

October 16, 2003

Ms. Linda Murphy, Director  
Office of Ecosystem Protection  
U.S. Environmental Protection Agency  
Water Technical Unit "SEW"  
P.O. BOX 8127  
Boston, MA 02114

Mr. Glenn Haas, Acting Assistant Commissioner  
Department of Environmental Protection  
1 Winter Street  
Boston, MA 02108

RE: Massachusetts Water Resources Authority  
Permit Number MA 0103284  
Operation and Maintenance Annual Report

Dear Ms. Murphy and Mr. Haas:

Attached please find the MWRA's Annual Report on Operation and Maintenance for the period covering July 2002 – June 2003. This submittal fulfills the requirements of MWRA's NPDES Permit MA0103284 - Section I.18.f that states in part:

"The MWRA shall report on the Plan's implementation and results to EPA and 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. The Status Sheets will be posted at [www.mwra.com](http://www.mwra.com).

If you have questions or need additional information, please feel free to call Grace Bigornia-Vitale at 617-788-4716.

Sincerely,

Michael J. Hornbrook  
Chief Operating Officer

cc: MA DEP, Boston  
MA DEP, Worcester  
Eric Hall, US EPA  
Catherine Coniaris, MA DEP

# MWRA Annual Report on Operation & Maintenance

July 2002 – June 2003

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 230 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 228 miles of interceptor sewer lines, and related appurtenances; a screen house; 11 pumping stations; 4 headworks facilities; and 5 combined sewer overflow (CSO) 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 a newly issued 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 MWRA's Pelletizing Facility. NEFCO's proposal contains a plan for the maintenance, repair and replacement of the facility. This plan is intended to establish the standard, by which, to measure NEFCO's performance. At this time, it may be too early to draw any specific conclusions because the operating agreement went into effect March 1, 2001 and the majority of vital equipment is new; the equipment was recently accepted, or is currently undergoing acceptance testing.

The new operating agreement calls for 6-month, 12-month, and subsequent annual reviews to ensure that NEFCO is operating and maintaining the facility correctly. The operating agreement also requires NEFCO to provide a letter of credit in the amount of \$1,000,000 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. COMPUTERIZED MAINTENANCE MANAGEMENT SOFTWARE**

The maintenance management software used by the Authority is MAXIMO version 4i. The software includes safety features that allow users to document hazardous materials in real time, automate lockout/tag-out/lineup activities, and "push" proper procedures out to 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. 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 aspects of the DITP maintenance program and is being implemented for all Wastewater Facilities. The software is used for work order management, planning and scheduling, asset

management, resource management, recording of maintenance costs, and generation of reports and analysis. 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 an equipment part, for example.

The MAXIMO system has been very successful at Deer Island, and thus MWRA is implementing the use of MAXIMO throughout the wastewater system.

NEFCO is in the process of installing and populating its computerized maintenance management software. When the process is complete, reporting parameters will be established to monitor and report compliance with maintenance standards.

#### **4. 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 is developing, and implementing, this multi-year plan, in part, under an initiative entitled the “Facilities Asset Management Program.” This asset management program addresses the goal of becoming more efficient by developing consistent, compatible and cost-effective operations and maintenance procedures.

Since the start-up of 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. The 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 and extended equipment life and reliability.

During Phase II of FAMP, the MWRA is expanding its efforts in the areas of condition monitoring; RCM rollout; asset replacement prioritization and capital improvements; and training of staff. The Authority has entered into another contract to explore, and better develop, these techniques to maintain its equipment assets.

#### **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.

<b>TABLE 1</b>
<b>CURRENT SERVICE CONTRACTS</b>
Trash removal
Janitorial services
Digester cleaning *
PICS maintenance
Security
Copier/fax maintenance
Electrical testing
CTG maintenance
STG maintenance
Boiler maintenance
Elevator maintenance
Crane maintenance
Oil separator cleaning
Vibration analysis
Overhead door maintenance
Lab hood certification
Locksmith services
HVAC chemical treatment
Power sweeping
Pest control
Public Access groundskeeping
Facilities painting
Cryo facility maintenance
CCTV maintenance
Legionella testing
Bridge crane services
Air balancing
Lube oil analysis
Instrumentation maintenance

\*Not an annual contract

## Deer Island Treatment Plant

July 2002 - June 2003

**Annual Report:** Attached, please find the Deer Island Maintenance page of the MWRA Report on Key Indicators of Performance for FY03. Monthly maintenance data is shown under six headings.

- Operations Light Maintenance PMs – The PIP program is for Operations personnel to perform light maintenance tasks. This will free up Maintenance personnel to work on the most critical maintenance work. This program has been initiated and the operations personnel now complete approximately 11% of all PM work orders hours.
- Preventive Maintenance (PM) Orders Completed is shown with respect to the target of 100% in a bar chart. Maintenance is working to increase the PM goal to 100%. The PM % complete has improved from 86 % to 92% in the past year.
- Preventive Maintenance Kitting - The first step to increase wrench time is to have all parts available for preventive maintenance work orders. Kitting is a task where the maintenance planner identifies the specific parts required for a task and the warehouse personnel assemble the parts in one location (kit) for the technician to pick up and use. Deer Island kitted all HVAC PMs which are 2% of all work orders in the past year.
- Predictive Maintenance - To extend the useful life of equipment and plan for equipment replacements predictive maintenance technologies are being implemented. 207 work orders were completed for vibration and oil analysis in the past year or 1% of all work orders.
- Maintenance Backlog in Crew Weeks - Backlog is determined by totaling the planned craft hours in open work orders and comparing them to craft resources available. The current backlog of 7 weeks is a result of recent vacancies in the maintenance department.
- Maintenance Overtime - The goal to maintain maintenance overtime to 5% of total wages and salaries was exceeded to control maintenance backlog increases caused by technician vacancies.. Overtime for the year was 5.5% of wages and salaries.

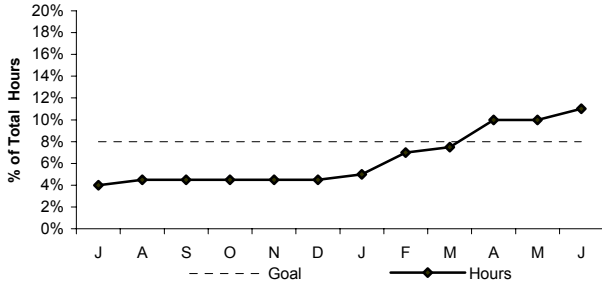
# Deer Island Maintenance

June 2003

## Productivity Initiatives

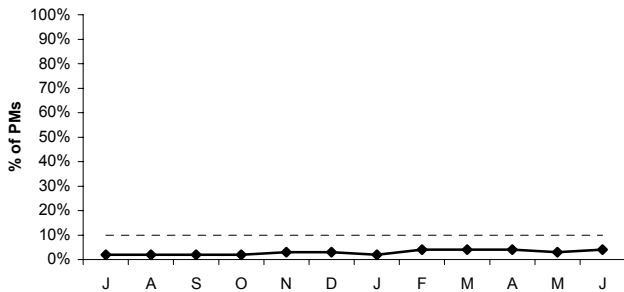
Productivity initiatives include Operations staff performing light maintenance and preventive maintenance kitting. Accomplishing these initiatives should result in a decrease in the overall maintenance backlog.

### Operations Light Maintenance PMs



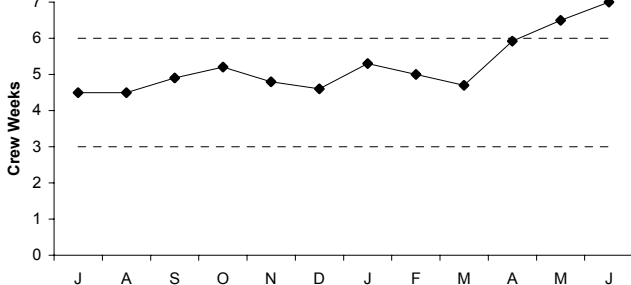
The percentage of preventive maintenance work order hours completed by Operations has increased from less than 1% in January 2002 to 11%. DI has reached the goal set for FY03. The industry benchmark is 10-15% of the total PM hours.

### Preventive Maintenance Kitting



The first step to increasing wrench time is to kit all preventive maintenance work orders. The FY03 goal was to kit 10% of all PM work orders. This goal was not achieved but steady improvement is expected in FY04. DI will complete adding materials to mechanical preventive maintenance schedules in September 2003.

### Maintenance Backlog in Crew Weeks

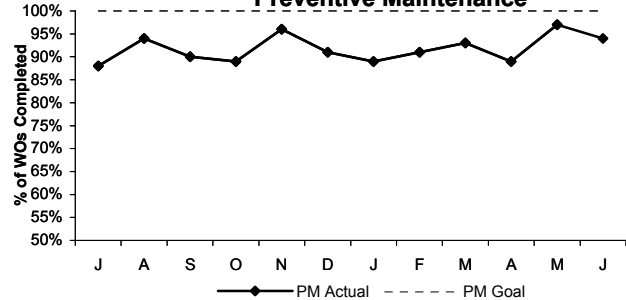


Since the loss of M&O Specialists and Electricians as a result of the early retirement program and promotions, DITP has experienced a steady increase in backlog. One vacancy in each classification has been requisitioned for replacement, which will help to curb the rise. An increase in overtime expenditures will also be required to bring the backlog back into industry standards.

## Proactive Initiatives

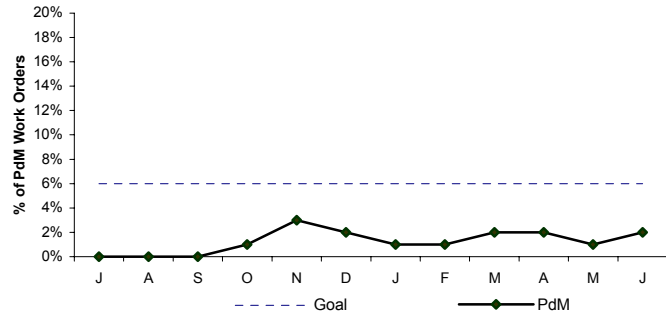
Proactive initiatives include completing 100% of all preventive maintenance tasks and increasing predictive maintenance tasks. These tasks should result in lower maintenance costs for emergencies, corrective maintenance, and overtime.

### Preventive Maintenance



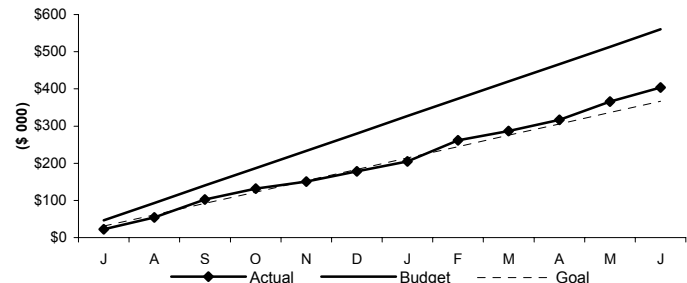
Proactive maintenance goals include completion of 100% of all PM work orders from Operations and Maintenance. Deer Island completed 94% of its PMs this month.

### Predictive Maintenance



Staff increased predictive maintenance activities by expanding the existing lubrication and vibration programs. Deer Island did not achieve its goal for FY03 but expects further improvements in FY04. Staff training in laser alignment was completed in June.

### Maintenance Overtime



Deer Island's maintenance overtime rose slightly above the goal this month due to work on Primary and Secondary Tank repairs and Cryogenic compressors.

**Critical Equipment Availability:** 12-Month Average - 98.2 %

An equipment availability report is generated daily that details the critical equipment required to treat the design 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 98% versus a 100% availability because the plant normally operates at approximately one-third the design flow capacity.

**Backlog:** 5.3 weeks average

Backlog is determined by totaling the planned craft hours in open work orders and comparing them to craft resources available. A 5.3-week backlog constitutes 5.3 weeks of work for the entire maintenance workforce. This backlog is within industry standards of 4 to 6 weeks.

**Preventive Maintenance (PM):**

92% of all PMs were completed (an increase of 6% from the last report), and 27,086 work orders were initiated this year. Incomplete PM's that are not completed in one month are safely rolled over into the next month's workload.

**Predictive Maintenance (PM)**

207 predictive maintenance work orders were completed in the past year. Predictive maintenance work includes vibration and oil analysis and is proactive maintenance work to extend equipment useful life.

**Average Craft Hours per Month:**

Preventative Maintenance	4664 hours	33.3%
Corrective Maintenance	7425 hours	53.0%
Emergency Maintenance	33 hours	0.2%
Project Work	1266 hours	9.0%
Other Work	627 hours	4.5%

**Total Work Orders:**

37,408 work orders initiated this year.

**Equipment Replacement:**

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

- Electrical Modifications (Ancillary Modifications 2-1) - \$ 3 million total.  
The scope of work includes replacements of segments of bus duct with cable bus in the Main Switch gear Building and Thermal Power Plant. Also included are modifications to the switchgear and substation associated with the North Main and Winthrop Pumping Stations. Lastly, it includes installation of a fire alarm system in the Old Administration building.
- Centrifuge Refurbishments - \$ 302,500  
Seven centrifuges (two digested sludge centrifuges and five waste sludge centrifuges) were refurbished by the original equipment supplier, Alfa Laval, in the past two years. In the past year, 4 waste sludge centrifuges were refurbished. The centrifuges



were disassembled, new parts installed or existing parts refurbished, reassembled, and balanced. The centrifuges require refurbishment at regular intervals based upon running hours for normal wear and tear and will continue in future years.

- Digester Mixers Refurbishments - \$ 145,000  
Three digester mixers were refurbished based upon impeller and bearing wear identified through vibration testing. The mixers were removed, shipped to the factory, bearing and impellers replaced and returned. The mixer motors also were replaced or refurbished for each mixer.
- Primary Drive Chain Replacement - \$ 264,000  
The primary drive chains were replaced due to normal wear and tear and corrosion. 45 of 48 drive chains were replaced in the past year with in-house staff completing the installation.
- Secondary Return Sludge Pumps - \$ 28,700  
The secondary return sludge pumps were refurbished with a new robust design to improve pump and tank availability. New shafts, bearings and seals were installed.
- Cryogenic Facility Instrumentation Repairs - \$ 73,000  
The valving and instrumentation for Train #2 was replaced and calibrated to improve system availability. The instrumentation is exposed to the ocean atmosphere that accelerated the equipment corrosion.
- HVAC Equipment Rebuilds and Replacements - 44,000  
HVAC equipment throughout the facility was replaced due to normal corrosion, wear and tear. The plant and ocean environment and resulted in premature failure of the HVAC cooling coils and components which required replacement.
- North Main Pump Station Mechanical Seal Installation - \$ 60,000  
A mechanical seal replaced the packing and sleeve in on one of the eight north main pump station pumps. The mechanical seals will save energy and ease maintenance of the pumps.
- Thermal Plant Boiler Repair - \$ 92, 000  
Thermal Plant Boiler wall support (buckstay ties) was damaged from a startup transient event following annual boiler maintenance. The boiler was supports were repaired, inspected, and the boiler returned to service.
- Disinfection Basin Sampling - \$ 90,000  
Instrumentation was added to the disinfection basin to enhance the sampling data collected. Ph, ORP, chlorine residual, temperature, and floatable samples were added to the end of the disinfection basin. These samples have improved the disinfection chlorine control significantly.
- Nut Island Telemetry - \$ 29,000  
The nut island telemetry design was upgraded to a lease line and spread spectrum radio. The new system is more reliable system to transmit the critical Nut Island levels, flows, and equipment status to Deer Island to control the South System Pump Station pumps. In house staff constructed all panels and completed installation
- East and West Odor Control pH an ORP Probe Replacements - \$ 70,000  
The original probes were unreliable and were required to be upgraded to a better design. In house staff replaced the pH and ORP probes in the east and west odor control facilities.
- Electrical Repairs - \$ 250,000

The major electrical repairs were completed with in-house staff in the last year included:

- Bus duct in substation 6A, 'A' side was replaced with cable bus.
- The load break switch in substation 22B-1 was replaced.
- The cryogenic air compressor motor was replaced.
- Various variable frequency drive service and replacements

# Wastewater Transport System

July 2002 - June 2003

## 1. Wastewater Transport Facilities

### Critical Equipment Availability

During FY03, Wastewater Transport facilities operated at full capacity throughout the year. The critical equipment evaluated includes pumps and screens in the (12) pump stations, (5) CSO's, the Screenhouse, and (4) Headworks.

CSO facilities operated with full chlorinating capability. The required number of pumps in each gravity and pumping CSO was available throughout the year. The gravity CSO facilities have dechlorinating capabilities, however startup testing was not complete at the Commercial Point CSO as of June 30, 2003.

The chart below is based on equipment reporting by operational personnel and indicates that the required facility equipment needed for safe and efficient wastewater treatment and transport to Deer Island was exceeded by actual availability throughout the fiscal year.

### Pump and Screen Availability Chart

<u>Facility Types</u>	<u>Pumps Available (monthly average)</u>	<u>Pumps Required</u>	<u>Screens/ in-line grinders Available (monthly average)</u>	<u>Screens/ In-line grinders Required</u>
*Pump Stations (12)	39	24	17	13
Pumping CSOs (2)	8	6	9	7
Screenhouse (1)	0	0	4	3
Gravity CSOs (3)	0	0	4	3
Headworks (4)	0	0	17	13
<b>Total available (reported)</b>	47	<b>30</b>	51	<b>39</b>
<b>Total number (in facilities)</b>	48		52	
<b>Total number required</b>	30		39	
<b>Percentage available</b>	98%		98%	
<b>Percentage required</b>	63%		75%	

\* This includes the Prison Point dry weather flow pumping system.

### Equipment Replacement

Equipment replacement is part of the maintenance strategy to ensure that requirements of the permit are consistently met. Projects and initiatives are completed during each fiscal year that maintain redundancy and continued reliability.

Selected examples of improvements and equipment replacement over the past fiscal year include the following:

- Alewife Brook Pump Station, flow meter - approximately \$14,800  
A new flow meter for each of the pumps (four total) was installed at the Alewife Brook Pump Station to more accurately measure the flow of wastewater through that station. This is essential to determine the efficiency of the pumps and the system.
- Delauri Pump Station, Screen overhaul – approximately \$24,000  
The first of two screens at this station was overhauled after about 9 years in operation. The project was a proactive measure to prevent any possible screen failure during the operation of this facility. New chain, rakes, shafts, and sprockets were installed bringing the screen back up to original design specifications and tolerances.
- Headworks, Shaft level indicators - approximately \$35,000  
The bubbler tubes used to measure levels in the shafts at the Chelsea Creek and Columbus Park Headworks were removed and replaced with ultrasonic level sensors. The newer technology provides more accurate data and reliability. Dual units were installed for redundancy. More units will be installed at the Ward Street Headworks during early FY04.
- Chelsea Headworks, scrubber media - approximately \$26,000  
The Chelsea Headworks scrubbers are undergoing work to improve their performance. The Polypropylene packing was removed and replaced in one of the scrubber units. The chemical spray system was rehabilitated with new spray heads and piping, and new upper access ports were installed to allow the chamber to be filled with the new scrubber media.
- Nut Island Conveyor Systems - approximately \$63,000  
The vertical grit conveyors were overhauled replacing conveyor parts and belting. The screenings conveyors are undergoing similar work to restore full working integrity. Screenings and grit removal is essential to the operation at Nut Island, and the operating context was changed to a duty/stand-by mode to prevent downtime. The grit conveyor system was modified with a spray wash down system to keep the abrasive grit off the roller parts.

## **2. Wastewater Pipeline Inspection and Maintenance**

### **Manhole Inspection and Rehabilitation Program**

The Technical Inspections Unit, in the Field Operations Department, 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.

The Technical Inspections Unit also conducts Global Positioning System (GPS) inspections at all Authority-owned pipeline structures and appurtenances. The program goals are to improve the ability of field staff to accurately locate MWRA manholes & structures and to expand the use of the computerized GIS system for detailed analyses and custom mapping. Inspections began in January 2002, and by the end of this fiscal year a total of 3,466 were completed.

In FY03 the Technical Inspection Unit staff inspected a total of about 759 manholes. Approximately 124 manholes were repaired or rehabbed. This work included frame and cover replacement, external repairs to raised manholes, internal repairs using the spin-cast application, and other miscellaneous repair work.

### **Pipeline Rehabilitation**

Section, 160, Winchester, and Medford: Design began for rehabilitation of 27" brick and concrete pipe. Portions of the Mystic Valley Sewer were identified as being damaged. Approximately 11,600 feet of the sewer will be evaluated and repairs will be made, where needed. Construction is currently scheduled to begin in November 2005.

Chelsea Sandcatcher Stabilization, Chelsea: The abandoned sandcatcher located on the bank of Chelsea Creek is severely deteriorated due to age. Design is underway to stabilize the structure by filling it, and adding riprap. Construction is currently scheduled to begin in June 2004.

Somerville Sewer Repair, Somerville: A contractor working on an MWRA water main damaged an adjacent 30-inch brick city sewer line, and performed temporary repairs. The MWRA began design of a permanent repair using a cured-in-place, resin-impregnated, flexible felt tube liner. Construction is scheduled to begin in September 2003.

Section 93A, Lexington: Design was completed for repair of approximately 4,125 feet of 30-inch concrete sewer pipe that was damaged by corrosion. The line will be repaired using a cured-in-place, resin-impregnated, flexible felt tube liner. The contract was awarded and construction began in July 2003. The project cost is about \$1.5 million.

East Boston Branch Sewer Rehabilitation, East Boston: Construction began on the repair of approximately 5400 feet of 45-inch x 41-inch brick sewer in April 2003. The pipe is being rehabilitated using a cured-in-place, resin-impregnated, flexible felt tube liner. The scheduled completion date is February 2004. The project cost is about \$5.1 million.

## **Pipeline Inspection and Cleaning**

During FY03 both 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.

The Technical Inspection Unit (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 structures, which include manholes. Approximately 45 miles of pipelines were TV inspected in FY03. Included in this total is approximately 3.7 miles of community assistance work. TIU uses sonar technology to inspect full pipes and structures enhancing our ability to identify maintenance areas.

Pipeline maintenance crews perform a variety of maintenance activities for the MWRA's wastewater transport system. The system includes a network of 228 miles of interceptor sewer lines. Approximately 13 miles of pipelines and 40 siphons were cleaned in FY03.

In addition to general pipeline and manhole repair work performed by the pipeline crews, the following are other activities they perform throughout the year:

- pipeline and structure repair work consisting of short sections in shallow excavations
- construction activities, such as fencing, trenching, pavement and masonry repairs
- Community Assistance, to clear obstructions and clean sections in community lines
- assistance to TIU to clear lines or bypass pump for TV inspection work
- 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
- easement clearing for access to pipelines and structures
- emergency response and overflow monitoring during wet weather events
- response to odor complaints in the system

### **3. Summary of Current Maintenance Program Budget & Staffing**

As indicated in Tables 1 & 2 below, The Field Operations Department has made a significant overall commitment to the maintenance of its wastewater system. Additional maintenance and improvement projects are included in the MWRA Capital Program.

Table 1 includes a summary of the budget expended in FY03 for programs within FOD that relate to Wastewater Pipeline and Facility maintenance efforts. The program budgets

include maintenance staff that provides interior and exterior care of the facilities, maintenance of the equipment, wastewater pipeline maintenance, planning and scheduling, management & supervision, and administrative support.

<b>TABLE 1 – FY03 APPROVED MAINTENANCE ANNUAL BUDGET</b>	
<b>Budget Line Item</b>	<b>Wastewater Transport</b>
Wages and Salaries	\$6,432,745
Overtime	\$308,702
Fringe Benefits	\$7,125
Chemicals	\$16,307
Utilities	\$123,828
Maintenance (Parts & Supplies)	\$2,132,991
Professional Services	\$9,888
Other Materials	\$397,113
Other Services	\$96,050
<b>TOTAL</b>	<b>\$9,524,749</b>

**Maintenance expenses**

The actual spending in FY03 for ‘Ongoing Maintenance’ in the Facility Maintenance program, which includes Building & Grounds and Facility Specialists work is approximately \$ 245,000. The total related ‘Ongoing Maintenance’ spending for Wastewater Pipeline and Technical Inspections for collection system maintenance during FY03 is approximately \$ 302,000.

Spending by the Metro Trades staff and specific facility costs are captured under the Equipment Maintenance program as ‘Ongoing Maintenance’. This includes special and major facility projects & initiatives, outsourced projects, service contracts, spare parts purchasing, corrective maintenance materials and parts, and preventive maintenance materials at cost of approximately \$ 1,718,000. A small proportion of these dollars includes spending for water pumping facilities; the major portion of dollars included in ‘Ongoing Maintenance’ represents expenses for wastewater facilities.

A total of 158 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 and painters). These groups perform maintenance activities at both wastewater and water facilities.

Work Coordination in the Field Operations Department 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 FY03 levels for employees reporting to two locations, FRSA, Quincy, MA and the Chelsea Facility. These numbers may vary slightly during the fiscal year due to vacancies and re-allocation of staff from Wastewater Operations to the Maintenance shops, resulting from organizational changes.

<b>TABLE 2 – MAINTENANCE STAFFING LEVELS</b>	
<b>Staffing Categories</b>	<b>No. of Staff</b>
Maintenance Manager	3
Engineers	4
Work Coordination; super. and staff	17
Area Managers	3
Administration	1
Unit Supervisors	11
Mechanic Specialists	15
Electrical Specialists	9
Plumbers	6
HVAC Specialists	2
Machinists and Welders	6
I&C Specialists	1
Technical Inspections; inspectors, foremen, and supervisors	15
WW Pipeline Maintenance; super., foremen, and laborers	20
Masons	4
Heavy Equipment Operators	4
Laborer	6
Building & Grounds Workers & Foremen	20
Carpenters/Painters (Facility Specialists)	10
Garage Repair Specialists	1
<b>Total</b>	<b>158</b>

### **Service Contracts**

The maintenance programs are supplemented by a series of service contracts. These contracts are intended to provide specialized services beyond the resources of the MWRA maintenance staff. Table 3 below shows the service contracts currently used by FOD.

The Field Operations Department utilizes the following services and service contracts to supplement the existing workforce and provide specialized maintenance where applicable at both Wastewater and Water Facilities:



<b>TABLE 3</b>		
<b>Service Contracts &amp; Services</b>	<b>Term</b>	<b>Type</b>
Boiler and Hot Water Heater maintenance	2 yr.	Scheduled work
Elevator maintenance	2 yr.	Scheduled work
Crane maintenance	2 yr.	Scheduled work
VFD Maintenance	1 yr.	Scheduled work
Instrumentation maintenance	2 yr.	Scheduled work
Air balancing (HVAC pneumatic controls)	On call	As needed
High Voltage Maintenance	On call	Annual
Hydraulics Maintenance	On call	Annual
Compressed Air Maintenance	On call	Annual
Diesel Generator Maintenance	On-call	As needed
Landscape Contract	1 yr.	Annual
Pest control	On call	As needed
Trash removal	1 yr.	As needed
Locksmith services	On-call	As needed
Copier/fax maintenance	On call	As needed
Overhead door maintenance	On call	As needed

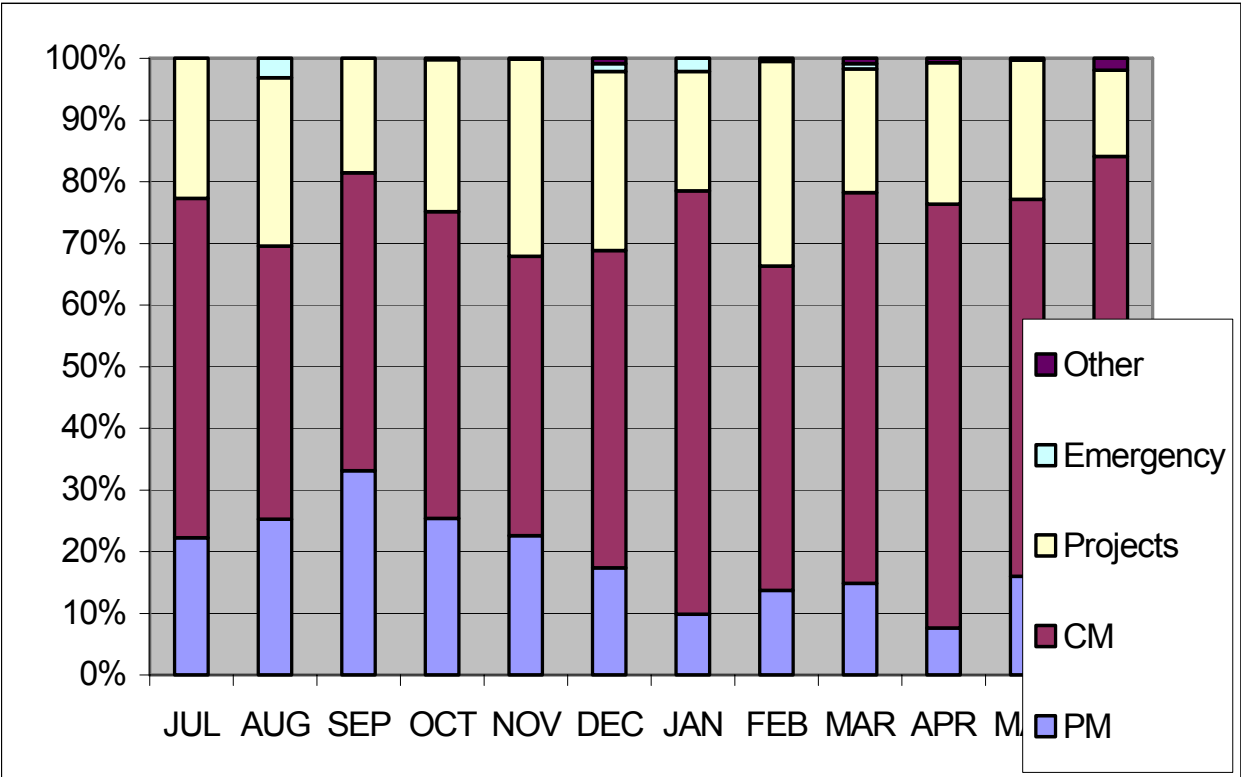
#### **4. Annual Maintenance Program Performance Indicators**

##### **Annual Statistical Maintenance Performance Information- Equipment Maintenance**

Key indicators of performance are used to monitor maintenance activities. Monthly maintenance staff hours are used to track productivity as well as monitor the type of maintenance performed. In the chart for the Metro Trades groups, shown below, are typical levels of effort by percentage for various types of work. This is derived by reported hours in the Maximo work order system.

Preventive/Predictive Maintenance (PM), Corrective Maintenance (CM), Emergency (EM), Project Work, and Other Work are the work types for Facilities Maintenance activities. The percentages will vary each month depending on the extent of corrective maintenance needed. The graph below is indicative of the way in which various crews spent their time in FY03.

The preventive maintenance target goal is 25% by the trades groups. Preventive maintenance performed by roving operational crews is not represented in the chart below.

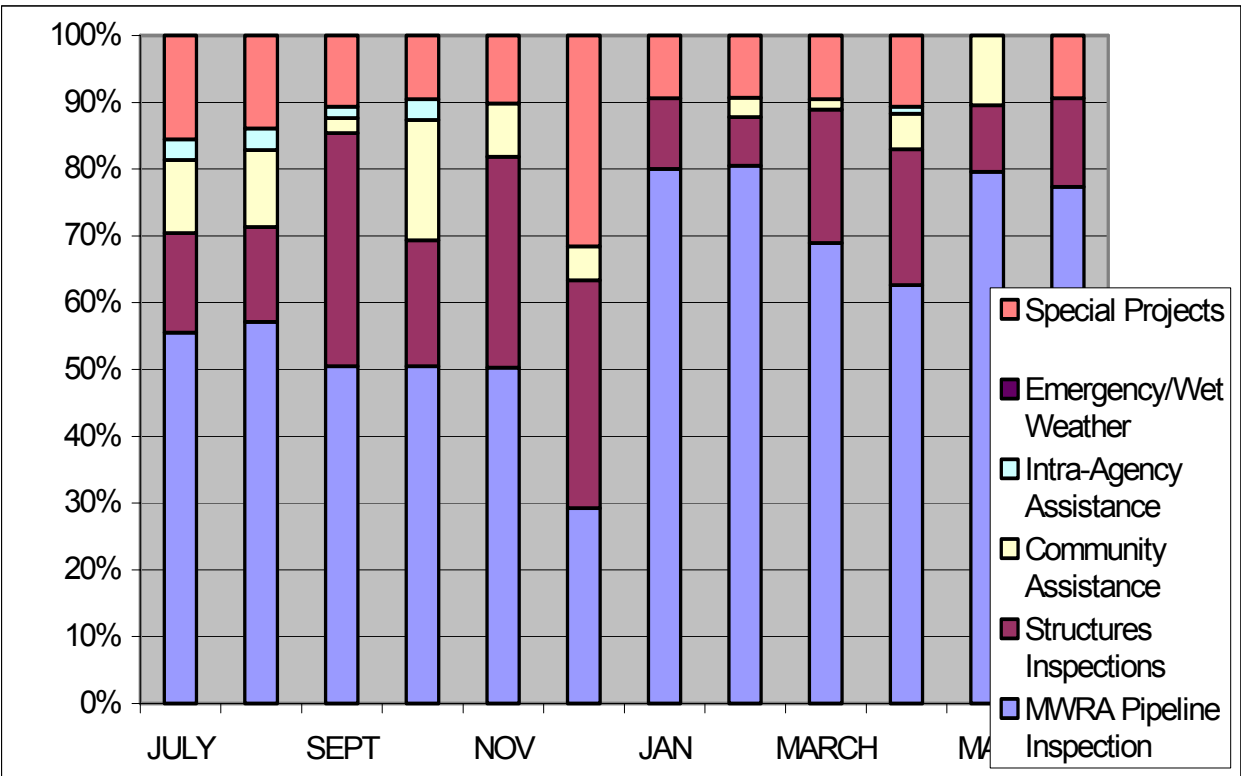


**Annual Statistical Maintenance Performance Information- Wastewater Pipeline Maintenance**

**Technical Inspections:**

The Technical Inspections program is responsible for inspecting the various elements of the Wastewater Collections System. Pipeline inspections average about 70% of the workload followed by structure inspections, including manholes, averaging about 30%. Approximately 45 miles of pipelines were inspected in FY03. Tide-gate inspections are part of the monthly routine inspections required by the NPDES permit, (65) in FY03. Other structures inspected include (123) headhouses, (38) diversion structures, and (759) manholes

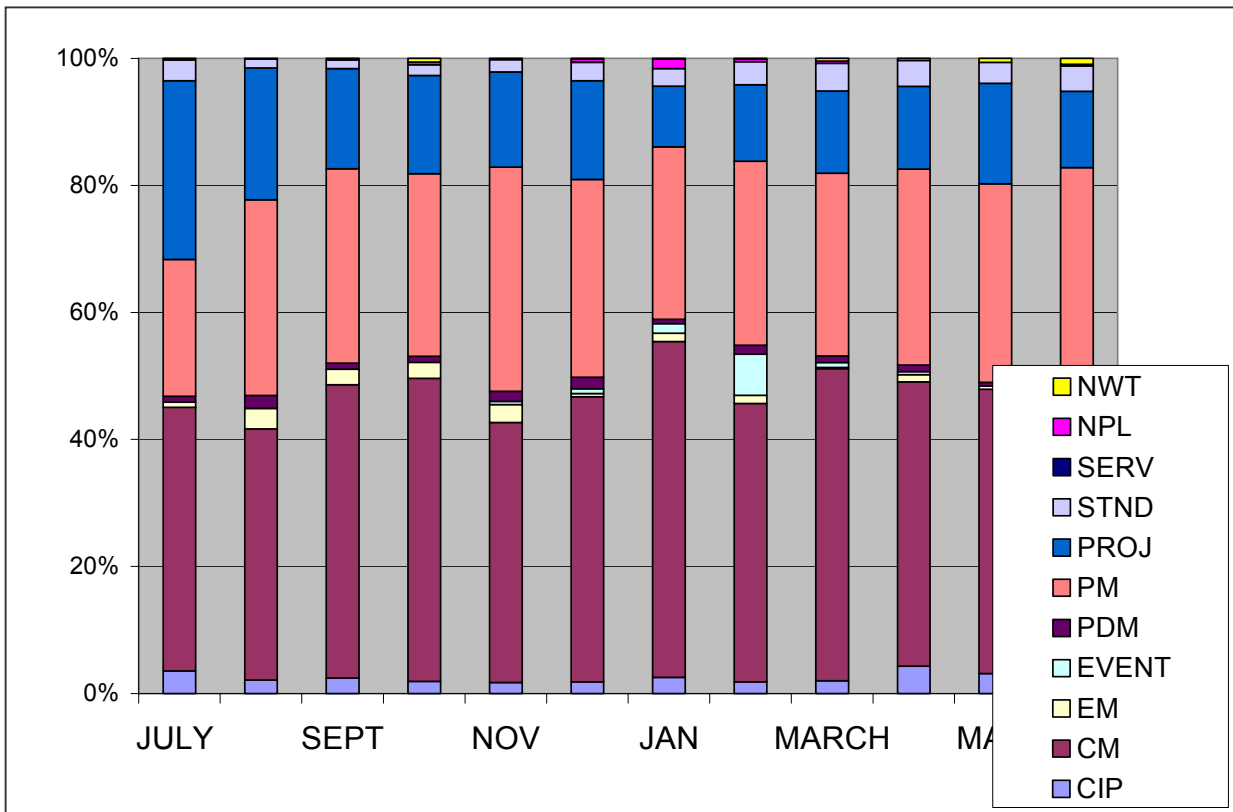
Pipeline Inspections, Structures Inspections, Intra-Agency Assistance, Community Assistance, Special Projects and Emergency /Wet Weather are the categories shown on the chart below. The chart is indicative of the percentage of work attributed to the different types of work associated with the inspection program in FY03.



**Pipeline Maintenance:**

The graph below is indicative of data collected for Wastewater Pipeline Maintenance in the Maximo work order system. These are key indicators of performance for FY03, based on monthly maintenance man-hours and the percentage of work performed for each work type.

Core business includes general pipeline cleaning and structures maintenance. This chart demonstrates the distribution of workload based on the work types shown. The general categories can be further broken down to subcategories. An example of this is CM (corrective maintenance) which can be comprised of bucketing, jetting, manhole repairs, and activities that were corrective in nature. Work orders are coded so that these accumulative man-hours can be further broken down for the manager’s use.



**Backlog:**

The Work Order Coordination group implemented the new Maximo computerized maintenance management system during FY02. This system provides capability to track, prioritize work orders, and generate reports of open and closed work activities. Backlog varies from as low as 2 weeks, for essential work orders, and up to 6 months for low priority work. Backlog levels depend on resources available, but daily coordination ensures that primary and critical equipment is functioning at adequate levels at all times.

Work Coordination is working closely with Deer Island’s Metrics Task Team to develop standardized measurement and reporting for the Maintenance Program throughout the Operations Division. Maximo is the system that captures the work activities and is capable of generating all of the necessary information and reporting in the future.

**Preventive Maintenance:**

A primary focus in FOD is preventive maintenance. Both Operations and Maintenance staff perform preventive maintenance. A new training program in FY02, the Productivity Improvement Program (PIP), was rolled out in negotiation with the bargaining units to train operations (as well as maintenance staff) to perform ordinary and generic preventive maintenance tasks. These tasks are referred to as light maintenance duties.

Reliability Centered Maintenance (RCM) was also piloted in FOD to begin identifying the most productive and beneficial preventive maintenance for critical systems and their components. This technique was initiated as part of the Facility Asset Management Program (FAMP) at Deer Island. Each system's operating context is studied and the preventive maintenance plan is designed based on the performance requirements of the equipment. This may not necessarily align with the OEM's recommended frequency-based preventive maintenance tasks. RCM focuses on preventing failures by trying to more closely monitor the condition of the equipment based on the possibility of failure and the causes of failure.

FOD is working on rolling out more RCM analyses over the next five years. A five-year plan for system evaluations is under development based on a criticality analysis for all facilities. The criticality study reviews the relative priority of each facility and system. Based on results of this study, the RCM program will be prioritized over the next several years by selecting systems with the highest criticality rating.

During Phase II of the FAMP implementation, more emphasis is being placed on condition monitoring techniques. Through a series of task teams and committee charters, established in FY03, we will further explore and implement new programs, such as vibration monitoring and lube oil analysis.

Wastewater Operations began implementing a monitoring system using handheld devices. Roving crews perform daily checks of equipment that include taking readings and performing general and visual inspection. The information is captured in a separate database from the Maximo system. Reports can be generated and information retrieved about the conditions of the equipment. Abnormal conditions are noted and forwarded to planner/schedulers for further action by the maintenance groups.

## **Annual Status Sheets – Fore River Pelletizing Plant**

July 2002 - June 2003

Critical Equipment Availability: Twelve Month-Average – 75.0 %

Operating logs indicate that an average of 9 of the 12 centrifuges were available during FY03. The centrifuges and ancillary equipment make up the critical components at the Pelletizing Plant because sludge can be processed through the Dryers or it can be sent to a landfill via the by-pass system. At this time, 10 centrifuges are available, giving the plant more than enough capacity to process current flows from Deer Island. The facility is currently operated on a 5-day workweek, ceasing operations 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 one week.

Work Orders:

In FY03, staff completed 1,167 or about 98 % of the 1088 work orders that were opened.

Equipment Replacement:

More than \$ 966,666 was spent on replacement parts and maintenance related items in FY03 including:

- Overhaul of Process Trains 4, 5, and 6
- Replacement of Mixer Feed B Screw on Trains 2 and 6.
- Major PM on Electrical Switchgear, including the 13.8kv Transformers
- Pugmill Paddle replacement on Train 1
- Regenerative Thermal Oxidizer No. 4 Exhaust Fan Wheel and Shaft replacement.
- Regenerative Thermal Oxidizer No. 3 Media Replacement.
- Dust Collector improvements to all 6 processing trains.