

October 25, 2005

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, Director
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. Murphy and Mr. Haas:

Attached please find the MWRA's annual status sheets on plant performance and maintenance for the period covering July 2004 – June 2005. 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 Grace Bigornia-Vitale at 788-4716.

Sincerely,

Michael J. Hornbrook
Chief Operating Officer

cc: MA DEP, Wilmington
MA DEP, Worcester
B. Pitt, US EPA
T. Borci, US EPA
D. Ferris, MA DEP
Catherine Vakalopoulos, MA DEP

MWRA Annual Report on Operation & Maintenance

July 2004 – June 2005

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"

This report constitutes the MWRA's annual results on plant performance and maintenance for the period covering July 2004 – June 2005. 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, 12 pump 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 appears that NEFCO'S performance is more than adequate based on the consistent reliability of the facility's systems.

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 4.1.1. 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 has been 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.

IN FY06, the MAXIMO system is being upgraded to an intranet version to allow continued customer support, take advantage of web based software maintenance, and to utilize new functionality in the newer MAXIMO version 5.2.

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

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 expanded its efforts in the areas of condition monitoring; Reliability Centered Maintenance rollout; asset replacement prioritization and capital improvements; and training of staff.

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
CURRENT SERVICE CONTRACTS
Trash removal
Janitorial services
Digester cleaning *
Centrifuge maintenance
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 2004 - June 2005

Annual Report: Attached, please find the Deer Island Maintenance page of the MWRA Report on Key Indicators of Performance for FY05. Monthly maintenance data is shown under six headings.

- Operations Light Maintenance Preventive Maintenance (PM) – One aspect of the Productivity Improvement 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 18% (from 11% in FY03) of all PM work orders hours.
- Preventive Maintenance Orders Completed is shown with respect to the target of 100% in a bar chart. Maintenance is working to reach the PM goal to 100%. The PM % completed was 96% 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 PMs for 20% 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. 2176 work orders were completed for vibration, acoustic ultrasonic, ultrasonic thickness, and oil analysis in the past year. As the year progressed more predictive maintenance was planned. For the month of June 2005, 9% of all work orders were predictive maintenance which is an increase of 2% over 2004.
- 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 June 2005 backlog was 5.1 weeks and the yearly backlog average was 5.8 weeks which is within industry benchmark standards.
- 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 6.5% of wages and salaries and will decrease as technician vacancies are filled.

Critical Equipment Availability: 12-Month Average - 98.8 %

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 98.8 % versus a 100% availability because the plant normally operates at approximately one-third the design flow capacity.

Backlog: 5.8 weeks average

Backlog is determined by totaling the planned craft hours in open work orders and comparing them to craft resources available. A 5.8-week backlog constitutes 5.8 weeks of work for the entire maintenance workforce. This backlog is within industry standards of 4 to 6 weeks.

Preventive Maintenance (PM):

96% of all PMs were completed and 23,963 PM 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)

2176 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.

Average Craft Hours per Month:

Preventative Maintenance	4202 hours	2.0 %
Predictive Maintenance	290 hours	0.8 %
Corrective Maintenance	9919 hours	56.2 %
Emergency Maintenance	9 hours	0.06 %
Project Work	1690 hours	11.3 %
Other Work	368 hours	2.5 %
Total	14999 hours	100.0 %

Total Work Orders:

32,231 work orders initiated this year
33,712 work orders completed/closed
2488 work orders canceled

Equipment Replacement:

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

- Centrifuges Refurbishment - \$ 168,775
Thirteen centrifuges (two digested sludge centrifuges and eleven waste sludge centrifuges) were refurbished by the original equipment supplier, Alfa Laval, in the past four years. In the past year, four waste sludge centrifuges and associated gearboxes 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 - \$ 67,866
Two digester mixers were refurbished based upon impeller and bearing wear identified through vibration testing. One mixer was removed, shipped to the factory, bearing and impellers replaced and returned and one mixer was refurbished on site. The mixer motors also were replaced or refurbished for each mixer.
- Reactor Aerator/Mixer Gearbox Rebuilds \$ 135,631
The secondary reactor aerators and mixers have large gearboxes that have started to fail. Four gearboxes were refurbished with new gears, seals, and bearings as necessary.
- Primary Scum Actuator Replacements - \$ 100,000
The primary scum actuators are reaching the end of their useful life and are being replaced with a more robust design to extend the service life.
- Disinfection Effluent Water Strainers - \$ 152,947
Three strainers were refurbished with a new design actuator and with mechanical seals replacing the original packing.
- Disinfection Hypochlorite Hose Pumps - \$ 24,885
Two disinfection hypochlorite hose pumps were replaced due to normal wear and tear.
- Gravity Thickener Rebuilds - \$ 50,000
Two gravity thickeners were rebuilt with the baffle plates replaced and uprights reconstructed.
- Digester Gas Flare Rebuilds - \$ 60,000
Two digester gas flares were rebuilt with new pressure control valves and isolation valves.
- Digester Gas Storage Tank Gas Bag Replacement - \$ 316,650
The digester gas storage tank gas bag failed and replacement was required.
- Cryogenic Facility Repairs - \$ 221,893
The cryogenic facilities were inspected and necessary corrective work was completed including rebuild of the vaporizers, extensive valve replacements, and replacement of the expander turbine.
- Pump Station Mechanical Seal Installation - \$ 76,704
Mechanical seals are being installed to replace the packing and sleeve in the north main pump station, south system, and Winthrop facility pumps. The mechanical seals will save energy and ease maintenance of the pumps and are being replaced over several years.
- Electrical Repairs - \$ 206,178
The major electrical repairs were completed with in-house staff in the last year included:
 - Various variable frequency drive service and replacements
 - Battery and charger replacements
 - Uninterruptible power supply replacements
 - Bus duct and load break switch replacements
 - Power conditioners

- Ancillary Modifications Design & Construction 3-1 – \$4,577,070 (\$ 1,176,082 of the contract was expended in FY05)

This project is concentrated on fixing problems identified with operation of the Secondary Clarifiers and includes the following:

- Furnish and install 66 cross collector hatches and 144 intermediate hatch covers; remove and dispose of the 144 existing intermediate hatch covers.
- Furnish and install 80 sections of safety railing, and railing support brackets in 90 locations.
- Furnish and install influent and effluent channel drains and sluice gates in six locations (each).
- Furnish and install modifications to the Return Sludge (RSL) piping system.
- Furnish and install modifications to the scum collection system.

- Equipment Condition Monitoring - \$ 1,530,000 (\$ 1,628,410 was expended in FY05 for this project)

This project involves the installation of an additional condition monitoring equipment (vibration and temperature monitoring devices) on major pieces of rotating equipment (e.g. pumps, compressors, etc.) on Deer Island. Benefits are that the machine health can be monitored and repairs made before catastrophic failures.

- Ancillary Modifications I Construction - \$11,170,862 (\$ 4,666,718 was expended in FY05 for this project)

This contract was awarded in June 2004 and the major project elements include:

- Rehabilitation of Residuals Complex scum screen room
- Rehabilitation of Winthrop Terminal Facility including Influent Screens
- Rehabilitation of North Met Trunk Sewer
- Replacement of North Main Pump Station Sump Pumps
- Replacement of various valves and meters in Digester Complex
- Insulation of HVAC ductwork in NMPS and WTF
- HVAC Modification in Disinfection Gallery

Wastewater Transport System

July 2004 - June 2005

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 228 miles of interceptor sewer lines, and related appurtenances, a screen house, 12 pump 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.

During FY05, the Intermediate Pump station came online providing the MWRA more pumping capacity in the Braintree Weymouth Interceptor tributary area. The Braintree Weymouth Replacement Pump Station is under construction, and the current schedule anticipates this station to be off-line in January 2006 with substitute by-pass pumping until the new facility comes on-line in FY07.

Wastewater Transport Facilities

1. Facilities Operation

During FY05 Wastewater Transport facilities operated at full capacity throughout the year. All required equipment to maintain flow and process of wastewater was available.

CSO facilities operated with sufficient chlorinating and dechlorinating capabilities. 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 13 pump stations, (5) CSO's, the Screenhouse, and 4 Headworks. Reports are generated by Operational Staff that track the availability of critical equipment on a daily basis. Other weekly operations and maintenance reports include flow information as well as pump and screen status at each facility. Transport Facilities operated at full capacity throughout the year with sufficient available equipment to meet wastewater flow demands. This data is further represented by the following 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 (13)	42	26	18	10
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
Total available (reported)	50	32	53	36
Total number (in facilities)	53		55	
Total number required	32		39	
Percentage available	95%		97%	
Percentage required	61%		75%	

3. Equipment Replacement and Significant Maintenance Projects

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. Many projects are extensive, requiring in-house resources or specialty/service contractors.

Selected noteworthy projects which represent improvements, equipment replacement, or significant repair work over the past fiscal year include the following:

In-house Projects

Headworks Screen Assessment Study

The aging screens at the Headworks are scheduled for replacement under the Capital Budget within the next five years. As an interim step to ensure reliability, Management engaged a consultant in conjunction with the original manufacturer to assess the condition of the screens and make recommendations concerning operation and maintenance. Deficiencies will be addressed to minimize downtime and ensure reliability until they are replaced. Parts to refurbish and spare parts will amount to close to 200,000 purchases over the next two fiscal years.

Three Remote Headworks- total associated cost; \$106,000

Work was conducted to repair and improve the performance for several of the critical systems at the Headworks facilities. They include the following systems:

- Grit Collection
- Grit Ejection System
- Screens
- HVAC & ductwork

Work included reworking shafts and clutches for the grit collections system, major screen repairs, replacing routing valves for the grit ejection system, and HVAC ductwork repairs and cleaning.

Nut Island Headworks- total associated cost; \$63,000

Work was conducted to ensure NPDES permit compliance with maintenance and repair of the following systems:

- Scrubbers
- Chemical Feed System
- Conveyors
- A/C system

Work included scrubber probes and sensor replacements, chemical feed pump replacement & repair, conveyor system improvements, and control room air conditioning & environment control.

Quincy Pump Station grinder- approximate cost; \$24,000

The grinder at this facility (started in FY04) suffered damage from incoming steel debris. It required complete replacement with assistance from a rigging company to remove the unit, ship, then lower a new unit into place for installation by in-house mechanical staff.

Prison Point Cooling Water Strainer- approximate cost \$17,000

The engines are presently cooled by water from the Charles River and the strainer removes potential contaminants. The unit had reached its useful life and no longer functioned properly. It was replaced to ensure that adequate cooling water would be available during storm events. The Authority is preparing to install auxiliary cooling water lines that will use city water. The incoming river water line will also undergo re-lining.

Outsourced Projects

Headworks Window Replacement- approximate cost, \$322,000

The existing steel-framed single glazed windows were severely deteriorated. They were replaced with steel-framed double glazed windows. The new windows are more energy efficient and reduce air infiltration. Work began in June 2004 and was completed in May 2005. The windows in the boiler rooms were not included in this contract. They will be replaced separately by a contract to begin in October 2005.

Grit Classifier Modifications- approximate cost \$65,000

The six grit classifiers at Nut Island Headworks do not efficiently remove the grit that they convey. This material then passes out of the plant in the effluent stream to the Deer Island Treatment Plant. Among the issues was is an excessive gap between the troughs and the conveyor screws. Two classifiers were modified under this contract as a trial. New trough liners, and replacement conveyor screws were installed to provide closer tolerances to improve the rate and quantity of grit removal from the waste stream. The work began in March 2005, and was completed in June 2005. The new units will undergo performance testing over the next year, before replacing the remaining four.

HVAC Controls Upgrade- approximate cost \$246,000

The HVAC system at the Prison Point CSO Pumping Station was controlled by a pneumatically operated system. The system was deteriorated with numerous breaks in the air lines, making it difficult to control the HVAC system. This project replaced the pneumatic control system with a digital control system. The work began in September 2004, and was completed in March 2005. A future project in the Capital Program will include upgrading the boiler and other major components of the system, including ductwork, fans and motors.

Underwater Inspection Services- approximate cost \$155,000

When the Nut Island Treatment Plant was replaced with the Nut Island Headworks, the former ocean outfalls were retained for emergency use. In order to ensure their continued availability, an inspection was conducted to determine if any damage or deterioration has occurred since they were decommissioned. The project will visually inspect the outlets using divers, and conduct a sonar inspection of the interior. In addition the emergency flow storage conduit within the Headworks facility, which provides short term storage of wastewater, was also inspected visually.

Wastewater Pipelines

1. Manhole Inspection and Rehabilitation Program

The Technical Inspections Unit (TIU), of 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.

In FY05 the TIU staff inspected a total of about 488 manholes. Approximately 115 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.

2. Pipeline Rehabilitation

The following projects are included in the MWRA Capital Budget. These projects are first identified by the TIU staff during routine television inspections of the pipelines. MWRA Engineering staff review these projects and perform or coordinate all necessary engineering, beginning with conceptual design. Large-scale pipeline rehabilitation

projects are contracted out. The following represents a list of current and ongoing pipeline projects.

Section 80,82, & 83 Sewer Rehabilitation, Arlington:

The Mill Brook Valley Sewer is a 75-year-old vitrified clay sewer 20-24-inches in diameter. Sections of the pipe are damaged and 6100 feet will be rehabilitated. Final design will be completed in July 2005 with construction scheduled to begin in 2006 and end in 2007.

Sections 47 and 86, Winchester Contract 6186:

Section 47, the Cummingsville Branch Sewer, is a 100-year-old vitrified clay sewer 15- to 20 inch diameter. Section 86, the Cummingsville Branch Relief Sewer, is a 50-year old concrete sewer, 30-inches in diameter. They receive flow from Winchester, Woburn and Burlington. The system experiences surcharging and overflows during wet weather. Contract 6186 will replace Section 47 with 4850 linear feet of new sewer. Portions of Section 86 will be rehabilitated, and other portions will be filled and abandoned. Construction began in March 2005 and is scheduled to be completed in June 2006.

Section, 160, Winchester, and Medford:

Portions of the Mystic Valley Sewer, which is a 27" brick and concrete sewer, were identified as being damaged. Approximately 11,000 feet of the sewer will be rehabilitated. Construction is currently scheduled to begin in August 2006.

Section 93A, Lexington Contracts 6798 & 6987:

Rehabilitation of 1425 linear feet of 30-inch concrete gravity sewer was completed in April 2005. During construction, however, deterioration of a portion of the upstream, force main was discovered. Rehabilitation of 1200 linear feet of 24-inch, ductile iron pipe, by sliplining is currently under design. Construction is scheduled to begin in January 2006.

East Boston Branch Sewer Rehabilitation, East Boston:

Repair of approximately 5400 feet of 45-inch x 41-inch brick sewer, using a cured-in-place, resin-impregnated, flexible felt tube liner, began in April 2003. Substantial completion was in May 2004. A final video inspection performed after one year revealed 900 linear feet of liner failure. Removal and replacement of the failed portions, performed under the contract warranty, began in June 2005. The completion date is September 2005. The project cost is about \$5.4 million.

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.

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 other structures and manholes. Approximately 34.5 miles of pipelines were TV inspected in FY05. Included in this total is approximately 8.3 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 Transport collection system includes 228 miles of interceptor sewer lines. Approximately 51.5 miles of pipeline and 49 siphons were cleaned in FY05.

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

FY05 Maintenance Program Costs

1. Budget

The Field Operations Department (FOD) 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.

Maintenance includes protecting the many assets of the MWRA with individual programs that care for interior and exterior structure of the facilities, maintain plant equipment, inspect and clean wastewater pipelines and structures, plan, schedule and track maintenance activities, supervise staff and provide administrative support. The table below includes a summary of the approved budget in FY05 for programs within FOD for related maintenance programs.

**FY05 APPROVED MAINTENANCE ANNUAL
BUDGET**

Budget Line Item	Total Funding
Wages and Salaries	\$7,155,999
Overtime	\$348,533
Fringe Benefits	\$9,572
Chemicals	\$1,356
Utilities	\$35,419
Maintenance (Parts & Supplies)	\$3,314,475
Prof Services	\$116,994
Other Materials	\$457,939
Other Services	\$66,256
Total	\$11,506,543

2. Maintenance Expenses

The actual spending in FY05 for ‘Ongoing Maintenance’ in the Facility Maintenance program, which includes Building & Grounds and Facility Specialists work is approximately \$ 379,888. The total related ‘Ongoing Maintenance’ spending for Wastewater Pipeline and Technical Inspections for collection system maintenance during FY05 is approximately \$ 265,441.

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 \$ 1,928,269. 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.

3. Staffing

A total of 140 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 FY05 average levels for employees reporting to the Chelsea Facility. The numbers of staff may vary slightly during the fiscal year due to vacancies and re-allocation or assignment from Wastewater Operations to the Equipment Maintenance shops, resulting from organizational changes. The table below indicates the amount of staffing available and dedicated to maintenance efforts.

MAINTENANCE STAFFING LEVELS

Staffing Categories	No. of Staff
Maintenance Manager	3
Engineers	2
Work Coordination; super. and staff	17
Area Managers	3
Administration	1
Mechanic Specialists	19
Electrical Specialists	12
Plumbers	8
HVAC Specialists	4
Machinists and Welders	4
I&C Specialists	1
Technical Inspections; inspectors, foremen, and supervisors	13
Pipeline Maint; supervisors., foremen., HEO's, & laborers	20
Building & Grounds Workers & Foremen	19
Carpenters/Painters/Masons (Facility Specialists)	14
Total	140

4. 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. The Field Operations Department currently utilizes the following service contracts and services, listed below, to supplement the existing workforce and assist with maintenance projects at Wastewater Facilities.

SERVICE CONTRACTS & UTILIZED SERVICES

Type and description	Term	Type of service
Boiler and Water Heater Service (Contract)	2 years	Scheduled, corrective & emergency repairs
Elevator maintenance (Contract)	2 years	Scheduled, corrective & emergency repairs
Crane maintenance (Contract)	2 years	Scheduled, corrective & emergency repairs
VFD maintenance (Purchase order)	1 year	Scheduled maintenance
Instrumentation maintenance (Contract)	2 years	Scheduled maintenance
HVAC pneumatic controls (Purchase order)	As needed	As needed adjustments
High Voltage Maintenance (Purchase order)	As needed	Preventive Maintenance
Hydraulics Maintenance (Purchase order)	As needed	Preventive and Corrective Maintenance
Compressed air maintenance (Purchase order)	1 year	Preventive and Corrective Maintenance
Diesel generator maintenance (Purchase order)	As needed	Preventive and Corrective Maintenance
Nut Island Landscape (Contract)	1 year	Specified scope
Overhead door maintenance (Purchase order)	As needed	Corrective Maintenance
Engineering & Consultants (Task order)	As needed	Mechanical, Electrical, HVAC, and Architectural Design

Annual Maintenance Program Performance

1. Backlog

The Maximo computerized maintenance management system captures all work order requests from operations and maintenance personnel. This gives management the ability 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 are functioning at adequate levels at all times. Critical equipment status is monitored by Operations and this information is provided to the Equipment Maintenance section. Work is prioritized accordingly, with critical equipment receiving the most attention.

Maximo is the system that captures the work activities and is capable of generating all of the necessary information and reporting. Work Coordination is further developing metrics to measure how well we are performing maintenance in the various discussed below.

2. Preventive Maintenance

A primary focus in the Field Operations Department (FOD) is preventive maintenance. Both Operations and Maintenance staff perform preventive maintenance tasks. The tasks performed by operational staff are defined as light maintenance duties.

The purpose of the light maintenance duty assignment is to increase the number of manhours contributed to PM activities and to allocate the PM work more efficiently. Wastewater Operations crews travel from facility to facility using a handheld monitoring system. Roving

crews perform daily checks of equipment that include taking readings and conducting visual inspections. The information is captured in a separate database outside of the Maximo work order system. Reports can be generated and information retrieved about the condition of any equipment. Abnormal conditions are noted and forwarded to planner/schedulers for work order processing and further action by the Equipment Maintenance section.

Reliability Centered Maintenance (RCM) was adopted by the Authority to begin identifying the most productive and beneficial preventive maintenance for critical systems and their components. Each system's operating context and preventive maintenance needs are analyzed based on the performance requirements of the equipment. The RCM analysis 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. Future developments will include the integration of RCM analyses results with the Maximo database for generation of condition monitoring and preventive maintenance work orders.

FOD has conducted several RCM analyses over the past few years. A criticality study was completed for all Wastewater facilities and will be the basis to prioritize all remaining system analyses. All recommendations for condition monitoring and select preventive maintenance tasks from these analyses must be approved by management and then are implemented and tracked by assigned staff.

Lube oil analysis is primary type of condition monitoring performed by FOD staff to check the internal condition of equipment. Samples are taken from many equipment oil reservoirs and analyzed by an outside lab service. Based on results, the oil/fluid is either scheduled for change or for repeat sampling in the future. Other condition monitoring techniques, such as infrared thermography, are under review and for future implementation.

3. Annual Statistical Maintenance Performance Indicators

Equipment Maintenance

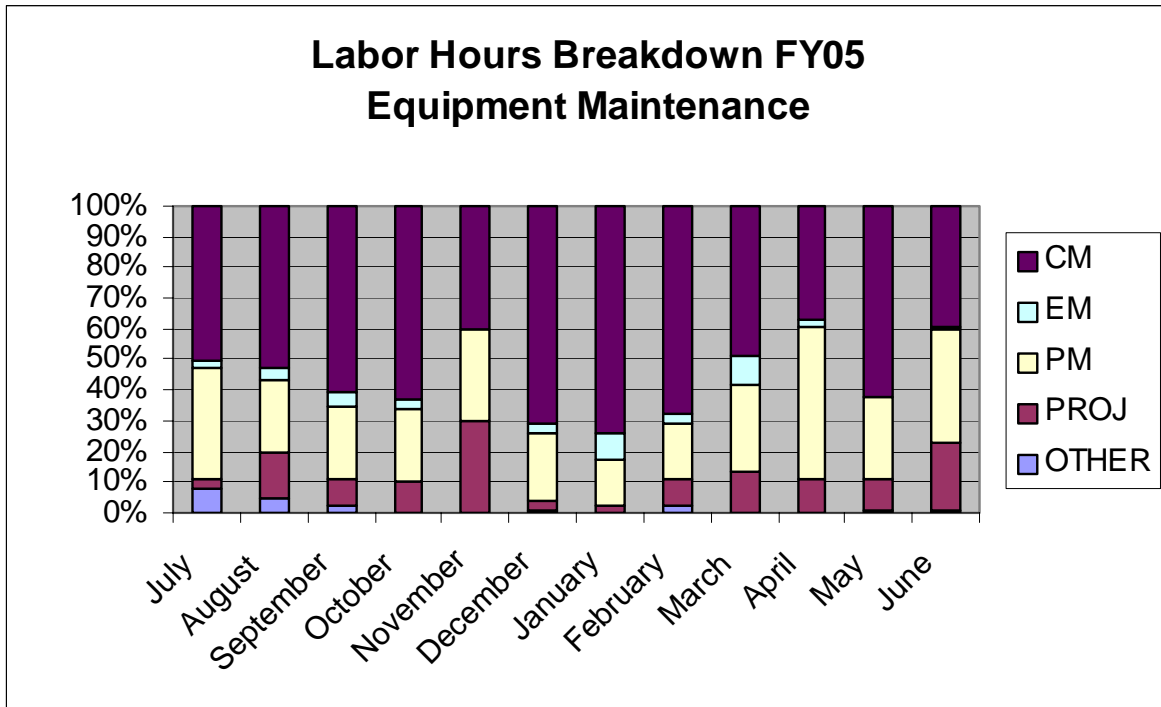
Key indicators of performance are used to monitor maintenance activities. Monthly maintenance staff hours are used to track productivity as well as monitor the type of maintenance performed. In the charts below maintenance time is represented by typical levels of effort, by percentage, for various programs. These are derived by reported hours in the Maximo work order system.

Equipment maintenance personnel are dedicated trades that maintain the wastewater facilities as well as water facilities. The chart below indicates the level of effort for wastewater facilities only. Staff in the associated trades shops are utilized for both types of facilities, and are assigned work based on critical items, priority, and backlog demand.

Preventive/Predictive Maintenance (PM), Corrective Maintenance (CM), Emergency (EM), Project Work, and Other Work are the work types for Equipment 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 FY05.

Preventive maintenance performed by roving Transport Wastewater operational crews is not represented in the chart below.



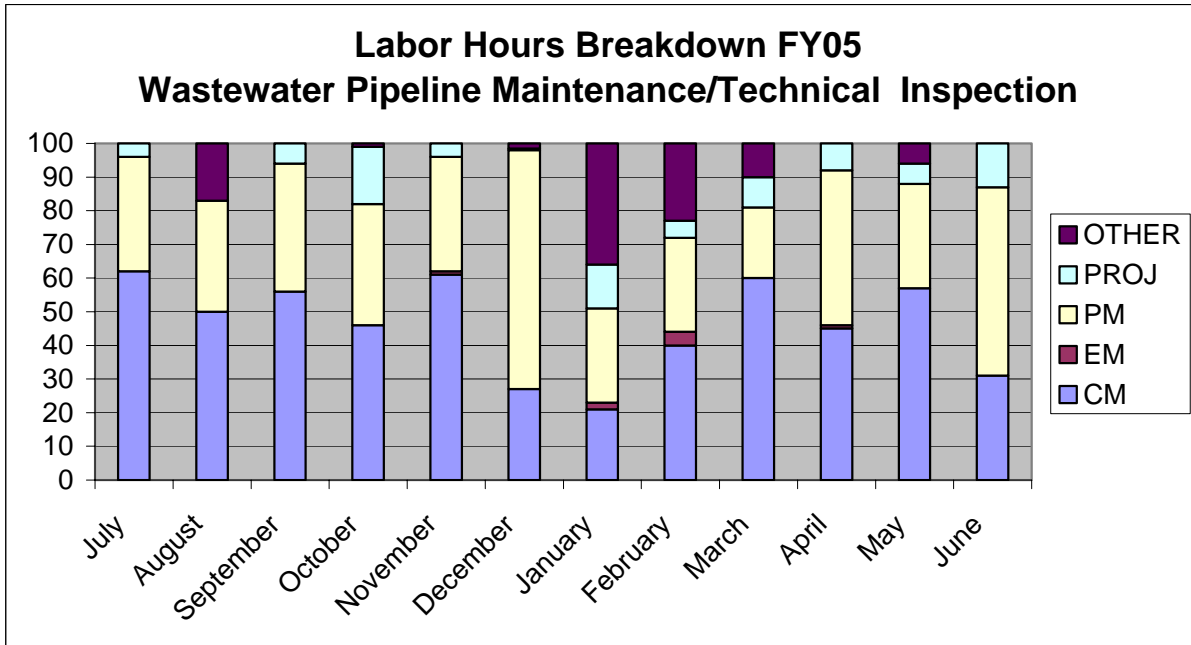
Wastewater Pipeline & Technical Inspections

The Wastewater Pipeline & Technical Inspections Section is responsible for inspecting the various elements of the Transport Wastewater Collections System. Pipeline inspections average about 70% of the workload followed by structure inspections, including manholes, averaging about 30%. Approximately 42.9 miles of pipelines were inspected in FY05. Tide-gate inspections are part of the monthly routine inspections required by the NPDES permit, (60) were performed in FY05. Other structures inspected include (46) headhouses, (53) diversion structures, and (488) manholes.

The information generated by this program provides the general workload and priority for pipeline cleaning and maintenance. The data is used by the Authority to define major initiatives and engineering studies, such as the future Master Plan for asset replacement.

The graph below is indicative of work activities for the Wastewater Pipeline Maintenance crews reported in the Maximo database. These are key indicators of performance in FY05, based on monthly maintenance manhours, and the percentage of work performed, for each work type.

The graph below represents the distribution of work by work type. 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 order reporting of time is coded so that these accumulative manhours can be further broken down for management's use.



Annual Status Sheets – Fore River Pelletizing Plant

July 2004 - June 2005

Critical Equipment Availability: Twelve Month-Average – 75.0 %

Operating logs indicate that an average of 9 of the 12 centrifuges were available during FY05. 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, 9 centrifuges are available, giving the plant more than enough capacity to process current flows from Deer Island. The facility is currently operated on a 6-day workweek.

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 FY05, staff completed 2,030 or about 94 % of the 2,162 work orders that were opened.

Equipment Replacement:

More than \$ 770,000 was spent on replacement parts and maintenance related items in FY05 including:

- Overhaul of Process Trains 3 and 4.
- Installed 5 new centrifugal sludge pumps.
- Complete overhaul on Centrifuge Nos. 3 and 10.
- Pugmill Paddle replacement on Train 5.
- Regenerative Thermal Oxidizer No. 2 Media Replacement.
- Replaced Separator B Screw on Train 5