

October 20, 2014

Susan Studlien, Director
Office of Environmental Stewardship
U.S. EPA Region 1
5 Post Office Square, Suite 100
Boston, MA 02109-3912

David Ferris, Director
Division of Watershed Management
Department of Environmental Protection
1 Winter Street
Boston, MA 02108

RE: Massachusetts Water Resources Authority
Permit Number MA 0103284 O&M Annual Report

Dear Ms. Studlien and Mr. Ferris:

Attached please find the MWRA's annual status sheets on plant performance and maintenance for the period covering July 2013 – June 2014. This submittal fulfills the requirements of MWRA's NPDES Permit MA0103284 - Section I.18.f and I.18.g that states in part:

“The MWRA shall submit annual status sheets on plant performance, using key indicators for maintenance”

The Status Sheets will be posted at www.mwra.com.

If you have questions or need additional information, please feel free to call Betsy Reilley at (617) 788-4940.

Sincerely,

Michael J. Hornbrook
Chief Operating Officer

cc: MA DEP, Wilmington
MA DEP, Worcester
T. Borci, US EPA
C. Vakalopoulos, MA DEP
F. Laskey, MWRA

MWRA Annual Report on Operation & Maintenance

July 2013 – June 2014

This report has been generated to fulfill the requirements of MWRA's NPDES Permit MA0103284 - Section I.18.f that states:

"Within ninety (90) days of the effective date of this permit, the permittee shall develop and implement a long-range operations and maintenance plan that will maximize the life of the treatment facility. The permittee shall report on the plan's implementation and results to EPA and the MADEP on a yearly basis"

Also included with this submittal are the annual status sheets on plant performance and maintenance as required in section I.18.g.

1. SYSTEM OVERVIEW

Deer Island Sewage Treatment Plant

The Deer Island Sewage Treatment Plant (DITP) is the centerpiece of MWRA's \$3.5 billion program to protect Boston Harbor against pollution from Metropolitan Boston's sewer systems. The DITP's purpose is to remove human, household, business, and industrial pollutants from the wastewater that is collected and transported through 5,400 miles of pipes and community owned sewer lines and approximately 228 miles of Authority owned interceptors and tunnels.

DITP is a state of the art wastewater treatment facility and one of the most automated in the country. The MWRA has made a considerable capital investment in the DITP and is fully committed to ensuring that this valuable public asset is cared for in the best possible manner. The MWRA's Board of Directors, Executive Director, management team, and staff are dedicated to providing the highest quality of asset management. The MWRA has assembled a highly skilled and qualified staff that will ensure that the treatment plant is operated and maintained to the satisfaction of the regulatory agencies and the public.

Wastewater Transport System

The Field Operations Department (FOD) operates and maintains MWRA's wastewater transport system, which transports wastewater from MWRA member communities to the Deer Island Treatment Plant. This system includes a network of 240 miles of interceptor sewer lines and related appurtenances, a screen house, 13 pumping stations, 4 remote headwork's facilities, 3 combined sewer overflow (CSO) facilities and 2 combined sewer overflow (CSO) storage facilities. The primary goal is to operate the system in a manner that will provide uninterrupted wastewater transport service in a safe, cost-effective, and environmentally sound manner.

Fore River Pelletizing Plant

The operation and output of the Fore River Pelletizing Plant (FRPP) is regulated, in part, by the terms of the federal NPDES permit, 40 CFR 503 regulations, and state sludge regulations in Massachusetts (310 CMR 32.00) and the states to which the pelletized product is shipped. Other important external factors that influence operation of the FRPP include an extensive residuals management facilities plan developed as part of the permitting process for the FRPP as well as commitments to local communities.

Under the terms of the current operating agreement between New England Fertilizer Company (NEFCo) and MWRA, NEFCo budgets for, and performs all necessary predictive, preventive and routine maintenance at the FRPP. NEFCo's agreement contains a plan for the maintenance, repair and operation of the facility. At this time, NEFCo performance meets the necessary standard for proper operation and maintenance. Since the inception of the agreement in March of 2001, there has not been an incident requiring an interruption in service.

The operating agreement requires NEFCo to provide a letter of credit in the amount of \$1,000,000 (adjusted for inflation) that MWRA may draw on in the event that there is a material breach of the operating agreement, such as failing to adequately maintain the facility.

2. PERMIT VIOLATIONS

There were no violations at MWRA facilities due to inadequate maintenance efforts.

3. FACILITIES ASSET MANAGEMENT PROGRAM (FAMP)

The goals of the MWRA multi-year maintenance plan include coordinated, consistent asset inventory; condition assessment; maintenance scheduling and long-term replacement planning. The MWRA has developed and implemented, the "Facilities Asset Management Program." This asset management program addresses the goal of becoming more efficient by developing consistent, compatible best practices, cost-effective operations and maintenance procedures.

Since the start-up of new Authority facilities, the MWRA has been conducting its maintenance on a calendar schedule in accordance with the original equipment manufacturers' (OEM) recommendations. This approach to maintenance was primarily driven by the contractual obligations of the OEM warranties. The Authority's management team believed that it was important to modify its existing program with the goal of achieving a more holistic approach to maintenance management. MWRA management acknowledges the importance of asset management and developed the Facilities Asset Management Program (FAMP) to meet the long-term demands of facility maintenance. The main objective of the FAMP program was to develop a sound maintenance strategy that would ultimately lead to better overall asset management, extended equipment life and increase reliability.

MWRA has expanded its efforts in the areas of condition monitoring; Reliability Centered Maintenance (RCM) rollout; asset replacement prioritization and capital improvements; and training of staff. DITP is continuing to build the program, focusing on Maximo upgrade to

version 7.5, continuing rollout of RCM, consolidating the tool data-base in Maximo, expanding condition monitoring oil analyses by using on site testing equipment, and reviewing analytical software for better asset management decision making.

4. COMPUTERIZED MAINTENANCE MANAGEMENT SOFTWARE

The maintenance management software used by the Authority is MAXIMO version 5.2. The software includes safety plan and job plan features that allow users to document hazardous materials and areas around the plant. It has the ability to use lockout/tag-out procedures or tasks and generate associated work orders for the field. MAXIMO provides document management capabilities to streamline maintenance and regulatory functions, and workflow capabilities for synchronizing operations. Applications can be fine-tuned to suit specific work processes or integrate with other programs. The software also includes mobile applications for gathering and downloading data and an intuitive interface.

Maintenance staff can prioritize tasks, assign work based on the availability of necessary parts and labor, and analyze equipment failures in order to implement appropriate preventive maintenance measures.

The MAXIMO maintenance management tool is used to manage all MWRA assets. The software is used for work order management, planning and scheduling, asset management, resource management, recording of maintenance costs, and generation of reports and analyses. The software can store large amounts of data and is equipped with built-in failure analysis programs. In addition, MAXIMO contains the historical record for all maintenance activities, thus allowing staff to better address a problem with a facility, or a specific asset group.

The MAXIMO system was upgraded in February 2007 to an intranet version (Maximo 5.2) for both Deer Island and Field Operations Division. The upgrade allows continued customer support and takes advantage of web-based software maintenance. This version reduces the labor hours for MIS staff to maintain the software as all testing and programming are completed remotely and not at each desktop computer. MWRA is currently reviewing Maximo version 7.5 and expected to implement over the next year.

MWRA has completed the implementation of the transportation module within Maximo. This module focuses on fleet services which includes all MWRA plated vehicles. Software is customized specifically to track, document and report information about all Transportation vehicles and equipment.

NEFCo has installed and populated computerized maintenance management software - Quickmaint. Quickmaint is used for work order management including preventive and corrective maintenance work.

5. SERVICE CONTRACTS

The maintenance program is supplemented by a series of service contracts. These contracts are intended to provide specialized services beyond the resources of the MWRA maintenance staff. Table 1 below shows the service contracts currently used by MWRA.

TABLE 1
DEER ISLAND CURRENT SERVICE CONTRACTS
Laser alignment
Boiler maintenance
CCTV maintenance
Centrifuge maintenance
Combustion Turbine Generator maintenance
Continuous emissions monitoring
Catch Basin Contract
Copier/fax maintenance
Crane maintenance
Cryogenics facility maintenance
Digester Mixer overhauls
Electrical testing
Elevator maintenance
Facilities coatings
HVAC chemical treatment (Legion Ella testing)
Hydro turbine generator maintenance
Hydraulic maintenance
Janitorial services
Lab hood certification
Plant and Public access landscape services
Locksmith services
Lube oil analysis
Oil separator cleaning
Overhead door maintenance
Pest control
Plant instrumentation and control system (PICs) maintenance
Pratt Whitney Preferred service
Reactor Mixer gearbox rebuild
Recycle contract (Scrap/Paper)
Security
Steam turbine generator maintenance
Trash removal
Vibration analysis

Deer Island Treatment Plant

July 2013 - June 2014

Annual Report: Deer Island Maintenance page of the MWRA Report on Key Indicators of Performance for FY14. Monthly maintenance data is shown under six headings.

- Preventive Maintenance Work Orders Completed - Maintenance is working to reach the PM goal of 100%. The average PM % completion rate is 99.9% over the past eight years.
- Work Order Kitting - The first step to increase wrench time is to have all parts available for work orders. Kitting is a task where the maintenance planner identifies the specific parts required for a task on the work order and electronically sends the information to warehouse personnel to assemble the parts in one location (kit) for the technician to pick up and use. Deer Island reached their goal of 47% in FY14.
- Predictive Maintenance - Extending the useful life of equipment and allows for better planning for equipment replacements. 6,863 work orders were completed for vibration, acoustic ultrasonic, ultrasonic thickness, and oil analysis in the past year. Deer Island reached its FY14 goal of 20% of all work orders were predictive maintenance.
- Maintenance Backlog in Hours - Backlog is determined by totaling the planned craft hours on open work orders and comparing them to craft resources which are available. The average backlog for last year was 16,782 hours for day to day plant maintenance activities which is under the industry standard of 8,730 hours to 17,460 hours. DITP monitors all of our metrics very closely to ensure the backlog is not affecting our availability of equipment.
- Maintenance Project Backlog in Hours – The average backlog for normal day to day maintenance activities and project backlog was 16,782 hours which includes 1,809 hours of project backlog.
- Maintenance Overtime - The goal is to maintain maintenance overtime to 5% of total wages and salaries. DITP was below the benchmark with 2.3%. This doesn't include any wet weather event overtime requiring maintenance staff to be onsite as a precautionary measure.

Critical Equipment Availability: 12-Month Average – 99.6%

An equipment availability report is generated daily that details the critical equipment required to treat the maximum flow of approximately 1.2 billion gallons per day. Higher maintenance priority is given to equipment that drops below the number required. No operational impact has occurred in the past year from a 99.6% versus 100% availability because the plant normally operates at approximately one-third the design flow capacity.

Day to Day Plant Maintenance Average Backlog was 16,782 hours Backlog is determined by totaling the planned craft hours on open work orders and comparing them to craft resources which are available. Day to day plant maintenance backlog includes all PM, PdM, Project and CM backlog. A backlog of 16,782 hours constitutes 5.7 weeks of work for the entire maintenance workforce. This backlog is within the industry standards of 8,730 hours to 17,460

hours or 4 to 6 weeks. DITP monitors all of the metrics very closely to ensure the backlog is not affecting the availability of equipment.

Preventive Maintenance (PM):

99.9% of all PMs were completed and 17,626 PM work orders were initiated this year. Incomplete PM's that are not completed in one month are rolled over into the next month's workload and given a high priority to complete first.

Predictive Maintenance (PdM)

6165 predictive maintenance work orders were completed in the past year. Predictive maintenance work includes vibration, acoustic ultrasonic, ultrasonic thickness and oil analysis and is proactive maintenance work to extend equipment useful life by monitoring and trending equipment characteristics.

Average Craft Hours per Month:

Preventative Maintenance	3560 hours	25 %
Predictive Maintenance	171 hours	1 %
Corrective Maintenance	8502 hours	60 %
Emergency Maintenance	3 hours	<1 %
Project Work	890 hours	6 %
Other Work	962 hours	7 %
Total	14, 088 hours	100.0 %

Total Work Orders:

35,927 work orders initiated this year
33,861 work orders completed/closed

Equipment Replacement:

Major replacements, in the past year, include the following:

- Centrifuges Refurbishment \$177,080
There are twelve waste sludge centrifuges which, due to high speed rotating assembly and critical nature of the process, require maintenance. Centrifuges require refurbishment at regular intervals based upon running hours for normal wear and tear. Due to the intricacy of the equipment all overhauls are sent back to Alfa Laval, the original equipment supplier. In the past year, two waste sludge centrifuges and gearbox were refurbished.
- Digester Mixers Refurbishments \$74,482
One digester mixer was refurbished based upon impeller and bearing wear identified through vibration testing. Due to the intricacy of the equipment all overhauls are sent back to SIHI, the original equipment supplier.

- Reactor Aerator/Mixer Gearbox Rebuilds \$291,440
 The secondary reactor aerators and mixers have large gearboxes that have started to fail. Six gearboxes were refurbished in FY14 with new gears, seals, and bearings.
- Boiler, STG and Hydro Plant Maintenance \$1,419,681
 A maintenance contract was put in place to perform annual preventive maintenance and repairs as necessary. This contract was combined with Hydro plant and STG to save money with one contract on like equipment and save on mobilization cost. In FY14, additional maintenance was required on the Steam Turbine.
- Cryogenic Facility Repairs \$419,691
 The Cryogenic facility has an annual maintenance contract to handle preventive maintenance and some project maintenance work. The maintenance work includes two shut downs per year and scheduled projects. The scheduled project this year was replace vaporizer controls, replace wafer valve on chiller and butterfly valves on Mole Sieve.
- Elevator Controllers Replacements \$231,584
 We have replaced two existing elevator controllers in the Power Plant and North Main Pump Station. We replaced the existing controllers with a new Galaxy controller. The Galaxy controller's variable-frequency closed loop controller with phase 1-2 fire service and code compliant features is state of the art system. The existing controllers were obsolete.
- Electrical Repairs - \$491,266
 The electrical system on Deer Island is extremely important which requires constant maintenance and equipment replacements to ensure reliability. These steps are necessary throughout the electrical distribution system. Some of these repairs and changes are installing new various variable frequency drives, rebuilt Gem drives, power line conditioners, transformers, circuit breakers and Uninterrupted Power Supply units (UPS).
- Grinder Rebuilds \$24,952
 The Residuals Complex at Deer Island has small Muffin Monster grinders, installed "in-line" to provide continuous grinding of sludge into uniform, homogenized slurry. The sludge, which travels through these in-line grinders, is transported from Primary and Secondary treatment processes. The in-line grinders in Residuals are used after pre-treatment solids and rags are removed. In-line grinders are smaller than the larger channel grinders in size due to the composition of sludge entering them. Normal wear and tear to the grinders caused by constant operation wears the gears and seals requiring periodic service to re-build the grinders or cutter blocks.

- Electric Carts Replacements \$128,650

Deer Island often uses burden carriers, which in effect are small electric “carts” to transport personnel, materials, equipment and supplies across its wide expanse, to and from its many facilities. Utilizing smaller, electric burden carriers is less costly than conventional vehicles and is more environmentally friendly. These new burden carriers will replace 10 of an existing fleet of 78 which most of which were first procured for Deer Island under a fit-out process approximately 18 years ago.

- Roller Gates Rebuilds \$149,605

The primary function of roller gates is to isolate channels or chambers. Isolation of flow is necessary for maintenance tasks to be performed. Stop logs are fabricated of structural steel and have specifically designed rubber fittings on the tops and bottoms that mate with the units above and below them to provide a water-tight seal. As part of the overhaul, the stop logs will be dismantled, removing all existing wheels, axles, bushings, retainers and seals. The stop logs will then be cleaned, shop blasted, and repainted to the original specifications. They will then receive all new wheels, bushings, retainers, and seals, per the original manufacturer’s specifications. The current plan is to overhaul approximately 15 stop logs each year until all have been refurbished.

- HVAC Equipment \$241,166

A key aspect of ensuring optimal operational performance of equipment on Deer Island is reducing occurrences of heat-related stresses. Excessive heat presents a constant challenge to HVAC staff as they work to maintain proper temperature and humidity levels within electrical buildings and facilities throughout the plant. DITP has purchased chillers, condensers, coils and associated equipment to ensure equipment reliability and take into account the environment at Deer Island. The replacement equipment includes updated environmentally beneficial of R-22 refrigerant and electro-fin™ coating to protect from exposure to the corrosive nature of hydrogen sulfide. This coating will prolong the useful life of these HVAC units.

- Purchase Dry Feed Lime Feeders \$47,634

Deer Island is moving toward an automated lime feed system to control odor associated with our grit removal. With these two new units grit will be treated with lime automatically throughout the process by being dispensed directly onto the belt conveyors transporting grit. The volumetric feed system process will allow for a more consistent and thorough mixing of the lime and grit and better odor control using a smaller amount of lime, providing efficiency and cost savings.

Wastewater Transport System

July 2013 - June 2014

Wastewater Transport System Overview

The Field Operations Department (FOD) operates and maintains MWRA's wastewater transport system, which transports wastewater from MWRA member communities to the Deer Island Treatment Plant. This system includes a network of 240 miles of interceptor sewer lines and related appurtenances, a screen house, 13 pumping stations, 4 remote headwork's facilities, 3 combined sewer overflow treatment (CSO) facilities and 2 combined sewer overflow (CSO) storage facilities. In 2011, the South Boston storage CSO facility pump station and odor control buildings were completed and are now operational. The Union Park CSO facility is operated under contract. The contract requires compliance with the facility NPDES permit and includes well defined maintenance tasks. The primary goal is to operate the system in a manner that will provide uninterrupted wastewater transport service in a safe, cost-effective, and environmentally sound manner.

Wastewater Transport Facilities

1. Facilities Operational Statement

During FY14 Wastewater Transport facilities operated at full capacity throughout the year with the following exceptions, Cottage Farm Diesel Engine #1 was unavailable during May 30th to June 11th for engine rehabilitation. Cottage Farm Diesel #2 was unavailable during June 11th to July 11th for engine rehabilitation. During the time period for both engine rehabilitation there were no activations of Cottage Farm. All required equipment to maintain flow and process of wastewater was available. CSO facilities operated with sufficient chlorination and dechlorination, though some NPDES exceedances were reported. The required number of pumps in each gravity and pumping CSO was available throughout the year.

2. Equipment Availability

The critical equipment evaluated includes pumps and screens in the pump stations, CSOs, the screen house, and headwork's. Operational staff track and report the availability of critical equipment on a daily basis and report on a weekly basis. The critical equipment availability for FY14 for FOD facilities was 99.98%. Higher maintenance priority is given to equipment that drops below the number required.

3. SCADA Systems

The MWRA Supervisory Control and Data Acquisition (SCADA) systems provide a means of monitoring and controlling facilities and equipment from a remote centralized location, as well as providing a continuous record of facility operations.

Significant improvements to the Wastewater SCADA system were made through two construction projects completed in 2008 and 2010, as well as through prior facility rehabilitation or replacement contracts and through in-house staff efforts. Remote monitoring and control is currently available for all of the wastewater facilities mentioned in the overview above. All wastewater facilities are designed and programmed to run independently without remote operator intervention. Each facility has an on-site control panel with a programmable logic controller (PLC), configured with logic and facility setpoints used to independently run the facility. Given the size, rapidly changing flow conditions, and some on-site operational requirements of the Headworks and CSO treatment facilities, MWRA continues to staff these facilities during storm events (CSOs) or on a continuous basis (Headworks).

To help ensure uninterrupted operation, critical process signals are redundant at wastewater facilities. This includes depth measurements within pump station and CSO facility wet wells used for controlling facility pumps, and depth sensors within Headworks shafts used in emergency isolation strategies. Additional hard wired control systems are further implemented at wastewater pumping facilities (backup pump control panels), which would activate facility pumps in the event of a PLC failure.

Maintenance of the SCADA systems is performed by MWRA Staff and through the use of an instrumentation service contract. The instrumentation service contract is primarily responsible for preventative and corrective repairs of 400+ fixed gas monitoring devices used to measure and alarm upon low oxygen, high hydrogen sulfide, high carbon monoxide, high sulfur dioxide, high chlorine or explosive conditions within wastewater facilities. Calibration of fixed gas monitoring equipment is performed on a monthly basis. MWRA staff performs periodic calibration and corrective repairs to other instrumentation (level sensors, pressure indicators, flow meters, position transmitters, etc.) at all other wastewater transport facilities with the exception of Nut Island. MWRA SCADA Engineering staff further maintains and updates the PLC logic, Human machine interfaces, computers, routers, switches and communication devices used in displaying, communicating, and storing SCADA data.

MWRA recognizes the cyber security risk to the SCADA system and has focused internal and external staff resources to help reduce this risk. MWRA is currently evaluating the formal adoption of the NIST Cyber Security Framework as a policy for guiding cyber security policy and practices. In the absence of a formal Framework adoption, the SCADA staff have had internal focus on working from the SANS Top 20 Cyber Security Controls and information from various cyber security training courses to guide cyber security efforts. MWRA is participating in a cyber security audit that will be conducted by a joint venture between the Department of Homeland Security and Idaho National Laboratories.

4. Equipment Replacement and Significant Maintenance Projects

Equipment replacement is part of the overall maintenance strategy that ensures compliance with permit requirements. Projects and initiatives are completed during each fiscal year to maintain redundancy and continued reliability. Many projects are extensive, requiring significant in-house resources and use of specialty/service contractors. Some examples of key improvements, equipment replacement, or significant repair work during the past fiscal year include in-house and out-sourced projects:

In-house Projects

Remote Headwork's Improvements: Staff continued to work to replace equipment at the headworks to maintain equipment reliability. Each year, staff works to upgrade the headwork's equipment. In the past year the following replacements have been completed:

- Chelsea Creek Headworks Channel # 3 Overhaul: Remove and Replace all shoes, wear strips, and head shafts. The overhaul on Headworks channel was performed to have Headworks ready for construction. Operation needs to have three channels available for wet weather so one channel can be given to contractor for rehabilitation project.
- Columbus Park and Chelsea Creek Headworks: Dewatering Pumps replacements were completed. A new pump, new base and isolation valves were purchased. MWRA Mechanics disassembled the original equipment and installed new pump and isolation valves. The pumps allow staff to remove wastewater from channels for maintenance work or operational inspections.
- Columbus Park and Ward Street compressor replacement: Booster compressors were purchased for both Headworks sites and installed permanently by staff to handle additional demands during wet weather. In the past, during wet weather events a third portable air compressor would be set up outside by staff at each site to meet demand.

Nut Island Odor Control Damper #2: Pneumatic Damper #2 froze due to age and the corrosive atmosphere in the odor control system. A new damper was purchased and installed to replace the deteriorating damper. This was a very labor-intensive and difficult project because of the size and location of the damper. Staff from multiple trades worked together erecting scaffolding, rigging to remove the existing, installs new damper, and functionally test.

Nut Island Generator Radiator: The radiator for the Nut Island emergency generator needed to be replaced due to many years located in a harsh environment. The replacement radiator would take a couple days, leaving the facility without emergency power. A generator large enough to power the facility was rented and wired by staff to provide emergency power during the replacement. .

Nut Island Chemical System Replacement: The odor control scrubber system had multiple leaks, and was very difficult to repair and operate. It was decided to remove existing equipment and piping. Staff installed four new peristaltic hydroxide pumps and four new peristaltic sodium hypochlorite pumps. All CPVC piping and valves were removed. All new piping, isolation valves, pressure switches, back pressure valves and pressure relief valves were installed. The new system will operate more efficiently with additional isolation valves to provide Operations with flexibility and system redundancy.

Bear Hill Tank-Electrical Connection: In the event of a power failure, Bear Hill Tank would not have an electrical supply. MWRA Electricians wired connections to the switch gear so that a towable generator to power the facility could be easily connected limiting any downtime.

Prison Point UPS Replacement: MWRA identified through testing the existing UPS was only 50% of the back-up needed for the facility. Staff analyzed UPS information and realized a larger UPS was required. Staff purchased and installed new UPS which now provides 4+ hours of back-up time.

Alewife #2 Screen: A length of chain failed causing a major failure of the #2 Screen. MWRA Staff removed the damaged chain and flights, installed new chain and clutch.

Hayes Pump #1 Motor: During routine vibration testing of Pump 1, the motor bearings were found to be out of tolerance and recommended to be rebuilt or replace the motor. MWRA Mechanics and Electricians removed the existing motor and installed a new motor. The motor was installed and laser aligned to the pump by MWRA Mechanics and returned to service. The original motor was sent out to be rebuilt and will be used as the spare for the facility.

Cottage Farm Wet Well Wash Down Replacement: This system is to spray water in wet well and drain to lower sump to remove wastewater and reduce odors. The piping was severely corroded, hard to access and had multiple leaks. Staff replaced failed piping with 200' of schedule 10 stainless steel pipe. This type of pipe was used due to its durability and light weight.

Commonwealth Avenue Pump Station: Staff purchased and installed variable frequency drives (VFD) for all four pumps in the facility. VFD's are used to adjust speed on electro-mechanical drive systems. These units also reduce energy cost.

Hyde Park Pump Station Generator: Lube oil analysis indicated cooling fluid in the lube oil. MWRA pressure tested the cooling system, found the after cooler to be leaking. Staff purchased and installed a new cooler.

Gillis Sewer Ejection Line: The sewer line had sheared underground due to settling. Maintenance staff together with Water Pipeline Crews dug up line and replaced.

Administration Building in Chelsea: The MIS Data Center needed to replace existing UPS to support new computer equipment. Electricians reworked redundant feeds, modified circuit distribution and installed new UPS unit.

Outsourced Projects

Squantum Pump #2: The pump was removed and reinstalled by in house staff. The pump was rebuilt offsite by outside contractors.

Squantum Pump Grinder: The grinder failed during operations. MWRA staff removed and re-installed spare grinder. The failed grinder was sent back to manufacturer for rebuild. Unit was rebuilt and will be used as a spare.

Chestnut Hill Pump Station: MWRA contractor Infrared completed electrical testing on our transformers and associated medium voltage electrical equipment.

Reservoir Road Pump Station: Pump #1 surge valve had an internal hydraulic leak. Hydraulic contractor investigated, had to disassemble valve and identified a cinched O-ring. O-ring was replaced. Surge valve was re-assembled and functionally tested.

Nut Island Headwork's Upgrade: A multi task contract to replace the embedded electrical conduits which had water intrusion. Modifications to the grit and screenings conveyors to enhance operation.

Cottage Farm Upgrade: The three (3) diesel engine drives for the storm water pumps had DOCs (diesel oxidation catalysts) installed. These units operate when hot gasses come in contact with catalyst, exhaust pollutants are converted to harmless substances. Mechanical overhaul work was also performed on all three (3) engines.

Prison Point-Engine #2: The #4 cylinder liner was running hot. An internal inspection identified the liner was damaged. A vendor and MWRA mechanics removed the damaged liner and replace it with a spare which was in inventory. The engine was test ran and returned to Operations.

Prison Point: Contract currently in place, The four (4) diesel engine for the storm water pumps had DOCs (diesel oxidation catalysts) installed for emissions and all four (4) exhaust silencers replaced.

Wastewater Transport Pipelines

Manhole Inspection and Rehabilitation Program

The Technical Inspections Unit (TIU), of the FOD conducts manhole inspections. These inspections facilitated the beginning of the manhole rehabilitation program. Specialized equipment and training are the essential elements of the program. Pipeline maintenance crews perform manhole renovations and repairs that result in reduced I/I. The manholes are coated using cementitious material applied with spinning equipment and then covered with special coatings to resist corrosion from hydrogen sulfide.

In FY14 TIU staff inspected a total of 723 manholes. Approximately 112 manholes were rehabilitated utilizing in house staff. The rehabilitation work included frame and cover replacement, external repairs to raised manholes, internal repairs using the spin-cast application, and other miscellaneous repair work.

2. Pipeline Rehabilitation

Pipeline Rehabilitation projects are first identified by the TIU during routine television inspections of the pipelines and interceptors. MWRA Engineers review these projects and perform or coordinate all necessary design and construction contracting. The following is a current pipeline construction/rehabilitation project included in the MWRA Capital Budget.

Siphon Rehabilitation Section 155, Somerville:

Emergency Repair Contract Number OP-226 – Contract included CIPP of 86 linear feet of 24” diameter concrete sewer pipe, required to eliminate any sewage contamination to the Mystic River. Repair was completed in October 2013.

Phase 5 Sewer Manhole Rehabilitation Contract No. OP-239

Contract OP-139 was designed by MWRA staff. It is the fifth in a series of annual contracts to rehabilitate sewer manholes. The work under this contract consists of internal rehabilitation of 55 sewer manholes at various locations in Boston, Cambridge, Everett, Malden, Stoneham, Lexington, Melrose, Chelsea and Medford. The interior surfaces of the manholes will be prepared by first cleaning and plugging active water infiltration. A fiber-reinforced, corrosion-resistant mortar will then be applied, which will improve the structural integrity of the manhole and also protect against future corrosion damage.

3. Pipeline Inspection and Cleaning

The Technical Inspection and Wastewater Pipeline Maintenance groups were merged to more efficiently and consistently maintain the wastewater collection system. The work performed by the inspection staff is an important element to the planning and execution of pipeline maintenance work. The inspection tasks are shared by the entire staff and the maintenance workload is prioritized based on inspection data and information.

TIU conducts internal inspections of MWRA structures and pipelines to reveal potential problem areas and identify locations requiring maintenance. Pipeline inspections average about 70% of the workload followed by inspections of other structures and manholes. Approximately 32.62 miles of pipelines were TV inspected in FY14.

Community Assistance was provided to member communities on an as needed basis. This assistance included:

- City of Waltham by-pass pumping. Waltham had a blocked storm culvert that was causing flooding to properties. MWRA personnel assisted by providing 2 pumps.
- City of Medford CCTV Inspection. MWRA inspected 2,344 linear feet of 12” diameter sewer, looking for structural deficiencies and I/I.

Pipeline maintenance crews perform a variety of maintenance activities for the MWRA's Wastewater Transport system. The Transport collection system includes 240 miles of interceptor sewer lines. Approximately 17.75 miles of pipeline and 97 siphons were cleaned in FY14.

In addition to general pipeline and manhole repair work performed under this program, the following are other activities pipeline crews perform during the year:

- pipeline spot repair work in shallow excavations
- clear obstructions and clean sections in community lines under the Community Assistance Program
- snow plowing and removal during winter months
- NPDES inspections and best practice management activities
- emergency pumping activities for communities during major wet weather events

- by-pass pumping for contracted pipeline rehabilitation or repairs
- emergency response and overflow monitoring during wet weather events
- response to odor complaints in the system

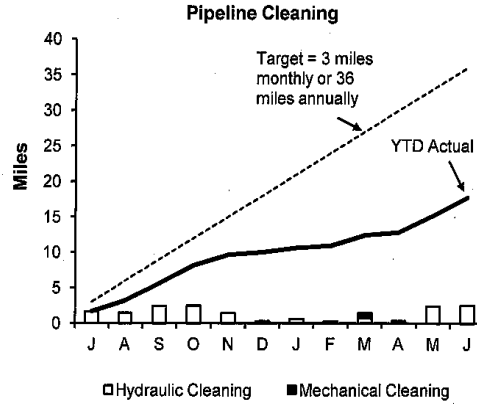
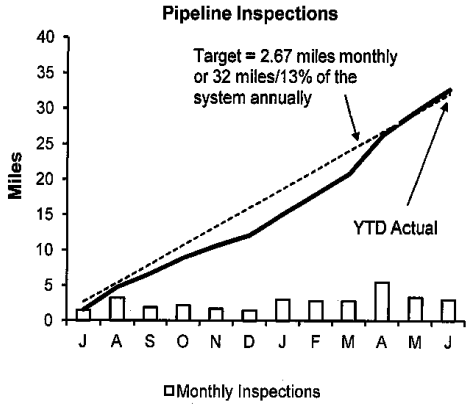
The attached “Maintenance Pipeline and Structure Inspections and Maintenance” page provides a breakdown of the pipeline inspections and maintenance activities for FY14.

Wastewater Pipeline and Structure Inspections and Maintenance

June 2014, FY 14

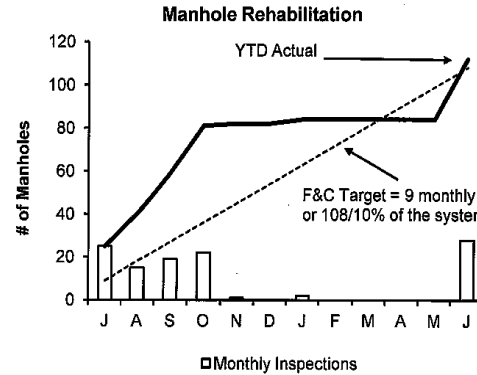
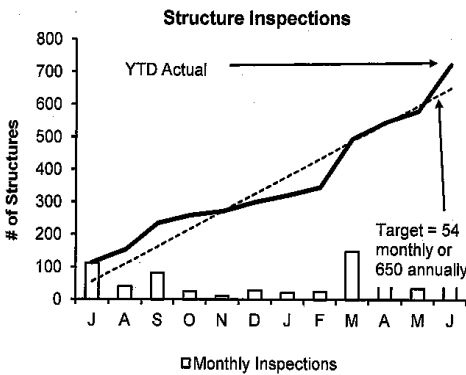
Inspections

Maintenance



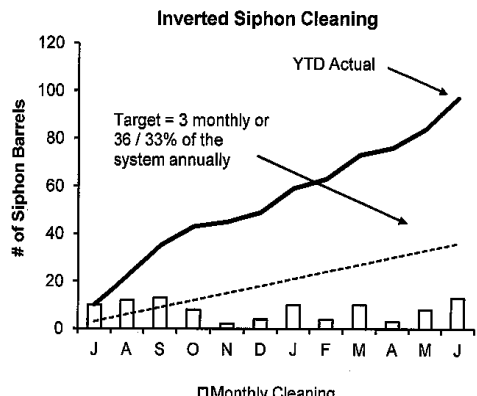
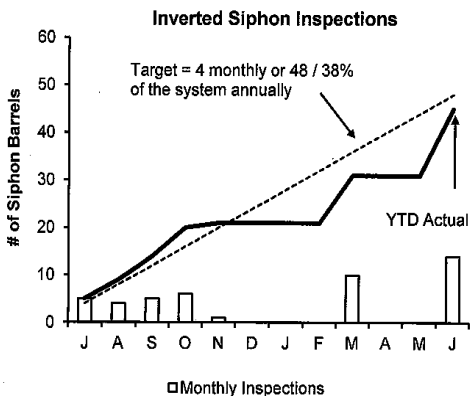
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FY14 Maintenance Program Costs, Staffing and Contracts

1. Budget

FOD has made a significant commitment to the maintenance of its wastewater system. Additional maintenance and improvement projects are included in the MWRA Capital Program and are identified on an annual basis. A Master Plan is ongoing within the Authority to prioritize projects and to determine required funding needs. The budget below includes only the Current Expense Budget (CEB). Maintenance includes protecting the many assets of the MWRA with individual programs that care for facility interior and exterior elements, maintain plant equipment, inspect and clean wastewater pipelines, and structures. Staff plan/schedule and track maintenance activities for each program, supervise staff, and provide adequate administrative support. The table below includes a summary of the approved budget in FY14 for programs within FOD for related maintenance activities.

FY14 APPROVED MAINTENANCE ANNUAL BUDGET

Budget Line Item	Total Funding
Wages and Salaries	\$8,328,709
Overtime	\$481,975
Maintenance (Parts & Supplies)	4,627,896
Professional Services	\$175,000
Other Materials	\$217,587
Other Services	\$230,478
Total	\$13,996,658

2. Staffing

A total of 115 employees are included in the chart below. They represent personnel responsible for the maintenance of wastewater transport facilities and pipelines. Unit Supervisors for each trade provide supervision and support in their respective areas: electrical, mechanical, machinists and welding, plumbing, HVAC, painting, and carpentry. Facility Maintenance and Equipment Maintenance are two consolidated programs made up of the mechanic specialists, machinists, metalworkers, welders, plumbers, HVAC specialists, electricians, building & grounds workers, and facility specialists (carpenters, painters, and masons). These groups perform maintenance activities at both wastewater and water facilities.

Work Coordination in FOD provides scheduling and job planning at all water and wastewater facilities, water and wastewater pipeline maintenance, and Western Operations. The Wastewater Pipeline Maintenance and Technical Inspection programs maintain the collections system for the Transport system only. The staffing represents FY14 average levels for employees reporting to the Chelsea Facility. The table below indicates the amount of staffing available and dedicated to maintenance efforts.

MAINTENANCE STAFFING LEVELS

Staffing Categories	No. of Staff
Equipment Maintenance Program	
Maintenance Manager	1
Engineers	1
Program Manager/Area Manager	4
Administration	1
Mechanic Specialists	18
Electrical Specialists	12
Plumbers	9
HVAC	6
Machinists and Welders	4
	56

Work Coordination Group Program	12
Collection System Technical Inspections Program	9
Wastewater Pipeline Maintenance Group	12
Building & Grounds Program	14
Facility Maintenance Program (Carpenters, Painters, Masons)	12
Subtotal	59
Total	115

Staffing levels may vary as a result of vacancies, transfers, and other factors. This chart provides a number of available staff during the fiscal year for maintaining the collections system and wastewater facilities. Equipment Maintenance, Building & Grounds, and Facility Maintenance programs perform similar core business functions at Water Pumping Facilities and locations.

3. Service Contracts

The Maintenance Program is supplemented by a series of service contracts. These services are intended to provide resources beyond the in-house capabilities of the Maintenance staff. FOD currently utilizes the following service contracts and services, listed below, to supplement the existing workforce and assist with maintenance projects at water and wastewater facilities.

<u>CURRENT SERVICE CONTRACTS</u>
Elevator Maintenance
Crane Maintenance
Hydraulic Equipment Maintenance
Instrumentation Maintenance
Fuel Storage Tanks
Fire Alarm and Sprinkler
Air Compressor Service
Boiler and Water Heater
Pest Control Services
Trash Removal
Electrical Testing
Grounds keeping
Lube Oil Analysis
Union Park Station Operation and Maintenance
Generator Maintenance
Overhead Door Maintenance
Vibration Monitoring

Wastewater Transport Equipment Maintenance

1. Annual Report

The Field Operations Department Equipment Maintenance page for key indicators of performance for FY14 is attached. Monthly maintenance data is shown under six headings.

- Operations Light Maintenance (PM) Hours – In an effort to free up maintenance staff to complete more detailed and complex maintenance, operations staff have been committed to completing a number of the routine monthly preventative maintenance tasks. These tasks generally consist of observation and light maintenance tasks. The industry benchmark is 10% - 15% of the total preventative maintenance hours. In FY14 operations staff completed an average of 299 hours per month which accounted for 13.8% of the total preventative maintenance hours.
- Overall Preventive Maintenance – The preventive maintenance work orders are completed by both operation and maintenance staff. The goal for FY14 was to complete 100% of all preventative maintenance work orders. The average PM completion for FY14 was 100%.
- Items Kitted Utilizing Maximo – In an effort to more efficiently complete work, maintenance staff and work coordination center staff have utilized the Lawson/Maximo interface to better kit stock and non stock material. The goal is to kit at least 50 items per month. The average for FY14 was 61 items per month.
- Operations Light Maintenance % PM Completion – In an effort to free up maintenance staff to complete more detailed and complex maintenance, operations staff have been committed to completing a number of the routine monthly preventative maintenance duties. The goal for operations staff is to complete 100% of the preventative maintenance work orders. In FY14 operations staff completed an average of 100% of the work orders.
- Maintenance Backlog in Crew Hours - Backlog is determined by totaling the planned craft hours in open work orders and comparing them to craft resources available. The FY14 backlog average was 7,664 hours which remains within the industry standard of 6,130 to 12,260 hours.
- Overtime Spending – Maintenance overtime spending was \$23,544 over budget for FY14. The overtime was used to support call ins for emergency maintenance and planned overtime. It was also used for emergency coverage and maintenance coverage related to weather events.

In addition to these monthly performance indicators Field Operation's staff also tracks the following:

2. Critical Equipment Availability

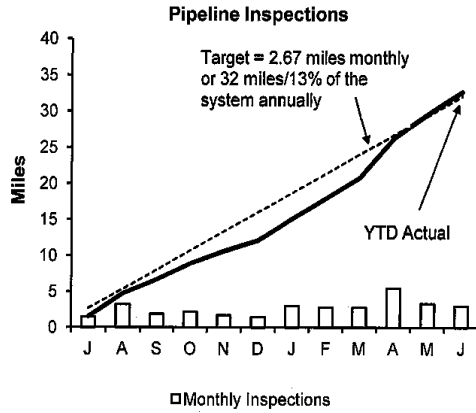
The average equipment availability for FY14 was 99.98 %. An equipment availability report is generated daily that details the critical equipment required to collect and transport the wastewater flow at the facility design capacity. Higher maintenance priority is given to equipment that drops below the number required. Because of the high daily equipment availability, no operational impact has occurred in the past year.

Wastewater Pipeline and Structure Inspections and Maintenance

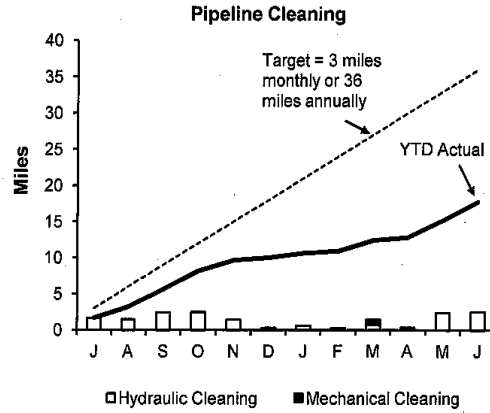
June 2014, FY 14

Inspections

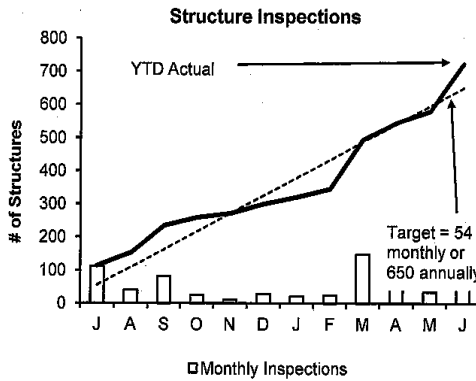
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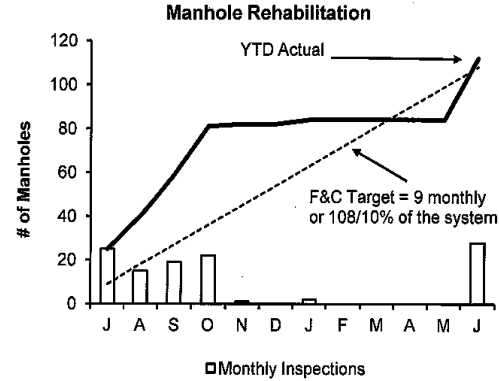
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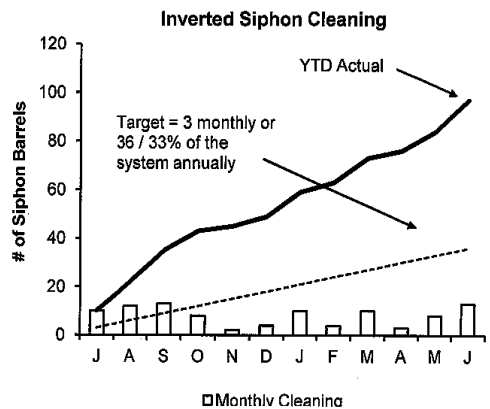
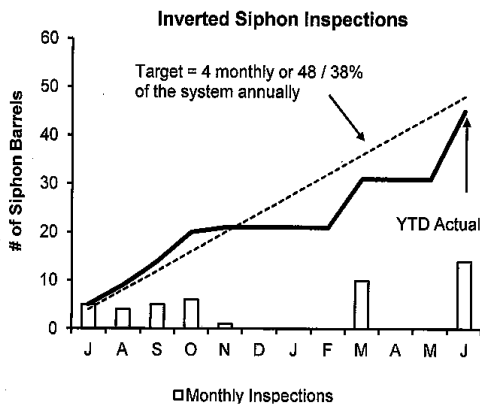
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Annual Status Sheets – Fore River Pelletizing Plant
July 2013 – June 2014

Critical Equipment Availability: 76.16%

Operating logs indicate that of the 2,190 machine days in the fiscal year 2014, centrifuges were available for 1,926 days for an availability of 87.95%. The centrifuges and ancillary equipment make up the critical components at the Pelletizing Plant because dewatered sludge can be processed through the dryers or it can be sent through a bypass system to trucks and taken to a landfill. The primary drivers of downtime were the factory reconditioning of two complete rotating assemblies and the installation of 2 new centrifuge control panels and associated equipment. At the present time, all 12 centrifuges are available giving the Plant more than enough capacity to process flows from Deer Island. The facility is currently operated on a 5-day workweek ceasing operations on most weekends.

Backlog:

The current maintenance monitoring software does not track craft hours, but it is estimated that the outstanding work orders could be completed in approximately two weeks.

Maintenance Work Orders:

In FY2014, 1,445 work orders were opened and 1,290 were completed. This equates to an 89.3% completion rate. The Preventative Maintenance system is continuously being modified to include updates for equipment changes, new lubrication schedules and new equipment inspection and cleaning practices. It is expected that the completion percentage will continue to improve as the modifications to the system are completed.

Maintenance:

More than \$1.211 million was spent on replacement parts and maintenance related items in FY2014, including:

- Centrifuge control panels and VFD upgrades were completed on the final two machines in the 1st quarter of FY14.
- Centrifuge repairs – two complete rotating assembly were sent back to the manufacturer and have been overhauled to OEM condition
- Furnace and gas piping was completely replaced on train 2 to meet updated codes.
- Drum 5 trunions were replaced and the tires were machined to OEM condition
- Conveyor Repairs – Several small to medium repairs were completed; Major repairs include:
 - Replaced mixer B, screws and liners on Train 5
 - Fabricated and replaced the dryer feed conveyor, trough and chute on Trains 2, 4, and 6
 - Trains 2 and 6 received a new material on the screw section that should help with wear resistance

- and replaced the dryer feed conveyor, trough and chute on Train 5