($24.5)</td>
<td>$16.1</td>
<td>$30.1</td>
<td>($84.2)</td>
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<td><strong>FY14-18 Cap (% Change)</strong></td>
<td>-33.8%</td>
<td>-35.7%</td>
<td>-14.7%</td>
<td>10.0%</td>
<td>18.9%</td>
<td>-10.6%</td>
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</tbody>
</table>
FY16 Proposed CIP Expenditures by Major Programs

- **Wastewater (excluding CSO)**: $73.0, 53%
- **CSO**: $13.7, 10%
- **Waterworks**: $41.6, 30%
- **Business Operations & Support**: $8.8, 6%
FY16 Big Spenders

<table>
<thead>
<tr>
<th>Project</th>
<th>FY16 Planned Spending</th>
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<tbody>
<tr>
<td>DI Treatment Plant Asset Protection</td>
<td>$ 45.2</td>
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<tr>
<td>Long-Term Redundancy</td>
<td>18.3</td>
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<tr>
<td>Facility Asset Protection</td>
<td>17.1</td>
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<tr>
<td>I/I Local Financial Assistance</td>
<td>16.9</td>
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<tr>
<td>Cambridge Sewer Separation</td>
<td>11.9</td>
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<tr>
<td>Weston Aqueduct Supply Mains</td>
<td>6.1</td>
</tr>
<tr>
<td>NIH Redundancy and Storage</td>
<td>5.5</td>
</tr>
<tr>
<td>Clinton Wastewater Treatment Plant</td>
<td>2.6</td>
</tr>
<tr>
<td>Applications Improvement Program</td>
<td>2.3</td>
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<tr>
<td>Central Monitoring System</td>
<td>2.3</td>
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</tbody>
</table>

Top 10 Spending in FY15 $128.2

FY16 Spending $147.1

The top ten projects account for 87.1% of FY16 planned spending.
FY14-18 Proposed CIP Expenditures by Major Programs

- **Wastewater (excluding CSO)**: $373.4M (51%)
- **CSO**: $58.6M (8%)
- **Waterworks**: $248.3M (34%)
- **Business Operations & Support**: $41.5M (6%)
On-Going Capital Projects
Deer Island Asset Protection

Total Budget: $720.9M
Spending Through FY14: $176.3M
Remaining Spending: $544.6M
FY14-18 Spending: $182.0M
FY16 Spending: $45.2M
Deer Island: Scum Skimmer Replacement

NTP: October 2013
SC : October 2016

Total Contract: $20.2M
FY14-18 Spending: $20.2M
FY16 Spending: $  6.0M
Deer Island: North Main Pump Station Motors/VFDs

NTP: December 2011
SC: March 2016

Total Contract: $24.3M
FY14-18 Spending: $17.8M
FY16 Spending: $4.2M
North Main Pump Station & Winthrop Terminal Facility Valve Replacements

NTP: June 2014
SC: June 2017

Total Contract: $17.0M
FY14-18 Spending: $17.0M
FY16 Spending: $5.7M
Deer Island Electrical Upgrades - Construction 4

NTP: May 2013
SC: May 2016

Total Contract: $10.9M
FY14-18 Spending: $10.9M
FY16 Spending: $4.5M
Spot Pond Covered Storage Facility and Pump Station

NTP: November 2011
SC: May 2015

Total Contract: $51.4M
FY14-18 Spending: $33.8M
FY16 Spending: $1.5M
Cambridge Sewer Separation

Total Contract: $92.1M
FY14-18 Spending: $41.7M
FY16 Spending: $11.9M

Contract 9
NTP: July 1998
SC: December 2015

Contract 8B - Concord Avenue
Clinton Treatment Plant Phosphorous Removal

Design & Construction

NTP: November 2013
SC: August 2018

Total Contract: $8.3M
FY14-18 Spending: $8.3M
FY16 Spending: $0.7M
Upcoming Capital Projects
Chelsea Headworks Rehabilitation

**Design**
- NTP: July 2010
- SC: June 2020
- Total Contract: $7.9M
- FY14-18 Spending: $5.2M
- FY16 Spending: $0.1M

**Construction**
- NTP: December 2015
- SC: June 2019
- Total Contract: $54.8M
- FY14-18 Spending: $35.7M
- FY16 Spending: $5.1M
Wachusett Aqueduct Pump Station

NTP: April 2015
SC: November 2018

Total Contract: $60.5M
FY14-18 Spending: $49.5M
FY16 Spending: $16.5M
Southern Extra High Redundancy – Section 111

**Design**
- NTP: February 2014
- SC: August 2021

Total Contract: $7.7M
- FY14-18 Spending: $4.7M
- FY16 Spending: $1.2M

**Construction**
- NTP: August 2016
- SC: June 2020

Total Contract: $29.8M
- FY14-18 Spending: $12.3M
- FY16 Spending: $0.0M
Weston Aqueduct Supply Mains (WASM) – Section 36

NTP: October 2014
SC: March 2017

Total Contract: $11.2M
Fy14-18 Spending: $11.2M
FY16 Spending: $4.5M
Alewife Brook Pump Station Rehabilitation

NTP: March 2015
SC : July 2017

Total Contract: $10.4M
Fy14-18 Spending: $10.4M
FY16 Spending: $2.4M
Deer Island Combined Heat and Power

Design
NTP: January 2016
SC: July 2022
Total Contract: $6.0M
FY14-18 Spending: $3.0M
FY16 Spending: $0.1M

Construction
NTP: July 2018
SC: July 2022
Total Contract: $83.0M
FY14-18 Spending: $0.0M
FY16 Spending: $0.0M
Total CIP increased $157.0 million over FY15 Final CIP.

4 Projects account for over $106 million, or 68% of the increase.

<table>
<thead>
<tr>
<th>Project</th>
<th>FY16 Proposed Increase</th>
<th>Effect on increase on FY14-18 Cap</th>
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<tbody>
<tr>
<td>Deer Island Treatment Plant Asset Protection</td>
<td>$ 63.0</td>
<td>$ 1.0</td>
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<td>Central Monitoring System</td>
<td>18.6</td>
<td>1.7</td>
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<tr>
<td>Long-Term Redundancy</td>
<td>18.3</td>
<td>(0.1)</td>
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<td>Northern High Service - Revere and Malden Pipe</td>
<td>6.2</td>
<td>(1.6)</td>
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<td></td>
<td>$ 106.1</td>
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## FY16 Projected Contract Awards ($ in millions)

<table>
<thead>
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<th>Subphase</th>
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<th>FY16 Proposed</th>
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<tr>
<td>Facility Asset Protection</td>
<td>Chelsea Creek Upgrade Construction</td>
<td>Dec-15</td>
<td>$54.8</td>
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<td>NIH Redundancy &amp; Storage</td>
<td>Sec 89/29 Redundancy Construction Phase 1B</td>
<td>Aug-15</td>
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<td>DI Treatment Plant Asset Protection</td>
<td>HVAC Equipment Replacement - Construction</td>
<td>Mar-16</td>
<td>17.1</td>
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<td>Clinton Wastewater Treatment Plant</td>
<td>Phosphorus Reduction Construction</td>
<td>Feb-16</td>
<td>7.1</td>
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<td>DI Treatment Plant Asset Protection</td>
<td>Sodium Bisulf &amp; Hypochlorite Tank Rehabilitation</td>
<td>Mar-16</td>
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<tr>
<td>DI Treatment Plant Asset Protection</td>
<td>Combined Heat &amp; Power Design</td>
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<td>Carroll Water Treatment Plant</td>
<td>Existing Facilities Modifications - CP7</td>
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<td>Ancillary Modifications - Final Design 4</td>
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<td>Applications Improvements Program</td>
<td>Enterprise Content Management</td>
<td>Sep-15</td>
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<tr>
<td>Central Monitoring System</td>
<td>Quabbin Power Communications &amp; Security</td>
<td>Oct-15</td>
<td>2.8</td>
</tr>
</tbody>
</table>

**Top 10 Awards for FY16**  
$128.4

**45 Contract Awards Planned for FY16**  
$166.5

The top ten awards account for over 77% of FY16 planned awards.
Future Risks/Uncertainties

- Co-Digestion Deer Island Receiving Facilities
- Fish Hatchery Pipeline/Hydro
- Sudbury Aqueduct – tunnel vs. surface pipeline;
- Residual Processing/Asset Management; and
- New regulatory mandates.
Report on Impacts From Nor’Easter Storm of December 9/10th

December 17, 2014
Antecedent Conditions

Previous Rainfall

October: 5.83-inches
3rd wettest Oct. in 11 years

November: 5.27-inches
2nd wettest Nov. In 11 years

December: 1.87-inches (prior to storm)
3.3 to 5.4 inches (12/09 storm)
Groundwater

Boston Groundwater Trust Data through December 2
127 GW wells at highest level ever
208 GW wells at highest level of the year

Ground surface frozen, increasing runoff

12.2 foot High Tide with storm surge
NOAA Forecast

Heavy Rainfall

- Onset: 6 am – 9 am
- Departure: 9 pm – 11 pm
- Heaviest: 1 pm – 7 pm
- Widespread Street Flooding
- River Flooding not expected

National Weather Service
Boston, MA
Coastal Flooding Potential

Coastal Flood Advisory

- **Impacts:** Minor Coastal Flooding
- **Where:** Entire Eastern MA Coastline
- **Storm Surge:** 1.5 ft – 2.5 ft
- **Timing:** Tue 11 am – 3 pm
## Rainfall Totals Throughout the MWRA Service Area

**December 9-11, 2014**

<table>
<thead>
<tr>
<th>Date</th>
<th>Braintree Weymouth</th>
<th>Chelsea Creek</th>
<th>Columbus Park</th>
<th>Framingham Pumping Station</th>
<th>Hanscom</th>
<th>Hayes Pumping Station</th>
<th>New Neponset Pumping Station</th>
<th>Ward Street</th>
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</thead>
<tbody>
<tr>
<td>12/10/2014</td>
<td>0.59</td>
<td>0.27</td>
<td>0.41</td>
<td>0.15</td>
<td>0.17</td>
<td>0.17</td>
<td>0.35</td>
<td>0.32</td>
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<tr>
<td>12/11/2014</td>
<td>0.00</td>
<td>0.04</td>
<td>0.02</td>
<td>0.05</td>
<td>0.19</td>
<td>0.10</td>
<td>0.02</td>
<td>0.04</td>
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<tr>
<td><strong>Total</strong></td>
<td>4.26</td>
<td>4.69</td>
<td>4.47</td>
<td>3.31</td>
<td>3.53</td>
<td>4.36</td>
<td>5.22</td>
<td>4.14</td>
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</table>
MWRA Sand Bagging the Green Line at Kenmore
Total South System Flow MGD: Dec 5-Dec 15
Total South System Flow MGD: Dec 9, 2014
<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
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<tbody>
<tr>
<td>Peak flow rate at Deer Island:</td>
<td>1.29 Billion Gallons per Day</td>
</tr>
<tr>
<td>Peak flow rate treated by CSO facilities:</td>
<td>871 MGD (Prison Point, Cottage Farm, Somerville Marginal and Union Park)</td>
</tr>
<tr>
<td>Total flow stored at CSO facilities:</td>
<td>18.2 MG</td>
</tr>
<tr>
<td>South Boston Tunnel:</td>
<td>storm water gates were closed after capturing First Flush (1MG) and rainfall was forecasted to exceed 4” in 24 hours, stormwater discharged to beach</td>
</tr>
<tr>
<td>All headworks reached hydraulic design capacity</td>
<td></td>
</tr>
<tr>
<td>All MWRA pump stations reached capacity – except Hingham and Framingham</td>
<td></td>
</tr>
</tbody>
</table>
EOC staffed for 48 hours

Operations & Maintenance staffed over 48 hours

CSO facilities staffed for duration of storm

Field staff monitored interceptor levels

Both Deer Island CTGs placed in operation
South System SSO Locations During Dec. 9-10, 2014 Event
3.5 to 5.4-inches of rainfall

Saturated ground water conditions

All MWRA facilities operated as designed

Deer Island at max. capacity

All CSO facilities at max. capacity

SSOs occurred
Massachusetts Water Resources Authority

6877 – VFD Additions Secondary Oxygen Reactor Batteries A, B and C - Deer Island Treatment Plant

December 17, 2014
Contract 6877 Summary

- **Contractor:** Dagle Electric Construction Co.

- **Contract Price:** $2,243,243

- **Contract Duration:** 540 days

- **Scope:** Furnish and install the following equipment:
  
  1. **Secondary Reactor Battery A mixers:** Six new 100 HP Variable Frequency Drives (VFDs) and replace six 100 HP motors
  2. **Secondary Reactor Battery B mixers:** Six new 100 HP VFD and replace six 100 HP motors
  3. **Secondary Reactor Battery C mixers:** Six new 100 HP VFD and replace six 100 HP motors
  4. **New environmentally controlled equipment room to place the new Secondary Reactor A and B equipment** (Secondary Reactor C equipment will be located in an existing electrical room)
Aerator System Background

- Mix pure oxygen into secondary reactor head space
- Mixers/aerators help dissolve oxygen into reactor liquid
- Oxygen assists in biological process to remove solids in secondary clarifiers
- 6 of 9 reactor trains operate 24/7
- Equipment has been in operation for approx. 18 years
• Three Reactor Batteries (A, B and C) each has three trains
• Each train has eight mechanical aerators.
• Aerators are driven by 50 to 150 HP motors
• Four of the eight motors in each train are two-speed; in addition one of the remaining four motors is controlled by a VFD based upon dissolved oxygen levels
Aerator System Improvements Scope

- This project will be installing VFDs on two of the 100 HP motors on each train (total of 18)
- VFDs control the speed of the motors based upon oxygen demand requirements
- Reduction of speed significantly reduces KW demand (approx $300,000/yr energy saving)
- Payback is approx 7.2 years factoring in cost of money, O&M costs, etc.
- NStar providing approx. $800,000 through MOU agreement to partially offset initial capital outlay.
Union Park Pump Station/CSO Facility
Renewal of Water Continuation Agreements

December 17, 2014
Contract Renewal Process


- A Supplementary Report is prepared for each community, and is basis of new Water Supply Agreement. Report includes:
  - Demand Analysis
  - Supply Analysis
  - Water Management Plan
  - Rates Info
## Demand

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<tr>
<td>Cambridge</td>
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• Some Partials are increasing MWRA demand
  – Peabody, Needham, Northborough

• Some Partials decreasing MWRA demand
  – Canton

• More or less Status-Quo
  - Cambridge, LWSC, Weston Winchester

• Framingham ????
• Limits on MWRA withdrawals: provision to increase limits upon notification to MWRA in emergencies or unusual circumstances.

• Formal amendments by petition.

• Obligations of Communities:
  – Water Conservation (metering, leak detection, public info)
  – Contingency/Emergency Response Plans
  – Protection of Local Sources
  – Conservation based rates