CHAPTER 2

EFFLUENT QUALITY

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INTRODUCTION

The goal of the Hyperion Treatment Plant (HTP) effluent monitoring program is to characterize the physical and chemical properties of treated wastewater discharged into Santa Monica Bay. The effluent monitoring data, in conjunction with receiving water monitoring data, are used to assess the effects of effluent on the physical, chemical, and biological aspects of the receiving waters. HTP's National Pollutant Discharge Elimination System (NPDES) Permit provides guidelines, referred to as Ocean Discharge Criteria, to prohibit discharges of chemicals that could cause degradation of the local marine environment and marine recreational areas.

HTP has a design capacity of 450 million gallons per day (MGD), and receives wastewater from the Los Angeles area and excess flow from the San Fernando Valley. The plant also receives solids from the primary and secondary treatment processes of the Donald C. Tillman and Los Angeles-Glendale Water Reclamation Plants. The solids from these upstream plants are discharged into sewer lines transporting wastewater to HTP. Most of the sewage treated at Hyperion is from domestic sources. Approximately, 21% of the wastewater flow is from industrial/ commercial discharges.

From January 2005 through December 2006, HTP discharged an average of 324 MGD of treated wastewater into Santa Monica Bay through the 5-Mile Outfall. The effluent released received complete secondary treatment. Beginning in November 1998, 100% of HTP's effluent underwent full secondary treatment. Prior to 1998, HTP discharged a mixture of advanced primary treated effluent and secondary treated effluent. Due to the design of the diffuser at the terminus of the 5-Mile Outfall, the effluent is diluted a minimum of 84:1 in the zone of initial dilution (ZID).

This chapter reports the concentrations of the HTP effluent constituents from January 2005 through December 2006 and summarizes trends in effluent quality from 1986 to 2006. It should be noted that some of the historical reporting periods shown in this chapter cover fiscal year data, while the recent reporting periods summarize calendar years. Table 2-1 lists constituents measured in the HTP effluent under the current NPDES effluent monitoring program, which became effective on May 14, 2005. Data for this reporting period is divided into separate tables for each year when necessary. Due to two NPDES permits being effective during this reporting period, some data for 2005 are presented in two tables – data preceding January 1, 2005 to May 14, 2005 (Table 2-2a-1) and data from May 14, 2005 to December 31, 2005 (Table 2-2a-2). Compounds listed in Tables 2-2a-1, 2-2a-2, and 2-2b are grouped into three categories: 1) conventional constituents and nutrients, 2) inorganic priority pollutants, and 3) organic priority pollutants.

Data pertaining to residual chlorine, radioactivity, effluent toxicity, and other constituents are discussed individually. All of these categories are discussed below in terms of contaminants found and their concentrations in effluent relative to current NPDES permit limits and Ocean Plan water quality objectives (SWRCB 1990).

MATERIALS AND METHODS

SAMPLE COLLECTION

Representative 5-Mile Outfall effluent samples were collected from the effluent pumping plant wet-well. During the period from January 2005 through December 2006, the Hyperion Treatment Plant received influent from the five outfall sewers: North, North Central, Central, Coastal Water Interceptor, and North Outfall Replacement (NOS, NCOS, COS, CWIS, and NORS, respectively). Representative influent samples from these sewer outfalls were collected at sampling points located upstream of any in-plant return flows. Influent samples were collected with programmed automatic samplers and the effluent was collected manually.

With the exception of chlorine, cyanide, dissolved oxygen, oil and grease (O&G), pH, settleable solids, and volatile organic compounds (VOC's), analyses of the remaining constituents listed in Tables 2-1, 2-2a-1, 2-2a-2, and 2-2b were performed on 24-hr composite samples. The 5-Mile Outfall effluent samples were collected hourly; whereas, influent samples were collected at varying time intervals in proportion to the flow. The hourly effluent samples were manually composited in proportion to established diurnal flow data of the daily 24-hour collection period. In the event of an autosampler malfunction, bi-hourly influent samples were collected and composited manually in proportion to flow.

Cyanide analyses were performed on grab samples collected at peak loading hours. Peak loading hours were based on previous diurnal studies.

One weekly grab sample was collected at peak flow for O&G analyses. Similarly, the quarterly samples for VOC analyses were also collected at peak flow. This is a change from the previous permit monitoring program, where these analytes were determined from three grab samples collected at eight-hour intervals with the middle grab at effluent peak flow. The previous NPDES permit required a convention to factor in the flow of those portions into the analysis to determine the final concentration.

Samples for O&G and organics analyses were collected in glass bottles. Samples for VOC's were collected in amber glass vials with Teflon® lined screw caps, and with no headspace remaining after collection. All other samples were collected in plastic bottles. Samples were preserved and stored as detailed in Standard Methods (APHA, 1998).

LABORATORY ANALYSIS

All samples were analyzed according to Environmental Laboratory Accreditation Program (ELAP) approved procedures while under ELAP accreditation. Specific methods used for individual analyte measurements are listed in Table 2-1.

DATA ANALYSIS

Data reduction methods providing more information than in past reports were included for this reporting period. In prior reports, results less than the Method Detection Limit (MDL) were listed as Not Detected (ND) and a value of zero was used in calculating the average. This convention remains. Estimated values for results greater than the MDL but less than the Practical Quantitation Level (PQL) [for the NPDES Permit that expired May 13, 2005], or Minimum Level (ML) [for the NPDES Permit that went into effect on May 14, 2005], were included in the average, and were reported as Detected Not Quantified (DNQ). Annual averages were taken from values above the detection limit of the method. If a calculated average resulted in a value less than the MDL, then that average became ND.

If a constituent's MDL changed during the period, the MDL that was most prevalent was used. If there was no prevalence, then the lowest MDL was applied. For data of samples of the new permit (after May 14, 2005) the following convention from the permit is used: "when one or more sample results are reported as 'not detected (ND)' or 'Detected Not Quantified (DNQ)', the median value of these samples will be used for compliance determination. If, in an even number of samples, one or both of the middle values is ND or DNQ, the median will be the lower of the two middle values". This convention is applied to data in Tables 2-2a-1, 2-2a-2, 2-2b, 2-4a and 2-4b.

Influent and effluent monitoring data for the 2005 and 2006 calendar years were averaged individually. Key metals in Table 2-5 are averaged for the two-year reporting period. It should be noted that the metals data represented in Figures 2-2 and 2-3 are fiscal year averages (i.e., July through June).

RESULTS AND DISCUSSION

CONVENTIONAL CONSTITUENTS AND NUTRIENTS

TSS, BOD, O&G, and Settleable Solids

The main objective in the treatment of wastewater is the removal of suspended and floatable materials and the treatment of biodegradable organics (Metcalf & Eddy 1979). The discharge of materials with high total suspended solids (TSS), biochemical oxygen demand (BOD), and O&G can cause degradation of the receiving environment through eutrophication and the introduction of toxic materials (Morel and Schiff 1983; p. 103).

HTP discharge limits for TSS, BOD, and O&G are 30, 30, and 25 mg/L, respectively. Since November 23, 1998, when Hyperion went to full secondary treatment, all the NPDES Permit limits for TSS, BOD, and O&G have been met.

The quality of HTP's effluent has been well within the interim NPDES limits for TSS and O&G (set at 60 mg/L and 25 mg/L, respectively) since 1986 and for BOD (set at 175 mg/L) since 1987. Additionally, Hyperion's effluent has been well within the current NPDES limits for TSS, O&G, and BOD since the completion of the secondary treatment expansion in November, 1998 (Figure 2-1). The trend of improved effluent quality resulted from implementation of a series of projects under the Hyperion Interim Improvement Program (HIIP). HIIP was conceived in early 1986 in an effort to produce the highest quality effluent possible until full secondary treatment came on-line in 1998. Under the program, the plant achieved an average of approximately 91% removal of TSS and 75% removal of BOD. Further immediate reductions in BOD, TSS, and O&G were seen in December 1998 due to the switch to full secondary treatment in November (Figure 2-1).

Table 2-3 illustrates average concentrations of TSS, BOD, O&G, and settleable solids in the plant's influent and effluent during January 2005 through December 2006. During this period, removal efficiencies for these constituents were consistently high. On average, approximately 94% of TSS, 94% of BOD, >99% of O&G, and >99% of settleable solids were removed from the wastewater treated at HTP.

During the period from January 2005 to December 2006, TSS, BOD, O&G, and settleable solids averaged approximately 22, 20, <3 mg/L, and <0.1 mL/L, respectively, in the 5-Mile effluent (Table 2-3). The performance averages of the last reporting period, January 2003 through December 2004, were 19.5, 18, <3 mg/L, and <0.1 mL/L, respectively. Concentrations of three of these four constituents were consistently well below the NPDES permit limits (Table 2-2a-1, Table 2-2a-2, Table 2-2b) for full secondary treatment, the exception is a settleable solids excursion, discussed under the "Summary of Non-Compliance".

Effluent settleable solids concentrations averaged <0.1 mL/L during the years 2005 and 2006.

Table 2-1. Constituents measured in the current 5-Mile Outfall effluent monitoring program, effective May 14, 2005.

Constituent	Units of Analysis	Frequency of Analysis	Sample Type	Method*
Flow	MGD	continuous	recorder/totalizer	
BOD	mg/L	daily	24-hour composite	5210B
Suspended Solids	mg/L	daily	24-hour composite	2540D
pH	pH units	weekly	grab sample	4500-H+ B
Oil & Grease	mg/L	weekly	grab sample	EPA 1664A
Temperature	°C	continuous	continuous	
Total Organic Carbon	mg/L	monthly	24-hour composite	5310B
Settleable Solids	mL/L	daily	grab sample	2540F
Total Chlorine Residual	μg/L	daily	grab sample	4500-Cl G
Dissolved Oxygen	mg/L	weekly	grab	4500-O G
Turbidity	NTU	weekly	24-hour composite	2130B
Ammonia-Nitrogen	mg/L	monthly	24-hour composite	EPA 350.1
Toxicity Concentration (Acute)	TU_a	monthly	24-hour composite	**
Toxicity Concentration (Chronic)	TU_c	monthly	24-hour composite	**
Cyanide	μg/L	monthly	grab	EPA 335.4
Nitrate-Nitrogen	mg/L	quarterly	24-hour composite	EPA 300.0
Organic-Nitrogen	mg/L	quarterly	24-hour composite	EPA 351.2
Radioactivity	pCi/L	monthly	24-hour composite	EPA 900.0
Total Phosphorus (as P)	μg/L	quarterly	24-hour composite	4500-P E
Tributyltin	ng/L	quarterly	24-hour composite	KRONE 1989
Arsenic	μg/L	monthly	24-hour composite	3114
Cadmium	μg/L	monthly	24-hour composite	EPA 200.8,EPA 200.7
Chromium (hexavalent)	μg/L	monthly	24-hour composite	3500-Cr D (SM 18th Edition)
Chromium (total)	μg/L	quarterly	24-hour composite	EPA 200.8, EPA 200.7
Copper	μg/L	monthly	24-hour composite	EPA 200.8, EPA 200.7
Lead	μg/L	monthly	24-hour composite	EPA 200.8, EPA 200.7
Mercury	μg/L	monthly	24-hour composite	3112
Nickel	μg/L	monthly	24-hour composite	EPA 200.8, EPA 200.7
Selenium	μg/L	monthly	24-hour composite	3114
Silver	μg/L	monthly	24-hour composite	EPA 200.8
Zinc	μg/L	monthly	24-hour composite	EPA 200.8, EPA 200.7
Antimony	μg/L	quarterly	24-hour composite	EPA 200.8
Beryllium	μg/L	quarterly	24-hour composite	EPA 200.7
Thallium	μg/L	quarterly	24-hour composite	EPA 200.8
Phenolic Compounds (non-chlorinated)	μg/L	quarterly	24-hour composite	EPA 625
Chlorinated Phenolics	μg/L	quarterly	24-hour composite	EPA 625
Aldrin and Dieldrin	μg/L	quarterly	24-hour composite	EPA 608
Chlordane and Related compounds	μg/L	quarterly	24-hour composite	EPA 608
DDT and Derivatives	μg/L	quarterly	24-hour composite	EPA 608
Endrin	μg/L	quarterly	24-hour composite	EPA 608
HCH's	μg/L	quarterly	24-hour composite	EPA 608
PCB's	μg/L	quarterly	24-hour composite	EPA 608
PCB congeners	μg/L	annually	24-hour composite	EPA 8082
Toxaphene	μg/L	quarterly	24-hour composite	EPA 608
Methyl-tert-butyl-ether	μg/L	quarterly	24-hour composite	EPA 624
PAH's	μg/L	quarterly	24-hour composite	EPA 625
Detected Priority Pollutants				
Volatiles	μg/L	quarterly	grab samples	EPA 624
Others	μg/L	quarterly	24-hour composite	***
Remaining Priority Pollutants				
Volatiles	μg/L	quarterly	grab samples	EPA 624
Others	μg/L	quarterly	24-hour composite	***

* All methods are from Standard Methods, 20th Edition (APHA 1998) unless otherwise specified.
EPA Methods are: 200.7 (EPA 1994), 200.8 (EPA 1994), 300.0 (EPA 1993), 335.4 (EPA 1993), 351.2 (EPA 1993), 608 (EPA 1984), 624 (EPA 1984), 625 (EPA 1984), 1664A (EPA 1999), 8082 (EPA 1996), 900.0 (EPA 1980).

** Acute toxicity is measured as described under EPA/821/R/02/012 (EPA 2002). Chronic toxicity is measured using EPA method 600/R-95/136 (EPA 1995).

*** Chlorinated pesticides and base/neutral/acid extractable compounds are analyzed by EPA Method 608 and 625, respectively.

Figure 2-1. Average concentrations of total suspended solids, biochemical oxygen demand, and oil and grease in 5-Mile Outfall effluent from reporting years 1986-87 through 2005-06.

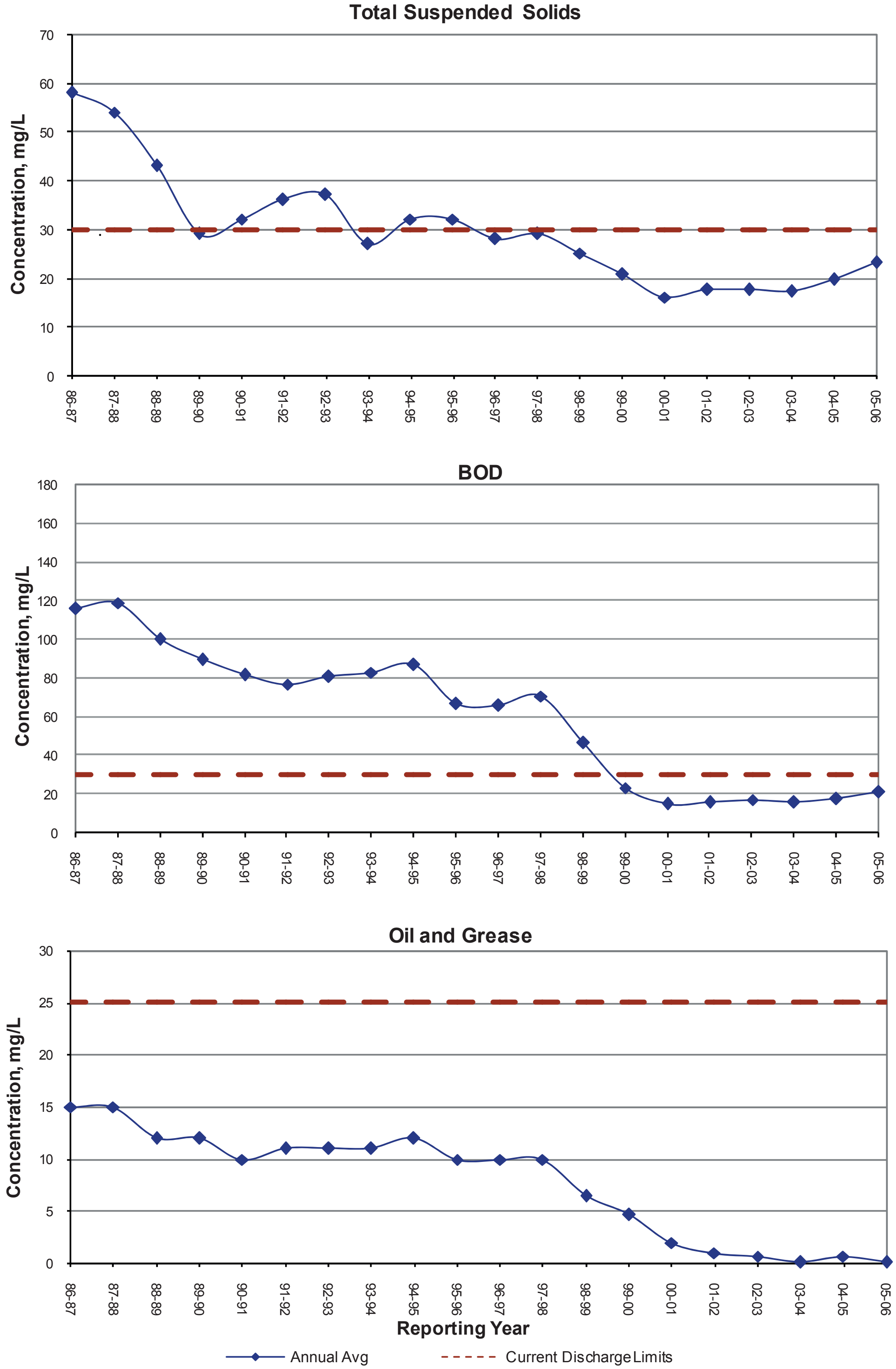
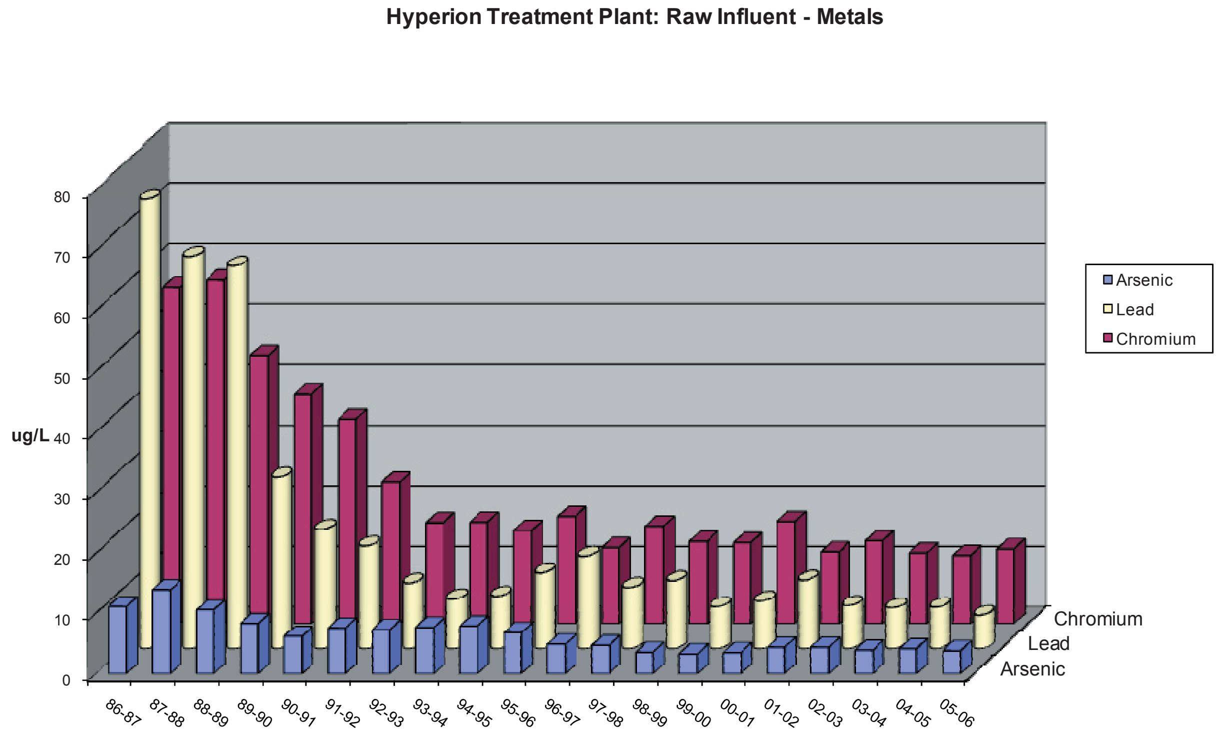


Figure 2-2. Concentrations of arsenic, chromium, and lead in plant influent and 5-Mile Outfall effluent for reporting years 1986-87 through 2005-06.



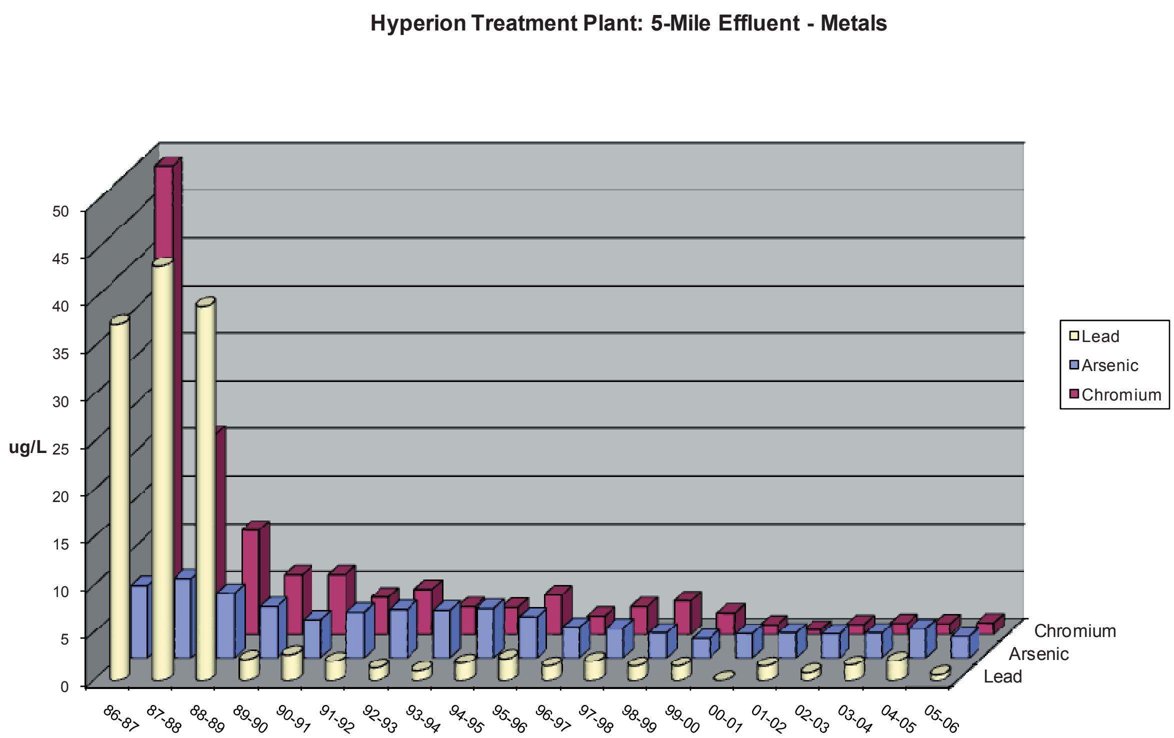
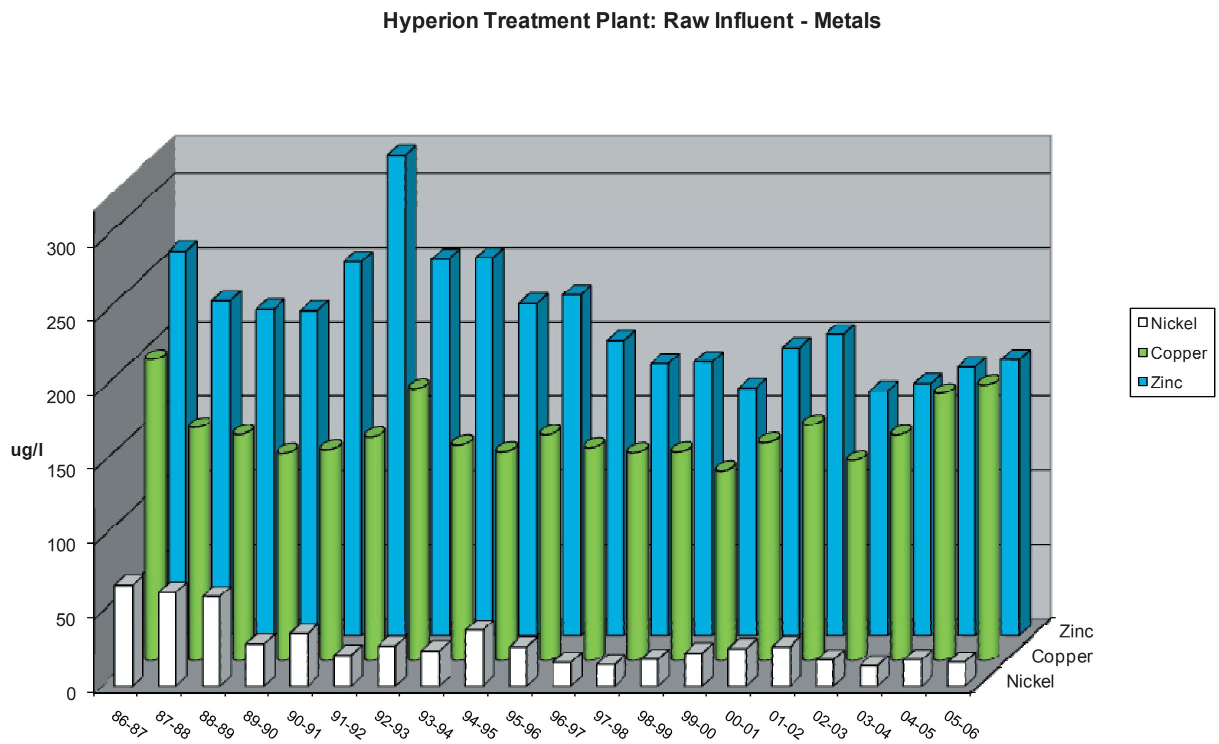


Figure 2-3. Concentrations of nickel, copper, and zinc in plant influent and 5-Mile Outfall effluent for reporting years 1986-87 through 2005-06.



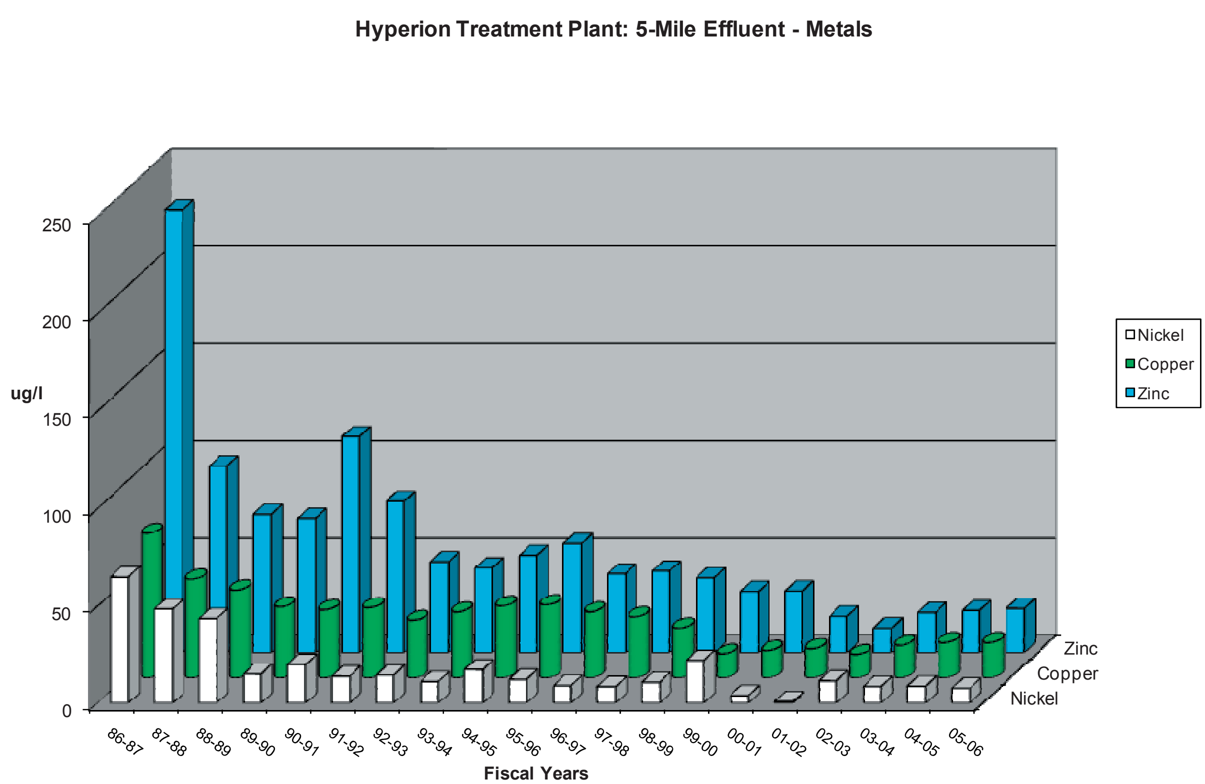


Table 2-2a-1. Annual averages, maximum and minimum concentrations of conventional constituents and other pollutants in the 5-Mile Outfall effluent (January 2005 through May 13, 2005). All concentrations are reported in μg/L unless otherwise noted.

Constituents	Current NPDES Limits[a]	Concentrations in 5-Mile Effluent Avg.	Max.	Min.	Concentrations After Initial Dilution[b] Avg.	Max.	Min.	CA Ocean Plan (ug/L) Objectives[c, j]
CONVENTIONAL CONSTITUENTS AND NUTRIENTS								
Total Suspended Solids (mg/L)	30	18	35	11	0.21	0.39	0.13	
Biochemical Oxygen Demand (mg/L)	30	17	26	8	0.20	0.31	0.09	
Oil & Grease (mg/L)	25	ND	6	ND	ND	0.07	ND	25
Settleable Solids (mL/L)	1.0	0.24	30	ND	0.003	0.35	ND	1.0
Total Organic Carbon (mg/L)	NL	18.4	21.2	14.3	0.22	0.25	0.17	
Phosphorus (Total) (mg/L)	NL	2.5	3.1	2.1	0.030	0.036	0.025	
Ammonia-Nitrogen (mg/L)	51	34.2	38.7	28.1	0.40	0.46	0.33	0.6
Organic-Nitrogen (mg/L)	NL	3.7	4.1	3.4	0.044	0.048	0.040	
Nitrate-Nitrogen (mg/L)	NL	0.03	0.04	0.02	0.00035	0.00047	0.00024	
Turbidity (NTU)	75	9	12.1	4.7	0.099	0.14	0.055	75
pH	6.0-9.0	6.9	7.2	6.7	d	d	d	
PRIORITY POLLUTANT INORGANICS (ug/L):								
Antimony	NL	1.33	1.85	0.8	0.016	0.022	0.0094	1200
Arsenic	12	2.68	3.5	DNQ(1.7)	0.032	0.041	DNQ(0.020)	8
Beryllium	2.8	ND	ND	ND	ND	ND	ND	0.033
Cadmium	21	ND	ND	ND	ND	ND	ND	1
Chromium (hexavalent)[e]	113	ND	ND	ND	ND	ND	ND	2
Chromium (total)[f]	NL	DNQ(0.9)	1.0	DNQ(0.8)	DNQ(0.011)	0.012	DNQ(0.009)	190000
Copper	87	DNQ(19)	DNQ(22)	DNQ(18)	DNQ(0.22)	DNQ(0.26)	DNQ(0.21)	3
Lead	101	DNQ(1)	DNQ(3)	ND	DNQ(0.01)	DNQ(0.04)	ND	2
Mercury	1.1	ND	DNQ(0.036)	ND	ND	DNQ(4X10^{-4})	ND	
Nickel	113	DNQ(10)	14	DNQ(5)	DNQ(0.12)	0.16	0.06	5
Selenium	1275	DNQ(1.5)	2.6	DNQ(0.9)	DNQ(0.018)	0.031	DNQ(0.011)	15
Silver	26	1.34	1.90	0.73	0.016	0.022	0.009	0.7
Thallium	1190	1.29	1.86	0.72	0.015	0.022	0.008	2
Zinc	346	DNQ(23)	DNQ(25)	DNQ(21)	DNQ(0.270)	DNQ(0.294)	DNQ(0.247)	20
Tributyltin (ng/L) *	119	6.2	12.3	ND	0.073	0.145	ND	1.4
Cyanide	85	ND	DNQ(5)	ND	ND	DNQ(0.06)	ND	1
PRIORITY POLLUTANT ORGANICS:								
PESTICIDES:								
Aldrin	0.002	ND	ND	ND	ND	ND	ND	0.022 ng/L
Dieldrin	0.004	ND	ND	ND	ND	ND	ND	0.040 ng/L
Endrin	0.170	ND	ND	ND	ND	ND	ND	0.002
Toxaphene	0.018	ND	ND	ND	ND	ND	ND	0.210 ng/L
DDT & Derivates (ng/L)	14	ND	ND	ND	ND	ND	ND	0.17
HCH's	0.340	ND	ND	ND	ND	ND	ND	0.004
Endosulfan	0.765	ND	ND	ND	ND	ND	ND	0.009
PCB's	0.002	ND	ND	ND	ND	ND	ND	0.019 ng/L
Chlordane & Related Compounds	0.0019	ND	ND	ND	ND	ND	ND	0.023 ng/L
Heptachlor [g]	0.061	ND	ND	ND	ND	ND	ND	0.05 ng/L
Heptachlor Epoxide	NL	ND	ND	ND	ND	ND	ND	0.02 ng/L
VOLATILE ORGANIC COMPOUNDS:								
Acrolein	18700	ND	ND	ND	ND	ND	ND	220
Acrylonitrile	9	ND	ND	ND	ND	ND	ND	0.10
Benzene	NL	ND	ND	ND	ND	ND	ND	5.9
Halomethanes	NL	2.33	3.96	0.70	0.027	0.047	0.008	130
Carbon tetrachloride	76	ND	ND	ND	ND	ND	ND	0.9
Chlorobenzene	NL	ND	ND	ND	ND	ND	ND	570
Chloroform	NL	5.52	6.50	4.54	0.065	0.076	0.053	130

Table 2-2a-1. Continued.

Constituents	Current NPDES Limits[a]	Concentrations in 5-Mile Effluent Avg.	Max.	Min.	Concentrations After Initial Dilution[b] Avg.	Max.	Min.	CA Ocean Plan (ug/L) Objectives[c,j]
Vinyl Chloride	NL	ND	ND	ND	ND	ND	ND	36
1,3-Dichloropropene	NL	ND	ND	ND	ND	ND	ND	8.9
Ethylbenzene	NL	ND	ND	ND	ND	ND	ND	4100
Methylene chloride	NL	2.46	3.18	1.74	0.029	0.037	0.020	450
1,1,2,2-Tetrachloroethane	NL	ND	ND	ND	ND	ND	ND	2.3
Tetrachloroethene	NL	5.72	10.4	1.03	0.067	0.122	0.012	2.0
Toluene	NL	ND	ND	ND	ND	ND	ND	85000
1,1,1-Trichloroethane	NL	ND	ND	ND	ND	ND	ND	540000
1,1,2-Trichloroethane	NL	ND	ND	ND	ND	ND	ND	9.4
Trichloroethene	NL	ND	ND	ND	ND	ND	ND	27
1,1-Dichloroethylene	NL	ND	ND	ND	ND	ND	ND	0.9
1,2-Dichloroethane	NL	ND	ND	ND	ND	ND	ND	28
Dichlorobromomethane	NL	1.16	1.62	0.70	0.014	0.019	0.008	6.2
Chlorodibromomethane	NL	1.17	2.34	ND	0.014	0.027	ND	8.6
ACID EXTRACTABLE COMPOUNDS:								
Non-Chlorinated Phenolic Compounds	NL	ND	ND	ND	ND	ND	ND	30
2,4-Dinitrophenol	340	ND	ND	ND	ND	ND	ND	4.0
4,6-Dinitro-2-Methyl Phenol	NL	ND	ND	ND	ND	ND	ND	220
Chlorinated Phenolic Compounds	85	ND	ND	ND	ND	ND	ND	1
2,4,6-Trichlorophenol	25	ND	ND	ND	ND	ND	ND	0.29
BASE AND NEUTRAL EXTRACTABLE COMPOUNDS:								
PAHs	0.748	ND	ND	ND	ND	ND	ND	8.8 ng/L
Fluoranthene	1270	ND	ND	ND	ND	ND	ND	15
Benzidine	0.006	ND	ND	ND	ND	ND	ND	0.069 ng/L
Bis (2-chloroethyl) ether	4	ND	ND	ND	ND	ND	ND	0.045
Bis (2-chloroethoxy) methane	374	ND	ND	ND	ND	ND	ND	4.4
Bis (2-chloroisopropyl) ether	NL	ND	ND	ND	ND	ND	ND	1200
Bis (2-ethylhexyl) phthalate	297	1.8	2.1	DNQ(1.4)	0.021	0.025	DNQ(0.016)	3.5
Di-n-butyl phthalate	NL	DNQ(0.23)	DNQ(0.27)	DNQ(0.19)	DNQ(0.003)	DNQ(0.003)	DNQ(0.002)	3500
1,4-Dichlorobenzene	NL	1.18	2.36	ND	0.014	0.028	ND	18
3,3-Dichlorobenzidine	0.688	ND	ND	ND	ND	ND	ND	0.0081
Diethyl phthalate	NL	DNQ(0.34)	DNQ(0.55)	DNQ(0.13)	DNQ(0.006)	DNQ(0.006)	DNQ(0.002)	33000
Dimethyl phthalate	NL	ND	ND	ND	ND	ND	ND	820000
2,4-Dinitrotoluene	221	ND	ND	ND	ND	ND	ND	2.6
Hexachlorobenzene	0.018	ND	ND	ND	ND	ND	ND	0.21 ng/L
Hexachlorobutadiene	NL	ND	ND	ND	ND	ND	ND	14
Hexachlorocyclopentadiene	4930	ND	ND	ND	ND	ND	ND	58
Isophorone	NL	ND	ND	ND	ND	ND	ND	730
Nitrobenzene	416	ND	ND	ND	ND	ND	ND	4.9
N-Nitrosodimethylamine	620	ND	ND	ND	ND	ND	ND	7.3
N-Nitrosodiphenylamine	212	ND	ND	ND	ND	ND	ND	2.5
N-Nitrosodi-N-propylamine	NL	ND	ND	ND	ND	ND	ND	0.38
Hexachloroethane	212	ND	ND	ND	ND	ND	ND	2.5
1,2-Diphenylhydrazine[h]	14	ND	ND	ND	ND	ND	ND	0.16
Dichlorobenzenes[i]	NL	ND	ND	ND	ND	ND	ND	5100
OTHERS:								
2,3,7,8-Dioxin (pg/L)* *	0.4	ND	ND	ND	ND	ND	ND	0.0039 pg/L
Residual Chlorine (mg/L)	0.17	ND	ND	ND	ND	ND	ND	0.002

a TSS, BOD, O&G, and settleable solids limit based on 30-day average concentration. All others are based on monthly average concentration.
b Calculated values based on a minimum initial dilution of 84 parts of seawater to 1 part effluent.
c For O&G and settleable solids based on 30-day avg. concentration. All others are based either on 30-day avg. or 6-month median.
d Not applicable: The concept of dilutions does not apply to pH measurements.
e Not listed as a priority pollutant.
f as Chromium (III)
g "Heptachlor" means the sum of heptachlor and heptachlor epoxide.
h as Azobenzene
i "Dichlorobenzenes" mean the sum of 1,2- and 1,3-dichlorobenzene
j Based on 6-month median and 30-day average limiting concentrations
* Tributyltin was analyzed by CRG Marine Laboratory, Torrance, CA.
** Dioxin is analyzed by Severn Trent Laboratories, Carol Stream, Ill.
NL = Not Listed; ND = Not Detected; DNQ=Detected but Not Quantified

Table 2-2a-2. Annual averages, maximum and minimum concentrations of conventional constituents and other pollutants in the 5-Mile Outfall effluent (May 14, 2005 through December 2005). All concentrations are reported in μg/L unless otherwise noted.

Constituents	Current NPDES Limits[a]	Concentrations in 5-Mile Effluent Avg.[c]	Max.	Min.	Concentrations After Initial Dilution[b] Avg.	Max.	Min.	CA Ocean Plan (ug/L) Objectives[j]
CONVENTIONAL CONSTITUENTS AND NUTRIENTS								
Total Suspended Solids (mg/L)	30	23	76	15	0.27	0.89	0.18	
Biochemical Oxygen Demand (mg/L)	30	21e	44	14	0.25e	0.52	0.16	
Oil & Grease (mg/L)	25	ND	ND	ND	ND	ND	ND	25
Settleable Solids (mL/L)	1.0	ND	0.9	ND	ND	0.01	ND	1.0
Total Organic Carbon (mg/L)	NL	20.5	23.2	17.5	0.24	0.27	0.21	
Phosphorus (Total) (mg/L)	NL	2.93	3.41	2.54	0.034	0.040	0.030	
Ammonia-Nitrogen (mg/L)	NL	35.6	37.1	33.7	0.42	0.44	0.40	0.6
Organic-Nitrogen (mg/L)	NL	4.1	4.1	4.0	0.048	0.048	0.047	
Nitrate-Nitrogen (mg/L)	NL	0.02	0.02	0.02	0.0002	0.0002	0.0002	
Turbidity (NTU)	75	10	28	8	0.12	0.33	0.09	75
pH	6.0-9.0	6.8	7.2	6.6	d	d	d	
PRIORITY POLLUTANT INORGANICS (ug/L):								
Antimony	NL	1.43	1.53	1.32	0.017	0.018	0.016	1200
Arsenic	NL	2.2	3.5	1.5	0.026	0.041	0.018	8
Beryllium	NL	ND	ND	ND	ND	ND	ND	0.033
Cadmium	NL	ND	0.3#	ND	ND	0.004#	ND	1
Chromium (hexavalent)[e]	NL	ND	ND	ND	ND	ND	ND	2
Chromium (total)[f]	NL	0.8#	1.4#	0.56#	0.009#	0.016#	0.007#	190000
Copper	NL	18	22	14	0.21	0.26	0.16#	3
Lead	NL	ND	1.4#	ND	ND	0.016#	ND	2
Mercury	NL	ND	0.022#	ND	ND	0.0003#	ND	0.04
Nickel	NL	7#	7.95	5#	0.082#	0.094	0.059#	5
Selenium	NL	1.0	1.2	0.6#	0.012	0.014	0.007#	15
Silver	NL	1.46	2.24	0.79	0.017	0.026	0.009	0.7
Thallium	NL	0.62#	2.04	0.62#	0.007#	0.024	0.007#	2
Zinc	NL	21	29	17#	0.25	0.34	0.2#	20
Tributyltin (ng/L) *	120	ND	ND	ND	ND	ND	ND	1.4
Cyanide	NL	ND	5#	ND	ND	0.06	ND	1
PRIORITY POLLUTANT ORGANICS:								
PESTICIDES:								
Aldrin	NL	ND	ND	ND	ND	ND	ND	0.022 ng/L
Dieldrin	NL	ND	ND	ND	ND	ND	ND	0.040 ng/L
Endrin	NL	ND	ND	ND	ND	ND	ND	0.002
Toxaphene	NL	ND	ND	ND	ND	ND	ND	0.210 ng/L
DDT & Derivates (ng/L)	14	0	0	0	0	0	0	0.17
HCH's	NL	0	0	0	0	0	0	0.004
Endosulfan	NL	0	0	0	0	0	0	0.009
PCB's	0.002	0	0	0	0	0	0	0.019 ng/L
Chlordane & Related Compounds	0.0019	0	0	0	0	0	0	0.023 ng/L
Heptachlor[g]	NL	0	0	0	0	0	0	0.05 ng/L
Heptachlor Epoxide	NL	ND	ND	ND	ND	ND	ND	0.02 ng/L
VOLATILE ORGANIC COMPOUNDS:								
Acrolein	NL	ND	ND	ND	ND	ND	ND	220
Acrylonitrile	NL	ND	ND	ND	ND	ND	ND	0.10
Benzene	NL	ND	ND	ND	ND	ND	ND	5.9
Halomethanes	NL	0	0	0	0	0	0	130
Carbon tetrachloride	NL	ND	ND	ND	ND	ND	ND	0.9
Chlorobenzene	NL	ND	ND	ND	ND	ND	ND	570
Chloroform	NL	6.92	8.65	5.90	0.081	0.10	0.69	130

Table 2-2a-2, continued.

Constituents	Current NPDES Limits[a]	Concentrations in 5-Mile Effluent Avg.[c]	Max.	Min.	Concentrations After Initial Dilution[b] Avg.	Max.	Min.	CA Ocean Plan (ug/L) Objectives[j]
Vinyl Chloride	NL	ND	ND	ND	ND	ND	ND	36
1,3-Dichloropropene	NL	0	0	0	0	0	0	8.9
Ethylbenzene	NL	ND	ND	ND	ND	ND	ND	4100
Methylene chloride	NL	3.76	6.49	2.13	0044	0.076	0.025	450
1,1,2,2-Tetrachloroethane	NL	ND	ND	ND	ND	ND	ND	2.3
Tetrachloroethene	NL	2.37	4.03	0.58#	0.028	0.047	0.007#	2.0
Toluene	NL	0.12#	0.43#	ND	0.001#	0.005#	ND	85000
1,1,1-Trichloroethane	NL	ND	ND	ND	ND	ND	ND	540000
1,1,2-Trichloroethane	NL	ND	ND	ND	ND	ND	ND	9.4
Trichloroethene	NL	ND	ND	ND	ND	ND	ND	27
1,1-Dichloroethylene	NL	ND	ND	ND	ND	ND	ND	0.9
1,2-Dichloroethane	NL	ND	ND	ND	ND	ND	ND	28
Dichlorobromomethane	NL	0.82#	0.97#	0.68#	0.01#	0.01#	0.01#	6.2
Chlorodibromomethane	NL	0.61#	0.67#	0.45#	0.01#	0.01#	0.01#	8.6
ACID EXTRACTABLE COMPOUNDS:								
Non-Chlorinated Phenolic Compounds	NL	0	0	0	0	0	0	30
2,4-Dinitrophenol	NL	ND	ND	ND	ND	ND	ND	4.0
4,6-Dinitro-2-Methyl Phenol	NL	ND	ND	ND	ND	ND	ND	220
Chlorinated Phenolic Compounds	NL	0	0	0	0	0	0	1
2,4,6-Trichlorophenol	NL	ND	ND	ND	ND	ND	ND	0.29
BASE AND NEUTRAL EXTRACTABLE COMPOUNDS:								
PAHs	0.748	0	0	0	0	0	0	8.8 ng/L
Fluoranthene	NL	ND	ND	ND	ND	ND	ND	15
Benzidine	NL	ND	ND	ND	ND	ND	ND	0.069 ng/L
Bis (2-chloroethyl) ether	NL	ND	ND	ND	ND	ND	ND	0.045
Bis (2-chloroethoxy) methane	NL	ND	ND	ND	ND	ND	ND	4.4
Bis (2-chloroisopropyl) ether	NL	ND	ND	ND	ND	ND	ND	1200
Bis (2-ethylhexyl) phthalate	NL	1.7#	1.8#	1.5#	0.02#	0.02#	0.02#	3.5
Di-n-butyl phthalate	NL	0.71#	0.98#	0.43#	0.01#	0.01#	0.01#	3500
1,4-Dichlorobenzene	NL	ND	2.03	ND	ND	0.024	ND	18
3,3-Dichlorobenzidine	NL	ND	ND	ND	ND	ND	ND	0.0081
Diethyl phthalate	NL	ND	1.55#	ND	ND	0.018#	ND	33000
Dimethyl phthalate	NL	ND	ND	ND	ND	ND	ND	820000
2,4-Dinitrotoluene	NL	ND	ND	ND	ND	ND	ND	2.6
Hexachlorobenzene	NL	ND	ND	ND	ND	ND	ND	0.21 ng/L
Hexachlorobutadiene	NL	ND	ND	ND	ND	ND	ND	14
Hexachlorocyclopentadiene	NL	ND	ND	ND	ND	ND	ND	58
Isophorone	NL	ND	0.3#	ND	ND	0.004#	ND	730
Nitrobenzene	NL	ND	ND	ND	ND	ND	ND	4.9
N-Nitrosodimethylamine	NL	ND	ND	ND	ND	ND	ND	7.3
N-Nitrosodiphenylamine	NL	ND	ND	ND	ND	ND	ND	2.5
N-Nitrosodi-N-propylamine	NL	ND	ND	ND	ND	ND	ND	0.38
Hexachloroethane	NL	ND	ND	ND	ND	ND	ND	2.5
1,2-Diphenylhydrazine[h]	NL	ND	ND	ND	ND	ND	ND	0.16
Dichlorobenzenes[i]	NL	0	0	0	0	0	0	5100
OTHERS:								
2,3,7,8-Dioxin (pg/L)**	0.33	0.1	0.2	0.1	0.001	0.002	0.001	0.0039 pg/L
Residual Chlorine (mg/L)	NL	ND	ND	ND	ND	ND	ND	0.002

a All are based on monthly average concentration.
b Calculated values based on a minimum initial dilution of 84 parts of seawater to 1 part effluent.
c The average indicates that the result is either average or median of more than one sample for the reporting period.
d Not applicable: The concept of dilutions does not apply to pH measurements.
e Not listed as a priority pollutant.
f as Chromium (III)
g "Heptachlor" means the sum of heptachlor and heptachlor epoxide.
h as Azobenzene
i "Dichlorobenzenes" mean the sum of 1,2- and 1,3-dichlorobenzene
j For O&G and settleable solids based on 30-day avg. concentration. All others based either on 30-day avg. or 6-month median.
* Tributyltin was analyzed by CRG Marine Laboratory, Torrance, CA.
** Dioxin is analyzed by Severn Trent Laboratories, Carol Stream, Ill.
NL = Not Listed; ND = Not Detected
\# = Detected but Not Quantified
A lower case "e" after a numerical value denotes the numerical value as an estimate.

Table 2-2b. Annual averages, maximum and minimum concentrations of conventional constituents and other pollutants in the 5-Mile Outfall effluent (January 2006 through December 2006). All concentrations are reported in µg/L unless otherwise noted.

Constituents	Current NPDES Limits[a]	Concentrations in 5-Mile Effluent Avg.[j]	Max.	Min.	Concentrations After Initial Dilution[b] Avg.	Max.	Min.	CA Ocean Plan (ug/L) Objectives[c]
CONVENTIONAL CONSTITUENTS AND NUTRIENTS								
Total Suspended Solids (mg/L)	30	22	37	11	0.26	0.44	0.13	
Biochemical Oxygen Demand (mg/L)	30	20e	30	10	0.24e	0.35	0.12	
Oil & Grease (mg/L)	25	ND	3	ND	ND	0.04	ND	25
Settleable Solids (mL/L)	1.0	ND	0.2	ND	ND	0.002	ND	1.0
Total Organic Carbon (mg/L)	NL	22.2	28.1	16.4	0.26	0.33	0.19	
Phosphorus (Total) (mg/L)	NL	3.10	3.59	2.61	0.036	0.042	0.031	
Ammonia-Nitrogen (mg/L)	NL	36.5	38.7	34.8	0.43	0.46	0.41	0.6
Organic-Nitrogen (mg/L)	NL	4.1	5.8	2.9	0.048	0.068	0.034	
Nitrate-Nitrogen (mg/L)	NL	ND	ND	ND	ND	ND	ND	
Turbidity (NTU)	75	11	19	5	0.13	0.22	0.06	75
pH	6.0-9.0	6.9	7.7	6.6	d	d	d	
PRIORITY POLLUTANT INORGANICS (ug/L):								
Antimony	NL	0.97#	1.02	0.88#	0.01#	0.01	0.01#	1200
Arsenic	NL	2.0	3.3	0.9#	0.02	0.04	0.01#	8
Beryllium	NL	ND	0.04#	ND	ND	0.0005#	ND	0.033
Cadmium	NL	ND	0.33#	ND	ND	0.004#	ND	1
Chromium (hexavalent)[e]	NL	ND	ND	ND	ND	ND	ND	2
Chromium (total)[f]	NL	1.33#	1.91#	0.80#	0.02#	0.02#	0.01#	190000
Copper	NL	18	22	16	0.21	0.26	0.19	3
Lead	NL	1.2#	1.8#	ND	0.01#	0.02#	ND	2
Mercury	NL	0.009#	0.020#	ND	0.0001#	0.0002#	ND	0.04
Nickel	NL	7.43#	11.8#	5.97#	0.09#	0.14#	0.07#	5
Selenium	NL	0.8#	1.5	0.6#	0.01#	0.02	0.01#	15
Silver	NL	1.10	1.40	0.4#	0.01	0.02	0.005#	0.7
Thallium	NL	0.51#	0.62#	0.08#	0.01#	0.01#	0.01#	2
Zinc	NL	21	26	17#	0.25	0.31	0.2#	20
Tributyltin (ng/L) *	120	ND	9.6	ND	ND	0.11	ND	1.4
Cyanide	NL	ND	ND	ND	ND	ND	ND	1
PRIORITY POLLUTANT ORGANICS:								
PESTICIDES:								
Aldrin	NL	ND	ND	ND	ND	ND	ND	0.022 ng/L
Dieldrin	NL	ND	ND	ND	ND	ND	ND	0.040 ng/L
Endrin	NL	ND	ND	ND	ND	ND	ND	0.002
Toxaphene	NL	ND	ND	ND	ND	ND	ND	0.210 ng/L
DDT & Derivates (ng/L)	14	0	0	0	0	0	0	0.17
HCH's	NL	0	0	0	0	0	0	0.004
Endosulfan	NL	0	0	0	0	0	0	0.009
PCB's	0.002	0	0	0	0	0	0	0.019 ng/L
Chlordane & Related Compounds	0.0019	0	0	0	0	0	0	0.023 ng/L
Heptachlor [g]	NL	0	0	0	0	0	0	0.05 ng/L
Heptachlor Epoxide	NL	ND	ND	ND	ND	ND	ND	0.02 ng/L
VOLATILE ORGANIC COMPOUNDS:								
Acrolein	NL	ND	ND	ND	ND	ND	ND	220
Acrylonitrile	NL	ND	ND	ND	ND	ND	ND	0.10
Benzene	NL	ND	ND	ND	ND	ND	ND	5.9
Halomethanes	NL	0	0	0	0	0	0	130
Carbon tetrachloride	NL	ND	ND	ND	ND	ND	ND	0.9
Chlorobenzene	NL	ND	ND	ND	ND	ND	ND	570
Chloroform	NL	7.16	8.37	6.52	0.084	0.098	0.077	130

Table 2-2b, continued.

Constituents	Current NPDES Limits[a]	Concentrations in 5-Mile Effluent Avg.J	Max.	Min.	Concentrations After Initial Dilution[b] Avg.	Max.	Min.	CA Ocean Plan (ug/L) Objectives[c]
Vinyl Chloride	NL	ND	ND	ND	ND	ND	ND	36
1,3-Dichloropropene	NL	0	0	0	0	0	0	8.9
Ethylbenzene	NL	ND	ND	ND	ND	ND	ND	4100
Methylene chloride	NL	1.45#	2.74	ND	0.02#	0.03	ND	450
1,1,2,2-Tetrachloroethane	NL	ND	ND	ND	ND	ND	ND	2.3
Tetrachloroethene	NL	0.89#	3.85	ND	0.01#	0.05	ND	2.0
Toluene	NL	0.17#	1.12#	0.10#	0.002#	0.013#	0.001#	85000
1,1,1-Trichloroethane	NL	ND	ND	ND	ND	ND	ND	540000
1,1,2-Trichloroethane	NL	ND	ND	ND	ND	ND	ND	9.4
Trichloroethene	NL	ND	ND	ND	ND	ND	ND	27
1,1-Dichloroethylene	NL	ND	ND	ND	ND	ND	ND	0.9
1,2-Dichloroethane	NL	ND	ND	ND	ND	ND	ND	28
Dichlorobromomethane	NL	0.90#	1.33#	0.45#	0.01#	0.02#	0.005#	6.2
Chlorodibromomethane	NL	0.61#	0.98#	0.2#	0.01#	0.01#	0.002#	8.6
ACID EXTRACTABLE COMPOUNDS:								
Non-Chlorinated Phenolic Compounds	NL	0	0	0	0	0	0	30
2,4-Dinitrophenol	NL	ND	ND	ND	ND	ND	ND	4.0
4,6-Dinitro-2-Methyl Phenol	NL	ND	ND	ND	ND	ND	ND	220
Chlorinated Phenolic Compounds	NL	0	0	0	0	0	0	1
2,4,6-Trichlorophenol	NL	ND	ND	ND	ND	ND	ND	0.29
BASE AND NEUTRAL EXTRACTABLE COMPOUNDS:								
PAHs	0.748	0	0	0	0	0	0	8.8 ng/L
Fluoranthene	NL	ND	0.0093#	ND	ND	0.0001#	ND	15
Benzidine	NL	ND	ND	ND	ND	ND	ND	0.069 ng/L
Bis (2-chloroethyl) ether	NL	ND	ND	ND	ND	ND	ND	0.045
Bis (2-chloroethoxy) methane	NL	ND	ND	ND	ND	ND	ND	4.4
Bis (2-chloroisopropyl) ether	NL	ND	ND	ND	ND	ND	ND	1200
Bis (2-ethylhexyl) phthalate	NL	1#	3#	1#	0.01#	0.04#	0.01#	3.5
Di-n-butyl phthalate	NL	0.37#	1.23#	ND	0.004#	0.014#	ND	3500
1,4-Dichlorobenzene	NL	1.89#	2.05#	ND	0.02#	0.02#	ND	18
3,3-Dichlorobenzidine	NL	ND	ND	ND	ND	ND	ND	0.0081
Diethyl phthalate	NL	ND	0.28#	ND	ND	0.003#	ND	33000
Dimethyl phthalate	NL	ND	ND	ND	ND	ND	ND	820000
2,4-Dinitrotoluene	NL	ND	ND	ND	ND	ND	ND	2.6
Hexachlorobenzene	NL	ND	ND	ND	ND	ND	ND	0.21 ng/L
Hexachlorobutadiene	NL	ND	ND	ND	ND	ND	ND	14
Hexachlorocyclopentadiene	NL	ND	ND	ND	ND	ND	ND	58
Isophorone	NL	ND	0.15#	ND	ND	0.002#	ND	730
Nitrobenzene	NL	ND	ND	ND	ND	ND	ND	4.9
N-Nitrosodimethylamine	NL	ND	ND	ND	ND	ND	ND	7.3
N-Nitrosodiphenylamine	NL	ND	ND	ND	ND	ND	ND	2.5
N-Nitrosodi-N-propylamine	NL	ND	ND	ND	ND	ND	ND	0.38
Hexachloroethane	NL	ND	ND	ND	ND	ND	ND	2.5
1,2-Diphenylhydrazine[h]	NL	ND	ND	ND	ND	ND	ND	0.16
Dichlorobenzenes[i]	NL	0	0	0	0	0	0	5100
OTHERS:								
2,3,7,8-Dioxin (pg/L)* *	0.33	0	0	0	0	0	0	0.0039 pg/L
Residual Chlorine (mg/L)	NL	ND	ND	ND	ND	ND	ND	0.002

a All are based on monthly average concentration.
b Calculated values based on a minimum initial dilution of 84 parts of seawater to 1 part effluent.
c For O&G and settleable solids based on 30-day avg. concentration. All others are based either on 30-day avg. or 6-month median.
d Not applicable: The concept of dilutions does not apply to pH measurements.
e Not listed as a priority pollutant.
f as Chromium (III)
g "Heptachlor" means the sum of heptachlor and heptachlor epoxide.
h as Azobenzene
i "Dichlorobenzenes" mean the sum of 1,2- and 1,3-dichlorobenzene
j Average or median
* Tributyltin was analyzed by CRG Marine Laboratory, Torrance, CA.
** Dioxin is analyzed by Severn Trent Laboratories, Carol Stream, Ill.
NL = Not Listed; ND = Not Detected
# = Detected but Not Quantified
A lower case "e" after a numerical value denotes the numerical value as an estimate.

Table 2-3. Average *monthly* averages of total suspended solids (TSS), Biochemical Oxygen Demand (BOD), oil & grease (O&G), and settleable solids in plant influent and 5-Mile Outfall effluent during January 2005 through December 2005 and January 2006 through December 2006.

Conc.		TSS			BOD		
		Influent mg/L	**5 Mile mg/L**	**% Removal**	**Influent mg/L**	**5 Mile mg/L**	**% Removal**
Avg.	2005	314	21	93	298e	20e	93e
	2006	383e	22	94e	314e	20e	94e

Conc.		O & G			Settleable Solids		
		Influent mg/L	**5 Mile mg/L**	**% Removal**	**Influent mL/L**	**5 Mile mL/L**	**% Removal**
Avg.	2005	50	<3	>99	21	<0.1	>99
	2006	53	<3	>99	21	<0.1	>99

A lower case "e" after a numerical value denotes the numerical value as an estimate.

Except for April 2005 (0.3 mL/L), the remaining 23 months averaged <0.1mL/L, well below the permit limit (Table 2-2a-1, 2-2a-2, 2-2b).

Upon release from the 5-Mile Outfall, the effluent is diluted 84:1 within the Zone of Initial Dilution (ZID). Calculated concentrations of the following contaminants in the receiving water after initial mixing varied between 0.11 to 0.44 mg/L for TSS, 0.05 to 0.39 mg/L for BOD, and 0 to 0.047 mg/L for O&G during the years 2005 and 2006 (Table 2-2a-1, 2-2a-2, 2-2b).

Summary of Non-Compliance

For calendar year 2005, HTP effluent was in compliance with limitations for all effluent constituents with three exceptions. A discharge of unchlorinated wastewater and rain water through the One-Mile ocean outfall occurred on January 9 and 10, 2005. One exceedance of the instantaneous maximum and one exceedance of the weekly average Settleable Solids limits also occurred on April 7, 2005.

On January 9, 2005, during very high plant flow caused by heavy rains, approximately 160,000 gallons of unchlorinated raw sewage and rain water discharged through the One-Mile Outfall. It was discovered that the primary influent air scrubber plenum became surcharged with raw sewage from the North Outfall Relief Sewer (NORS) influent line. This caused two manhole covers on the plenum to be lifted and removed by the water and flooding of the area around the Headworks occurred. The raw sewage flooding was captured by the in-plant storm water system and directed to the CSD-PS1 (Contaminated Storm Drain). At approximately 2200 hours, the CSD wet well was found to be overflowing to the One-Mile Outfall; plant flow at this time was approximately 827 MGD. Operations personnel tried to alleviate the overflow, but the overflow did not stop until 0200 hours on January 10, 2005.

On January 10, 2005, again during very high plant flow, the primary influent air scrubber plenum became surcharged with raw sewage from the NORS line again, causing flooding of the area. The flooding was captured by the in-plant storm water system and directed to the CSD-PS1. The CSD pump station was carefully monitored to prevent another overflow. In spite of measures taken by plant personnel, including pulling bulkheads between influent lines and vigilant monitoring of the CSD wet well level, the overflow to the One-Mile Outfall occurred again. After clearing the blocked influent pump screens, the CSD wet well returned to its

Table 2-4a. Average, maximum, and minimum values of detected priority pollutant metals and cyanide (μg/L) in plant influent and 5-Mile Outfall effluent during January 2005 through December 2005.

Conc., μg/L	As Influent	As 5-Mile	Cd Influent	Cd 5-Mile	Cr Influent	Cr 5-Mile	Cu Influent	Cu 5-Mile
Avg.#	3.4	2.4	1.7*	ND	10.8	0.9*	198	18
Max.	4.6	3.5	3.4*	0.3*	20.3	1.4*	514	22
Min.	2.5	1.5	0.6*	ND	5.8	0.56*	105	14
Conc., μg/L	**Pb Influent**	**Pb 5-Mile**	**Hg Influent**	**Hg 5-Mile**	**Ni Influent**	**Ni 5-Mile**	**Se Influent**	**Se 5-Mile**
Avg.#	6*	0.5*	0.196*	ND	18*	8.3*	2.6	1.25
Max.	8*	3*	0.403	0.036*	65	14	4.9	2.6
Min.	3*	ND	0.084	ND	9*	5*	1.5	0.6*
Conc., μg/L			**Ag Influent**	**Ag 5-Mile**	**Zn Influent**	**Zn 5-Mile**	**CN^- Influent**	**CN^- 5-Mile**
Avg.#			10.6	1.4	168	22*	ND	ND
Max.			19.0	2.24	212	29	8*	5*
Min.			5.9	0.73	127	17*	ND	ND

- "#" Indicates that the result is either average or median of more than one sample for the reporting period.
- Maximum and minimum values also denoted with "*" are a DNQ value.

normal operating level, thus ceasing the overflow to the One-Mile Outfall. This overflow lasted for four minutes, and was calculated to be 1,400 gallons of unchlorinated raw sewage and rain water. Plant flow at the time of the overflow was over 800 MGD. Subsequently, plant staff made sure the screen was kept clear and that the pumps operated properly until such time the flow decreased and the flooding was no longer an issue.

On Thursday, April 7, 2005, an HTP five-mile effluent settleable solids sample exceeded the NPDES permit daily instantaneous maximum limit of 3.0 ml/L and caused an exceedance of the NPDES permit weekly average limit of 1.5 ml/L. At approximately 11:45 a.m. HTP Operations personnel became aware of a high turbidity reading of the HTP's secondary effluent at the Service Water Facility. At this time, operations personnel were in the process of placing a secondary reactor module back in service, and the flow through the reactor became erratic, washing over into secondary clarifiers. This caused a washout of solids from the clarifiers and consequently to the Five-Mile Ocean Outfall. Operations staff took immediate action which corrected the problem, and the secondary treatment was stabilized by around 2:00 p.m. Due to the solids washout, the HTP's 1:00 p.m. Five-Mile Effluent grab sample for settleable solids laboratory result was 30.0 ml/L as reported by the HTP Laboratory, which exceeds the NPDES Permit limit of 3.0 ml/L, daily instantaneous maximum. Visual inspection of the effluent and the return to normal turbidity readings at approximately 2:00 p.m. showed that the effluent quality had returned to normal. This incident lasted approximately 2 ½ hours.

For calendar year 2006, HTP effluent was in compliance with limitations for all effluent constituents except receiving water non-compliances (due to sightings of Materials of Sewage Origin, termed MOSOs) and chronic toxicity non-compliances. Also, on November 29, 2006, Discharge Serial No. 001, exceeded the effluent ammonia daily maximum limit. The receiving water

Table 2-4b. Average, maximum, and minimum values of detected priority pollutant metals and cyanide (µg/L) in plant influent and 5-Mile Outfall effluent during January 2006 through December 2006.

Conc., µg/L	**As Influent**	**As 5-Mile**	**Cd Influent**	**Cd 5-Mile**	**Cr Influent**	**Cr 5-Mile**	**Cu Influent**	**Cu 5-Mile**
Avg.#	2.8	2.0	1.4*	ND	12.2	1.33*	188	18
Max.	9.8	3.3	3.2*	0.33*	20.6	1.91*	454	22
Min.	0.9*	0.9*	0.6*	ND	5.6*	0.80*	135	16
Conc., µg/L	**Pb Influent**	**Pb 5-Mile**	**Hg Influent**	**Hg 5-Mile**	**Ni Influent**	**Ni 5-Mile**	**Se Influent**	**Se 5-Mile**
Avg.#	4.9*	1.2*	0.251*	0.009*	15.3*	7.4*	1.8	0.8*
Max.	10	1.8*	0.859	0.020*	29.9	11.8*	3.8	1.5
Min.	3.0*	ND	0.091*	ND	7.2*	6.0*	1.0*	0.6*
Conc., µg/L			**Ag Influent**	**Ag 5-Mile**	**Zn Influent**	**Zn 5-Mile**	**CN^- Influent**	**CN^- 5-Mile**
Avg.#			8.20	1.10	189	21	ND	ND
Max.			13.7	1.40	232	26	ND	ND
Min.			3.61	0.40*	161	17*	ND	ND

- "#" Indicates that the result is either average or median of more than one sample for the reporting period.
- Maximum and minimum values also denoted with "*" are a DNQ value.

non-compliances are discussed in Chapter 3 of this report. The chronic toxicity and ammonia non-compliances are discussed below.

A HTP effluent sample collected on May 8, 2006 exceeded the chronic toxicity permit limit and as a result accelerated testing was implemented. Accelerated testing consists of six additional tests, approximately every two weeks, over a twelve week period. Four of the accelerated tests conducted in June, July, and August did not exceed the permit limit; however, accelerated tests conducted on July 24 and August 28 did exceed the permit limit. The August 28 sample was the third exceedance of the accelerated testing and prompted an initial TRE (Toxicity Reduction Evaluation) investigation.

The City of Los Angeles, Bureau of Sanitation, conducted an internal maintenance inspection of Discharge Serial No. 002, also known as the Five-Mile Outfall, between November 28 and November 30, 2006. An approval letter from the Los Angeles Regional Water Quality Control Board, dated October 20, 2006, was received by the City of Los Angeles allowing the event and the proposed receiving water monitoring program. During this time period, chlorinated secondary effluent and West Basin brine were diverted to Discharge Serial No. 001, the One-Mile Outfall. Monthly average permit limits for the One-Mile Outfall were considered inapplicable as this event was of short duration. Please note that under normal operating conditions, Discharge Serial No. 001 is not used.

On November 29, 2006 the effluent ammonia-nitrogen concentration, 38.1 mg/L, exceeded the daily maximum limit of 34 mg/L for Discharge Serial No. 001. No corrective action or additional samples could be taken as the One-Mile flow was re-directed back to Serial No. 002 on November 30, 2006. The One-Mile effluent sampling point was located approximately 10 feet upstream of the effluent chlorination point, resulting in non-detected total chlorine residual results on November 28, 29, and November 30, 2006. Total chlorine residual was detected at most of the end-of-pipe receiving

Table 2-5. Average concentrations (ug/L) of key metals in 5-Mile Outfall effluent and their removal efficiency for years 1986 through 2005-2006.

Metal	Year	Influent Conc. (µg/L)	5-Mile Conc. (µg/L)	Percent Removal*
	1986-87	11.2	7.6	32%
Arsenic	1987-88	14.0	8.3	41%
	1988-89	10.6	6.8	36%
	1989-90	8.3	5.4	35%
	1990-91	6.2	4.0	36%
	1991-92	7.6	4.8	37%
	1992-93	7.3	5.1	30%
	1993-94	7.7	5.0	35%
	1994-95	7.9	5.2	34%
	1995-96	6.8	4.3	37%
	1996-97	4.9	3.2	35%
	1997-98	4.7	3.1	34%
	1998-99	3.6	2.4	33%
	1999-00	3.3	2.0	39%
	2001-02	4.4	2.6	41%
	2003-04	3.9‡	2.6	33%
	2005-06	3.1	2.2	29%
	1986-87	55.7	49.2	12%
Chromium	1987-88	56.9	21.0	63%
	1988-89	44.4	11.0	75%
	1989-90	38.1	6.3	84%
	1990-91	33.9	6.3	81%
	1991-92	23.5	4.0	83%
	1992-93	16.8	4.8	71%
	1993-94	16.9	3.0	82%
	1994-95	15.5	2.9	81%
	1995-96	17.8	4.2	76%
	1996-97	12.7	2.0	84%
	1997-98	16.2	3.0	82%
	1998-99	13.7	2.0	85%
	1999-00	13.5	0.5	96%
	2001-02	12‡	0.5‡	96%
	2003-04	11.8‡	1.2‡	90%
	2005-06	11.5	1.1‡	90%
Copper	1986-87	202.9	74.4	63%
	1987-88	157.2	50.9	68%
	1988-89	152.4	45.4	70%
	1989-90	139.9	36.7	74%
	1990-91	142.3	35.2	75%
	1991-92	150.8	36.3	76%
	1992-93	183.3	29.9	84%
	1993-94	145.4	34.1	76%
	1994-95	140.9	37.2	74%
	1995-96	152.2	37.8	75%
	1996-97	143.6	34.2	76%
	1997-98	140.3	31.6	78%
	1998-99	140.9	25.9	82%
	1999-00	127.7	10.9	91%
	2001-02	159.0	13.5	92%
	2003-04	152	16.7‡	89%
	2005-06	193	18	91%

* Based on calculation. ND = Not Detected
‡ Average calculated from values that are DNQ or <MDL. Concentrations below detection limit were taken as zero.

Table 2-5., Continued

Metal	Year	Influent Conc. (µg/L)	5-Mile Conc. (µg/L)	Percent Removal*
Lead	1986-87	74.3	37.5	50%
	1987-88	64.9	43.5	33%
	1988-89	63.3	39.3	38%
	1989-90	28.4	2.2	92%
	1990-91	19.8	2.7	86%
	1991-92	17.1	2.0	88%
	1992-93	10.9	1.3	88%
	1993-94	8.3	1.0	88%
	1994-95	8.8	1.8	80%
	1995-96	12.6	2.3	82%
	1996-97	15.4	1.5	90%
	1997-98	10.2	2.0	80%
	1998-99	11.3	ND	-
	1999-00	7.0	ND	-
	2001-02	11.4	1.5‡	87%
	2003-04	6.8	1.6‡	76%
	2005-06	5.4‡	0.8‡	85%
Nickel	1986-87	68.2	65.0	5%
	1987-88	63.3	48.6	23%
	1988-89	60.3	43.7	28%
	1989-90	28.2	14.9	47%
	1990-91	35.1	19.8	44%
	1991-92	20.6	13.8	33%
	1992-93	26.7	14.4	46%
	1993-94	23.6	11.1	53%
	1994-95	37.4	17.2	54%
	1995-96	26.2	12.2	53%
	1996-97	15.8	9.1	42%
	1997-98	14.3	8.5	41%
	1998-99	17.9	10.7	40%
	1999-00	22	8.8	60%
	2001-02	26.3‡	4.5 ‡	83%
	2003-04	13.5‡	8.6	36%
	2005-06	16.6‡	7.8‡	53%
Zinc	1986-87	259	227	12%
	1987-88	226	96	57%
	1988-89	220	71	68%
	1989-90	219	69	68%
	1990-91	252	111	56%
	1991-92	324	78	76%
	1992-93	254	47	82%
	1993-94	255	44	83%
	1994-95	224	50	78%
	1995-96	230	56	76%
	1996-97	199	41	80%
	1997-98	183	42	77%
	1998-99	185	39	79%
	1999-00	167	32	81%
	2001-02	203	18	91%
	2003-04	170	21‡	87%
	2005-06	178	22‡	88%

* Based on calculation. ND = Not Detected.
‡ Average calculated from values that are DNQ or <MDL. Concentrations below detection limit were taken as zero.

water stations (A2, A2+50, and A2-50) on each day of the three-day event.

Performance Goals Summary of Non-Compliance

During calendar year 2006, three constituents exceeded performance goal limitations. One non-compliance for tributyltin occurred in January 2006 and three non-compliances for chloroform occurred in January, April and July 2006. Five non-compliances for ammonia-nitrogen occurred in February, March, May, June, and November 2006. No corrective action measures were required in 2006, as the permit specifies that the non-compliance must occur in three successive monitoring periods.

Nutrients

Nutrients, mainly nitrogen, enter the Bay from a variety of natural and anthropogenic sources and are essential for survival of phytoplankton. However, if nutrient inputs are excessive, phytoplankton and algal blooms can produce excessive biomass, resulting in eutrophic conditions. For this reason, ocean discharges of nutrients are regulated. Regulation of ammonia-nitrogen is especially important because ammonia, particularly in its un-ionized form, is highly toxic to fish and other aquatic species.

Nutrient levels in the 5-Mile Outfall effluent averaged 2.9 mg/L for total phosphorus and 35.8 mg/L for ammonia-nitrogen in 2005-2006 (Table 2-2a-1, 2-2a-2, 2-2b). After an initial dilution of 84:1, calculated concentrations of phosphorus and ammonia were 0.03 mg/L and 0.43 mg/L, respectively. Ammonia levels in 5-mile effluent have been increasing slightly over the last five years. This is believed to originate from the recently completed conversion of the anaerobic digesters from a mesophilic to a thermophilic process. Higher levels of ammonia nitrogen occur in the digested sludge due to this process conversion. The water removed from the digested sludge during centrifugation, termed centrate, is returned for treatment at the primary stage of the process and is thought to be a source of the elevated ammonia, along with increased urbanization of the HTP service area. The prior permit's monthly average discharge limit of 51 mg/L is no longer in effect; the new permit, effective May 14, 2005, does not have a limit for 5-mile outfall effluent, but does have a daily maximum limit for the one-mile outfall of 34 mg/L. The plant's monthly performance goal limit of 36.3 mg/L has on a few occasions been breached, as discussed previously, under "Performance Goals Summary".

Concentrations of total phosphorus in Hyperion's influent were previously noted to have steadily declined, but appear now to have reached a steady-state range of 5-8 mg/L. Improved phosphorus removal was achieved through phosphorus precipitation by addition of iron salts (ferric and ferrous chloride) in the advanced primary treatment process and in the anaerobic digesters. Total phosphorus in HTP's effluent has undergone a steady, gradual decline since the conversion to full secondary, and has maintained levels of about 2 to 3 mg/L.

PRIORITY POLLUTANT INORGANICS

Metals

During the 2005-2006 reporting period, six out of 13 priority pollutant metals were frequently detected in both Hyperion's influent and effluent. The six metals are arsenic, copper, lead, nickel, silver, and zinc. Total chromium, cadmium, and mercury were consistently detected in the influent, but were mostly undetected or present in very low levels in the effluent (Table 2-4a, b). Antimony, beryllium, thallium, and hexavalent chromium were detected in low levels in the effluent (Table 2-2a-1, 2-2a-2, and 2-2b). The 2005-2006 influent levels of priority pollutant metals were similar to that of the previous reporting period. Concentrations of all detected metals in the effluent were below NPDES Permit limits and California Ocean Plan Standards (Table 2-2a-1, Table 2-2a-2, Table 2-2b).

The concentrations of most metals in the plant influent, except copper and zinc, have declined significantly since 1986-87 (Table 2-5). This is the result of the City's vigorous source control programs (CLA, EMD 1993). Historically, there has been a slight gradual decrease of arsenic in the 5-mile effluent and in the influent (Table 2-5). Arsenic is prevalent in ground water and present in the City of Los Angeles Department of Water and Power's water sources. This could explain the low but persistent presence of arsenic in the wastewater. Other metals, such as chromium and lead, continue to reach lower concentrations in the effluent and retain high removal efficiency (Table 2-5).

The removal efficiency of metals through the treatment processes is related to the chemical and physical characteristics of the individual metal. In general, higher removal efficiencies are found in metals that are less soluble in wastewater and have greater tendencies to associate with particles in the wastewater (Chen et al. 1974). This group of less soluble metals includes cadmium, chromium, mercury, lead, copper, silver, and zinc. Arsenic and nickel are more soluble in wastewater and are not easily removed. Similarly, metals in the former group were found to be associated with the particulate phase of sewage treated at HTP, while arsenic and nickel were found mostly in dissolved form (EMD, unpublished data).

Removal efficiencies of six detected priority pollutant metals are shown in Table 2-5. Figures 2-2 and 2-3 show historical influent and effluent trends. Consistent with the above findings, removal efficiencies of chromium, copper, and zinc were much higher than the removal efficiencies of the more wastewater soluble metals, arsenic and nickel. Removal efficiencies for all metals, except arsenic, have dramatically improved since 1986-87 (CLA, EMD 1993- 2005). No significant change has been observed in arsenic removal efficiency.

Cyanide

Cyanide was not consistently detected in HTP's influent or 5-Mile Outfall effluent. The monthly average of cyanide in the effluent varied from below the minimum detection limit (MDL=4 μg/L) to 5 μg/L (Table 2-2a-1, 2-2a-2, and 2-2b). The concentrations of cyanide in the 5-Mile Outfall effluent were always below the previous NPDES permit limit of 85ug/L. The permit that became effective May 14, 2005, does not list an effluent permit limit for Cyanide. During both years the effluent cyanide concentration was well within the California Ocean Plan objectives (Table 2-2a-1, 2-2a-2, and 2-2b).

Tributyltin

HTP's NPDES Permits for this reporting period, issued in 1994 and in May, 2005, both require quarterly monitoring of tributyltin. Tributyltin was detected in the first quarter of 2005 and in the first quarter of 2006 in Hyperion's effluent. The levels detected resulted in annual effluent averages far below the limits of 119 ng/L and 120 ng/L, respectively, for the two permits in effect for this reporting period (Table 2-2a-1, 2-2a-2, and 2-2b).

Organic Constituents

After initial dilution, effluent concentrations of all organic compounds were low and less than both NPDES Permit limits and Ocean Plan levels (Table 2-2a-1, 2-2a-2, and 2-2b). The priority pollutant limits are important because of the toxicity of the priority pollutants to the receiving water environment. For example, lipid-soluble hydrophobic compounds such as polyaromatic hydrocarbons (PAH's), DDT's, and PCB's are known to bioaccumulate in tissues of organisms resulting in toxic effects. The effluent contained no detectable concentrations of PAH's, DDT's, or PCB's during 2005-2006. The highest concentrations shown in Table 2-2a-1, 2-2a-2, and 2-2b were for VOC's such as methylene chloride, tetrachloroethene, toluene, and various halogenated hydrocarbons. During 2005, a low concentration of dioxin was detected in plant effluent, whereas, in 2006, dioxin remained undetected. There were no permit exceedances in this reporting period for any organic compound.

Residual Chlorine

The current NPDES permit of HTP does not require chlorination of the final effluent. Only in the event of an emergency discharge through the 1-Mile outfall is chlorination of effluent required to prevent possible nearshore or beach contamination.

Part of Hyperion's secondary effluent, which is chlorinated for in-plant use, is eventually released into the ocean through the 5-Mile Outfall. Daily residual chlorine of 5-Mile Outfall effluent is monitored to ensure that none is discharged into the receiving water. For this reporting period, residual chlorine was undetected for effluent discharged through the 5-Mile Outfall.

Radioactivity

A low level of gross beta radioactivity was consistently detected in the 5-Mile Outfall effluent throughout 2005-2006. However, the amount detected was always below the two NPDES Permit limits (0.030 ϱCi/ml and 0.050 ϱCi/ml, respectively).

The new permit, effective May 14, 2005, also included limits on gross alpha radioactivity, with a limit set at 0.015 ϱCi/ml. For the 2005 -2006 reporting period, low levels of alpha radioactivity were also detected in the effluent, but remained below the limit.

Toxicity

To control discharge of toxic chemicals to the environment, the Federal Clean Water Act states, "the discharge of toxic pollutants in toxic amounts be prohibited". The EPA, as authorized by the Clean Water Act, implements this policy through the use of "whole effluent toxicity" testing using the sensitive life stage of aquatic organisms exposed to wastewater effluents.

Effluent Acute Toxicity Tests

The Hyperion Treatment Plant is mandated by the Regional Board under the NPDES permit to conduct acute toxicity testing of its 5-Mile Outfall effluent. The new permit that became effective on May 14, 2005 requires that the TUa (acute toxicity units) of the effluent be less than or equal to 2.8, which is to be determined by acute toxicity tests as specified in EPA/821-R-02-12 (EPA 2002). The species tested included the topsmelt (*Atherinops affins*) and the mysid (*Mysidopsis bahia*). In 2005, the most sensitive species to HTP effluent was determined to be the topsmelt, which was used for 24 months after the determination.

For the periods January through December 2005 and January through December 2006, the acute toxicity results indicated no exceedances for the 5-mile effluent of the Hyperion Treatment Plant.

Effluent Chronic Toxicity Tests

The Hyperion Treatment Plant is also required under its NPDES Permit to conduct monthly chronic toxicity tests of its effluent. This directive requires that three species of marine organisms be tested each year for three consecutive months to select the most sensitive species. The three test organisms chosen for these screening tests are the veliger larvae of the red abalone (*Haliotis rufescens*), sporophytes of the giant kelp (*Macrocystis pyrifera*), and the larvae of the inland silverslide (*Menidia beryllina*). At the end of this screening period, the most sensitive species is to be used for the remainder of the year.

The chronic toxicity test limit is currently set at 84.0 TUc (chronic toxicity units) under the HTP NPDES permit. To comply with the TUc limit of 84.0, test organisms must not show any acute or chronic response in 1.20% plant effluent. In 2005, there were no chronic toxicity test exceedances. Please see the earlier narrative under "Summary of Non-Compliance" for details regarding the chronic toxicity exceedances in 2006.

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