NPDES compliance summary report fiscal year 1994

Massachusetts Water Resources Authority

Environmental Quality Department
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NPDES COMPLIANCE SUMMARY REPORT
Fiscal Year 1994

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Background

The National Pollutant Discharge Elimination System (NPDES) Compliance Summary Report Fiscal Year (FY) 1994 was written to present and summarize the monitoring and compliance data compiled and analyzed by the Massachusetts Water Resources Authority (MWRA) NPDES Unit during the period of July 1993 to June 1994. Although this report is not a regulatory requirement, it acts as a document to track effluent quality trends and record changes and improvements of the MWRA sewerage system.

The Environmental Protection Agency (EPA) mandates that any discharge to a body of water must be permitted through the NPDES. The MWRA is permitted to discharge effluent from two primary treatment plants, Deer Island and Nut Island, one advanced secondary treatment plant, Clinton, and three combined sewer overflow treatment facilities, Cottage Farm, Prison Point, and Somerville Marginal. Three additional gravity combined sewer overflow (CSO) facilities, Constitution Beach, Fox Point, and Commercial Point, are owned and operated by the MWRA. The effluent from these facilities discharges to the City of Boston sewer lines; thus, the Boston Water and Sewer Commission (BWSC) NPDES Permit allows for the ultimate discharge of the effluent.

The Clinton Plant serves the town of Clinton and part of the Lancaster Sewer District. The MWRA operates the plant under special arrangements originating at the time the Metropolitan District Commission (MDC) acquired land in Clinton for the Watchusett Reservoir. The Clinton Treatment Plant operates under a permit separate from the Boston NPDES permit and will not be discussed in this report.

The discharge limits set in the MWRA NPDES Permit are limits for secondary treatment plants. Neither Deer Island nor Nut Island have secondary treatment capability yet. The MWRA is currently operating under court-ordered limits while a secondary treatment plant is being built at Deer Island. Negotiations for a NPDES Permit for the soon-to-be-completed upgraded Deer Island plant are in progress.

Treatment Plants Monitoring Results

The FY94 monitoring results from both Deer Island and Nut Island plants were comparable to the last three years' monitoring results.

Flows

With the exception of FY93, which was a very wet year, the average daily flow has been on a downward trend over the past five years (Figures 1 and 2). In FY94, the DI average daily flow was 249 MGD, the minimum flow was 171 MGD, and the maximum flow was 528 MGD. The average flow to NI was 123 MGD, the minimum flow was 47 MGD and the maximum flow was 315 MGD. The contribution of infiltration/inflow is more evident in Nut Island than in Deer Island; influent flow to Nut Island is significantly increased with increased precipitation or, conversely, decreased with decreased precipitation. The implementation of a system-wide sewer system Inspection and Maintenance Program combined with an aggressive Infiltration and Inflow Program resulted in reduced wet weather flow reaching the treatment plants. This is evident in the FY92 and FY94 results when the total precipitation during those years were comparable, but the average daily flow was lower in FY94.

Biochemical Oxygen Demand (BOD)

In FY94, the Deer Island average influent BOD was 149 mg/L and the average effluent concentration was 123 mg/L. There were 16 BOD-related violations. The 12-month running average removal rates ranged from 17% to 22%, violating the minimum requirement of 27%. In addition, the maximum limit, 200 mg/L, and the monthly average limit, 140 mg/L, were each exceeded two times during FY94. This low performance is expected of an aging primary plant and of treatment systems with combined sewers. Figures 3 graphs the FY94 effluent BOD measurements at Deer Island.

In FY94, the Nut Island average influent BOD concentration was 171 mg/L. The effluent BOD concentration was 108 mg/L. The 12-month running average removal rates, which ranged from 22% to 35%, were above the minimum limit requirement of 15%. There were eight BOD-related violations. The daily maximum limit, 185 mg/L, and the average monthly limit, 130 mg/L, were each exceeded four times. Figure 4 graphs the FY94 effluent BOD measurements at Nut Island.

Figure 1 Deer Island Flows Compared to Total Precipitation, FY89 - FY94

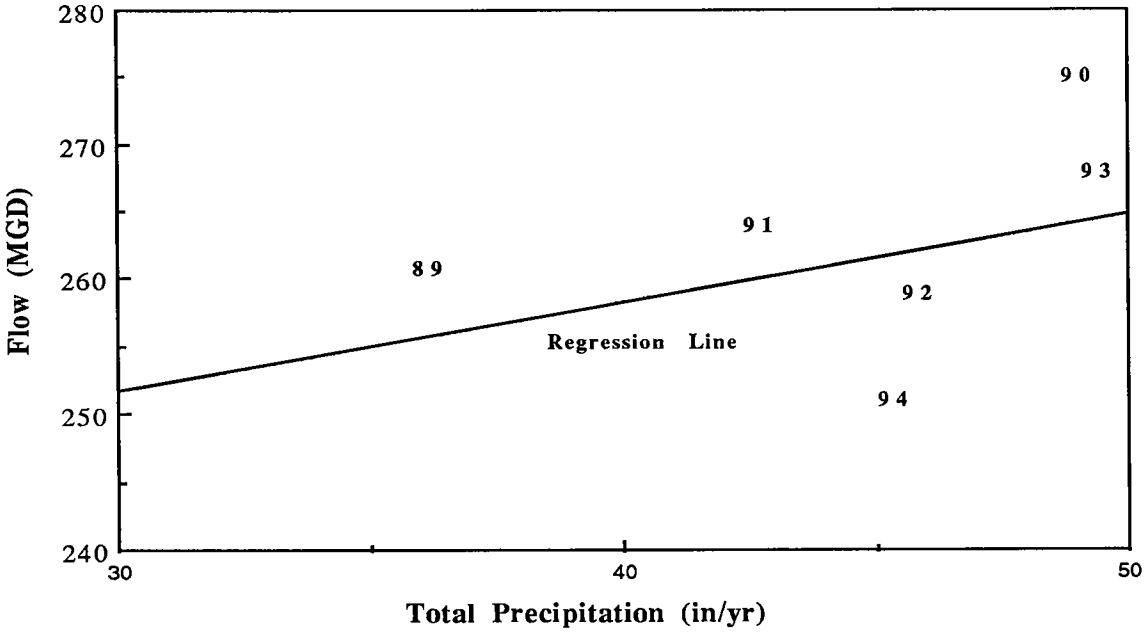


Figure 2 Nut Island Flows Compared to Total Precipitation, FY89 - FY94

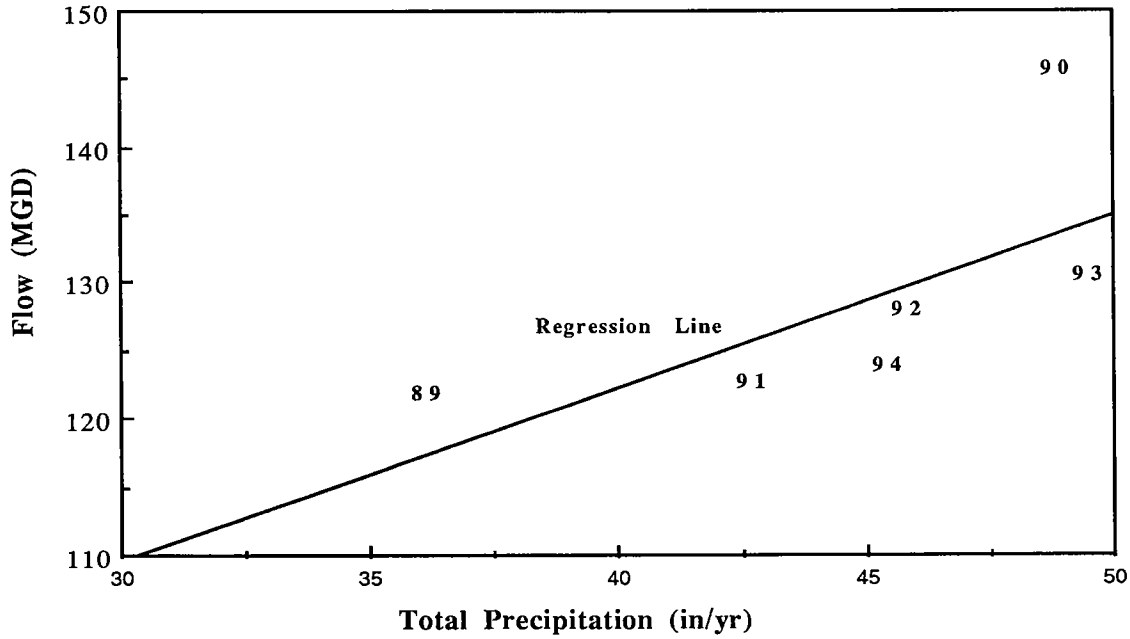


Figure 3 Deer Island Treatment Plant

Effluent BOD, Fiscal Year 1994

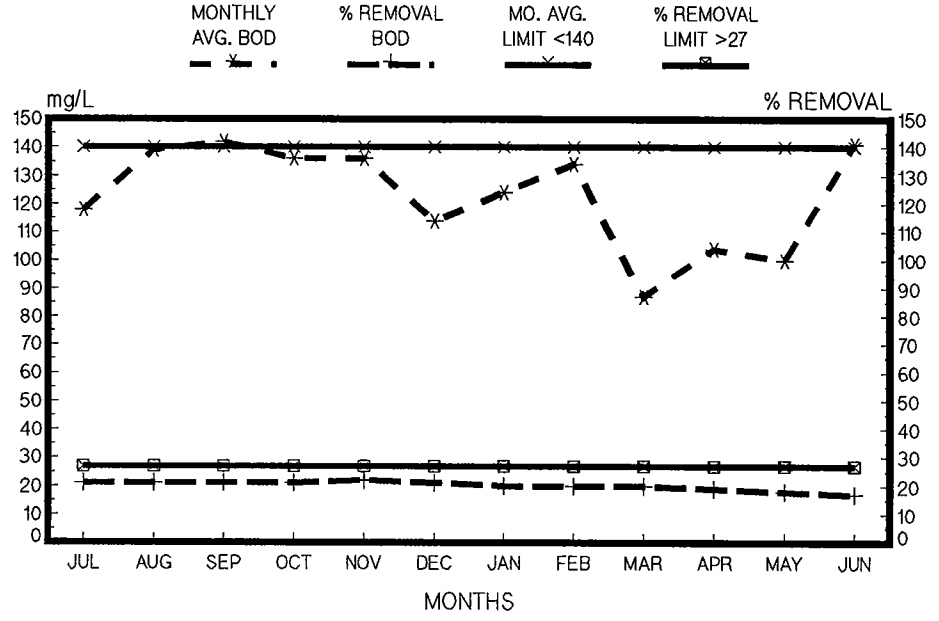
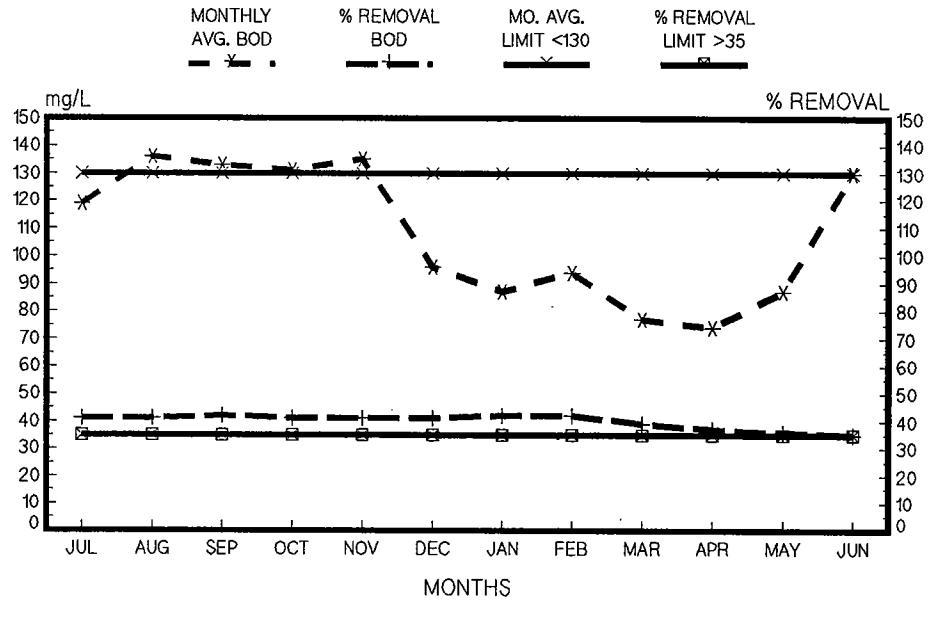


Figure 4 Nut Island Treatment Plant

Effluent BOD, Fiscal Year 1994



Total Suspended Solids (TSS)

At Deer Island, the average influent TSS concentration was 137 mg/L and the average effluent TSS concentration was 73 mg/L. The 12-month running average removal rates ranged from 44% to 57%, well above the minimum requirement of 38%. The monthly average limit, 110 mg/L, was consistently met as well. Plant performance is graphed in Figure 5. There was one limit violation however. One high TSS measurement, 250 mg/L, exceeded the maximum daily limit of 180 mg/L.

At Nut Island, the average influent TSS concentration was 227 mg/L and the effluent concentration was 78 mg/L. The 12-month running average removal rates were well above the minimum requirement of 43%. The maximum monthly average limit, 110 mg/L, was also consistently met. Plant performance is graphed in Figure 6. Like Deer Island, there was only one limit violation. One high TSS measurement of 197 mg/L exceeded the permit limit of 195 mg/L by only 2 mg/L.

Settleable Solids, Fecal and Total Coliforms

There were no interim limits violations of these parameters for either the Deer Island or Nut Island effluents.

pH

There were several pH-related violations of the NPDES Permit limits. At Deer Island, there was one low pH measurement of 6.3. At Nut Island, there were seven low pH measurements ranging from 6.30 to 6.49. The permit limit range is 6.5 to 8.5. The NPDES permit, however, allows for measurements outside of permit limits if *"values are exceeded due to natural causes as a result of approved treatment processes and provided the effluent does not cause a violation of the water quality standards for the receiving water."* The low pH measurements were more indicative of acid rain contribution than of poor effluent quality. Furthermore, an effluent with a low pH does not have a significant impact on the highly buffered marine environment such as Boston Harbor.

Figure 5 Deer Island Treatment Plant

Effluent TSS Fiscal Year 1994

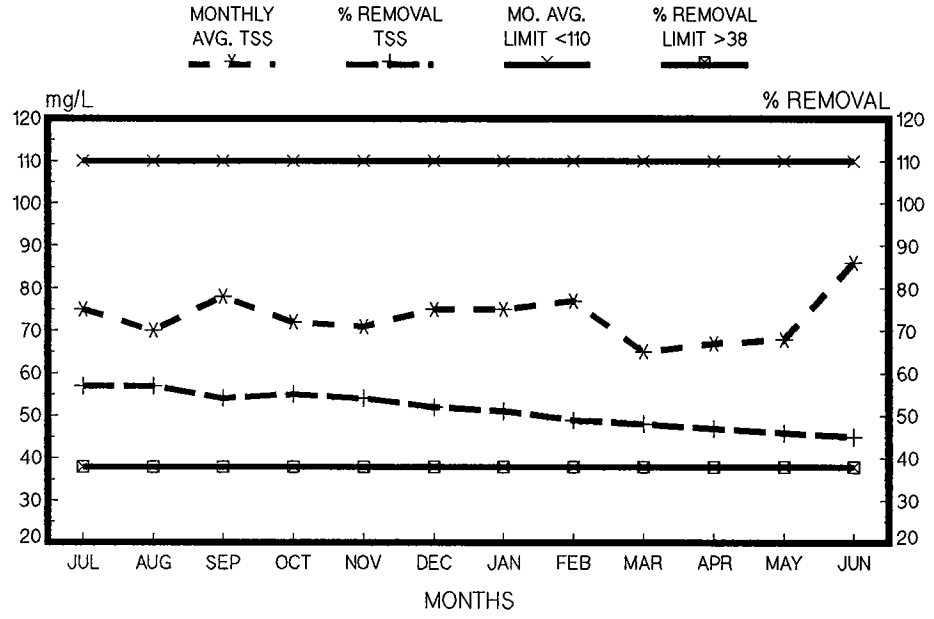
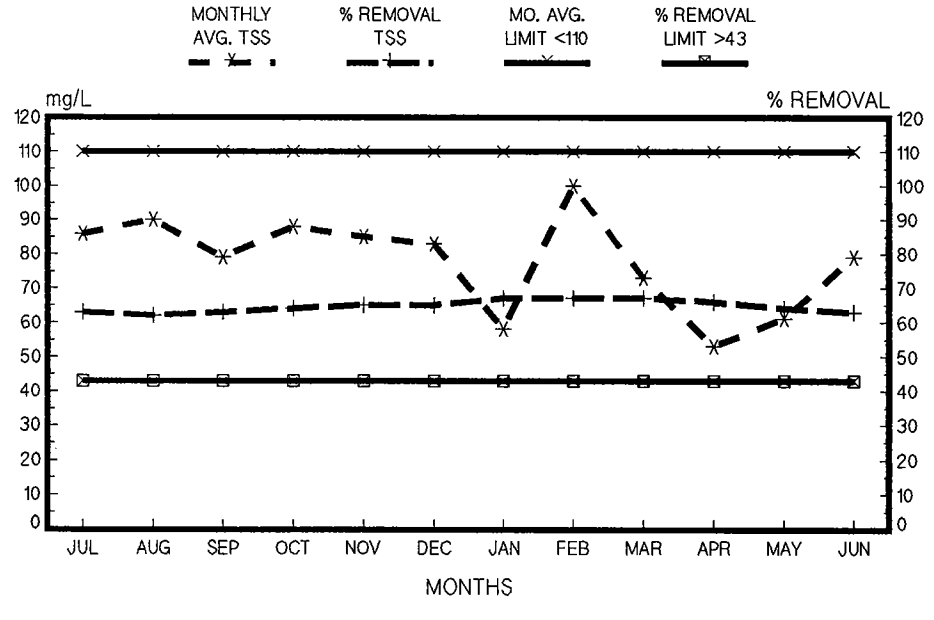


Figure 6 Nut Island Treatment Plant

Effluent TSS, Fiscal Year 1994



Nutrients

Because of their potential detrimental effects on the marine environment, nutrients were carefully monitored at Deer Island and Nut Island. Nutrients sampled for in FY94 were: Total Kjeldahl Nitrogen (TKN), ammonia, nitrites, nitrates, orthophosphorus, and total phosphorus. The monitoring results showed seasonality; higher values were measured in the warmer months than in the colder months. Preliminary calculations indicated that effluent ammonia concentrations were not high enough to cause violations of water quality standards even during the critical summer months when stratification often occurs.

Metals

At both Deer Island and Nut Island plants, measurable amounts of chromium, copper, lead, zinc, and low concentrations of other priority metals were observed. Boron and molybdenum were also measured, but these are not priority pollutants. Metals loadings to Boston Harbor have decreased dramatically since the late 80's, but have leveled off over the past five years.

Pesticides

There were several pesticides detected at very low concentrations in both the Deer Island and Nut Island effluents. Looking at results of tests that used EPA-approved methodologies (NPDES data), of twelve samples taken at Deer Island, the following were detected in measurable amounts: d-BHC in four, DDT in three, g-BHC in two, and b-BHC in one. Looking at results of tests that used non-EPA methods, cis-chlordane, lindane, 4,4'-DDE, and 4,4'-DDT were consistently detected. Of twelve samples, hexachlorobenzene was detected in nine, 4,4'-DDD, endrin, and heptachlor epoxide were detected in four.

At Nut Island, out of the twelve samples that were analyzed using EPA-approved methods, d-BHC was detected in three, aldrin, DDD, b-BHC, and chlordane in one.

Although chemicals like PCBs and DDTs have been banned by the EPA since the early 80's, pesticides have not fully disappeared from the sewerage system.

Semivolatiles

At both Deer Island and Nut Island plants, only benzoic acid and 4-methyl phenol were reported in measurable amounts. These constituents, however, are not priority pollutants.

Volatiles Organics

At Deer Island, measurable amounts of chloroform, bromoform, and methylene chloride were reported infrequently. Acetone was consistently detected. At Nut Island, methylene chloride was detected once in 12 samples. Measurable amounts of acetone and 2-butanone were consistently detected. Both acetone and 2-butanone have very low toxicity and therefore are not considered priority pollutants.

Toxicity

At Deer Island, the chronic toxicity tests that used Cyprinodon variegatus (the sheepshead minnow) passed consistently. Tests that used the Champia parvula (red alga) always failed. The EPA has determined, however, that this red alga is too sensitive a species to be used for toxicity tests and has withdrawn it as a test species for permit renewals. The results of the acute static toxicity test, using Mysidopsis bahia (mysid shrimp) violated limits in eight of the twelve tests. According to a study done by the EPA, the acute toxicity has been traced to surfactants, a common ingredient in household detergents.

At Nut Island, chronic toxicity tests that used sheepshead minnow consistently passed while tests that used red algae always failed. The acute static toxicity tests using mysid shrimp violated limits in eight of twelve samples.

Bioaccumulation Study

The 1993 Bioaccumulation Study results suggest that the discharge of organic contaminants have decreased since 1987. Probable reasons for the decrease in the levels of contaminants are lower concentration of contaminants in the effluent, cessation of sludge discharge to the Boston Harbor and lower contributions from CSOs, rivers, and the atmosphere.

Combined Sewer Overflow Facilities

Flow and Activation

There were no significant differences in the number of activations at the CSO facilities between FY94 and FY93 except for Constitution Beach and Somerville Marginal (Table 1). In FY94, the number of activations at Constitution Beach doubled and the number of activations at Somerville Marginal decreased by 11.

Although the total rainfall in FY94 was 3.82 inches lower than in FY93, there were more high-intensity rainfall events in FY94. There were more chances of activations, which perhaps explains why there were more activations in FY94 than in FY93 at Constitution Beach.

At Somerville Marginal on the other hand, the reduction of activations in FY94 can be explained by the manner in which an activation was defined in the past. In FY93, when an activation carried over to the following day, another activation was reported. This manner of reporting was in line with the NPDES Discharge Monitoring Report (DMR) format. In other words, one significant rainfall event in FY93 may have been recorded as two activation events. In FY94, where the activation was caused by a single storm event, although it carried over to the next day, it was reported as one activation.

Table 1 Combined Sewer Treatment Facilities, Summary of Activations

	FY94			FY93			FY 92		
	Total Volume Treated (MG)	Total Number of Activations	Permit Violations	Total Volume Treated (MG)	Total Number of Activations	Permit Violations	Total Volume Treated (MG)	Total Number of Activations	Permit Violations
Cottage Farm	621	31	5	677	33	2	361	23	2
Prison Point	449	26	1	269	26	1	429	29	2
Somerville Marginal	72	34	1	90	45	2	89	48	2
Constitution Beach	0.68	8	*	2	4	*	11	12	*
Fox Point	76	20	*	37	21	*	37	22	*
Commercial Point	93	25	*	77	28	*	80	33	*

* Not applicable

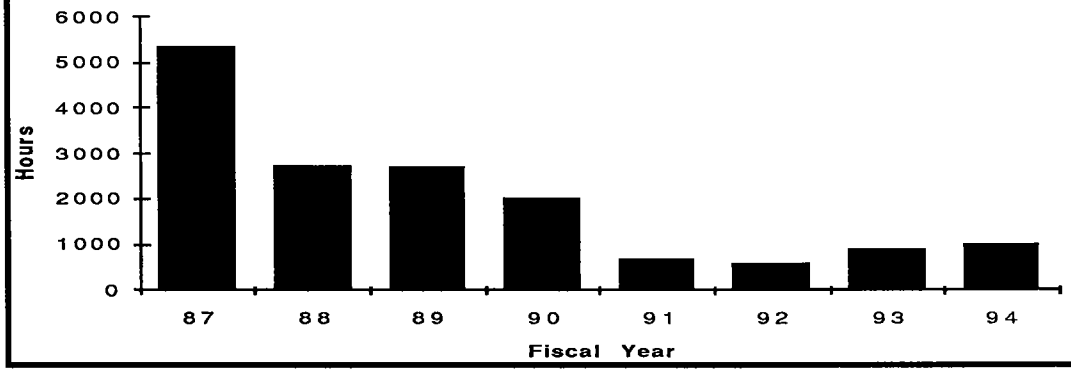
There were seven NPDES permit violations in FY94. Two were high coliform measurements, measured each at Cottage Farm and Prison Point, and five pH-related violations, four measured at Cottage Farm and one at Somerville Marginal. The high coliform counts violated the restriction "no more than 10% of the samples can exceed 2500/100 ml." The low pH violations at Cottage Farm were due to acid rain and the high pH violation at Somerville Marginal was due to hypochlorite disinfection.

Choking

There has been a slight increase in the number of hours the flows at the headworks were choked (Figure 7). Choking at the headworks restricts flow into Deer Island. Flows may be choked at the headworks because of excessive wet weather flow or because of maintenance work at Deer Island.

There was a 40% increase from FY92 to FY94. The slight increase from FY93 was primarily the result of construction-related activities. The construction-related choking hours were scheduled mostly at night when the wastewater flow was at a minimum and did not result in dry weather discharges from CSO facilities.

Figure 7 Hours of Choking at Deer Island Headworks



Current Initiatives and What's to Come

Included in the Court Order, the MWRA was required to develop the Combined Sewer Overflow Facilities Plan so that the amount and frequency of combined sewer overflows into Boston Harbor would be reduced. In addition to court mandates, the MWRA has started a number of programs including system-wide inspection, maintenance, and improvement of the collection system. A metering program was also undertaken to document the success of our Infiltration and Inflow (I/I) program. The I/I Program, in cooperation with our member communities, was implemented to control the magnitude of infiltration (groundwater) and inflow (surface runoff and other sources) entering the sewer system. The I/I Program has resulted in reduction of infiltration/inflow contribution. Other programs or studies that the MWRA are undertaking are showing positive results as well.

Combined Sewer Overflow Plans

The new National CSO Policy includes a requirement for the implementation of "Nine Minimum Controls" by January 1997. Although the MWRA has not yet completed its assessment of overall compliance with this policy, a number of activities relative to CSO control are progressing. The MWRA and the CSO communities have been making significant progress on the implementation of System Optimization Plans (SOPs) for CSO control. Of the 148 recommended measures, approximately 70 SOPs have been completed. Full SOP implementation will reduce system-wide CSO discharge volume by 20%. In addition to the SOPs, the MWRA has also recently completed the Final CSO Conceptual Plan and System Master Plan. This report presents MWRA's final conceptual recommendations for CSO control.

CSO Receiving Water Quality Monitoring

As required by the NPDES permit and in cooperation with member communities, the MWRA has implemented the CSO Receiving Water Monitoring Program, designed to measure impact of CSO discharges to the receiving water. Monitoring results have shown improvements to the receiving bodies of water. Bacteria levels have significantly decreased at beaches near three new CSO treatment facilities- at Tenean Beach, Constitution Beach, and Malibu Beach. Monitoring will continue in FY95.

Pretreatment Program

The MWRA Pretreatment Program, managed by the Toxic Reduction and Control Department (TRAC), monitors and restricts toxic discharges to acceptable levels from industrial users within the sewerage system. This program is essential in the control of toxic discharges to the Boston Harbor since the ability of Deer Island and Nut Island plants to remove toxics in wastewater is limited. The pretreatment program attacks the problem of toxic discharges through source reduction, raw material substitution, and public education. The success of the Pretreatment Program is evident in the decreased amounts of metals entering the MWRA system.

Public Education

The Wastewater Education Program has been effective in reaching and teaching young children and young adults about source reduction and wastewater treatment. This highly successful program will be instrumental in the reduction of toxics loads contributed by households, commercial establishments, and the unregulated community.

The New Primary Plant

In early 1995, the new primary plant will be subjected to functional testing, performance testing, equipment evaluation, instrument adjustments and overall fine-tuning of operations. Once the new primary plant becomes operational, improved primary treatment is expected and conventional pollutants loadings to the Boston Harbor will decline.

The Secondary Pilot Plant

Most of the operational problems of the 2 MGD pilot plant at the Deer Island plant have been corrected. In the coming year, the pilot plant will be subjected to different treatment scenarios. Results from these tests will provide valuable information to derive optimum process specifications for the upgraded Deer Island Plant. In addition to obtaining process control data, much knowledge can be obtained regarding secondary effluent quality. Concentration of toxics, effluent toxicity, and problematic parameters can be identified. The ability of MWRA to meet NPDES permit limits can then be predicted.

Deer Island Secondary Plant

The MWRA has made significant progress in meeting the court-ordered schedule for the construction of a secondary treatment plant. As of 1994, 84% of the new Deer Island Secondary Plant was designed and 55% of construction was completed. Construction work to retrofit the Nut Island plant into a headwork facility is ongoing. Current target date for completion of the inter-island tunnel, which will convey flows from the south system to the north system, is the Fall of 1996. The new outfall tunnel, which will convey Deer Island Treatment Plant effluent 9.5 miles out to Massachusetts Bay, is projected to be completed in the Fall of 1997.

Overall, the MWRA has performed a considerable number of projects designed to protect the environment. The MWRA will continue:

- to monitor effluent discharge quality to ensure meeting NPDES permit requirements and water quality standards
- to aggressively inspect and maintain the collection system
- to reduce excessive inflow/infiltration to the sewerage system
- to ensure proper operation of the treatment plants while in the midst of construction activities
- to control and reduce toxics entering the facility by controlling them at the source by working cooperatively with the regulated industries in the areas of source reduction, raw material substitution, process modification, recycling, and process flow reduction
- to implement EPA's CSO Nine Minimum Controls, and to move on to the next phase of the CSO program
- to assess receiving water quality through our CSO monitoring program
- to develop criteria for optimum secondary plant performance through the pilot plant and
- to reach more young people through public education.

I. Introduction

The objective of this report is to present and to summarize the National Pollutant Discharge Elimination System (NPDES) monitoring and compliance data compiled and analyzed by the Massachusetts Water Resources Authority (MWRA) NPDES Unit during the period of July 1993 to July 1994. Results of other wastewater characterization studies required by other MWRA programs that were conducted in FY94 are also included in order to compare monitoring efforts.

Before presenting the monitoring data, some background information is introduced; Section II presents information on the permits and limits under which the MWRA sewerage system operates, the monitoring programs conducted in FY94, and the methodologies used in sample collection, sample analyses, and treatment of results. Section III introduces some background information by giving an overview of the MWRA sewage treatment systems, facilities, and wastewater treatment process.

Section IV presents monitoring results and summarizes facility compliance with permits and court-ordered interim limits. Two treatment plants and three combined sewer overflow facilities (CSOs) were monitored to gather operational data and to comply with the MWRA NPDES Permit. Three additional CSOs that are owned and operated by the MWRA, but not included in the NPDES Permit, were monitored to gather operational data.

Although many of the limited parameters in the wastewater are given in concentrations as small as 0.01 ug/L, it is crucial to realize that despite the seemingly insignificant levels measured, the studies and monitoring are essential to ensure compliance with water quality standards. The MWRA's treatment plants and CSO facilities serve large communities' needs for sewer systems while maintaining healthy water environments for wildlife. Section V compares Deer Island and Nut Island results. Section V also deals with issues for the future. This part discusses how the MWRA can continue to maintain functional sewer systems as well as healthy bodies of water.

II. Background Information

The Environmental Protection Agency (EPA) mandates that any discharge to a body of water must be permitted through NPDES. The MWRA is permitted to discharge effluent from two primary treatment plants, Deer Island and Nut Island, and three CSO treatment facilities, Cottage Farm, Prison Point, and Somerville Marginal. Somerville Marginal is a gravity CSO, unlike Cottage Farm and Prison Point, which have detention capacities. Three additional gravity CSO facilities, Constitution Beach, Fox Point, and Commercial Point, are owned and operated by the MWRA. The effluent from these facilities, however, discharges to the City of Boston sewer lines. Thus, the Boston Water and Sewer Commission (BWSC) NPDES Permit allows for the ultimate discharge of the effluent.

The limits set in the MWRA NPDES Permit are limitations for secondary treatment plants. Neither Deer Island nor Nut Island have secondary treatment capabilities. The MWRA is currently operating under court-ordered interim limits while a secondary treatment plant is being built. The MWRA is now in negotiating stages for a new NPDES Permit for the soon-to-be-completed upgraded Deer Island Plant.

Not only does the MWRA monitor to comply with the NPDES requirements, the MWRA has its own monitoring programs: Local Limits, Plant Monitoring Program, and Harbor Studies. These studies serve to assure appropriate control of discharges to the system, assure the highest quality of treatment of wastewater, and to assure the quality of life of the organisms living in the receiving bodies of water.

A. Permits and Compliance Order

A.1 NPDES Permit

The MWRA is authorized to discharge under the National Pollutant Discharge Elimination System "in compliance with the provisions of the Clean Water Act, as amended, 33 U.S.C. § 1251 et seq., and the Massachusetts Clean Water Act, as amended, Mass. Gen. Laws, ch. 21, § 266-53, the MWRA is permitted to discharge from (MWRA Publicly Owned Treatment Works, CSO Treatment Facilities, and CSO Outfalls), in accordance with effluent limitations, monitoring limitations, and other conditions..."

Effluent Limitations

The NPDES Permit establishes limitations for all authorized discharges. It also establishes limitations for all CSO treatment facilities.

Monitoring Requirements

The NPDES Permit establishes monitoring requirements for existing POTW outfalls. It also imposes monitoring requirements for CSO treatment facility outfalls. In addition, CSO outfall identification and monitoring requirements and receiving water quality monitoring are mandated.

Reporting Requirements

Certain reports on the state of the MWRA sewerage and operational systems (e.g. Infiltration/Inflow Report, CSO Facilities and Systems Inspection, Operational Upsets, Overflow reports, Operations Bypass Reports, and Maintenance Program), MWRA discharges (e.g. Monthly Discharge Monitoring Reports (DMRs)), effects of discharges (e.g. Annual Bioaccumulation Study), and pretreatment program (e.g. Annual Industrial Waste Report) are required to be sent to the EPA according to a set schedule.

A summary of the Permit limits and monitoring requirements is in Table II-1 for POTWs and Table II-2 for CSOs.

A.2 Court Order

The MWRA is operating under a court order issued in June, 1986. In addition to establishing attainable discharge limits for Deer Island and Nut Island, the court order established a schedule under which the MWRA must comply to upgrade the sewerage system and treatment plants. A summary of the court-ordered Interim limits is presented in Table II-3.

Table II-1

NPDES PERMIT Numerical Effluent Limitations for POTW Outfalls Deer Island and Nut Island			
Effluent Characteristic	Discharge Limitation Average Monthly	Average Weekly	Max Daily
BOD	*	*	*
TSS	*	*	*
Settleable Solids	*	*	*
pH	Not less than 6.5 nor greater than 8.5 at any time to Boston Harbor, Quincy Bay, Hingham Bay, the Inner Harbor, and the Mystic River.		
Fecal Coliform	*	*	*
Total Coliform	*	*	*
Chlorine, Total Residue	(1) The total chlorine residual and other toxic components of the effluent shall not result in any demonstrable harm to aquatic life or violate any state of federal water quality standard which has been or may be promulgated. Upon promulgation of any such standards, this permit may be modified in accordance with such standard. (2) The permittee shall minimize the use of chlorine, still maintaining adequate bacterial control.		
Oil and Grease of Petroleum Origin (TPH)			15 mg/L
NOEC@	10% or greater (Sample which is composed of 10% or greater effluent.)		
LOEC# ; MATC$; LC50&	(a) Chronic Toxicity Tests to Establish the NOEC, LOEC, and MATC- Chronic toxicity tests on representative 24-hour composite samples of the discharge using each of the following organisms:(i) the sheephead minnow, Cyprinodon variegatus (7-day tests to measure growth and survival); and (ii) the red marine alga, Champia parvula (2 to 4 day tests to evaluate the effects on sexual reproduction). The endpoints to be established in the chronic tests are the No Observed Effect Concentration (NOEC), the Lowest Observed Effect Concentration (LOEC), and the Maximum Acceptable Toxicant Concentration (MATC). (b) Acute Static Toxicity Tests to Establish the NOEL and LC50- 96-hour acute static toxicity tests on representative 24-hour composite samples of the discharge shall be conducted using one to five-day-old juvenile mysid shrimp, Mysidopsis bahia, to establish No Observed Acute Effect Levels (NOAEL) and LC50s of the effluents.		
NOAEL~			20% or greater (Sample which is composed of 20% or greater effluent, the remainder being dilution water.)
Other Monitored Parameters			
Pollutants listed in Appendix D of 40 CFR Part 122.			

* Court Ordered Interim Limit applies to this parameter.

@ No Observed Effect Concentration- is the highest concentration of effluent to which organisms are exposed in a life cycle or partial life cycle test which contains no adverse effects (on growth survival, and reproduction).

Lowest Observed Effect Concentration- is the lowest concentration of effluent to which organisms are exposed in a life cycle or partial life-cycle test which causes an adverse effect (on survival, growth, and reproduction).

$ MATC is the Maximum Allowable Toxicant Concentration. It is the effluent concentration that may be present in a receiving water without causing significant harm to productivity or other uses. The MATC is determined by the results of chronic tests of either a partial life-cycle with sensitive life stages or a full life-cycle or the test organism. The MATC is the geometric mean of the No Observed Effect Concentration and the Lowest Observed Effect Concentration.

& LC50 is defined as the concentration effluent in a sample that causes mortality to 50% of the test population at a specific time of observation.

~ No Observed Acute Level is the highest concentration of effluent to which organisms are exposed in a short-term test in which at least 90% of the test organisms survive.

Table II-2

NPDES PERMIT Effluent Limitations and Monitoring Requirements for CSO Treatment Facility Outfalls			
Characteristic	Discharge Limitation Average Monthly	Average Weekly	Maximum Daily
pH	The pH of the effluent shall not be less than (1) 6.5 nor greater than 8.5 at any time to the Inner Harbor and Mystic River (2) 6.5 nor greater than 9.0 at any time to the Charles River		
Fecal Coliform	1000 MPN/100mL	Not more than 10% of the total samples can exceed 2500 per 100mL during any monthly sampling period.	
Chlorine, Total Residual	(1) The total chlorine residual and other toxic components of the effluent shall not result in any demonstrable harm to aquatic life or violate any state or federal water quality standard which has been or may be promulgated. Upon promulgation of any such standard, this permit may be modified in accordance with such standard. (2) The permittee shall minimize the use of chlorine, still maintaining adequate bacterial control.		
Other Monitored Parameters			
Rainfall/Precipitation			
Flow			
BOD*			
TSS*			
Settleable Solids			
NOAEL@	"No Observed Acute Effects Level" (NOAEL) is the highest concentration of effluent to which organisms are exposed in a shot-term test in which at least 90% of the test organisms survive.		
LC50@	"LC50" is defined as the concentration of effluent in a sample that causes mortality to 50% of the test population at a specific time of observation.		
Cadmium@			
Chromium (Hexavalent)@			
Copper@			
Lead@			
Mercury@			
Nickel@			
Zinc@			
Chlorinated Hydrocarbons@			
Ammonia Nitrogen@			
Total Phosphorus@			
Pesticides@			
PAHs@			
VOCs@			

* Report both influent and effluent results for this parameter.

@ Conducted only during the first and fifth year of the permit. Not required to be monitored this period.

Table II-3

COURT ORDERED SEWAGE TREATMENT PLANT INTERIM LIMITATIONS			
Effluent Characteristic	Effluent Limits Average Monthly	Maximum Daily	Percent Removal*
Deer Island			
$BOD_{(5)}$	140 mg/L	200 mg/L	27%
$TSS_{(5)}$	110 mg/L	180 mg/L	38%
Settleable Solids	2.8 mL/L	N/A	N/A
Fecal Coliform	200/100 mL	N/A	N/A
Total Coliform	1000/100 mL	N/A	N/A
pH	The pH of the effluent shall not be less than 6.5 nor greater than 8.5 at any time unless these values are exceeded due to natural causes or as a result of approved modifications of treatment processes.		
Nut Island			
$BOD_{(5)}$	130 mg/L	185 mg/L	15%
$TSS_{(5)}$	110 mg/L	195 mg/L	43%
Settleable Solids	1.8 mL/L	N/A	N/A
Fecal Coliform	200/100 mL	N/A	N/A
Total Coliform	1000/100 mL	N/A	N/A
pH	The pH of the effluent shall not be less than 6.5 nor greater than 8.5 at any time unless these values are exceeded due to natural causes or as a result of approved modifications or treatment processes.		
Other Effluent Limitations			
Chlorine	The Authority shall minimize the use of chlorine consistent with maintaining adequate bacterial control.		
Reduction of Suspended Solids	Volatile suspended solids shall be reduced through anaerobic digestion as follows, with percentage reductions to computed as a two month rolling average: Deer Island 50%, Nut Island 61%.		
Special Monitoring of Oil and Grease	The Authority shall separately measure the concentration of the following by means of a weekly grab sample: Influent oil and grease, effluent oil and grease, digester sludge influent oil and grease, and digester sludge effluent oil and grease.		

* Percent Removal is based on a 12 month running average.

B. Monitoring Programs

In FY94, the MWRA conducted several NPDES-required monitoring activities. These monitoring programs included the NPDES Compliance Monitoring Program, Plant Monitoring Program, and Local Limits Monitoring Program. The Harbor Studies Monitoring Program was a specialized study done to better estimate the quality of effluent and was not required by the NPDES Permit. Monitoring activities required by other MWRA programs were also conducted, but are not included in this report.

B.1 NPDES Compliance Monitoring Program

The NPDES Compliance Monitoring Program is managed by the NPDES Compliance Unit. The program calls for monthly priority pollutant scans and whole effluent toxicity (WET) tests on the Deer Island and Nut Island effluents. Chemical analyses on the Cottage Farm, Prison Point, and Somerville Marginal CSO facility overflows are also conducted. In FY94, the chemical analyses were performed by Energy and Environmental Engineering of Somerville, Massachusetts and Aquatec, Inc. of New Bedford, Massachusetts. The WET tests were performed by Aquatec, Inc. of Colchester, Vermont. Sampling for NPDES compliance was conducted by the Monitoring Section of Toxic Reduction and Control Department (TRAC). Sampling was normally scheduled on the second full week of the month. Sampling took place over six days in order to fulfill the requirements of the chronic 7-day renewal test.

Two automatic samplers were set up three times to collect samples on Day 2, Day 4, and Day 6 of each sampling period. One sampler collected samples for chemical analyses. The other sampler collected samples for toxicity tests. The chemistry samples were analyzed for pollutants listed in Appendix J, Table J.1. Both grab and composite samples were collected during each sampling event. Grab samples were collected for analyses of cyanide, volatile organics, hexavalent chromium, and petroleum hydrocarbons (PHC). Composite samples were analyzed for metals, semi-volatile organics, and pesticides. Analyses were conducted once a month except for PHC analysis, which was conducted once a week.

Sampling at the three permitted CSO facilities was conducted at the first activation of each month for selected priority pollutant analyses and at every activation for conventional parameters analyses.

A list of parameters, sampling frequency, analytical procedures, and other relevant information is presented in Table II-4.

B.2 Plant Monitoring Program

The Plant Monitoring Program, consisting of Process Control and NPDES Monitoring, was conducted by the Deer Island and Nut Island Treatment Plant Laboratories. The treatment plants monitored for plant performance and NPDES compliance daily. This report, however, will only present monitoring data addressing NPDES permit compliance concerns.

Sampling was conducted daily by Laboratory personnel and occasionally by Operations staff. Grab samples were collected at each sampling site at approximately the same time and usually by the same personnel. Daily composite samples were collected by a 24-hour time-composite sampler. Samples were delivered to the laboratory and were analyzed within EPA-prescribed holding times and in accordance with the Deer Island Laboratory Standard Operating Procedures (SOP).

The Deer Island Laboratory, in addition to testing Deer Island samples, also analyzed CSO samples. During each activation, grab samples were collected by CSO facility personnel. Except for samples used for fecal coliform analyses, samples were collected during the first four hours of discharge or any portion of discharges that were less than four hours duration. The samples were collected every fifteen minutes during the first hour and then once after one-and-one-half hour, two hours, three hours, and four hours from the onset of the discharge. For fecal coliform analyses, grab samples were taken during the first two hours of activation, and every eight hours thereafter.

A list of parameters, sampling frequency, analytical procedures, and other relevant information can be found in Table II-5.

B.3 Local Limits Monitoring Program

The Local Limits Monitoring Program was similar to the NPDES Program. Mandated by the Pretreatment Program of the NPDES Permit, samples were collected from Deer Island and Nut Island influent during the same time period as were those for the NPDES Program. The influent samples were analyzed for pollutants listed in Appendix J, Table J.1. A list of parameters, sampling frequency, analytical procedures, and other relevant information is presented in Table II-6.

B.4 Harbor Studies Monitoring Program

The Harbor Studies Monitoring Program, which was conducted from June 1993 to November 1993, was designed to give a better estimate of the concentration of constituents in Deer Island effluent and hence did not use EPA approved methodologies, which are used by the NPDES and TRAC laboratories. Instead, the Battelle methodologies were used. The Batelle methodologies have lower analytical detection levels than the EPA approved methodologies by a magnitude of 1,000. The effluent samples were collected from the Deer Island treatment plant and were analyzed for PAHs, pesticides/PCBs, and eight selected metals.

Table II.4
NPDES Compliance Monitoring Program

Parameter	Type [1]	Frequency	Analytical Method [2]
Metals			
Antimony	Composite	Monthly	204.2
Arsenic	Composite	Monthly	206.2
Beryllium	Composite	Monthly	200.7
Boron	Composite	Monthly	200.7
Cadmium	Composite	Monthly	213.1
Chromium	Composite	Monthly	200.7
Copper	Composite	Monthly	200.7
Lead	Composite	Monthly	239.2
Mercury	Composite	Monthly	245.1
Molybdenum	Composite	Monthly	200.7
Selenium	Composite	Monthly	270.2
Silver	Composite	Monthly	200.7
Thallium	Composite	Monthly	279.2
Zinc	Composite	Monthly	200.7
Cyanide	Grab	3 x Monthly	335.2
Total petroleum hydrocarbon	Grab	Weekly	418.1
Pesticides/PCBs	Composite	Monthly	Modified 608
Semi-volatiles	Composite	Monthly	Modified 625
Volatiles	Composite	3 x Monthly	Modified 624

1 Composite samples are 24-hour time composite
2 EPA methods

Table II.5
Deer Island and Nut Island Treatment Plants Monitoring Program

Parameter	Type[1]	Frequency	Analytical Method [2]
Conventional			
pH	Grab	Daily	150.1
Settleable Solids	Grab	Daily	160.5
Biochemical Oxygen Demand	Composite	Daily	405.1
Total Suspended Solids	Composite	Daily	160.2
Total Coliform	Grab	3 times Daily	9222 D [3]
Fecal Coliform	Grab	3 times Daily	9222 B [3]
Oil and Grease	Grab	Weekly	413.1
Total Chlorine Residual	Grab	3 times daily	330.5
Chlorides	Composite	Daily	4500 B [3]
Metals			
Arsenic	Composite	Monthly	206.2
Cadmium	Composite	Monthly	213.1
Chromium	Composite	Monthly	218.1
Copper	Composite	Monthly	220.1
Lead	Composite	Monthly	239.1
Mercury	Composite	Monthly	245.1
Nickel	Composite	Monthly	249.1
Silver	Composite	Monthly	272.1
Zinc	Composite	Monthly	289.1
Iron	Composite	Monthly	236.2
Nutrients			
Total Kjeldahl Nitrogen	Composite	Monthly	351.3
Ammonia	Composite	Monthly	350.2
Nitrates	Composite	Monthly	353.3
Nitrites	Composite	Monthly	354.1
Orthophosphorus	Composite	Monthly	365.2
Total Phosphorus	Composite	Monthly	365.2

1 Composite samples are 24-hour time composite except for samples for metals analyses.
2 EPA methods
3 Standard Methods

Table II.6
Local Limits Monitoring Program

Parameter	Type [1]	Frequency	Analytical Method [2]
Metals			
Antimony	Composite	3 x Monthly	204.2
Arsenic	Composite	3 x Monthly	206.2
Beryllium	Composite	3 x Monthly	200.7
Boron	Composite	3 x Monthly	200.7
Cadmium	Composite	3 x Monthly	213.1
Chromium	Composite	3 x Monthly	200.7
Copper	Composite	3 x Monthly	200.7
Lead	Composite	3 x Monthly	239.2
Mercury	Composite	3 x Monthly	245.1
Molybdenum	Composite	3 x Monthly	200.7
Selenium	Composite	3 x Monthly	270.2
Silver	Composite	3 x Monthly	200.7
Thallium	Composite	3 x Monthly	279.2
Zinc	Composite	3 x Monthly	200.7
Cyanide	Composite	3 x Monthly	335.2
Pesticides/PCBs	Composite	3 x Monthly	608
Semi-volatiles	Composite	3 x Monthly	625
Volatiles	Composite	3 x Monthly	624

1 24-hr composite
2 EPA Methods

III. An Overview of the MWRA Sewerage System and Facilities

The MWRA is responsible for the collection, transport, pumping, treatment, and disposal of sewage. The MWRA serves 45 communities with a total population of over 2.0 million people, over 5,500 businesses, and over 1,400 industries. Over 5,400 miles of town and city-owned local sewers connect at over 1,800 points to over 230 miles of MWRA interceptor sewers. Also included in the vast sewerage system are nine pumping stations, four headworks, three treatment plants, over 80 combined sewer outfalls, and six CSO treatment facilities. One of the treatment plants serves the Town of Clinton and the Lancaster Sewer District under special arrangements originating at the time the MDC acquired land in Clinton for the Watchusett Reservoir. The Clinton Treatment Plant operates under a permit separate from the Boston NPDES permit and will not be discussed in this report.

The sewerage system is divided into two major regions: the North and the South. The North System serves a population of about 1.3 million and is located to the north and west of Boston. The South System serves a population of about 0.70 million and is located to the south and southwest of Boston. Most of the sewerage system is separate. Portions of Boston, Cambridge, Somerville, and Chelsea, however, still have combined sewers.

The MWRA operates three treatment plants. Two of these plants, Deer Island in Winthrop and Nut Island in Quincy, serve the 43 communities in the sewerage system and are allowed to discharge under the Boston NPDES Permit. Deer Island provides primary treatment to sewage flows from the Northern System. Effluent is discharged through outfalls to the President Roads in Boston Harbor. Nut Island provides primary treatment to sewage flows from the South System. The effluent is discharged through outfalls to Nantasket Roads Channel in Boston Harbor.

Nine pumping stations move wastewater from low lying areas to the MWRA sewer system. The pumping stations are Alewife Brook in West Somerville, Braintree/Weymouth in Quincy, DeLauri in Charlestown, Caruso in East Boston , Hingham, Houghs Neck in Quincy, Quincy, Hayes in Wakefield, and Squantum in North Quincy.

Sewage from the MWRA interceptors serving the North System is screened at three major headworks located at Ward Street in Roxbury, Columbus Park in South Boston, and Chelsea Creek in Chelsea. Another headwork, Winthrop, which screens sewage from the town of Winthrop, is located on Deer Island. Sewage from the South System is screened at Nut Island.

The conditions for discharge of effluent from three CSO chlorination facilities are also included in the Boston NPDES Permit. These three CSO chlorination facilities are Cottage Farm in Cambridge, Prison Point in Cambridge, and Somerville Marginal in Somerville. These facilities discharge to the Charles River, the Inner Harbor, and the Mystic River respectively. Three other CSO chlorination facilities, Constitution Beach in East Boston, Fox Point in Dorchester, and Commercial Point in Dorchester, are owned and operated by the MWRA. Effluent from these facilities discharge to BWSC lines and are included in the BWSC NPDES permit. The six CSO facilities provide treatment for approximately 50% of the CSO volume. Figure III.1 is a schematic of a typical CSO treatment facility. Table III.1 lists the MWRA treatment facilities and relevant information pertaining to each facility.

A. Treatment Plants

A.1 Deer Island

The Deer Island Treatment Plant (DI), in operation since June of 1968, serves 22 communities and portions of Boston, Brookline, Newton, and Milton, encompassing an area of approximately 168 square miles.

Four MWRA pumping stations are located throughout the contributing area. Three remote headworks, Chelsea Creek, Ward Street, and Columbus Park, are connected to the DI main pumping station by deep rock tunnels. Wastewater from the various pumping stations arrives at the treatment plant through these headworks and wastewater from the town of Winthrop arrives at the plant through the Winthrop terminal. These headworks provide the screening and grit-removal phase of treatment. Residuals from the headworks are sent to a landfill. The Deer Island Treatment Plant was designed to provide primary treatment for an average daily flow of 343 million gallons per day (MGD) and a peak flow of 925 MGD.

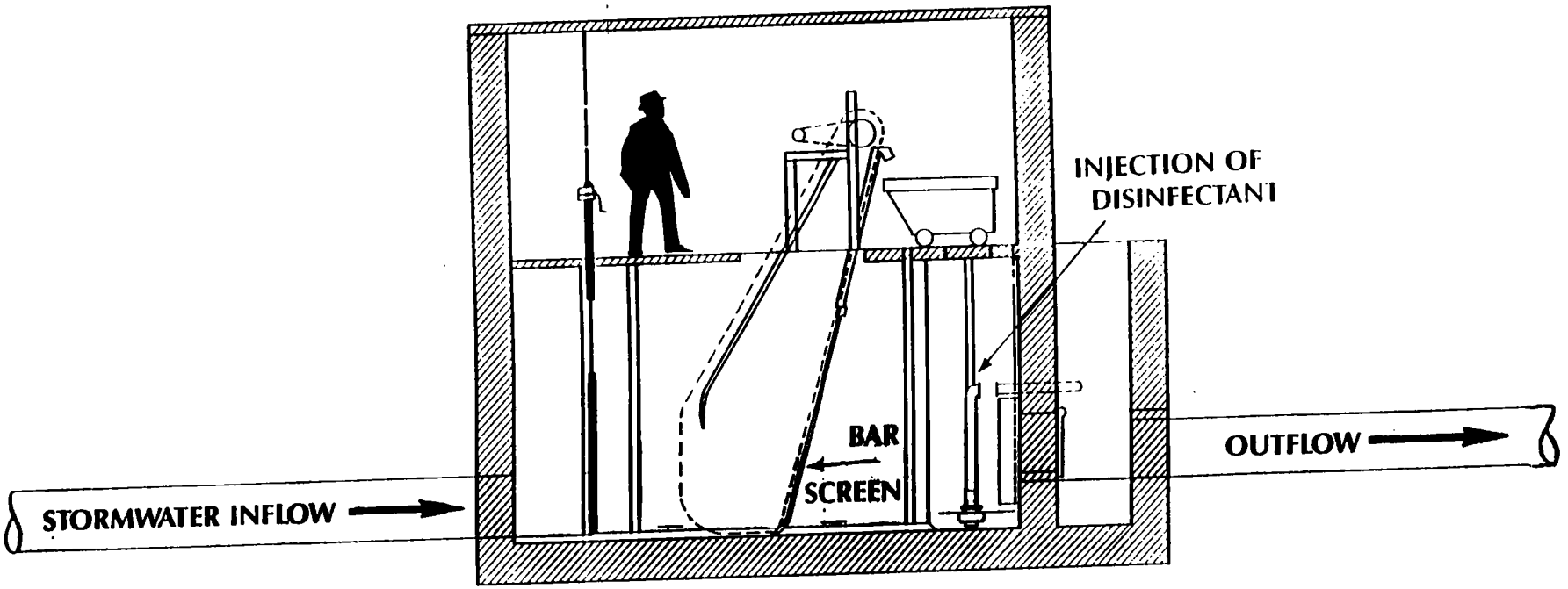


Figure III.1 Combined Sewer Overflow Facility Treatment Schematic

Table III.1 List of Treatment Facilities and Discharge Locations

Facility Name	Location	First year of Operation	Treatment Process	Design Flow (MGD)	Conduit Size At Facility In	Conduit Size At Facility Out	Outfall Number	Receiving Water
POTW Deer Island	Deer Island Boston, MA (North System)	1968	Screening Sedimentation Chlorination	343		9'x 10' 6'x 6.5' BLOCKED 9' Dia 9' Dia	MWR001 MWR002 MWR003 MWR004 MWR005	Boston Harbor
Nut Island	147 Sea St. Quincy, MA (South System)	1952	Screening Sedimentation Chlorination	112		5'Dia 5'Dia 5'Dia 5'Dia	MWR101 MWR102 MWR103 MWR104	Boston Harbor
CSO FACILITIES Cottage Farm	Memorial Dr. near Boston University Bridge, Cambridge	1971	Screening Settling Chlorination Detention	233	72" N. Charles Relief 42" S. Charles Relief 54" Brookline	96" Outfall	MWR201	Charles River
Prison Point	Near Museum of Science Bridge, Cambridge	1980	Screening Settling Chlorination Detention	385	10' Conduit	8' Conduit	MWR203	Inner Harbor
Somerville Marginal	McGrath Highway under Route I-93, Somerville	1973*	Screening Chlorination	245	7' x 7.5' Conduit 84" Conduit	6' x 8' Conduit	MWR205	Mystic River
Constitution Beach	Off Shore St. East Boston	1987	Screening Chlorination	20	36" Conduit	36" Conduit	BOS002	Boston Harbor
Fox Point	Freeport Street near Southeast Expressway, Dorchester	1989	Screening Chlorination	119	10' x 12' Conduit	10' x 12' Conduit	BOS089	Dorchester Bay
Commercial Point	Victory Road Dorcester	1991	Screening Chlorination	194	15' x 11' Conduit	15' x 11' Conduit	BOS090	Dorchester Bay

* Rehabilitated in 1988
MWR refers to MWRA
BOS refers to BWSC

Figure III.2 presents the process flow diagram of the plant. As of FY94 the Deer Island treatment procedure include:

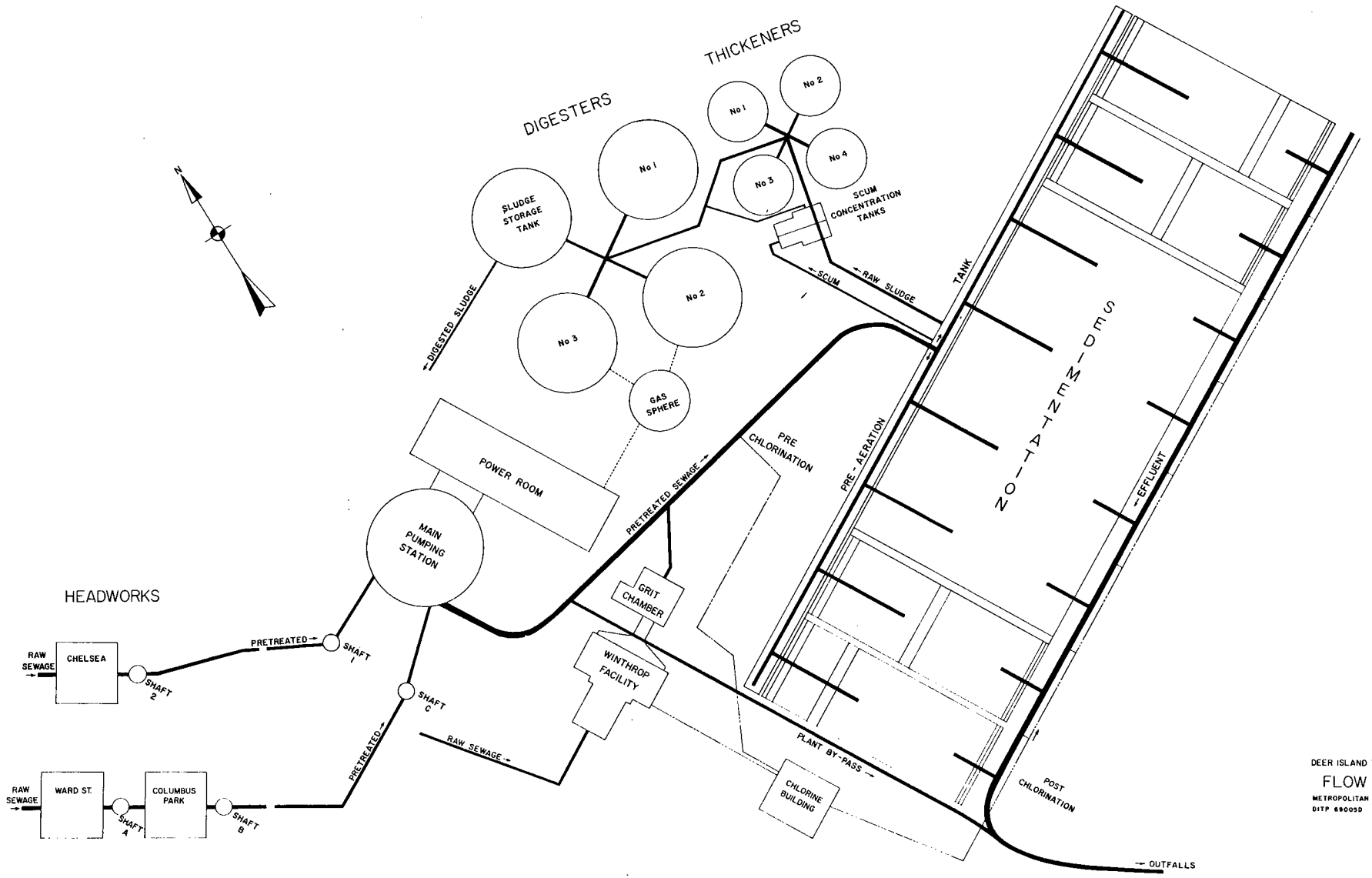
- screening and grit removal (done at the headworks)
- prechlorination
- preaeration
- primary settling
- disinfection

The facility consists of a preaeration channel, eight sedimentation tanks, four thickeners, and four digesters. Wastewater flows through the preaeration channel where air is introduced to help in the settling process and to avoid odor problems. The wastewater flows to sedimentation tanks where floatables, consisting mainly of oil, grease, and plastics, rise to the surface while the sludge, consisting of heavy solid particles, settles to the bottom. The floatables (scum) are skimmed off the top while the settled solids (sludge) is scraped off the bottom. Scum is pumped to the scum concentrator while the sludge is pumped to the sludge thickeners. After the scum and sludge are concentrated and thickened, they are conveyed to the anaerobic digesters for further treatment. The digested sludge (and scum) is barged to the Fore River Pelletizing Plant where it is converted into fertilizer pellets.

Effluent is disinfected with sodium hypochlorite prior to discharge to the Harbor through one long submerged line with five outfall pipes designated 001 to 005. Only two of the five permitted outfall pipes are used daily, 001 and 002. Outfall 003 is permanently blocked and outfall 004 is used only during extreme high flows. Outfall 005 can be activated if the need ever arises. Figure III.3 shows the DI outfall system schematic.

Construction activities for the new secondary treatment plant continue. As of FY 1994 84% of the design and 55% of the construction has been completed. In 1995 the new primary plant is expected to be in full operation. In 1996 the first two batteries of secondary treatment will become operational. One more battery of secondary treatment has been recommended and is scheduled for completion by 1999.

Figure III.2 Deer Island Treatment Plant Flow Diagram



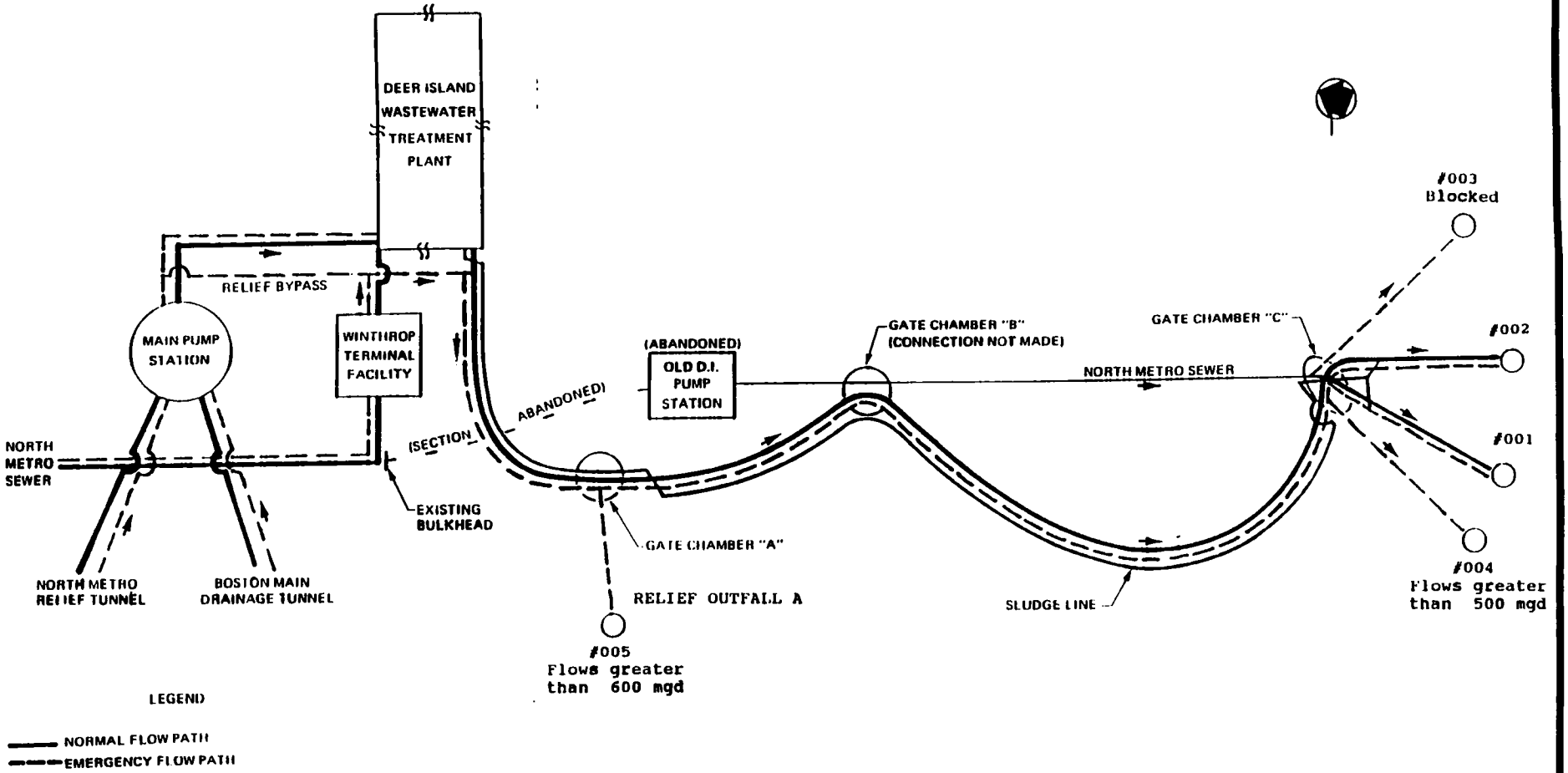


Figure III.3 Deer Island Outfall System Schematic

A.2 Nut Island

The Nut Island Treatment Plant (NI), in operation since 1952, serves 21 communities in the southern portion of the Sewerage System and parts of Boston, Brookline, Newton, and Milton. The area served by NI is approximately 238 square miles. Five MWRA pumping stations are located throughout the contributing area.

The Nut Island plant was designed to provide primary treatment for an average daily flow of 112 MGD and a peak flow of 230 MGD. Figure III.4 presents the NI process flow diagram. Current treatment processes include:

- screening and grit removal
- prechlorination
- preaeration
- primary settling
- disinfection

Nut Island consists of two bar screens, six grit chambers, five preaeration tanks, six sedimentation tanks, and four digesters. Unlike at DI, screening and grit removal is accomplished at the plant. Wastewater entering NI passes through bar screens and grit chambers. Grit and screenings are sent to a landfill.

Wastewater is pumped to the preaeration channels and then flows by gravity through the sedimentation tanks. Scum is skimmed off the top and sent to a landfill. Sludge is scraped from the bottom and pumped to the anaerobic digesters for further treatment. The digested sludge is barged to the Fore River Pelletizing Plant where it is converted to fertilizer pellets.

Effluent is disinfected with chlorine gas prior to discharge. Outfalls 101, 102, and 103 discharge to Boston Harbor. Outfall 104 discharges to Hingham Bay. Figure III.5 shows the NI outfall system schematic.

Construction activities to retrofit NI into a headwork for the new Deer Island secondary treatment plant are progressing. The project is expected to be completed by September 1995.

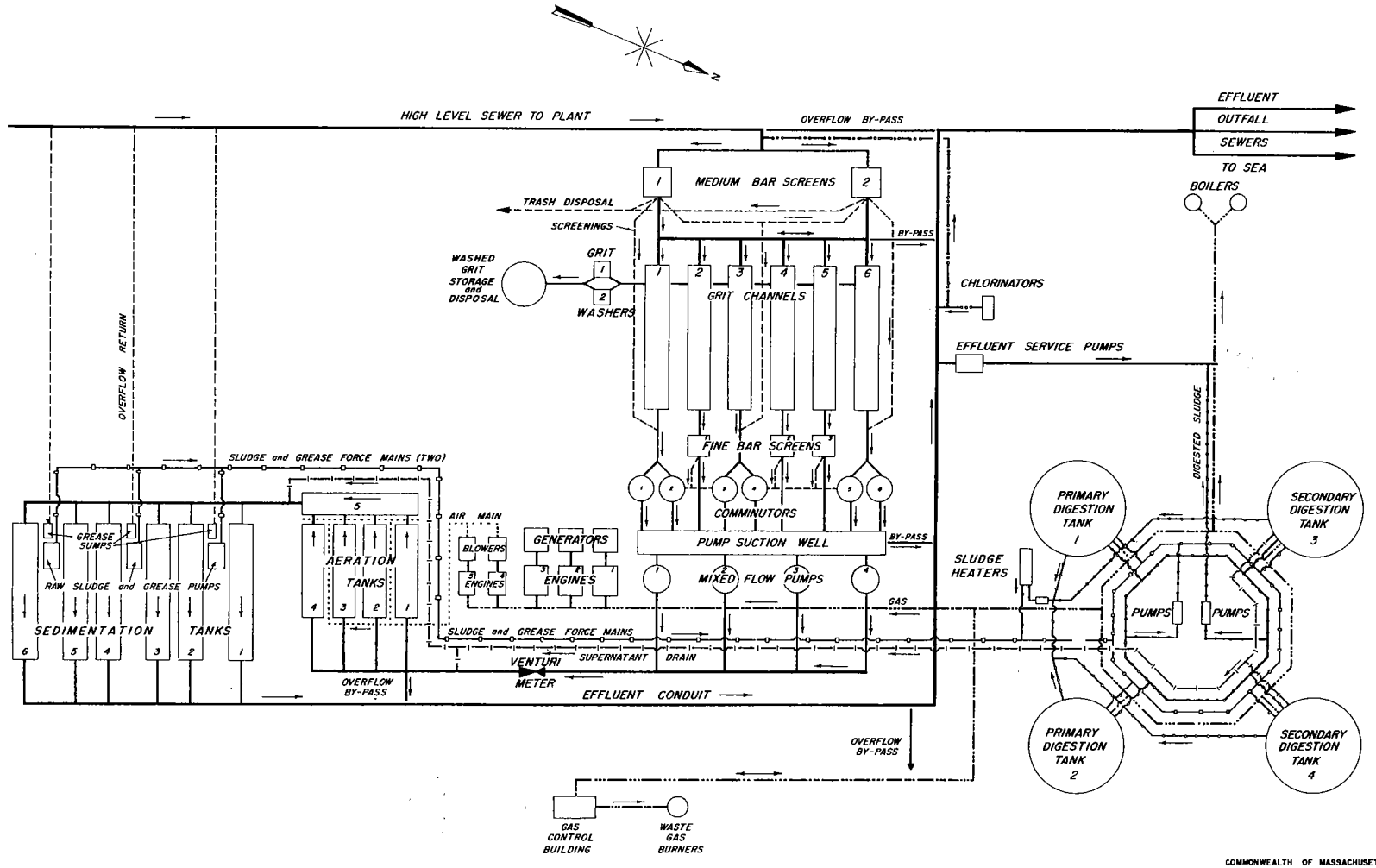
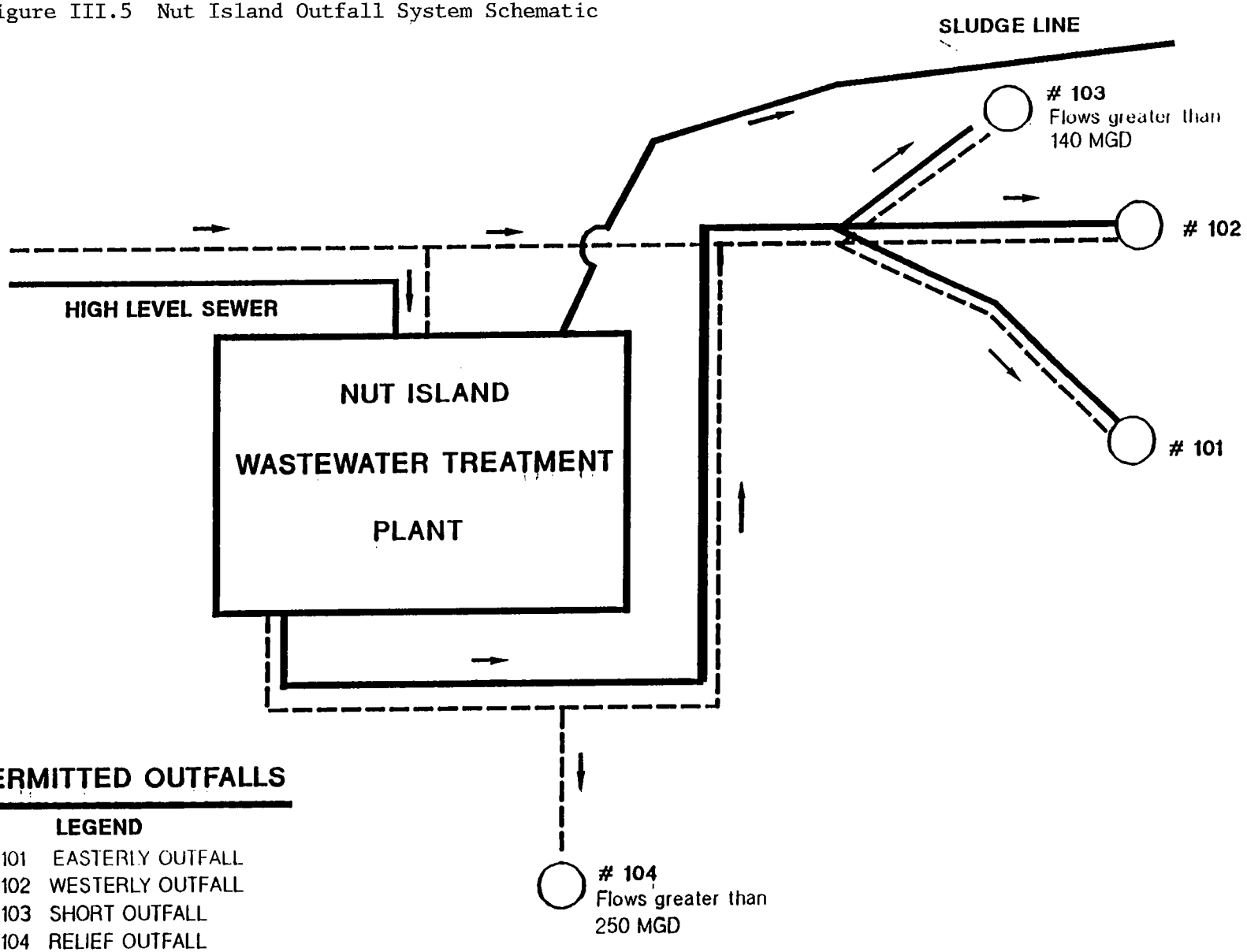


Figure III.4 Nut Island Treatment Plant Flow Diagram

Figure III.5 Nut Island Outfall System Schematic



B. Combined Sewer Overflow Facilities

B.1 Cottage Farm Combined Sewer Overflow Facility

During dry weather conditions wastewater arrives at the Ward Street Headwork where it is pumped to the Deer Island plant. Under storm conditions, when the sewer line and Deer Island capacity are exceeded, wastewater is choked at the Ward Street Headwork facility. As a result, wastewater backs up to the Cottage Farm CSO facility. Wastewater is retained at Cottage Farm up to a volume of 1.3 MG. Any excess flow is screened, settled, chlorinated, and discharged to the Charles River through outfall MWR201. This facility, on line since 1971, has a design capacity of 233 MGD.

B.2 Prison Point Combined Sewer Overflow Facility

Prison Point, like Cottage Farm, is a dry weather and stormwater pumping station. The dry weather phase is a five MGD capacity sewer pumping station which discharges to a sewer in Charlestown. The dry weather discharge eventually flows to the Deer Island Plant. The stormwater phase has a maximum capacity of 385 MGD and treatment includes screening, detention, and chlorination. The combined flow after screening is chlorinated and discharged downstream below the new Charles River Dam at outfall MWR203. This facility came on line in 1980.

B.3 Somerville Marginal Combined Sewer Overflow Facility

Somerville Marginal CSO is an unmanned gravity facility with a design capacity of 245 MGD. Unlike Cottage Farm or Prison Point, this facility does not provide any detention capacity during storm conditions. Treatment consists of screening and chlorination. The effluent is discharged to the lower Mystic River basin at outfall number MWR205. This facility came on line in 1973 and was upgraded in 1988.

B.4 Constitution Beach Combined Sewer Overflow Facility

Constitution Beach is an unmanned gravity facility with a design capacity of 20 MGD. Treatment includes screening and disinfection. The effluent is discharged to a BWSC line that ultimately discharges to Boston harbor through BOS002.

This outfall is included in the BWSC permit. Since the issuing of that permit, full ownership of Constitution Beach CSO Facility has been transferred to the MWRA. It is expected that Constitution Beach CSO Facility will be included in the MWRA NPDES permit when the MWRA NPDES permit is reissued. This facility came on line in 1987.

B.5 Fox Point Combined Sewer Overflow Facility

Fox Point is an unmanned gravity CSO facility with a design capacity of 119 MGD. Operation of this facility is very similar to that of the Constitution Beach CSO; treatment includes screening and disinfection. The effluent is discharged to a BWSC sewer line that discharges to Dorchester Bay through BOS089. This outfall is included in the BWSC permit. This facility came on line in 1989.

B.6 Commercial Point Combined Sewer Overflow Facility

Commercial Point is an unmanned gravity CSO with a design capacity of 194 MGD. Treatment includes screening and chlorination. Effluent is discharged to a BWSC line that ultimately discharges to Dorchester Bay through BOS090. This outfall is included in the BWSC permit. This facility came on line in 1991.

IV. Monitoring Results and Discussion

Section IV embodies the main objective of the FY94 Report - to present and discuss monitoring results. The results are analyzed through tables, text, and graphs to provide a practical look at the monitored constituents of MWRA wastewater in FY94. Historical data are provided to keep track of trends and to flag any abnormalities.

Influent and effluent characteristics from the treatment plants, Deer Island and Nut Island, are discussed at length in this section. The influent characteristics presented are flow, conventional parameters, nutrients, and priority pollutants (metals, cyanide, pesticides/PCBs, and organic compounds). The effluent characteristics presented are conventional parameters, nutrients, priority pollutants, whole effluent toxicity, and the 1993 Deer Island Effluent Bioaccumulation Study.

In addition to Deer Island and Nut Island results, data from Cottage Farm, Prison Point, and Somerville Marginal including activations, conventional parameters, priority pollutants, priority pollutant loadings, and compliance are presented.

Finally, data from the three BWSC-permitted CSO facilities, Constitution Beach, Fox Point, and Commercial Point that are only monitored for operational parameters and are also presented in Section IV.

A. Deer Island

A.1 Influent Characteristics

A.1.a Flow

In FY94, the average flow reaching the Deer Island plant was 249 MGD. The minimum flow recorded was 171 MGD. The maximum flow, recorded on March 22, was 528 MGD and happened after a heavy rainfall that measured 1.21 inches. The combination of the heavy rain and snowmelt produced the maximum flow. Because some towns in the North System still have combined sewers, the amount of flow reaching the Deer Island Plant depends on the intensity and duration of the rainfall event.

In December, the above average flow of 272 MGD was attributed to high-intensity rainfall events (6.6 inches total rainfall). In April, the high flow of 287 MGD was attributed to snowmelt. Other high flows (as in January and March) were due to both heavy precipitation and snowmelt. Figure IV.A.1 illustrates the flow characteristics in FY94.

In FY94, there was only a 7% decrease in the amount of flow going through the plant compared to FY93 (Figure IV.A.2) even though the amount of precipitation decreased by a considerable amount (3.82 inches). Average flows to Deer Island plant have been in a downward trend over the past five years except for FY93 (Figure IV.A.3). During the winter months and early spring, the average daily flow to the plant was similar when compared to historical data; however, starting in early summer and extending to late fall, the average daily flows were noticeably lower. Figure IV.A.3 illustrates the relationship between average daily flow and the total precipitation for the last seven years.

A.1.b Conventional Parameters

Results of Deer Island Laboratory monitoring for influent, effluent, and residuals are presented in Appendix A, Table A-1, Deer Island Treatment Plant Operations Summary. Table IV.A.1 provides an overview of the influent loadings to the Deer Island plant. The table shows the BOD and TSS influent loading in FY94 to be comparable to the FY92 but slightly lower than FY93 data. For example, in FY94, the influent BOD loading was approximately 13% lower and the TSS loading was 20% lower than FY93.

Although oil and grease concentrations showed a 24% decrease from FY93 data and an approximate 50% decrease from FY92, it is suspected that there was no real reduction in oil and grease concentration over the years. From February 1993 on, the analytical procedure employed for the analysis of oil and grease was one designated for water and wastewater samples. Prior to that time, the analysis used was one designated for solids samples. The two methods are very similar, the one significant difference between the two methods being that the amount of time needed to digest the samples was longer for solid samples. As expected, the analytical results were higher with the solids analysis procedure. It is suspected therefore, that there was no real reduction in oil and grease concentration over the past years.

FIGURE IV.A.1 DEER ISLAND FLOWS VS PRECIPITATION
FY94

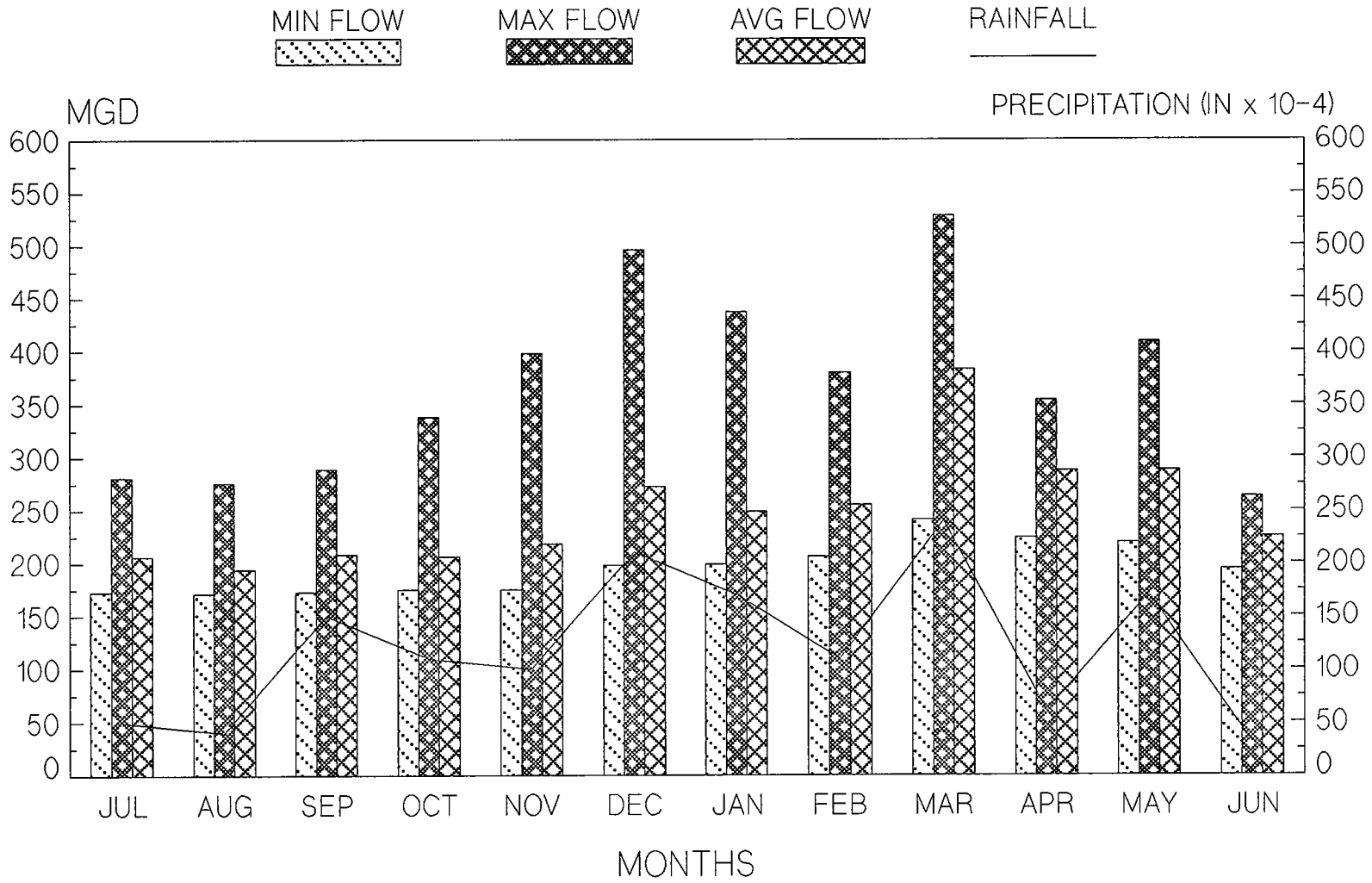


Figure IV.A.2 Deer Island FY94 Average Flows Compared to Historical Data

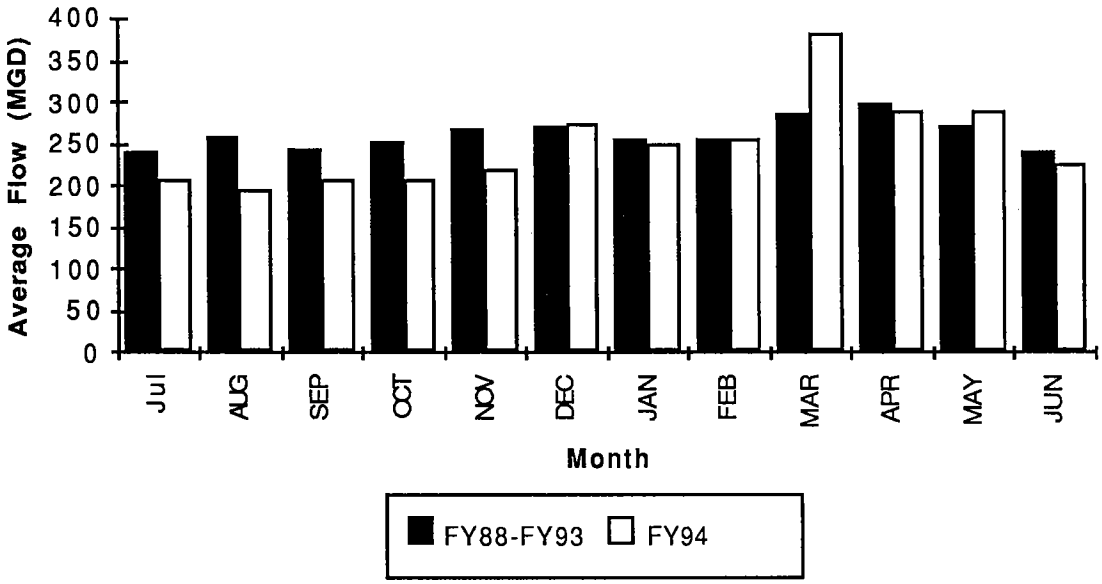


Figure IV.A.3 Deer Island Average Daily Flow Compared to Precipitation

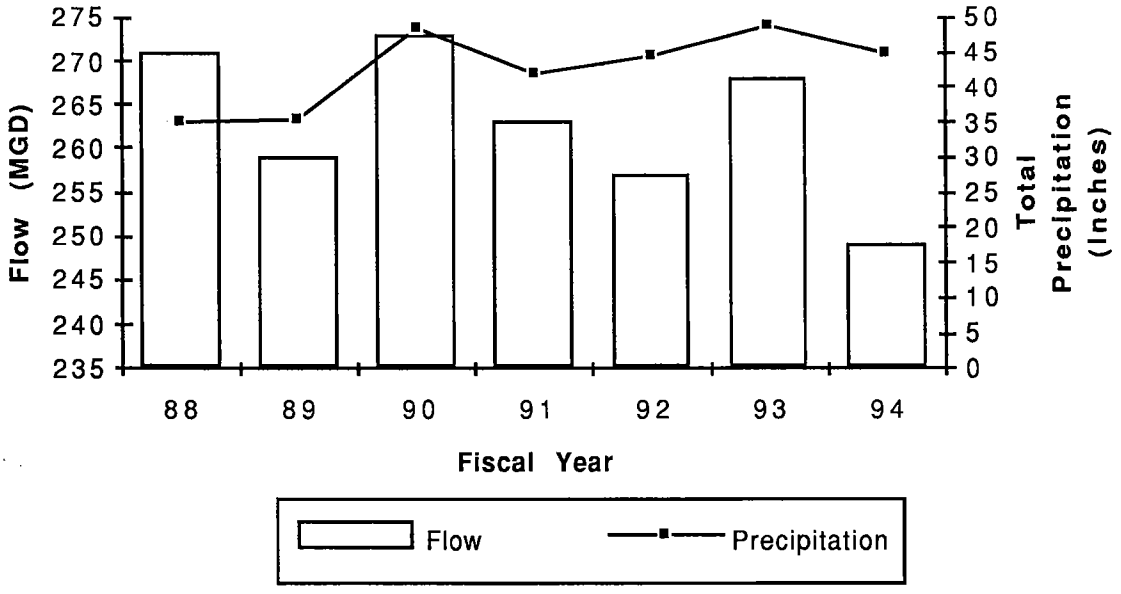


Table IV.A.1 Deer Island Influent Characterization, FY 1994

PARAMETER	FY94	FY93	FY92
Flow (MGD)			
Minimum	171	174	166
Average	249	266	257
Maximum	528	628	582
Total Suspended Solids			
Min Conc (mg/L)	93	121	113
Ave Conc (mg/L)	137	153	132
Max Conc (mg/L)	175	193	170
Average Loading (lbs/d)	284502	339421	282926
Biochemical Oxygen Demand			
Min Conc (mg/L)	99	123	123
Ave Conc (mg/L)	149	159	146
Max Conc (mg/L)	175	190	169
Average Loading (lbs/d)	309422	352732	312933
Settleable Solids			
Min Conc (mg/L)	1.9	1.4	3.1
Ave Conc (mg/L)	3.9	3.7	3.0
Max Conc (mg/L)	5.6	5.0	3.9
Average Loading (lbs/d)	8099	8208	6430
Oil and Grease			
Min Conc (mg/L)	14	20	28
Ave Conc (mg/L)	36	43	64
Max Conc (mg/L)	64	84	127
Average Loading (lbs/d)	74760	95393	137176
Total Kjeldahl Nitrogen		*	**
Min Conc (mg/L)	11.2	13.9	
Ave Conc (mg/L)	21.9	26.9	
Max Conc (mg/L)	29.3	44.7	
Average Loading (lbs/d)	45479	59676	

Table IV.A.1 (cont)

PARAMETER	FY94	FY93	FY92
Ammonia-Nitrogen		*	**
Min Conc (mg/L)	5.6	6.8	
Ave Conc (mg/L)	12.3	13.4	
Max Conc (mg/L)	17.9	17.9	
Average Loading (lbs/d)	25543	29727	
Nitrates		*	**
Min Conc (mg/L)	0.100	0.13	
Ave Conc (mg/L)	0.800	0.70	
Max Conc (mg/L)	2.700	2.15	
Average Loading (lbs/d)	1661	1553	
Nitrites		*	**
Min Conc (mg/L)	0.000	0.02	
Ave Conc (mg/L)	0.100	0.06	
Max Conc (mg/L)	0.200	0.13	
Average Loading (lbs/d)	208	133	
Orthophosphorus		*	**
Min Conc (mg/L)	0.400	2.04	
Ave Conc (mg/L)	2.300	2.04	
Max Conc (mg/L)	5.100	2.04	
Average Loading (lbs/d)	4776	4519	
Total phosphorus		*	**
Min Conc (mg/L)	0.600	2.63	
Ave Conc (mg/L)	4.000	6.04	
Max Conc (mg/L)	8.300	9.07	
Average Loading (lbs/d)	8307	13399	

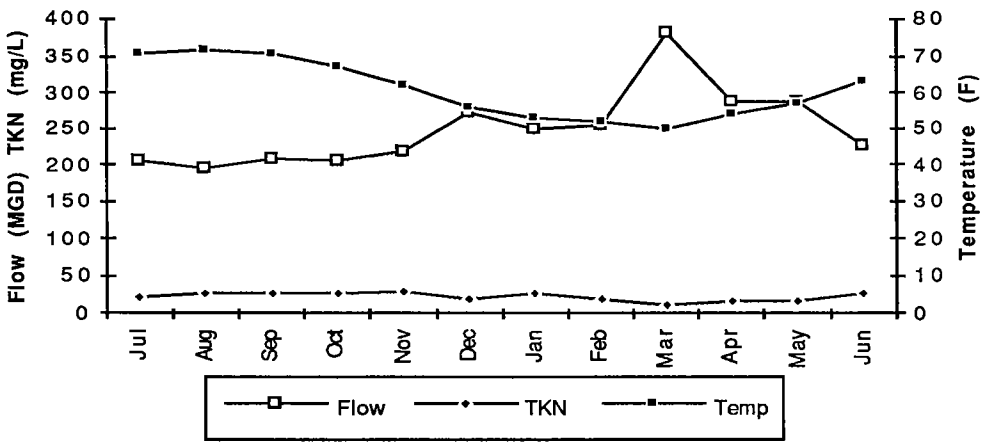
* Summary of weekly analyses starting in April 11 and ending in June 30.

** Not Analyzed

A.1.c Nutrients

Nitrogen in wastewater influent mainly exists in the form of ammonia and organic nitrogen, together called Total Kjeldahl nitrogen (TKN). Other forms of nitrogen found in wastewater are nitrites and nitrates. Figure IV.A.4 compares the influent TKN concentration, flow, and wastewater temperature. The TKN values were lower in late winter to early spring than they were in the late fall. This pattern runs contrary to the flow pattern; flows were higher in the late winter to early spring than they were in the summer and fall. When compared to wastewater temperatures, the TKN values (except for the month of January) followed the same trend; they were lower with lower temperatures. Phosphorus values followed the same pattern as the TKN values. Phosphorus concentrations were about 5-6 times lower than the TKN concentrations.

Figure IV.A.4 Deer Island Influent Flow and TKN Compared to Wastewater Temperature



A.1.d Priority Pollutants

Two sets of influent priority parameters data were gathered during FY94, the Deer Island Laboratory and the Local Limits. The Deer Island Laboratory only measured the concentration of select metals. The Local Limits Study conducted a complete priority pollutant scan. The results of these analyses are presented in Appendix A, Tables A-1 and A-2 respectively.

Metals The influent data consistently showed measurable amounts of copper and zinc. Lead, copper, chromium, beryllium, and zinc were detected more than 50% of the time. Other metals were occasionally detected at very low concentrations and reported values were between the method detection and quantitation limits. These values are often referred to as "J" values, estimated values below the reporting or quantitation limits. The method detection limit is the smallest amount of a substance that can be detected above background noise by following a particular method of analysis. The reporting or quantitation limit is the smallest concentration that can be quantified. It is the smallest concentration where the linear relationship between pollutant concentration and instrument response (Appendix I). Substituting half the quantitation limit for below detection level (BDL) values to derive average values may have artificially raised the average concentration.

Table IV.A.2 compares the data from the Local Limits and Deer Island influent metal concentrations. Lead, mercury, and nickel compare well. The concentrations of all other metals, except copper and cadmium, were higher in Local Limits results than in Deer Island results. It is suspected that the seemingly big difference between the results of the two studies lie in the method detection limit employed by each laboratory.

Table IV.A.2 Deer Island FY94 Influent Metals Concentrations Compared

Metals	Mean Concentration (mg/L) Local Limits Data * *	Deer Island Lab Data *
Arsenic	0.003	0.007
Chromium	0.009	0.012
Copper	0.080	0.063
Cadmium	0.002	0.001
Lead	0.020	0.019
Mercury	0.0004	0.0004
Nickel	0.011	0.012
Silver	0.003	0.006
Zinc	0.103	0.161

* Half the MDL was substituted for measurements that were below detection.

Historical metal loadings, calculated from the Deer Island laboratory data, are presented in Figure IV.A.5. The metal loadings to the facility were high in the late 80s and have leveled off over the past five years. The decrease in loadings values was not necessarily due to lower concentrations of contaminants; rather, it was probably due to decreased flows and lower calculated average concentrations brought about by lower detection levels.

Cyanide Cyanide was detected in nine of 27 samples and was detected in the samples collected in the winter months. Most often, cyanide was detected when the influent was prechlorinated. It is theorized that the readings were false positives due to analytical interference. CN analyses are subject to a number of interferences. Sulfides, fatty acids, aldehydes, and other oxidizing agents, all of which are found naturally in wastewaters, are known to interfere in the analyses. Without proper sample pretreatment, the presence of these compounds will result in erroneous data.

Pesticides/PCBs There were several pesticides/PCBs detected in the 27 Local Limits samples: lindane was detected in eight; DDT and DDE in three; and alpha-BHC, beta- BHC, chlordane, and heptachlor in two.

Organic Compounds Of the semivolatiles, phthalates, 4-methyl phenol, benzoic acid, phenols, benzyl alcohol, naphthalene, 2-methyl naphthalene, and phenanthrene were estimated to be present. Of the volatile organic compounds, acetone, methylene chloride, trichloroethenes, tetrachloroethenes, and xylenes were detected.

A.2 Effluent Characteristics

A.2.a Conventional Parameters

The effluent characteristics for conventional parameters are presented in Appendix A, Table A-1 and are summarized in Table IV.A.3. The average concentrations of conventional parameters have remained constant over the past three years except for oil and grease, which was much higher in FY92. The discrepancies in the oil and grease concentrations were primarily caused by a change in analytical methods used. See section A.1.b.

Figure IV.A.5 Deer Island Influent, Mean Metal Loadings
1988 - 1994 Deer Island Laboratory

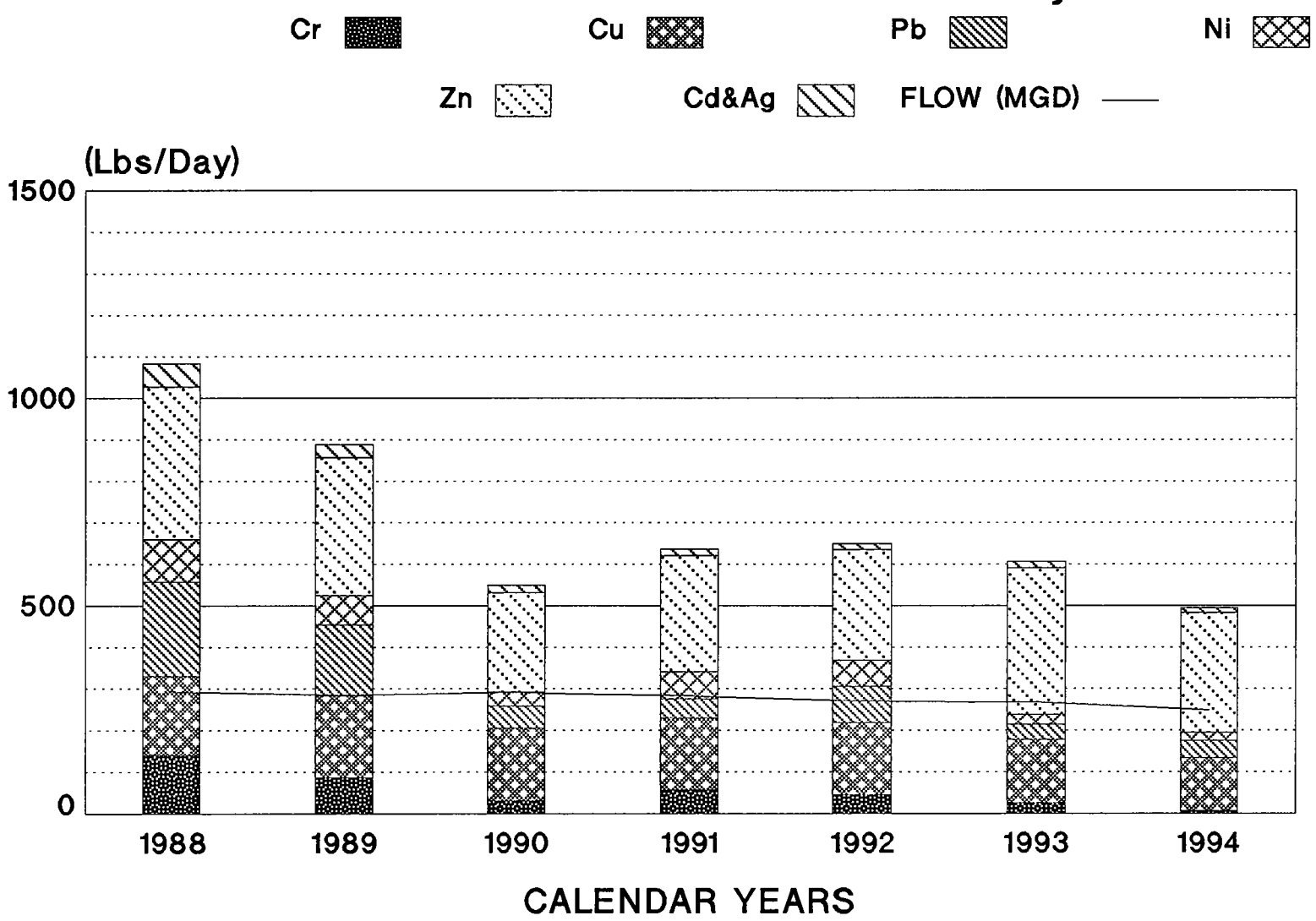


Table IV.A.3 Deer Island Effluent Characterization, FY 1994

Parameter	FY94	FY93	FY92
Flow (MGD)			
Minimum	171	174	166
Average	249	266	257
Maximum	528	628	582
Total Suspended Solids			
Min Conc (mg/L)	65	58	65
Ave Conc (mg/L)	73	70	70
Max Conc (mg/L)	86	77	77
Average Loading (lbs/d)	151596	155291	150037
Biochemical Oxygen Demand			
Min Conc (mg/L)	87	89	103
Ave Conc (mg/L)	123	128	130
Max Conc (mg/L)	142	152	147
Average Loading (lbs/d)	255429	283960	278639
Settleable Solids			
Min Conc (mg/L)	0.1	0.1	0.1
Ave Conc (mg/L)	0.5	0.3	0.2
Max Conc (mg/L)	0.9	0.5	0.4
Average Loading (lbs/d)	976	643	493
Oil and Grease			
Min Conc (mg/L)	12.3	15	22
Ave Conc (mg/L)	25	27	44
Max Conc (mg/L)	36	37	67
Average Loading (lbs/d)	51917	59898	94309
Total Kjeldahl Nitrogen			
Min Conc (mg/L)	12.8	14.9	10
Ave Conc (mg/L)	21.7	22.2	21
Max Conc (mg/L)	32.8	26.2	27.7
Average Loading (lbs/d)	45064	49249	45011

PARAMETER	FY94	FY93	FY92
Ammonia			
Min Conc (mg/L)	6.08	7.59	6.3
Ave Conc (mg/L)	12.58	12.35	11.7
Max Conc (mg/L)	18.51	15.7	15.3
Average Loading (lbs/d)	26124	27398	25078
Nitrates			
Min Conc (mg/L)	0.13	0.05	0.20
Ave Conc (mg/L)	1.04	0.66	1.17
Max Conc (mg/L)	5.98	1.63	3.70
Average Loading (lbs/d)	2160	1453	2501
Nitrites			
Min Conc (mg/L)	0.01	0.02	0.00
Ave Conc (mg/L)	0.10	0.16	0.56
Max Conc (mg/L)	0.26	0.48	1.80
Average Loading (lbs/d)	208	357	1196
Orthophosphorus			
Min Conc (mg/L)	0.48	0.98	1.80
Ave Conc (mg/L)	2.15	2.27	2.53
Max Conc (mg/L)	4.09	3.59	3.30
Average Loading (lbs/d)	4465	5036	5431
Total phosphorus			
Min Conc (mg/L)	1.19	2.03	3.20
Ave Conc (mg/L)	2.92	3.64	3.97
Max Conc (mg/L)	5.18	4.71	5.20
Average Loading (lbs/d)	6064	8068	8501

A.2.b Nutrients

The nutrients nitrogen and phosphorus are monitored because of their potential detrimental effect on receiving bodies of water. Concentrations of inorganic nitrogen are closely monitored by the MWRA because nitrogen is the limiting nutrient in a marine environment. The inorganic forms of nitrogen (ammonia, nitrite, and nitrate) are easily taken up by algae resulting in rapid algal growth (blooms). When the blooms die, oxygen is consumed by the bacteria decaying the algae. The water may become hypoxic (low in oxygen) or even anoxic (no oxygen) resulting in the death of fish and other aquatic species.

Another oxygen-depleting process involving nitrogen is the conversion of ammonia to the nitrite and nitrate forms. Approximately 4.3 mg of O_2 per mg of ammonia-nitrogen is consumed in the conversion to nitrate-nitrogen. This process is known as nitrification. Not only does nitrogen encourage algal growth and present a BOD problem, but certain forms are very harmful to fish. Nitrites and the ammonium ion are particularly toxic to fish and other aquatic species. Atmospheric deposition also contributes to the nitrogen load of a body of water. Besides contributing to the nitrogen load, the pH of acid rain shifts the equilibrium of nitrogen derivatives into more toxic forms.

Phosphorus, like nitrogen, is a limiting nutrient, but unlike nitrogen, is limiting in fresh water. There is no toxicity associated with phosphorus compounds. They are problematic because they accelerate the process of eutrophication, the aging process of a body of water caused by high loads of nutrients that stimulate plant growth. Phosphorus is taken up by algae, and the algae undergo rapid growth. When the algae die, bacteria decomposing the dead cells use up oxygen. As a result, the body of water experiences low oxygen levels. Cell mass also accumulates in the body of water eventually upsetting the natural balance of the water system.

Concentrations of nutrients that were monitored in FY94 were TKN, ammonia, nitrates, nitrites, orthophosphorus, and total phosphorus. Nutrient data for this monitoring period are included in the Deer Island Operations Summary, Appendix A, Table A-1 and are also summarized in Table IV.A.3. There was a seasonal pattern in the effluent nutrient data; higher TKN concentrations are measured in the months with warm wastewater temperatures than in the months with cold wastewater temperatures (except for January). In addition, TKN concentrations in the effluent were similar to those in the influent.

Effluent phosphorus values were not always consistent with influent values. There appears to be no overall trend in nutrient concentrations over the past six years (Figure IV.A.6).

A.2.c Priority Pollutants

Testing of Deer Island effluent was performed by NPDES, Harbor Studies, and the Deer Island Laboratory monitoring programs. The NPDES program conducted full priority pollutant scans, the Deer Island lab analyzed for select metals, and the Harbor Studies analyzed certain metals, pesticides/PCBs, and PAHs. Results from the Deer Island, NPDES, and Harbor Studies analyses are found in Appendix A, Tables A-1, A-4, A-5 and A-6. In general, the three data sets show a positive correlation despite the differences in monitoring protocols.

Metals All of the metals detected in the influent were also detected in the effluent, as expected of a primary treatment facility. Copper, lead, and zinc were detected in measurable amounts. The other metals, if detected, were mostly estimated values or slightly above method detection levels. Figure IV.A.7 graphs the metal loadings calculated from Deer Island Laboratory results from FY88 to FY94 and shows decreasing total metal loadings discharged to the harbor.

Pesticides The pesticide data from the NPDES set reported several compounds in the effluent including b-BHC, d-BHC, g-BHC, and DDT. Endosulfan, heptachlor, heptachlor epoxide, aldrin, chlordane, and a-BHC were estimated. The Harbor Studies data showed DDT, DDD, DDE, g-BHC (lindane), and hexachlorobenzene but were measured at much lower concentrations than were the NPDES data.

Organic Compounds Of the semivolatiles, phenols, 4-methyl phenol, benzoic acid, and phthalates were detected. Naphthalene and 2-methyl naphthalene were estimated values. Of all the volatile compounds, 1,2-dichloroethene, acetone, benzene, chloroform, methylene chloride, tetrachloroethylene, and toluene were detected most of the time. The Harbor Studies data reported measurable amounts of PAHs; however, they were reported at concentrations that were lower than the NPDES data reporting limits.

Figure IV.A.6 Deer Island Effluent, Nutrient Concentration

FY 1989 - 1994 Deer Island Laboratory

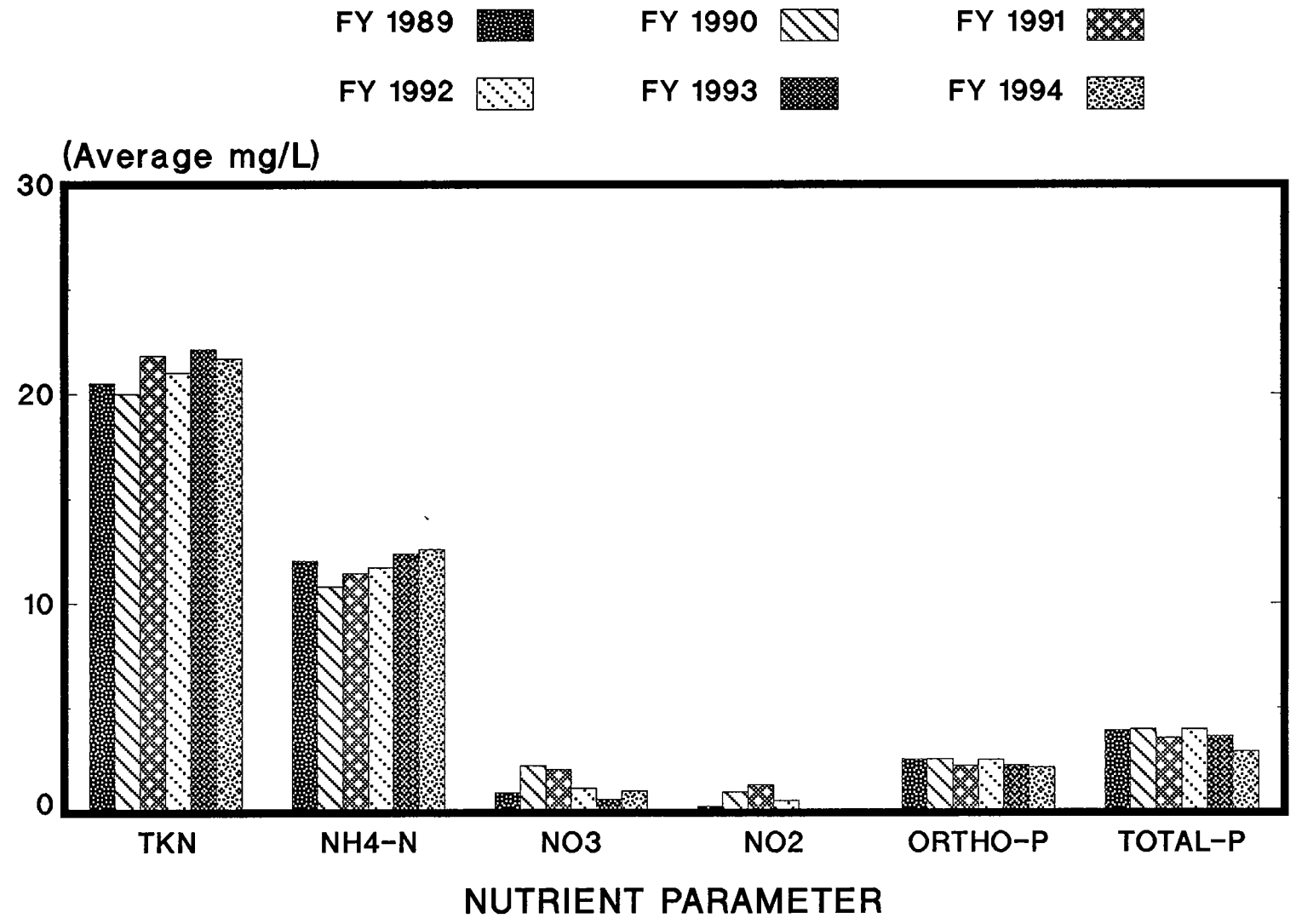
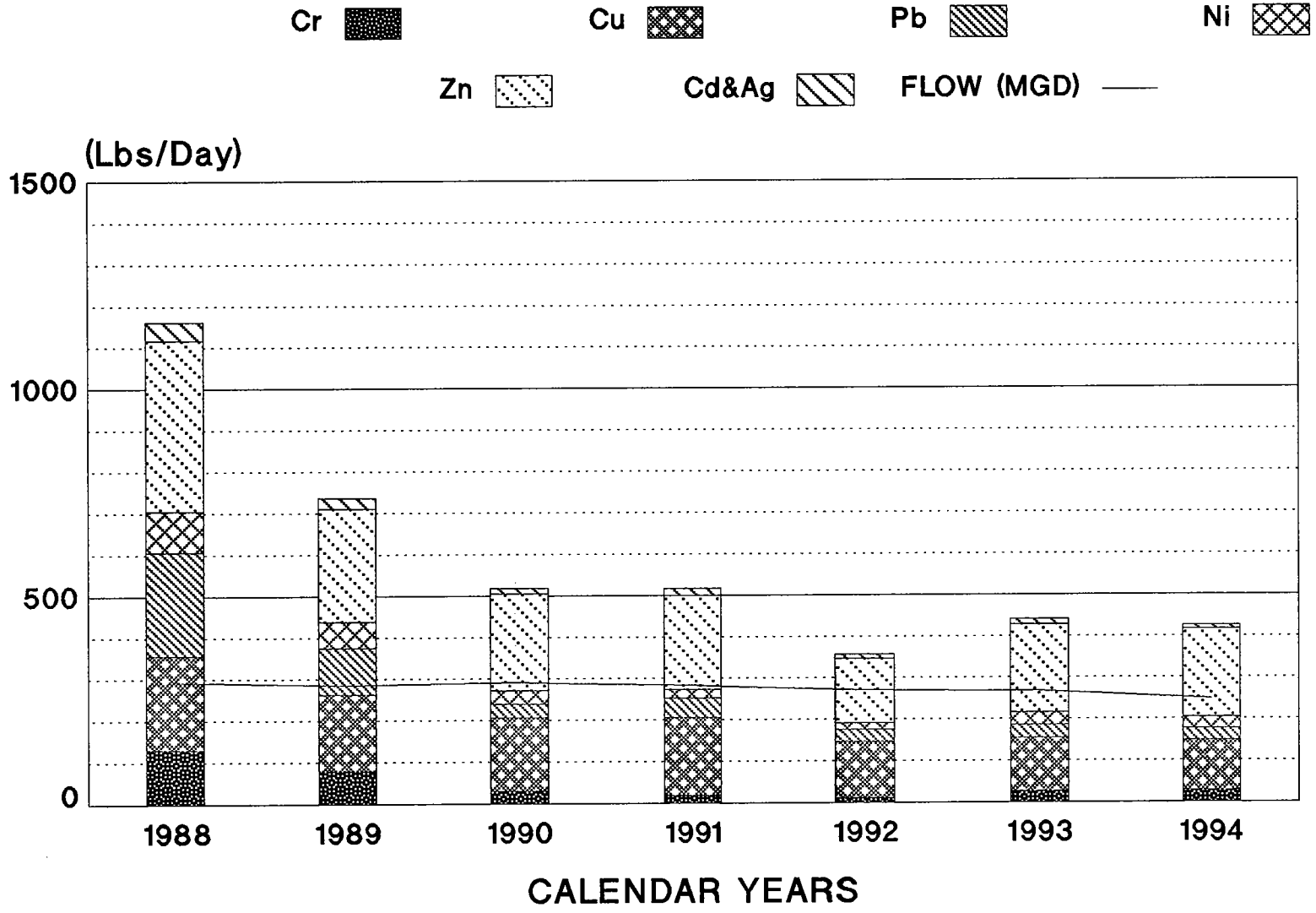


Figure IV.A.7 Deer Island Effluent, Mean Metal Loadings
1988 - 1994, Deer Island Laboratory



A.2.d Whole Effluent Toxicity

The MWRA tested effluent toxicity every month at the Deer Island treatment plant. Three tests were used: an acute static toxicity test using mysid shrimp, Mysidopsis bahia, a chronic survival and growth test using the sheepshead minnow, Cyprinodon variegatus , and a chronic reproduction test using the red alga, Champia parvula. NPDES permit limits for the toxicity tests performed were: a No Observed Effect Concentration (NOEC) of 20% for the acute test and a NOEC of 10% for the chronic tests. The results of toxicity testing in 1994 were consistent with previous years. Table IV.A.4 summarizes the results of the toxicity testing in FY94.

Acute Static Toxicity Test The results of the mysid shrimp acute tests showed that the NOEC limit of 20% was not met in eight of the 12 tests. No acute toxicity could be attributed to metals or pesticides. An EPA study found that the probable cause of most acute toxicity in Deer Island's wastestream was surfactants, a widely used ingredient in household detergents. Currently, concentrations of surfactants in the effluent from the two plants are consistent with the concentrations that could cause the observed mortality. The EPA study further concluded that surfactants are readily biodegraded with secondary treatment.

Chronic Toxicity Tests The results of the sheepshead minnow chronic tests showed that the NOEC limit of 10% for both growth and survival endpoints were consistently met. The results of the chronic test on the red alga, a test to assess effects on sexual reproduction, were in compliance once. The EPA has concluded that using the red alga for toxicity compliance is compromised by its ultrasensitive and inconsistent results; thus, it has been withdrawn as a test species in permit renewals.

A.2.e 1993 Bioaccumulation Study, Boston Harbor

Bioaccumulation studies measure the potential for long-term build-up of pollutants in aquatic species. In the summer of 1993, the MWRA conducted a mussel bioaccumulation study for Deer Island effluent. The study was designed to duplicate studies conducted in 1987, 1991, and 1992. Mussels were collected in Gloucester and deployed at the following locations for 60 days: the Deer Island effluent discharge, the proposed offshore

Table IV.A.4 Deer Island, Results of Toxicity Testing, FY 1994

	Mysid acute LC50	Mysid acute NOEC	Cyprinodon chronic Survival NOEC	Cyprinodon chronic Growth NOEC	Champia chronic NOEC
Limits (%)	**None**	**20**	**10**	**10**	**10.0**
July	27	**10**	40	40	**7.0**
August	27	**10**	60	40	**0.2**
September	24	5	40	20	**2.0**
October	23	**10**	60	40	**10.0**
November	23	10	40	40	**2.0**
December	22	< 5	60	60	**2.0**
January	32	20	60	60	**2.0**
February	33	**20**	40	40	**0.7**
March	46	**20**	60	60	**0.7**
April	24	< 5	40	40	**2.0**
May	38	**20**	60	60	< 0.2
June	25	**10**	40	40	**2.0**
Average	**29**	**12**	**50**	**45**	**2.6**
Violations		**8**			**11**

discharge site in Massachusetts Bay (for pre-discharge baseline data); and the New England Aquarium in Boston's Inner Harbor (dirty control).

At the start of the study, tissue from the Gloucester mussels was analyzed for PAHs, PCBs, organochlorine pesticides, lead, and mercury. At the end of the 60-day deployment, the mussels deployed at Deer Island showed significant bioaccumulation of PAHs, PCBs, DDTs, alpha-chlordane, and trans-nonachlor. The mussels deployed offshore had similar to or lower body burdens than those of the Gloucester mussels. The mussels deployed at the Aquarium had body burdens of contaminants which were significantly greater than those of the mussels at Deer Island. In conclusion, the FY93 study indicated that mussels were continuing to bioaccumulate several contaminants, but at lower levels than in 1987. Only low molecular weight PAHs, which make up 90% of the PAHs in the Deer Island discharge, have shown a steady decrease since 1987. A summary of bioaccumulation study results are in Table IV.A.5.

Table IV.A.5 Concentration of Contaminants Bioaccumulating in Boston Harbor Mussels

	PRE-DEPLOYMENT	CLEAN CONTROL	DIRTY CONTROL	DEER ISLAND
Copper (ug/g)				
1987	6.6	7.1		9.5**
1991	8.8	7.4	12.7**	9.3
Lead (ug/g)				
1987	2.8	3.1		6.7**
1991	6.5	5.0	6.4	5.9
1993	5.1	3.7**		5.9
Zinc (ug/g)				
1987	83.0	92.0		152**
1991	148.0	173.0	220**	143.0
Mercury (ug/g)				
1993	0.39	0.10**		0.18**
Total PAH's (ng/g)				
1987	581	465		2363**
1991	217	228	2570**	1207**
1992	216	129**	3545**	1937**
1993	188	166	1321**	665**
Total PCB's (ng/g)				
1987	317	227		630**
1991	77	77	477**	199**
1992	65	44**	652**	133**
1993	AP	110	596**	321**
Total DDT's (ng/g)				
1987	52	30		63
1991	28	28	94**	48**
1992	15	12	103**	25**
1993	AP	30	130**	63**
Alpha-Chlordane (ng/g)				
1987	8.7	6.7		21.5**
1991	2.4	2.5	19**	10.3**
1992	1.9	1.7	19**	6.9**
1993	2.9	3.8	10.5**	8.2**

	PRE-DEPLOYMENT	CLEAN CONTROL	DIRTY CONTROL	DEER ISLAND
Dieldrin (ng/g)				
1987	6.6	3.6		11.4
1991	< 1.4	2.3	9**	2.9
1992	< 1.0	1.2	6.7**	2.7
1993	< 2.9	2.2	4.5**	3.4
Lindane (ng/g)				
1987	1.8	0.8		5.5
1991	< 1.5	< 2.2	< 3.2	< 2.5
1992	< 1.0	< 1.0	< 1.9	< 1.3
1993	AP	< 1.7	2.3	2.7
Trans-nonachlor (ng/g)				
1987	7.7	6.2		18**
1991	< 1.4	< 1.5	< 2.5	8.9**
1992	2.1	2.5	21.3**	8.3**
1993	4.8	4	11.0**	10.7**

Hexachlorobenzene, heptachlor, aldrin, heptachlor epoxide, mirex have not been detected at any station.

* Mussels collected from Barnstable in 1987 and Gloucester in 1991. Clean control at proposed offshore discharge in 1987 and in Gloucester in 1991. Dirty control at New England Aquarium.

** Statistically different (p=<0.05) from pre-deployment.

AP Analytical problem, no data

A.3 Compliance with Interim Limits

Plant performance during FY94 measured against regulatory permit limits is presented in Table IV.A.6 and Figure IV.A.8. Figure IV.A.8 consists of graphs that chart trend analyses of conventional parameters for the twelve monitoring months in FY94.

BOD There was a total of 16 BOD-related violations: two monthly average, two daily maximum allowable, and 12 violations of the 12-month running average removal efficiencies. The BOD concentration violations occurred in the months of September, December, and June. In September, both the monthly average and daily maximum limit were exceeded. In December, the daily maximum limit was exceeded. In June, the monthly average limit was exceeded by just one mg/L. The 12-month running average removal rate was consistently below the limit. This is expected of an aging primary treatment plant.

Combined sewer systems tend to show seasonality with respect to BOD, TSS, and nutrient concentrations. These three parameters are a function of the stormwater entering the sewer system. The stormwater dilutes the wastewater rendering the wastewater constituents lower than the normal domestic flow. BOD and TSS, however, may peak due to the first flush effect. Scouring velocities are attained in the pipes, and thus debris that had settled is flushed out. The high BOD and TSS concentrations usually last less than two hours. The first flush effect is more prominent after a long dry period. Infiltration, which like the first flush effect is affected by stormwater entering the system, can also raise the BOD and TSS concentrations. Occasionally the concentrations of inorganics may increase due to high dissolved concentrations in groundwater.

TSS The TSS 12-month running average limit was consistently met. However, there was one TSS daily maximum limit violation in December. The violation occurred after a significant rainfall (2.76 in.). Scouring velocities and introduction of suspended solids from surface runoff could have caused this violation.

pH There was one low pH reading of 6.3. The NPDES permit allows for pH values not within permit limits if "values are exceeded due to natural causes or as a result of approved treatment processes and provided the effluent does not cause a violation of the water quality standards for the receiving water." The low pH measurement of 6.3 was

likely due to acid rain contribution, caused by rainfall and/or snowmelt. Additionally, there is no impact of a slightly acidic discharge on a highly buffered marine environment. It will probably not cause any violation of water quality standards. Acid rain can also contribute to the acidity of wastewater from CSO facilities where, in theory, flows going through the facilities are rain-induced.

Settleable Solids There was no violation of this constituent.

Fecal Coliform There was no violation of this constituent.

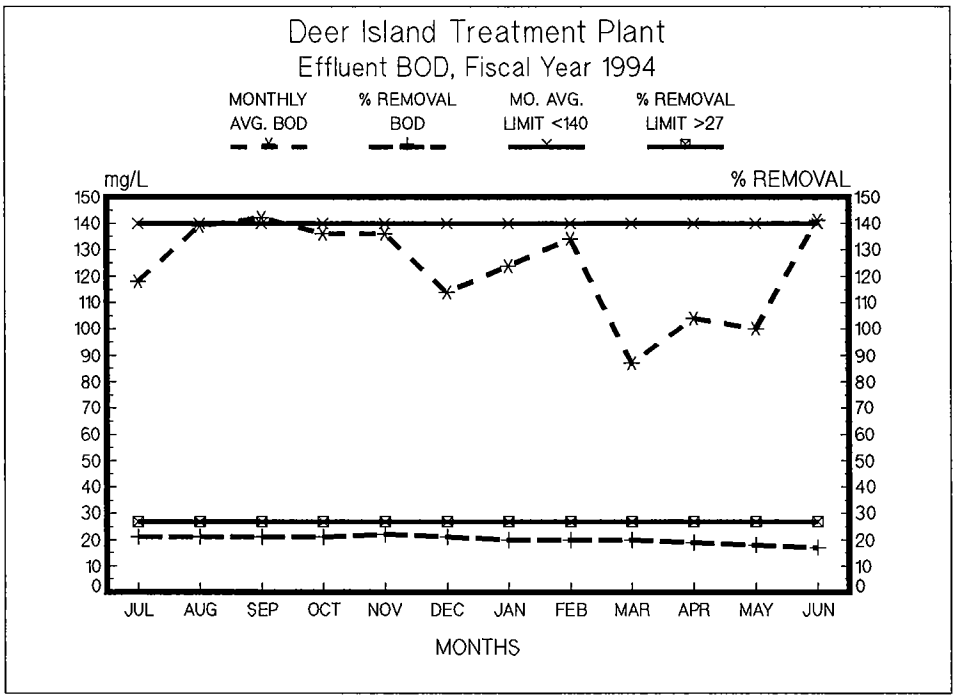
Total Coliform There were no violation of this constituent.

Table IV.A.6 Deer Island Effluent Quality Compliance with Interim Limits

Parameter	Interim Limits*	Range of Values Exceeding Limits	No of Violations
Biochemical Oxygen Demand			
Mo Ave (mg/L)	140	141, 142	2
Dly Max (mg/L)	200	261, 266	2
12-mo running removal rate (%)	27	17 - 22	12
Total Suspended Solids			
Mo Ave (mg/L)	110		0
Dly Max (mg/L)	180	250	1
12-mo running removal rate (%)	38		0
Settleable Solids (mg/L)	2.8		0
Fecal Coliform (#/100 mL)	200		0
Total Coliform (#/100 mL)	1000		0
pH	6.5 - 8.5	6.3	1
	Total Number of Violations		**18**

* Except for removal rates, the effluent quality must be equal or greater to than limits. Removal rates must be equal to or gretaer then limits.

Figure IV.A.8 Deer Island Trend Analyses of Conventional Pollutants



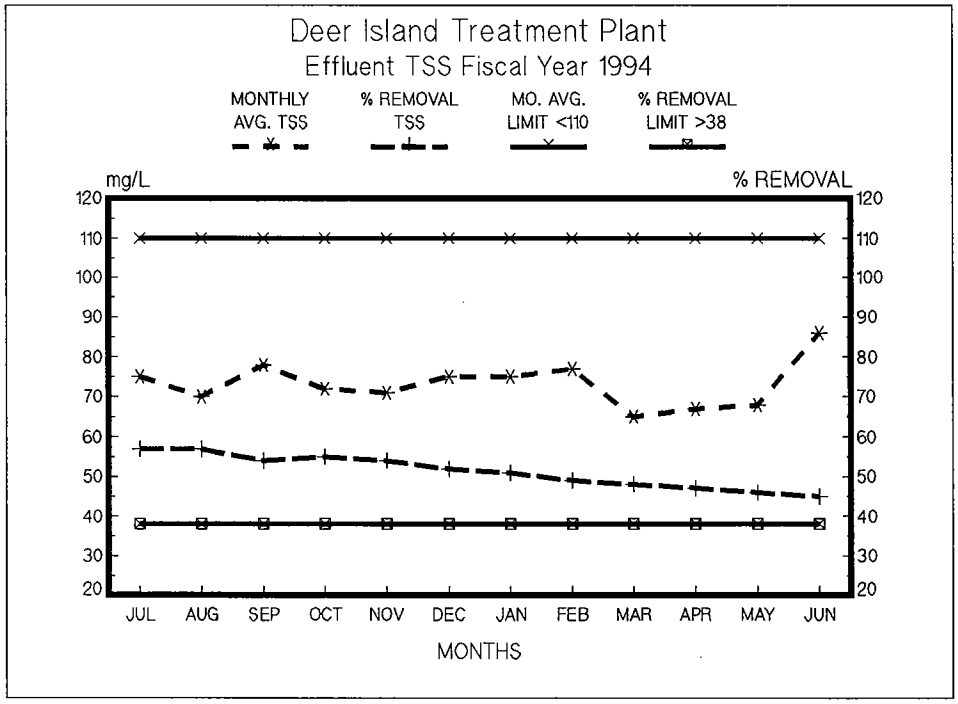
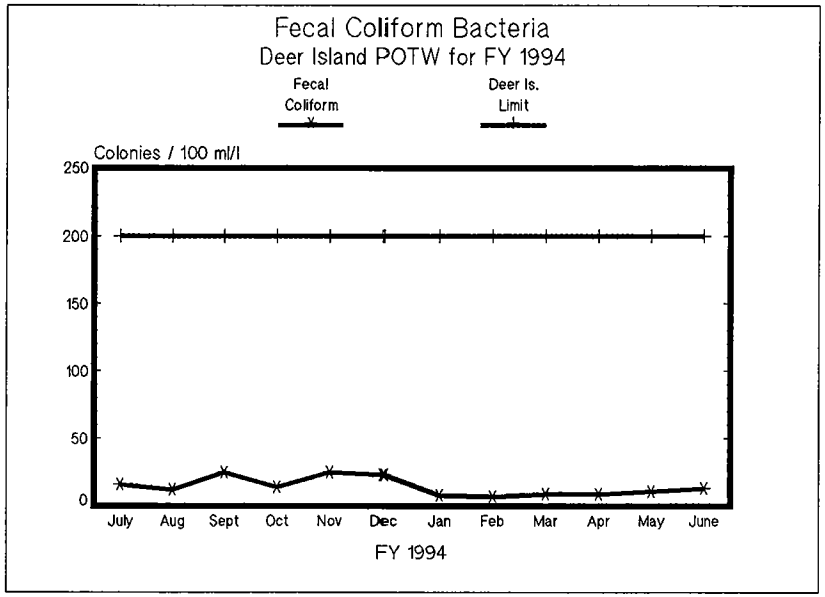
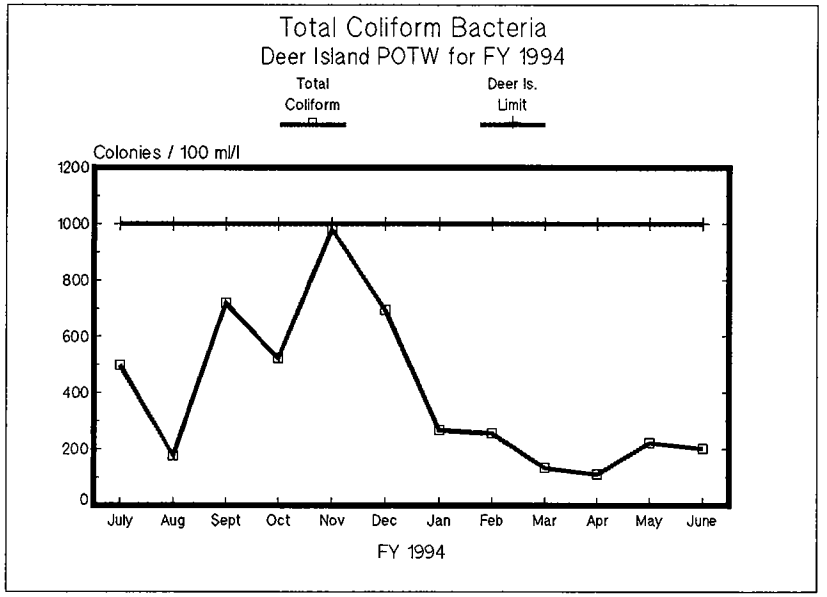
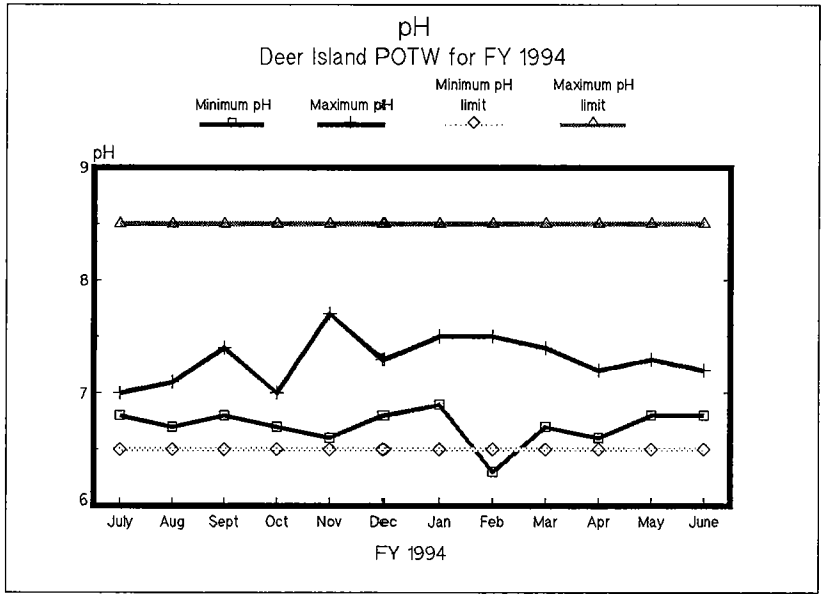
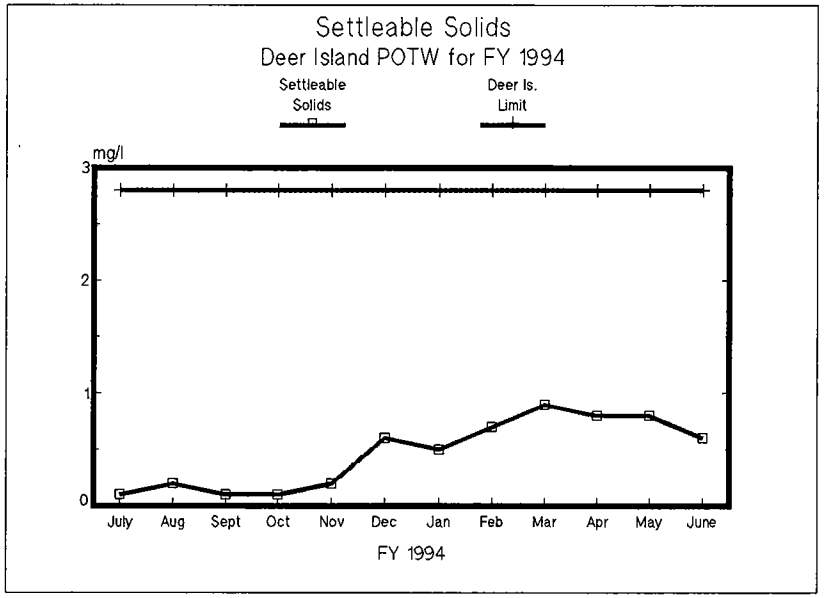


Figure IV.A.8 Continued









A.4 Effluent Quality Compared to Water Quality Standards

Almost all of the priority pollutant concentrations were reported as being below method detection limits. The priority pollutants that were detected in the effluent were detected at very low concentrations. In order to compare treatment plant effluent concentrations with water quality standards, the average concentrations were calculated for those constituents that were detected at least once during the fiscal year. For metals and cyanide, half the method detection limit was assigned for those measurements that were below detection. For organics, one tenth of the reporting limit was used. For results that were below the quantitation limit, the estimated values were used. This assumption agreed with the Harbor Studies results conducted using analytical methods with very low detection levels (10 ng/L reporting limit).

Table IV.A.7 compares the effluent maximum concentration observed and the calculated arithmetic mean concentrations of each pollutant with the pollutant concentration in Boston Harbor around the Deer Island outfall. The receiving water quality data were collected in the summer of 1987 when dilution of discharge was presumably at the seasonal low due to stratification. Also shown in Table IV.A.7 is the calculated critical dilution ratio required to meet water quality standards. The critical dilution required to meet acute criteria is estimated as the ratio of the maximum concentration observed to the water quality standard. To meet chronic and human health criteria, the critical dilutions required are estimated as the ratio of the arithmetic mean concentrations to the water quality standards.

Critical dilution calculations are questionable because they do not truly reflect constituent concentrations within the mixing zone, as evidenced by the data collected around the Deer Island outfall. Nonetheless, critical dilution analyses were performed, assuming a very conservative estimate of 10:1 available dilution at the outfall site. Results of the analyses show that copper appears to violate both the acute and chronic criteria while DDT is only problematic by the chronic criterion.

The water quality criterion for human health is expressed as the allowable concentration to protect against long-term (chronic) human health effects by two primary modes of exposure: consuming fish (including shellfish) and drinking water. Presently, national policy specifies that the duration of exposure for human health criteria for carcinogens is derived assuming a lifetime exposure of 70 years time period.

It is difficult to assess human health criteria violations because of variables such as: shellfish that normally live at the outfall site are not harvested for public consumption, fish migrate, people vary in the frequency with which they eat fish, and people change residence. Background exposure and other routes of exposure including recreational, occupational, food (other than fish), and air further complicate the estimation of safe human health criteria. Assessing human health criteria violations using critical dilutions calculations may not be the best way to quantify health risks.

A.5 Priority Pollutants of Concern

The majority of priority pollutants measured in Deer Island effluent had concentrations well below detection levels except for the following:

Copper The copper concentration was high enough to cause concern. The critical dilutions required to meet both acute and chronic water quality criteria are 23 and 21 respectively, well above the assumed available dilution at the outfall pipe. It is believed that most of the copper entering the sewer system comes from households where copper is leached out from copper pipes by the action of acidic water supply.

DDT There were three detects of DDT in the effluent, two of them being reported as estimated values. There appears to be no problem meeting the acute criteria. However, the chronic critical dilution requirement was 26:1, much higher that the calculated available dilution of 10:1. The average concentration was artificially raised by substituting half the MDL for values that were reported below detection level; thus, the chronic critical dilution was raised. DDT has been banned for use in the United States since December 1992. Residual DDT and its degradation products are suspected still to be present in the sewer system. Until the contaminant is totally flushed out, DDT and its degradation products may continue to be measured in the effluent for some time.

Table IV.A.7 Deer Island Effluent Quality Compared to Water Quality Standards

Parameter	Boston Harbor	Max Conc (ug/L)	Ave Conc (ug/L)	Acute Criteria (ug/L)	Max Conc : Acute Criteria	Chronic Criteria (ug/L)	Ave Conc: Chronic Criteria	Human Health Criteria (10-6 Risk Level)	Ave Conc: Human Health Criteria
Aldrin	0.00005	0.044	0.015	1.3				0.00014	107 : 1
Arsenic		4.000	2.000	69.0		36		0.14	14 : 1
Cadmium	0.0348	9.000	1.000	43		9.3			
Chlordane		0.130	0.057 *	0.09		0.004		0.00059	
Chromium	0.175	20.000	12.000	1100.00		50			
Copper	0.943	67.000	60.000	2.90	23 : 1	2.9	21 : 1		
Cyanide		40.000*	25.000**	1.00		1		220000	
DDT	0.00057	0.110	0.026	0.13		0.001	26 : 1	0.00059	44 : 1
Dieldrin	0.00062	0.030	0.011	0.71		0.0019	6 : 1	0.00014	79 : 1
Endosulfan				0.034		0.0087		159	
Endosulfan Alpha		0.021	0.008	0.034		0.0087		159	
Endosulfan Beta				0.034		0.0087		159	
Endrin				0.037		0.0023		0.81	
Heptachlor	0.000084	0.028	0.007	0.053		0.0036	2 : 1	0.00021	33 : 1
Heptachlor Epoxide		0.017	0.006	0.053		0.0036	2 : 1	0.00011	55 : 1
Lindane	0.00136	0.116	0.024	0.16				0.063	
Lead	0.0849	24.000	13.000	220.00		8.5	2 : 1		
Mercury	< 0.0071	0.200	0.120	2.10		0.025	5 : 1	0.15	
Nickel	0.53	12.000	7.000	75.00		8.3		4600	
PCBs				10.00		0.03		0.000046	
Pentachlorophenol				13.00		7.9		0.09	
Selenium		10.000	2.000	300.00		71			
Silver		3.000	2.000	2.30					
Toxaphene				0.21		0.0002		0.00075	
Zinc	1.238	91.000	82.000	95.00		86			

* Only one detect in 12 samples.

** Data suspect

B. Nut Island

B.1 Influent Characteristics

B.1.a Flow

In FY 94, the average flow to Nut Island was 123 MGD and the minimum recorded flow was 47 MGD. March 1994 was the seventh wettest month in the 110-year record, accumulating a total of 7.49 inches of precipitation. The combination of rainfall and snowmelt produced a maximum flow of 315 MGD on the 21st. It was during this month, from March 10 and to the 21st, that the influent flow to Nut Island was so high. Because of the high flows, the emergency outfall (104) and the main spillway had to be opened continuously during that period. Figure IV.B.1 graphs the minimum, average, and maximum flows of FY94 and compares them with average daily precipitation.

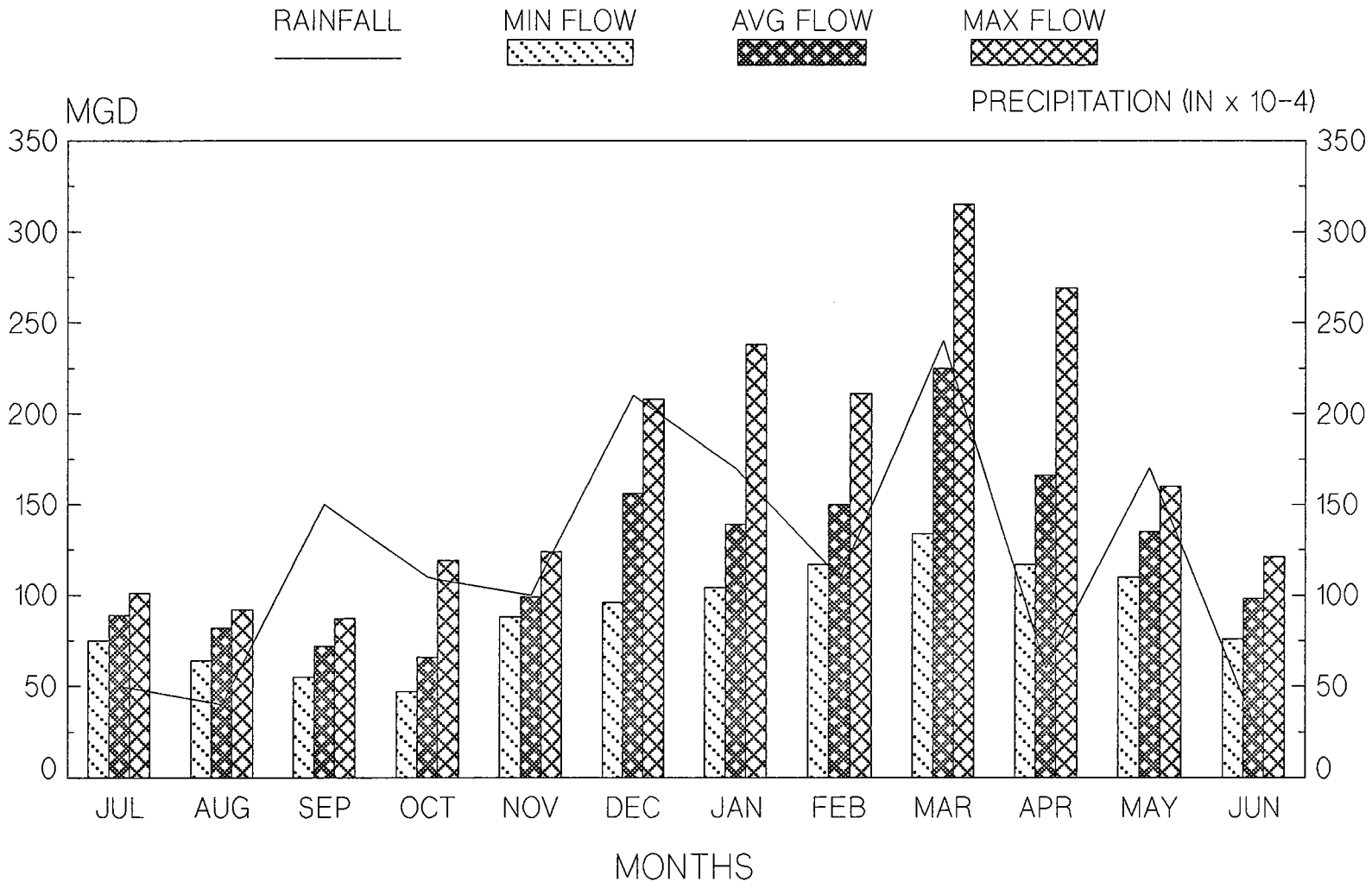
In FY94 there was a decrease in the average flow going through the plant when compared to FY93 records. The seasonality of flow is also evident when the flow records from FY88 to FY94 are analyzed (Figure IV.B.2). In general, the average monthly flow over the seven-year period followed the trend depicted in the FY94 data; the flows were high during the high-precipitation months and low during the low-precipitation months. Except for the months with high precipitation, December, January, March, and May, the average daily flows for each month were slightly lower than the average monthly daily flows for the previous six-year period.

Figure IV.B.3 illustrates the relationship between monthly average daily flow and total precipitation for the last seven years. The Nut Island flow tended to increase with increased precipitation (from FY89-FY90, FY91-FY92, FY92-FY93) or to decrease with decreased precipitation. As previously suggested, this trend indicate a significant amount of infiltration and inflow contribution to the system.

B.1.b Conventional Parameters

Results of monitoring for influent conventional pollutants are presented in Appendix B, Table B-1. Table IV.B.1 provides an overview of the flow and influent loadings. It shows an 8% BOD loadings decrease and about a 24% TSS loadings increase from FY93. In general, NI wastewater is slightly stronger than Deer Island's.

FIGURE IV.B.1 NUT ISLAND FLOWS VS PRECIPITATION
FY94



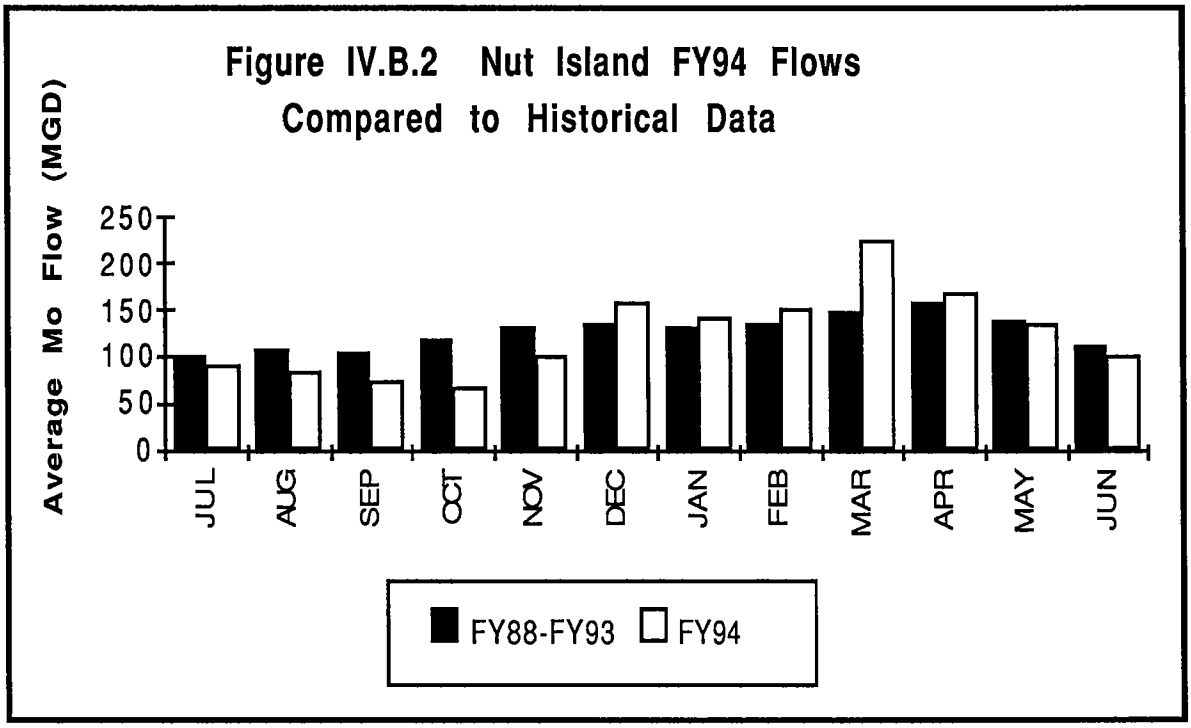


Figure IV.B.2 Nut Island FY94 Flows
Compared to Historical Data
Average Mo Flow (MGD)
250
200
150
100
50
0
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
FY88-FY93
FY94

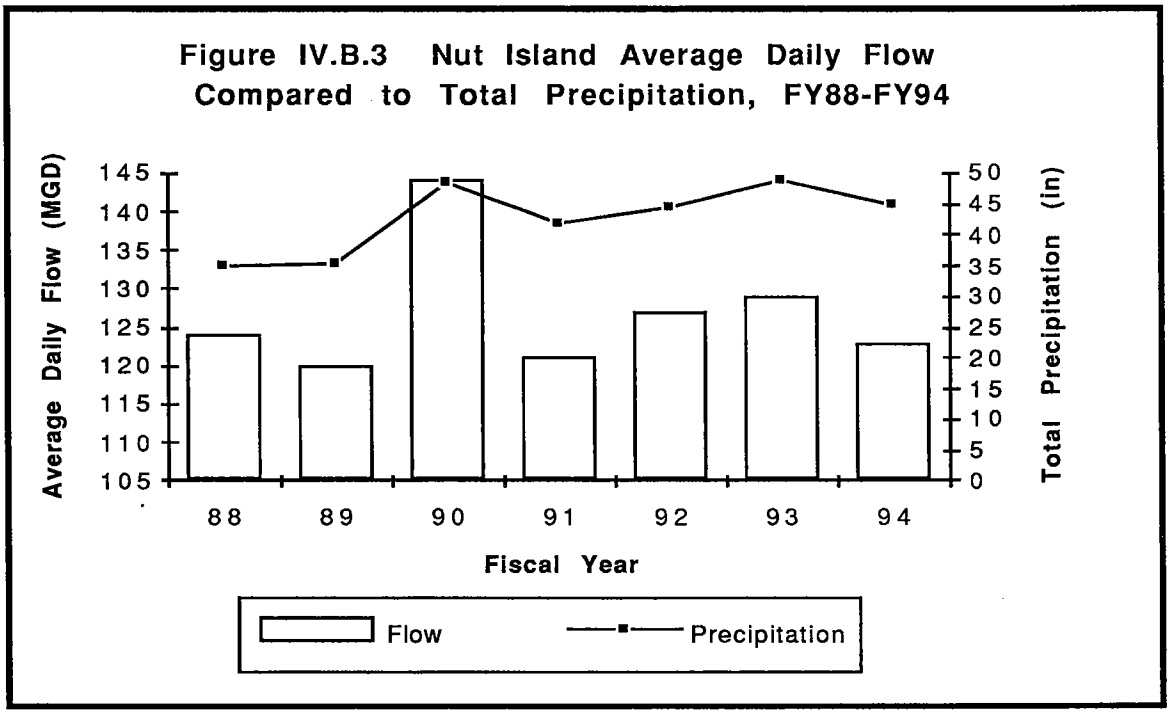


Figure IV.B.3 Nut Island Average Daily Flow
Compared to Total Precipitation, FY88-FY94
Average Daily Flow (MGD)
145
140
135
130
125
120
115
110
105
Total Precipitation (in)
50
45
40
35
30
25
20
15
10
5
0
88
89
90
91
92
93
94
Fiscal Year
Flow
Precipitation

Table IV.B.1 Nut Island Influent Characterization, FY 1994

PARAMETER	FY94	FY93	FY92
Flow (MGD)			
Minimum	47	50	73
Average	123	129	127
Maximum	315	262	254
Total Suspended Solids			
Minimum (mg/L)	122	112	162
Average (mg/L)	227	174	221
Maximum (mg/L)	354	206	437
Loadings (lb/d)	232861	187200	234079
Biochemical Oxygen Demand			
Minimum (mg/L)	97	122	141
Average (mg/L)	171	177	194
Maximum (mg/L)	247	251	259
Loadings (lb/d)	175415	190427	205481
Settleable Solids (mg/L)			
Minimum	2.7	5.1	5.2
Average	7.5	8	10.3
Maximum	19.8	10.5	39.3
Loadings (lb/d)	7694	8607	10910
Oil and Grease (mg/L)			
Minimum	5.8	11	23
Average	31	35	42
Maximum	115	59	119
Loadings (lb/d)	31800	37655	44486
Total Kjeldahl Nitrogen		*	**
Min Conc (mg/L)	10.08	10.57	
Ave Conc (mg/L)	22.84	19.40	
Max Conc (mg/L)	34.79	25.20	
Average Loading (lbs/d)	23430	20873	

Table IV.B.1 (cont)

PARAMETER	FY94	FY93	FY92
Ammonia-Nitrogen			**
Min Conc (mg/L)	2.24	5.01	
Ave Conc (mg/L)	10.06	13.66	
Max Conc (mg/L)	20.44	20.07	
Average Loading (lbs/d)	10320	14695	
Nitrates			**
Min Conc (mg/L)	0.00	0.00	
Ave Conc (mg/L)	0.20	0.21	
Max Conc (mg/L)	0.51	0.58	
Average Loading (lbs/d)	205	230	
Nitrites		**	**
Min Conc (mg/L)	0.00		
Ave Conc (mg/L)	0.05		
Max Conc (mg/L)	0.09		
Average Loading (lbs/d)	51		
Orthophosphorus			**
Min Conc (mg/L)	0.10	0.57	
Ave Conc (mg/L)	1.64	0.91	
Max Conc (mg/L)	2.70	1.24	
Average Loading (lbs/d)	1682	974	
Total phosphorus			**
Min Conc (mg/L)	0.90	1.83	
Ave Conc (mg/L)	2.97	3.22	
Max Conc (mg/L)	4.60	3.99	
Average Loading (lbs/d)	3047	3467	

* Summary of weekly analyses starting in April 5 and ending in June 30.

** Not Analyzed

As at Deer Island, the oil and grease concentration appears to have decreased at Nut Island. FY94 data show a 11% decrease from FY93, and a 26% decrease from FY92. It is suspected, however, that there were no real reductions in oil and grease concentrations. The differences in the measurements were caused primarily by the different analytical methods employed in the monitoring periods. See Deer Island section A.1.b.

B.1.c Nutrients

Nitrogen in wastewater influent exists mainly in the form of ammonia and organic nitrogen, together called total Kjeldahl nitrogen (TKN). Other forms of nitrogen found in wastewater are nitrites and nitrates. The influent TKN values showed seasonality, measuring lowest in the spring and highest in the fall (Figure IV.B.4). This seasonality was probably caused by the increase in wastewater entering the sewer system in the form of snowmelt and runoff, which both dilute wastewater strength. When compared to Deer Island influent, the Nut Island TKN concentration was higher. This difference in TKN values was probably caused by the discharge of nutrient-rich filtrate from the sludge pelletizing plant into the sewer system which ultimately flows into the Nut Island plant.

B.1.d Priority Pollutants

There are two sets of Nut Island data for influent priority pollutants, the Nut Island Laboratory set and the Local Limits set. The Nut Island Laboratory conducted analyses for select metals while the Local Limits Study conducted a full priority pollutant scan. The results of these analyses are presented in Appendix B, Tables B-1, and B-2 respectively.

Metals

Measurable amounts of copper, lead, zinc, and very low concentrations of other metals were observed in both the Nut Island Laboratory and the Local Limits Study data. With the exception of Cd, Ag, and Zn, the values reported by Nut Island Laboratory and Local Limits corresponded well. The Local Limits data reported a higher average concentration for Cd but a lower concentration for Ag and Zn (Table IV.B.2).

Figure IV.B.4 Nut Island Influent Flow and TKN Compared to Wastewater Temperature

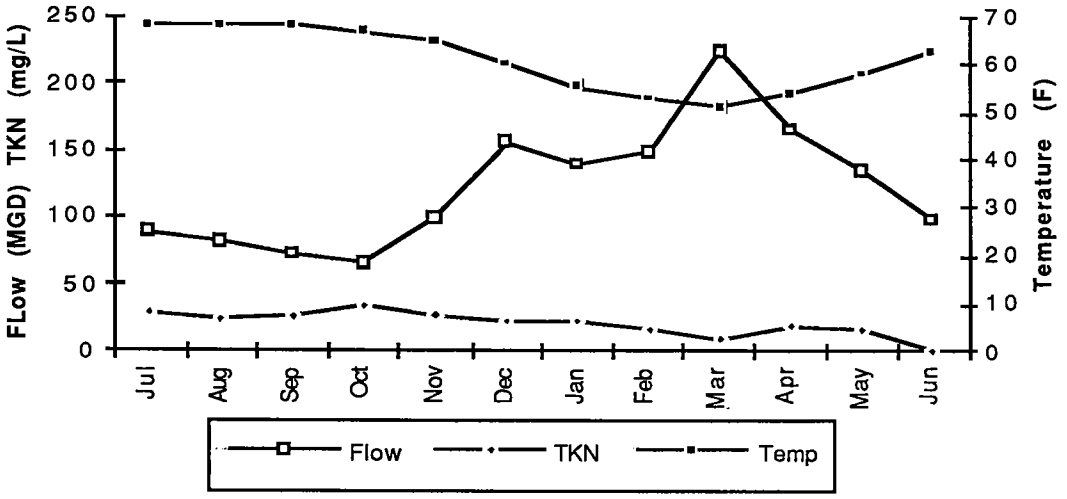


Table IV.B.2 Nut Island FY94 Influent Metals Concentration Compared

Metals	Mean Concentration	
	Local Limits Data	Nut Island Lab Data
Arsenic	< 0.002	0.002
Chromium	0.007	0.008
Copper	0.103	0.091
Cadmium	0.002	0.001
Lead	0.015	0.015
Mercury	0.0004	0.0003
Nickel	< 0.012	0.011
Silver	0.004	0.007
Zinc	0.116	0.152

Notes:
1. Concentration expressed in mg/L.
2. The geometric mean concentration was calculated by substituting half the MDL for measurements that were below detection.
3. * No data

The Nut Island historical influent metal loadings are presented in Figure IV.B.5. There has been a decrease of total metals loadings since 1990 but they have since levelled off. The apparent decrease in loadings in FY94 is due to the better analytical methods used (lower method detection levels). The calculated average concentration is therefore, much lower than in previous years.

Cyanide Cyanide was detected only once in 28 samples. Cyanide is rarely detected in Nut Island influent.

Pesticides/PCBs Gamma-BHC was detected in five of 28 samples. Only one such value however, was above detection limits, the other four being estimated values. Chlordane and dieldrin were also estimated in two of 28 samples.

Organic Compounds Of the semivolatiles, phthalates, 1,4-dichlorobenzene, benzoic acid, benzyl alcohol, 4-methyl phenol, and 2-methyl naphthalene were detected. Of the volatile organic compounds, acetone, 2-butanone, chloroform, carbon disulfide, methylene chloride, tetrachloroethylene, toluene, xylenes, and trichloroethylene were detected more than 50% of the time.

B.2 Effluent Characteristics

B.2.a Conventional Parameters

The concentrations of conventional parameters in the effluent are contained in Appendix B, Table B -1 and are summarized and compared with previous years' data in Table IV.B.3. As shown, the FY94 average BOD, TSS, and TKN measurements were slightly higher than FY92 and FY93 measurements. Other data from FY92 , FY93, and FY94 were comparable except for oil and grease and nitrites measurements which were lower in FY94. The difference in oil and grease measurements may be attributed to the differing analytical procedures employed in the monitoring period. See Deer Island section A.1.b.

Figure IV.B.5 Nut Island Influent, Mean Metal Loadings
1988 - 1994, Nut Island Laboratory

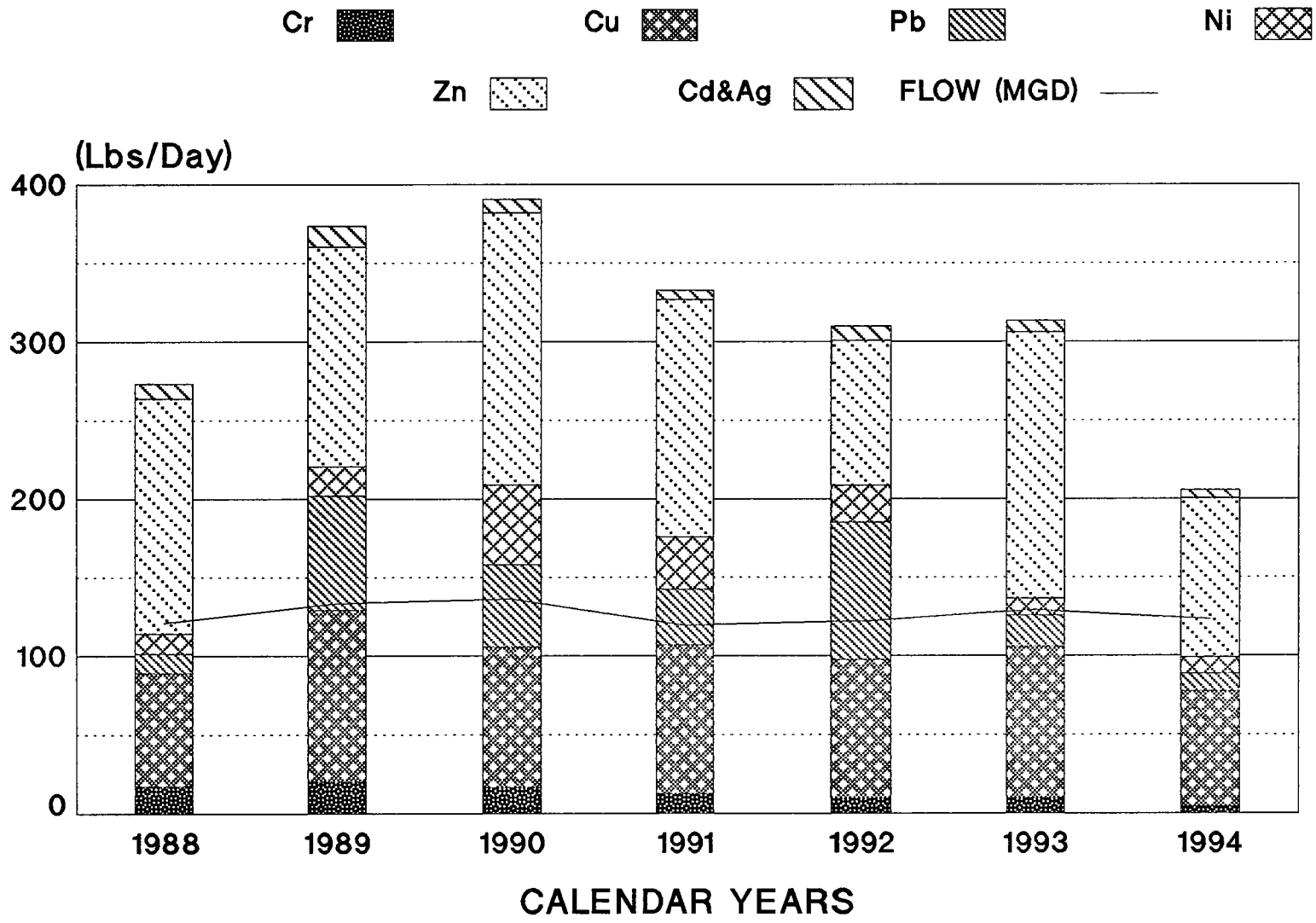


Table IV.B.3 Nut Island Effluent Characterization, FY 1994

Parameter	FY94	FY93	FY92
Flow (MGD)			
Minimum	47	50	73
Average	123	129	127
Maximum	315	262	254
Total Suspended Solids			
Minimum (mg/L)	53	44	48
Average (mg/L)	78	66	67
Maximum (mg/L)	100	80	79
Loadings (lb/d)	80014	71007	70965
Biochemical Oxygen Demand			
Minimum (mg/L)	74	64	62
Average (mg/L)	108	103	99
Maximum (mg/L)	136	142	122
Loadings (lb/d)	110789	110814	104859
Settleable Solids (mg/L)			
Minimum	0.5	0.8	0.9
Average	0.9	1.1	1.2
Maximum	1.1	1.3	1.7
Loadings (lb/d)	923	1183	1271
Oil and Grease (mg/L)			
Minimum	2.1	8.0	10.8
Average	16.4	22.7	21.3
Maximum	25.3	37.2	41.0
Loadings (lb/d)	16823	24422	22561
Total Kjeldahl Nitrogen			
Min Conc (mg/L)	11.90	7.14	10.22
Ave Conc (mg/L)	19.97	16.41	15.66
Max Conc (mg/L)	26.39	24.58	21.56
Average Loading (lbs/d)	20486	17655	16587

PARAMETER	FY94	FY93	FY92
Ammonia-Nitrogen			
Min Conc (mg/L)	2.80	2.45	2.80
Ave Conc (mg/L)	10.24	11.25	8.11
Max Conc (mg/L)	17.78	17.35	11.10
Average Loading (lbs/d)	10504	12103	8590
Nitrates			
Min Conc (mg/L)	0.09	0.03	0.01
Ave Conc (mg/L)	0.80	0.82	0.33
Max Conc (mg/L)	1.79	1.50	1.06
Average Loading (lbs/d)	821	887	350
Nitrites			
Min Conc (mg/L)	0.01	0.06	0.02
Ave Conc (mg/L)	0.07	0.24	0.15
Max Conc (mg/L)	0.16	0.76	0.37
Average Loading (lbs/d)	72	258	162
Orthophosphorus			
Min Conc (mg/L)	0.49	0.24	0.90
Ave Conc (mg/L)	1.69	1.32	1.64
Max Conc (mg/L)	2.50	2.83	2.90
Average Loading (lbs/d)	1734	1424	1737
Total phosphorus			
Min Conc (mg/L)	0.26	1.50	1.60
Ave Conc (mg/L)	2.57	3.50	2.70
Max Conc (mg/L)	3.85	9.13	3.70
Average Loading (lbs/d)	2636	3761	2860

B.2.b Nutrients

Nutrient data are contained in the Nut Island Operations Summary Report in Appendix B, Table B-1 and are summarized in Table IV.B.3. Figure IV.B.6 compares nutrient concentrations from FY89 to FY94. As shown, there was a slight increase in TKN concentration in FY94. It is suspected that the increase, like last year's, was due to ammonia-rich filtrate from the sludge pelletizing facility being discharged back to the Nut Island Plant. Total phosphorus concentrations show no trends over the past six years.

B.2.c Priority Pollutants

Testing of Nut Island effluent was performed for NPDES and the Nut Island Laboratory monitoring programs. The NPDES program conducted full priority pollutant scans, while the Nut Island Laboratory analyzed for select metals. The results of the Nut Island Laboratory and NPDES monitoring programs are presented in Appendix B, Tables B-1 and B-4 respectively.

Metals All of the metals detected in the influent were also detected in the effluent, as expected of a primary treatment facility. Copper, lead, chromium, mercury, and zinc were detected in measurable amounts. The other metals, if detected, registered slightly above detection levels. The concentration of metals, such as As, Ni, and Ag, were lower in the NPDES results. The big differences between the studies' results are probably due to the laboratories' different method detection limits. Figure IV.B.7 graphs Nut Island data and compares the metal loadings from FY87 to FY94. In general, the figure shows a decreasing trend.

Pesticides/PCBs Several compounds were detected in the effluent in measurable amounts. Of 12 samples, aldrin and d-BHC were detected in five, g-BHC in three, 4,4'-DDD and endosulfan sulfate in two, and b-BHC, chlordane, and endosulfan in one.

Organic Compounds Of the semivolatiles, naphthalene, phenols, 4-methyl phenol, benzoic acid, benzyl alcohol, and phthalates were detected. Of all the volatile compounds, 1,2-dichloroethene, acetone, benzene, chloroform, methylene chloride, tetrachloroethylene, 2-butanone, 2-hexanone, methylene chloride, styrene, toluene, and xylenes were detected. In addition, acetone was measured in high concentrations, most probably from laboratory contamination. See Deer Island Section A.2.c.

B.2.d Whole Effluent Toxicity

The MWRA tested effluent toxicity every month at the Nut Island treatment plant. Three tests were used: an acute static toxicity test using mysid shrimp, a chronic survival and growth test using the sheepshead minnow, and a chronic reproduction test using the red alga. NPDES permit limits for the toxicity tests performed are a NOEC of 20% for the acute test and a NOEC of 10% for the chronic tests. The results of toxicity testing in FY94 were similar to previous years' results. Table IV.B.4 summarizes the results of toxicity tests conducted during FY94.

Acute Static Toxicity Test The result of the mysid shrimp acute test showed that the NOEC limit of 20% was violated in eight of 12 samples. An EPA study found that the probable cause of most acute toxicity in Deer Island's wastestream was surfactants, a widely used ingredient in household detergents. It is believed that the cause of acute toxicity in Nut Island's effluent is also from surfactants. No acute toxicity could be attributed to metals or pesticides. Currently, concentrations of surfactants in the effluent from the two plants are consistent with the concentrations that could cause the observed mortality. The EPA study further concluded that surfactants are readily biodegraded with secondary treatment.

Chronic Toxicity Tests The results of the sheepshead minnow chronic tests showed that the NOEC limit of 10% for both the growth and survival endpoint were consistently met. The results of the chronic test using a red alga showed that the NOEC limit of 10% at the sexual reproduction endpoint always failed. The EPA has concluded that using the red alga for toxicity compliance is compromised by its ultrasensitive and inconsistent results; thus, it has been withdrawn as a test species in permit renewals.

B.3 Compliance with Interim Limits

Plant performance during FY94 measured against regulatory permit limits is presented in Table IV.B.5 and Figure IV.B.8. Figure IV.B.8 consists of graphs that chart trend analyses of conventional parameters for the twelve monitoring months in FY94.

Figure IV.B.6 Nut Island Effluent, Nutrient Concentrations
FY 1989 - 1994, Nut Island Laboratory

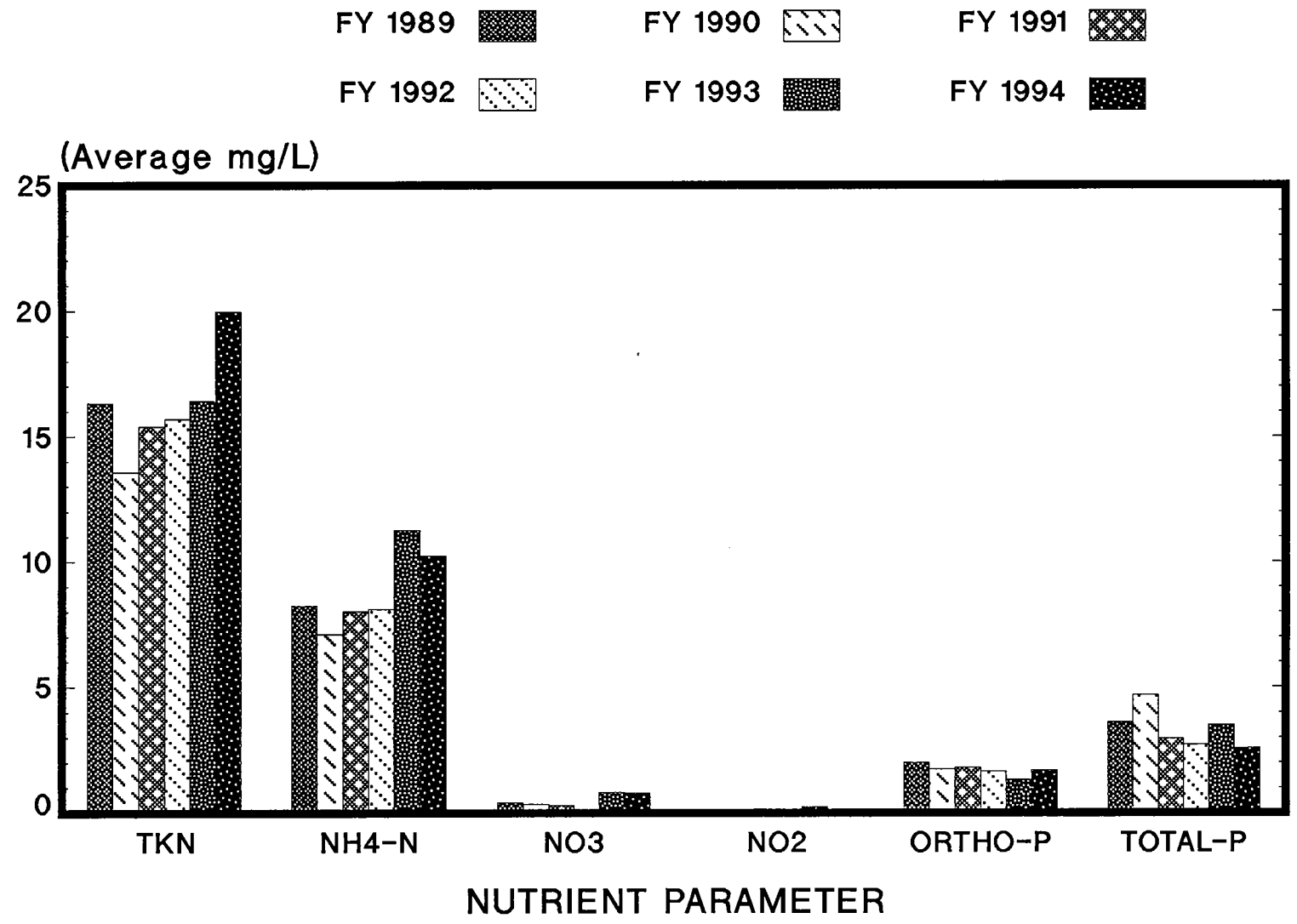


Figure IV.B.7 Nut Island Effluent, Mean Metal Loadings
1988 - 1994, Nut Island Laboratory

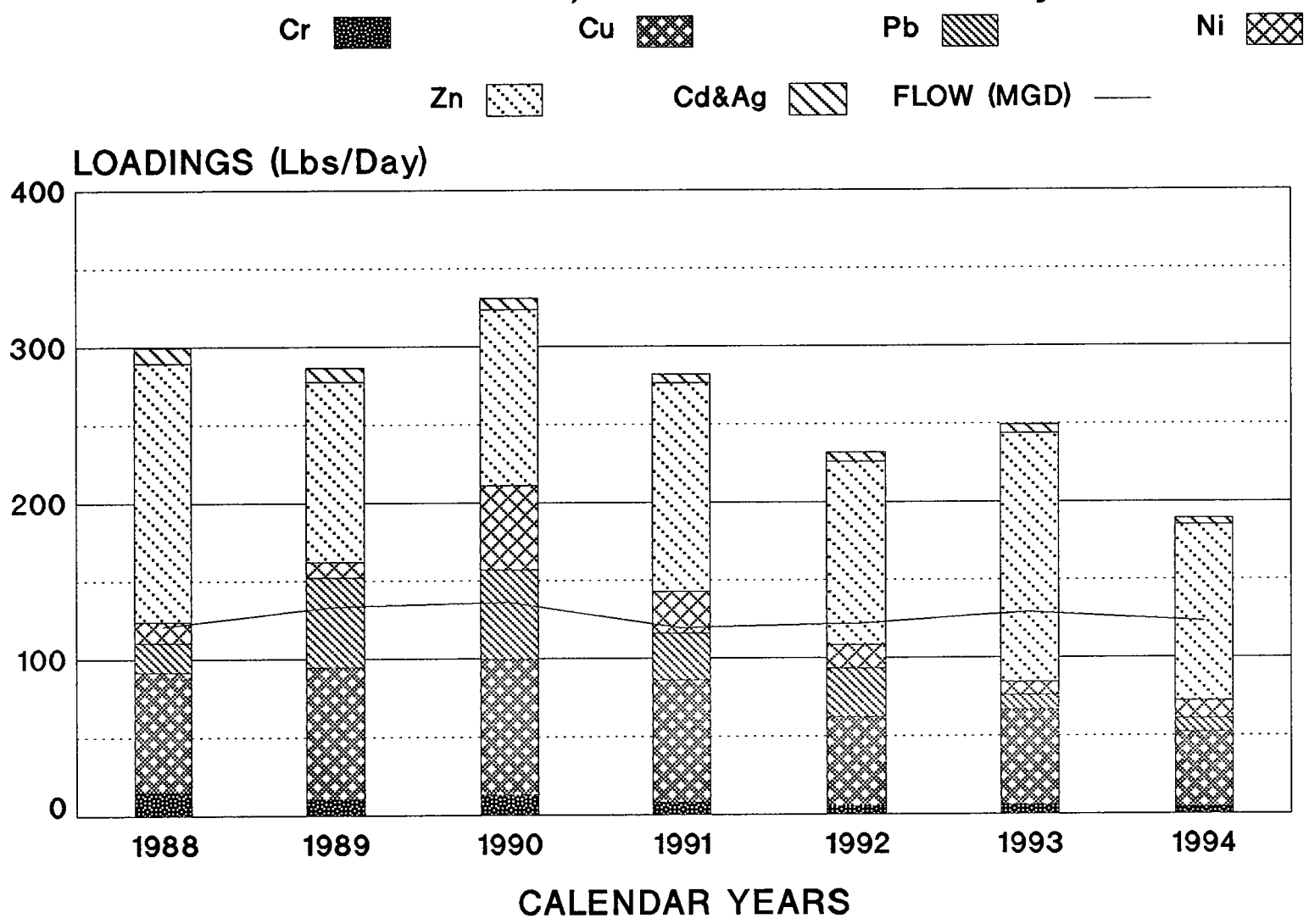


Table IV.B.4 Nut Island Effluent Results of Toxicity Testing, FY 1994

	Mysid acute		Cyprinodon chronic		Champia chronic
	LC50	NOEC	Survival NOEC	Growth NOEC	NOEC
Limits (%)	**None**	**20**	**10**	**10**	**10.0**
July	30	**10**	60	40	**2.0**
August	42	**10**	60	40	**2.0**
September	30	20	60	20	**2.0**
October	25	**10**	60	20	**2.0**
November	32	20	60	40	**2.0**
December	52	20	60	60	**0.7**
January	51	20	60	40	**2.0**
February	37	**10**	40	40	**2.0**
March	45	**5**	60	60	**2.0**
April	38	**10**	60	60	**2.0**
May	42	**10**	60	60	**2.0**
June	29	**10**	60	60	**0.7**
Average	**38**	**13**	**58**	**45**	**1.8**
Violations		**8**			**12**

BOD The 12-month running average BOD removal requirement was consistently met. However, there were a total of eight BOD-related violations: the average monthly limit was exceeded in August through November and the daily maximum concentration limit was exceeded twice in July, once in August, and once in September. See Deer Island section A.3.

TSS The TSS 12 month running average limit was consistently met. However, there was one TSS daily maximum limit violation in December. The violation happened after a significant rainfall (2.76 inches). Scouring velocities and introduction of suspended solids from surface runoff could have caused this violation.

pH There were seven low pH violations, ranging from 6.30 to 6.46. The NPDES permit allows for values outside permit limits. See Deer Island section A.3.

Settleable Solids There was no violation of this constituent.

Fecal and Total Coliform There were no violations of these parameters.

Table IV.B.5 Nut Island Effluent Compliance With Interim Limits

Parameter	Interim Limits*	Range Of Values Exceeding Limits	No of Violations
Biochemical Oxygen Demand			
Mo Ave (mg/L)	130	131 - 136	4
Dly Max (mg/L)	185	187 - 253	4
12-mo running removal rate (%)	15		
Total Suspended Solids			
Mo Ave (mg/L)	110		
Dly Max (mg/L)	195	197	1
12-mo running removal rate (%)	43		
Settleable Solids (mg/L)	1.8		
Fecal Coliform (#/100 mL)	200		
Total Coliform (#/100 mL)	1000		
pH	6.5 - 8.5	6.30 - 6.49	7
	Total Number of Violations		**16**

* Except for removal rates, the effluent quality must be less than or equal to limits. Removal rates must be equal to or greater than limits.

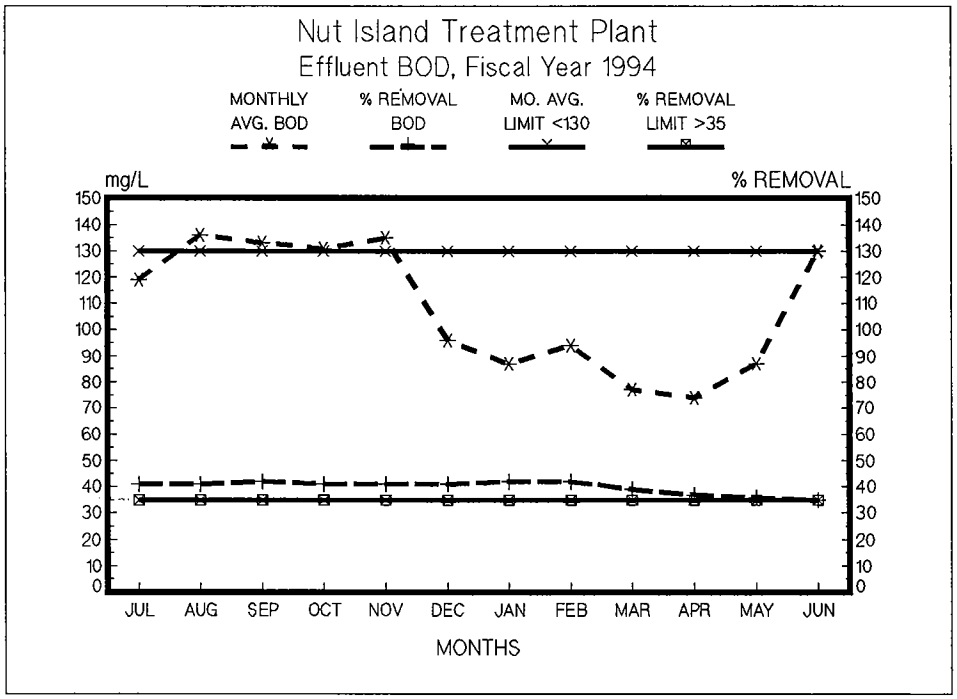
B.4 Effluent Quality Compared to Water Quality Standards

Table IV.B.6 compares the maximum effluent concentration observed and the calculated arithmetic mean concentrations of each pollutant with the pollutant concentration in Boston Harbor around the Nut Island outfall. The receiving water data was also collected in the summer of 1987 when dilution of discharge was presumably at the seasonal low due to stratification. Table IV.B.6 also shows the calculated critical dilution ratio required to meet water quality standards. As far as the acute criteria are concerned, the problematic parameters appear to be copper and cyanide. There appears to be no problem in meeting the chronic criteria.

B.5 Priority Pollutants of Concern

Copper The majority of priority pollutants measured in Nut Island effluent had concentrations well below detection levels except for copper. The critical dilutions required to meet both acute and chronic water quality criteria are 34 and 22 respectively, well above the assumed available dilution at the outfall pipe. It is believed that most of the copper comes from households where it is leached out of copper pipes as a result of acidic water supply.

Figure IV.B.8 Nut Island Trend Analyses of Conventional Pollutants



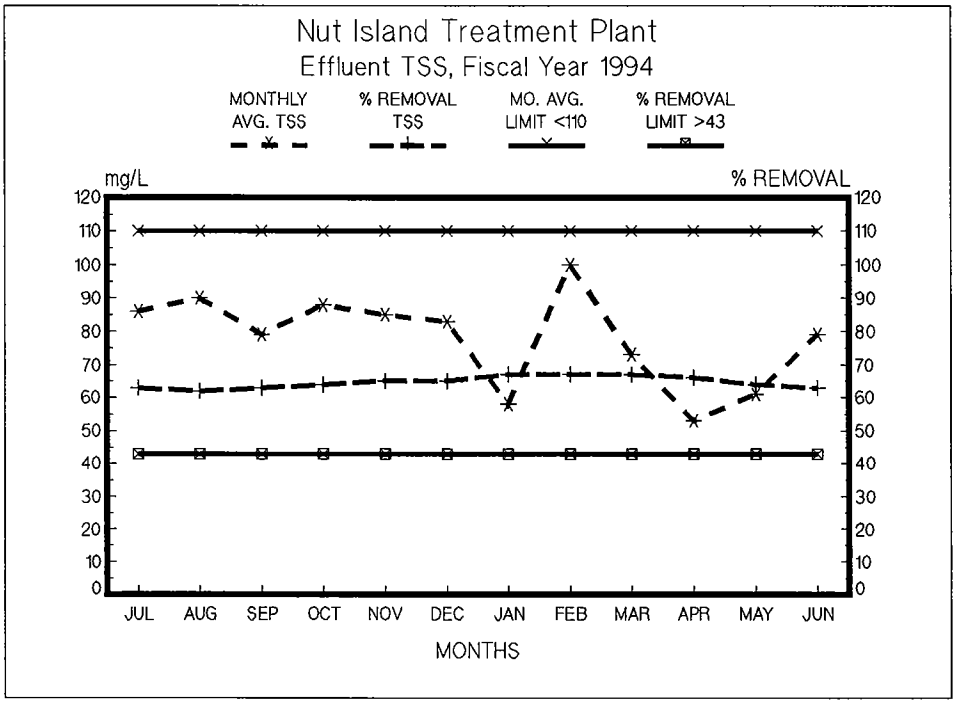
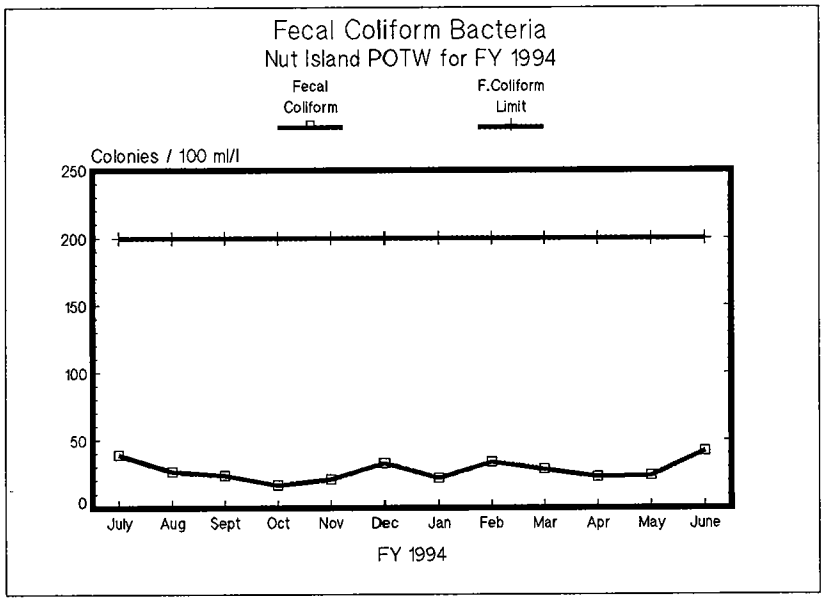
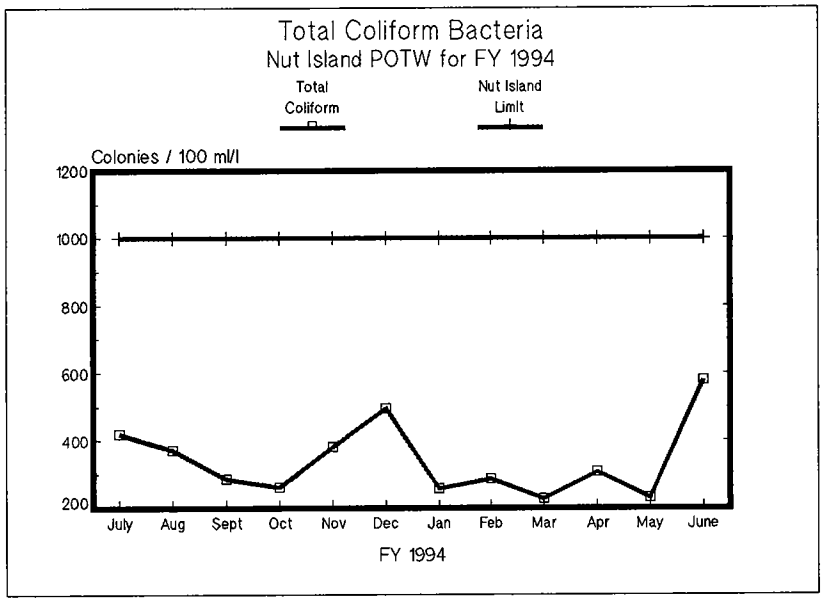
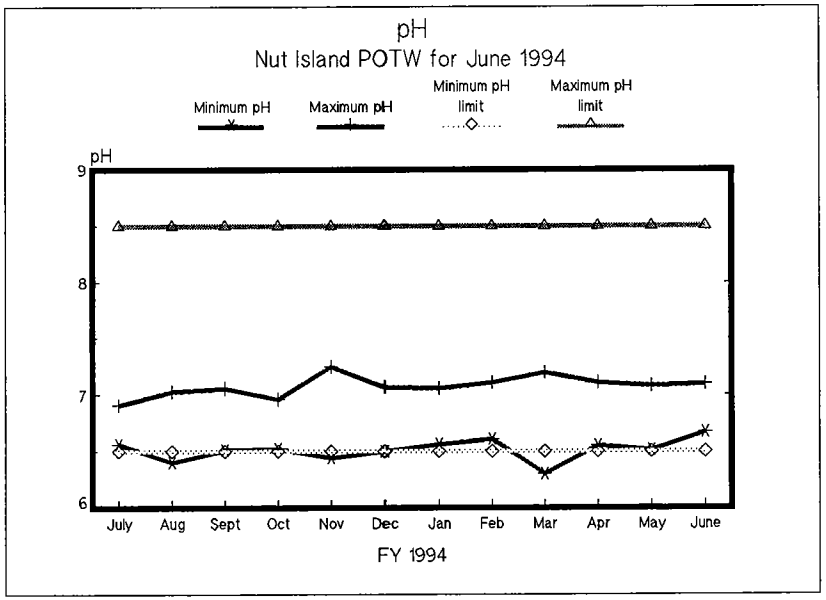


Figure IV.B.8 Continued







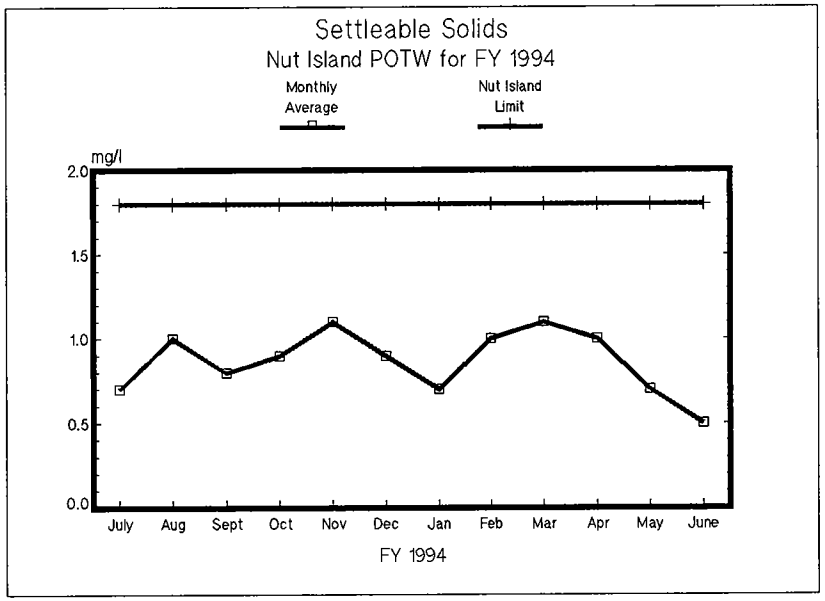


Table IV.B.6 Nut Island Effluent Compared to Water Quality Standards

Parameter	Boston Harbor *	Effluent Max Conc (ug/l)	Effluent Ave Conc (ug/l)	Acute Criteria (ug/l)	Max Conc : Acute Criteria	Chronic Criteria (ug/l)	Ave Conc: Chronic Criteria	Human Health Criteria	Ave Conc: Human Health Criteria
Aldrin	0.00002	0.076	0.015	1.3				0.00014	107 : 1
Arsenic		4.000	1.000	69.0		36		0.14	7 : 1
Cadmium	0.0249	1.000	0.500	43		9.3			
Chlordane		0.077	0.023	0.09	1 : 1	0.004	6 : 1	0.00059	39 : 1
Chromium (Total)	0.325	12.000	7.500	1100.00		50			
Copper	0.818	99.000	64.000	2.90	34 : 1	2.9	22 : 1		
Cyanide		42.000	13.000	1.00	42 : 1	1	13 : 1	220000	
DDT	0.00012			0.13		0.001		0.00059	
Dieldrin	0.0005			0.71		0.0019		0.00014	
Endosulfan				0.034		0.0087		159	
Endosulfan Alpha		0.019	0.009	0.034	1 : 1	0.0087	1 : 1	159	
Endosulfan Beta				0.034	2 : 1	0.0087	1 : 1	159	
Endrin				0.037		0.0023		0.81	
Heptachlor	0.00016			0.053		0.0036		0.00021	
Heptachlor Epoxide				0.053		0.0036		0.00011	
Lindane	0.00109	0.064	0.013	0.16				0.063	
Lead	0.1078	17.000	9.000	220.00		8.5	1 : 1		
Mercury	< 0.0064	0.200	0.100	2.10		0.025	4 : 1	0.15	1 : 1
Nickel	0.454	20.000	7.000	75.00		8.3	1 : 1	4600	
PCBs						0.03		0.000045	
Pentachlorophenol				13.00		7.9		0.09	
Selenium		4.000	2.000	300.00		71			
Silver		4.000	2.000	2.30	2 : 1				
Toxaphene				0.21		0.0002		0.00075	
Zinc	1.238	110.000	71.000	95.00	1 : 1	86	1 : 1		

* Secondary Treatment Facilities Plan, Volume V, Appendix X

C. Cottage Farm Combined Sewer Overflow Facility

C.1 Activations

An activation, as defined in this report, is an event where the wastewater flow exceeds the holding capacity of the sewer lines and the hydraulic capacity of the treatment plant, necessitating a diversion of flow to the CSO treatment facilities. In general, CSO activations occur as a result of excessive surface runoff caused by precipitation, the combination of precipitation and snowmelt, or choking at the headworks. Choking is the process by which flow to Deer Island is restricted at the headworks. Choking may or may not necessarily result in a discharge at the Cottage Farm or Prison Point CSO facility. Cottage Farm is influenced by choking at the Ward Street and Columbus Park Headworks while Prison Point is influenced by the Chelsea Creek. The volume of storm-induced flow is dependent on rainfall intensity, drainage area, and the sewer line capacity at the time of storm occurrence.

When there is a multiple-storm event, predicting the rainfall-runoff volume becomes even more complicated; consequently, the prediction of flow becomes even more challenging. The six CSO facilities behave differently due to the differing characteristics of the drainage area, collection system, and configurations of the facilities. For instance, there were more occurrences of high-intensity rainfall in FY94 than in FY93 resulting in higher flows in some of the CSO facilities although the total rainfall in FY93 was higher than in FY94.

Appendix C, Table C-1 contains the Cottage Farm FY94 activation data and is summarized in Table IV.C.1. Table IV.C.1 also compares FY94 data with FY93 and FY92 data. There was no significant difference in the number of times Cottage Farm activated between FY94 and FY93. However, there was a significant difference in the number of times Cottage Farm activated between FY94 and FY92, even though the amounts of rainfall were roughly the same. There were more high-intensity rainfall events in FY94 that triggered more overflow occurrences than in FY92. Except for the month of June, there was at least one activation each month at this facility, with most activations occurring in the month of March. Figure IV.C.1 presents the individual activations during FY94 while Figure IV.C.2 compares the total number of activations at Cottage Farm from FY89 to FY94.

Table IV.C.1 Cottage Farm CSO FY94 Activations Summary

	FY94	FY93	FY92
Number of Activations	31	33	23
Total Volume Treated (MG)	621	677	361
Maximum Flow (MGD)	123	145	64
Minimum Flow (MGD)	0.08	0.69	0.01
Average Flow (MGD)	20.02	20.52	15.69
Total Rainfall (in/year)	45.00	48.82	44.60

Average flow is calculated by dividing the total volume treated by the number of times the facility activated.

There has been a slight increase in the number of hours the flows from the headworks were choked in order to restrict flow to Deer Island. There was a 41% increase from FY92 to FY94. A slight increase of 12% from FY93 is primarily the result of construction-related activity. The construction-related choking hours were scheduled mostly at night when the wastewater flow was at a minimum and did not result in flow diversions to the CSO facilities.

C.2. Conventional Parameters

There are many factors that influence the concentration of wastewater constituents of CSO samples; the amount of runoff available for dilution, sampling occurrence with respect to first flush, representativeness of sample, and sample handling all play a part in the results obtained. Due to these factors, a wide spread in the measured amount of pollutants in CSO samples is expected. No removal of BOD and TSS is expected because the CSO facilities are not designed to remove these contaminants. At times, the effluent concentration of BOD and TSS may be higher than the influent concentration.

Analytical results of conventional parameter testing of both the influent and the effluent are included in Appendix C, Table C-1 and are summarized in Table IV.C.2. The wide ranges of BOD and TSS influent and effluent values reported demonstrate the variability of wastewater strength. Appendix C Table C-2 quantifies the amount of suspended solids and BOD discharged from Cottage Farm to the Charles River during each activation.

Figure IV.C.1 Cottage Farm CSO Activations, FY94

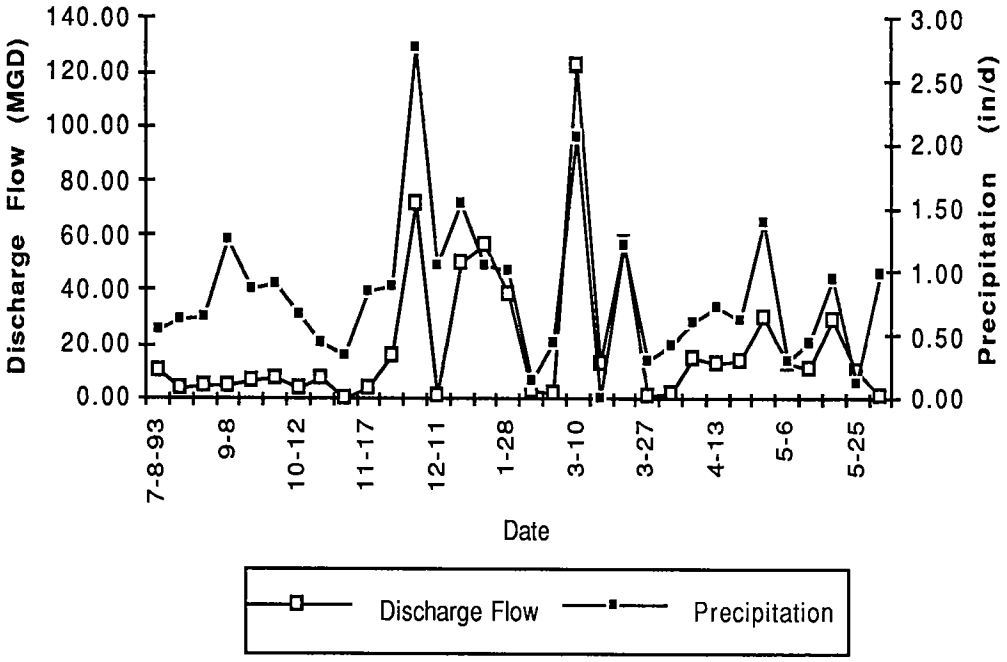


Figure IV.C.2 Cottage Farm CSO Activations, FY89-FY94

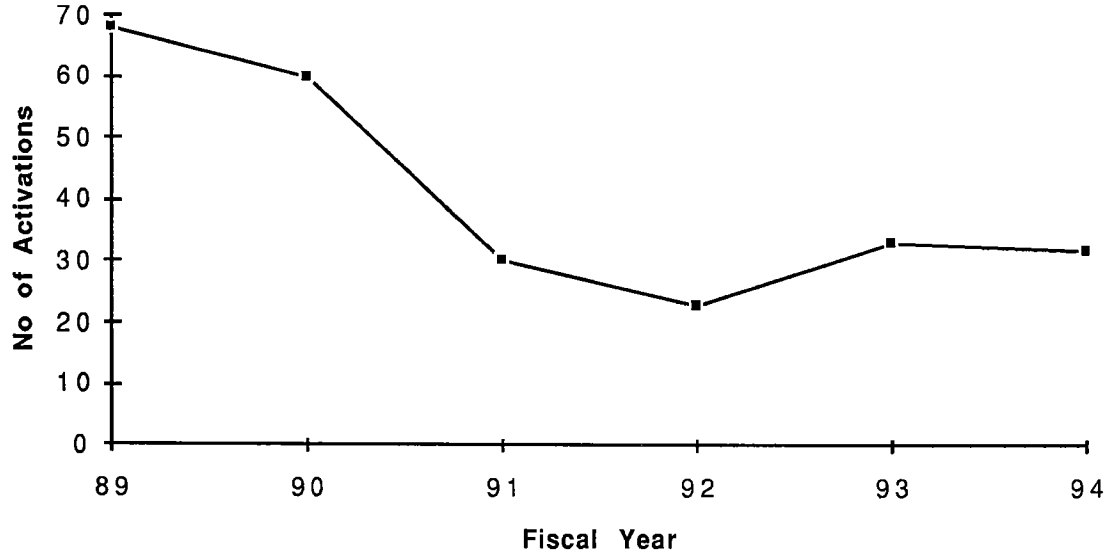


Table IV.C.2 Cottage Farm CSO Influent and Effluent Characteristics

Parameter	Concentration (*)					
	Influent			Effluent		
	Min	Ave	Max	Min	Ave	Max
TSS	13	177	1048	15	57	186
BOD	9	90	216	22	50	94
Fecal Coliform (#/100 mL)				10	45	284000
pH (units)				5.84		7.73

(*) Concentration expressed in mg/L except for pH and Fecal Coliform

C.3 Priority Pollutants

During the first measurable storm event of each month, samples were collected for selected priority pollutants, surfactants, ammonia, and phosphorus. Results of effluent monitoring conducted in 1994 are in Appendix C, Table C-3.

Metals Of the metals, copper, chromium, lead, mercury, and zinc were consistently present. Cadmium was detected 50% of the time.

Cyanide/Total Phenols Cyanide was consistently detected. Total phenols was detected 70% of the time.

Pesticides/PCBs Endosulfan I and endrin aldehyde were detected in one of ten samples while methoxychlor was detected in three of nine samples. G-BHC was estimated to be present once in ten samples.

Semi-volatile Organic Compounds Of the semivolatile organic compounds, only bis(2-ethylhexyl)phthalate, benzoic acid, and p-cresol were detected in reportable amounts. However, the latter two compounds are not on EPA's priority pollutants list.

C.4 Priority Pollutants Loadings

Appendix C, Table C-4 quantifies the amounts of toxic contaminants discharged to the Charles River through the Cottage Farm facility during each monthly sampling event. The loadings were calculated using the flows measured during the time of sampling. The calculated loadings should not be used to project monthly or yearly loadings because only one storm per month was sampled for selected pollutants at each permitted CSO facility.

C.5 Compliance With Regulatory Requirements

Fecal Coliforms There were two high fecal counts of 284,000 and 59,000 colonies/100 mL that were measured in March. These two high measurements constituted 25% of the total number of samples that month. In March, the NPDES permit limit, which states "no more than 10% of the samples can exceed 2500 colonies/100mL," was not met.

pH There were four low pH readings that violated the 6.5 limit. These readings ranged from 5.8 to 6.44. The NPDES permit allows for measurements outside of permit limits if values are exceeded due to natural causes or as a result of approved treatment processes and provided the effluent does not cause a violation of the water quality standards. The low pH measurements were more indicative of acid rain contribution than of poor effluent quality since CSO discharges are mostly rainfall runoff.

D. Prison Point Combined Sewer Overflow Facility

D.1 Activations

Appendix D, Table D-1 contains the Prison Point FY94 operations summary and is summarized in Table IV.D.1. Table IV.D.1 also compares FY94 with FY93 and FY92 data.

Although the total rainfall in FY93 was 3.82 inches higher than in FY94, there was a higher frequency of high-intensity rainfall in FY94, resulting in higher flows. The storm of December 5 alone yielded the high flow of 80 MGD. Except for the months of August, February, and June, there was at least one activation each month, with most activations occurring in the months of September and May.

Table IV.D.1 Prison Point CSO FY94 Activations Summary

	FY94	FY93	FY92
Number of Activations	26	26	29
Total Volume Treated (MG)	449	268	429
Maximum Flow (MGD)	80	28	63
Minimum Flow (MGD)	3.01	1.63	1
Average Flow (MGD)	17.28	10.34	14.79
Total Rainfall (in/year)	45.00	48.82	44.60

Average flow is calculated by dividing the total volume treated by the number of times the facility activated.

The number of activations, which increased sharply from FY89 to FY90, has since decreased and appears to have leveled off. FY89 was a very wet year, accumulating 48.42 inches of rainfall, and registering 42 activations at Prison Point. FY93 was also a very wet year, accumulating a total of 48.82 inches but in contrast, registering only 26 activations. Part of the reason for this significant decrease in activations at the CSO facilities is the increased pumping capacity at Deer Island. Rain-induced choking at the Chelsea Headworks had also decreased. By mid-1991, more wet weather flows could be sent to Deer Island, flows that otherwise would have been discharged to the lower Charles River through Prison Point. Figure IV.D.1 depicts the activations in FY94 while Figure IV.D.2 compares the total number of activations from 1989 to 1994.

D.2 Conventional Parameters

The results of analyses for conventional pollutants in the influent and effluent are contained in Appendix D, Table D-1 and are summarized in Table IV.D.2. The wide ranges of BOD and TSS influent and effluent values demonstrate the variability of wastewater strength, which is a result of combined sewers. No BOD and TSS removal is realized at a CSO chlorination facility. Appendix D Table D-2 quantifies the conventional pollutant loadings discharged from the Prison Point facility to the lower Charles River.

Figure IV.D.1 Prison Point CSO Activations, FY94

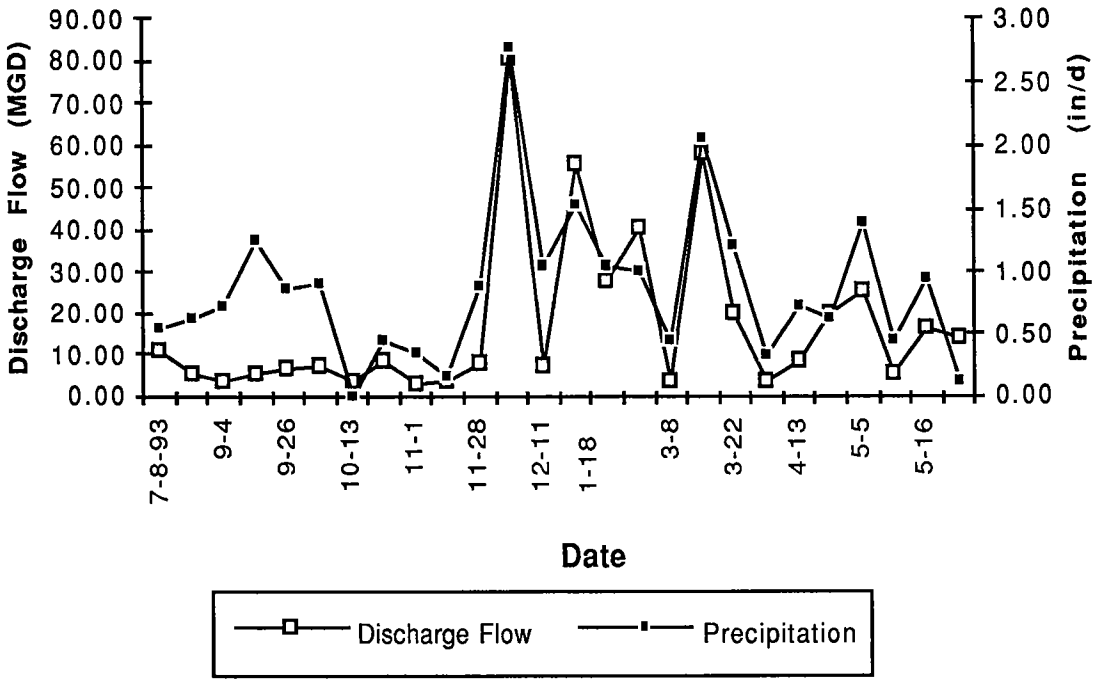


Figure IV.D.2 Prison Point CSO Activations, FY89-FY94

Table IV.D.2 Prison Point CSO Influent and Effluent Characteristics

Parameter	Concentration (*)					
	Influent			Effluent		
	Min	Ave	Max	Min	Ave	Max
TSS	44	210	1048	30	88	202
BOD	27	70	165	22	44	74
Fecal Coliform (#/100 mL)				10	30	4200
pH (units)				6.51		7.59

(*) Concentration expressed in mg/L except for pH and Fecal Coliform

D.3 Priority Pollutants

Results of effluent monitoring performed in FY94 are presented in Appendix D, Table D-3. Effluent characteristics of the Prison Point facility are comparable to those of the Cottage Farm effluent.

Metals Of the metals detected, arsenic, chromium, copper, lead, cadmium, nickel, zinc, and mercury were consistently present.

Cyanide/Total Phenols Cyanide was consistently detected. Total phenols, on the other hand, was detected 30% of the time.

Pesticides/PCBs Of nine samples, endrin aldehyde was detected in three samples while a-BHC, b-BHC, g-BHC, methoxychlor, heptachlor, endosulfan I, and heptachlor epoxide were detected in only one sample. Of all the compounds detected, only methoxychlor and endrin aldehyde were reported in measurable amounts.

Semivolatile Organic Compounds A number of compounds were detected. Of the semivolatile organic compounds, only bis(2-ethylhexyl)phthalate, benzoic acid, and p-cresol were detected in reportable amounts. However, the latter two compounds are not on EPA's priority pollutants list, however.

D.4 Priority Pollutants Loadings

Appendix D, Table D-4 quantifies the amounts of toxic contaminants discharged to the Charles River through the Prison Point facility during each monthly sampling event. The loadings were calculated using the flows measured during the time of sampling. The calculated loadings should not be used to project monthly or yearly loadings because only one storm per month was sampled for priority pollutants at each permitted CSO facility. For most constituents, the FY94 loadings appear to have increased from previous years, but these measurements are misleading since they resulted from higher method detection limits used in the analyses.

D.5 Compliance With Regulatory Requirements

Except for one high fecal count of 4,200 colonies/100 mL that was measured in May, this facility would have met all NPDES limits. This one high count constituted 25% of the total number of samples that month, not complying with the NPDES permit limit which states "no more than 10% of the samples can exceed 2500 colonies/100mL".

E. Somerville Marginal Combined Sewer Overflow Facility

E.1 Activations

Appendix E Table E-1 contains the Somerville Marginal FY94 activation data, and it is summarized in Table IV.E.1. Table IV.E.1 also compares FY94 with FY93 and FY92 data.

The majority of activations in FY94 at this facility occurred in the month of May, but the highest flows were measured in the months of December, January, and March. On December 5, a rainfall event measuring 2.76 inches yielded a flow of 10.14 MGD. The March 10 storm of 2.05 inches produced a discharge of almost 11 MGD. These two storm events produced an unusually high flow considering that the total volume of discharge during the whole month of May was only 3.83 MG.

There was a decrease in the number of activations in FY94 when compared to FY93 and FY92. In previous years, when an activation carried over to the following day, it was reported as another activation. This manner of reporting was in line with the NPDES Discharge

Monitoring Report (DMR) format. In other words, one significant rainfall event in FY93 may have been recorded as a two-activation event. And FY93 was a very wet year. By contrast, in FY94, when an activation was caused by a single storm event and activation carried over to the following day, it was recorded as a single event. This may explain the decreased activation frequency at Somerville. There were no significant differences in the total volume of sewage treated in FY93 and FY94 however.

The average flow discharged from this facility was about the same during the last three years. There was an overall decreasing trend in the number of times the facility activated and in the volume of flow treated and discharged from this facility since 1992. Figure IV.E.1 graphs the activations in FY94 while Figure IV.E.2 graphs the activations from FY89 to FY94.

Table IV.E.1 Somerville Marginal CSO FY94 Activations Summary

	FY94	FY93	FY92
Number of Activations	34	45	48
Total Volume Treated (MG)	72	90	89
Maximum Flow (MGD)	11	8	8.5
Minimum Flow (MGD)	0.006	0.101	0.003
Average Flow (MGD)	2.11	2.0	1.85
Total Rainfall (in/year)	45.00	48.82	44.60

Average flow is calculated by dividing the total volume treated by the number of times the facility activated.

E.2 Conventional Parameters

The results of analyses for conventional pollutants in the influent and effluent are contained in Appendix E, Table E-1 and are summarized in Table IV.E.2. The wide range of BOD and TSS influent and effluent values demonstrate the variability of wastewater strength, which is a result of combined sewers. No BOD and TSS removal is realized at a CSO chlorination facility. Appendix E Table E-2 quantifies the conventional pollutant loadings discharged from the Somerville Marginal facility to the Mystic River.

Figure IV.E.1 Somerville Marginal CSO Activations, FY94

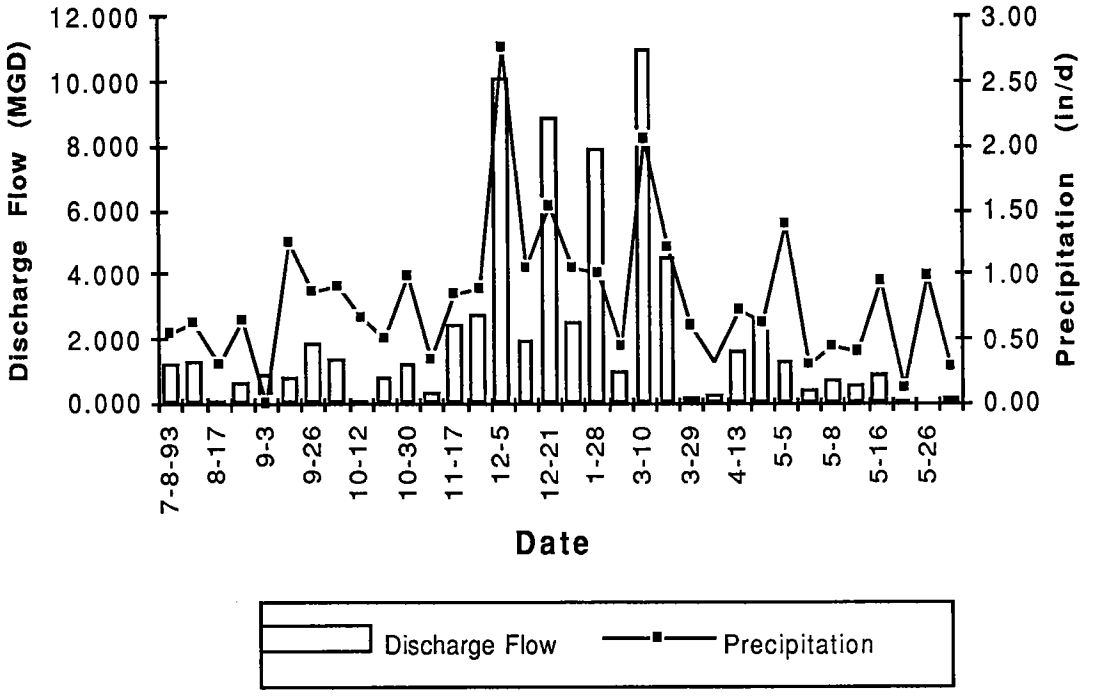


Figure IV.E.2 Somerville Marginal CSO Activations, FY89-FY94

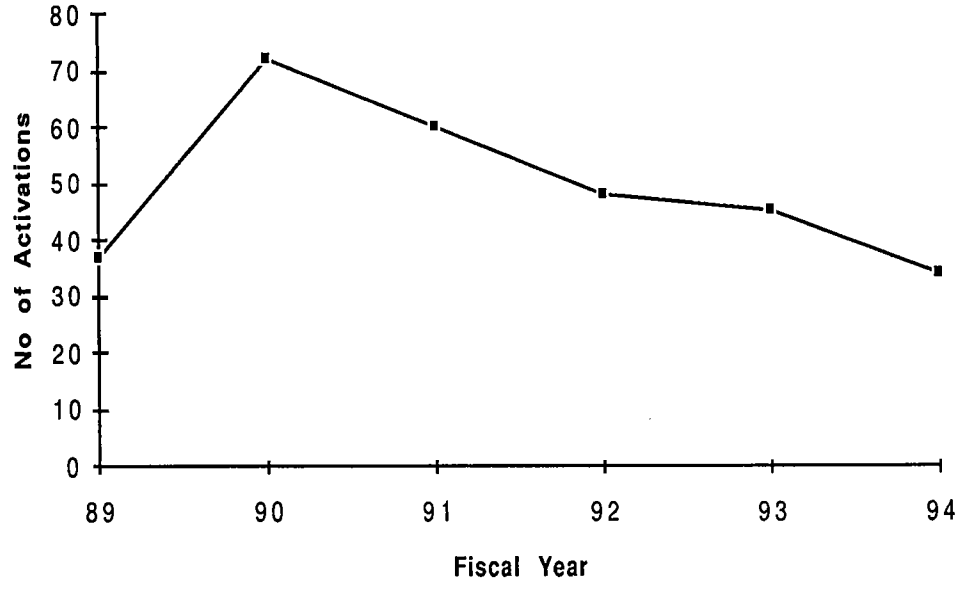


Table IV.E.2 Somerville Marginal CSO Influent and Effluent Characteristics

Parameter	Concentration (*)					
	Influent			Effluent		
	Min	Ave	Max	Min	Ave	Max
TSS	10	108	556	12	79	420
BOD	20	71	296	14	38	71
Fecal Coliform (#/100 mL)				10	15	170
pH (units)				6.52		8.58

(*) Concentration expressed in mg/L except for pH and Fecal Coliform

E.3 Priority Pollutants

Results of analyses performed in FY94 are contained in Appendix E, Table E-3. Effluent characteristics of the Somerville Marginal facility are comparable to those of Cottage Farm and Prison Point effluent.

Metals Of the metals detected, arsenic, chromium, copper, lead, cadmium, nickel, zinc, and mercury were consistently present.

Cyanide/Total Phenols Cyanide was consistently detected. Total phenols was detected 30% of the time.

Pesticides/PCBs Of nine samples, d-BHC and b-BHC were detected in two while b-BHC, methoxychlor, endrin aldehyde, and heptachlor epoxide were detected in only one. D-BHC, b-BHC, and endrin aldehyde showed measurable amounts.

Semivolatile Organic Compounds A number of compounds were detected. Of the semivolatile organic compounds only bis(2-ethylhexyl)phthalate, and benzoic acid were detected in reportable amounts. However, benzoic acid is not on EPA's priority pollutants list however.

E.4 Priority Pollutants Loadings

Appendix E, Table E-4 quantifies the amounts of toxic contaminants discharged to the Mystic River through the Somerville Marginal facility during each monthly sampling event. The loadings were calculated using the flows measured during the time of sampling. The calculated loadings should not be used to project monthly or yearly loadings because only one storm per month was sampled for priority pollutants at each permitted CSO facility. For most constituents, the FY94 loadings appear to have increased from previous years; however, these measurements are misleading since they resulted from higher method detection limits used in the analyses.

E.5 Compliance With Regulatory Requirements

There was only one high pH measurement at this facility. The high reading of 8.58 violated the upper limit of 8.5 pH units. This facility uses sodium hypochlorite for disinfection. Hypochlorite is very alkaline and tends to raise the pH of water. Since the high pH reading was the direct result of the disinfection process, it is not considered a true permit violation. The NPDES permit allows for permit limits violations provided that such violations were due to natural causes or as a result of approved treatment processes. No other permit limit was violated.

F. Constitution Beach Combined Sewer Overflow Facility

F.1 Activations

Although the Constitution Beach CSO is not currently permitted to the MWRA, the MWRA collects operational data to determine facility performance. In FY94, there were eight activations that registered a total of 0.683 MG treated and discharged to Boston Harbor. The number of activations in FY94 doubled from FY93.

Although the total rainfall in FY93 was 3.82 inches greater than in FY94, there was a greater frequency of high-intensity rainfall in FY94. This probably explains the increased frequency of activations at Constitution Beach. Appendix F, Table F-1 contains operations data and is summarized in Table IV.F.1. Table IV.F.1 also compares FY94 activations with FY93 and FY92 data.

Constitution Beach came on line in 1987, but no flow information is available because of malfunctioning flow meters since that time. Part of the problem occurred during high tides when backflow caused the totalizer to register negative readings. After several attempts to correct the problem failed, new flow meters were installed in April 1993. Flows for the period preceding the installation of new meters were estimated by the amount of hypochlorite used during activation. Consequently, flows recorded prior to April 1993 were probably overestimated. Figure IV.F.1 graphs discharge versus precipitation at Constitution Beach. Figure IV.F.2 depicts the number of activations from FY90 to FY94.

Table IV.F.1 Constitution Beach CSO FY94 Activations Summary

	FY94	FY93	FY92
Number of Activations	8	4	12
Total Volume Treated (MG)	0.683	1.57	11
Maximum Flow (MGD)	0.2	1.22	5.7
Minimum Flow (MGD)	0.01	0.1	0.23
Average Flow (MGD)	0.085	0.39	0.91
Total Rainfall (in/year)	45.00	48.82	44.60

Average flow is calculated by dividing the total volume treated by the number of times the facility activated.

F.2 Conventional Parameters

Analytical results of conventional parameter testing of both influent and effluent are contained in Appendix F, Table F-1 and are summarized in Table IV.F.2. Typical of combined wastewater characteristics, there was a wide range in the values reported. Appendix F Table F-2 quantifies the amount of suspended solids and BOD discharged into Boston Harbor during each activation.

Figure IV.F.1 Constitution Beach CSO Activations, FY94

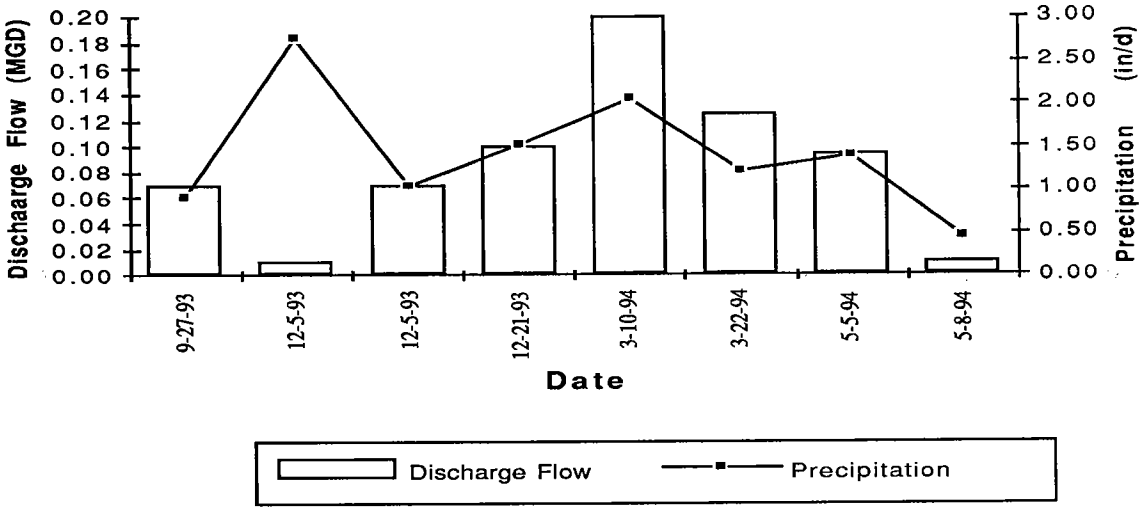


Figure IV.F.2 Constitution Beach CSO Activations, FY90-FY94

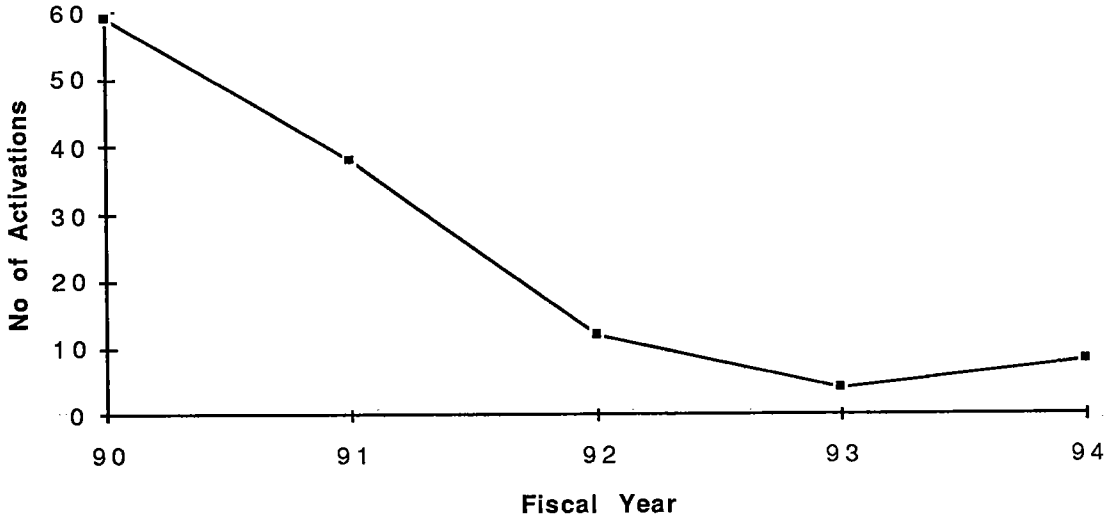


Table IV.F.2 Constitution Beach CSO Influent and Effluent Characteristics

Parameter	Concentration (*) Influent Min	Influent Ave	Influent Max	Effluent Min	Effluent Ave	Effluent Max
TSS	11	111	382	9	91	325
BOD	26	53	69	20	42	60
Fecal Coliform (#/100 mL)				10	48	280
pH (units)				6.85		8.73

(*) Concentration expressed in mg/L except for pH and Fecal Coliform

G. Fox Point Combined Sewer Overflow Facility

G.1 Activations

Like Constitution Beach, Fox Point is not currently permitted to the MWRA. Operational data from this facility are contained in Appendix G Table G-1 and are summarized in Table IV.G.1. The number of activations for the last three years are similar. Fox Point, like Constitution Beach, also experienced malfunctioning flow meters, and the flows reported may have been overestimated.

Table IV.G.1 Fox Point CSO FY94 Activations Summary

	FY94	FY93	FY92
Number of Activations	20	21	22
Total Volume Treated (MG)	76.15	36.91	38
Maximum Flow (MGD)	12	8.08	5
Minimum Flow (MGD)	0.4	0.36	0.4
Average Flow (MGD)	3.8	1.76	1.7
Total Rainfall (in/year)	45.00	48.82	44.60

Average flow is calculated by dividing the total volume treated by the number of times the facility activated.

During the latter part of FY94, flow data were estimated based on the amount of chlorine used during activations. As a result, the total volume and the average flow of wastewater treated appears to have doubled in FY94 when compared with FY92 and FY93 data. The flows are probably comparable to previous years. Figure IV.G.1 charts the activations in FY94 while figure IV.G.2 depicts the activations from FY91 to FY94.

G.2 Conventional Parameters

Analytical results of conventional parameter testing of both influent and effluent are contained in Appendix G, Table G-1 and are summarized in Table IV.G.2. Typical of combined wastewater characteristics, there was a wide range in the values reported. Appendix G Table G-2 quantifies the amount of TSS and BOD discharged into Boston Harbor during each activation.

Table IV.G.2 Fox Point CSO Influent and Effluent Characteristics

	Concentration (*)					
Parameter	Influent			Effluent		
	Min	Ave	Max	Min	Ave	Max
TSS	21	261	1248	9	155	428
BOD	22	70	224	20	51	122
Fecal Coliform (#/100 mL)				10	3425	66000
pH (units)				6.49		8.91

(*) Concentration expressed in mg/L except for pH and Fecal Coliform

H. Commercial Point Combined Sewer Overflow Facility

H.1 Activations

The majority of activations at Commercial Point occurred in the month of May. However, the storms in December and March produced high flows. Appendix H, Table H-1 contains the Commercial Point FY94 activation data and is summarized in Table IV.H.1. Table IV.H.1 also compares the activations during this monitoring period with FY93 and FY92 data.

Figure IV.G.1 Fox Point CSO Activations, FY94

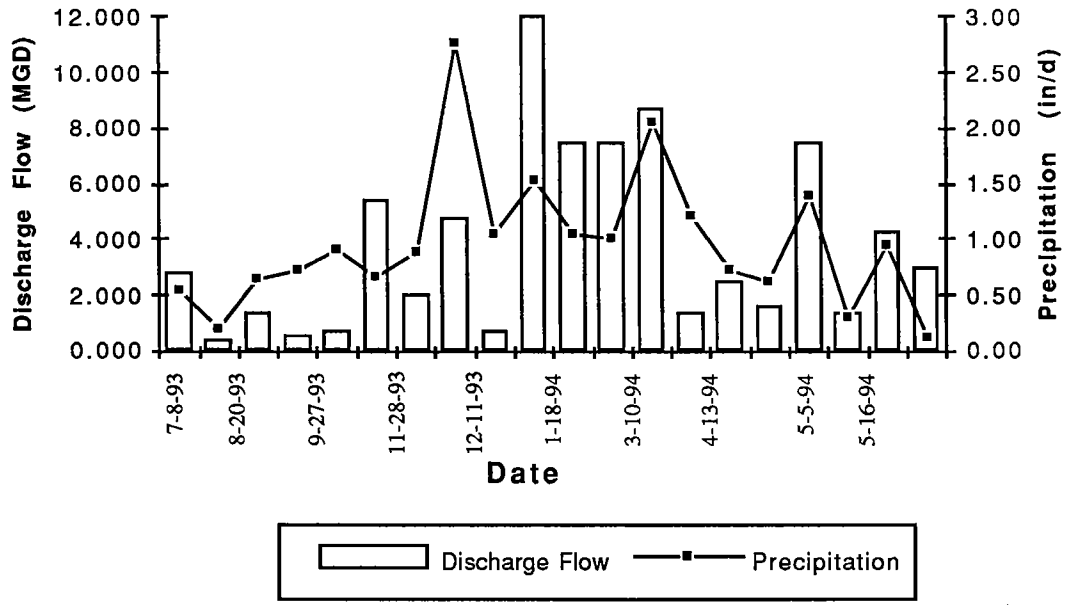


Figure IV.G.2 Fox Point CSO Activations, FY91-FY94

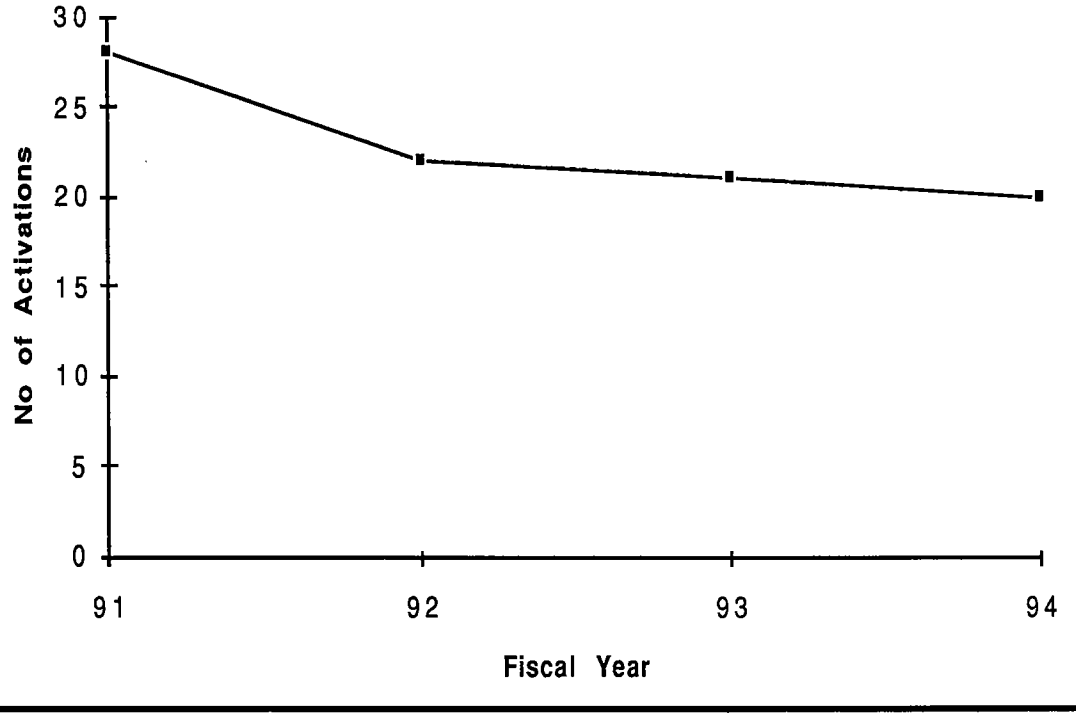


Table IV.H.1 Commercial Point CSO FY94 Activations Summary

	FY94	FY93	FY92
Number of Activations	25	28	33
Total Volume Treated (MG)	92.6	77.24	80
Maximum Flow (MGD)	16.5	9.84	11
Minimum Flow (MGD)	0.21	0.1	1
Average Flow (MGD)	3.72	2.97	2.4
Total Rainfall (in/year)	45.00	48.82	44.60

Average flow is calculated by dividing the total volume treated by the number of times the facility activated.

There was a small decrease in the number of activations in the last three years, however, there was a slight increase in the total volume of wastewater treated. The increase was due to the greater frequency of high-intensity rainfall in FY94. Figure IV.H.1 charts the activations in FY94 while figure IV.H.2 depicts the activations from FY91 to FY94.

H.2 Conventional Parameters

The results of analyses for conventional pollutants in the influent and effluent are included in Appendix H, Table H-1, Commercial Point Operations Summary and are summarized in Table IV.H.2. Typical of combined wastewater characteristics, there was a wide range in the values reported. Appendix H Table H-2 quantifies the amount of suspended solids and BOD discharged into Boston Harbor during each activation.

Table IV.H.2 Commercial Point CSO Influent and Effluent Characteristics

	Concentration (*)					
Parameter	**Influent**			**Effluent**		
	Min	**Ave**	**Max**	**Min**	**Ave**	**Max**
TSS	18	130	740	18	133	530
BOD	18	45	67	18	40	66
Fecal Coliform (#/100 mL)				10	45	57000
pH (units)				6.43		8.96

(*) Concentration expressed in mg/L except for pH and Fecal Coliform

Figure IV.H.1 Commercial Point CSO Activations, FY94

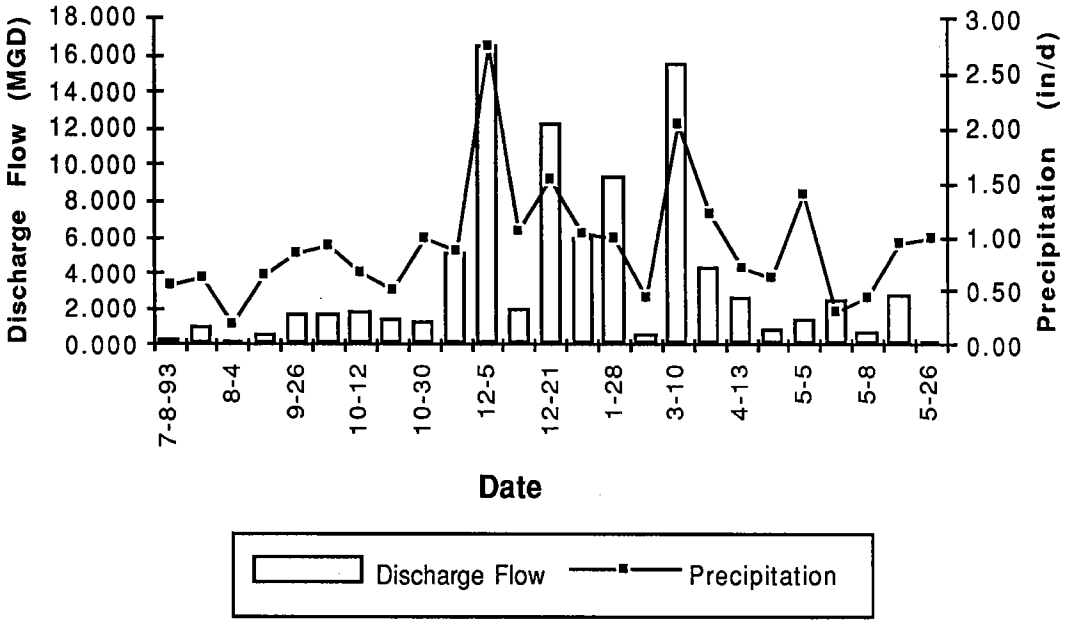
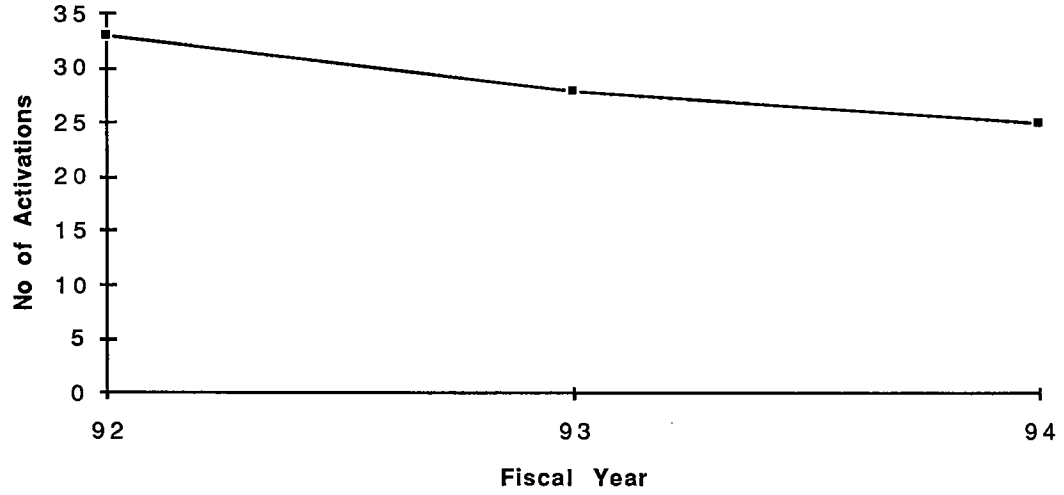


Figure IV.H.2 Commercial Point CSO Activations, FY92-FY94



V. Present and Future: A Summary

A. FY94 Operations and Monitoring Results

The monitoring results at both Deer Island and Nut Island plants were very comparable to the last three years. The treatment plants performed as expected. Other than the slightly increased construction-related choking at the headworks and occasional flow reallocation to the outfalls, there were no major upsets at Deer Island. At Nut Island however, a sludge return line connecting to the influent line was accidentally broken by a contractor. In order to stop total inundation of raw sewage at the construction site, the influent was diverted to outfall 104 without the benefit of primary settling. The diverted flow however was chlorinated prior to discharge to the harbor.

The average flows to the plants have been decreasing over the past couple of years. FY94 flows were slightly lower than in FY92 even though precipitation data for both years were comparable. The implementation of a system-wide Inspection and Maintenance Program combined with an aggressive Infiltration and Inflow Program resulted in reduced wet weather flow reaching the treatment plants.

In general, the "strength" of the wastewater that entered Deer Island was weak to medium. The strength of wastewater entering the Nut Island plant slightly was weaker than the Deer Islands. FY94 proved to be a typical year for the Deer Island and Nut Island treatment plant performances, as compared to past data. Deer Island recorded 17% and 45% 12-month running removal rates for BOD and TSS respectively. Although these rates were normal for Deer Island, Nut Island attained a 35% BOD 12-month removal rate and a 63% TSS 12-month removal rate, which are typical removal efficiencies of primary treatment plants. Effluent numbers were very similar to past years data as well.

Compliance with NPDES permit discharge limits were similar to FY93 data. Toxicity tests failures of both Deer Island and Nut Island effluents increased by only one in FY94 from FY93. Readings of pH outside the NPDES range decreased from ten in FY93 to eight in FY94. All eight pH values were below the NPDES low pH threshold, implicating acid rain as the main cause of the acidic values. These acidic discharges, however, were not of concern because slightly acidic water entering a highly buffered water environment, such as a marine environment, does not cause any detrimental effects to the water body.

For priority pollutants, there were two constituents of concern, Cu and DDT. The high concentrations of Cu are suspected to be from household pipes. Copper is leached from pipes by an acidic water supply. The MWRA is initiating a corrosion control program to abate this problem. Once the program is implemented, there will be a reduction in copper contribution from households. Lower concentrations of Cu in treatment plant effluent are expected to follow.

Although chemicals like PCBs and DDTs have been banned by the EPA since the early 80s, pesticides have not fully disappeared from the MWRA Sewerage System. DDT was found in Deer Island effluent in measurable amounts. Until the sewerage system has flushed itself of DDT and its degradation products (DDE, DDD), they are expected to be detected in Deer Island and Nut Island effluents.

B. Current Initiatives

Under Court Order, the MWRA developed the Combined Sewer Overflow Facilities Plan to reduce the amount of flow and the frequency of activations of combined sewer overflows into Boston Harbor. In addition to court mandated programs, the MWRA has started a number of its own programs. For example, system-wide inspection, maintenance, and improvement of the collection system are MWRA initiatives aimed at providing the best sewerage service possible. A metering program was also undertaken to document the success of the Infiltration and Inflow (I/I) program. The I/I Program, in cooperation with member communities, was implemented to control the magnitude of infiltration (groundwater) and inflow (surface runoff and other sources) entering the sewer system. The I/I Program has resulted in reduction of infiltration/inflow contribution. Other programs or studies that the MWRA is undertaking are showing positive results as well.

Combined Sewer Overflow Plans

The new National CSO Policy includes a requirement for the implementation of "Nine Minimum Controls" by January 1997. Although the MWRA has not yet completed its assessment of overall compliance with this policy, a number of activities relative to CSO control are progressing. The MWRA and the CSO communities have been making significant strides in the implementation of System Optimization Plans (SOPs) for CSO control. Of the 148 recommended measures, approximately 70 SOPs have been completed.

Full SOP realization will reduce system-wide CSO discharge volume by 20 percent. In addition to the SOPs, the MWRA has also recently completed the Final CSO Conceptual Plan and System Master Plan. This report presents MWRA's final conceptual recommendations for CSO control.

CSO Receiving Water Quality Monitoring

As required by the NPDES permit and in cooperation with member communities, the MWRA has invoked the CSO Receiving Water Monitoring Program, a program designed to measure impact of CSO discharges to the receiving water. Monitoring results have shown measurable improvements to the receiving bodies of water. Bacteria levels have significantly decreased at beaches near three new CSO treatment facilities: Tenean Beach, Constitution Beach, and Malibu Beach. Monitoring will continue in FY95.

Pretreatment Program

The MWRA Pretreatment Program, managed by the Toxic Reduction and Control Department (TRAC), continues to monitor and restrict toxic discharges to acceptable levels from industrial users within the sewerage system. This program is essential in the control of toxic discharges to the Boston Harbor. Because the ability of Deer Island and Nut Island plants to remove toxics in wastewater is limited, it is imperative that toxics are controlled at their source. The pretreatment program tackles the problem through source reduction, product substitution, and public education. The success of the Pretreatment Program is evident in the decreased amounts of metals entering the MWRA system.

Public Education

The Wastewater Education Program has been effective in reaching young children and young adults about source reduction and wastewater treatment. It has been documented that these children bring home what they learned and in turn, taught their parents about water pollution. This highly successful program will be instrumental in the reduction of toxics loads contributed by household.

C. In the Future

The New Primary Plant

In 1995, the new primary plant will be subjected to functional testing, equipment testing, performance evaluation, process adjustment, and overall fine-tuning of operations. During these times, influent flow will be pumped to both the old and the new primary plants, with the majority of the flow going to the new plant. The new plant will have improved performance characteristics from existing treatment facilities.

The Secondary Pilot Plant

The 2 MGD pilot plant at the Deer Island plant has been debugged. In the coming years, the pilot plant will provide valuable information on process control, facility performance, and effluent quality. This prototype of the upgraded Deer Island plant provides the means of running different treatment alternatives to derive optimum process specifications.

Deer Island Secondary Plant

The MWRA has made significant progress in meeting the court-ordered schedule for the construction of a secondary treatment plant. As of 1994, 84% of the new Deer Island Secondary Plant was designed and 55% of construction was completed. The new secondary plant can only improved performance characteristics from the existing treatment facilities. These improvements will be evident in the quality of effluent discharged. Loadings of conventional pollutants are expected to decrease while treatment efficiencies are expected to increase.

Construction work to retrofit the Nut Island plant into a headwork facility is ongoing. The inter-island tunnel, which will convey flows from the south system to the north system, is also under construction. The current target date for completion of the inter-island tunnel is the Fall of 1996. The new outfall tunnel, which will convey Deer Island Treatment Plant effluent 9.5 miles out to Massachusetts Bay, is projected to be completed in the Fall of 1997.

D. Summary of Commitment

Overall, the MWRA has performed a considerable number of projects designed to protect the environment. The MWRA will continue:

- to monitor effluent discharge quality to ensure meeting NPDES permit requirements and meeting water quality standards
- to aggressively inspect and maintain the collection system
- to reduce excessive inflow/infiltration to the sewerage system
- to ensure proper operation of the treatment plants while in the midst of construction activities
- to control and reduce toxics entering the facility by controlling them at their source while working cooperatively with the regulated industries in the areas of source reduction, raw material substitution, process modification, recycling, and process flow reduction
- to implement EPA's CSO Nine Minimum Controls, and to move on to the next phase of the CSO program
- to assess receiving water quality through our CSO monitoring program
- to develop criteria for optimum secondary plant performance through the pilot plant and
- to reach more young people through public education.

It is important to keep good track of all parameters, whether they be regulated or not, to ensure that the receiving bodies of water remain healthy and to ensure that changes in water quality are recorded. Many improvements are forthcoming, not only of the quality of treated water discharged from Deer Island and combined sewer overflows facilities, but also of the overall health of Boston Harbor. The outlook is promising. The MWRA will continue in its effort to restore the integrity of the harbor and its tributaries.

Appendix A

Appendix A Table A-1 Deer Island Treatment Plant Operations Summary, Fiscal Year 1994

	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	SUMMARY MIN VALUE	SUMMARY AVE VALUE	SUMMARY MAX VALUE
FLOW (MGD)															
AVERAGE	206	194	208	206	218	272	249	255	383	287	288	225		249	
MINIMUM	173	171	173	175	175	198	199	206	241	224	219	194	171		
MAXIMUM	281	276	289	338	398	496	437	380	528	354	409	263			528
PEAK FLOW	600	588	596	543	578	644	603	475	622	583	606	473			644
TEMP (DEG F)	71	72	71	67	62	56	53	52	50	54	57	63		61	
EFFLUENT pH															
MINIMUM	6.8	6.7	6.8	6.7	6.6	6.8	6.9	6.3	6.7	6.6	6.8	6.8	6.30		
MAXIMUM	7.0	7.1	7.4	7.0	7.7	7.3	7.5	7.5	7.4	7.2	7.3	7.2			7.7
CONVENTIONAL PARAMETERS (mg/L)															
SETTLEABLE SOLIDS															
INFLUENT	4.5	4.4	4.9	5.0	4.0	2.5	4.1	3.5	1.9	3.1	3.1	5.6	1.9	3.9	5.6
EFFLUENT	0.1	0.2	0.1	0.1	0.2	0.6	0.5	0.7	0.9	0.8	0.8	0.6	0.1	0.5	0.9
BIOCHEMICAL OXYGEN DEMAND															
INFLUENT	168	164	175	164	171	119	152	148	99	132	130	165	99	149	175
EFFLUENT	118	139	142	136	136	114	124	134	87	104	100	141	87	123	142
TOTAL SUSPENDED SOLIDS															
INFLUENT	175	152	162	148	146	107	125	121	93	122	126	172	93	137	175
EFFLUENT	75	70	78	72	71	75	75	77	65	67	68	86	65	73	86
OIL AND GREASE															
INFLUENT	39.9	63.5	41.2	44.4	45.8	27.3	35.9	*	14.0	24.0	25.3	29.6	14	36	64
EFFLUENT	25.7	31.2	27.1	27.9	35.6	21.8	27.2	*	12.3	18.9	23.2	24.1	12	25	36
TOTAL COLIFORMS (#/100ML)															
INFLUENT (E+06)	48.6	53.41	61.9	51.76	34.82	12.63	0.28	0.02	0.01	0.06	0.01	22.95	0.01	24	62
EFFLUENT	498	177	719	523	981	695	268	256	134	111	222	201	111	399	981

Appendix A Table A-1 Deer Island Treatment Plant

	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	SUMMARY MIN VALUE	SUMMARY AVE VALUE	SUMMARY MAX VALUE
FECAL COLIFORM (#/100ML)															
INFLUENT (E+06)	4.38	5.36	6.03	4.02	2.81	1.16	0.01	**	**	**	**	2.06	0.01	3.23	6
EFFLUENT	16	12	25	14	25	23	8	7	9	9	11	13	7	14	25
RESIDUAL CHLORINE	1.78	1.86	1.86	2.22	2.25	2.37	2.94	3.9	2.93	2.85	2.64	2.42	1.78	2.50	4
CHLORIDES	1284	1538	1122	1030	916	1072	1070	983	725	798	867	1078	725.00	1040	1538
METALS (ug/L)															
ARSENIC															
INFLUENT	*	3.0	< 20	< 16	< 22	< 18	< 3	*	*	*	*	*	< 3	< 7.1	3.0
EFFLUENT	*	4.0	< 20	< 16	< 22	< 18	3.0	*	*	*	*	*	< 16	< 7.5	4.0
CHROMIUM															
INFLUENT	15.0	19.0	13.0	14.0	15.0	6.0	3.0	*	*	*	*	*	3.0	12.1	19.0
EFFLUENT	11.0	14.0	10.0	16.0	15.0	16.0	13.0	*	*	*	*	*	10.0	13.6	16.0
COPPER															
INFLUENT	62.0	74.0	69.0	69.0	76.0	60.0	68.0	62.0	50.0	60.0	61.0	44.0	44.0	62.9	76.0
EFFLUENT	54.0	59.0	50.0	63.0	67.0	64.0	76.0	64.0	47.0	54.0	55.0	35.0	35.0	57.3	76.0
CADMIUM															
INFLUENT	1.0	1.0	1.0	1.0	1.0	1.0	1.0	*	*	*	*	*	1.0	1.0	1.0
EFFLUENT	1.0	1.0	1.0	1.0	2.0	1.0	1.0	*	*	*	*	*	1.0	1.1	2.0
IRON															
INFLUENT	1760	2113	1753	1633	1600	1168	1460	*	1410	1520	1413	1157	1157	1544	2113
EFFLUENT	1677	1861	1244	1238	1257	1315	1247	*	1385	1387	1190	1580	1190	1398	1861
LEAD															
INFLUENT	21.0	12.0	23.0	21.0	22.0	17.0	15.0	*	21.0	18.0	21.0	22.0	12.0	19.4	23.0
EFFLUENT	12.0	8.0	16.0	13.0	57.0	18.0	13.0	*	17.0	11.0	14.0	11.0	8.0	17.3	57.0
MERCURY															
INFLUENT	0.6	0.4	0.5	0.3	0.4	*	0.2	*	*	*	*	*	0.2	0.4	0.6
EFFLUENT	0.6	0.4	0.3	< 0.2	< 0.2	*	0.2	*	*	*	*	*	< 0.2	0.3	0.6
NICKEL															
INFLUENT	12.0	14.0	13.0	11.0	14.0	8.0	9.0	*	*	*	*	*	8.0	11.6	14.0
EFFLUENT	9.0	9.0	9.0	12.0	14.0	11.0	12.0	*	*	*	*	*	9.0	10.9	14.0

Appendix A Table A-1 Deer Island Treatment Plant

	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	SUMMARY MIN VALUE	SUMMARY AVE VALUE	SUMMARY MAX VALUE
SILVER															
INFLUENT	6.0	10.0	6.0	6.0	6.0	4.0	4.0	*	*	*	*	*	4.0	6.0	10.0
EFFLUENT	5.0	5.0	5.0	5.0	5.0	4.0	3.0	*	*	*	*	*	3.0	4.6	5.0
ZINC															
INFLUENT	250.0	219.0	158.0	129.0	129.0	120.0	114.0	145.0	*	*	*	184.0	114.0	160.9	250.0
EFFLUENT	95.0	98.0	94.0	82.0	88.0	104.0	87.0	104.0	*	*	*	98.0	82.0	94.4	104.0
NUTRIENTS (mg/L)															
TKN															
INFLUENT	21.17	26.60	25.54	26.38	29.29	18.76	27.16	17.70	11.20	17.02	16.46	25.10	11.20	21.86	29.29
EFFLUENT	21.82	22.88	24.08	24.53	29.62	19.52	32.76	17.95	12.83	17.67	15.85	21.10	12.83	21.72	32.76
AMMONIA															
INFLUENT	13.72	15.54	15.12	15.32	17.92	11.87	14.00	8.30	5.60	9.13	7.90	13.16	5.60	12.30	17.92
EFFLUENT	13.56	18.51	15.40	15.71	15.96	11.17	15.40	8.65	6.08	10.25	7.62	12.60	6.08	12.58	18.51
NITRATES															
INFLUENT	0.10	0.08	0.11	0.09	0.45	0.08	0.63	2.41	2.60	0.11	2.70	0.10	0.08	0.79	2.70
EFFLUENT	0.21	0.70	0.41	0.25	0.48	0.13	0.17	0.86	0.57	5.98	1.00	1.73	0.13	1.04	5.98
NITRITE															
INFLUENT	0.02	0.08	0.07	0.05	0.03	< 0.01	*	0.02	0.07	0.15	*	0.05	< 0.01	0.06	0.15
EFFLUENT	0.11	0.26	0.01	0.10	0.03	0.22	*	0.01	0.10	0.12	*	0.07	0.01	0.10	0.26
ORTHOPHOSPHORUS															
INFLUENT	5.14	2.73	3.47	2.62	2.09	1.37	1.90	1.66	0.35	*	*	1.93	0.35	2.33	5.14
EFFLUENT	2.75	2.80	4.09	2.88	2.34	1.25	2.24	2.62	0.48	1.38	0.61	2.39	0.48	2.15	4.09
TOTAL PHOSPHORUS															
INFLUENT	5.72	4.95	6.01	4.04	4.25	3.12	4.30	8.30	1.77	2.88	2.07	0.58	0.58	4.00	8.30
EFFLUENT	3.47	4.64	5.18	2.98	3.31	2.45	2.81	2.26	1.22	2.80	2.71	1.19	1.19	2.92	5.18

Appendix A Table A-1 Deer Island Treatment Plant

	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	SUMMARY MIN VALUE	SUMMARY AVE VALUE	SUMMARY MAX VALUE
PRIMARY SLUDGE															
FLOW (MGD)	0.218	0.274	0.269	0.289	0.307	0.268	0.290	0.296	0.233	0.334	0.273	0.279	0.218	0.278	0.334
SCUM (MGD)	0.007	0.005	0.005	0.005	0.006	0.007	0.009	0.013	0.022	0.009	0.014	0.007	0.005	0.009	0.022
pH															
MINIMUM	5.30	5.50	5.50	5.50	5.40	5.30	5.50	5.40	5.40	5.40	5.50	5.40	5.30	5.43	5.50
MAXIMUM	5.90	6.10	5.90	6.10	6.20	5.90	6.20	6.10	6.00	6.00	5.90	6.00	5.90	6.03	6.20
SOLIDS (%)	6.99	6.51	6.80	6.40	6.33	6.74	6.29	5.83	7.11	6.67	6.80	6.54	5.83	6.58	7.11
VOLATILE SOLIDS (%)	78.00	79.00	80.00	82.00	83.00	81.00	83.00	84.00	78.00	81.00	81.00	83.00	78.00	81.08	84.00
GREASE (%)	5.80	7.50	11.50	8.20	11.30	9.90	12.60	14.60	*	*	14.80	16.30	5.80	11.25	16.30
DIGESTED SLUDGE															
FLOW(MGD)															
METER READING	0.338	0.367	0.393	0.379	0.361	0.319	0.347	0.339	0.296	0.414	0.341	0.378	0.30	0.356	0.41
ELEVATION	0.241	0.268	0.295	0.292	0.313	0.247	0.287	0.276	0.230	0.301	0.261	0.311	0.23	0.277	0.31
pH															
MINIMUM	7.10	7.00	6.90	7.00	7.20	7.10	7.10	7.00	7.00	7.10	7.10	7.10	6.90	7.06	7.20
MAXIMUM	8.20	7.60	7.40	7.50	7.60	7.60	7.60	8.10	7.70	7.60	7.70	7.40	7.40	7.67	8.20
TOTAL SOLIDS (%)	3.38	3.21	2.95	2.67	2.39	2.49	2.00	2.02	2.69	2.17	2.82	2.69	2.00	2.62	3.38
VOLATILE SOLIDS (%)	59.00	56.00	57.00	57.00	57.00	56.00	61.00	60.00	57.00	59.00	57.00	59.00	56.00	57.92	61.00
GREASE (%)	3.00	10.60	9.60	4.10	3.50	2.70	6.80	5.20	*	*	3.80	5.20	2.70	5.45	10.60
METALS (mg/L)															
ARSENIC	*	0.15	< 0.200	< 0.166	< 0.217	< 0.18	0.02	*	*	*	*	*	< 0.166	0.09	0.15
CHROMIUM	2.93	3.22	2.72	2.56	1.48	1.70	1.18	*	*	*	*	*	1.18	2.25	3.22
COPPER	24.22	21.32	21.98	19.18	12.94	17.08	12.98	11.62	15.05	10.72	15.03	*	10.72	16.56	24.22
CADMIUM	0.17	0.16	0.16	0.13	0.09	0.10	0.07	*	*	*	*	*	0.07	0.13	0.17
IRON	496.00	402.50	501.00	347.00	270.00	348.00	278.00	*	*	284.00	411.67	*	270.00	370.91	501.00
LEAD	10.51	11.72	11.08	8.55	6.28	6.48	4.73	5.16	7.61	6.04	7.89	*	4.73	7.82	11.72
MERCURY	0.22	0.26	0.14	0.28	0.17	*	0.05	*	*	*	*	*	0.05	0.19	0.28
NICKEL	1.12	1.20	1.17	0.94	0.73	0.90	0.64	*	*	*	*	*	0.64	0.96	1.20
SILVER	0.29	0.48	0.19	0.81	0.07	0.06	0.44	*	*	*	*	*	0.06	0.33	0.81
ZINC	35.90	33.30	34.50	27.50	19.90	24.20	15.80	16.50	*	*	*	*	15.80	25.95	35.90

Appendix A Table A-1 Deer Island Treatment Plant

	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	SUMMARY MIN VALUE	SUMMARY AVE VALUE	SUMMARY MAX VALUE
NUTRIENTS (mg/L)															
TKN	1795	1120	1568	1859	1330	2070	1623	1014	980	1593	2008	1970	980	1577	2070
AMMONIA	1061	560	672	613	697	711	560	468	428	294	605	804	294	623	1061
ORTHOPHOSPHORUS	40	*	33	28	41	40	39	45	21	28	44	*	21	36	45
TOTAL PHOSPHORUS	352	440	395	310	246	482	375	273	236	454	528	269	236	363	528
GAS PRODUCED (E+03 cu ft)															
WASTED	839	933	1170	1158	828	288	217	125	174	358	92	202	92.00	532	1170
USED	0	0	0	0	0	1073	1397	1474	1244	1360	1267	1242	0.00	755	1474
TOTAL	839	933	1170	1158	828	1361	1614	1599	1418	1718	1359	1444	828.00	1287	1718

NOTES:

1. Data reduced from Deer Island Treatment Plant Monthly Operation Logs. All chemical analyses were conducted by Deer Island Laboratory.
2. * Not analyzed
3. ** Sample was prechlorinated, data not appropriate.

Appendix A Table A-2 Deer Island Influent Characterization, Fiscal Year 1994

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	MIN	AVE	MAX	TIMES DETECTED
Metals (ug/L)																
Antimony	< 80	< 80	< 80	< 80	a	< 80	< 80	< 5	< 5	< 5	< 5	< 5				0 of 25
Arsenic	< 7	< 5	< 5	**3.70**	a	< 5	**6.00**	**4.49**	**1.46**	**2.62**	< 2	< 2	< 2	2.81	6.00	6 of 25
Beryllium	< 4	< 4	< 4	< 4	a	< 4	< 4	< 1	< 1	< 1	< 1	< 1				0 of 25
Boron	**401**	**405**	**474**	**454**	a	**324**	**300**	**365**	**171**	**228**	**254**	**286**	171	333	474	25 of 25
Cadmium	< 5	< 5	**3.95**	< 5	a	< 5	< 5	< 4	**0.73**	< 1	< 1	**4.42**	< 1	2.24	4.42	4 of 25
Chrome(hex)	< 5	< 5	< 5	< 5	a	< 5	< 5	< 5	< 5	< 5	< 5	< 1				0 of 25
Chromium	< 10	< 10	**16.00**	**7.41**	a	**11.46**	< 10	**5.98**	**22.15**	**6.46**	**9.47**	**7.98**	< 10	< 9.26	22.15	15 of 25
Copper	**81.8**	**85.7**	**109.2**	**102.4**	a	**87.5**	**65.0**	**61.3**	**54.5**	**72.8**	**89.4**	**71.1**	54.46	80.05	109.20	25 of 25
Lead	< 30	< 30	**26.64**	**36.31**	a	**22.89**	**15.00**	**12.90**	**15.54**	**19.08**	**23.19**	**15.51**	< 30	< 19.74	36.31	13 of 25
Mercury	< 1	< 1	**0.78**	< 1	a	< 1	**0.30**	**0.15**	< 0.2	**0.35**	**0.35**	**0.25**	< 0.2	0.39	0.78	8 of 25
Molybdenum	< 80	< 80	< 80	< 80	a	< 80	< 80	< 80	**5.86**	**16.00**	**18.00**	**20.58**	< 80	< 30.95	20.58	7 of 25
Nickel	< 20	< 20	< 20	< 20	a	< 20	< 20	< 12	**10.29**	**21.67**	**12.60**	< 12	< 12	< 10.60	21.67	2 of 25
Selenium	< 7	< 5	< 10	< 10	a	< 5	**7.00**	**5.04**	< 2	**4.77**	**1.94**	< 2	< 2	3.56	7.00	3 of 25
Silver	< 7	< 7	**5.09**	< 7	a	< 7	< 7	< 3	**2.20**	**2.65**	**2.21**	**3.29**	< 3	3.13	5.09	5 of 25
Thallium	< 5	< 5	< 20	< 10	a	< 5	< 5	< 10	< 20	< 20	< 20	< 20				0 of 25
Zinc	**100**	**113**	**142**	**131**	a	**119**	**89**	**84**	**127**	**110**	**107**	**115**	84	113	142	25 of 25
Inorganics (mg/L)																
Total Cyanide	< 0.01	< 0.01	**0.004**	< 0.01	< 0.01	< 0.01	< 0.01	**0.024**	**0.012**	**0.012**	**0.024**	**0.008**	< 0.01	< 0.01	0.02	9 of 27
Oil and Grease	**6.0**	**9.6**	**8.9**	**12.9**	**33.1**	**8.6**	**9.0**	**61.9**	**8.2**	**14.3**	**3.6**	**26.8**	3.57	16.91	61.86	25 of 27
Surfactants	**4.6**	**4.3**	**5.3**	**5.4**	**5.0**	**3.7**	**3.5**	**3.9**	**2.4**	**3.3**	**4.1**	**5.3**	2.36	4.23	5.39	27 of 27
Pesticides/PCBs (ug/L)																
Alpha-BHC	< 0.05	< 0.05	**0.012**	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	**0.018**	< 0.05	< 0.05	0.01	0.02	2 of 27
Beta-BHC	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	**0.030**	< 0.05	< 0.05	**0.017**	< 0.05	< 0.05	0.01	0.03	2 of 27
Chlordane	< 0.50	< 0.50	< 0.20	< 0.70	< 1.00	< 1.00	< 1.00	< 0.50	< 0.50	< 0.50	**0.188**	< 0.20	< 0.20	2.55	0.19	2 of 27
4,4'-DDD (P,P'TDE)	< 0.10	< 0.10	**0.040**	**0.032**	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.20	< 0.10	< 0.10	< 0.02	0.04	3 of 27
4,4'-DDT	< 0.10	< 0.10	**0.027**	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	**0.032**	**0.171**	< 0.10	< 0.03	0.17	3 of 27
Delta-BHC	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	**0.085**	**0.056**	< 0.05	< 0.02	0.09	2 of 27
Gamma-BHC	**0.013**	**0.019**	**0.031**	< 0.05	< 0.05	< 0.05	< 0.05	**0.031**	< 0.05	**0.016**	< 0.05	**0.015**	< 0.05	< 0.01	0.03	8 of 27
Heptachlor	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	**0.034**	**0.021**	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	0.03	2 of 27

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	MIN	AVE	MAX	DETECTED
Semi-volatile Organics (ug/L)																
Benzoic Acid	**188**	**133**	**247**	**219**	a	**126**	**140**	**205**	**92**	**142**	**139**	**160**	91.76	156.82	247.41	26 of 27
4-Methylphenol	**45.4**	**57.2**	**35.7**	**37.7**	a	**23.9**	**32.0**	**30.4**	**10.3**	**26.4**	**22.1**	**27.6**	10.29	45.7	57.2	26 of 27
Phenol	**41.25**	**37.88**	**8.88**	**15.59**	a	**8.64**	**5.00**	**8.49**	< 20	**32.32**	**4.42**	**8.00**	< 20	< 18.63	41.25	21 of 27
Benzyl Alcohol	**19.06**	**20.16**	**12.57**	**13.44**	a	**14.93**	**6.00**	**12.98**	**5.68**	**16.15**	**11.59**	**17.60**	5.68	13.35	20.16	22 of 27
Bis(2-ethylhexyl) phthalate	**19.2**	**16.7**	**6.6**	**7.6**	a	**8.3**	**7.0**	**19.5**	**12.5**	**198.2**	**7.1**	**10.5**	6.62	33.23	198.16	26 of 27
Butylbenzylphthalate	**3.35**	**3.02**	< 50	**2.67**	a	**2.07**	< 20	**4.46**	**3.46**	**6.98**	**2.53**	**3.49**	< 20	< 4.80	6.98	17 of 27
D-N-Butyl phthalate	**4.61**	**4.04**	**5.97**	**3.32**	a	< 10	< 20	**11.05**	**6.00**	**8.60**	**5.11**	**7.49**	< 10	< 5.77	11.05	17 of 27
Di-N-Octyl phthalate	**1.31**	**1.34**	< 50	< 20	a	< 10	< 20	< 20	< 20	< 50	< 20	< 50	< 10	< 3.22	1.34	5 of 27
Diethyl phthalate	**9.22**	**9.68**	**8.59**	**7.63**	a	**5.54**	**5.00**	**8.95**	**5.00**	**6.54**	**6.53**	**9.51**	5.00	7.68	9.68	25 of 27
2-methylnaphthalene	**1.35**	**1.68**	< 50	**3.68**	a	**2.07**	< 20	**18.77**	**2.93**	**5.37**	**1.47**	**3.98**	< 20	< 9.11	18.77	18 of 27
Naphthalene	**1.00**	**1.66**	< 50	< 30	a	< 10	< 20	**6.07**	**1.46**	**4.83**	**1.00**	**5.00**	< 10	< 4.68	6.07	15 of 27
Phenanthrene	< 10	< 20	< 50	< 23	a	< 10	< 20	**3.72**	**1.54**	< 50	< 20	**5.00**	< 10	< 3.48	5.00	3 of 27
Volatile Organic Compounds (ug/L)																
Acetone	**163**	**64**	**100**	**53**	**115**	**97**	**120**	**150**	**82**	**105**	**97**	**93**	53.30	103.30	162.83	26 of 27
Benzene	< 10	**1.00**	**1.00**	< 10	< 10	< 10	< 10	**1.51**	**1.54**	**2.00**	**1.00**	**1.00**	< 10	1.17	2.00	11 of 27
Bromoform	< 10	< 10	< 10	< 10	< 10	< 10	< 10	**11.18**	< 10	< 10	**2.47**	< 10	< 10	< 1.97	11.18	3 of 27
2-Butanone	< 10	< 10	< 10	**2.30**	< 10	**14.46**	< 10	**5.58**	< 10	< 10	**8.87**	**1.98**	< 10	< 3.35	14.46	6 of 27
Carbon disulfide	**13.81**	**5.74**	< 10	**6.35**	**6.02**	**9.04**	**3.00**	< 10	< 10	**3.84**	< 10	**3.93**	< 10	< 4.64	13.81	15 of 27
Chloroform	**4.39**	**5.32**	**4.00**	**3.00**	**4.50**	**4.93**	**7.00**	**11.53**	**3.07**	**4.54**	**10.06**	**5.00**	3.00	5.61	11.53	27 of 27
Dibromochloromethane	< 10	< 10	< 10	< 10	< 10	< 10	< 10	**5.58**	**1.54**	< 10	**5.00**	< 10	< 10	< 1.76	5.58	4 of 27
Dichlorobromomethane	< 10	< 10	< 10	< 10	< 10	< 10	< 10	**4.05**	**1.54**	**1.00**	**8.53**	< 10	< 10	< 1.93	8.53	5 of 27
Trans-1,2-Dichloroethylene	**2.96**	**2.66**	**2.32**	**1.33**	**2.00**	< 10	**2.00**	**3.02**	**2.00**	**3.00**	**2.53**	**2.51**	< 10	< 2.28	3.02	22 of 27
Ethylbenzene	< 10	< 10	**1.00**	< 10	< 10	< 10	< 10	< 10	< 10	**0.95**	< 10	< 10	< 10	< 1.00	1.00	3 of 27
Methylene chloride	**5.13**	**6.38**	**10.40**	**4.00**	**12.50**	**2.61**	**7.00**	< 10	**1.93**	**4.00**	**2.47**	**15.89**	< 10	< 6.11	15.89	21 of 27
Tetrachloroethylene	**4.35**	**3.94**	**7.28**	**4.74**	**3.50**	**6.39**	**4.00**	**5.54**	**3.93**	**3.54**	**4.06**	**3.51**	3.50	< 4.57	7.28	26 of 27
Toluene	**5.04**	**6.00**	**5.32**	**5.34**	**5.00**	**4.54**	**5.00**	**5.47**	**9.03**	**4.00**	**4.00**	**4.00**	4.00	< 5.23	9.03	27 of 27
Total Xylenes	1.35	**2.98**	**2.29**	**2.34**	< 10	**4.46**	**5.00**	**3.04**	**4.00**	**4.46**	**3.00**	**2.02**	< 10	< 2.99	5.00	18 of 27
1,1,1-Trichloroethane	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	**1.00**	**1.00**	**1.00**	**1.51**	< 10	< 1.04	1.51	5 of 27
Trichloroethylene	2.61	**2.66**	**3.35**	**2.36**	< 10	**1.93**	**3.00**	**2.51**	**4.46**	**5.46**	**5.06**	**4.00**	< 10	< 3.20	5.46	23 of 27

Notes:

1. Bold are detected values. Samples collected in November, signified "a" were deemed not representative.
2. The monthly average concentration is the weighted concentration back-calculated from daily loadings during each sampling day. In calculating the daily loadings, for those values reported below detection levels, one half (metals) and one-tenth (organics) of their reporting limit is used.
3. The yearly average concentration is calculated from the monthly averages.
4. A complete list of pesticides, semi-volatiles and volatile organics analyzed is included in Appendix J, Table 1. Only parameters that were detected or estimated to be present are included in this table.

Appendix A Table A-3 Deer Island Influent Loadings, Fiscal Year 1994

	Average Monthly Loadings (lbs/d)												SUMMARY		
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	MIN	AVE	MAX
Metals															
Arsenic	**6.01**	4.04	4.34	**6.36**	a	5.67	**12.46**	**9.55**	**4.68**	**6.26**	2.40	1.88	1.88	5.79	12.46
Boron	**689**	**656**	**822**	**781**	a	**735**	**623**	**777**	**545**	**547**	**610**	**536**	536	666	822
Cadmium	4.30	4.04	**6.85**	4.30	a	5.67	5.19	4.25	**2.34**	1.20	1.20	**8.30**	1.20	4.33	8.30
Chromium	8.59	8.09	**27.75**	**12.72**	a	**26.01**	10.38	**12.72**	**70.74**	**15.46**	**22.75**	**14.97**	8.09	20.93	70.74
Copper	**140.5**	**138.7**	**189.4**	**175.9**	a	**198.5**	**135.0**	**130.3**	**174.0**	**174.2**	**214.6**	**133.5**	130.33	164.06	214.61
Lead	25.77	24.27	**46.22**	**62.38**	a	**51.93**	**31.15**	**27.42**	**49.63**	**45.66**	**55.69**	**29.11**	24.27	40.84	62.38
Mercury	0.86	0.81	**1.36**	0.86	a	1.13	**0.62**	**0.32**	0.32	**0.85**	**0.83**	**0.47**	0.32	0.77	1.36
Molybdenum	68.72	64.72	69.39	68.72	a	90.74	83.07	85.07	**18.70**	**38.30**	**43.23**	**38.62**	18.70	60.84	90.74
Nickel	17.18	16.18	17.35	17.18	a	22.68	20.77	12.76	**32.87**	**51.88**	**30.27**	11.26	11.26	22.76	51.88
Selenium	5.79	4.04	8.67	8.59	a	5.67	**14.54**	**10.71**	3.19	**11.42**	**4.67**	1.88	1.88	7.20	14.54
Silver	6.01	5.66	**8.83**	6.01	a	7.94	7.27	3.19	**7.01**	**6.35**	**5.30**	**6.17**	3.19	6.34	8.83
Zinc	**172**	**183**	**246**	**225**	a	**271**	**185**	**179**	**404**	**263**	**258**	**216**	172.47	236.55	404.39
Inorganics															
Total Cyanide	1.72	1.62	**7.38**	1.72	1.82	2.27	2.08	**51.26**	**38.79**	**29.49**	**56.69**	**15.31**	1.62	17.51	56.69
Oil and Grease	**10390**	**15562**	**15474**	**22163**	**60138**	**19525**	**18690**	**131554**	**26343**	**34240**	**8563**	**50201**	8563	34404	131554
Surfactants	**7818**	**6927**	**9154**	**9253**	**9169**	**8382**	**7185**	**8278**	**7538**	**8009**	**9839**	**10009**	6927	8463	10009
Pesticides/PCBs															
Alpha-BHC	0.009	0.008	**0.021**	0.009	0.009	0.011	0.010	0.011	0.016	0.012	**0.043**	0.009	0.01	0.01	0.04
Beta-BHC	0.009	0.008	0.009	0.009	0.009	0.011	0.010	**0.064**	0.016	0.012	**0.041**	0.009	0.01	0.02	0.06
Chlordane	0.086	0.081	0.035	0.120	18.181	22.685	20.767	0.106	0.160	0.120	**0.452**	0.038	0.03	5.24	22.68
4,4'-DDD (P,P'TDE)	0.017	0.016	**0.069**	**0.055**	0.018	0.023	0.021	0.021	0.032	0.024	0.048	0.019	0.02	0.03	0.07
4,4'-DDT	0.017	0.016	**0.047**	0.017	0.018	0.023	0.021	0.021	0.032	0.024	**0.077**	**0.321**	0.02	0.05	0.32
Delta-BHC	0.009	0.008	0.009	0.009	0.009	0.011	0.010	0.011	0.016	0.012	**0.204**	**0.105**	0.01	0.03	0.20
Gamma-BHC	**0.022**	**0.031**	**0.054**	0.009	0.009	0.011	0.010	**0.066**	0.016	**0.038**	0.012	**0.028**	0.01	0.03	0.07
Heptachlor	0.009	0.008	0.009	0.009	0.009	0.011	0.010	**0.072**	**0.067**	0.012	0.012	0.009	0.01	0.02	0.07
Semi-volatile Organics															
Benzoic Acid	**322**	**216**	**429**	**376**	a	**286**	**291**	**435**	**293**	**341**	**335**	**301**	215.83	329.47	435.04
4-Methylphenol	**78.0**	**92.5**	**62.0**	**64.7**	a	**54.3**	**66.5**	**64.6**	**32.9**	**63.2**	**53.1**	**51.8**	32.87	62.13	92.49
Phenol	**70.87**	**61.29**	**15.41**	**26.79**	a	**19.61**	**10.38**	**18.06**	6.39	**77.35**	**10.60**	**15.01**	6.39	30.16	77.35
Benzyl Alcohol	**32.74**	**32.61**	**21.80**	**23.09**	a	**33.87**	**12.46**	**27.61**	**18.15**	**38.65**	**27.83**	**33.03**	12.46	27.44	38.65

	Average Monthly Loadings (lbs/d)												SUMMARY		
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	MIN	AVE	MAX
Semi-volatile Organics (cont)															
Bis(2-ethylhexyl) phthalate	**32.9**	**27.1**	**11.5**	**13.1**	a	**18.9**	**14.5**	**41.5**	**40.0**	**474.3**	**17.0**	**19.7**	11.48	64.59	474.31
Butylbenzylphthalate	**5.76**	**4.89**	8.67	**4.58**	a	**4.70**	4.15	**9.48**	**11.06**	**16.71**	**6.07**	**6.55**	4.15	7.51	16.71
D-N-Butyl phthalate	**7.92**	**6.53**	**10.35**	**5.70**	a	2.27	4.15	**23.51**	**19.17**	**20.58**	**12.28**	**14.05**	2.27	11.50	23.51
Di-N-Octyl phthalate	**2.24**	**2.17**	8.67	3.44	a	2.27	4.15	4.25	6.39	11.97	4.80	9.38	2.17	5.43	11.97
Diethyl phthalate	**15.84**	**15.66**	**14.90**	**13.10**	a	**12.56**	**10.38**	**19.03**	**15.97**	**15.65**	**15.68**	**17.85**	10.38	15.15	19.03
2-methylnaphthalene	**2.31**	**2.72**	8.67	**6.32**	a	**4.70**	4.15	**39.92**	**9.35**	**12.84**	**3.54**	**7.46**	2.31	9.27	39.92
Naphthalene	**1.72**	**2.69**	8.67	5.15	a	2.27	4.15	**12.91**	**4.68**	**11.55**	**2.40**	**9.38**	1.72	5.96	12.91
Phenanthrene	1.72	3.24	8.67	3.95	a	2.27	4.15	**7.91**	**4.92**	11.97	4.80	**9.38**	1.72	5.73	11.97
Volatile Organic Compounds															
Acetone	**280**	**104**	**174**	**92**	**209**	**221**	**249**	**318**	**262**	**252**	**234**	**174**	91.56	213.94	318.26
Benzene	1.72	**1.62**	**1.73**	1.72	1.82	2.27	2.08	**3.21**	**4.91**	**4.79**	**2.40**	**1.88**	1.62	2.51	4.91
Bromoform	1.72	1.62	1.73	1.72	1.82	2.27	2.08	**23.77**	3.19	2.39	**5.94**	1.88	1.62	4.18	23.77
2-Butanone	1.72	1.62	1.73	**3.95**	1.82	**32.81**	2.08	**11.86**	3.19	2.39	**21.31**	**3.71**	1.62	7.35	32.81
Carbon disulfide	**23.72**	**9.29**	1.73	**10.91**	**10.94**	**20.50**	**6.23**	2.13	3.19	**9.20**	2.40	**7.38**	1.73	8.97	23.72
Chloroform	**7.54**	**8.61**	**6.93**	**5.15**	**8.18**	**11.18**	**14.54**	**24.51**	**9.81**	**10.86**	**24.16**	**9.38**	5.15	11.74	24.51
Dibromochloromethane	1.72	1.62	1.73	1.72	1.82	2.27	2.08	**11.86**	**4.91**	2.39	**12.01**	1.88	1.62	3.83	12.01
Dichlorobromomethane	1.72	1.62	1.73	1.72	1.82	2.27	2.08	**8.62**	**4.91**	**2.39**	**20.48**	1.88	1.62	4.27	20.48
Trans-1,2-Dichloroethylene	**5.08**	**4.30**	**4.03**	**2.28**	**3.64**	2.27	**4.15**	**6.42**	**6.39**	**7.18**	**6.07**	**4.71**	2.27	4.71	7.18
Ethylbenzene	1.72	1.62	**1.73**	1.72	1.82	2.27	2.08	2.13	3.19	**2.26**	2.40	1.88	1.62	2.07	3.19
Methylene chloride	**8.80**	**10.32**	**18.04**	**6.87**	**22.72**	**5.91**	**14.54**	2.13	**6.16**	**9.57**	**5.94**	**29.81**	2.13	11.74	29.81
Tetrachloroethylene	**7.47**	**6.38**	**12.62**	**8.15**	**6.36**	**14.50**	**8.31**	**11.79**	**12.55**	**8.47**	**9.74**	**6.59**	6.36	9.41	14.50
Toluene	**8.66**	**9.71**	**9.23**	**9.18**	**9.09**	**10.29**	**10.38**	**11.64**	**28.84**	**9.57**	**9.61**	**7.51**	7.51	11.14	28.84
Total Xylenes	2.31	**4.82**	**3.97**	**4.02**	1.82	**10.13**	**10.38**	**6.45**	**12.78**	**10.68**	**7.21**	**3.79**	1.82	6.53	12.78
1,1,1-Trichloroethane	1.72	1.62	1.73	1.72	1.82	2.27	2.08	2.13	**3.19**	**2.39**	**2.40**	**2.84**	1.62	2.16	3.19
Trichloroethylene	4.48	**4.30**	**5.81**	**4.05**	1.82	**4.38**	**6.23**	**5.34**	**14.26**	**13.07**	**12.15**	**7.51**	1.82	6.95	14.26
Ave Monthly Flow (MGD)	**206**	**194**	**208**	**206**	**218**	**272**	**249**	**255**	**383**	**287**	**288**	**225**			

Notes:

1. The average monthly loading is calculated using the monthly average concentration and monthly average flow.
2. Bold numbers reflect detected values.
3. a sample was contaminated and was deemed not representative.

Appendix A Table A-4 Deer Island Effluent Characterization, NPDES Data, FY 1994

METALS (ug/L)	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	SUMMARY MIN	SUMMARY AVE	SUMMARY MAX	TIMES DETECTED
Antimony	< 2	< 5	< 2	< 2	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5				0 of 12
Arsenic	< 2	< 2	< 2	< 2	< 2	< 2	4	4	< 2	3	< 2	< 2	< 2	2	4	3 of 12
Beryllium	< 1	< 1	< 1	< 1	< 1	< 4	< 1	< 1	< 1	1	< 1	< 1	< 1	< 1	1	1 of 12
Boron	38	380	500	460	380	310	380	300	200	223	283	320	38	343	500	12 of 12
Cadmium	< 1	< 1	< 1	1	< 1	< 1	< 1	< 1	< 1	< 1	1	9	< 1	1	9	3 of 12
Chromium	3	< 5	10	8	9	< 5	9	4	20	4	7	7	< 5	12	20	10 of 12
Copper	60	63	67	66	57	52	65	52	51	56	65	60	51	60	67	12 of 12
Lead	14	10	14	24	10	10	11	8	12	21	12	14	8	13	24	12 of 12
Mercury	0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	0.10	0.10	< 0.2	0.12	0.2	3 of 12
Molybdenum	22	28	22	16	15	11	11	12	< 8	13	17	21	< 8	16	28	11 of 12
Nickel	< 12	< 12	< 12	< 12	< 12	< 12	< 12	< 12	< 12	12	9	< 12	< 12	7	12	2 of 12
Selenium	< 2	< 2	< 10	< 10	< 2	< 2	3	4	< 2	4	3	10	< 2	2	10	5 of 12
Silver	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	3	2	< 3	< 3	2	3	2 of 12
Thallium	< 2	< 2	< 10	< 10	< 2	< 10	< 2	< 10	< 2	< 2	< 2	< 2				0 of 12
Zinc	70	80	83	91	83	77	78	72	86	91	87	81	70	82	91	12 of 12
INORGANICS (mg/L)																
Cyanide	0.028	0.020	0.035	0.012	0.014	0.017	0.028	0.040	0.019	0.027	0.033	0.026	0.012	0.025	0.040	12 of 12
Phenols	0.017	0.016	0.022	0.010	0.041	0.010	0.016	0.015	0.014	0.016	0.010	<0.006	< 0.006	0.016	0.041	11 of 12
PHC	1.250	1.225	1.660	0.830	< 1.000	< 1.000	3.650	0.950	3.900	2.575	5.300	2.800	< 1.000	2.095	5.300	10 of 12
ORGANOCHLORINE PESTICIDES AND PCBs (ug/L)																
4,4'DDT	< 0.10	< 0.10	0.11	0.06	< 0.10	< 0.10	< 0.10	< 0.05	< 0.10	< 0.10	< 0.10	0.065	< 0.05	< 0.026	0.110	3 of 12
a-BHC	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.034	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.007	0.034	1 of 12
aldrin	< 0.05	< 0.05	< 0.05	< 0.05	0.044	< 0.05	0.034	< 0.025	< 0.05	0.021	0.015	0.016	< 0.025	< 0.015	0.044	5 of 12
b-BHC	< 0.05	< 0.05	0.074	< 0.05	< 0.05	< 0.05	< 0.05	< 0.025	< 0.05	< 0.05	0.012	< 0.05	< 0.025	< 0.011	0.074	2 of 12
Chlordane	< 1.00	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.10	< 0.20	< 0.40	0.130	< 0.20	< 0.10	< 0.057	0.130	1 of 12
d-BHC	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.12	< 0.05	0.136	0.080	0.152	< 0.05	< 0.043	0.152	4 of 12
Endosulfan I	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.025	< 0.05	0.012	0.021	0.009	< 0.025	< 0.008	0.021	3 of 12
Endosulfan Sulfate	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.05	< 0.05	< 0.10	< 0.10	< 0.10	< 0.10	< 0.05	< 0.013	0.050	1 of 12
g-BHC	0.078	< 0.05	0.116	< 0.05	0.025	< 0.05	< 0.05	0.048	< 0.05	0.025	0.051	0.016	< 0.05	< 0.024	0.116	7 of 12

Appendiix A Table A-4, Deer Island Effluent

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	MIN	AVE	MAX	TIMES DETECTED
Pesticides (cont)																
Heptachlor	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	**0.028**	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.007	0.028	1 of 12
Heptachlor epoxide	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.025	< 0.05	< 0.05	< 0.05	**0.017**	< 0.05	< 0.006	0.017	1 of 12
SEMIVOLATILE ORGANICS (ug/L)																
2-methylnaphthalene	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	**2**	**3**	**1**	**3**	< 50	< 3.95	3.00	4 of 12
4-Methyl phenol (p-cre	**42**	**38**	**43**	**39**	**44**	**16**	**42**	**20**	**12**	**24**	**25**	**32**	12	31	44	12 of 12
Benzoic acid	**390**	**180**	**270**	**310**	**230**	**89**	**210**	**240**	**110**	**82**	**167**	**180**	82	208	390	12 of 12
Benzyl alcohol	< 50	< 50	**21**	**19**	**20**	**12**	**21**	**16**	< 10	**11**	**11**	**16**	< 10	13	21	9 of 12
bis(2-ethylhexyl)ptha	**14**	**9**	**10**	**10**	**7**	**10**	**9**	**10**	**4**	**10**	**7**	**8**	4	9	14	12 of 12
Butylbenzyl phthalate	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	**2**	**3**	**2**	**3**	< 50	< 4	3	4 of 12
Di-n-butylpthalate	< 50	< 50	< 50	< 50	< 50	**11**	< 50	< 50	**9**	**5**	**7**	**6**	< 50	< 6	11	5 of 12
Diethyl pthalate	< 10	**8**	**11**	**10**	**9**	**6**	**9**	**13**	**6**	**7**	**7**	**10**	< 10	< 8	13	11 of 12
Naphthalene	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	**1**	**2**	**1**	**4**	< 50	< 4	4	4 of 12
Phenol	< 50	**12**	< 50	< 50	**11**	< 50	**7**	**9**	<10	**4**	5	**8**	<10	< 6	12	7 of 12
VOLATILE ORGANICS (ug/L)																
1,1,1-trichloroethane	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	**1.00**	< 10	**1.67**	< 10	< 1.06	1.67	2 of 12
1,2-dichloroethylene	**2.30**	**1.67**	**2.00**	**2.00**	< 10	< 10	< 10	< 10	**1.67**	**2.00**	**2.67**	**2.33**	< 10	< 1.91	2.67	8 of 12
2-butanone	**3.13**	< 10	**3.00**	**2.85**	**7.33**	**8.00**	< 10	**2.33**	< 10	**6.00**	< 10	**5.33**	< 10	< 3.50	8.00	8 of 12
Acetone	**165**	**118**	**169**	**2.00**	**163**	**116**	**112**	**152**	**73**	**112**	**81**	**96**	2.00	113	169	12 of 12
Benzene	< 10	< 10	< 10	< 10	< 10	< 10	**0.97**	< 10	**1.67**	**1.67**	**1.00**	**1.00**	< 10	< 1.11	1.67	5 of 12
Bromodichloromethan	**1.95**	**1.66**	**3.01**	**2.24**	< 10	< 10	**2.33**	**1.67**	**5.67**	**3.33**	**5.33**	**2.67**	< 10	< 2.66	5.67	10 of 12
Bromoform	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	**10.00**	**1.63**	**1.67**	<10	< 10	< 2.88	10.00	3 of 12
Bromomethane	< 10	**1.33**	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	**1.33**	< 10	< 1.08	1.33	2 of 12
Carbon disulfide	**4.70**	**6.34**	**3.05**	**1.38**	**3.33**	< 10	**2.33**	< 10	< 10	**1.33**	**1.00**	**2.00**	< 10	< 2.37	6.34	9 of 12
Chloroform	**10.39**	**12.34**	**8.38**	**8.17**	**9.33**	**7.00**	**10.67**	**10.33**	**5.00**	**7.33**	**9.33**	**10.00**	5.00	9.02	12.34	12 of 12
Chloroethane	< 10	**1.66**	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	<10	< 10	< 1.06	1.66	1 of 12
Chloromethane	**5.43**	**7.35**	**5.97**	**2.86**	**2.00**	**< 10**	**1.67**	< 10	< 10	< 10	< 10	**6.00**	< 10	**3.02**	7.35	7 of 12
Dibromochloromethan	< 10	< 10	**1.30**	< 10	< 10	< 10	< 10	< 10	**8.33**	**2.33**	**2.67**	**1.00**	< 10	< 1.89	8.33	5 of 12
Ethyl benzene	**1.00**	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	**0.97**	**0.90**	<10	< 10	< 0.99	1.00	3 of 12
Methylene chloride	**6.21**	**9.69**	**5.95**	**10.12**	**16.67**	**3.00**	**6.67**	**6.00**	**4.67**	**4.00**	**3.33**	**12.67**	3.00	7.41	16.67	12 of 12
Tetrachloroethene	**5.87**	**3.01**	**8.01**	**6.98**	**6.00**	**7.33**	**5.00**	**4.67**	**4.33**	**4.00**	**4.00**	**3.67**	3.01	5.24	8.01	12 of 12

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	SUMMARY MIN	SUMMARY AVE	SUMMARY MAX	TIMES DETECTED
Volatile Organics (cont)																
Toluene	**5.26**	**6.67**	**6.42**	**6.46**	**5.67**	**3.67**	**4.33**	**4.00**	**4.33**	**4.33**	**4.33**	**4.00**	3.67	4.96	6.67	12 of 12
Trichloroethene	**2.61**	**3.34**	**1.87**	**1.38**	< 10	< 10	**3.00**	**2.00**	**3.67**	**5.00**	**4.67**	**3.33**	< 10	< 2.74	5.00	10 of 12
Vinyl Acetate	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 1.03	0.00	0 of 12
Xylene	**1.00**	**2.34**	< 10	**1.76**	**2.33**	**3.67**	**3.00**	**2.33**	**4.33**	**4.00**	**2.33**	**1.67**	< 10	< 2.48	4.33	11 of 12

Notes:

1. Bold are detected values.
2. The monthly average concentration is the flow-weighted concentration, back-calculated from daily loadings during each sampling day. In calculating the daily loadings, for those values that were reported below detection levels, one-half (metals) and one-tenth (organics) of their reporting limit is used.
3. The yearly average concentration is calculated fron the monthly averages.
4. A complete list of pesticides, semi-volatiles and volatile organics analyzed is included in Appendix J, Table 1. Only parameters that were detected or estimated to be present are included in this table.

Appendix A Table A-5 Deer Island Effluent Priority Pollutants Loadings, FY 1994

	Loadings (lbs/d)												SUMMARY		
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	MIN	AVE	MAX
METALS															
Arsenic	1.72	1.62	1.73	1.72	1.82	2.27	**8.31**	**8.51**	3.19	**6.38**	2.40	1.88	1.6	3.5	8.5
Boron	**653**	**615**	**867**	**790**	**691**	**703**	**789**	**638**	**639**	**535**	**681**	**600**	534.6	683.4	867.4
Cadmium	0.86	0.81	0.87	**1.72**	0.91	1.13	1.04	1.06	1.60	1.20	**2.40**	**18.14**	0.8	2.6	18.1
Chromium	**5.15**	4.04	**17.35**	**13.74**	**16.36**	5.67	**18.69**	**8.51**	**63.88**	**8.78**	**16.01**	**12.51**	4.0	15.9	63.9
Copper	**103**	**102**	**116**	**113**	**104**	**118**	**135**	**111**	**163**	**135**	**157**	**112**	101.9	122.4	162.9
Lead	**24.05**	**16.18**	**24.29**	**41.23**	**18.18**	**22.68**	**22.84**	**17.01**	**38.33**	**51.06**	**29.62**	**26.27**	16.2	27.6	51.1
Mercury	**0.34**	0.16	0.17	0.17	0.18	0.23	0.21	0.21	0.32	0.24	**0.32**	**0.31**	0.2	0.2	0.3
Molybdenum	**37.80**	**45.30**	**38.16**	**27.49**	**27.27**	**24.95**	**22.84**	**25.52**	12.78	**31.12**	**41.63**	**40.03**	12.8	31.2	45.3
Nickel	10.31	9.71	10.41	10.31	10.91	13.61	12.46	12.76	19.17	**28.72**	**20.82**	11.26	9.7	14.2	28.7
Selenium	1.72	1.62	0.87	0.86	1.82	2.27	**6.23**	**8.51**	3.19	**8.78**	**6.41**	**18.77**	0.9	5.1	18.8
Silver	2.58	2.43	2.60	2.58	2.73	3.40	3.11	3.19	4.79	**7.98**	**5.60**	2.81	2.4	3.7	8.0
Zinc	**120**	**129**	**144**	**156**	**151**	**175**	**162**	**153**	**275**	**218**	**210**	**151**	120.3	170.4	274.7
INORGANICS															
Cyanide	**48**	**32**	**61**	**21**	**25**	**38**	**59**	**84**	**61**	**64**	**79**	**48**	20.9	51.8	84.4
Phenols	**29**	**26**	**38**	**17**	**75**	**23**	**33**	**32**	**45**	**38**	**24**	6	5.6	32.1	74.5
PHC	**2148**	**1982**	**2880**	**1426**	909	1134	**7580**	**2020**	**12457**	**6163**	**12730**	**5254**	909	4724	12730
ORGANOCHLORINE PESTICIDES AND PCBs															
4,4'DDT	0.02	0.02	**0.19**	**0.10**	0.02	0.02	0.02	0.01	0.03	0.02	0.02	**0.12**	0.01	0.05	0.19
a-BHC	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.07**	0.02	0.01	0.01	0.01	0.01	0.02	0.07
aldrin	0.01	0.01	0.01	0.01	**0.08**	0.01	**0.07**	0.01	0.02	**0.05**	**0.04**	**0.03**	0.01	0.03	0.08
b-BHC	0.01	0.01	**0.13**	0.01	0.01	0.01	0.01	0.01	0.02	0.01	**0.03**	0.01	0.01	0.02	0.13
Chlordane	0.17	0.03	0.03	0.03	0.18	0.05	0.04	0.02	0.06	0.10	**0.31**	0.04	0.02	0.09	0.31
d-BHC	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.26**	0.02	**0.33**	**0.19**	**0.29**	0.01	0.09	0.33
Dieldrin	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.03	0.02	0.02	**0.06**	0.01	0.02	0.06
Endosulfan I	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	**0.03**	**0.05**	**0.02**	0.01	0.02	0.05
Endosulfan Sulfate	0.02	0.02	0.02	0.02	0.02	0.02	**0.10**	0.01	0.03	0.02	0.02	0.02	0.01	0.03	0.10
g-BHC	**0.13**	0.01	**0.01**	0.01	**0.05**	0.01	0.01	**0.10**	0.02	**0.06**	**0.12**	**0.03**	0.01	0.05	0.13
Heptachlor	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.06**	0.02	0.01	0.01	0.01	0.01	0.01	0.06

Appendix A Table A-5 Deer Island Treatment Plant

	Loadings (lbs/d)												SUMMARY		
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	MIN	AVE	MAX
Pesticides (cont)															
Heptachlor epoxide	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	**0.03**	0.01	0.01	0.03
SEMIVOLATILE ORGANICS															
2-methylnaphthalene	8.6	8.1	8.7	8.6	9.1	11.3	10.4	10.6	**6.4**	**6.4**	**2.4**	**5.0**	2.40	7.96	11.34
4-Methyl phenol (p-cresol)	**72.2**	**61.5**	**74.6**	**67.0**	**80.0**	**36.3**	**87.2**	**42.5**	**38.3**	**58.2**	**59.2**	**60.7**	36.30	61.48	87.22
Benzoic acid	**670.0**	**291.2**	**468.4**	**532.6**	**418.2**	**201.9**	**436.1**	**510.4**	**351.4**	**196.3**	**400.3**	**337.8**	196.27	401.21	670.04
Benzyl alcohol	8.6	8.1	**36.4**	**32.6**	**36.4**	**27.2**	**43.6**	**34.0**	3.2	**26.3**	**26.4**	**30.0**	3.19	26.08	43.61
bis(2-ethylhexyl)pthalate	**24.1**	**14.6**	**17.3**	**17.2**	**12.7**	**22.7**	**18.7**	**21.3**	**12.8**	**23.1**	**16.0**	**14.4**	12.73	17.90	24.05
Butylbenzyl phthalate	8.6	8.1	8.7	8.6	9.1	11.3	10.4	10.6	**6.4**	**8.0**	**5.6**	**6.3**	5.60	8.47	11.34
Di-n-butylpthalate	8.6	8.1	8.7	8.6	9.1	**25.0**	10.4	10.6	**28.7**	**12.0**	**16.0**	**11.3**	8.09	13.08	28.75
Diethyl pthalate	1.7	**12.9**	**19.1**	**17.2**	**16.4**	**13.6**	**18.7**	**27.6**	**19.2**	**17.6**	**17.6**	**18.1**	1.72	16.64	27.65
Naphthalene	8.6	8.1	8.7	8.6	9.1	11.3	10.4	10.6	**3.2**	**4.0**	**2.4**	**7.5**	2.40	7.71	11.34
Phenol	8.6	**19.4**	8.7	8.6	**20.0**	11.3	**14.5**	**19.1**	3.2	**8.8**	11.2	**15.6**	3.19	12.43	20.00
VOLATILE ORGANICS															
1,1,1-trichloroethane	1.7	1.6	1.7	1.7	1.8	2.3	2.1	2.1	3.2	**2.4**	2.4	**3.1**	1.62	2.18	3.19
1,2-dichloroethylene	**4.0**	**2.7**	**3.5**	**3.4**	1.8	2.3	4.8	2.8	**5.3**	**4.8**	**6.4**	**4.4**	1.82	3.85	6.41
2-butanone	**5.4**	1.6	**5.2**	**4.9**	**13.3**	**18.1**	2.1	**5.0**	3.2	**14.4**	2.4	**10.0**	1.62	7.13	18.15
Acetone	**283.4**	**190.3**	**293.1**	**3.7**	**297.0**	**263.1**	**232.6**	**324.0**	**233.2**	**268.9**	**193.8**	**180.8**	3.68	230.30	323.97
Benzene	1.7	1.6	1.7	1.7	1.8	2.3	**2.0**	2.1	**5.3**	**4.0**	**2.4**	**1.9**	1.62	2.38	5.32
Bromodichloromethane	**3.4**	**2.7**	**5.2**	**3.8**	1.8	2.3	**4.8**	**3.5**	**18.1**	**8.0**	**12.8**	**5.0**	1.82	5.96	18.10
Bromoform	1.7	1.6	1.7	1.7	1.8	2.3	2.1	2.1	**31.9**	**3.9**	**4.0**	1.9	1.62	4.73	31.94
Bromomethane	1.7	**2.2**	1.7	1.7	1.8	2.3	2.1	2.1	3.2	2.4	2.4	**2.5**	1.72	2.18	3.19
Carbon disulfide	**8.1**	**10.3**	**5.3**	**2.4**	**6.1**	2.3	**4.8**	2.1	3.2	**3.2**	**2.4**	**3.8**	2.13	4.49	10.26
Chloroform	**17.9**	**20.0**	**14.5**	**14.0**	**17.0**	**15.9**	**22.2**	**22.0**	**16.0**	**17.6**	**22.4**	**18.8**	14.03	18.17	22.42
Chloroethane	1.7	**2.7**	1.7	1.7	1.8	2.3	2.1	2.1	3.2	2.4	2.4	1.9	1.72	2.17	3.19
Chloromethane	**9.3**	**11.9**	**10.4**	**4.9**	**3.6**	**2.3**	**3.5**	2.1	3.2	2.4	2.4	**11.3**	2.13	5.60	11.89
Dibromochloromethane	1.7	1.6	**2.3**	1.7	1.8	2.3	2.1	2.1	**26.6**	**5.6**	**6.4**	**1.9**	1.62	4.67	26.62
Ethyl benzene	**1.7**	1.6	1.7	1.7	1.8	2.3	2.1	2.1	3.2	**2.3**	**2.2**	1.9	1.62	2.05	3.19
Methylene chloride	**10.7**	**15.7**	**10.3**	**17.4**	**30.3**	**6.8**	**13.8**	**12.8**	**14.9**	**9.6**	**8.0**	**23.8**	6.81	14.50	30.30
Tetrachloroethene	**10.1**	**4.9**	**13.9**	**12.0**	**10.9**	**16.6**	**10.4**	**9.9**	**13.8**	**9.6**	**9.6**	**6.9**	4.86	10.72	16.64
Toluene	**9.0**	**10.8**	**11.1**	**11.1**	**10.3**	**8.3**	**9.0**	**8.5**	**13.8**	**10.4**	**10.4**	**7.5**	7.51	10.03	13.84
Trichloroethene	**4.5**	**5.4**	**3.2**	**2.4**	1.8	2.3	**6.2**	**4.3**	**11.7**	**12.0**	**11.2**	**6.3**	1.82	5.93	11.97

Appendix A Table A-5 Deer Island Treatment Plant

	Loadings (lbs/d)												SUMMARY		
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	MIN	AVE	MAX
Volatile Organics (cont)															
Vinyl Acetate	1.7	1.6	1.7	1.7	1.8	2.3	2.1	2.1	3.2	2.4	2.4	1.9	1.62	2.08	3.19
Xylene	**1.7**	**3.8**	1.7	**3.0**	**4.2**	**8.3**	**6.2**	**5.0**	**13.8**	**9.6**	**5.6**	**3.1**	1.72	5.51	13.84
Average Flow (MGD)	206	194	208	206	218	272	249	255	383	287	288	225			

Notes:

1. The average monthly loading is calculated using the monthly average concentration and monthly average flow.
2. Bold numbers reflect detected values.

Appendix A Table A-6 Deer Island Effluent Characterization, Harbor Studies Monitoring Program, FY 1994

	JUNE		JUL		AUG		SEP		OCT		NOV		SUMMARY			TIMES	
	16	18	14	16	11	13	15	17	13	15	10	12	MIN	MEAN	MAX	DETECTED	
METALS (ug/L)																	
Cadmium	0.42	0.41	0.58	0.81	0.42	0.44	0.57	0.47	0.46	0.57	1.15	0.29	0.29	0.549	1.2	12	of 12
Chromium	3.39	2.86	3.42	4.48	3.21	3.36	3.7	7.61	2.96	2.02	2.37	1.65	1.65	3.419	7.6	12	of 12
Copper	75.3	75.6	80.9	73.2	68.8	67.9	85.9	81.4	68.9	66	62.9	56.2	56.2	71.917	85.9	12	of 12
Lead	13	11.1	11.2	7.81	9.53	10.2	16.7	23.3	8.73	7.49	13.3	8.64	7.49	11.750	23.3	12	of 12
Mercury	0.165	0.204	0.094	0.143	0.12	0.289	0.234	0.232	0.087	0.079	0.101	0.127	0.079	0.156	0.3	12	of 12
Nickel	5.89	5.97	6.69	3.81	7.31	5.86	5.66	5.29	6.39	6.4	5.38	7.62	3.81	6.023	7.6	12	of 12
Silver	5.08	5.87	2.4	3.25	7.11	6.03	3.39	5.09	4.09	1.75	3.16	2.82	1.75	4.170	7.1	12	of 12
Zinc	124	95	75.9	81.3	66.6	72.5	91.5	94.2	85.9	67.9	109	76.2	66.6	86.667	124.0	12	of 12
ORGANOCHLORINE PESTICIDES (ug/L)																	
4,4'DDD	.0239	.0258	.0177	.0168	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	.0077	.0258	4	of 12
4,4'DDE	.0040	.0040	.0035	.0028	.0034	.0034	.0132	.0127	.0024	.0024	.0028	.0023	0.002	.0047	.0132	12	of 12
4,4'DDT	.0063	.0094	.0098	.0067	.0046	.0008	.0120	.0044	.0055	.0089	.0069	.0068	0.001	.0068	.0098	12	of 12
Aldrin	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	0	of 12
cis-chlordane	.0036	.0062	.0081	.0043	.0011	.0008	.0012	.0008	.0023	.0026	.0020	.0048	0.001	.0031	.0081	12	of 12
Dieldrin	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	.0265	.0000	0	of 12
Endrin	< .0100	< .0100	< .0100	< .0100	.0074	.0579	.0033	.0024	< .0100	< .0100	< .0100	< .0100	< .0100	.0066	.0579	4	of 12
Lindane	.0140	.0158	.0150	.0128	.0160	.0163	.0169	.0119	.0133	.0202	.0130	.0124	0.012	.0148	.0202	12	of 12
Heptachlor	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	< .0100	0	of 12
Heptachlor epoxide	< .0100	< .0100	< .0100	< .0100	.0010	.0010	.0012	.0013	< .0100	< .0100	< .0100	< .0100	< .0100	.00103	.0013	4	of 12
Hexachlorobenzene	.1015	.0938	.1651	.1065	< .0100	.0056	< .0100	< .0100	.0482	.0697	.0391	.0524	< .0100	.0571	.1651	9	of 12
POLYCYCLIC AROMATIC HYDROCARBONS (ug/L)																	
Naphthalenes	1.408	1.434	1.015	1.081	2.453	1.281	2.236	1.394	0.927	1.348	0.954	1.064	0.927	1.383	2.453	12	of 12
C1-naphthalenes	1.755	1.761	1.136	1.167	1.935	1.737	3.987	2.331	1.520	2.730	1.881	2.139	1.136	2.007	3.987	12	of 12
C2-naphthalenes	2.575	2.543	1.488	1.470	3.100	3.028	6.377	3.952	2.825	5.040	3.546	3.927	1.470	3.323	6.377	12	of 12
C3-naphthalenes	2.351	2.345	1.339	1.282	3.128	3.241	5.472	3.941	7.080	10.899	9.091	9.715	1.282	4.990	10.899	12	of 12
C4-naphthalenes	1.073	1.124	0.631	0.556	1.921	1.976	2.897	2.381	1.805	2.764	2.177	2.489	0.556	1.816	2.897	12	of 12
Biphenyl	0.232	0.219	0.134	0.120	0.224	0.206	0.425	0.277	0.142	0.270	0.177	0.192	0.120	0.218	0.425	12	of 12
Acenaphthylene	0.016	0.018	0.006	0.011	0.013	0.012	0.020	0.011	0.547	0.462	0.556	0.549	0.006	0.185	0.556	12	of 12
Acenaphthene	0.147	0.154	0.112	0.126	0.153	0.175	0.189	0.162	0.113	0.187	0.184	0.163	0.112	0.155	0.189	12	of 12
Dibenzoffuram	0.092	0.091	0.080	0.068	0.101	0.121	0.012	0.112	0.066	0.111	0.090	0.092	0.012	0.086	0.121	12	of 12
Fluorene	0.190	0.192	0.137	0.124	0.205	0.237	0.275	0.231	0.096	0.156	0.214	0.200	0.096	0.188	0.275	12	of 12

	JUNE		JUL		AUG		SEP		OCT		NOV		SUMMARY			TIMES DETECTED	
	16	18	14	16	11	13	15	17	13	15	10	12	MIN	MEAN	MAX		
PAH (con't)																	
C1-fluorenes	0.733	0.457	0.281	0.358	0.417	0.517	0.602	0.419	0.312	0.567	0.487	0.521	0.281	0.473	0.733	12	of 12
C2-fluorenes	0.398	0.417	0.241	0.226	0.582	0.617	0.754	0.660	0.392	0.584	0.535	0.640	0.226	0.504	0.754	12	of 12
C3-fluorenes	0.413	0.463	0.241	0.232	0.652	0.675	0.807	< 0.010	0.823	1.015	1.059	1.001	< 0.010	0.615	1.059	11	of 12
Phenantrrene	0.405	0.432	0.329	0.306	0.406	0.495	0.497	0.472	0.139	0.461	0.476	0.448	0.139	0.406	0.497	12	of 12
Anthracene	0.048	0.050	0.021	0.032	0.047	0.059	0.057	0.051	0.042	0.074	0.070	0.060	0.021	0.051	0.074	12	of 12
C1-phenanthrenes/antl	0.475	0.517	0.306	0.287	0.527	0.565	0.657	0.588	0.435	0.677	0.674	0.755	0.287	0.539	0.755	12	of 12
C2-phenanthrenes/antl	0.547	0.589	0.317	0.304	0.590	0.580	0.737	0.643	0.586	0.828	0.797	0.949	0.304	0.622	0.949	12	of 12
C3-phenanthrenes/antl	0.325	0.342	0.154	0.159	0.361	0.373	0.418	0.362	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.208	0.418	8	of 12
C4-phenanthrenes/antl	0.164	0.200	0.107	0.107	0.214	0.206	0.209	0.210	0.258	0.346	0.336	0.397	0.107	0.230	0.397	12	of 12
Dibenzothiophene	0.070	0.073	0.045	0.045	0.074	0.082	0.089	0.098	0.048	0.082	0.070	0.070	0.045	0.071	0.098	12	of 12
C1-dibenzothiophenes	0.214	0.182	0.118	0.115	0.211	0.209	0.271	0.227	0.182	0.254	0.233	0.251	0.115	0.206	0.271	12	of 12
C2-dibenzothiophenes	0.303	0.301	0.166	0.156	0.317	0.339	0.395	0.352	0.205	0.322	0.292	0.340	0.156	0.291	0.395	12	of 12
C3-dibenzothiophenes	0.292	0.256	0.158	0.142	0.289	0.272	0.354	0.316	0.250	0.318	0.326	0.377	0.142	0.279	0.377	12	of 12
Fluoranthene	0.176	0.206	0.167	0.146	0.160	0.189	0.181	0.168	0.123	0.271	0.237	0.171	0.123	0.183	0.271	12	of 12
Pyrene	0.174	0.200	0.144	0.136	0.146	0.172	0.173	0.156	0.113	0.239	0.223	0.167	0.113	0.170	0.239	12	of 12
C1-fluoranthenes/pyre	0.126	0.136	0.095	0.087	0.124	0.123	0.130	0.118	0.123	0.199	0.253	0.201	0.087	0.143	0.253	12	of 12
Benz(a)anthracene	0.061	0.076	0.066	0.054	0.046	0.045	0.054	0.041	0.033	0.082	0.079	0.052	0.033	0.057	0.082	12	of 12
Chrysene	0.075	0.075	0.065	0.050	0.051	0.058	0.058	0.048	0.040	0.097	0.091	0.058	0.040	0.064	0.097	12	of 12
C1-chrysenes	0.066	0.068	0.046	0.051	0.057	0.053	0.061	0.042	0.024	0.048	0.058	0.051	0.024	0.052	0.068	12	of 12
C2-chrysenes	0.046	0.058	0.033	0.033	0.041	0.051	0.056	0.051	0.041	0.071	0.087	0.079	0.033	0.054	0.087	12	of 12
C3-chrysenes	< 0.010	< 0.010	< 0.010	< 0.010	0.031	0.027	0.031	0.023	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.010	0.031	4	of 12
C4-chrysenes	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	0	of 12
Benzo(b)fluoranthene	0.062	0.085	0.072	0.055	0.050	0.050	0.057	0.042	0.035	0.109	0.087	0.053	0.035	0.063	0.109	12	of 12
Benzo(k)fluoranthene	0.023	0.027	0.021	0.021	0.018	0.020	0.023	0.017	0.011	0.034	0.028	0.017	0.011	0.022	0.034	12	of 12
Benzo(e)pyrene	0.035	0.039	0.034	0.030	0.028	0.028	0.028	0.018	0.018	0.050	0.045	0.030	0.018	0.032	0.050	12	of 12
Benzo(a)pyrene	0.033	0.039	0.021	0.003	0.023	< 0.010	0.030	0.020	0.016	0.058	0.051	0.028	< 0.010	0.027	0.058	11	of 12
Perylene	0.012	0.012	0.008	0.008	0.006	< 0.010	0.010	0.005	0.006	0.017	0.015	0.008	< 0.010	0.009	0.017	11	of 12
Indeno(1,2,3-c,d)pyrer	0.075	0.075	0.058	0.062	0.127	0.128	0.145	0.081	0.039	0.095	0.084	0.050	0.039	0.085	0.145	12	of 12
Dibenz(a,h)pyrene	< 0.01	< 0.010	< 0.010	< 0.010	0.007	0.006	0.007	0.005	0.006	0.012	0.010	0.006	< 0.010	0.005	0.012	8	of 12
Benzo(g,h,i)perylene	0.035	0.052	0.043	0.033	0.027	0.024	0.027	0.017	0.016	0.050	0.038	0.024	0.016	0.032	0.052	12	of 12
Total PAHs	**31.23**	**33.31**	**23.44**	**25.24**	**29.86**	**30.98**	**43.81**	**37.04**	**32.44**	**45.93**	**35.61**	**39.33**	**23.44**	**34.02**	**45.93**	12	of 12

Notes:

1. Reporting limit is 10 ng/L.
2. The average concentration in calculated by substituting one-half (metals) and one-tenth (organics) the reporting limit for values that were reported below the detection levels.

Appendix A Table A-7 Deer Island Treatment Plant Priority Pollutants, Historical Data

	Average Concentration			
	FY91	FY92	FY93	FY94
Metals (ug/L)				
Antimony	17.625	2.500	12.167	BDL
Arsenic	1.417	1.542	1.708	2.000
Beryllium	0.425	0.417	1.000	1.000
Boron	372.500	327.000	306.333	343.000
Cadmium	1.625	0.750	1.375	1.000
Chromium	8.000	4.417	3.500	12.000
Chromium (hex)	4.333	3.403	2.583	0.000
Copper	55.333	60.083	56.583	60.000
Lead	12.750	10.675	13.175	13.000
Mercury	0.942	0.267	0.338	0.200
Molybdenum	6.000	6.583	19.250	16.000
Nickel	10.417	8.625	7.250	7.000
Selenium	1.333	1.167	1.667	2.000
Silver	3.792	3.750	3.083	2.000
Thallium	0.792	1.083	1.708	BDL
Zinc	77.500	74.667	83.667	82.000
Inorganics (mg/L)				
Cyanide	0.023	0.009	0.008	0.025
Phenols	0.018	0.023	0.028	0.016
Petroleum Hydrocarbons	2.905	2.975	2.214	2.095
Pesticides/PCBs (ug/L)				
Aldrin	0.083	0.015	0.010	0.015
b-BHC	0.013	0.164	0.013	0.011
g-BHC	0.012	0.028	0.008	0.024
a-BHC	0.019	0.015	0.017	0.007
d-BHC	0.006	0.015	0.066	0.043
4,4'DDE	0.010	0.029	0.017	BDL
4,4'DDD	0.010	0.029	0.033	BDL

	Average Concentration			
	FY91	FY92	FY93	FY94
Pesticides/PCBs (cont)				
4,4'DDT	0.010	0.178	0.028	0.026
Heptachlor epoxide	0.006	0.015	0.008	0.007
Endosulfan Sulfate	0.010	0.029	0.086	0.013
Endosulfan I	0.010	0.063	0.008	0.008
Endrin	0.010	0.029	0.016	BDL
Heptachlor	0.006	0.015	0.011	0.007
Dieldrin	0.010	0.029	0.017	0.011
Chlordane	0.050	0.152	0.111	0.057
Semivolatile Organics (ug/L)				
Phenol	2.833	1.833	1.583	6.389
Bis(2-chloroethyl)ether	2.583	1.083	1.292	BDL
Benzyl alcohol	5.667	8.167	15.667	13.167
4-Methyl phenol	7.000	16.500	19.750	31.000
bis(2-ethylhexyl)pthalate	4.333	9.250	8.917	8.919
Benzoic acid	17.583	32.667	121.917	208.000
Naphthalene	2.500	1.083	1.583	3.806
2-methylnaphthalene	2.750	2.500	1.792	3.947
Diethyl pthalate	2.417	2.750	6.083	8.114
Di-n-butylpthalate	2.417	2.167	4.250	5.972
Butylbenzyl phthalate	2.417	2.083	2.750	4.164
Di-n-octylphthalate	2.417	1.250	1.958	BDL
Volatile Organics (ug/L)				
Methylene chloride	11.750	8.306	6.667	7.410
Acetone	173.111	115.944	118.778	113.000
Chloroform	6.428	8.250	7.886	9.020
2-butanone	5.681	9.097	2.925	3.500
1,1,1-trichloroethane	3.104	2.542	1.278	1.060
Trichloroethene	3.639	2.972	2.836	2.740
Tetrachloroethene	5.604	7.528	6.111	5.240
Toluene	7.131	6.611	5.861	4.960

	Average Concentration			
	FY91	**FY92**	**FY93**	**FY94**
Volatile Organics (cont)				
Xylene	5.076	5.264	3.781	2.480
1,2-dichloroethene	1.042	2.924	1.975	1.910
Ethyl benzene	0.743	0.785	0.725	0.990
Chloromethane	2.458	2.486	3.294	1.890
Carbon disulfide	1.394	3.125	3.111	2.370
2-hexanone	0.986	1.000	1.017	BDL
Bromomethane	1.122	1.167	1.239	1.080
Bromodichloromethane	0.999	1.340	1.236	2.660
Styrene	0.492	0.625	0.667	BDL
Dibromochloromethane	0.575	0.646	0.625	1.890
Benzene	1.729	1.708	1.569	1.110
Bromoform	0.492	0.542	1.153	2.080
1,1,2-trichloroethane	0.492	0.500	0.819	BDL
Carbon tetrachloride	0.492	0.500	0.667	BDL
1,2 dichloropropane	0.492	0.500	0.667	BDL
Chlorobenzene	0.492	0.500	0.667	BDL
Vinyl Acetate	0.983	1.806	1.044	1.030

Notes:
BDL Below Detection Limit

Appendix B

Appendix B Table B-1 Nut Island Treatment Plant, Operations Summary, Fiscal Year 1994

	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	SUMMARY MIN VALUE	SUMMARY AVE VALUE	SUMMARY MAX VALUE
DAILY FLOW (MGD)															
AVERAGE	89	82	72	66	99	156	139	150	225	166	135	98		123	
MINIMUM	75	64	55	47	88	96	104	117	134	117	110	76	47		
MAXIMUM	101	92	87	119	124	208	238	211	315	269	160	121			315
PEAK FLOW (b)	120	148	121	138	166	208	266	239	316	275	184	148			316
TEMP (DEG F)	68	68	68	67	65	60	55	53	51	54	58	63		61	
EFFLUENT pH															
MINIMUM	6.56	6.40	6.51	6.52	6.44	6.50	6.56	6.61	6.30	6.55	6.51	6.67	6.30		
MAXIMUM	6.91	7.03	7.06	6.96	7.25	7.07	7.06	7.11	7.20	7.11	7.08	7.10			7.25
CONVENTIONAL PARAMETERS (mg/l)															
SETTLEABLE SOLIDS															
INFLUENT	9.7	7.3	13.3	19.8	13.1	3.5	3.6	3.7	2.7	4.3	3.9	5.3	2.7	7.5	19.8
EFFLUENT	0.7	1	0.8	0.9	1.1	0.9	0.7	1	1.1	1	0.7	0.5	0.5	0.9	1.1
BIOCHEMICAL OXYGEN DEMAND															
INFLUENT	196	232	247	221	217	142	165	133	97	105	127	165	97	171	247
EFFLUENT	119	136	133	131	135	96	87	94	77	74	87	130	74	108	136
TOTAL SUSPENDED SOLIDS															
INFLUENT	250	189	242	292	299	221	354	240	244	122	130	136	122	227	354
EFFLUENT	86	90	79	88	85	83	58	100	73	53	61	79	53	78	100
OIL AND GREASE															
INFLUENT	37.0	11.5	10.9	115.0	55.6	19.8	*	5.8	14.7	24.0	24.1	22.6	5.8	31.0	115.0
EFFLUENT	21.8	10.4	8.6	23.1	22.8	12.7	*	2.1	12.6	16.3	25.1	25.3	2.1	16.4	25.3
TOTAL COLIFORMS															
INFLUENT (E+06)	96.5	107.8	118.5	93.4	63.7	21.2	7.9	5.2	1.4	9.4	3.9	38.1	1.4	47.2	119
EFFLUENT	420	373	286	262	382	495	258	286	228	307	232	580	228	342	580
FECAL COLIFORM															
INFLUENT (E+06)	4.2	4.7	5.0	3.3	2.8	0.5	0.4	0.7	0.1	0.2	0.6	2.9	0.1	2.1	5.0
EFFLUENT	39.0	27.0	24.0	17.0	21.0	33.0	22.0	34.0	29.0	23.0	24.0	42.0	17.0	27.9	42.0

Appendix B Table B-1 Nut Island Treatment Plant

	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	SUMMARY MIN VALUE	SUMMARY AVE VALUE	SUMMARY MAX VALUE
RESIDUAL CHLORINE	2.1	2.1	3.0	3.1	3.0	3.0	3.1	2.9	2.8	2.6	2.1	1.7	1.7	2.6	3.1
CHLORIDES	706	794	720	674	551	441	372	371	380	301	462	477	301	521	794
METALS															
ARSENIC															
INFLUENT	*	0.0020	< 0.020	< 0.016	< 0.022	< 0.018	< 0.003	*	*	*	*	*	< 0.003	0.002	0.002
EFFLUENT	*	0.0040	< 0.020	< 0.016	< 0.022	< 0.018	0.004	*	*	*	*	*	< 0.016	0.004	0.004
CHROMIUM															
INFLUENT	0.028	0.010	0.004	0.005	0.004	0.003	0.004	*	*	*	*	*	0.003	0.008	0.028
EFFLUENT	0.011	0.013	0.004	0.004	0.008	0.005	0.004	*	*	*	*	*	0.004	0.007	0.013
COPPER															
INFLUENT	0.138	0.095	0.084	0.112	0.116	0.063	0.078	0.072	0.060	0.053	0.134	0.206**	0.053	0.091	0.138
EFFLUENT	0.068	0.063	0.051	0.083	0.067	0.049	0.053	0.052	0.037	0.043	0.054	0.066**	0.037	0.056	0.083
CADMIUM															
INFLUENT	0.001	0.001	0.001	0.001	0.001	0.001	0.001	*	*	*	*	*	0.001	0.001	0.001
EFFLUENT	0.001	0.001	0.001	0.001	< 0.001	0.001	0.001	*	*	*	*	*	< 0.001	0.001	0.001
IRON															
INFLUENT	7.895	8.865	3.700	2.598	2.333	1.303	1.435	*	*	1.250	2.520	*	1.250	3.544	8.865
EFFLUENT	5.978	5.090	2.261	1.658	1.588	1.083	1.115	*	*	1.053	1.091	*	1.053	2.324	5.978
LEAD															
INFLUENT	0.030	0.009	0.010	0.017	0.018	0.015	0.012	0.012	0.014	0.008	0.017	*	0.008	0.015	0.030
EFFLUENT	0.007	0.006	0.006	0.012	0.010	0.011	0.010	0.009	0.008	0.007	0.010	*	0.006	0.009	0.012
NICKEL															
INFLUENT	0.023	0.011	0.006	0.007	0.011	0.007	0.010	*	*	*	*	*	0.006	0.011	0.023
EFFLUENT	0.010	0.010	0.008	0.006	0.008	0.007	0.011	*	*	*	*	*	0.006	0.009	0.011
SILVER															
INFLUENT	0.009	0.009	0.012	0.008	0.007	0.003	0.004	*	*	*	*	*	0.003	0.007	0.012
EFFLUENT	0.004	0.005	0.006	0.005	0.004	0.003	0.003	*	*	*	*	*	0.003	0.004	0.006
ZINC															
INFLUENT	0.232	0.170	0.175	0.158	0.139	0.089	0.099	*	*	*	*	*	0.089	0.152	0.232
EFFLUENT	0.253	0.209	0.142	0.161	0.117	0.103	0.111	*	*	*	*	*	0.103	0.157	0.253

Appendix B Table B-1 Nut Island Treatment Plant

	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	SUMMARY MIN VALUE	SUMMARY AVE VALUE	SUMMARY MAX VALUE
MERCURY															
INFLUENT	0.0011	0.0004	0.0006	0.0005	0.0026	*	0.0003	*	*	*	*	*	0.0003	0.0009	0.0026
EFFLUENT	0.0005	0.0002	0.0003	0.00036	0.0002	*	0.0004	*	*	*	*	*	0.0002	0.0003	0.0005
NUTRIENTS (mg/l)															
TKN															
INFLUENT	28.63	25.20	26.32	34.79	27.65	23.95	22.10	16.93	10.08	19.04	16.60	*	10.08	22.84	34.79
EFFLUENT	21.00	26.39	23.80	25.99	23.18	16.85	17.45	16.17	11.90	17.08	19.88	*	11.90	19.97	26.39
AMMONIA															
INFLUENT	9.93	3.23	20.44	14.99	14.90	7.14	11.76	10.57	2.24	10.80	3.50	11.20	2.24	10.06	20.44
EFFLUENT	9.12	4.59	17.78	14.63	13.65	9.43	10.89	9.73	2.80	9.20	10.22	10.78	2.80	10.24	17.78
NITRATES															
INFLUENT	0.12	0.08	*	0.49	0.04	0.06	0.08	0.15	< 0.1	0.23	0.51	< 0.1	< 0.10	0.20	0.51
EFFLUENT	0.09	0.25	0.66	1.04	2.15	2.29	0.75	1.79	0.24	< 0.1	0.36	< 0.1	< 0.10	0.80	2.29
NITRITE															
INFLUENT	*	*	*	*	*	*	*	*	0.09	0.06	0.002	0.05	0.002	0.05	0.09
EFFLUENT	0.02	0.00	0.03	0.01	0.02	0.26	0.11	0.16	0.09	0.04	0.01	0.06	0.01	0.07	0.26
ORTHOPHOSPHORUS															
INFLUENT	1.51	1.90	2.48	2.19	2.70	0.10	*	*	0.61	1.52	0.98	2.43	0.10	1.64	2.70
EFFLUENT	1.61	2.45	2.34	2.46	2.50	0.80	1.20	1.52	0.49	1.52	1.06	2.30	0.49	1.69	2.50
TOTAL PHOSPHORUS															
INFLUENT	1.69	3.30	2.91	3.85	4.60	2.77	3.48	2.69	0.90	2.64	2.96	3.81	0.90	2.97	4.60
EFFLUENT	3.10	2.72	3.69	2.97	3.85	2.66	2.81	3.16	0.92	2.60	2.59	0.26	0.26	2.57	3.85
SLUDGE															
PRIMARY SLUDGE															
FLOW (MGD)	0.19	0.18	0.19	0.19	0.19	0.19	0.20	0.18	0.17	0.19	0.19	0.19	0.17	0.19	0.20
pH	6.29	5.55	5.6	5.57	5.64	5.6	5.61	5.59	5.38	5.55	5.57	5.56	5.38	5.63	6.29
SOLIDS (%)	6.01	6.18	5.95	6.43	6.2	6.53	5.2	4.59	5.19	5.29	5.18	5.06	4.59	5.65	6.53
VOLATILE SOLIDS (%)	80.9	80.76	80.26	80.94	78.21	76.62	83.69	78.38	81	80.43	83.04	81.95	76.62	80.52	83.69
GREASE (%)	11.12	11.52	10.94	13.49	10.67	8.72	*	5.82	9.89	9.33	12.28	10.45	5.82	10.38	13.49

Appendix B Table B-1 Nut Island Treatment Plant

	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	SUMMARY MIN VALUE	SUMMARY AVE VALUE	SUMMARY MAX VALUE
DIGESTED SLUDGE															
FLOW (MGD)	0.046	0.069	0.047	0.092	0.118	0.144	0.115	0.101	0.113	0.095	0.134	0.139	0.046	0.101	0.144
pH	7.35	7.29	7.29	*	7.59	*	*	7.26	7.36	7.24	7.26	11.50	7.240	7.793	11.500
TOTAL SOLIDS (%)	4.67	5.25	3.98	4.53	3.93	4.35	2.35	3.19	2.70	2.79	2.92	2.54	2.350	3.600	5.250
VOLATILE SOLIDS (%)	63	58	59	63	57	57	64.3	62	67	66	62	68	56.560	62.112	67.620
GREASE (%)	6.80	10.40	8.63	*	4.53	*	*	2.08	5.03	8.52	4.13	7.62	2.080	6.416	10.400
ARSENIC (mg/l)	*	0.026	< 0.200	< 0.166	< 0.217	< 0.18	< 0.024	*	*	*	*	*	< 0.024	0.026	0.026
CHROMIUM (mg/l)	1.386	1.670	1.272	2.034	1.522	1.114	0.712	*	*	*	*	*	0.712	1.387	2.034
COPPER (mg/l)	25.54	23.56	23.30	34.42	24.22	16.84	12.34	14.02	18.07	21.54	21.48	20.68	12.336	21.333	34.420
CADMIUM (mg/l)	0.128	0.115	0.098	0.155	0.110	0.082	0.071	*	*	*	*	*	0.071	0.108	0.155
IRON (mg/l)	439	458	476	581	555	337	304	*	*	569	499	*	304.000	468.528	580.500
LEAD (mg/l)	4.670	5.270	3.620	8.550	7.690	3.790	2.842	4.373	4.734	5.220	6.068	*	2.842	5.166	8.550
NICKEL (mg/l)	1.016	1.002	1.092	1.535	1.300	0.956	1.068	*	*	*	*	*	0.956	1.138	1.535
SILVER (mg/l)	0.209	0.034	0.273	0.497	0.026	0.075	0.332	*	*	*	*	*	0.026	0.207	0.497
ZINC (mg/l)	31.800	26.400	23.400	40.500	28.400	21.000	15.000	31.5	*	*	*	*	15.000	27.250	40.500
MERCURY (mg/l)	0.2200	0.3290	0.1310	0.2610	0.5350	*	0.0870	*	*	*	*	*	0.087	0.261	0.535
GAS PROD (E+06cu. ft./d)	0.794	0.855	0.814	0.771	0.793	0.775	0.794	0.739	0.632	0.814	0.830	0.812	0.632	0.785	0.855

Notes:

Data reduced from Nut Island Monthly Operation Logs. All anayses were performed by Nut Island Laboratory.

* No Data

** Samples collected from copper pipes. Data suspect.

Appendix B Table B-2 Nut Island Influent Characterization, Fiscal Year 1994

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	SUMMARY MIN	SUMMARY AVE	SUMMARY MAX	TIMES DETECTED
Metals (ug/L)																
Arsenic	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 2	< 2	< 2	< 2	< 2				0 of 28
Antimony	< 80	< 80	< 80	< 80	< 80	< 80	< 80	< 5	< 5	< 5	< 5	< 5				0 of 28
Beryllium	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 1	< 1	< 1	< 1	**0.75**	< 1	< 1.4	0.75	1 of 28
Boron	**305**	**315**	**387**	**376**	**320**	**194**	**256**	**185**	**105**	**153**	**170**	**250**	105	251	387	28 of 28
Cadmium	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 1	< 1	**0.72**	< 1	< 1	< 1	< 1.68	0.72	1 of 28
Chrome-hex	**5.38**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	2.74	5.38	1 of 28
Chromium	**9.16**	**11.12**	**13.02**	< 10	< 10	**8.76**	< 10	**6.28**	**16.49**	**3.92**	**4.73**	**6.50**	< 10	6.79	16.49	15 of 28
Copper	**186**	**181**	**254**	**99**	**81**	**63**	**46**	**98**	**37**	**36**	**58**	**96**	36	103	254	28 of 28
Lead	**25.51**	**20.38**	**37.93**	< 30	< 30	< 30	< 30	**5.41**	**7.50**	**4.00**	**9.49**	**15.04**	< 30	15.44	37.93	13 of 28
Mercury	**0.96**	< 1	**1.01**	< 1	< 1	< 1	< 0.2	< 0.2	< 0.2	< 0.2	**0.20**	**0.20**	< 0.2	0.40	1.01	5 of 28
Molybdenum	< 80	< 80	< 80	< 80	< 80	< 80	< 80	< 8	< 8	< 8	**7.47**	**6.52**	< 8	< 25.5	7.47	2 of 28
Nickel	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 12	< 12	< 12	< 12	< 12				0 of 28
Selenium	< 10	< 5	< 10	< 10	< 5	< 5	**6.00**	< 2	< 2	**2.14**	< 2	< 2	< 2	2.89	6.00	3 of 28
Silver	**7.06**	**5.36**	**7.83**	< 7	**7.23**	< 7	< 7	**2.74**	< 3	**3.01**	< 3	**5.27**	< 3	4.33	7.83	8 of 28
Thallium	< 5	< 5	< 20	< 10	< 5	< 10	< 5	< 2	< 2	< 2	< 2	< 2				0 of 28
Zinc	**199.6**	**216.9**	**290.8**	**122.9**	**98.5**	**69.0**	**45.9**	**95.0**	**58.5**	**43.9**	**70.9**	**82.6**	44	116	291	28 of 28
Inorganics (mg/L)																
Total Cyanide	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**0.006**	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	1 of 28
Oil and Grease	**10.3**	**6.3**	**9.7**	**18.4**	**12.0**	**9.5**	**12.0**	**40.8**	**7.8**	**22.4**	**18.5**	**10.0**	6.33	14.80	40.84	25 of 27
Surfactants	**5.2**	**5.5**	**7.6**	**5.9**	**5.1**	**3.8**	**4.8**	**5.2**	**1.9**	**3.8**	**3.6**	**5.4**	1.86	4.82	7.60	28 of 28
Pesticides/PCBs (ug/L)																
Chlordane	< 0.5	< 0.5	< 0.2	< 0.73	< 1.0	< 1.0	< 0.75	< 0.5	< 0.5	< 0.5	**0.076**	**0.131**	< 0.5	0.07	0.13	2 of 28
Dieldrin	< 0.1	**0.050**	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.01	0.05	2 of 28
Gamma-BHC	**0.014**	< 0.05	**0.058**	< 0.05	< 0.05	< 0.05	< 0.05	**0.016**	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.01	0.06	5 of 28
Semi-volatile Organic Compounds (ug/L)																
Benzoic Acid	**319.3**	**116.4**	**258.7**	**111.8**	a	**85.0**	**206.1**	**53.0**	< 50	**67.4**	**23.3**	**234.8**	< 50	135	319	22 of 28
4-Methylphenol	**54.99**	**52.37**	**51.10**	**32.79**	a	**22.71**	**33.03**	**36.75**	**2.50**	**15.43**	**9.43**	**37.54**	2.50	32	55	27 of 28

Semi-volatile Organics (cont)																	
Phenol	**28.99**	**26.21**	**17.39**	**11.74**	a	**16.88**	**36.46**	**17.07**	< 20	**9.86**	**4.97**	**20.52**	< 20	17.45	36.46	23	of 28
Benzyl alcohol	**16.29**	**16.20**	**14.66**	**5.37**	a	**8.46**	**6.46**	**8.94**	< 20	**4.43**	**5.47**	**16.03**	< 20	9.48	16.29	21	of 28
Bis(2-ethylhexyl)phthalate	**15.05**	**12.64**	**9.97**	**14.06**	a	**12.68**	< 30	**14.47**	**13.04**	**8.00**	**8.49**	**24.61**	< 30	12.36	24.61	25	of 28
Butylbenzyl phthalate	**3.39**	**3.03**	< 50	**2.70**	a	< 15	< 30	**3.50**	**2.00**	**2.86**	**5.96**	**1.50**	< 15	3.00	5.96	15	of 28
Di-N-butyl phthalate	**2.70**	**3.05**	**5.66**	**3.02**	a	< 15	< 30	**3.00**	**5.00**	**5.86**	**9.50**	**3.50**	< 15	4.62	9.50	17	of 28
Di-N-octyl phthalate	**1.64**	**1.00**	< 50	< 5	a	< 15	< 30	< 20	< 20	< 20	< 15	< 20	< 5	1.89	1.64	5	of 28
1,4-Dichlorobenzene	< 15	**1.75**	< 50	**2.37**	a	< 15	< 30	**5.00**	**1.00**	**1.00**	< 15	**2.50**	< 15	2.24	5.00	10	of 28
Diethyl phthalate	**10.52**	**9.84**	**11.33**	**10.32**	a	**5.00**	**8.53**	**9.50**	**5.00**	**6.43**	**7.98**	**12.52**	5.00	17.46	12.52	27	of 28
2-methylnaphthalene	**1.30**	**1.57**	< 50	< 5	a	< 15	< 30	< 20	< 20	< 20	< 15	< 20	< 5	< 2.22	1.57	7	of 28
Volatile Organic Compounds (ug/L)																	
Acetone	**112.1**	**96.8**	**94.3**	**51.0**	a	**184.9**	**338.5**	**92.1**	**204.3**	**79.2**	**57.0**	**120.0**	51.0	130.0	338.5	26	of 27
2-Butanone	**3.4**	< 10	**4.3**	**4.3**	a	**104.6**	**75.4**	**109.4**	**36.8**	**65.8**	**28.0**	**150.0**	3.4	53.0	150.0	19	of 27
Carbon Disulfide	**1.91**	< 10	< 10	**1.67**	a	< 10	< 10	< 10	**1.00**	< 15	< 10	**2.00**	< 10	1.28	2.00	5	of 27
Chloroform	**3.00**	**3.64**	**2.67**	**1.99**	a	**2.61**	**2.00**	**3.00**	**1.51**	**2.00**	**3.00**	**4.00**	1.51	2.67	4.00	24	of 27
Trans-1,2-Dichloroethylene	**1.00**	**1.00**	< 10	**1.00**	a	< 10	**1.00**	**1.00**	< 10	**1.00**	**1.00**	**1.00**	< 10	1.00	1.00	12	of 27
Methylene chloride	**1.34**	**2.36**	**1.99**	**1.67**	a	< 10	**2.97**	**3.98**	< 10	**6.18**	**1.00**	**1.00**	< 10	2.23	6.18	14	of 27
Styrene	< 10	< 10	< 10	< 10	a	< 10	< 10	**27.17**	< 10	**1.43**	< 10	< 10	< 10	3.42	27.17	4	of 27
Tetrachloroethylene	**2.61**	**3.13**	**3.01**	**2.69**	a	**5.93**	**6.00**	**5.01**	**7.48**	**4.00**	**12.48**	**4.00**	2.61	5.12	12.48	26	of 27
Toluene	**7.50**	**5.00**	**4.00**	**3.00**	a	**2.39**	**3.00**	**3.50**	**2.00**	**2.00**	**3.00**	**4.00**	2.00	3.58	7.50	25	of 27
Total Xylenes	**4.27**	**1.00**	< 10	< 10	a	**1.93**	**1.49**	< 10	**3.50**	**1.43**	**2.00**	**1.00**	< 10	1.79	4.27	13	of 27
1,1,1-Trichloroethane	< 10	< 10	**1.34**	< 10	a	< 10	**1.49**	< 10	< 10	**1.43**	**1.00**	**2.00**	< 10	1.07	2.00	7	of 27
Trichloroethylene	**1.00**	**2.41**	< 10	**1.00**	a	< 10	**2.53**	**1.00**	< 10	**1.00**	**5.97**	**1.00**	< 10	1.72	5.97	13	of 27

Notes:

1. Bold are detected values. Samples collected in November, signified "a" were deemed not representative.
2. The monthly average concentration is the weighted concentration back-calculated from daily loadings during each sampling day. In calculating the daily loadings, for those values reported below detection levels, one half (metals) and one-tenth (organics) of their reporting limit is used.
3. The yearly average concentration is calculated from the monthly average
4. A complete list of pesticides, semi-volatiles and volatile organics analyzed is included in Appendix J, Table 1. Only parameters that were detected or estimated to be present are included in this table.

Appendix B Table B-3 Nut Island Influent Loading, Fiscal Year 1994

	Average Monthly Loadings (lbs/d)												SUMMARY		
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	MIN	AVE	MAX
Metals															
Beryllium	1.48	1.37	1.20	1.10	1.65	2.60	2.32	0.63	0.94	0.69	0.56	**0.61**	0.56	1.26	2.60
Boron	**226**	**215**	**232**	**207**	**264**	**252**	**296**	**231**	**197**	**212**	**192**	**204**	192	227	296
Cadmium	1.86	1.71	1.50	1.38	2.06	3.25	2.90	0.63	0.94	**0.99**	0.56	0.41	0.41	1.52	3.25
Chrome-hex	**3.99**	1.71	1.50	1.38	2.06	3.25	2.90	3.13	4.69	3.46	2.81	2.04	1.38	2.74	4.69
Chromium	**6.80**	**7.61**	**7.82**	2.75	4.13	**11.39**	5.80	**7.86**	**30.94**	**5.43**	**5.32**	**5.32**	2.75	8.43	30.94
Copper	**138**	**123**	**153**	**54**	**67**	**82**	**54**	**122**	**69**	**50**	**65**	**78**	49.90	88.01	152.60
Lead	**18.93**	**13.94**	**22.78**	8.26	12.38	19.52	17.39	**6.77**	**14.06**	**5.54**	**10.68**	**12.29**	5.54	13.54	22.78
Mercury	**0.71**	0.34	**0.61**	0.28	0.41	0.65	0.12	0.13	0.19	0.14	**0.23**	**0.16**	0.12	0.33	0.71
Molybdenum	29.69	27.36	24.02	22.02	33.03	52.04	46.37	5.00	7.51	5.54	**8.41**	**5.32**	5.00	22.19	52.04
Selenium	3.71	1.71	3.00	2.75	2.06	3.25	**6.96**	1.25	1.88	**2.96**	1.13	0.82	0.82	2.62	6.96
Silver	**5.24**	**3.67**	**4.70**	1.93	**5.97**	4.55	4.06	**3.43**	2.81	**4.17**	1.69	**4.31**	1.69	3.88	5.97
Zinc	**148.2**	**148.3**	**174.6**	**67.7**	**81.3**	**89.7**	**53.2**	**118.9**	**109.8**	**60.8**	**79.9**	**67.5**	53.25	99.99	174.64
Inorganics															
Total Cyanide	0.74	0.68	0.60	0.55	0.83	1.30	1.16	1.25	**10.40**	1.38	1.13	0.82	0.55	1.74	10.40
Oil and Grease	**7623**	**4327**	**5798**	**10120**	**9916**	**12312**	**13911**	**51094**	**14672**	**31026**	**20783**	**8173**	4327	15813	51094
Surfactants	**3833**	**3789**	**4566**	**3255**	**4236**	**4899**	**5578**	**6529**	**3495**	**5296**	**4092**	**4432**	3255	4500	6529
Pesticides/PCBs															
Chlordane	0.037	0.050	0.020	0.073	0.100	0.100	0.075	0.050	0.050	0.050	**0.076**	**0.131**	0.02	0.07	0.13
Dieldrin	0.007	**0.050**	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.01	0.01	0.05
Gamma-BHC	**0.010**	0.500	**0.058**	0.500	0.500	0.500	0.500	**0.016**	0.500	0.500	0.500	0.500	0.01	0.38	0.50
Semi-volatile Organic Compounds															
Benzoic Acid	**237.0**	**79.6**	**155.4**	**61.5**	**223.0**	**110.6**	**238.9**	**66.3**	0.9	**93.3**	**26.2**	**191.9**	0.94	123.72	238.94
4-Methylphenol	**40.82**	**35.82**	**30.68**	**18.05**	**58.73**	**29.54**	**38.29**	**45.98**	**4.68**	**21.36**	**10.62**	**30.68**	4.68	30.44	58.73
Phenol	**21.51**	**17.93**	**10.44**	**6.46**	**42.61**	**21.96**	**42.27**	**21.35**	3.75	**13.65**	**5.60**	**16.77**	3.75	18.69	42.61
Benzyl alcohol	**12.09**	**11.08**	**8.80**	**2.95**	**9.91**	**11.01**	**7.49**	**11.19**	3.75	**6.14**	**6.16**	**13.10**	2.95	8.64	13.10
Bis(2-ethylhexyl)phthalate	**11.17**	**8.64**	**5.98**	**7.74**	**12.81**	**16.50**	3.48	**18.10**	**24.47**	**11.08**	**9.55**	**20.11**	3.48	12.47	24.47
Butylbenzyl phthalate	**2.52**	**2.07**	0.30	**1.48**	1.65	1.95	3.48	**4.37**	**3.75**	**3.96**	**6.71**	**1.23**	0.30	2.79	6.71

Appendix B Table B-3 Nut Island Treatment Plant

	Average Monthly Loadings (lbs/d)												SUMMARY		
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	MIN	AVE	MAX
Semi-volatile Organics (cont)															
Di-N-butyl phthalate	**2.00**	**2.09**	**3.40**	**1.66**	1.65	1.95	3.48	**3.75**	**9.38**	**8.12**	**10.69**	**2.86**	1.65	4.25	10.69
Di-N-octyl phthalate	**1.22**	**0.68**	0.30	0.28	1.65	1.95	3.48	2.50	3.75	2.77	1.69	1.63	0.28	1.83	3.75
1,4-Dichlorobenzene	1.11	**1.20**	0.30	**1.30**	1.65	1.95	3.48	**6.26**	**1.88**	**1.38**	1.69	**2.05**	0.30	2.02	6.26
Diethyl phthalate	**7.81**	**6.73**	**6.80**	**5.68**	**7.44**	**6.51**	**9.88**	**11.88**	**9.38**	**8.90**	**8.99**	**10.23**	5.68	8.35	11.88
2-methylnaphthalene	**0.97**	**1.07**	0.30	0.28	1.65	1.95	3.48	2.50	3.75	2.77	1.69	1.63	0.28	1.84	3.75
Volatile Organic Compounds															
Acetone	**83.2**	**66.2**	**56.6**	**28.1**	**125.7**	**240.5**	**392.4**	**115.2**	**383.3**	**109.7**	**64.2**	**98.1**	28.06	146.92	392.37
2-Butanone	**2.5**	0.7	**2.6**	**2.4**	**60.8**	**136.1**	**87.4**	**136.9**	**69.0**	**91.0**	**31.6**	**122.6**	0.68	61.96	136.89
Carbon Disulfide	**1.42**	0.7	0.6	**0.92**	2.48	1.3	1.2	1.3	**1.88**	2.08	1.1	**1.63**	0.60	1.38	2.48
Chloroform	**2.23**	**2.49**	**1.60**	**1.10**	**14.81**	**3.40**	**2.32**	**3.75**	**2.82**	**2.77**	**3.38**	**3.27**	1.10	3.66	14.81
Trans-1,2-Dichloroethylene	**0.74**	**0.68**	0.60	**0.55**	2.48	1.30	**1.16**	**1.25**	1.88	**1.38**	**1.13**	**0.82**	0.55	1.16	2.48
Methylene chloride	**0.99**	**1.61**	**1.19**	**0.92**	2.48	1.30	**3.44**	**4.97**	1.88	**8.55**	**1.13**	**0.82**	0.82	2.44	8.55
Styrene	0.74	0.68	0.60	0.55	2.48	1.30	1.16	**33.98**	1.88	**1.98**	1.13	0.82	0.55	3.94	33.98
Tetrachloroethylene	**1.94**	**2.14**	**1.81**	**1.48**	**23.02**	**7.71**	**6.96**	**6.27**	**14.03**	**5.54**	**14.05**	**3.27**	1.48	7.35	23.02
Toluene	**5.57**	**3.42**	**2.40**	**1.65**	**3.71**	**3.11**	**3.48**	**4.38**	**3.75**	**2.77**	**3.38**	**3.27**	1.65	3.41	5.57
Total Xylenes	**3.17**	**0.68**	0.60	0.55	2.48	**2.51**	**1.73**	**1.25**	**6.56**	**1.98**	**2.25**	**0.82**	0.55	2.05	6.56
1,1,1-Trichloroethane	0.74	0.68	**0.80**	0.55	**2.47**	1.30	**1.73**	1.25	1.88	**1.98**	**1.13**	**1.63**	0.55	1.35	2.47
Trichloroethylene	**0.74**	**1.65**	0.60	**0.55**	2.48	1.30	**2.93**	**1.25**	1.88	**1.38**	**6.73**	**0.82**	0.55	1.86	6.73
Average Flow (MGD)	89	82	72	66	99	156	139	150	225	166	135	98			

Notes:

1. The monthly average loading is calculated using the calculated monthly average concentration and monthly average flow.
2. Bold numbers reflect detected values.

Appendix B Table B-4 Nut Island Effluent Characterization, Priority Pollutants, Fiscal Year 1994

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	SUMMARY MIN	SUMMARY AVE	SUMMARY MAX	TIMES DETECTED
Metals (ug/L)																
Antimony	**3.0**	< 5	< 2	< 2	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	2.0	3.0	1 of 12
Arsenic	< 2	< 2	< 2	**2.0**	< 2	< 2	**4.0**	< 2	< 2	< 2	< 2	< 2	< 2	1.0	4.0	2 of 12
Beryllium	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1				0 of 12
Boron	**300**	**300**	**380**	**380**	**320**	**200**	**250**	**170**	**120**	**163**	**193**	**253**	120	253	380	12 of 12
Cadmium	< 1	**1.0**	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.5	1.0	1 of 12
Chromium	**8.0**	**10.0**	**9.0**	**8.0**	**12.0**	< 5	**5.0**	**6.0**	**12.0**	**4.0**	**4.0**	**5.0**	< 5	7.5	12.0	11 of 12
Copper	**93**	**85**	**79**	**99**	**62**	**50**	**67**	**59**	**33**	**39**	**47**	**55**	33	64	99	12 of 12
Lead	**17**	**10**	**9**	**11**	**7**	**6**	**8**	**8**	**6**	**9**	**5**	**7**	5	9	17	12 of 12
Mercury	**0.2**	< 0.2	< 0.2	**0.2**	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	0.1	0.2	2 of 12
Molybdenum	< 8	**8.0**	**8.0**	**6.0**	< 8	< 8	< 8	< 8	< 8	< 8	**6.0**	**6.0**	< 8	5.0	8.0	5 of 12
Nickel	< 12	< 12	**20.0**	< 12	< 12	< 12	< 12	< 12	< 12	< 12	< 12	< 12	< 12	7.0	20.0	1 of 12
Selenium	< 2	< 2	< 10	< 10	< 2	< 2	**4.0**	**2.0**	< 2	**3.0**	< 2	< 2	< 2	2.0	4.0	3 of 12
Silver	< 3	< 3	**4.0**	< 3	< 3	< 3	< 3	< 7	< 3	< 3	< 3	< 3	< 3	2.0	4.0	1 of 12
Thallium	< 2	< 2	< 4	< 10	< 2	< 10	< 2	< 2	< 2	< 2	< 2	< 2				0 of 12
Zinc	**85.0**	**90.0**	**90.0**	**110.0**	**68.0**	**56.0**	**72.0**	**67.0**	**61.0**	**50.0**	**57.0**	**51.0**	50.0	71.0	110.0	12 of 12
Inorganics (mg/L)																
Cyanide	**0.006**	**0.007**	**0.006**	**0.007**	**0.042**	**0.012**	**0.018**	**0.010**	**0.013**	**0.015**	**0.015**	**0.010**	0.006	0.013	0.042	12 of 12
Phenols	**0.026**	**0.011**	**0.026**	**0.012**	**0.035**	**0.008**	**0.025**	**0.017**	**0.012**	**0.016**	**0.019**	*	0.008	0.019	0.035	11 of 12
PHC	**1.225**	**0.800**	**2.100**	**1.175**	**0.800**	**0.800**	**1.500**	**1.950**	**1.680**	**2.350**	**3.200**	**2.880**	0.800	1.705	3.200	12 of 12
Pesticides/PCBs (ug/L)																
4,4'DDD	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	**0.062**	**0.04**	< 0.05	< 0.05	< 0.10	< 0.10	< 0.10	< 0.10	0.014	0.062	2 of 12
Aldrin	< 0.05	< 0.05	< 0.05	< 0.05	**0.076**	< 0.05	**0.01**	< 0.05	< 0.05	**0.01**	**0.04**	**0.01**	< 0.05	0.015	0.076	5 of 12
b-BHC	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	**0.064**	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.010	0.064	1 of 12
Chlordane	< 1.00	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.05	**0.08**	< 0.20	< 0.05	0.023	0.077	1 of 12
d-BHC	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	**0.054**	< 0.05	**0.12**	< 0.05	**0.09**	**0.10**	**0.06**	< 0.05	0.038	0.120	5 of 12
Endosulfan I	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.05	< 0.05	**0.02**	< 0.05	< 0.05	0.009	0.019	1 of 12
Endosulfan sulfate	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	**0.02**	**0.01**	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.011	0.020	2 of 12
g-BHC	**0.04**	< 0.05	**0.064**	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	**0.01**	< 0.05	< 0.05	0.013	0.064	3 of 12

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	SUMMARY MIN	SUMMARY AVE	SUMMARY MAX	TIMES DETECTED
Semi-volatile Organics (ug/L)																
4-Methyl phenol	< 50	**25**	**37**	**42**	**34**	**15**	**19**	**13**	< 10	**11**	**18**	**28**	< 10	21	42	10 of 12
Benzoic acid	**300**	**83**	**150**	**210**	**140**	**64**	**120**	**78**	**45**	**91**	**111**	**223**	45	135	300	12 of 12
Benzyl alcohol	**13**	**13**	**11**	**14**	**13**	**9**	**12**	**17**	**3**	**7**	**9**	**17**	3	12	17	12 of 12
bis(2-ethylhexyl)pthal:	**12**	**7**	**6**	**10**	< 50	**6**	**3**	**12**	**2**	**8**	**4**	**8**	< 50	7	12	11 of 12
Butyl benzylpthalate	< 50	< 50	< 50	< 50	< 50	< 50	< 20	**3**	< 10	**2**	**2**	**2**	< 10	< 11	3	4 of 12
Di-n-butylpthalate	< 50	< 50	< 50	< 50	< 50	**10**	< 20	< 50	**8**	**4**	**7**	**5**	< 20	< 18	10	5 of 12
Diethylpthalate	**12**	**10**	**11**	**12**	**11**	**6**	**11**	**12**	**4**	**7**	**7**	**13**	4	10	13	12 of 12
Naphthalene	< 50	< 50	< 50	< 50	< 50	< 50	< 20	< 50	< 10	**2**	**1**	< 20	< 10	< 9	2	2 of 12
Phenol	< 50	**9**	< 50	< 50	**15**	**9**	**12**	< 50	< 10	**10**	**10**	**18**	< 10	9	18	7 of 12
Volatile Organics (ug/L)																
1,1,1-trichloroethane	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	**1.3**	**1.3**	**1.3**	< 10.0	1.1	1.3	3 of 12
1,2-dichloroethene	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	**1.0**	< 10.0	< 10.0	**1.0**	< 10.0	< 10.0	1.0	1.0	2 of 12
2-butanone	**80.3**	**5.3**	**6.3**	**6.0**	**243.3**	**142.7**	**64.7**	**75.5**	**87.7**	**54.3**	**59.3**	**126.0**	< 10.0	79.3	243.3	12 of 12
2-hexanone	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	**1.3**	< 10.0	< 10.0	1.0	1.3	1 of 12
Acetone	**186.7**	**250.0**	**236.7**	< 10.0	**156.7**	**109.0**	**170.3**	**165.0**	**105.0**	**82.0**	**89.3**	**134.3**	< 10.0	140.5	250.0	11 of 12
Bromodichloromethan	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	**1.7**	**1.7**	**1.3**	< 10.0	1.1	1.7	3 of 12
Carbon disulfide	**1.0**	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	**3.7**	< 10.0	**1.7**	< 10.0	1.3	3.7	3 of 12
Chloroform	**4.0**	**4.0**	**3.3**	**2.7**	**3.7**	< 10	**3.0**	**3.5**	**2.7**	**4.0**	**5.0**	**5.3**	< 10.0	3.7	5.3	11 of 12
Dibromochloromethan	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	**1.0**	< 10.0	< 10.0	1.0	1.0	1 of 12
Ethyl benzene	< 10.0	< 10.0	**1.3**	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	**1.3**	< 10.0	< 10.0	1.1	1.3	2 of 12
Methylene chloride	< 10.0	**4.0**	**1.3**	**3.7**	< 10.0	< 10.0	**80.0**	< 10.0	**2.0**	**1.7**	**6.0**	**4.3**	< 10.0	8.9	80.0	8 of 12
Styrene	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	**25.0**	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	3.0	25.0	1 of 12
Tetrachloroethene	**2.7**	**2.3**	**2.3**	**3.0**	**3.3**	**4.3**	**8.0**	**4.5**	**6.0**	**4.3**	**13.0**	**3.3**	2.33	4.8	13.0	12 of 12
Toluene	**4.7**	**4.3**	**3.0**	**3.0**	**4.7**	**2.0**	**2.7**	**2.0**	**2.3**	**2.0**	**3.3**	**4.0**	2.00	3.2	4.7	12 of 12
Trichloroethene	**1.0**	**1.0**	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	**1.0**	**1.3**	< 10.0	< 10.0	1.0	1.3	4 of 12
Xylene	**1.7**	**1.0**	**6.0**	< 10.0	< 10.0	**1.7**	**1.3**	< 10.0	**2.7**	**2.7**	**2.3**	**3.0**	< 10.0	2.1	6.0	9 of 12

Notes:

1. Bold are detected values.
2. The monthly average concentration is the flow-weighted concentration, back-calculated from daily loadings during each sampling day. In calculating the daily loadings, for those values that were reported below detection levels, one-half (metals) and one-tenth (organics) of their reporting limit is used.
3. The yearly average concentration is calculated fron the monthly averages.
4. A complete list of pesticides, semi-volatiles and volatile organics analyzed is included in Appendix J, Table 1. Only parameters that were detected or estimated to be present are included in this table.

Appendix B Table B-5 Nut Island Effluent Priority Pollutant Loadings, FY 1994

	Loadings (lbs/d)												SUMMARY		
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	MIN	AVE	MAX
Metals															
Antimony	**2.2**	1.7	0.6	0.6	2.1	3.2	2.9	3.1	4.7	3.5	2.8	2.1	0.6	2.5	4.7
Arsenic	0.7	0.7	0.6	**1.2**	0.8	1.3	**4.6**	1.3	1.9	1.4	1.1	0.8	0.6	1.4	4.6
Boron	**223**	**205**	**228**	**209**	**265**	**260**	**290**	**213**	**226**	**227**	**217**	**208**	205	231	290
Cadmium	0.4	**0.7**	0.3	0.3	0.4	0.6	0.6	0.6	0.9	0.7	0.6	0.4	0.3	0.5	0.9
Chromium	**5.9**	**6.8**	**5.4**	**4.4**	**9.9**	3.2	**5.8**	**7.5**	**22.6**	**5.1**	**4.1**	**4.2**	3.2	7.1	22.6
Copper	**69.0**	**58.2**	**47.4**	**54.5**	**51.3**	**64.9**	**77.8**	**74.0**	**62.0**	**53.6**	**52.4**	**44.9**	44.9	59.2	77.8
Lead	**12.6**	**6.8**	**5.4**	**6.1**	**5.8**	**7.8**	**9.3**	**10.0**	**11.3**	**12.9**	**5.6**	**5.7**	5.4	8.3	12.9
Mercury	**0.1**	0.1	0.1	**0.1**	0.1	0.1	0.1	0.1	**0.2**	0.1	0.1	0.1	0.1	0.1	0.2
Molybdenum	3.0	**5.5**	**4.8**	**3.3**	3.3	5.2	4.6	5.0	7.5	5.5	**6.7**	**4.7**	3.0	4.9	7.5
Nickel	4.5	4.1	**12.0**	3.3	5.0	7.8	7.0	7.5	11.3	8.3	6.7	4.9	3.3	6.9	12.0
Selenium	0.7	0.7	3.0	2.8	0.8	1.3	**4.6**	**2.5**	1.9	**4.2**	1.1	0.8	0.7	2.0	4.6
Silver	1.1	1.0	**2.4**	0.8	1.2	1.9	1.7	4.4	2.8	2.1	1.7	1.2	0.8	1.9	4.4
Zinc	**63.1**	**61.6**	**54.0**	**60.5**	**56.3**	**72.7**	**83.6**	**84.0**	**114.6**	**68.9**	**64.0**	**41.9**	41.9	68.8	114.6
Inorganics															
Cyanide	**4.5**	**4.6**	**3.7**	**3.9**	**34.8**	**16.0**	**21.3**	**11.9**	**23.8**	**21.0**	**16.8**	**8.2**	3.7	14.2	34.8
Phenols	**19.3**	**7.5**	**15.6**	**6.6**	**29.0**	**10.4**	**29.0**	**21.3**	**22.6**	**22.2**	**21.3**	*	6.6	18.6	29.0
PHC	**909**	**547**	**1261**	**647**	**662**	**1039**	**1742**	**2444**	**3157**	**3260**	**3591**	**2365**	547	1802	3591
Pesticides/PCBs															
4,4'DDD	0.004	0.003	0.003	0.003	0.004	**0.081**	**0.046**	0.006	0.009	0.014	0.011	0.008	0.003	0.016	0.081
Aldrin	0.004	0.003	0.003	0.003	**0.063**	0.006	**0.012**	0.006	0.009	**0.019**	**0.040**	**0.010**	0.003	0.015	0.063
b-BHC	0.004	0.003	0.003	0.003	0.004	**0.083**	0.006	0.006	0.009	0.007	0.006	0.004	0.003	0.012	0.083
Chlordane	0.007	0.014	0.012	0.011	0.017	0.026	0.023	0.025	0.038	0.007	**0.086**	0.016	0.007	0.023	0.086
d-BHC	0.004	0.003	0.003	0.003	0.004	**0.070**	0.006	**0.150**	0.009	**0.118**	**0.117**	**0.051**	0.003	0.045	0.150
Endosulfan I	0.007	0.007	0.006	0.006	0.008	0.013	0.012	0.013	0.009	0.007	**0.021**	0.004	0.004	0.009	0.021
Endosulfan sulfate	0.007	0.007	0.006	0.006	0.008	0.013	**0.023**	**0.013**	0.019	0.014	0.011	0.008	0.006	0.011	0.023
g-BHC	**0.030**	0.003	**0.038**	0.003	0.004	0.006	0.006	0.006	0.009	0.007	**0.010**	0.004	0.003	0.011	0.038

Appendix B Table B-5 Nut Island

	Loadings (lbs/d)												SUMMARY		
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	MIN	AVE	MAX
Semi-volatile Organics															
4-Methyl phenol	3.7	**17.1**	**22.2**	**23.1**	**28.1**	**19.5**	**22.1**	**16.3**	1.9	**15.7**	**20.2**	**23.3**	1.9	17.8	28.1
Benzoic acid	**222.6**	**56.8**	**90.1**	**115.6**	**115.8**	**83.1**	**139.3**	**97.8**	**84.6**	**126.7**	**124.9**	**183.4**	56.8	120.1	222.6
Benzyl alcohol	**9.6**	**8.9**	**6.6**	**7.7**	**10.8**	**11.7**	**13.9**	**21.3**	**5.6**	**9.7**	**9.7**	**14.2**	5.6	10.8	21.3
bis(2-ethylhexyl)pthalate	**8.9**	**4.8**	**3.6**	**5.5**	4.1	**7.8**	**3.5**	**15.0**	**3.8**	**11.1**	**4.5**	**6.6**	3.5	6.6	15.0
Butyl benzylpthalate	3.7	3.4	3.0	2.8	4.1	6.5	1.2	**3.8**	1.9	**2.8**	**1.9**	**1.6**	1.2	3.1	6.5
Di-n-butylpthalate	3.7	3.4	3.0	2.8	4.1	**13.0**	1.2	6.3	**15.0**	**5.5**	**8.2**	**3.8**	1.2	5.8	15.0
Diethylpthalate	**8.9**	**6.8**	**6.6**	**6.6**	**9.1**	**7.8**	**12.8**	**15.0**	**7.5**	**9.2**	**7.9**	**10.4**	6.6	9.1	15.0
Naphthalene	3.7	3.4	3.0	2.8	4.1	6.5	1.2	6.3	1.9	**2.3**	**1.3**	1.6	1.2	3.2	6.5
Phenol	3.7	**6.2**	3.0	2.8	**12.4**	**11.7**	**13.9**	6.3	1.9	**13.9**	**11.6**	**14.5**	1.9	8.5	14.5
Volatile Organics															
1,1,1-trichloroethane	0.7	0.7	0.6	0.6	0.8	1.3	1.2	1.3	1.9	**1.8**	**1.5**	**1.1**	0.6	1.1	1.9
1,2-dichloroethene	0.7	0.7	0.6	0.6	0.8	1.3	1.2	**1.2**	1.9	1.4	**1.1**	0.8	0.6	1.0	1.9
2-butanone	**59.6**	**3.6**	**3.8**	**3.3**	**201.4**	**185.3**	**75.1**	**94.6**	**164.7**	**75.4**	**66.6**	**103.5**	3.3	86.4	201.4
2-hexanone	0.7	0.7	0.6	0.6	0.8	1.3	1.2	1.3	1.9	1.4	**1.5**	0.8	0.6	1.1	1.9
Acetone	**138.5**	**171.0**	**142.1**	0.6	**129.6**	**141.6**	**197.8**	**206.8**	**197.3**	**113.7**	**100.2**	**110.3**	0.6	137.5	206.8
Bromodichloromethane	0.7	0.7	0.6	0.6	0.8	1.3	1.2	1.3	1.9	**2.3**	**1.9**	**1.1**	0.6	1.2	2.3
Carbon disulfide	**0.7**	0.7	0.6	0.6	0.8	1.3	1.2	1.3	1.9	**5.1**	1.1	**1.4**	0.6	1.4	5.1
Chloroform	**3.0**	**2.7**	**2.0**	**1.5**	**3.0**	1.3	**3.5**	**4.4**	**5.0**	**5.5**	**5.6**	**4.4**	1.3	3.5	5.6
Dibromochloromethane	0.7	0.7	0.6	0.6	0.8	1.3	1.2	1.3	1.9	1.4	**1.1**	0.8	0.6	1.0	1.9
Ethyl benzene	0.7	0.7	**0.8**	0.6	0.8	1.3	1.2	1.3	1.9	1.4	**1.5**	0.8	0.6	1.1	1.9
Methylene chloride	0.7	**2.7**	**0.8**	**2.0**	0.8	1.3	**92.9**	1.3	**3.8**	**2.3**	**6.7**	**3.6**	0.7	9.9	92.9
Styrene	0.7	0.7	0.6	0.6	0.8	1.3	1.2	**31.3**	1.9	1.4	1.1	0.8	0.6	3.5	31.3
Tetrachloroethene	**2.0**	**1.6**	**1.4**	**1.7**	**2.8**	**5.6**	**9.3**	**5.6**	**11.3**	**6.0**	**14.6**	**2.7**	1.4	5.4	14.6
Toluene	**3.5**	**3.0**	**1.8**	**1.7**	**3.9**	**2.6**	**3.1**	**2.5**	**4.4**	**2.8**	**3.7**	**3.3**	1.7	3.0	4.4
Trichloroethene	**0.7**	**0.7**	0.6	0.6	0.8	1.3	1.2	1.3	1.9	**1.4**	**1.5**	0.8	0.6	1.1	1.9
Xylene	**1.2**	**0.7**	**3.6**	0.6	0.8	**2.2**	**1.5**	1.3	**5.0**	**3.7**	**2.6**	**2.5**	0.6	2.1	5.0
Average Flow (MGD)	89	82	72	66	99	156	139	150	225	166	135	98			

Notes:

1. The average monthly loading is calculated using the monthly average concentration and monthly average flow.
2. Bold numbers reflect detected values.

Appendix B Table B-6 Nut Island Treatment Plant Priority Pollutants, Historical Data

	Average Concentration			
	FY91	FY92	FY93	FY94
Metals (ug/L)				
Antimony	17.83	2.75	11.88	2.000
Arsenic	1.33	1.79	1.71	1.000
Beryllium	0.43	0.42	1.00	1.000
Boron	245.25	218.33	235.58	253.000
Cadmium	1.63	0.96	1.00	1.000
Chromium	5.42	5.29	5.58	8.000
Chromium (hex)	8.17	3.22	2.58	0.000
Copper	56.75	56.33	60.00	64.000
Lead	7.43	7.32	10.00	9.000
Mercury	0.48	0.26	0.31	0.100
Molybdenum	5.00	6.42	18.17	5.000
Nickel	12.04	9.75	9.67	7.000
Selenium	1.75	1.17	1.46	2.000
Silver	3.46	3.67	2.75	2.000
Thallium	0.79	1.50	1.38	2.000
Zinc	60.33	63.67	64.17	71.000
Inorganics (mg/L)				
Cyanide	0.01	0.01	0.01	0.013
Phenols	0.02	0.03	0.03	0.019
Petroleum Hydrocarbons	2.61	2.03	1.71	1.705
Pesticides/PCBs (ug/L)				
Aldrin	0.02	0.02	0.01	0.015
b-BHC	0.02	0.51	0.01	0.010
g-BHC	0.02	0.02	0.03	0.013
a-BHC	0.02	0.02	0.03	BDL
d-BHC	0.02	0.02	0.02	0.038
4,4'DDE			0.02	BDL
4,4'DDD	0.02	0.08	0.02	0.014

Appendix B Table B-6 Nut Island Treatment Plant

	Average Concentration			
	FY91	FY92	FY93	FY94
Pesticides/PCBs (cont)				
4,4'DDT	0.02	0.08	0.01	
Heptachlor epoxide	0.03	0.02	0.01	
Endosulfan Sulfate	0.02	0.05	0.10	0.011
Endosulfan I	0.02	0.12	0.01	0.009
Endrin	0.02	0.05	0.01	BDL
Heptachlor	0.02	0.02	0.01	BDL
Dieldrin			0.02	
Chlordane	0.07	0.25	0.11	0.023
Semivolatile Organics (ug/L)				
Phenol	3.33	1.42	2.92	8.670
Benzoic acid	19.00	33.00	68.13	134.670
Benzyl alcohol	5.33	13.00	11.17	11.500
4-Methyl phenol	5.08	15.25	19.83	20.720
bis(2-ethylhexyl)pthalate	3.33	2.92	3.08	3.390
Diethyl pthalate	3.42	3.33	7.17	9.610
N-nitrosodiphenylamine	2.75	1.00	1.21	
Dimethyl phthalate	2.83	1.00	1.21	9.610
Di-n-butylpthalate	2.92	2.25	3.50	5.420
Butylbenzylphthalate	3.33	2.92	3.08	3.39
Volatile Organics (ug/L)				
Methylene chloride	9.36	6.00	4.75	8.920
Acetone	149.11	154.47	112.72	140.500
Chloroform	5.67	8.17	6.50	3.740
2-butanone	219.67	117.13	111.89	71.290
1,1,1-trichloroethane	5.42	2.26	1.68	1.080
Trichloroethene	1.70	1.19	0.79	1.030
Bromodichloromethane	1.31	2.54	2.04	1.14
Toluene	6.58	5.75	6.11	3.170
Tetrachloroehtene	7.29	5.89	4.36	4.76
Xylene	1.92	1.84	4.27	2.110

Appendix B Table B-6 Nut Island Treatment Plant

	Average Concentration			
	FY91	FY92	FY93	FY94
Volatile Organics (cont)				
1,2-dichloroethene	0.61	1.41	0.81	1.000
Ethyl benzene	0.58	0.62	0.78	1.060
Chloromethane	1.00	1.15	1.15	
Carbon disulfide	0.79	0.85	1.05	1.280
2-hexanone	1.00	1.00	1.47	1.030
Styrene	0.50	0.50	0.72	3.000
Dibromochloromethane	0.56	1.06	0.89	1.000
Benzene	0.69	0.58	0.94	
Carbon tetrachloride	0.50	0.50	0.75	
1,2 dichloropropane	0.50	0.50	0.71	
Chlorobenzene	0.65	0.50	0.71	
4-methyl-2-pentanone	1.33	1.00	1.08	

Notes:
BDL Below Detection Limit

Appendix C

Appendix C Table C-1 Cottage Farm CSO Facility Operations Summary, Fiscal Year 1994

DATE	RAINFALL (INCHES)	DISCHARGE DURATION (HOURS)	TOTAL FLOW (MG)	PH (SU)	BOD INFLUENT (MG/L)	BOD EFFLUENT (MG/L)	TSS INFLUENT (MG/L)	TSS EFFLUENT (MG/L)	SETTLEABLE. SOLIDS (MG/L)	FECAL COLIFORM (#/100 ml)	CHLORINE RESIDUAL (MG/L)
JULY											
7-8-93	0.55	3.50	10.00	6.44	86	71	194	186	1.00	10	2.15
7-27-93	0.62	4.00	3.80	7.18	46	24	96	60	1.30	10	2.08
AUGUST											
8-20-93	0.65	2.75	4.70	7.11	109	94	272	120	0.40	50	1.50
SEPTEMBER											
9-8-93	1.26	2.50	4.30	7.03	113	64	132	88	0.03	10	1.90
9-26-93	0.86	3.25	6.54	7.31	86	54	192	49	0.30	10	1.50
9-27-93	0.91	7.00	7.51	6.92	115	77	182	64	0.30	10	1.00
OCTOBER											
10-12-93	0.66	2.10	3.55	6.73	65	50	84	59	0.60	10	1.67
10-31-93	0.45	2.10	7.68	5.84	130	64	148	64	1.60	10	1.00
NOVEMBER											
11-1-93	0.34	2.75	0.08	6.44	77	64	68	34	0.20	10	1.30
11-17-93	0.85	3.00	3.98	6.68	118	78	267	90	1.00	10	1.12
11-28-93	0.88	5.00	15.59	6.38	216	46	120	87	0.33	100	1.12
DECEMBER											
12-5-93	2.76	13.25	71.29	7.52	67	49	162	59	0.20	10	1.10
12-11-93	1.05	5.00	0.83	6.95	46	46	40	31	0.20	80	1.30
12-21-93	1.53	10.00	49.52	7.16	72	50	124	30	1.00	10	1.18
JANUARY											
1-18-94	1.04	17.00	56.00	7.01	68	31	160	79	2.00	10	1.25
1-28-94	1.00	13.25	38.58	7.52	56	24	126	15	2.00	10	1.20
FEBRUARY											
2-21-94	0.14	5.50	2.44	7.73	92	29	96	22	2.00	10	1.44

Appendix C Table C-1 Cottage Farm CSO Facility

DATE	RAINFALL (INCHES)	DISCHARGE DURATION (HOURS)	TOTAL FLOW (MG)	PH (SU)	BOD INFLUENT (MG/L)	BOD EFFLUENT (MG/L)	TSS INFLUENT (MG/L)	TSS EFFLUENT (MG/L)	SETTLEABLE. SOLIDS (MG/L)	FECAL COLIFORM (#/100 ml)	CHLORINE RESIDUAL (MG/L)
MARCH											
3-8-94	0.44	4.25	1.66	7.38	84	26	86	26	2.00	10	1.50
3-10-94 *	2.05	17.00	122.83	7.27	50	22	119	20	2.00	10	1.40
3-11-94		6.50	12.79	6.65	19	48	13	47	2.00	10	1.50
3-22-94	1.21	16.75	56.81	6.71	213	58	1048	94	2.00	284000	1.40
3-23-94 *		3.00	0.85	6.57	80	66	134	28	2.00	59000	1.00
3-27-94	0.30	4.75	0.51	7.14	112	71	180	26	2.00	100	1.40
3-28-94	0.42	4.00	1.89	7.23	**	65	**	22	2.00	10	2.50
3-29-94	0.60	15.00	15.27	7.20	79	51	74	35	2.00	50	1.70
APRIL											
4-13-94	0.72	4.50	10.96	6.67	143	39	480	56	2.00	10	1.25
4-14-94*		2.00	2.05	7.04	107	47	298	58	2.00	60	1.50
4-16-94	0.63	6.00	14.31	7.26	105	62	58	94	2.00	100	1.70
MAY											
5-5-94	1.39	9.50	29.58	6.77	71.4	33.8	120	74	2.00	10	1.52
5-6-94	0.30	6.00	12.99	7.07	9.44	40.6	194	32	2.00	2000	1.25
5-8-94	0.44	6.75	11.54	6.93	99	31	90	30	2.00	1370	1.50
5-16-94	0.94	8.75	29.49	7.03	70.8	22.8	142	52	2.00	10	1.28
5-25-94	0.11	3.75	10.04	7.20	41.4	84	29	131	2.00	410	1.58
5-26-94	0.98	1.25	0.71	7.15	86.8	72.7	94	44	2.00	500	1.00
TOTAL		**216.70**	**620.67**								
AVERAGE		**6.77**	**20.02**	**6.96**	**90.47**	**49.94**	**177.39**	**57.22**	**1.39**	**45**	**1.44**
MINIMUM		**2.00**	**0.08**	**5.84**	**9.44**	**22.00**	**13.00**	**15.00**	**0.03**	**10**	**1.00**
MAXIMUM		**17.00**	**122.83**	**7.73**	**216.00**	**94.00**	**1048.00**	**186.00**	**2.00**	**284000**	**2.50**
No. OF ACTIVATIONS		**31**									

* Continued from previous day activation.

** Sample bottles broken, no analyses conducted.

Appendix C Table C-2 Cottage Farm CSO BOD and TSS Loadings, Fiscal Year 1994

DATE	Total Flow (MG)	Biochemical Oxygen Demand Influent (lbs/d)	Biochemical Oxygen Demand Effluent (lbs/d)	Biochemical Oxygen Demand Removal (%)	Total Suspended Solids Influent (lbs/d)	Total Suspended Solids Effluent (lbs/d)	Total Suspended Solids Removal (%)
JULY							
7-8-93	10.00	7172	5921	17	16180	15512	4
7-27-93	3.80	1458	761	48	3042	1902	38
AUGUST							
8-20-93	4.70	4273	3685	14	10662	4704	56
SEPTEMBER							
9-8-93	4.30	4052	2295	43	4734	3156	33
9-26-93	6.54	4691	2945	37	10472	2673	74
9-27-93	7.51	7206	4825	33	11404	4010	65
OCTOBER							
10-12-93	3.55	1924	1480	23	2487	1747	30
10-31-93	7.68	8327	4099	51	9480	4099	57
NOVEMBER							
11-1-93	0.08	48	40	17	43	21	50
11-17-93	3.98	3917	2589	34	8863	2987	66
11-28-93	15.59	28084	5981	79	15602	11312	28
DECEMBER							
12-5-93	71.29	39835	29133	27	96318	35079	64
12-11-93	0.83	318	318	0	277	215	23
12-21-93	49.52	29736	20650	31	51212	12390	76
JANUARY							
1-18-94	56.00	31759	14478	54	74726	36896	51
1-28-94	38.58	18018	7722	57	40541	4826	88

Appendix C Table C-2 Cottage Farm CSO Facility

DATE	Total Flow (MG)	Biochemical Oxygen Demand Influent (lbs/d)	Biochemical Oxygen Demand Effluent (lbs/d)	Biochemical Oxygen Demand Removal (%)	Total Suspended Solids Influent (lbs/d)	Total Suspended Solids Effluent (lbs/d)	Total Suspended Solids Removal (%)
FEBRUARY							
2-21-94	2.44	1872	590	68	1954	448	77
MARCH							
3-8-94	1.66	1163	360	69	1191	360	70
3-10-94	122.83	51220	22537	56	121904	20488	83
3-11-94	12.79	2027	5120	-153	1387	5013	-262
3-22-94	56.81	100918	27480	73	496538	44537	91
3-23-94	0.85	567	468	18	950	198	79
3-27-94	0.51	476	302	37	766	111	86
3-28-94	1.89	*	1025	*	*	347	*
3-29-94	15.27	10061	6495	35	9424	4457	53
APRIL							
4-13-94	10.96	13071	3565	73	43875	5119	88
4-14-94	2.05	1829	804	56	5095	992	81
4-16-94	14.31	12531	7399	41	6922	11218	-62
MAY							
5-5-94	29.58	17614	8338	53	29604	18256	38
5-6-94	12.99	1023	4398	-330	21017	3467	84
5-8-94	11.54	9528	2984	69	8662	2887	67
5-16-94	29.49	17413	5608	68	34924	12789	63
5-25-94	10.04	3467	7034	-103	2428	10969	-352
5-26-94	0.71	514	430	16	557	261	53
TOTAL	**621**						
AVERAGE	**20.02**	**13439**	**6700**	**19**	**34631**	**8414**	**34**
MINIMUM	**0.08**	**48**	**40**	**-330**	**43**	**21**	**-352**
MAXIMUM	**122.83**	**100918**	**29133**	**79**	**496538**	**44537**	**91**
No of ACTIVATIONS		**31**					

Appendix C Table C-3 Cottage Farm CSO Facility, Effluent Characterization, Fiscal Year 1994

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	SUMMARY MIN	SUMMARY MEAN	SUMMARY MAX	TIMES DETECTED
Metals (ug/L)																
Antimony	a	V	a	a	a	< 5	a	a	a	< 5	a	N				0 of 2
Arsenic	a	E	a	a	a	5.0	a	a	a	< 2	a	O	< 2.0	3.0	5.0	1 of 2
Beryllium	a	R	a	a	a	< 1	a	a	a	< 1	a					0 of 2
Cadmium	2.0	Y	1.0	< 1	< 1	< 1	2.0	< 1	< 1	18.0	3.0	A	< 1.0	3.0	18.0	5 of 10
Chromium	a		a	a	a	45.0	a	a	a	12.0	a	C	12.0	29.0	45.0	2 of 2
Copper	170.0	S	96.0	63.0	100.0	67.0	83.0	50.0	60.0	97.0	98.0	T	50.0	88.0	170.0	10 of 10
Lead	200.0	H	68.0	38.0	64.0	110.0	88.0	< 15	41.0	78.0	59.0	I	< 15.0	75.0	200.0	9 of 10
Mercury	1.3	O	0.2	0.4	0.4	0.6	0.2	< 0.2	0.2	0.6	0.7	V	< 0.2	0.6	1.3	9 of 10
Nickel	17.0	R	18.0	< 12	< 12	< 12	11.0	15.0	< 12	12.0	12.0	A	< 12.0	< 11.0	18.0	6 of 10
Selenium	a	T	a	a	a	< 2	a	a	a	< 2	a	T				0 of 2
Silver	a		a	a	a	< 3	a	a	a	< 3	a	I				0 of 2
Thallium	a	A	a	a	a	< 2	a	a	a	< 2	a	O				0 of 2
Zinc	370.0	C	160.0	99.0	200.0	100.0	210.0	75.0	110.0	150.0	140.0	N	75.0	161.0	370.0	10 of 10
		T														
Inorganics (mg/L)		V														
cyanide	0.066	A	0.016	0.020	0.037	0.011	0.055	0.009	0.032	0.017	0.025		0.009	0.029	0.066	10 of 10
phenol	0.007	T	0.011	0.008	< 0.006	0.006	< 0.006	0.007	< 0.006	0.010	0.010		< 0.006	0.006	0.011	7 of 10
Ammonia mg/l	4.320	I	5.800	15.500	4.730	2.930	3.290	0.310	2.760	6.960	5.270		0.310	5.187	15.500	10 of 10
Phosphorus mg/l	2.380	O	1.680	0.690	1.860	1.110	1.730	2.170	0.900	2.480	2.260		0.690	1.726	2.480	10 of 10
MBAS	3.240	N	2.660	a	3.560	0.720	a	5.280	1.270	3.320	1.410		0.720	2.683	5.280	8 of 8
Pesticides/PCBs (ug/L)																
g-BHC	< 0.066		< 0.050	< 0.050	< 0.050	< 0.050	0.034	< 0.050	< 0.064	< 0.058	< 0.050		< 0.050	0.008	0.034	1 of 10
Endosulfan I	0.067		< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.064	< 0.058	< 0.050		< 0.050	0.011	0.067	1 of 10
Methoxychlor	a		< 0.500	0.250	< 0.500	< 0.500	0.380	< 0.500	< 0.064	< 0.058	0.640		< 0.058	0.165	0.640	3 of 9
Endrin aldehyde	0.320		< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.130	< 0.120	< 0.100		< 0.100	0.042	0.320	1 of 10
Semi-volatile Organics (ug/L)																
2-methylnaphthalene	5		1	< 10	< 10	< 10	6	7	7	4	1		< 10	3.4	7	7 of 10
benzo(a)anthracene	1		< 11	< 10	< 10	< 10	< 20	< 21	< 21	< 24	< 20		< 10	1.6	1	1 of 10
benzo(a)pyrene	1		< 11	< 10	< 10	< 10	< 20	< 21	< 21	< 24	< 20		< 10	1.5	1	1 of 10
benzo(b)fluoranthene	1		< 11	< 10	< 10	< 10	< 20	< 21	< 21	< 24	< 20		< 10	1.6	1	1 of 10
benzo(k)fluoranthene	1		< 11	< 10	< 10	< 10	< 20	< 21	< 21	< 24	< 20		< 10	1.6	1	1 of 10

Appendix C Table C-3 Cottage Farm CSO Facility

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	SUMMARY MIN	SUMMARY MEAN	SUMMARY MAX	TIMES DETECTED
Semivolatile Organics (cont)																
benzoic acid	**4**		**26**	**51**	**10**	**16**	**50**	**81**	**36**	**29**	**62**		< 10	36.5	81	10 of 10
benzyl alcohol	**6**		< 11	**3**	< 10	< 10	**2**	**6**	< 21	**2**	< 20		< 10	2.6	6	5 of 10
bis(2-ethylhexl)phthalate	**11**		**5**	**4**	**18**	**3**	**16**	**26**	**10**	**13**	**5**		3.0	11.1	26	10 of 10
butylbenzylphthalate	**3**		**1**	< 10	< 10	< 10	**2**	**3**	**5**	**3**	**2**		< 10	2.2	5	7 of 10
chrysene	**1**		< 11	< 10	< 10	< 10	< 20	< 21	< 21	< 24	< 20		< 10	1.6	1	1 of 10
di-n-butylphthalate	**5**		**4**	< 10	< 10	< 10	**4**	**3**	**9**	**8**	**2**		< 10	3.8	9	7 of 10
di-n-octyl phthalate	**1**		< 11	< 10	< 10	< 10	**1**	< 21	< 21	< 24	< 20		< 10	1.5	1	2 of 10
diethylphthalate	**5**		**4**	**2**	**4**	< 10	**2**	**< 10**	**1**	**5**	**4**		< 10	3.8	5	8 of 10
fluoranthene	**2**		< 11	< 10	< 10	< 10	**2**	< 21	< 21	< 24	< 20		< 10	1.7	2	2 of 10
fluorene	**1**		< 11	< 10	< 10	< 10	< 20	< 21	< 21	< 24	< 20		< 10	1.5	1	1 of 10
naphthalene	**2**		< 11	< 10	< 10	< 10	**2**	**3**	**2**	**2**	< 20		< 10	1.7	3	5 of 10
o-dichlorobenzene	< 12		**1**	< 10	< 10	< 10	< 20	< 21	< 21	< 24	< 20		< 10	1.6	1	1 of 10
p-cresol	**4**		< 11	**10**	**17**	**6**	**11**	**13**	**3**	**8**	**10**		< 11	8.3	17	9 of 10
p-dichlorobenzene	< 12		< 11	< 10	< 10	< 10	< 20	< 21	< 21	**5**	**4**		< 10	2.1	5	2 of 10
phenanthrene	**3**		< 11	< 10	< 10	< 10	**3**	**2**	**2**	**1**	< 20		< 10	1.7	3	5 of 10
phenol	< 12		< 11	**2**	**2**	< 10	**3**	< 21	< 21	< 24	< 20		< 10	1.9	3	3 of 10
pyrene	**2**		< 11	< 10	< 10	< 10	**2**	< 21	< 21	< 24	< 20		< 10	1.7	2	2 of 10

Notes:

a Not analyzed.

Bold numbers were detected values.

A complete list of pesticides and semivolatile organics analyzed is included in Appendix J Table 1. Only parameters that were detected or estimated to be present are included in this table.

Appendix C Table C-4 Cottage Farm CSO Facility Priority Pollutants Loadings, Fiscal Year 1994

	Loadings (lbs/d)												SUMMARY		
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	MIN	MEAN	MAX
Metals															
Arsenic	a	V	a	a	a	**2.973**	a	a	a	0.017	a	N	0.017	1.495	2.973
Cadmium	**0.167**	E	**0.036**	0.015	0.017	0.297	**0.934**	0.010	0.566	**0.308**	**0.740**	O	0.010	0.309	0.934
Chromium	a	R	a	a	a	**26.755**	a	a	a	**0.205**	a		0.205	13.480	26.755
Copper	**14.178**	Y	**3.443**	**1.865**	**3.319**	**39.835**	**38.764**	**1.017**	**67.864**	**1.658**	**24.176**	A	1.017	19.612	67.864
Lead	**16.680**		**2.439**	**1.125**	**2.124**	**65.401**	**41.100**	0.153	**46.374**	**1.334**	**14.555**	C	0.153	19.128	65.401
Mercury	**0.1084**	S	**0.0072**	**0.0118**	**0.0133**	**0.3567**	**0.0934**	0.0203	**0.2262**	**0.0103**	**0.1727**	T	0.007	0.102	0.357
Nickel	**1.418**	H	**0.646**	0.178	0.199	3.567	**5.137**	**0.305**	6.786	**0.205**	**2.960**	I	0.178	2.140	6.786
Zinc	**30.858**	O	**5.738**	**2.931**	**6.639**	**59.456**	**98.078**	**1.526**	**124.418**	**2.565**	**34.538**	V	1.526	36.675	124.418
		R										A			
Inorganics		T										T			
cyanide	**5.504**		**0.574**	**0.711**	**1.228**	**6.540**	**25.687**	**0.183**	**36.194**	**0.291**	**6.167**	I	0.183	8.308	36.194
phenol	**0.584**	A	**0.394**	**0.237**	0.020	**3.567**	0.280	**0.142**	0.679	**0.171**	**2.467**	O	0.020	0.854	3.567
Ammonia mg/l	**360**	C	**208**	**459**	**157**	**1742**	**1537**	**6**	**3122**	**119**	**1300**	N	6.308	900.997	3121.755
Phosphorus mg/l	**198**	T	**60**	**20**	**62**	**660**	**808**	**44**	**1018**	**42**	**558**		20.429	347.091	1017.964
MBAS	**270**	I	**95**	a	**118**	**428**	a	**107**	**1436**	**57**	**348**		56.762	357.546	1436.460
		V													
Pesticides/PCBs		A													
g-BHC	0.0006	T	0.0002	0.0001	0.0002	0.0030	**0.0159**	0.0001	0.0072	0.0010	0.0123		0.0001	0.0041	0.0159
Endosulfan I	**0.0056**	I	0.0002	0.0001	0.0002	0.0030	0.0023	0.0001	0.0072	0.0010	0.0123		0.0001	0.0032	0.0123
Methoxychlor	a	O	0.0018	**0.0074**	0.0017	0.0297	**0.1775**	0.0010	0.0072	0.0010	**0.1579**		0.0010	0.0428	0.1775
Endrin aldehyde	**0.0267**	N	0.0004	0.0003	0.0003	0.0059	0.0047	0.0002	0.0339	0.0002	0.0025		0.0002	0.0075	0.0339
Semi-volatile Organics															
2-methylnaphthalene	**0.417**		**0.036**	0.030	0.033	0.595	**2.802**	**0.142**	**7.917**	**0.068**	**0.247**		0.0296	1.2287	7.9175
benzo(a)anthracene	**0.067**		0.039	0.030	0.033	0.595	0.934	0.043	2.375	0.041	0.493		0.0296	0.4650	2.3752
benzo(a)pyrene	**0.058**		0.039	0.030	0.033	0.595	0.934	0.043	2.375	0.041	0.493		0.0296	0.4642	2.3752
benzo(b)fluoranthene	**0.067**		0.039	0.030	0.033	0.595	0.934	0.043	2.375	0.041	0.493		0.0296	0.4650	2.3752
benzo(k)fluoranthene	**0.075**		0.039	0.030	0.033	0.595	0.934	0.043	2.375	0.041	0.493		0.0296	0.4658	2.3752
benzoic acid	**0.334**		**0.932**	**1.510**	**0.332**	**9.513**	**23.352**	**1.648**	**40.719**	**0.496**	**15.295**		0.3319	9.4131	40.7185
benzyl alcohol	**0.500**		0.039	**0.089**	0.033	0.595	**0.934**	**0.122**	2.375	**0.034**	0.493		0.0332	0.5215	2.3752
bis(2-ethylhexl)phthalate	**0.917**		**0.179**	**0.118**	**0.597**	**1.784**	**7.473**	**0.529**	**11.311**	**0.222**	**1.233**		0.1184	2.4364	11.3107
butylbenzylphthalate	**0.250**		**0.036**	0.030	0.033	0.595	**0.934**	**0.061**	**5.655**	**0.051**	**0.493**		0.0296	0.8139	5.6554

	Loadings (lbs/d)												SUMMARY		
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	MIN	MEAN	MAX
Semi-volatile Organics (cont)															
chrysene	**0.083**		0.039	0.030	0.033	0.595	0.934	0.043	2.375	0.041	0.493		0.0296	0.4667	2.3752
di-n-butylphthalate	**0.417**		**0.143**	0.030	0.033	0.595	**1.868**	**0.061**	**10.180**	**0.137**	**0.493**		0.0296	1.3957	10.1796
di-n-octyl phthalate	**0.067**		0.039	0.030	0.033	0.595	**0.467**	0.043	2.375	0.041	0.493		0.0296	0.4183	2.3752
diethylphthalate	**0.417**		**0.143**	**0.059**	**0.133**	0.595	**0.934**	**0.203**	**1.131**	**0.085**	**0.987**		0.0592	0.4688	1.1311
fluoranthene	**0.167**		0.039	0.030	0.033	0.595	**0.934**	0.043	2.375	0.041	0.493		0.0296	0.4750	2.3752
fluorene	**0.050**		0.039	0.030	0.033	0.595	0.934	0.043	2.375	0.041	0.493		0.0296	0.4633	2.3752
naphthalene	**0.167**		0.039	0.030	0.033	0.595	**0.934**	**0.061**	**2.262**	**0.034**	0.493		0.0296	0.4648	2.2621
o-dichlorobenzene	0.100		**0.036**	0.030	0.033	0.595	0.934	0.043	2.375	0.041	0.493		0.0296	0.4680	2.3752
p-cresol	**0.334**		0.039	**0.296**	**0.564**	**3.567**	**5.137**	**0.265**	**3.393**	**0.137**	**2.467**		0.0394	1.6200	5.1374
p-dichlorobenzene	0.100		0.039	0.030	0.033	0.595	0.934	0.043	2.375	**0.085**	**0.987**		0.0296	0.5221	2.3752
phenanthrene	**0.250**		0.039	0.030	0.033	0.595	**1.401**	**0.041**	**2.262**	**0.017**	0.493		0.0171	0.5161	2.2621
phenol	0.100		0.039	**0.059**	**0.066**	0.595	**1.401**	0.043	2.375	0.041	0.493		0.0394	0.5213	2.3752
pyrene	**0.167**		0.039	0.030	0.033	0.595	**0.934**	0.043	2.375	0.041	0.493		0.0296	0.4750	2.3752
Flow (MGD)	**10.00**		**4.30**	**3.55**	**3.98**	**71.29**	**56.00**	**2.44**	**135.62**	**2.05**	**29.58**				

NOTES:

1. Loadings were calculated using the flow at the time of sampling event.
2. Bold numbers reflect detected values.

Appendix D

Appendix D Table D-1 Prison Point CSO Facility Operations Summary, Fiscal Year 1994

DATE	RAINFALL (INCHES)	DISCHARGE DURATION (HOURS)	TOTAL FLOW (MG)	PH (SU)	BOD INFLUENT (MG/L)	BOD EFFLUENT (MG/L)	TSS INFLUENT (MG/L)	TSS EFFLUENT (MG/L)	SETTL. SOLIDS (MG/L)	FECAL COLIFORM (#/100ml)	CHLORINE RESIDUAL (MG/L)
JULY											
7-8-93	0.55	3.50	10.53	6.69	101	48	252	132	1.0	10	0.87
7-27-93	0.62	3.00	5.17	7.26	64	40	182	86	1.3	20	2.15
SEPTEMBER											
9-4-93	0.72	3.50	3.33	7.21	50	25	468	130	0.2	20	1.90
9-8-93	1.26	4.00	5.39	7.42	57	66	166	134	0.3	10	1.60
9-26-93	0.86	4.00	6.44	7.05	70	56	132	117	0.3	10	1.70
9-27-93	0.91	6.00	6.88	6.98	50	51	122	94	1.3	10	1.70
OCTOBER											
10-13-93	0.00	1.25	3.32	7.20	56	59	122	110	0.4	10	0.83
10-31-93	0.45	4.00	8.21	6.68	73	51	124	43	0.2	10	1.73
NOVEMBER											
11-1-93	0.34	2.50	3.01	6.80	66	50	60	46	0.4	10	1.80
11-18-93	0.16	4.00	3.81	6.55	66	52	114	152	0.2	10	1.45
11-28-93	0.88	4.25	7.49	6.51	52	50	104	140	1.0	10	1.38
DECEMBER											
12-5-93	2.76	11.00	80.32	7.59	67	50	138	80	0.2	10	1.12
12-11-93	1.05	3.00	7.45	6.96	100	67	82	43	0.2	10	1.65
12-21-93	1.53	6.50	55.46	6.63	67	50	110	101	1.0	10	3.13
JANUARY											
1-18-94	1.04	5.30	27.50	6.67	41	24	136	45	2.0	10	1.25
1-28-94	1.00	9.00	40.63	7.14	51	28	184	57	2.0	10	1.17
MARCH											
3-8-94	0.44	2.00	3.25	7.43	121	74	362	202	2.0	10	1.40
3-10-94*	2.05	3.00	14.50	7.39	27	22	44	30	2.0	10	1.30
		12.00	43.50	6.99	59	24	288	35	2.0	30	1.60
3-22-94*	1.21	5.50	20.13	6.57	76	41	196	90	2.0	20	1.05
				6.96	62	37	166	60	2.0	10	1.30

DATE	RAINFALL (INCHES)	DISCHARGE DURATION (HOURS)	TOTAL FLOW (MG)	PH (SU)	BOD INFLUENT (MG/L)	BOD EFFLUENT (MG/L)	TSS INFLUENT (MG/L)	TSS EFFLUENT (MG/L)	SETTL. SOLIDS (MG/L)	FECAL COLIFORM (#/100ml)	CHLORINE RESIDUAL (MG/L)
APRIL											
4-7-94	0.32	1.50	3.24	6.82	165	51	1048	178	2.0	80	1.40
4-13-94	0.72	2.25	8.33	6.91	90	60	222	76	2.0	190	1.10
4-16-94	0.63	5.50	20.00	7.46	39	24	112	32	2.0	800	1.50
MAY											
5-5-94	1.39	5.00	25.63	6.58	59.4	37.5	172	44	2.0	670	1.12
5-8-94	0.44	2.50	5.63	6.77	71	28	200	68	2.0	4200	2.50
5-16-94	0.94	4.50	16.04	6.85	40	28.5	107	51	2.0	100	1.02
5-25-94	0.11	3.00	14.00	7.43	131	51.8	478	101	2.0	1800	1.50
TOTAL	**22.38**	**121.55**	**449.18**								
AVERAGE	**0.86**	**4.50**	**17.28**		**70**	**44**	**210**	**88**	**1.3**	**30**	**1.51**
MINIMUM	**0.00**	**1.25**	**3.01**	**6.51**	**27**	**22**	**44**	**30**	**0.2**	**10**	**0.83**
MAXIMUM	**2.76**	**12.00**	**80.32**	**7.59**	**165**	**74**	**1048**	**202**	**2.0**	**4200**	**3.13**
No of ACTIVATIONS			**26**								

* Two sets of samples taken

Appendix D Table D-2 Prison Point CSO BOD and TSS Loadings, Fiscal Year 1994

DATE	Total Flow (MG)	Biochemical Oxygen Demand Influent (mg/L)	Biochemical Oxygen Demand Effluent (mg/L)	Biochemical Oxygen Demand Removal (%)	Total Suspended Solids Influent (mg/L)	Total Suspended Solids Effluent (mg/L)	Total Suspended Solids Removal (%)
JULY							
7-8-93	10.53	8873	4217	52	22139	11597	48
7-27-93	5.17	2760	1725	38	7849	3709	53
SEPTEMBER							
9-4-93	3.33	1388	694	50	12990	3608	72
9-8-93	5.39	2562	2966	-16	7461	6023	19
9-26-93	6.44	3757	3005	20	7084	6279	11
9-27-93	6.88	2868	2925	-2	6998	5392	23
OCTOBER							
10-13-93	3.32	1552	1636	-5	3382	3049	10
10-31-93	8.21	5000	3493	30	8493	2945	65
NOVEMBER							
11-1-93	3.01	1655	1254	24	1505	1154	23
11-18-93	3.81	2098	1653	21	3624	4832	-33
11-28-93	7.49	3249	3124	4	6498	8748	-35
DECEMBER							
12-5-93	80.32	44883	33495	25	92446	53592	42
12-11-93	7.45	6216	4165	33	5097	2673	48
12-21-93	55.46	30989	23126	25	50877	46714	8
JANUARY							
1-18-94	27.50	9403	5504	41	31192	10321	67
1-28-94	40.63	17279	9487	45	62342	19312	69
MARCH							
3-8-94	3.25	3280	2006	39	9812	5475	44
3-10-94 *	14.50	3265	2660	19	5321	3628	32
	43.50	21405	8707	59	104484	12698	88
3-22-94 *	20.13	11581	6546	43	30379	20980	31

DATE	Total Flow (MG)	Biochemical Oxygen Demand Influent (mg/L)	Effluent (mg/L)	Removal (%)	Total Suspended Solids Influent (mg/L)	Effluent (mg/L)	Removal (%)
APRIL							
4-7-94	3.24	4452	1376	69	28275	4802	83
4-13-94	8.33	6255	4170	33	15428	5282	66
4-16-94	20.00	6505	4003	38	18682	5338	71
MAY							
5-5-94	25.63	12695	8014	37	36759	9403	74
5-8-94	5.63	3331	1314	61	9384	3191	66
5-16-94	16.04	5351	3813	29	14315	6823	52
5-25-94	14.00	15296	6048	60	55811	11793	79
TOTAL	**449.18**						
AVERAGE	**17.28**	**8813**	**5597**	**32**	**24394**	**10347**	**44**
MINIMUM	**3.01**	**1388**	**694**	**-16**	**1505**	**1154**	**-35**
MAXIMUM	**80.32**	**44883**	**33495**	**69**	**104484**	**53592**	**88**
No Of ACTIVATIONS	**26**						

* Two sets of samples taken

Appendix D Table D-3 Prison Point CSO Facility, Effluent Characterization, Fiscal Year 1994

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	MIN	AVE	MAX	TIMES DETECTED
Metals (ug/L)																
Antimony	a	N	a	a	a	< 5	a	N	a	< 5	a	N	< 5	< 5	< 5	0 of 2
Arsenic	a	O	a	a	a	4	a	O	a	6	a	O	4.0	5.0	6.0	2 of 2
Beryllium	a		a	a	a	< 1	a		a	< 1	a		< 1	< 1	< 1	0 of 2
Boron	a	A	a	a	63	a	a	A	a	a	a	A	63.0	63.0	63.0	1 of 1
Cadmium	4	C	2	2	< 1	< 1	4	C	1	1	1	C	< 1	2.0	4.0	7 of 9
Chromium	a	T	a	a	a	12	a	T	a	15	a	T	12.0	14.0	15.0	2 of 2
Copper	200	I	120	120	72	84	95	I	54	110	38	I	38.0	99.0	200.0	9 of 9
Lead	390	V	180	240	78	110	130	V	78	130	50	V	50.0	154.0	390.0	9 of 9
Mercury	1	A	0.4	0.6	< 0.2	0.2	< 0.2	A	< 0.2	0.4	< 0.2	A	< 0.2	0.3	1.0	5 of 9
Molybdenum	a	T	a	a	< 8	a	a	T	a	a	a	T	< 8	< 8	< 8	0 of 1
Nickel	26	I	16	< 12	12	420	16	I	< 12	14	< 12	I	< 12	58.0	420.0	6 of 9
Selenium	a	O	a	a	a	< 2	a	O	a	< 2	a	O	< 2	< 2	< 2	0 of 2
Silver	a	N	a	a	a	< 3	a	N	a	< 2	a	N	< 2	< 2	< 2	0 of 2
Thallium	a		a	a	a	< 2	a		a	< 2	a		< 2	< 2	< 2	0 of 2
Zinc	840		360	310	170	180	330		280	240	130		130.0	316.0	840.0	9 of 9
Inorganics (mg/L)																
cyanide	0.12		0.025	0.022	0.052	0.029	0.025		0.039	0.032	< 0.005		< 0.005	0.039	0.120	8 of 9
phenol	< 0.005		0.015	< 0.006	< 0.006	0.006	< 0.006		< 0.006	0.009	< 0.005		< 0.005	0.005	0.015	3 of 9
Ammonia	2.8		2.06	2.18	1.36	1.27	1.52		1.66	2.9	0.39		0.390	1.793	2.900	9 of 9
Phosphorus	0.98		0.96	0.86	0.49	0.61	0.72		0.68	1.66	0.38		0.380	0.816	1.660	9 of 9
MBAS	1.26		a	1.47	0.78	0.52	a		0.59	1.89	0.64		0.520	1.021	1.890	7 of 7
Pesticides/PCBs (ug/L)																
a-BHC	< 0.057		< 0.05	< 0.05	< 0.055	< 0.051	< 0.05		< 0.052	< 0.054	0.029		< 0.050	0.008	0.029	1 of 9
B-BHC	< 0.057		< 0.05	< 0.05	< 0.055	< 0.051	< 0.05		0.035	< 0.054	< 0.05		< 0.050	0.008	0.035	1 of 9
g-BHC	< 0.057		0.036	< 0.05	< 0.055	< 0.051	< 0.05		< 0.052	< 0.054	< 0.05		< 0.050	0.009	0.036	1 of 9
Methoxychlor	a		< 0.500	< 0.500	< 0.550	< 0.510	< 0.10		< 0.100	2.8	< 0.100		< 0.100	0.379	2.800	1 of 8
heptachlor	< 0.057		0.026	< 0.050	< 0.055	< 0.051	< 0.05		< 0.052	< 0.054	< 0.05		< 0.050	0.007	0.026	1 of 9
endosulfan I	0.029		< 0.05	< 0.05	< 0.055	< 0.051	< 0.05		< 0.052	< 0.054	< 0.05		< 0.050	0.008	0.029	1 of 9
Endrin aldehyde	0.140		< 0.100	< 0.110	< 0.110	< 0.110	< 0.10		0.078	< 0.110	0.06		< 0.110	0.046	0.140	3 of 7
heptachlor epoxide	< 0.057		< 0.05	< 0.05	< 0.055	< 0.051	< 0.05		< 0.052	< 0.054	0.025		< 0.050	0.007	0.025	1 of 9

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	MIN	AVE	MAX	TIMES DETECTED
Semi-volatile Organic Compounds (ug/L)																
2-methylnaphthalene	< 11.0		**1.0**	< 10.0	< 10.0	< 10.0	**4.0**		**1.0**	< 20.0	< 10.0		< 10.0	1.456	4.000	3 of 9
acenapthene	**1.0**		< 10.0	< 10.0	< 10.0	< 10.0	< 20.0		< 25.0	< 20.0	< 10.0		< 10.0	1.389	1.000	1 of 9
benzoic acid	**1.0**		**19.0**	**25.0**	**11.0**	< 10.0	**15.0**		< 25.0	**41.0**	**10.0**		< 10.0	13.944	41.000	7 of 9
bis(2-ethylhexl)phthalate	**8.0**		**4.0**	**15.0**	**4.0**	**9.0**	**16.0**		**27.0**	**10.0**	**5.0**		4.0	10.889	27.000	9 of 9
butylbenzylphthalate	**1.0**		< 10.0	< 10.0	< 10.0	< 10.0	**2.0**		< 25.0	**2.0**	**1.0**		< 10.0	1.389	2.000	4 of 9
chrysene	**0.7**		< 10.0	< 10.0	< 10.0	< 10.0	< 20.0		< 25.0	< 20.0	< 10.0		< 10.0	1.356	0.700	1 of 9
di-n-butylphthalate	**2.0**		< 10.0	**2.0**	< 10.0	< 10.0	**2.0**		**4.0**	**5.0**	**4.0**		< 10.0	2.444	5.000	6 of 9
di-n-octyl phthalate	**0.5**		< 10.0	< 10.0	< 10.0	< 10.0	**1.0**		< 25.0	< 20.0	**1.0**		< 10.0	1.222	1.000	3 of 9
diethylphthalate	**1.0**		**2.0**	**2.0**	< 10.0	< 10.0	**1.0**		< 25.0	**2.0**	< 10.0		< 10.0	1.500	2.000	5 of 9
fluoranthene	**1.0**		**1.0**	< 10.0	< 10.0	< 10.0	**4.0**		**2.0**	< 20.0	< 10.0		< 10.0	1.556	4.000	4 of 9
fluorene	**1.0**		< 10.0	< 10.0	< 10.0	< 10.0	< 20.0		< 25.0	< 20.0	< 10.0		< 10.0	1.389	1.000	1 of 9
m-dichlorobenzene	**1.0**		< 10.0	< 10.0	< 10.0	< 10.0	< 20.0		< 25.0	< 20.0	< 10.0		< 10.0	1.389	1.000	1 of 9
naphthalene	< 11.0		**2.0**	< 10.0	< 10.0	< 10.0	**3.0**		< 25.0	< 20.0	< 10.0		< 10.0	1.622	3.000	2 of 9
o-cresol	**1.0**		< 10.0	< 10.0	< 10.0	< 10.0	< 20.0		< 25.0	< 20.0	< 10.0		< 10.0	1.389	1.000	1 of 9
p-cresol	< 11.0		**23.0**	**3.0**	< 10.0	**3.0**	**8.0**		**4.0**	**18.0**	< 10.0		< 10.0	6.900	23.000	6 of 9
p-dichloobenzene	**1.0**		**2.0**	< 10.0	< 10.0	< 10.0	< 20.0		< 25.0	**1.0**	< 10.0		< 10.0	1.389	2.000	3 of 9
phenanthrene	**1.0**		**2.0**	**2.0**	< 10.0	< 10.0	**4.0**		**2.0**	< 20.0	**1.0**		< 10.0	1.778	4.000	6 of 9
phenol	< 11.0		< 10.0	< 10.0	< 10.0	< 10.0	**3.0**		< 25.0	< 20.0	< 10.0		< 10.0	1.511	3.000	1 of 9
pyrene	**1.0**		**1.0**	< 10.0	< 10.0	< 10.0	**3.0**		**2.0**	< 20.0	**1.0**		< 10.0	1.444	3.000	5 of 9

NOTES:

a Not analyzed

Bold numbers were detected values.

A complete list of pesticides and semivolatile organics analyzed is included in Appendix J Table 1. Only parameters that were detected or estimated to be present are included in this table.

Appendix D Table D-4 Prison Point CSO Facility Priority Pollutants Loadings, Fiscal Year 1994

	Loadings (lbs/d)															TIMES DETECTED
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	MIN	AVE	MAX	
Metals																
Arsenic	a	N	a	a	a	2.68	a	N	a	0.42	a	N	0.417	1.548	2.679	2 of 2
Boron	a	O	a	a	1.58	a	a	O	a	a	a	O	1.582	1.582	1.582	1 of 1
Cadmium	0.35		0.06	0.06	0.01	0.33	0.92		0.48	0.07	0.21		0.013	0.277	0.917	7 of 9
Chromium	a	A	a	a	a	8.04	a	A	a	1.04	a	A	1.042	4.540	8.038	2 of 2
Copper	17.56	C	3.33	3.32	1.81	56.27	21.79	C	26.17	7.64	8.12	C	1.807	16.224	56.269	9 of 9
Lead	34.25	T	5.00	6.65	1.96	73.69	29.82	T	37.80	9.03	10.69	T	1.958	23.208	73.686	9 of 9
Mercury	0.09	I	0.01	0.02	0.00	0.13	0.02	I	0.05	0.03	0.02	I	0.003	0.041	0.134	5 of 9
Nickel	2.28	V	0.44	0.17	0.30	281.34	3.67	V	2.91	0.97	1.28	V	0.166	32.597	281.345	6 of 9
Zinc	73.77	A	10.00	8.58	4.27	120.58	75.69	A	135.68	16.67	27.79	A	4.268	52.557	135.675	9 of 9
		T						T				T				
Inorganics		I						I				I				
cyanide	10.54	O	0.69	0.61	1.31	19.43	5.73	O	18.90	2.22	0.53	O	0.534	6.662	19.426	8 of 9
phenol	0.04	N	0.42	0.02	0.08	4.02	0.69	N	1.45	0.63	0.53	N	0.017	0.875	4.019	3 of 9
Ammonia	246		57	60	34	851	349		804	201	83		34.141	298.5	850.7	9 of 9
Phosphorus	86		27	24	12	409	165		329	115	81		12.301	138.7	408.6	9 of 9
MBAS	110.65		a	40.70	19.58	348.33	a		285.89	131.30	136.80		19.581	153.3	348.3	7 of 7
Pesticides/PCBs																
a-BHC	0.0005		0.0001	0.0001	0.0001	0.0033	0.0011		0.0024	0.0003	0.0062		0.000	0.002	0.006	1 of 9
B-BHC	0.0005		0.0001	0.0001	0.0001	0.0033	0.0011		0.0170	0.0003	0.0011		0.000	0.003	0.017	1 of 9
g-BHC	0.0005		0.0010	0.0001	0.0001	0.0033	0.0011		0.0024	0.0003	0.0011		0.000	0.001	0.003	1 of 9
Methoxychlor	a		0.0014	0.0014	0.0014	0.0335	0.0023		0.0048	0.1945	0.0021		0.001	0.030	0.195	1 of 8
heptachlor	0.0005		0.0007	0.0001	0.0001	0.0033	0.0011		0.0024	0.0003	0.0011		0.000	0.001	0.003	1 of 9
endosulfan I	0.0025		0.0001	0.0001	0.0001	0.0033	0.0011		0.0024	0.0003	0.0011		0.000	0.001	0.003	1 of 9
Endrin aldehyde	0.0123		0.0003	0.0003	0.0003	0.0074	0.0011		0.0378	0.0003	0.0128		0.000	0.008	0.038	3 of 7
heptachlor epoxide	0.0005		0.0001	0.0001	0.0001	0.0033	0.0011		0.0024	0.0003	0.0053		0.000	0.002	0.005	1 of 9
Semi-volatile Organic Compounds																
2-methylnaphthalene	0.097		0.028	0.028	0.025	0.670	0.917		0.485	0.139	0.214		0.025	0.289	0.917	3 of 9
acenapthene	0.088		0.028	0.028	0.025	0.670	0.459		1.211	0.139	0.214		0.025	0.318	1.211	1 of 9
benzoic acid	0.088		0.528	0.692	0.276	0.670	3.440		1.211	2.848	2.138		0.088	1.321	3.440	7 of 9
bis(2-ethylhexl)phthalate	0.703		0.111	0.415	0.100	6.029	3.670		13.083	0.695	1.069		0.100	2.875	13.083	9 of 8
butylbenzylphthalate	0.088		0.028	0.028	0.025	0.670	0.459		1.211	0.139	0.214		0.025	0.318	1.211	4 of 9

	Loadings (lbs/d)															TIMES DETECTED
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	MIN	AVE	MAX	
Semi-volatile Organic Compounds																
chrysene	**0.061**		0.028	0.028	0.025	0.670	0.459		1.211	0.139	0.214		0.025	0.315	1.211	1 of 9
di-n-butylphthalate	**0.176**		0.028	**0.055**	0.025	0.670	**0.459**		**1.938**	**0.347**	**0.855**		0.025	0.506	1.938	6 of 9
di-n-octyl phthalate	**0.044**		0.028	0.028	0.025	0.670	**0.229**		1.211	0.139	**0.214**		0.025	0.288	1.211	3 of 9
diethylphthalate	**0.088**		**0.056**	**0.055**	0.025	0.670	**0.229**		1.211	**0.139**	0.214		0.025	0.299	1.211	5 of 9
fluoranthene	**0.088**		**0.028**	0.028	0.025	0.670	**0.917**		**0.969**	0.139	0.214		0.025	0.342	0.969	4 of 9
fluorene	**0.088**		0.028	0.028	0.025	0.670	0.459		1.211	0.139	0.214		0.025	0.318	1.211	1 of 9
m-dichlorobenzene	**0.088**		0.028	0.028	0.025	0.670	0.459		1.211	0.139	0.214		0.025	0.318	1.211	1 of 9
naphthalene	0.097		**0.056**	0.028	0.025	0.670	**0.688**		1.211	0.139	0.214		0.025	0.347	1.211	2 of 9
o-cresol	**0.088**		0.028	0.028	0.025	0.670	0.459		1.211	0.139	0.214		0.025	0.318	1.211	1 of 9
p-cresol	0.097		**0.639**	**0.083**	0.025	**2.010**	**1.835**		**1.938**	**1.250**	0.214		0.025	0.899	2.010	6 of 9
p-dichloobenzene	**0.088**		**0.056**	0.028	0.025	0.670	0.459		1.211	**0.069**	0.214		0.025	0.313	1.211	3 of 9
phenanthrene	**0.088**		**0.056**	**0.055**	0.025	0.670	**0.917**		**0.969**	0.139	**0.214**		0.025	0.348	0.969	6 of 9
phenol	0.097		0.028	0.028	0.025	0.670	**0.688**		1.211	0.139	0.214		0.025	0.344	1.211	1 of 9
pyrene	**0.088**		**0.028**	0.028	0.025	0.670	**0.688**		**0.969**	0.139	**0.214**		0.025	0.316	0.969	5 of 9
Flow	10.53		3.33	3.32	3.01	80.32	27.5		58.1	8.33	25.63					

Notes:
a Not analyzed
Bold numbers reflect detected values.
Loadings were calculated using the flow at the time of ssampling.

Appendix E

Appendix E Table E-3 Somerville Marginal CSO Facility, Effluent Characterization, Fiscal Year 1994

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	MIN	AVE	MAX	TIMES DETECTED
Metals (ug/L)																
Antimony	a	S	a		a	< 5	a	N	a	< 5	a	S				0 of 2
Arsenic	a	H	a	a	a	2	a	O	a	3	a	H	2.0	1.0	3.0	2 of 2
Beryllium	a	O	a	a	a	< 1	a		a	< 1	a	O				0 of 2
Cadmium	2	R	< 1	1	a	< 1	3	C	2	2	2	R	< 1	1.0	3.0	6 of 8
Chromium	a	T	a	a	a	7	a	I	a	37	a	T	7.0	5.0	37.0	2 of 2
Copper	89		30	55	a	26	77	V	68	96	120		26.0	62.0	120.0	8 of 8
Lead	240	A	72	210	a	51	160	A	130	150	140	A	51.0	128.0	240.0	8 of 8
Mercury	0.5	C	< 0.2	< 0.2	a	< 0.2	< 0.2	T	< 0.2	a	0.4	C	< 0.2	0.2	0.5	2 of 8
Nickel	17	T	< 12	< 12	a	< 12	19	I	19	17	< 12	T	< 12	11.0	19.0	4 of 8
Selenium	a	I	a	a	a	< 2	a	O	a	< 2	a	I				0 of 2
Silver	a	V	a	a	a	< 3	a	N	a	< 3	a	V				0 of 1
Thallium	a	A	a	a	a	< 2	a		a	< 2	a	A				0 of 2
Zinc	430	T	140	200	a	82	400		260	310	250	T	82.0	230.0	430.0	8 of 8
		I										I				
Inorganics (mg/L)		O										O				
Cyanide	0.051	N	0.019	0.017	0.012	0.005	0.083		0.049	0.012	0.016	N	0.005	0.029	0.083	9 of 9
Total phenols	< 0.005		0.01	0.007	a	< 0.006	< 0.006		< 0.006	0.01	< 0.005		< 0.005	0.003	0.010	3 of 8
Ammonia	0.400		0.75	0.89	a	0.34	0.66		0.21	0.12	1.51		0.120	0.542	1.510	8 of 8
Phosphorus	0.930		0.54	0.88	a	0.93	0.93		0.95	0.68	0.86		0.540	0.744	0.950	8 of 8
MBAS	1.200		a	0.66	a	0.63	a		0.61	0.97	1.12		0.610	0.577	1.200	6 of 6
Pesticides/PCBs (ug/L)																
a-BHC	< 0.063		< 0.025	< 0.054	< 0.100	< 0.050	< 0.050		< 0.050	< 0.059	< 0.050		< 0.050	0.008	0.000	0 of 9
g-BHC	< 0.063		< 0.050	< 0.054	< 0.100	< 0.050	< 0.050		< 0.050	< 0.059	0.025		< 0.050	0.008	0.025	1 of 9
d-BHC	< 0.063		< 0.050	< 0.054	< 0.100	< 0.050	< 0.050		0.027	< 0.059	0.052		< 0.050	0.014	0.052	2 of 9
b-BHC	0.091		< 0.050	< 0.054	< 0.100	< 0.050	< 0.050		0.085	< 0.059	< 0.050		< 0.050	0.024	0.091	2 of 9
hepatchlor epoxide	< 0.063		< 0.050	< 0.054	< 0.100	< 0.050	< 0.050		0.038	< 0.059	< 0.050		< 0.050	0.010	0.038	1 of 9
endrin aldehyde	0.087		< 0.050	< 0.054	< 0.100	< 0.050	< 0.050		< 0.050	< 0.059	< 0.050		< 0.050	0.015	0.087	1 of 9
Methoxychlor	< 0.063		< 0.050	< 0.054	< 0.100	< 0.050	< 0.050		< 0.050	< 0.059	0.29		< 0.050	0.038	0.290	1 of 9
Semi-volatile Organic Compounds (ug/L)																
benzoic acid	15		9	14	< 10	< 10	12		35	12	18		< 10	13.0	35.0	7 of 9
benzyl alcohol	2		< 10	< 10	< 10	< 10	< 20		< 22	< 24	< 20		< 10	1.6	2.0	1 of 9

Appendix E Table E-1 Somerville Marginal CSO Facility Operations Summary, Fiscal Year 1994

DATE	RAINFALL (INCHES)	DISCHARGE DURATION (HOURS)	TOTAL FLOW (MG)	PH (SU)	BOD INFLUENT (MG/L)	BOD EFFLUENT (MG/L)	TSS INFLUENT (MG/L)	TSS EFFLUENT (MG/L)	SETTL. SOLIDS (MG/L)	FECAL COLIFORM GEO MEAN	CHLORINE RESIDUAL (MG/L)
JULY											
7-8-93	0.55	3.00	1.184	6.76	30.0	35.0	110	168	0.2	20	4.0
7-27-93	0.62	5.00	1.304	6.78	20.0	17.0	40	57	0.2	10	3.0
AUGUST											
8-17-93	0.30	7.00	0.019	6.93	296.0	34.0	34	30	0.2	10	4.0
8-20-93	0.65	2.75	0.606	6.71	144.0	41.0	80	74	0.2	10	4.0
SEPTEMBER											
9-4-93	0.72	6.50	0.855	6.90	231.0	71.0	88	70	0.2	10	4.0
9-8-93	1.26	5.00	0.827	6.55	68.0	66.0	44	44	0.3	10	4.0
9-26-93	0.86	5.00	1.870	7.79	93.0	40.0	46	32	0.3	10	3.0
9-27-93	0.91	7.00	1.347	7.79	101.0	50.0	36	27	0.3	10	4.0
OCTOBER											
10-12-93	0.66	7.00	0.016	8.58	67.0	50.0	11	18	0.1	10	4.0
10-21-93	0.51	2.75	0.787	7.92	87.0	50.0	32	79	1.0	10	4.0
10-30-93	0.98	7.25	1.231	8.15	67.0	50.0	42	25	0.2	10	3.0
NOVEMBER											
11-1-93	0.34	5.50	0.290	7.50	66.0	50.0	10	12	0.2	10	3.0
11-17-93	0.85	8.00	2.387	6.52	65.0	59.0	92	44	0.2	10	3.0
11-28-93	0.88	6.00	2.728	7.27	45.0	50.0	74	54	0.3	10	3.0
DECEMBER											
12-5-93	2.76	16.25	10.138	7.68	67.0	50.0	140	41	0.2	10	3.0
12-11-93	1.05	10.25	1.890	8.25	46.0	46.0	28	23	0.2	10	3.0
12-21-93	1.53	12.00	8.847	6.86	67.0	50.0	102	128	1.0	20	3.0
JANUARY											
1-18-94	1.04	8.50	2.500	6.64	102.0	52.0	476	174	2.0	10	3.0
1-28-94	1.00	5.25	7.908	6.89	30.0	24.0	112	113	2.0	20	3.0

DATE	RAINFALL (INCHES)	DISCHARGE DURATION (HOURS)	TOTAL FLOW (MG)	PH (SU)	BOD INFLUENT (MG/L)	BOD EFFLUENT (MG/L)	TSS INFLUENT (MG/L)	TSS EFFLUENT (MG/L)	SETTL. SOLIDS (MG/L)	FECAL COLIFORM GEO MEAN	CHLORINE RESIDUAL (MG/L)
MARCH											
3-8-94	0.44	0.50	0.971	*	*	*	*	*	*	*	*
3-10-94 **	2.05	10.25	10.998	8.09	37.0	27.0	84	41	2.0	10	4.0
				6.96	20.0	14.0	58	48	2.0	10	*
3-22-94	1.21	11.00	4.496	6.59	38.0	19.0	61	51	2.0	170	4.0
3-29-94	0.60	1.45	0.143	*	*	*	*	*	*	*	*
APRIL											
4-7-94	0.32	1.15	0.223	6.67	89.0	55.0	556	420	2.0	20	4.0
4-13-94	0.72	5.50	1.610	6.69	68.0	38.0	354	216	2.0	10	4.0
4-16-94	0.63	2.50	2.557	7.25	39.0	31.0	162	162	2.0	110	4.0
MAY											
5-5-94	1.39	8.25	1.265	6.84	28.1	22.2	78	50	2.0	120	4.0
5-6-94	0.30	2.25	0.350	6.92	28.4	20.9	34	24	2.0	10	3.5
5-8-94	0.44	8.00	0.725	8.21	28.0	22.0	42	13	2.0	10	4.0
5-15-94	0.40	2.75	0.565	6.71	57.8	33.8	165	108	2.0	170	4.0
5-16-94	0.94	8.00	0.865	6.76	23.6	13.9	69	63	2.0	10	3.0
5-25-94	0.11	3.00	0.051	7.43	63.4	20.4	112	51	2.0	10	4.0
5-26-94	0.98	2.25	0.006	6.95	44.2	20.3	74	72	2.0	10	4.0
JUNE											
6-29-94	0.27	3.00	0.135	6.54	55.4	58.6	76	71	2.0	10	4.0
TOTAL	**28.27**	**199.85**	**71.69**								
AVERAGE	**0.85**	**5.97**	**2.109**		**70.5**	**38.2**	**108**	**79**	**1.1**	**15**	**3.6**
MINIMUM	**0.11**	**0.50**	**0.006**	**6.52**	**20.0**	**13.9**	**10**	**12**	**0.1**	**10**	**3.0**
MAXIMUM	**2.76**	**16.25**	**10.998**	**8.58**	**296.0**	**71.0**	**556**	**420**	**2.0**	**170**	**4.0**
No of ACTIVATIONS		**34**									

* Sample bottles broken, no analyses conducted

** Two sets of samples taken

Appendix E Table E-2 Somerville Marginal CSO BOD and TSS Loadings, Fiscal Year 1994

DATE	Total Flow (MG)	Biochemical Oxygen Demand Influent (lbs/d)	Biochemical Oxygen Demand Effluent (lbs/d)	Biochemical Oxygen Demand Removal (%)	Total Suspended Solids Influent (lbs/d)	Total Suspended Solids Effluent (lbs/d)	Total Suspended Solids Removal (%)
JULY							
7-8-93	1.184	296.2	345.6	-16.7	1086.2	1658.9	-52.7
7-27-93	1.304	217.5	184.9	15.0	435.0	619.9	-42.5
AUGUST							
8-17-93	0.019	46.9	5.4	88.5	5.4	4.8	11.8
8-20-93	0.606	727.8	207.2	71.5	404.3	374.0	7.5
SEPTEMBER							
9-3-93	0.855	1647.2	506.3	69.3	627.5	499.1	20.5
9-8-93	0.827	469.0	455.2	2.9	303.5	303.5	0.0
9-26-93	1.870	1450.4	623.8	57.0	717.4	499.1	30.4
9-27-93	1.347	1134.6	561.7	50.5	404.4	303.3	25.0
OCTOBER							
10-12-93	0.016	8.9	6.7	25.4	1.5	2.4	-63.6
10-21-93	0.787	571.0	328.2	42.5	210.0	518.5	-146.9
10-30-93	1.231	687.9	513.3	25.4	431.2	256.7	40.5
NOVEMBER							
11-1-93	0.290	159.6	120.9	24.2	24.2	29.0	-20.0
11-17-93	2.387	1294.0	1174.5	9.2	1831.5	875.9	52.2
11-28-93	2.728	1023.8	1137.6	-11.1	1683.6	1228.6	27.0
DECEMBER							
12-5-93	10.138	5664.9	4227.5	25.4	11837.1	3466.6	70.7
12-11-93	1.890	725.1	725.1	0.0	441.4	362.5	17.9
12-21-93	8.847	4943.5	3689.2	25.4	7526.0	9444.3	-25.5
JANUARY							
1-18-94	2.500	2126.7	1084.2	49.0	9924.6	3627.9	63.4
1-28-94	7.908	1978.6	1582.9	20.0	7386.7	7452.7	-0.9

DATE	TOTAL FLOW (MG)	BOD INFLUENT (MG/L)	EFFLUENT (MG/L)		TSS INFLUENT (MG/L)	EFFLUENT (MG/L)	
MARCH							
3-8-94	0.971	*	*	*	*	*	*
3-10-94	10.998	1045.6	1880.3	-79.8	6512.4	4081.7	37.3
3-22-94	4.496	1424.9	712.4	50.0	2287.3	1912.3	16.4
3-29-94	0.143	*	*	*	*	*	*
APRIL							
4-7-94	0.223	165.5	102.3	38.2	1034.1	781.1	24.5
4-13-94	1.610	913.1	510.2	44.1	4753.3	2900.3	39.0
4-16-94	2.557	831.7	661.1	20.5	3454.7	3454.7	0.0
MAY							
5-5-94	1.265	296.5	234.2	21.0	822.9	527.5	35.9
5-6-94	0.350	82.9	61.0	26.4	99.2	70.1	29.4
5-8-94	0.725	169.3	133.0	21.4	254.0	78.6	69.0
5-15-94	0.565	272.4	159.3	41.5	777.5	508.9	34.5
5-16-94	0.865	170.3	100.3	41.1	497.8	454.5	8.7
5-25-94	0.051	27.0	8.7	67.8	47.6	21.7	54.5
5-26-94	0.006	2.2	1.0	54.1	3.7	3.6	2.7
JUNE							
6-29-94	0.135	62.4	66.0	-5.8	85.6	79.9	6.6
TOTAL	**71.694**						
AVERAGE	**2.109**	**957.417**	**690.940**	**28.564**	**2059.734**	**1450.085**	**11.663**
MINIMUM	**0.006**	**2.212**	**1.016**	**-79.825**	**1.468**	**2.402**	**-146.875**
MAXIMUM	**10.998**	**5664.912**	**4227.546**	**88.514**	**11837.129**	**9444.349**	**70.714**
No of ACTIVATIONS	**34**						

* Sample bottles broken, no analyses conducted

** Average of two samples taken during the duration of the activation.

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	MIN	AVE	MAX	TIMES DETECTED
Semi-volatile Organic Compounds (cont)																
bis(2-ethylhexyl)phthalate	**9**		**6**	**17**	**12**	**7**	**11**		**10**	**16**	**5**		5	10	17	9 of 9
butylbenzylphthalate	**1**		< 10	< 10	< 10	< 10	**1**		< 22	**3**	< 20		< 10	1.4	3.0	3 of 9
chrysene	< 11		< 10	< 10	< 10	< 10	< 20		< 22	**1**	< 20		< 10	1.4	1.0	1 of 9
di-n-butylphthalate	**1**		**1**	< 10	< 10	< 10	**1**		**4**	< 24	**5**		< 10	1.9	5.0	5 of 9
di-n-octyl phthalate	**1**		< 10	< 10	< 10	< 10	**1**		< 22	< 24	< 20		< 10	1.3	1.0	2 of 9
diethylphthalate	**2**		< 10	< 10	< 10	< 10	< 20		< 22	< 24	< 20		< 10	1.6	2.0	1 of 9
fluoranthene	**11**		< 10	< 10	< 10	< 10	**2**		< 22	**3**	< 20		< 10	2.7	11.0	3 of 9
N-nitroso-di-n-propylamine	< 11		< 10	< 10	**25**	< 10	< 20		< 22	< 24	< 20		< 10	4.2	25.0	1 of 9
N-nitrosodimethylamine	**3**		< 10	< 10	< 10	< 10	< 20		< 22	< 24	< 20		< 10	1.7	3.0	1 of 9
o-dichlorobenzene	< 11		< 10	< 10	**5**	< 10	< 20		< 22	< 24	< 20		< 10	2.0	5.0	1 of 9
p-cresol	< 11		**4**	**11**	< 10	< 10	< 20		< 22	< 24	**5**		< 10	3.3	11.0	3 of 9
p-dichlorobenzene	**2**		< 10	< 10	< 10	< 10	< 20		< 22	< 24	< 20		< 10	1.6	2.0	1 of 9
pentachlorophenol	< 25		< 25	< 25	< 25	**3**	< 20		< 22	< 24	< 20		< 20	2.4	3.0	1 of 9
phenanthrene	< 11		< 10	< 10	< 10	< 10	**2**		< 22	**2**	< 20		< 10	1.5	2.0	2 of 9
pyrene	< 11		< 10	< 10	< 10	< 10	**2**		< 22	**1**	< 20		< 10	1.4	2.0	2 of 9

Notes:

a Not analyzed

Bold numbers reflects detected values.

A complete list of pesticides and semivolatile organics analyzed is included in Appendix J Table 1. Only parameters that were detected or estimated to be present are included in this table.

Note: Blank space indicates no hit

Appendix E Table E-4 Somerville Marginal CSO Facility Priority Pollutants Loadings, Fiscal Year 1994

	Loadings (lbs/d)												SUMMARY		
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	MIN	AVE	MAX
Metals															
Arsenic	a	S	a	a	a	**0.169**	a	N	a	**0.040**	a	S	0.0403	0.1047	0.1691
Cadmium	**0.020**	H	0.004	**0.0001**	a	0.042	**0.063**	O	**0.183**	**0.027**	**0.021**	H	0.0001	0.0450	0.1834
Chromium	a	O	a	a	a	**0.592**	a		a	**0.497**	a	O	0.4968	0.5443	0.5919
Copper	**0.879**	R	**0.225**	**0.007**	a	**2.198**	**1.605**	C	**6.237**	**1.289**	**1.266**	R	0.0073	1.7134	6.2372
Lead	**2.370**	T	**0.540**	**0.028**	a	**4.312**	**3.336**	I	**11.924**	**2.014**	**1.477**	T	0.0280	3.2501	11.9240
Mercury	**0.0049**		0.0007	0.0000	a	0.0085	0.0021	V	0.0092	0.0013	**0.0042**		0.0000	0.0039	0.0092
Nickel	**0.168**	A	0.045	0.001	a	0.507	**0.396**	A	**1.743**	**0.228**	0.063	A	0.0008	0.3939	1.7427
Zinc	**4.246**	C	**1.050**	**0.027**	a	**6.933**	**8.340**	T	**23.848**	**4.162**	**2.638**	C	0.0267	6.4055	23.8481
		T						I				T			
Inorganics		I						O				I			
cyanide	**0.504**	V	**0.142**	**0.002**	**0.239**	**0.423**	**1.731**	N	**4.494**	**0.161**	**0.169**	V	0.0023	0.8739	4.4944
phenol	0.005	A	**0.075**	**0.001**	a	0.051	0.013		0.055	**0.134**	0.005	A	0.0009	0.0423	0.1343
Ammonia	**3.950**	T	**5.623**	**0.119**	a	**28.747**	**13.761**		**19.262**	**1.611**	**15.931**	T	0.1188	11.1255	28.7473
Phosphorus	**9.183**	I	**4.049**	**0.117**	a	**78.632**	**19.391**		**87.137**	**9.131**	**9.073**	I	0.1174	27.0892	87.1372
MBAS	**11.8**	O	a	**0.1**	a	**53.3**	a		**56.0**	**13.0**	**11.8**	O	0.0881	24.3328	55.9512
		N										N			
Pesticides/PCBs															
g-BHC	0.0001		0.0000	0.0000	0.0002	0.0004	0.0001		0.0005	0.0001	**0.0003**		0.0000	0.0002	0.0005
d-BHC	0.0001		0.0000	0.0000	0.0002	0.0004	0.0001		**0.0025**	0.0001	**0.0005**		0.0000	0.0004	0.0025
b-BHC	**0.0009**		0.0000	0.0000	0.0002	0.0004	0.0001		**0.0078**	0.0001	0.0001		0.0000	0.0011	0.0078
hepatchlor epoxide	0.0001		0.0000	0.0000	0.0002	0.0004	0.0001		**0.0035**	0.0001	0.0001		0.0000	0.0005	0.0035
endrin aldehyde	**0.0009**		0.0000	0.0000	0.0002	0.0004	0.0001		0.0005	0.0001	0.0001		0.0000	0.0002	0.0009
Methoxychlor	0.0001		0.0000	0.0000	0.0002	0.0004	0.0001		0.0005	0.0001	**0.0031**		0.0000	0.0005	0.0031
Semi-volatile Organic Compounds															
benzoic acid	**0.1481**		**0.0675**	**0.0019**	0.0199	0.0846	**0.2502**		**3.2103**	**0.1611**	**0.1899**		0.0019	0.4593	3.2103
benzyl alcohol	**0.0197**		0.0075	0.0001	0.0199	0.0846	0.0417		0.2018	0.0322	0.0211		0.0001	0.0476	0.2018
bis(2-ethylhexl)phthalate	**0.0889**		**0.0450**	**0.0023**	**0.2389**	**0.5919**	**0.2294**		**0.9172**	**0.2148**	**0.0528**		0.0023	0.2646	0.9172
butylbenzylphthalate	**0.0079**		0.0075	0.0001	0.0199	0.0846	**0.0209**		0.2018	**0.0403**	0.0211		0.0001	0.0449	0.2018
chrysene	0.0109		0.0075	0.0001	0.0199	0.0846	0.0417		0.2018	**0.0134**	0.0211		0.0001	0.0446	0.2018
di-n-butylphthalate	**0.0099**		**0.0075**	0.0001	0.0199	0.0846	**0.0209**		**0.3669**	0.0322	**0.0528**		0.0001	0.0661	0.3669
di-n-octyl phthalate	**0.0049**		0.0075	0.0001	0.0199	0.0846	**0.0209**		0.2018	0.0322	0.0211		0.0001	0.0437	0.2018
diethylphthalate	**0.0197**		0.0075	0.0001	0.0199	0.0846	0.0417		0.2018	0.0322	0.0211		0.0001	0.0476	0.2018

	Loadings (lbs/d)												SUMMARY		
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	MIN	AVE	MAX
Semi-volatile Organic Compounds (cont)															
fluoranthene	**0.1086**		0.0075	0.0001	0.0199	0.0846	**0.0417**		0.2018	**0.0403**	0.0211		0.0001	0.0584	0.2018
N-nitroso-di-n-propylamine	0.0109		0.0075	0.0001	**0.4977**	0.0846	0.0417		0.2018	0.0322	0.0211		0.0001	0.0997	0.4977
N-nitrosodimethylamine	**0.0296**		0.0075	0.0001	0.0199	0.0846	0.0417		0.2018	0.0322	0.0211		0.0001	0.0487	0.2018
o-dichlorobenzene	0.0109		0.0075	0.0001	**0.0995**	0.0846	0.0417		0.2018	0.0322	0.0211		0.0001	0.0555	0.2018
p-cresol	0.0109		**0.0300**	**0.0015**	0.0199	0.0846	0.0417		0.2018	0.0322	**0.0528**		0.0015	0.0528	0.2018
p-dichlorobenzene	**0.0197**		0.0075	0.0001	0.0199	0.0846	0.0417		0.2018	0.0322	0.0211		0.0001	0.0476	0.2018
pentachlorophenol	0.0247		0.0187	0.0003	0.0498	**0.2537**	0.0417		0.2018	0.0322	0.0211		0.0003	0.0716	0.2537
phenanthrene	0.0109		0.0075	0.0001	0.0199	0.0846	**0.0417**		0.2018	**0.0269**	0.0211		0.0001	0.0460	0.2018
pyrene	0.0109		0.0075	0.0001	0.0199	0.0846	**0.0417**		0.2018	**0.0134**	0.0211		0.0001	0.0446	0.2018
FLOW	1.184		0.899	0.016	2.387	10.138	2.500		10.998	1.610	1.265				

NOTES:

a Not analyzed

Bold numbers reflect detected values

Loadings were calculated using the flow at the time of sampling.

Appendix F

Appendix F Table F-1 Constitution Beach CSO Facility Operations Summary, Fiscal Year 1994

DATE	RAINFALL (INCHES)	DISCHARGE DURATION (HOURS)	TOTAL FLOW (MG)	PH (SU)	BOD INFLUENT (MG/L)	BOD EFFLUENT (MG/L)	TSS INFLUENT (MG/L)	TSS EFFLUENT (MG/L)	SETTL. SOLIDS (MG/L)	FECAL COLIFORM GEO MEAN	CHLORINE RESIDUAL (MG/L)
SEPTEMBER											
9-27-93	0.91	1.75	0.070	8.28	69.0	50.0	382	325	1.3	10	4
DECEMBER											
12-5-93	2.76	1.50	0.013	7.89	67.0	50.0	26	22	0.2	10	4
12-11-93	1.05	1.00	0.070	8.73	67.0	50.0	30	44	1.0	10	4
12-21-93	1.53	3.00	0.100	7.72	67.0	50.0	14	89	89.0	10	3
MARCH											
3-10-94	2.05	3.00	0.200	6.86	30.0	20.0	11	9	2.0	10	*
3-22-94	1.21	1.25	0.125	7.00	69.0	60.0	366	176	2.0	40	3
MAY											
5-5-94	1.39	4.25	0.095**	6.88	25.8	20.6	26	28	2.0	10	2
5-8-94	0.44	1.00	0.010**	6.85	29.0	33.0	36	36	2.0	280	4
TOTAL	**11.34**	**16.75**	**0.683**								
AVERAGE	**1.42**	**2.09**	**0.085**	**7.53**	**53.0**	**42**	**111**	**91**	**12.4**	**48**	**3**
MINIMUM	**0.44**	**1.00**	**0.013**	**6.85**	**25.8**	**20**	**11**	**9**	**0.2**	**10**	**2**
MAXIMUM	**2.76**	**4.25**	**0.200**	**8.73**	**69.0**	**60**	**382**	**325**	**89.0**	**280**	**4**
No of ACTIVATIONS		**8**									

* No chlorine reading

** Flow meter malfunction, flows estimated

Appendix F Table F-2 Constitution Beach CSO BOD and TSS Loadings, Fiscal Year 1994

DATE	Total Flow (MG)	Biochemical Oxygen Demand Influent (lbs/d)	Biochemical Oxygen Demand Effluent (lbs/d)	Biochemical Oxygen Demand Removal (%)	Total Suspended Solids Influent (lbs/d)	Total Suspended Solids Effluent (lbs/d)	Total Suspended Solids Removal (%)
SEPTEMBER							
9-27-93	0.070	40.3	29.2	28	223.0	189.7	15
DECEMBER							
12-5-93	0.013	7.0	5.2	25	2.7	2.3	15
12-11-93	0.070	39.1	29.2	25	17.5	25.7	-47
12-21-93	0.100	55.9	41.7	25	11.7	74.2	-536
MARCH							
3-10-94	0.200	50.0	33.4	33	18.3	15.0	18
3-22-94	0.125	71.9	62.6	13	381.6	183.5	52
MAY							
5-5-94	0.095*	*	*	*	*	*	*
5-8-94	0.010*	*	*	*	*	*	*
TOTAL	**0.683**						
AVERAGE	**0.085**	**44.0**	**34**	**25**	**109**	**82**	**-80**
MINIMUM	**0.013**	**7.0**	**5**	**13**	**3**	**2**	**-536**
MAXIMUM	**0.200**	**71.9**	**63**	**33**	**382**	**190**	**52**
No of ACTIVATIONS	**8.000**						

* Flow meter malfunction

Appendix G

Appendix G Table G-1 Fox Point CSO Facility Operations Summary, Fiscal Year 1994

DATE	RAINFALL (INCHES)	DISCHARGE DURATION (HOURS)	TOTAL FLOW (MG)	PH (SU)	BOD INFLUENT (MG/L)	BOD EFFLUENT (MG/L)	TSS INFLUENT (MG/L)	TSS EFFLUENT (MG/L)	SETTL. SOLIDS (MG/L)	FECAL COLIFORM (#/100mL)	CHLORINE RESIDUAL (MG/L)
JULY											
7-8-93	0.55	2.00	2.849	6.51	48	46	130	76	0.2	10	3.0
AUGUST											
8-4-93	0.20	0.33	0.400	*	*	*	*	*	*	*	*
8-20-93	0.65	2.20	1.330	6.75	27	25	140	137	0.1	10	3.0
SEPTEMBER											
9-4-93	0.72	2.00	0.576	6.49	66	66	46	38	0.3	10	4.0
9-27-93	0.91	3.00	0.748	8.91	100	49	720	262	1.3	10	3.0
OCTOBER											
10-12-93	0.66	13.00	5.430	7.73	65	50	46	17	0.1	10	3.0
NOVEMBER											
11-28-93	0.88	2.25	2.000	6.88	47	51	100	48	2.7	50	4.0
DECEMBER											
12-5-93	2.76	10.50	4.75**	7.53	200	122	616	117	1.0	10	3.0
12-11-93	1	2	0.750	6.98	122	67	392	76	2.6	10	3.0
12-21-93	1.53	2.00	12.000	6.73	67	50	106	108	1.0	10	3.0
JANUARY											
1-18-94	1.04	3.00	7.500	6.58	61	74	448	406	6.0	10	4.0
1-28-94	1.00	4.00	7.500	8.91	34	66	120	52	2.0	10	4.0
MARCH											
3-10-94	2.05	15.25	8.750	6.51	37	35	21	184	2.0	10	4.0
3-10-94				6.93	30	41	61	175	2.0	900	2.5
3-22-94	1.21	2.50	1.350	6.72	45	37	117	234	2.0	30	4.0
APRIL											
4-13-94	0.72	1.45	2.500**	6.66	40	28	88	126	2.0	230	4.0
4-16-94	0.63	2.50	1.625**	6.78	224	67	1248	228	2.0	190	4.0

DATE	RAINFALL (INCHES)	DISCHARGE DURATION (HOURS)	TOTAL FLOW (MG)	PH (SU)	BOD INFLUENT (MG/L)	BOD EFFLUENT (MG/L)	TSS INFLUENT (MG/L)	TSS EFFLUENT (MG/L)	SETTL. SOLIDS (MG/L)	FECAL COLIFORM (#/100mL)	CHLORINE RESIDUAL (MG/L)
MAY											
5-5-94	1.39	5.50	7.500	6.81	51.5	56.2	90	244	2.0	280	4.0
5-6-94	0.30	2.50	1.35**	6.86	35.7	19.7	578	438	8.0	700	4.0
5-16-94	0.94	2.25	4.25**	6.74	22.2	21.7	76	63	2.0	10	4.0
5-25-94	0.11	2.00	3.00**	7.06	72.6	53.6	80	75	2.0	66000	4.0
TOTAL			**76.158**								
AVERAGE		**3.99**	**3.808**	**7.05**	**70**	**51**	**261**	**155**	**2.1**	**3425**	**3.6**
MINIMUM		**0.33**	**0.400**	**6.49**	**22**	**20**	**21**	**17**	**0.1**	**10**	**2.5**
MAXIMUM		**15.25**	**12.000**	**8.91**	**224**	**122**	**1248**	**438**	**8.0**	**66000**	**4.0**
No. of ACTIVATIONS		**20**									

* Sample bottles broken, no analyses conducted

** Flow meter malfunction, no flow records

Appendix G Table G-1 Fox Point CSO Facility Operations Summary, Fiscal Year 1994

DATE	RAINFALL (INCHES)	DISCHARGE DURATION (HOURS)	TOTAL FLOW (MG)	PH (SU)	BOD INFLUENT (MG/L)	BOD EFFLUENT (MG/L)	TSS INFLUENT (MG/L)	TSS EFFLUENT (MG/L)	SETTL. SOLIDS (MG/L)	FECAL COLIFORM (#/100mL)	CHLORINE RESIDUAL (MG/L)
JULY											
7-8-93	0.55	2.00	2.849	6.51	48	46	130	76	0.2	10	3.0
AUGUST											
8-4-93	0.20	0.33	0.400	*	*	*	*	*	*	*	*
8-20-93	0.65	2.20	1.330	6.75	27	25	140	137	0.1	10	3.0
SEPTEMBER											
9-4-93	0.72	2.00	0.576	6.49	66	66	46	38	0.3	10	4.0
9-27-93	0.91	3.00	0.748	8.91	100	49	720	262	1.3	10	3.0
OCTOBER											
10-12-93	0.66	13.00	5.430	7.73	65	50	46	17	0.1	10	3.0
NOVEMBER											
11-28-93	0.88	2.25	2.000	6.88	47	51	100	48	2.7	50	4.0
DECEMBER											
12-5-93	2.76	10.50	4.75**	7.53	200	122	616	117	1.0	10	3.0
12-11-93	1	2	0.750	6.98	122	67	392	76	2.6	10	3.0
12-21-93	1.53	2.00	12.000	6.73	67	50	106	108	1.0	10	3.0
JANUARY											
1-18-94	1.04	3.00	7.500	6.58	61	74	448	406	6.0	10	4.0
1-28-94	1.00	4.00	7.500	8.91	34	66	120	52	2.0	10	4.0
MARCH											
3-10-94	2.05	15.25	8.750	6.51	37	35	21	184	2.0	10	4.0
3-10-94				6.93	30	41	61	175	2.0	900	2.5
3-22-94	1.21	2.50	1.350	6.72	45	37	117	234	2.0	30	4.0
APRIL											
4-13-94	0.72	1.45	2.500**	6.66	40	28	88	126	2.0	230	4.0
4-16-94	0.63	2.50	1.625**	6.78	224	67	1248	228	2.0	190	4.0

DATE	RAINFALL (INCHES)	DISCHARGE DURATION (HOURS)	TOTAL FLOW (MG)	PH (SU)	BOD INFLUENT (MG/L)	BOD EFFLUENT (MG/L)	TSS INFLUENT (MG/L)	TSS EFFLUENT (MG/L)	SETTL. SOLIDS (MG/L)	FECAL COLIFORM (#/100mL)	CHLORINE RESIDUAL (MG/L)
MAY											
5-5-94	1.39	5.50	7.500	6.81	51.5	56.2	90	244	2.0	280	4.0
5-6-94	0.30	2.50	1.35**	6.86	35.7	19.7	578	438	8.0	700	4.0
5-16-94	0.94	2.25	4.25**	6.74	22.2	21.7	76	63	2.0	10	4.0
5-25-94	0.11	2.00	3.00**	7.06	72.6	53.6	80	75	2.0	66000	4.0
TOTAL			**76.158**								
AVERAGE		**3.99**	**3.808**	**7.05**	**70**	**51**	**261**	**155**	**2.1**	**3425**	**3.6**
MINIMUM		**0.33**	**0.400**	**6.49**	**22**	**20**	**21**	**17**	**0.1**	**10**	**2.5**
MAXIMUM		**15.25**	**12.000**	**8.91**	**224**	**122**	**1248**	**438**	**8.0**	**66000**	**4.0**
No. of ACTIVATIONS		**20**									

* Sample bottles broken, no analyses conducted

** Flow meter malfunction, no flow records

Appendix G Table G-2 Fox Point CSO Facility BOD and TSS Loadings, Fiscal Year 1994

DATE	Total Flow (MG)	Biochemical Oxygen Demand Influent (lbs/d)	Effluent (lbs/d)	(%)	Total Suspended Solids Influent (lbs/d)	Effluent (lbs/d)	(%)
JULY							
7-8-93	2.849	1141	1093	4	3089	76	98
AUGUST							
8-4-93	0.400	*	*	*	*	*	*
8-20-93	1.330	299	277	7	1553	137	91
SEPTEMBER							
9-4-93	0.576	317	317	0	221	183	17
9-27-93	0.748	624	306	51	4492	1634	64
OCTOBER							
10-12-93	5.430	2944	2264	23	2083	770	63
NOVEMBER							
11-28-93	2.000	784	851	-9	1668	801	52
DECEMBER							
12-5-93	**	**	**	**	**	**	**
12-11-93	6.980	3900	22820	-485	4424	151	97
12-21-93	12.000	6705	5004	25	10608	10809	-2
JANUARY							
1-18-94	7.500	3816	4629	-21	28022	25395	9
1-28-94	7.500	2127	4128	-94	7506	3253	57
MARCH							
3-10-94	8.750	2445	2773	-13	2992	13099	-338
3-22-94	1.350	507	417	18	1317	2635	-100

DATE	TOTAL FLOW (MG)	BOD INFLUENT (MG/L)	EFFLUENT (MG/L)	(%)	TSS INFLUENT (MG/L)	EFFLUENT (MG/L)	(%)
APRIL							
4-13-94	**	**	**		**	**	
4-16-94	**	**	**		**	**	
MAY							
5-5-94	7.500	3221	3515	-9	5630	15262	-171
5-6-94	**	**	**		**	**	
5-16-94	**	**	**		**	**	
5-25-94	**	**	**		**	**	
TOTAL	**76.158**						
AVERAGE	**3.808**	**2218**	**3723**	**-39**	**5662**	**5708**	**-5**
MINIMUM	**0.400**	**299**	**277**	**-485**	**221**	**76**	**-338**
MAXIMUM	**12.000**	**6705**	**22820**	**51**	**28022**	**25395**	**98**
No. of ACTIVATIONS	**20**						

* Sample bottles broken, no analyses conducted

** Flow meter malfunction, flows are estimates

Appendix H

Appendix H Table H-1 Commercial Point CSO Facility Operations Summary, Fiscal Year 1994

DATE	RAINFALL (INCHES)	DISCHARGE DURATION (HOURS)	TOTAL FLOW (MG)	PH (SU)	BOD INFLUENT (MG/L)	BOD EFFLUENT (MG/L)	TSS INFLUENT (MG/L)	TSS EFFLUENT (MG/L)	SETTL. SOLIDS (MG/L)	FECAL COLIFORM GEO MEAN	CHLORINE RESIDUAL (MG/L)
JULY											
7-8-93	0.55	4.50	0.380	6.47	36	51.0	126	234	1.0	10	3.0
7-27-93	0.62	3.70	1.000	7.24	38	46.0	70	66	0.2	10	3.0
AUGUST											
8-4-93	0.20	0.33	0.210	*	*	*	*	*	*	*	*
8-20-93	0.65	2.25	0.550	6.43	38	39.0	120	142	0.1	10	3.0
SEPTEMBER											
9-26-93	0.86	6.00	1.690	7.34	18	24.0	48	43	0.3	10	3.0
9-27-93	0.91	5.00	1.650	7.44	66	66.0	120	118	1.3	10	3.0
OCTOBER											
10-12-93	0.66	4.25	1.780	6.49	67	50.0	114	86	0.1	10	3.0
10-21-93	0.51	3.25	1.350	6.48	67	52.0	98	93	1.0	10	4.0
10-30-93	0.98	6.50	1.280	7.07	67	50.0	64	38	0.2	10	3.0
NOVEMBER											
11-28-93	0.88	4.50	5.080	7.50	50	50.0	54	49	0.2	10	3.0
DECEMBER											
12-5-93	2.76	3.00	16.520	7.99	67	50.0	154	146	0.2	10	4.0
12-11-93	1.05	3.25	1.940	7.45	46	46.0	18	18	0.2	10	3.0
12-21-93	1.53	8.50	12.270	7.08	67	50.0	50	34	1.0	10	3.0
JANUARY											
1-18-94	1.04	8.75	6.000	6.63	46	59.0	130	166	2.4	400	2.0
1-5-94	1.00	5.00	9.350	6.81	25	20.0	94	92	2.0	10	3.0
MARCH											
3-8-94	0.44	4.00	0.560	7.49	36	22.0	129	123	2.0	10	2.0
3-10-94*	2.05	21.25	15.600	7.40	27	26.0	64	22	2.0	700	4.0
				7.01	38	38.0	115	125	2.0	120	3.5
3-22-94	1.21	4.75	4.230	6.50	57	38.0	740	212	2.8	100	4.0

DATE	RAINFALL (INCHES)	DISCHARGE DURATION (HOURS)	TOTAL FLOW (MG)	PH (SU)	BOD INFLUENT (MG/L)	BOD EFFLUENT (MG/L)	TSS INFLUENT (MG/L)	TSS EFFLUENT (MG/L)	SETTL. SOLIDS (MG/L)	FECAL COLIFORM GEO MEAN	CHLORINE RESIDUAL (MG/L)
APRIL											
4-13-94	0.72	2.00	2.620	6.81	50	41.0	204	286	4.0	2400	4.0
4-16-94	0.63	0.50	0.820	8.96	47	43.0	396	530	2.4	4300	3.0
MAY											
5-5-94	1.39	9.00	1.440	6.80	34.4	20.6	24	32	2.0	10	3.0
5-6-94	0.30	4.00	2.530	7.05	22.2	17.9	46	44	2.0	10	4.0
5-8-94	0.44	2.75	0.660	6.45	37	26.0	90	54	2.0	10	4.0
5-16-94	0.94	8.00	2.820	6.69	33.9	53.4	46	470	6.0	800	4.0
5-26-94	0.98	2.25	0.220	7.13	42.2	29.9	148	100	2.0	57000	3.0
TOTAL		**127.28**	**92.55**								
AVERAGE		**5.09**	**3.702**		**44.91**	**40.4**	**130.48**	**132.92**	**1.6**	**45**	**3.3**
MINIMUM		**0.33**	**0.210**	**6.43**	**18.00**	**17.9**	**18.00**	**18.00**	**0.1**	**10**	**2.0**
MAXIMUM		**21.25**	**16.520**	**8.96**	**67.00**	**66.0**	**740.00**	**530.00**	**6.0**	**57000**	**4.0**
No of ACTIVATIONS		**25**									

* Very short discharge duration. Not enough time to collect samples.

** Two sets of samples taken.

Appendix H Table H-2 Commercial Point CSO BOD and TSS Loadings, Fiscal Year 1994

DATE	Total Flow (MG)	Biochemical Oxygen Demand Influent (lbs/d)	Biochemical Oxygen Demand Effluent (lbs/d)	Biochemical Oxygen Demand Removal (%)	Total Suspended Solids Influent (lbs/d)	Total Suspended Solids Effluent (lbs/d)	Total Suspended Solids Removal (%)
JULY							
7-8-93	0.380	114	162	-42	399	742	-86
7-27-93	1.000	317	384	-21	584	550	6
AUGUST							
8-4-93	0.210	*	*	*	*	*	*
8-20-93	0.550	174	179	-3	550	651	-18
SEPTEMBER							
9-26-93	1.690	254	338	-33	677	606	10
9-27-93	1.650	908	908	0	1651	1624	2
OCTOBER							
10-12-93	1.780	995	742	25	1692	1277	25
10-21-93	1.350	754	585	22	1103	1047	5
10-30-93	1.280	715	534	25	683	406	41
NOVEMBER							
11-28-93	5.080	2118	2118	0	2288	2076	9
DECEMBER							
12-5-93	16.520	9231	6889	25	21218	20115	5
12-11-93	1.940	744	744	0	291	291	0
12-21-93	12.270	6856	5117	25	5117	3479	32
JANUARY							
1-18-94	6.000	2302	2952	-28	6505	8307	-28
1-5-94	9.350	1949	1560	20	7330	7174	2
MARCH							
3-8-94	0.560	168	103	39	602	574	5
3-10-94	15.600	4424	4163	6	11644	9563	18
3-22-94	4.230	2011	1341	33	26106	7479	71

DATE	TOTAL FLOW (MG)	BOD INFLUENT (MG/L)	EFFLUENT (MG/L)	Removal (%)	TSS INFLUENT (MG/L)	EFFLUENT (MG/L)	Removal (%)
APRIL							
4-13-94	2.620	1093	896	18	4458	6249	-40
4-16-94	0.820	321	294	9	2708	3625	-34
MAY							
5-5-94	1.440	413	247	40	288	384	-33
5-6-94	2.530	468	378	19	971	928	4
5-8-94	0.660	204	143	30	495	297	40
5-16-94	2.820	797	1256	-58	1082	11054	-922
5-26-94	0.220	77	55	29	272	183	32
TOTAL	**92.550**						
AVERAGE	**3.702**	**1559**	**1337**	**8**	**4113**	**3695**	**-36**
MINIMUM	**0.210**	**77**	**55**	**-58**	**272**	**183**	**-922**
MAXIMUM	**16.520**	**9231**	**6889**	**40**	**26106**	**20115**	**71**
No of ACTIVATIONS	**25**						

* No samples taken

Appendix I

Appendix I Instrument Detection Limits, Method Detection Limits, and Quantitation Limits- A Brief Description

An understanding of the detection limits of analysis is essential to reviewing the data from chemical analyses. There are three different types of detection limits that are most often encountered:

- **Instrument Detection Limits**
- **Method Detection Limits**
- **Quantitation Limits**, also known as **Reporting Limits.**

Instrument detection limits (IDL) reflect only the capability of the Gas Chromatograph (GC), or any other instrument, used to conduct the analysis. This will be the lowest of the three detection limits. The IDL will not take into account the losses of the pollutant associated with the matrix (soil or wastewater) and extraction procedure. This discrepancy is known as matrix interference.

Method detection limits (MDL) are the smallest amount of a substance that can be detected above background noise by following a particular method. The MDL is statistically determined by running a series of analyses using various low concentrations of a pollutant. Using a Student's "T" test, the smallest concentration that has a 99% probability of being detected above the background is designated the MDL for that pollutant. The EPA, using several private laboratories, has determined what the MDLs are for most priority pollutants using their detailed methods. These are published in the 40 CFR and some are listed in Appendix J, Table J-1 of this report.

In general, if a plot is made of pollutant concentration versus instrument response, it will generate a linear relationship. As the pollutant concentration approaches zero, the linearity of the relationship is lost. At the point where the linearity is lost is the **Quantitation Limit (QL)** or sometimes the **Reporting Limit**. In other words, the smallest concentration where the linear relationship holds is the smallest concentration that can be quantified. Generally, the QL can be thought of as about five times the MDL. Quantitative limits only come into play on GC/MS analyses, that is, methods 608, 624, and 625. Specific limits are highly matrix dependent .

The EPA has developed **Contract Required Quantitation Limits (CRQL)**, which serve as a guideline for selecting contract laboratories to perform analyses. Some CRQLs are listed in Appendix J, Table J-1 of this report.

In short, the IDL is the lowest concentration that a particular instrument can detect. The MDL is the lowest concentration that can be detected using a particular method. The QL is the smallest concentration that can be confidently considered to be accurate.

Reported concentrations that are between the MDL and the QL indicate that a pollutant is present, but at a concentration too low to be accurately quantified. For example, using EPA method 624, chloroform has a MDL of 1.6 and a QL of 10 ug/L. If the concentration from an analysis is reported as 5 ug/L then what can be inferred is "A very low concentration of chloroform was detected. We are not sure what the concentration present in the wastewater really is, but our best guess is 5 ug/L." The EPA requires that these intermediate values be flagged with a "J" on any reports submitted to them. Therefore, these are sometimes simply called "J-values."

For non-detects in analyses of metals, cyanide, petroleum hydrocarbons, etc., it is customary for "less than the MDL" to be listed as a result. For a non-detect in the 608, 624, and 625 analyses "less than the QL" is typically listed.

Often it becomes necessary to estimate a concentration for below detection limit values, specifically when calculating the average yearly concentration of a pollutant. A well established method is to assume the actual concentration of a non-detected pollutant is simply one half of the MDL. While no scientific theory supports this assumption, it is more reasonable than either assuming the concentration is zero, or the MDL itself. It is also accepted by the EPA and DEP as a standard practice that can be applied to any series of tests.

This technique is utilized in this report. For all metals, cyanide, petroleum hydrocarbons, etc., half the MDL was assumed for all non-detects (i.e. values below MDL). For the 608, 624, and 625 analyses, 1/2 the MDL, which is the same as 1/10 the QL, was assumed for all non-detects (i.e. values below QL).

In Appendix J, Table J-1 is a list of the parameters regularly tested for in the MWRA 's effluent. The required EPA method is referenced by its number and the recommended EPA detection limit is given. The CRQL is also provided when applicable. These limits are then compared to the detection levels normally attained by the contract laboratory analyzing MWRA effluent.

Appendix J

Table J.1 List of Parameters Tested

Table J.2 EPA List of 126 Priority Pollutants

Table J.3 NPDES Permit Testing Requirements, 40 CFR 122, Appendix D, Tables II and III.

Appendix J Appendix J-1 List of Parameters Tested
(Influent and Effluent)*

	EPA Method Number	EPA MDL	CRQL	Contract Lab MDL	Contract Lab QL
METALS					
Antimony	204.2	3.0	NA	5.0	NA
Arsenic	206.2	1.0	NA	2.0	NA
Beryllium	200.7	0.3	NA	1.0	NA
Cadmium	213.2	0.1	NA	1.0	NA
Chromium	218.2	1.0	NA	5.0	NA
Copper	200.7	6.0	NA	4.0	NA
Lead	239.2	1.0	NA	1.5	NA
Mercury	245.1	0.2	NA	0.2	NA
Nickel	200.7	15.0	NA	12.0	NA
Selenium	270.2	2.0	NA	2.0	NA
Thallium	279.2	1.0	NA	2.0	NA
Zinc	200.7	2.0	NA	10.0	NA
Boron	200.7	5.0	NA	30.0	NA
Molybdenum	246.2	1.0	NA	8.0	NA
Silver	272.2	0.2	NA	3.0	NA
OTHER INORGANIC CHEMICALS					
Cyanide	335.2	20.0	NA	10.0	NA
Hexavalent Chromium	307 B	10.0	NA	5.0	NA
Oil & Grease (mg/L)	413.1	5.0	NA	5.0	NA
Petroleum Hydrocarbons (mg/L)		1.0	NA	1.0	NA
Surfactants (mg/L)		25.0	NA	25.0	NA
PESTICIDES	608			NA	
alpha-BHC		0.003	0.05		0.05
beta-BHC		0.006	0.05		0.05
delta-BHC		0.009	0.05		0.05
gamma-BHC (Lindane)		0.004	0.05		0.05
Heptachlor		0.003	0.05		0.05
Aldrin		0.004	0.05		0.05
Heptachlor epoxide		0.083	0.05		0.05
Endosulfan I		0.014	0.05		0.05
Endrin aldehyde		0.023	0.10		0.10
Dieldrin		0.002	0.10		0.10
4,4'-DDE		0.004	0.10		0.10
Endrin		0.006	0.10		0.10
Endosulfan II		0.004	0.10		0.10
4,4'-DDD		0.011	0.10		0.10
Endosulfan sulfate		0.066	0.10		0.10
4,4'-DDT		0.012	0.10		0.10
Methoxychlor			0.50		0.50
Toxaphene		0.240	0.50		5.00
Chlordane		0.014	0.05		0.20

	EPA Method Number	EPA MDL	CRQL	Contract Lab MDL	Contract Lab QL
PCBs	608				
Aroclor-1016		ND	1.00		1.00
Aroclor-1221		ND	2.00		2.00
Aroclor-1232		ND	1.00		1.00
Aroclor-1242		0.065	1.00		1.00
Aroclor-1248		ND	1.00		1.00
Aroclor-1254		ND	1.00		1.00
Aroclor-1260		ND	1.00		1.00
VOLATILE ORGANICS	624				
Chloromethane		ND	10		10
Bromomethane		ND	10		10
Vinyl chloride		ND	10		10
Chloroethane		ND	10		10
Methylene chloride		2.8	10		10
Acetone			10		10
Carbon disulfide			10		10
1,1-dichloroethylene		2.8	10		10
1,1-dichloroethane		4.7	10		10
1,2-dichloroethylene		1.6	10		10
Chloroform		1.6	10		10
Methylethyl ketone (2-butanone)			10		10
1,2-dichloroethane		2.8	10		10
1,1,1-trichloroethane		3.8	10		10
Carbon tetrachloride		2.8	10		10
Vinyl acetate			10		10
Bromodichloromethane		2.2	10		10
1,2-dichloropropane		6.0	10		10
Cis 1,3 dichloropropene		5.0			
Trichloroethylene		1.9	10		10
Chlorodibromomethane		3.1	10		10
1,1,2-trichloroethane		5.0	10		10
Benzene		4.4	10		10
Trans-1,3-dichloropropene		ND	10		10
Bromoform		4.7	10		10
4-methyl-2-pentanone			10		10
2-hexanone			10		10
Tetrachloroethylene		4.1	10		10
1,1,2,2-tetrachloroethane		6.9	10		10
Toluene		6.0	10		10
Chlorobenzene		6.0	10		10
Ethlybenzene		7.2	10		10
Styrene			10		10
Xylene (Total)			10		10
2-chloroethylvinylether			10		10

	EPA Method Number	EPA MDL	CRQL	Contract Lab MDL	Contract Lab QL
Volatile Organics (cont)					
Trichlorofluoromethane			10		10
Acrolein			10		10
Acrylontrile			10		10
SEMI-VOLATILES	**625**				
Phenol		1.5	10		10
Bis (2-chloroethyl) ether		5.7	10		10
2-chlorophenol		3.3	10		10
m-dichlorobenzene		1.9	10		10
p-dichlorobenzene		1.9	10		10
o-dichlorobenzene		1.9	10		10
o-cresol			10		10
2,2'oxybis (1-chloropropane)		5.7	10		10
p-cresol			10		10
N-nitroso-di-n-propylamine		ND	10		10
Hexachloroethane		1.6	10		10
Nitrobenzene		1.9	10		10
Isophrone		2.2	10		10
o-nitrophenol		3.6	10		10
2,4-dimethylphenol		2.7	10		10
Bis (2-chloroethoxy)methane		5.3	10		10
2,4-dichlorophenol		2.7	10		25
1,2,4-trichlorobenzene		1.9	10		10
Naphthalene		1.6	10		10
p-chloroaniline			10		10
Hexachlorobutadiene			10		10
p-chloro-m-cresol			10		10
2-methylnaphthalene			10		10
Hexachlorocyclopentadiene		ND	10		10
2,4,6-trichlorophenol		2.7	10		10
2,4,5-trichlorophenol			25		25
2-chloronaphthalene		1.9	10		10
o-nitroaniline			25		25
Dimethyl phthalate		1.6	10		10
Acenaphthylene		3.5	10		10
2,6-dinitrotoluene		1.9	10		10
m-nitroaniline			25		25
Acenaphthene		1.9	10		10
2,4-dinitrophenol		42.0	25		25
p-nitrophenol		3.6	25		25
Dibenzofuran			10		10
2,4-dinitrotoluene		5.7	10		10
Diethyl phthalate		1.9	10		10
4-chlorophenyl phenyl ether		4.2	10		10
Fluorene		1.9	10		10

	EPA Method Number	EPA MDL	CRQL	Contract Lab MDL	Contract Lab QL
Semivolatiles (Cont)	625				
p-nitroaniline			25		25
4,6-dinitro-o-cresol			10		10
N-nitrosodiphenylamine		1.9	10		10
4-bromophenyl phenyl ether		1.9	10		10
Hexachlorobenzene		1.9	10		10
Pentachlorophenol		3.6	25		10
Phenanthrene		5.4	10		10
Anthracene		1.9	10		10
Di-n-butyl phthalate		2.5	10		10
Fluoranthene		2.2	10		10
Pyrene		1.9	10		10
Butyl benzyl phthalate		2.5	10		10
3,3'dichlorobenzidine		16.5	10		10
Benzo(a)anthracene		7.8	10		10
Chrysene		2.5	10		10
Bis (2-ethylhexyl) phthalate		2.5	10		10
Di-n-octyl phthalate		2.5	10		10
Benzo(b)fluoranthene		4.8	10		10
Benzo(k)fluoranthene		2.5	10		10
Benzo(a)pyrene		2.5	10		10
Indeno(1,2,3-cd)pyrene		3.7	10		10
Dibenz(a,h)anthracene		2.5	10		10
Benzo(ghi)perylene		4.1	10		10
Benzoic acid			10		10
Benzyl alcohol			10		10
Benzidene		44	10		10
1,2-diphenylhydrazine			10		10
N-nitrosodimethylamine		ND	10		10

* Pollutants analyzed in addition to influent and effluent analyses of conventional pollutants listed in Appendix A, Table 1
All units expressed in ug/L unless otherwise noted.

ND Not determined by EPA

NA Not Applicable

Appendix J Table J-2 EPA List of 126 Priority Pollutants

Chlorinated Benzenes
- Chlorobenzene
- 1,2-dichlorobenzene
- 1,3-dichlorobenzene
- 1,4-dichlorobenzene
- 1,2,4-trichlorobenzene
- Hexachlorobenzene

Chlorinated Ethanes
- Chloroethane
- 1,1-dichloroethane
- 1,2-dichloroethane
- 1,1,1-trichloroethane
- 1,1,2,2-tetrachloroethane
- Hexachloroethane

Chlorinated Phenols
- 2-chlorophenol
- 2,4-dichlorophenol
- 2,4,6-trichlorophenol
- Parametachlorocresol (4-chloro-3-methyl phenol)

Other Chlorinated Organics
- Chloroform (trichloromethane)
- Carbon tetrachloride (tetrachloromethane)
- Bis(2-chloroethoxy)methane
- Bis(2-chloroethyl)ether
- 2-chloroethyl vinyl ether (mixed)
- 2-chloronaphthalene
- 3,3-dichlorobenzidine
- 1,1-dichlorethylene
- 1,2-trans-dichloroethylene
- 1,2-dichloropropane
- 1,2-dichloropropylene (1,3-dichloropropene)
- Tetrachloroethylene
- Trichloroethylene
- Vinyl chloride (chloroethylene)
- Hexachlorobutadiene
- Hexachlorocyclopentadiene
- 2,3,7,8-tetrachloro-dibenzo-p-dioxin (TCDD)

Haloethers
- 4-chlorophenyl phenyl ether
- 2-bromophenyl phenyl ether
- Bis(2-chloroisopropyl) ether

Halomethanes
- Mehthylene chloride (dichloromethane)
- Methyl chloride (chloromethane)
- Methyl bromide (bromomethane)
- Bromoform (tribromomethane)
- Dichlorobromomethane
- Chlorodibromomethane

Nitroamines
- N-nitrosodimethylamine
- N-nitrosodiphenylamine
- N-nitrosodi-n-propylamine

Phenols (other than chlorinated)
- 2-nitrophenol
- 4-nitrophenol
- 2,4-dinitrophenol
- 4,6-dinitro-o-cresol (4,6-dinitro-2-methylphenol)
- Pentachlorophenol
- Phenol
- 2,4-dimethylphenol

Phthalate Esters
- Bis(2-ethylhexyl)phthalate
- Butyl benzyl phthalate
- Di-N-butyl phthalate
- Di-n-octyl phthalate
- Diethyl phthalate
- Dimethyl phthalate

Table J-2 Continued

Polynuclear Aromatic Hydrocarbons (PAHs)

- Acenaphthene
- 1,2-benzanthracene (benzo (a) anthracene)
- Benzo(a)pyrene (3,4-benzo-pyrene)
- 3,4-benzofluoranthene (benzo(b) fluoranthene)
- 11,12-benzofluoranthene (benzo(k) fluoranthene)
- Chrysene
- Acenphthalene
- Anthracene
- 1,12-benzoperylene (bonze(ghi) perylene)
- Fluorene
- Fluoranthene
- Phenanthrene
- 1,2,5,6-dibenzanthracene (dibenzo(a,h)anthracene)
- Indeno (1,2,3-cd) pyrene (2,3-o-phenylene pyrene)
- Pyrene

Pesticides and Metabolites

- Aldrin
- Dieldrin
- Chlordane (technical mixture and metabolites)
- Alpha-endosulfan
- Beta-endosulfan
- Endosulfan sulfate
- Endrin
- Endrin aldehyde
- Heptachlor
- Heptachlor epoxide (BHC-hexachlorocyclohexane)
- Alpha-BHC
- Beta-BHC
- Gamma-BHC (Lindane)
- Delta-BHC
- Toxaphene

DDT and Metabolites

- 4,4-DDT
- 4,4-DDE (p,p-DDX)
- 4,4-DDD (p,p-TDE)

Polychlorinated Biphenyls (PCBs)

- PCB-1242 (Arochlor 1242)
- PCB-1254 (Arochlor 1254)
- PCB-1221 (Arochlor 1221)
- PCB-1232 (Arochlor 1232)
- PCB-1248 (Arochlor 1248)
- PCB-1260 (Arochlor 1260)
- PCB-1016 (Arochlor 1016)

Other Organics

- Acrolein
- Acrylonitrile
- Benzene
- Benzidine
- 2,4-dinitrotoluene
- 2,6-dinitrotoluene
- 1,2-diphenylhydrazine
- Ethylbenzene
- Isophorone
- Naphthalene
- Nitrobenzene
- Toluene

Inorganics

- Antimony
- Arsenic
- Asbestos
- Beryllium
- Cadmium
- Chromium
- Copper
- Cyanide, total
- Lead
- Mercury
- Nickel
- Selenium
- Silver
- Thallium
- Zinc

Appendix J Table J-3 NPDES Permit Application Testing Requirements, 40 CFR 122, Apppendix D, Tables II and III

Organic Toxic Pollutants

Volatiles

acrolein
acrylonitrile
benzene
bromoform
carbon tetrachloride
chlorobenzene
chlorodibromomethane
chloroethane
2-chloroethylvinyl ether
chloroform
dichlorobromomethane
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethylene
1,2-dichloropropane
1,3-dichloropropylene
ethyl benzene
methyl bromide
methyl chloride
methylene chloride
1,1,2,2-tetrachloroethane
tetrachloroethylene
toluene
1,2-trans-dichloroethylene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethylene
vinyl chloride

Acid Compounds

2-chlorophenol
2,4-dichorophenol
2,4-dimethylphenol
4,6-dinitro-o-cresol
2,4-dinitrophenol
2-nitrophenol
4-nitrophenol
p-chloro-m-cresol
pentachlorophenol
phenol
2,4,6-trichlorophenol

Base/Neutral

acenaphthene
acenaphthylene
anthracene
benzidine
benzo(a)anthracene
benzo(a)pyrene
3,4-benzofluoranthracene
benzo(ghi)perylene
benzo(k)fluoranthene
bis(2-chloroethoxy)methane
bis(2-chloroethyl)ether
bis(2-ethylhexyl)phthalate
4-bromophenyl phenyl ether
butylbenzyl phthalate
2-chloronaphthalene
4-chlorophenyl phenyl ether
chrysene
dibenzo(a,h)anthracene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzidine
3-3'-dichlorobenzidine
diethyl phthalate
dimethyl phthalate
di-n-butyl phthalate
2,4-dinitrotoluene
2,6-dinitrotoluene
di-n-octyl phthalate
1,2-diphenylhydrazine
fluoranthene
fluorene
hexachlorobenzene
hexachlorobutadiene
hexachlorocyclopentadiene
hexachloroethane
indeno(1,2,3-cd)pyrene
isophorone
napthalene
nitrobenzene
N-nitrosodimethylamine
N-nitrosodi-n-propylamine
N-nitorsodiphenylamine
phenanthrene
pyrene
1,2,4-trichlorobenzene

(Table J-3 *Organic Pollutants* Contined)

Pesticides

aldrin
alpha-BHC
beta-BHC
gamma-BHC
delta-BHC
chlordane
4,4'-DDT
4,4'-DDE
4,4'-DDD
dieldrin
alpha-endosulfan
beta-endosulfan
endosulfan sulfate
endrin
endrin aldehyde
heptachlor
heptachlor epoxide
PCB-1242
PCB-1254
PCB-1221
PCB-1232
PCB-1248
PCB-1260
PCB-1016
toxaphene

Other Toxic Pollutants (Metals and Cyanide) and Total Phenols

anitmony, total
arsenic, total
beryllium, total
cadmium, total
chromium, total
copper, total
lead, total
mercury, total
nickel, total
selenium, total
silver, total
thallium, total
zinc, total
cyanide, total
phenols, total

Glossary, Abbreviations, Acronyms and Units

GLOSSARY

ABNs- See Acid Base Neutrals
Acid Base Neutrals (ABNs)- Also called semivolatile organics. A category of organic chemical pollutants. See Appendix J, Table J.3.
Acute- A stimulus severe enough to rapidly induce an effect; in aquatic toxicity tests, an effect observed in 96 hours or less typically is considered acute. When referring to aquatic toxicology or human health, an acute effect is not always measured in terms of lethality.
Acute Criteria- The maximum concentration of a constituent in water that an organism may be exposed to one hour over three years without dying.
Acute Static Toxicity Test- Test designed to measure water quality effect on mortality. It measures the effect of the whole effluent sample on an organism. Animals are put in a vial with effluent and the fatal effects are monitored. To calculate water quality standards, the test is run on sensitive animals. The concentration that shows a 95% mortality rate is then multiplied by two.
Activation- An event when the wastewater flow exceeds the holding capacity of the sewer lines and exceeds the hydraulic capacity of the treatment plant causing a diversion of flow to the CSO facilities.
Aeration- The process of adding air to a liquid (e.g. wastewater).
Aliquot- A measured portion of a sample.
Anaerobic Digester- The structure where organic material is broken down by organisms in the absence of oxygen.
Anoxia- The absence of oxygen.
Average Monthly Discharge Limitation- The highest allowable average of "daily discharge" over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges.
Average Weekly Discharge Limitation- The highest allowable average of "daily discharge" over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week.
Bar Screen- A screen made of bars designed to catch large debris (e.g. rags, wood, shoes) in waterways.
Below Detection Limit/Level (BDL)- Values below the Reporting or Quantification Limit. For a further explanation see Appendix I.
Bioaccumulation- The process by which a compound is taken up by an aquatic organism, both from water and through food.
Biochemical- Having to do with a chemical change resulting from the metabolic activities of living organisms.
Biochemical Oxygen Demand (BOD)- The amount of oxygen needed to oxidize inorganic materials and to degrade organic materials by *biochemical reactions* in a certain time at a certain temperature. BOD is used as a measure of organic pollution.
Biomagnification- The process by which the concentration of a compound increases in species occupying successive trophic levels.
BDL- See Below Detection Limit
Bloom- A large mass of algae (microscopic and or macroscopic) in water.
BOD- See Biochemical Oxygen Demand.
Buffering Capacity- The amount certain water bodies are able to resist changes in pH from addition of an acidic or caustic substances.

CFR- See Code of Federal Regulations
40 CFR Part 122- Code of Federal Regulations- Protection of the Environment. Part 122 is Administered Permit Programs: The National Pollutant Discharge Elimination System. Appendix D lists the Permit Application Requirements.
Chemical Oxygen Demand (COD)- The amount of oxygen needed for the *chemical oxidation* of chemicals in water. COD is used to measure the suitability of water for organisms that require oxygen.
Chlorination- The addition of chlorine or chlorine compounds to wastewater. Chlorination is most often done for disinfection purposes.
Choking- A process by which flows that can not be handled by existing pumps are "choked back" into the sewer system, frequently leading to local overflows.
Chronic- A stimulus that lingers or continues for a relatively long period of time, often one-tenth of the life span or more. Chronic should be considered a relative term depending on the life span of an organism. The measurement of a chronic effect can be reduced growth, reduced reproduction, etc., in addition to lethality.
Chronic Criteria- The maximum concentration of a constituent in water that an organism may be exposed to four days over three years without showing long term, short of mortality, harmful effects. Chronic criteria involve the growth, reproductivity, fertility, and sublethal effects on organisms.
Chronic Reproduction Test- A test designed to measure the chronic effects of wastewater on reproduction and fertility.
Chronic Survival and Growth Test- Test designed to see if any mortality occurs after the chronic criteria have been passed. After the organism has survived the size of the animals are measured after seven days and statistically compared to controls.
Clean Water Act (CWA)- (Formally referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Pub. L. 92-500, as amended by Pub. L. 95-576, Pub. L. 96-483, and Pub. L. 97-117: 33 U.S.C.§1251 et seq.
COD- See Chemical Oxygen Demand
Code of Federal Regulations (CFR)- Codification of the general and permanent rules of the Federal Government. CFR 40 covers environmental protection.
Combined Sewer- A sewer receiving both sanitary wastewater and storm water runoff.
Combined Sewer Overflow Facility- A place where overflow from combined sewers is screened, settled, and chlorinated before being discharged.
Combined Sewer Overflow Pipe- A pipe that discharges overflow from combined sewers in order to prevent back ups in the sewerage system.
Composite Sample- A sample consisting of a minimum of eight grab samples collected at equal intervals during a 24-hour period (or lesser period if specified) and combined proportional to flow, or a sample continuously collected proportionally to flow over that same time period.
Conventional Parameters/Pollutants- Those pollutants and constituents that are removed from wastewater by conventional treatment. Generally these constituents are settleable solids, biochemical oxygen demand, total suspended solids, oil and grease, total coliforms, fecal coliform, residual chlorine, and chlorides.
Conventional Treatment- Well-known or well-established water or wastewater treatment methods, usually consisting of primary and secondary processes and does include advanced or tertiary treatment.
Criteria- The numerical and or narrative elements of water quality standards.
Critical Dilution- Dilution of the effluent required to meet Water Quality Standards.
CWA- See Clean Water Act.

Daily Discharge- The discharge of a pollutant measured during a calendar day or any 24-hours period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurements, the daily discharge is calculated as the average measurement of the pollutant over the day.
Designated Use- Specified use of a body of water included in state water quality standards.
Digester- A place where organic matter is broken either with oxygen (aerobically) or without oxygen (anaerobically).
Disinfection- The destruction of pathogens (e.g. fecal bacteria) in a water source or wastewater.
Effluent- The wastewater or other water coming out of a treatment facility or process.
Effluent Limitation- Any restriction imposed by the Director (the person authorized to sign NPDES permits by EPA and/or the State) on quantities, discharge rates, and concentrations of "pollutants" which are "discharged" from "point sources" into "waters of the United States," the waters of the "contiguous zone," or the ocean.
Eutrophication- The natural process by which a body of water ages. Nutrients stimulate plant growth and lakes, estuaries, and bays evolve into bogs or marshes. Effluent high in nutrient loadings cause excessive plant growth that accelerates eutrophication.
Fecal Coliform- Bacteria found in the wastes of warm blooded animals. Fecal coliform is used as an indicator that disease causing bacteria and viruses are present. It is a component of Total Coliform.
Floatables- Constituents of wastewater that rise to the surface in the settling process, consisting mainly of oil, grease, and plastics.
Grab Sample- An individual sample collected in a period of less than 15 minutes.
Gravity Facility- A combined sewer overflow facility that receives flows by gravity (descending gradients from source to outfall) and no pumping is required.
Grit- Heavy suspended mineral matter in wastewater like sand and gravel.
Grit Chamber- A detention tank were grit is separated by sedimentation (grit settles to the bottom). The settling is controlled by the velocity of the water.
Headwork- A structure where wastewater are screened out and grit and other solids are trapped before the wastewater is pumped to a treatment facility.
Human Health Criteria- Estimated concentrations or quantities of chemicals that can be expected to occur in the environment in water, sediment, or food and that are not likely to pose a significant risk to the exposed human population. Human health criteria are published under section 304(a) of the CWA and are based on the latest scientific information. This information is updated and issued to the states to serve as guidance for the development of criteria.
Hydrocarbons- Chemical compounds only containing hydrogen and carbon.
Hypochlorite- The chemical used for chlorine disinfection of wastewater (either calcium, sodium, or lithium).
Hypoxia- The state of very low oxygen concentration.
IDL- See Instrument Detection Limit.
I/I- Infiltration and Inflow.
Infiltration- Groundwater that enters sewer pipes through cracks.
Inflow- Water that enters sewer pipes through illegal connections and storm water runoff.
Inorganic- Not containing carbon.
Influent- Wastewater or other water going into treatment facility or process.

Instrument Detection Limit (IDL)- The smallest amount of a substance a particular instrument is capable of detecting. See Appendix I for a further explanation.
Interceptor- A large sewerage line collecting water from smaller sewerage pipes.
J values- Values between the Method Detection Limit and the Quantification (or Reporting) Limit. See Appendix I for further explanation.
LC50- See Lethal Concentration 50%
Lethal Concentration 50% (LC50)- The concentration of effluent in a sample that causes mortality to 50% of the test population at a specific tim of observation.
Limiting Nutrient- In a given ecosystem, the limiting nutritional factor that controls the growth of plants or animals. Usually the limiting nutrient for plant growth is nitrogen in the marine environment and phosphorus in the fresh water environment. The limiting nutrient can also be thought of as the specific nutrient that will have the most impact on a receiving body of water (for example, the acceleration eutrophication of fresh water bodies caused by phosphorus in wastewater effluent).
Local Limits- The development of specific limits as part of the General Pretreatment Program- "The permittee shall develop and enforce specific effluent limits for industrial users, and all other users, as appropriate, pursuant to 40 CFR 403.5."
LOEC- See Lowest Observed Effect Concentration
Lowest Observed Effect Concentration (LOEC)- The lowest concentration of effluent to which organisms are exposed in a life cycle or partial life-cycle test which contains an adverse effect (on survival, growth, and reproduction).
MATC- See Maximum Acceptable Toxicant Concentration
Maximum Acceptable Toxicant Concentration (MATC)- The effluent concentration that may be present in a receiving water without causing significant harm to productivity or other uses. The MATC is determined by the results of chronic tests of either a partial life-cycle with sensitive life stages or a full life-cycle of the test organism. The MATC is the geometric mean of the No Observed Effect Concentration and the Lowest Observed Effect Concentration.
Maximum Daily Discharge Limitation- The highest allowable daily discharge.
MBAS- See Methylene Blue Anion Surfactant
MDL- See Method Detection Limit
Metals- A group of priority pollutants. See Appendix J, Table J.2 for a complete list.
Method Detection Limit (MDL)- The smallest amount of a substance that can be detected above background noise by following a particular method of analysis. See Appendix I for a further explanation.
Methylene Blue Anion Surfactant- See Surfactant.
Mixing Zone- Area where discharged effluent is first diluted. The area is extended to cover the secondary mixing in the ambient water body. A mixing zone is an allocated impact zone where water quality criteria can be exceeded as long as toxic conditions are prevented.
National Pollutant Discharge Elimination System (NPDES)- The national program for issuing, modifying, revoking and reissuing, terminating, monitoring, and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, and 405 of the Clean Water Act (CWA). The term includes and "approved program."

Nine Minimum Controls- Part of the EPA's CSO Policy. The Nine Minimum Controls are:
1) Proper operation and regular maintenance (O&M) programs for the sewer system and combined sewer overflow points
2) Maximum use of the collection system for storage
3) Review and modification of the pretreatment programs to assure CSO impacts are minimized
4) Maximization of flow to the POTW for treatment
5) Prohibition of CSO discharges during dry weather
6) Control of solid and floatable materials in CSO discharges
7) Pollution prevention programs that focus on contaminant reduction activities
8) Public notification to ensure that the public receives adequate notification of CSO occurrences and CSO impacts, and
9) Monitoring to effectively characterize CSO impacts and the efficacy of CSO controls.

Nitrification- The conversion of ammonia and nitrite to nitrate.

NOAL- See No Observed Acute Level

NOEC- See No Observed Effect Concentration

No Observed Acute Level (NOAL)- The highest concentration of effluent to which organisms are exposed in a short-term test in which at least 90% of the test organisms survive.

No Observed Effect Concentration (NOEC)- The highest concentration of effluent to which organisms are exposed in a life cycle of partial life cycle test which contains no adverse effects (on growth, survival, and reproduction).

NPDES- See National Pollutant Discharge Elimination System

Nutrient- Any element or compound essential as raw material for organism growth and development. Examples- phosphorus and nitrogen.

Oil and Grease- Fats, oils, and grease from animal and plant derivation. Also called FOGs.

Organic Compounds- Volatiles, Acid Compounds, Base/Neutral, and Pesticides. Organics are listed in 40 CFR Ch. 1 Appendix D of CWA Section 307(a). See Appendix I, Table J.3 for a complete list.

Ortho-Phosphorus- A form of phosphorus, included in nutrients.

Outfall- the site of initial discharge

PAH- See Polynuclear Aromatic Hydrocarbon

Pesticides/PCBs- Subdivision of priority pollutants. See Appendix J, Table J.2 for a complete list.

Petroleum Hydrocarbon (PHC)- Oil and grease from petroleum derivation.

pH- The negative log of the hydrogen ion concentration used to express acidity (<7) and alkalinity (>7).

PHC- See Petroleum Hydrocarbon.

Pollutant- Dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemicals wastes, biological materials, radioactive materials, (except those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. §2011 et seq.)), heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water. It does not mean: (a) Sewage from vessels; or (b) Water, gas, or other material which is injected into a well to facilitate production of oil or gas, or water derived in association with oil and gas production and disposed or in a well, if the well used either to facilitate production or for disposal purposes is approved by authority of the State in which the well is located, and if the State in which the well is located, and if the State determines that the injection or disposal will not result in the degradation of ground or surface water resources.

Polynuclear Aromatic Hydrocarbon (PAH)- A type of semivolatile organic. Also know as polycyclic aromatic hydrocarbon.
POTW- See Publicly Owned Treatment Works
Preaeration- The process by which air is added to primary influent to help in the removal of gases, addition of oxygen, flotation of grease, and in the settling or coagulation of wastewater.
Prechlorination- The addition of chlorine to primary influent at or near the beginning of the treatment facility/process.
Primary Settling- The detention of wastewater as part of primary treatment to settle out solids (sludge) and collect floatables (scum).
Primary Treatment- Screening and settling of wastewater.
Priority Pollutants- Refers to some of the chemicals listed in 40 CFR Ch. 1 Appendix D under Section 307(a) of the CWA. There are 65 compounds and families of compounds that are among the most persistent, prevalent, and toxic of chemicals know to man. These 65 compounds or families of compounds have been translated into 126 individual pollutants. See Appendix J, Table J.2 for a the complete list.
Priority Pollutant Scan- A series of chemical analyses to identify the presence of priority pollutants.
Publicly Owned Treatment Works (POTW)- Any facility or system used in the treatment (including recycling and reclamation) of municipal sewage or industrial wastes of liquid nature that is owned by a "State" or "municipality." This definition includes sewers, pipes,or other conveyances only if they convey wastewater to a POTW providing treatment.
Pumping Station- Structures where wastewater from low lying areas is pumped.
Quantification Limit- See Reporting Limit.
Reporting Limit- The smallest concentration that can be quantified. On a graph of pollutant concentration versus instrument response, the reporting limit is the smallest concentration where the linear relationship holds before starting to curve as the pollutant concentration goes to zero. Also called the Quantification Limit. See Appendix I for a further explanation.
Residuals- Matter left over by treatment processes including screenings, scum, and sludge.
Screening- The process by which sewage from interceptors first goes through headworks where grit and large objects like leaves, sticks, and hygiene products (like tampon applicators and condoms) are screened out.
Screenings- The objects that are collected by the process of screening.
Scum- Solids that float to the top of wastewater.
Secondary Treatment- The treatment of wastewater beyond solids and grit removal. The process decreases the organic load.
Sedimentation- The process by which solids are a allowed to settle by gravity.
Sedimentation Tank- Tanks used to detain wastewater while the solids settle out.
Semi Volatile Organics- Also known as Acid Base Neutrals (ABNs). A subcategory of organic pollutants. See Appendix J, Table J.3 for a complete list.
Separate Sewer- A sewerage system divided into a storm sewer and a sanitary sewer.
Settleable Solids- The estimated amount of sludge that will settle by sedimentation. It is a fraction of the suspended-solids.
Settled Solids- Sludge. See sludge.
Sewage- Any wastes, including wastes from humans, households, commercial establishments, industries, and storm water runoff, that are discharged to or otherwise enter a POTW.

Sludge- Solids, residues, and precipitate separated from or created in sewage by the unit processes of a POTW.
SOPs- See System Optimization Plans or Standard Operating Procedures
Stratification- The separation of water into layers characterized by thermal differences.
Standard Operating Procedures- Documented protocols for plant operation, laboratory procedures, etc.
Surcharging- When the capacity of the sewer is insufficient and sewage escapes through a manhole.
Surfactant- Surface-active agent. Large organic molecules that cause foaming. They are usually found in detergents.
System Optimization Plans (SOPs)- Hydraulic improvements that, in conjunction with ongoing programs of municipal sewerage agencies, might promote a balanced hydraulic system, including optimization of the collector/interceptor system upstream of regulators, to ensure that the storage and transport capacity of the system is maximized within constraints unalterable except for major structural modifications.
Thickeners- The structure where sludge is sent to be thickened by removing water.
TKN- See Total Kjeldahl Nitrogen.
Total Coliform- Bacteria found in decaying matter, feces, and soil. It used as an indicator of pathogens that are present in wastewater. A component of Total Coliform is Fecal Coliform.
Total Kjeldahl Nitrogen (TKN)- The total organic and ammonia nitrogen.
Total Phosphorus- A measure of all the forms of phosphorus, a nutrient, found in water (orthophosphates, polyphosphates, and organic phosphates).
Total Suspended Solids (TSS)- The sum of insoluble solids that either float on the surface of, or are in suspension in water, wastewater, or other liquids.
Toxic Pollutant- Any pollutant listed as toxic in Appendix D of 40 CFR Part 122, under Section 307(a)(1) of CWA.
Toxics- Pollutants that have a toxic effect on living organisms. The CWA Section 307(a) "priority pollutants" are a subset of this group of pollutants.
Toxicity Test- A procedure to determine the toxicity of a chemical or an effluent using living organisms. A toxicity test measures the degree of effect on exposed test organisms of a specific chemical or effluent.
TSS- See Total Suspended Solids.
Twelve Month Running Average- The monthly average computed using the specific month AND the previous 11 months.
Unregulated Community- Dischargers not required to have Permits to discharge into MWRA sewerage system. They are not regulated or required to meet Local Limits, nor are they regulated under the Local Limits Discharge Program.
Vertical Mixing- The vertical movement of the water column caused by either wind, and/or density and/or temperature differences.
VOA- See Volatile Organic Acid. Same as Volatile Organic Compound (VOC).
VOC- See Volatile Organic Compound
Volatile Organic Compound (VOC)- Same as Volatile Organic Acid (VOA).
Volatile Solids- Those solids of a suspended solid sample that are burned off in a muffle oven at 550 ±50° C.
Water Quality- The chemical, biological, and physical conditions of a body of water.
Water Quality Criteria- Specific levels of pollutants that would make a body of water unsuitable for its designated use (i.e. harmful if used for drinking, swimming, farming, fishing, or industrial processes).

Water Quality Standard- A law or regulation that consists of: the beneficial designated use or uses of a water body; the numeric and narrative water quality criteria that are necessary to protect the use or uses of that particular water body; and an antidegradation statement.

WET- See Whole-Effluent Toxicity

Whole-Effluent Toxicity (WET)- The total toxic effect of effluent, not chemical specific but rather the cumulative effect - whether it be synergic or antagonsitic, of the chemicals found in the effluent.

ABBREVIATIONS, ACRONYMS, AND UNITS

Abbreviations, Acronyms

ABNs- Acids Bases Neutrals
BDL- Below Detection Limit
BOD- Biochemical Oxygen Demand
BWSC- Boston Water and Sewer Commission
CFR- Code of Federal Regulations
CSO- Combined Sewer Overflow
CWA- Clean Water Act
DEP- Department of Environmental Protection
DI- Deer Island
ENQUAD- Environmental Quality Department
EPA- Environmental Protection Agency
FY- Fiscal Year
IDL- Instrument Detection Level
I/I- Infiltration and Inflow
LC50- Median Lethal Concentration
LD50- Median Lethal Dose
LOAEL- Lowest Observed Adverse Effect Level
LOEC- Lowest Observed Effect Concentration
MATC- Maximum Acceptable Toxicant Concentration
MDC- Metropolitan District Commission
MDL- Method Detection Limit
MPN- Most Probable Number
MWRA- Massachusetts Water Resources Authority
NI- Nut Island
NOAL- No Observed Acute Level
NOEC- No Obeserved Effect Concentration
NPDES- National Pollutant Discharge Elimination System
PAH- Polycyclic (or Polynuclear) Aromatic Hydrocarbon
PCB- Polychlorinated Biphenyl
PHC- Petroleum Hydrocarbon
POTW- Publicly Owned Treatment Works
SD- Standard Deviation
SOP- Standard Operating Procedure or System Optimization Plan (CSO)
TKN- Total Kjeldahl Nitrogen
TRAC- Toxic Reduction and Control Department
TSS- Total Suspended Solids
VOA- Volatile Organic Acid
VOC- Volatile Organic Compound
WET- Whole Effluent Toxicity Test

Units

in/yr- Inches per year
L- Liter
lbs- pounds
lbs/day- pounds per day
mL/L- milliliters per liter
MG- Million Gallons
MGD- Million Gallons per Day
mg/L- milligrams per liter
ug/L- micrograms per liter

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