Operations Maintenance Update

Wastewater and Water Supply Advisory Committees
February 2011
Today’s Agenda

- Asset Management Goals
- Operations Assets
- CIP and CEB Spending
- Operations Asset Management Program
  - Planning
  - Metrics
  - Condition Monitoring
  - Software Use
  - Training
Preventive, Predictive, Corrective Maintenance

Cooperative Maintenance and Operations Partnership leads to Maintenance Excellence

Management Commitment
Asset Management Goals

• **Cost effectively replace components at the appropriate time to**
  – ensure reliable plant operation
  – preserve value of ratepayer investment

• **Prolong equipment life**

• **Control large spending spikes**
  – avoid historical deferred maintenance approach
  – incorporate planned budget approach
Deer Island Wastewater Treatment Plant

• Result of $3.8 Billion Dollar Construction Project

• 2nd Largest Wastewater Treatment Plant in the United States

• Built on 120 Acres

• Treatment Capacity:
  – Maximum
    • 1.27 Billion Gal/Day
  – Average Daily Flow:
    • 365 Million Gal/Day
John J. Carroll Water Treatment Plant

- $350 Million Construction Cost
- Placed in service in July 2005
- Treatment Processes
  - Ozonation for primary disinfection
  - Corrosion control (soda ash and CO2)
  - Chloramination for secondary disinfection
  - Fluoridation
- Plant capacity 405 MGD max; designed for 270 MGD average, operating at <200 MGD average
Metro Operations

Water System ($ 6.0B)
- 100 miles of tunnels and aqueducts
- 284 miles of water distribution piping
- 11 pump stations
- 11 storage facilities
- 4904 valves

Transport System ($ 2.2B)
- 228 miles of interceptor sewers
- 12 pump stations
- 4 combined sewer overflows facilities
- 4 headworks
- 1 screen house
Capital Project Spending

FY 08 through FY12 Spending - $1,010M

- FY 08 Actual Spending $196.8M
- FY 09 Actual Spending $183.9M
- FY 10 Actual Spending $211.4M
- FY 11 Projection $183.0M
- FY 12 Projection $235.0M
Operations Major Capital Projects

Water System
- Spot Pond Storage Facility ($63M)
- Metrowest Tunnel and Hultman Aqueduct ($704M)
- Long Term Redundancy Projects ($529M)
- Valve Replacements ($20M)
- CWTP UV Addition ($38M)
- Ware UV Disinfection Project ($5M)

Transport System
- North Dorchester Bay Tunnel Pump Station and Odor Control ($223M)
- West Roxbury Tunnel ($89M)
- Interceptor and Pumping Facility Asset Protection ($160M)
  - Remote Headworks Rehabilitation
  - Somerville CSO Gate/Stop Log Replacements
  - Alewife Brook Pump Station Rehabilitation
  - Prison Point HVAC Replacement
  - Nut Island Mechanical and Electrical Replacements

Wastewater Treatment – Deer Island
- Deer Island Asset Protection ($512M)
  - Clarifier Rehabilitation ($60M)
  - North Main Pump Station VFDs ($50M)
  - Heat Loop Piping Replacement ($14M)
  - Digester Sludge Pump Replacement ($3M)
  - Digester Modules 1 and 2 Piping Replacement ($13M)
Components of FY12 CEB Request

- Wages & Salaries: 45%
- Maintenance: 17%
- Utilities: 14%
- Other Services: 12%
- Other: 2%
- Prof. Services: 2%
- Overtime: 2%
- Chemicals: 6%
- Total = $155.5M
Operations Division FY12 CEB Maintenance Request

Total = $26.2 M

- Building & Grounds Serv. 12%
- Electrical Services 9%
- HVAC Materials 2%
- Electrical Materials 5%
- Spec. Equip Materials 6%
- Plant & Mach. Materials 25%
- Other Materials & Services 41%

Total Services = 62% or $16.2M
Service contracts

- Maintenance contracts
  - Cryogenics
  - Centrifuge
  - Combustion Turbine Gen
  - Steam Turbine Generator
  - Boiler
  - M/V Electrical Testing
  - Variable Frequency Drives
  - Pest Control
  - Janitorial
  - Landscape
  - Paving
  - Hydraulics
  - Elevator
  - Crane
  - Air Compressor
  - Security
Maintenance Planning

- **Maintenance Priority List**
  - Meet weekly with operations/Maintenance/Engineering
  - Discuss highest priority work
  - Maintenance uses meeting to create area Daily Dispatch

- **Daily Dispatch record**
  - Plan for tomorrow and schedule for the day
  - Schedule eight hours of work for all technicians
  - Includes WO#, Description, Location, # of hours
  - Priority work/PM/Projects
  - Management tracks productivity
Maintenance Highlights

• 72,970 Pieces of equipment in Maximo
• 98.7% Equipment availability
• 41,166 Work Orders per year
• 2074 Preventive Maintenance/month
• 100% Preventive Maintenance completed
• 17% Predictive Maintenance
• < 1% Emergency Maintenance
## Maintenance Metrics

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Industry Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maint. Spending/RAV</td>
<td>1.0-1.5%</td>
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<tr>
<td>Availability</td>
<td>97%</td>
</tr>
<tr>
<td>Emergency Maintenance</td>
<td>&lt; 5%</td>
</tr>
<tr>
<td>Overtime</td>
<td>&lt; 5%</td>
</tr>
<tr>
<td>Operations Light Maint.</td>
<td>10-15%</td>
</tr>
<tr>
<td>Backlog</td>
<td>3-6 weeks</td>
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</tbody>
</table>

Benchmark data was taken from industry data including Society of Maintenance & Reliability Professionals, International Benchmarking Clearinghouse, Maintenance Technology Magazine, Maintenance Handbooks, and various technical papers from Fortune 500 companies and Maintenance Consultants.
# Wastewater Pipeline TV Inspection/Maintenance

<table>
<thead>
<tr>
<th>Description</th>
<th>Total</th>
<th>FY10</th>
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<tbody>
<tr>
<td>Sewer line CCTV Inspections/Cleaning (Miles)</td>
<td>228</td>
<td>32</td>
</tr>
<tr>
<td>Siphon Inspections/Cleaning (Number of Barrels)</td>
<td>108</td>
<td>48 (24 cleaned)</td>
</tr>
<tr>
<td>Structure Inspections (Includes Manholes, Head houses, Diversion and Junction Chambers)</td>
<td>~4300</td>
<td>650</td>
</tr>
<tr>
<td>Manhole Frame and Cover Replacements</td>
<td>~4200</td>
<td>108</td>
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</table>
| Community Assistance                                            | 43    | As needed  
|                                                                 |       | Avg. 1 - 3 miles |
## Water Pipeline Maintenance

<table>
<thead>
<tr>
<th>Service</th>
<th>Total</th>
<th>FY10</th>
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</thead>
<tbody>
<tr>
<td>Leak Detection Inspections</td>
<td>284 miles</td>
<td>284 miles</td>
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<tr>
<td>Valve Exercising</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main Line Valves</td>
<td>2092</td>
<td>1100</td>
</tr>
<tr>
<td>Blow Off Valves</td>
<td>1197</td>
<td>375</td>
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<tr>
<td>Valve Replacement/Retrofits</td>
<td>4904</td>
<td>78</td>
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</table>
Predictive Maintenance

% of PdM Work Orders

FY00 FY01 FY02 FY03 FY04 FY05 FY06 FY07 FY08 FY09 FY10

0% 3% 6% 9% 12% 15% 18% 21%

FY10 DITP Target
Operations Light Maintenance PMs

% of Total PM Hours

0% 2% 4% 6% 8% 10% 12% 14% 16% 18% 20%

FY00 FY02 FY04 FY06 FY08 FY10

Industry Benchmark
Condition Monitoring

- Lubrication / Oil Analysis
- Vibration
- Temperature
- Thermography
- Ultrasonic
Condition Monitoring
Water Leak Detection Program
Software Utilization

- Maximo 5.2 (upgrade to 7.0 on 12/1/11)
- Lawson/Maximo interface
- Increase Functionality
  - Attached documents
  - Data-base roll-up
  - Performance reporting
  - Required fields
  - PICS Maximo Interface
  - Enhanced Queries
Operations/Maintenance Training

- Alignment Training
- Maximo Training
- Vibration Training
- RCM Training
- Arc flash Training
- B&G Pump Training
- New Procedures
Preventive, Predictive, Corrective Maintenance

Cooperative Maintenance and Operations Partnership leads to Maintenance Excellence

Management Commitment
Questions