II. GENERAL INFORMATION AND BASIC DATA REQUIREMENTS

A. Treatment System Description

1. **On which of the following are you basing your application: a current, improved discharged, or altered discharge, as defined in 40 CFR 125.58? [40 CFR 125.59(a)]**

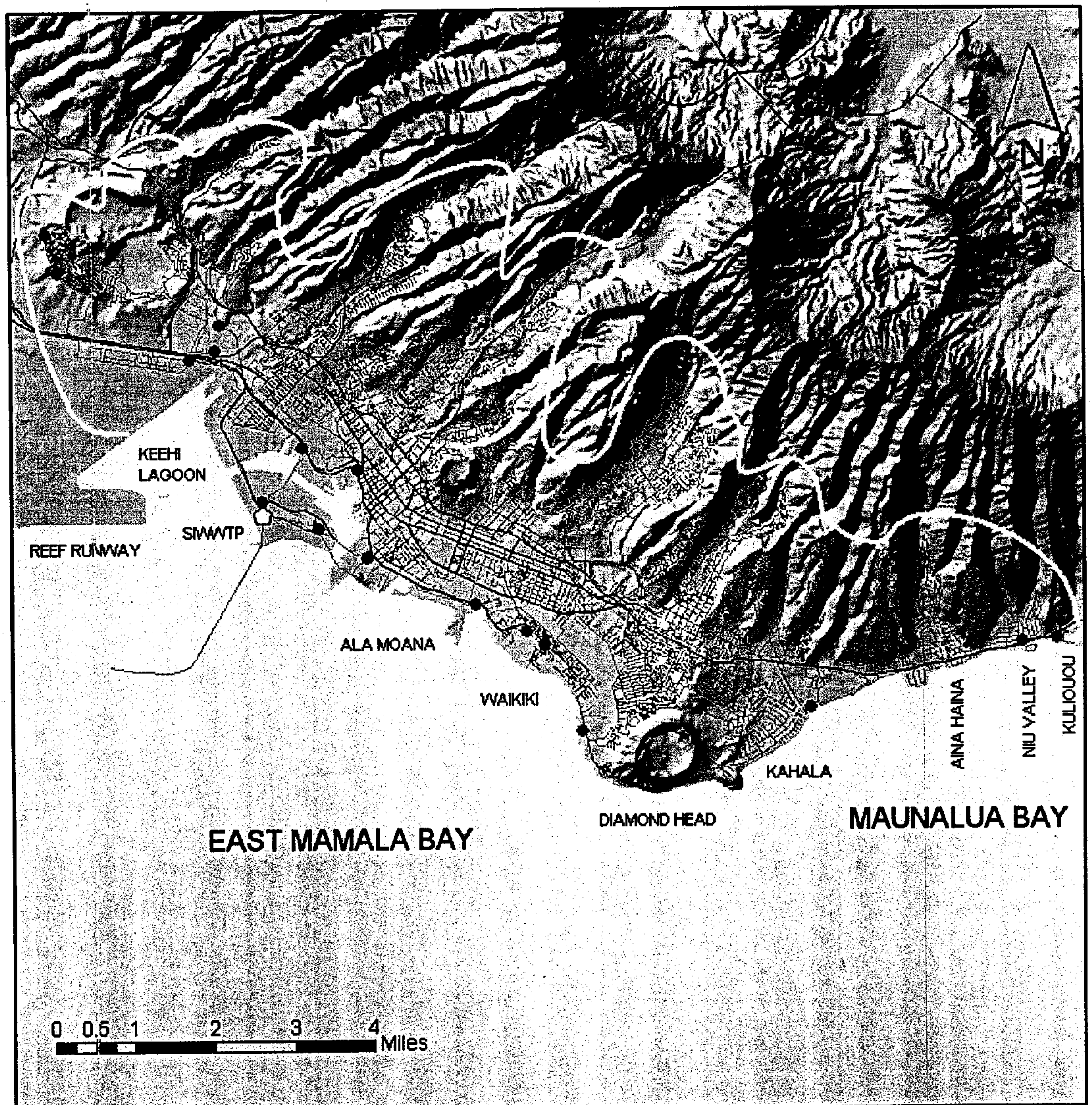
RESPONSE:

This application is based on an “improved” discharge.

The Sand Island Wastewater Treatment Plant (SIWWTP) facility and deep ocean outfall are located on the southeastern side of Oahu; see Figure II.A.1, and is owned and operated by the City and County of Honolulu (CCH). The service area, which is known as the East Mamala Bay service area, encompasses about 79 square miles. The size of the existing service area is relatively fixed by other service areas to the east and west, by the ocean to the south, and by the mountains to the north. The Kuliouou tributary area in the eastern portion of the service area has been recommended for inclusion in the SIWWTP collection system (Belt Collins, 1993). Land within the existing service area is already highly developed, and only moderate population growth is anticipated from "in-filling" of underdeveloped land.

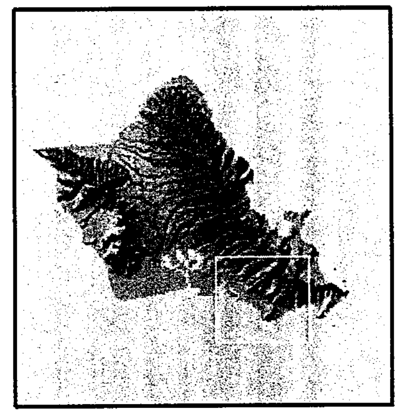
The service area is the Honolulu urban area, including Waikiki. The SIWWTP serves an existing full-time resident population of roughly 332,000 and a tourist population of about 72,000 based on estimates for the year 2000. Because there are no major industrial activities, such as pineapple canning in the service area, the SIWWTP receives wastewater that is primarily residential or domestic in origin.

Tourism is the State's largest industry, directly or indirectly supporting more than one-half of the civilian jobs in Hawaii. Possibly more than any other major city in the United States, Honolulu's economy is dependent on the tourism industry. The tourist industry is, in turn, highly dependent on a clean ocean environment, particularly at Mamala Bay with its world famous Waikiki Beach.



Legend

- Plant
- Major Road
- SI Collection System
- Pump Station



Sand Island WWTP Service Area

All wastewater from the South Honolulu sewer system (also known as the East Mamala Bay District) are discharged into the Ala Moana Wastewater Pump Station (WWPS) and conveyed to the Sand Island Wastewater Treatment Plant (SIWWTP) via a force main under the main ship channel of Honolulu Harbor. Interceptor and major trunk sewers, which discharge into the pump station include the Ala Moana trunk sewer serving the downtown central business district; the Ala Moana interceptor serving the major portions of Waikiki, Diamond Head, Ala Moana shopping center and Kewalo; the East End relief serving Kakaako, South King and portions of McCully, lower Makiki, Moiliili and lower University; the high level Manoa - Kaimuki sewer tunnel serving East Honolulu, Kaimuki, Waialae-Kahala, Maunalani Heights, Palolo, St. Louis Heights, Manoa Valley - University and upper Makiki-Puowaina; and the high level Kalihi sewer tunnel, serving Nuuanu, Pacific Heights and Punchbowl.

The average daily flow into Ala Moana WWPS in 1995 was 52.14 mgd from an estimated service population of 283,761 residents and visitors. The average annual daily flows into the Ala Moana station ranged from a high of 54.7 mgd to a low of 47.59 mgd between 1991-92 to 1998-99. The 1984-85 average daily flow was 53.26 mgd. The estimated average annual daily contribution per capita is approximately 185 gallons per capita per day including commercial, and industrial flows, and average dry weather infiltration. According to the I/I study, the average sewage flow into the station was 27.03 mgd and the dry weather infiltration was 21.27 mgd in 1995 (total of 48.3 mgd). The present pumping station was completed in 1984-85 and was designed to have sufficient pumping capacity to the year 2015, however, because of an increase of the static head at the Sand Island plant's head-works, the station will be modified to meet present flow conditions.

The Hart Street WWPS receives all the flows from the North Honolulu sewer system for conveyance under Kapalama Channel to the Sand Island WWTP. The principal interceptors in the system are the North and South Kapalama interceptor sewer on or near Nimitz Highway between Awa WWPS on the east and Kamehameha Highway WWPS on the west near the Honolulu International Airport. The North Kapalama interceptor serves the Iwilei semi-industrial area including the former Dole pineapple cannery site, now used for mixed commercial activity; Liliha-Palama; portions of Nuuanu Valley and School Street. The South Kapalama Interceptor serves Aliamanu-Salt Lake, Honolulu International Airport, military housings, Moanalua-Red Hill, Kalihi Valley and Kalihi Kai. Military housing facilities include Halsey and Radford Terrace Naval housing areas, and Camp Catlin mauka (or mountain side) of the airport, and the Coast Guard Kiai-Kai Hale Housing on Red Hill. Housing counts in 1999 and average limited daily flows in mgd from these installations were estimated as follows:

MILITARY HOUSING FACILITY CONNECTED TO CITY COLLECTION SYSTEM					
Facility	Halsey Terrace	Radford Terrace	Camp Catlin	Coast Guard Kiai-Kai Hale	Total
Housing Units	503	428	390	318	1,639
Flow [mgd]	0.1900	0.2238	0.0092	0.0800	0.5030

Similar to the Navy's installations in West Mamala Bay, the U.S. Navy compensates the City and County for monthly sewer service charges and its share of the treatment cost at Sand Island WWTP. The first utility contract with the Navy was concluded on September 28, 1988.

The average annual daily flow into Hart Street WWPS in 1997-98 was 17.2 mgd from an estimated service population of 116,366 people. The average annual flows into the Hart Street station ranged from a high of 19.47 mgd in 1991-92 to a low of 17.2 mgd in 1997-98. The reduction may be due to less storm water inflow, or less dry weather infiltration, or the elimination of the Dole pineapple cannery flows. The 1984-85 average daily flow was 16.58 mgd. The estimated average annual daily contribution per capita is approximately 148 gallons per day including commercial and industrial flows, and dry weather infiltration. The I/I study estimated that the average sewage flow into the station was 10.58 mgd and the dry-weather infiltration was 9.23 mgd (total of 19.81 mgd). The pumping station was modified in 1984-85 to increase it pumping capacity to the 2010 wet weather flows, however, the station will be modified to accommodate an increase of the static head at the Sand Island plant.

The Fort Shafter SPS receives flows from the Fort Shatter military reservation, Tripler Medical Center, Aliamanu Military Housing, and 242 homes in the Moanalua Gardens subdivision, which are the responsibility of the City and County. The 1986 average daily flow into the pump station was 1.423 mgd compared with 1.40 mgd in 1970; however, only 1.336 mgd are from military facilities and the remaining 0.087 mgd is the City's responsibility. The flows from the Fort Shatter sewer system, including the portion serving Moanalua Gardens are assumed to remain constant to the year 2025. The per capita contribution from military facilities was 106 gpd in 1986 based on the 1980 population figures. Treatment capacity set aside at the Sand Island WNTP for the Fort Shatter sewer system was and is 2.33 mgd.

A commercial offshore fish farm has also established itself in Mamala Bay. Located at roughly 21°17'10" N/158°0'06'W, the operation exists in the middle of three outfalls, two of (Sand Island and Barbers Point Outfalls) which are currently discharging primary treated effluent. Shoreward of the operation is the Fort Kamehameha Outfall discharge. The operation is currently farming a fish native to the Hawaiian Islands: Pacific Threadfin (*Polydactylus sexfilis*), known in Hawaii as *Moi*. The operating area covers 28 acres, having 4 net cages in waters 150 feet depth. Each cage is anticipated to produce 150,000 pounds of *Moi* every eight months. The operation is managed under NPDES **PERMIT NO. HI 0021792**.

On Sand Island itself, a local sewer system and two pump stations built by the State Department of Transportation and dedicated to the City and County for operation and maintenance serve the area. Facilities served by the system include the State industrial subdivision, Sand Island State Park, Pier 51 and Pier 52, and the U.S. Coast Guard Reservation. All flows from the system is collected at the Sand Island Parkway WWPS and pumped to the treatment works. Most of the daily flows come from the Coast Guard station. The average daily flow in 1992-93 from the Parkway station, which is located on the treatment plant site was 0.114 mgd. The design average ultimate flow of the WWPS is 0.144 mgd.

During the 1997-98 year, the average annual flow at the Sand Island WWTP was 69.5 mgd according to plant records, which may leave a theoretical excess capacity of 12.5 mgd. The 1999-20 figure was still lower at 67.56 mgd and the annual average daily flows ranged from a high of 78.0 mgd to 66.7 mgd between 1991-92 to 1999-20. Because the influent flow meter at the plant has been known to give less than accurate reading, the reading of the effluent flow meter has been used. According to 1998 Annual Assessment Report for the plant, the average effluent flow averaged 73.5 mgd for the 1998 calendar year. Based on the I/I study, the Ala Moana and the Hart Street stations contributed 30.5 mgd of dry weather infiltration in 1995 to the Sand Island average daily flows. The 1990 208 Plan predicted that the plant will reach its treatment capacity by the year 2000. This has not happened perhaps because of a decline of the resident and visitor population in mid-1995. The 1971 WQPO Study projected that the average daily flow into the plant will reach its capacity (81.3 mgd) in 1990. However, the WQPO flow projection for 1990 included an allowance of 12 mgd for the two pineapple canneries in existence at that time and a population of 451,000. The combined flows from the two canneries, both closed now were 3.0 mgd in 1979. Dole Cannery operation ceased in 1995.

2. Description of the Treatment/Outfall System [40 CFR 125.62(a) and 125.62(e)]

a. **Provide detailed descriptions and diagrams of the treatment system and outfall configuration which you propose to satisfy the requirements of section 301(h) and 40 CFR part 125, subpart G. What is the total discharge design flow upon which this application is based?**

RESPONSE:

The CCH is currently under major construction to increase the capacity of the ~~SIWWTP from 82 mgd to 90 mgd, as specified in Belt Collins 1993. Because~~ construction is ongoing, two operating configurations will be specified in this reapplication. See Appendices A and B for descriptions of the current and proposed treatment system. Both of these appendices provide a description of the various operating modes that each configuration is possible of applying.

OUTFALL DESCRIPTION

Configuration

A profile of the Sand Island ocean outfall is shown on Figure II.A.2a1.

The 84-inch diameter outfall consists of the 1,453-foot-long (443 meters) land portion and an underwater section of 9,120 feet (2,780 meters) in length; see R.M. Towill, 1972. Approximately 7,000 feet (2,134 meters) of the submerged portion is buried. A single pipe diffuser extends an additional 3,398 feet (1,036 meters).

The diffuser includes 1,548 feet (472 meters) of 84-inch-diameter (2.13 meters) pipe, 912 feet (278 meters) of 66-inch-diameter pipe (1.68 meters), and 938 feet (286 meters) of 48-inch-diameter (1.22 meters) pipe. The diffuser varies in depth from 225 to 242 feet (69 to 74 meters) and is located on a ledge which is located on a steep slope where the diffuser generally runs parallel with the sea bottom contours.

Effluent is discharged from the diffuser through 282 side ports, with openings ranging from 3.00 inches (at the shoreward portion) to 3.53 (near the end) inches in diameter (0.0762 to 0.0897 meters). The bell mouth side ports are spaced 24 feet on-center on each side of the pipe and are 6.0 inches above the midsection of each pipe section. A flapgate, which can be manually lifted for cleaning and flushing, is located at the end of the diffuser. This flapgate has two additional 7.0-inch diameter ports.

Hydraulics

The outfall was designed to handle projected design flows in the year 2025, which at that time (1970) was projected to be a peak wet weather hydraulic flow of 202 mgd and an average daily design flow of 130 mgd.

The total hydraulic heads required for the design average and peak flows are 23.0 feet and 47.1 feet, respectively, based on a Manning's n value of 0.014 for the outfall and 0.015 for the diffuser.

The City conducts annual inspections using a remotely operated vehicle (ROV) for examination of the outfall and the diffuser ports. The examination checks for leaks, flow distribution, and internal and external blockage of the ports by sand or silt disposition or other debris. In shallow waters, divers do the inspection. The Oceanographic Team of the Department of Environmental Services conducts all work.

b. **Provide a map showing the geographic location of proposed outfall(s) (i.e., discharge). What is the latitude and longitude of the proposed outfall(s)?**

RESPONSE:
See Figure II.A.2b for the existing location of the Sand Island Deep Ocean Outfall, based on Old Hawaiian Datum coordinates. The outfall was completed in 1976.

Latitude: 21° 17' 01" N
Longitude: 157° 54' 24" W

See also Figure II.A.2b1 for the outfall profile.

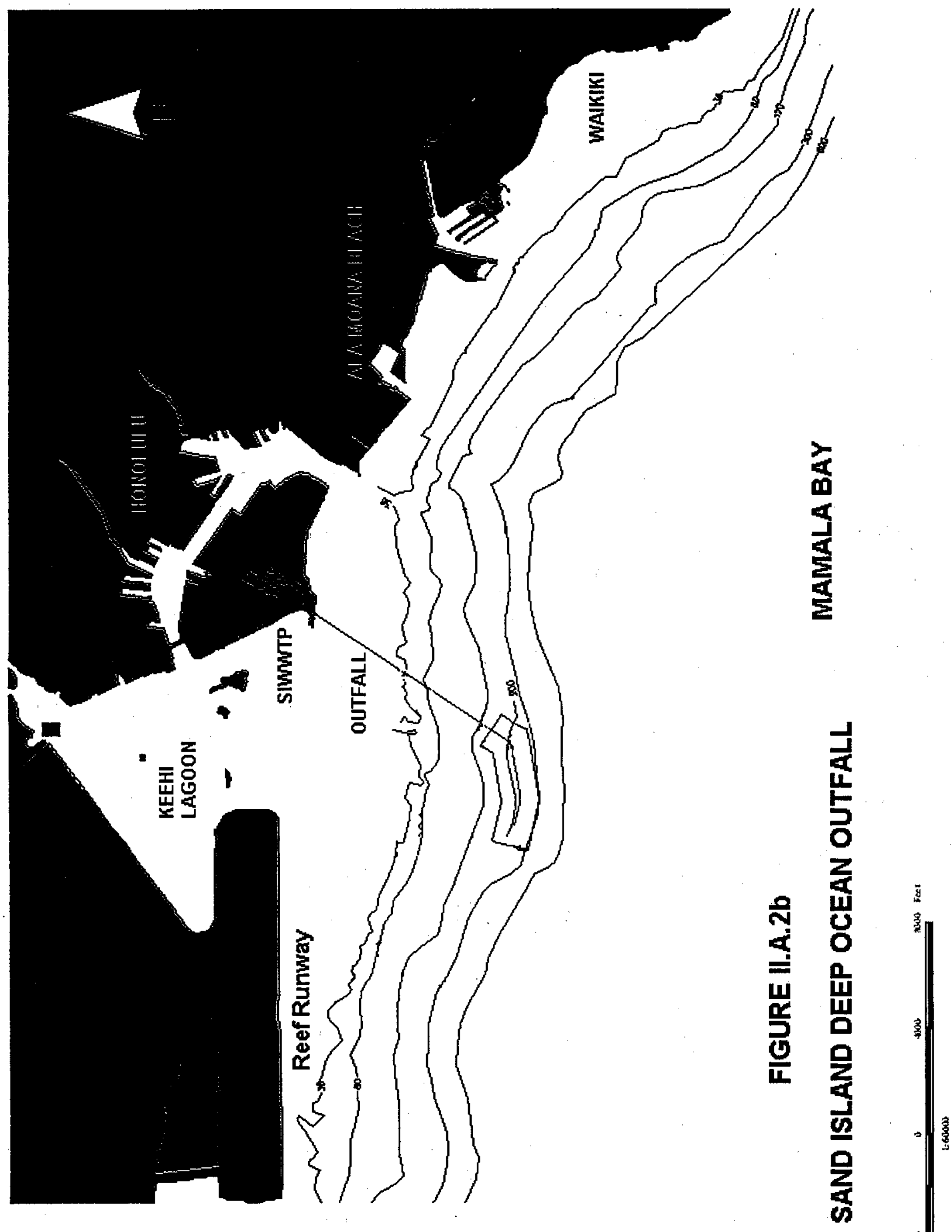
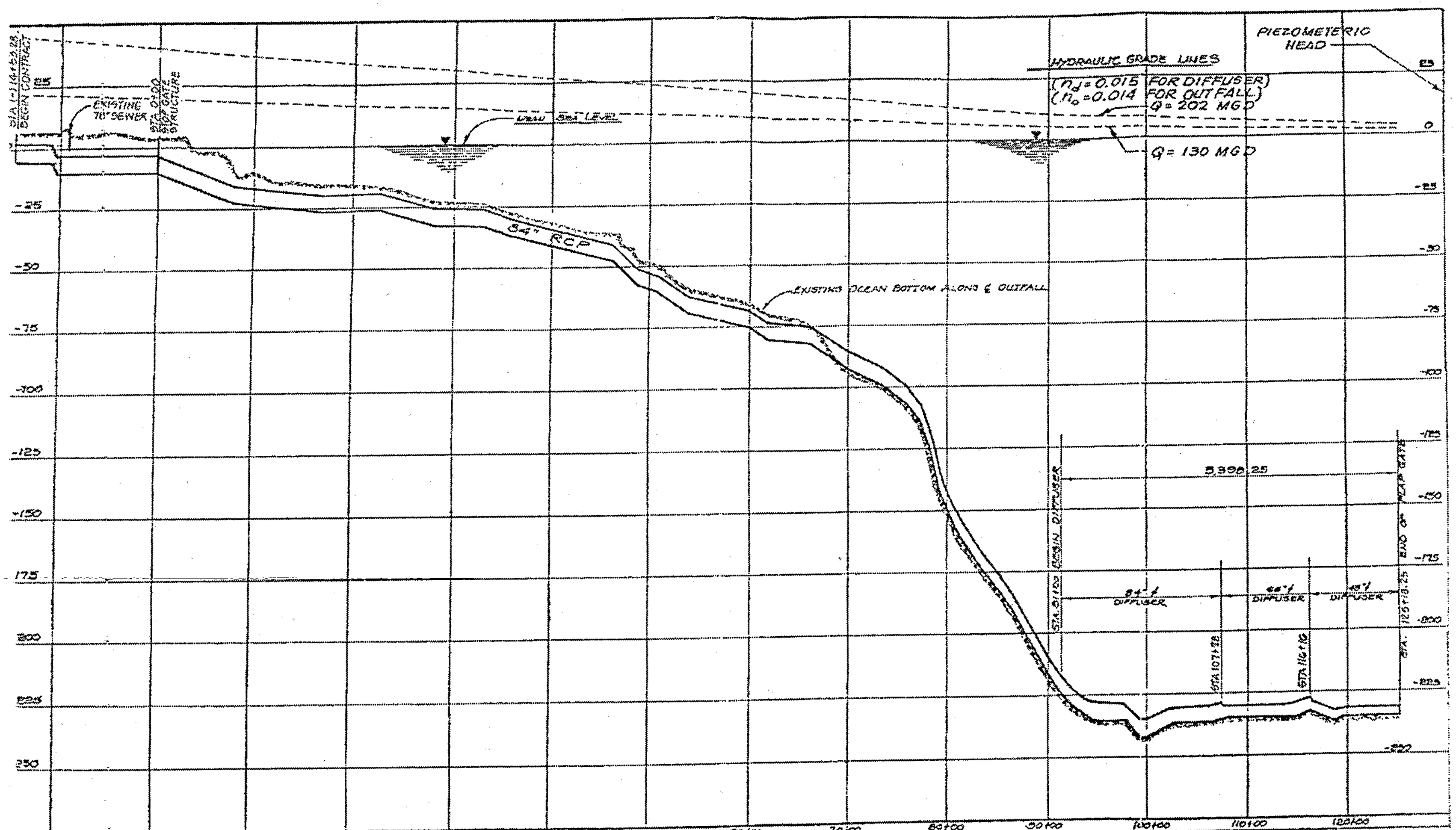


FIGURE II.A.2b

SAND ISLAND DEEP OCEAN OUTFALL



RCE: DESIGN PLANS FOR OCEAN OUTFALL SYSTEM, SAND ISLAND TREATMENT PLANT AND OCEAN OUTFALL; CCH JOB NO. 29-71 BY R.M. TOWILL, CORP. 1972

FIGURE II.A.2b1

SAND ISLAND DEEP OCEAN OUTFALL

c. **For a modification based on an improved or altered discharge, provide a description and diagram of your current treatment system and outfall configuration. Include the current outfall's latitude and longitude, if different from the proposed outfall.**

RESPONSE:

This application is based on the proposed treatment plant and outfall configuration to achieve compliance with 40 CFR 125.60. See responses to question II.A.2.a and II.A.2.b for treatment system description/diagram and current outfall latitude/longitude, respectively.

3. **Primary or equivalent treatment requirements [40 CFR 125.60]**

a. **Provide data to demonstrate that your effluent meets at least primary or equivalent treatment requirements as defined in 40 CFR 125.58(r) [40 CFR 125.60]**

RESPONSE:

40 CFR 125.58(r) states, "*Primary or equivalent treatment for the purposes of this subpart means treatment by screening, sedimentation, and skimming adequate to remove at least 30 percent of the biochemical oxygen demanding material and of the suspended solids in the treatment works influent, and disinfection, where appropriate.*"

The design for the existing, and expanded, facility includes treatment by screening, sedimentation, and skimming. Compliance data from January 1, 1998 to December 31, 2002 are used to demonstrate the facility can meet primary treatment. Tables II.A.3.a1 through II.A.3.a5 shows biochemical oxygen (BOD_5) and total suspended solids (TSS) removal, from 1998 to 2002, respectively.

Review of Table II.A.3.a1 through II.A.3.a5, shows that the SIWWTP met or exceeded 30% BOD_5 and 60% TSS removal, based on a monthly average, from 1998 to 2002. On two events (July and August 1999), however, the plant did not meet 30% BOD_5 requirement and was subsequently issued a Finding of Violation and Order for Compliance in December 1999. Since that time, the facility has met the BOD_5 removal requirement through, in part, to the refurbishment of the dissolved air flotation system which had deteriorated. Efforts are underway to ensure the existing facilities meets permit requirements, through chemical addition when needed.

See Appendix B for enhancements to the plant to ensure 30% BOD_5 and TSS removal.

TABLE II.A.3.a1

1998 Monthly and Annual Average BOD5 and Suspended Solids Data

		BOD$_5$			Suspended Solids		
Month	Effluent Flow [m^3/sec]	Influent [mg/L]	Effluent [mg/L]	Percent Removal [%]	Influent [mg/L]	Effluent [mg/L]	Percent Removal [%]
January	3.1795	151	100	34	148	50	66
February	3.1779	159	105	34	145	51	64
March	3.1932	158	107	32	136	46	66
April	3.2492	159	104	35	137	47	66
May	3.1854	156	107	32	145	49	66
June	3.1305	164	113	31	141	47	67
July	3.1734	152	101	33	144	47	68
August	3.3325	150	97	35	132	44	67
September	3.3691	148	99	33	131	47	64
October	3.1957	146	101	31	135	51	62
November	3.2792	149	103	31	136	52	62
December	3.1617	157	107	32	144	51	64
Annual Average	3.2189	154	104	33	140	49	65

TABLE II.A.3.a2

1999 Monthly and Annual Average BOD5 and Suspended Solids Data

		BOD$_5$			Suspended Solids		
Month	Effluent Flow [m^3/sec]	Influent [mg/L]	Effluent [mg/L]	Percent Removal [%]	Influent [mg/L]	Effluent [mg/L]	Percent Removal [%]
January	3.2009	154	107	30	148	56	62
February	3.2555	160	112	30	142	52	63
March	3.2349	157	107	32	145	54	63
April	3.1931	159	111	30	145	53	64
May	3.1146	174	118	32	149	50	66
June	3.1324	165	109	34	148	50	66
July	3.1956	153	117	23	136	51	62
August	3.2583	153	109	29	131	48	64
September	3.3680	139	97	30	138	47	66
October	3.3156	150	103	31	139	46	67
November	3.2685	146	98	33	141	49	65
December	3.3283	152	94	38	143	48	66
Annual Average	3.2388	155	107	31	142	50	65

TABLE II.A.3.a3

2000 Monthly and Annual Average BOD5 and Suspended Solids Data

		BOD_5			Suspended Solids		
Month	Effluent Flow [m^3/sec]	Influent [mg/L]	Effluent [mg/L]	Percent Removal [%]	Influent [mg/L]	Effluent [mg/L]	Percent Removal [%]
January	3.2835	160	101	37	145	49	66
February	3.1000	169	102	40	147	50	66
March	3.1626	155	96	38	155	51	67
April	3.1834	152	100	34	148	49	67
May	3.1176	161	102	36	151	51	66
June	3.1242	163	106	35	148	46	69
July	3.2783	160	103	35	145	46	68
August	3.2477	162	109	33	143	48	67
September	3.2077	165	106	36	143	51	64
October	3.1655	156	103	34	149	53	64
November	3.1660	157	110	30	144	48	67
December	3.1656	162	111	31	139	52	63
Annual Average	3.1835	160	104	35	146	50	66

TABLE II.A.3.a4

2001 Monthly and Annual Average BOD5 and Suspended Solids Data

		BOD_5			Suspended Solids		
Month	Effluent Flow [m^3/sec]	Influent [mg/L]	Effluent [mg/L]	Percent Removal [%]	Influent [mg/L]	Effluent [mg/L]	Percent Removal [%]
January	3.1338	161	109	32	150	56	62
February	3.1566	162	111	32	137	53	61
March	2.9762	167	107	36	155	55	64
April	3.0824	151	102	32	140	50	64
May	3.0657	158	105	34	144	50	65
June	3.1018	162	111	32	145	51	65
July	3.1450	157	107	31	140	52	63
August	3.1841	154	104	33	139	52	62
September	3.1144	151	96	37	132	49	63
October	3.0726	149	99	33	142	46	68
November	3.0985	150	98	35	144	52	64
December	3.0245	162	104	36	148	49	67
Annual Average	3.0963	157	104	34	143	51	64

TABLE II.A.3.a5

2002 Monthly and Annual Average BOD5 and Suspended Solids Data

		BOD_5			Suspended Solids		
Month	Effluent Flow [m^3/sec]	Influent [mg/L]	Effluent [mg/L]	Percent Removal [%]	Influent [mg/L]	Effluent [mg/L]	Percent Removal [%]
January	3.1817	150	98	35	133	47	65
February	3.0156	155	104	33	139	49	65
March	2.9689	164	106	36	136	47	65
April	2.9773	160	109	32	133	48	64
May	3.0261	165	111	33	142	50	65
June	3.0450	170	111	35	146	50	66
July	3.0561	165	108	34	141	47	67
August	3.0229	171	110	36	150	48	68
September	3.0900	160	100	37	141	46	68
October	3.1530	142	97	32	134	45	67
November	3.0230	154	100	35	143	47	67
December	3.0154	156	107	32	140	44	68
Annual Average	3.0479	159	105	34	140	47	66

The average daily influent BOD_5 for data obtained from 1998 to 2002, see Table II.A.3.a6, is 157 mg/L. Table II.A.3.a6 provide other general statistics such as BOD_5 (influent/effluent), TSS (influent/effluent), effluent pH, and effluent enterococcus concentration. When compared against other facilities, the influent concentrations for both BOD_5 and TSS are significantly lower than what one may "normally" anticipated (i.e., for medium strength wastewater, 220 mg/L. We assume the lower concentrations for these conventional pollutants are associated with existing high inflow and infiltration (I/I).

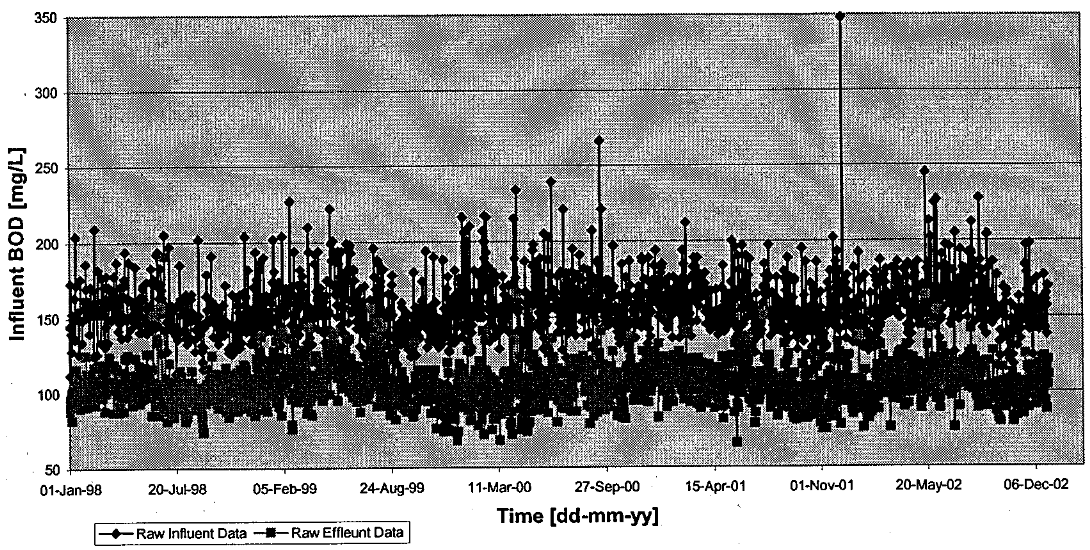
TABLE II.A.3.a6
General Statistics: BOD_5, TSS, and pH

Statistic	Influent BOD5 [mg/L]	Effluent BOD5 [mg/L]	Influent TSS [mg/L]	Effluent TSS [mg/L]	Effluent PH [SU]	Effluent Enterococcus [cfu/100mL]
Average	157	105	142	49	6.97	3,505,735
Standard Deviation	19	13	19	7.6	0.1	1,833,197
CV	0.12	0.12	0.13	0.15	0.01	0.52
n	1,740	1,732	1,625	1,746	1,637	1,822
Maximum	348	191	380	108	7.76	10,000,000
Minimum	109	66	72	28	6.67	120,000

It should be noted that the average influent of BOD_5 and TSS are quite similar, but the variability, as expressed by the sample standard deviation, is quite different.

Figure II.A.3.a1, a time series plot of the influent and effluent BOD_5, does not show an obvious cyclic, or seasonal, tendency. The figure does, however, depict a single event having influent BOD_5 concentration around 350 mg/L and does show the average value and spread of the data, as shown Table II.A.3.a6. The

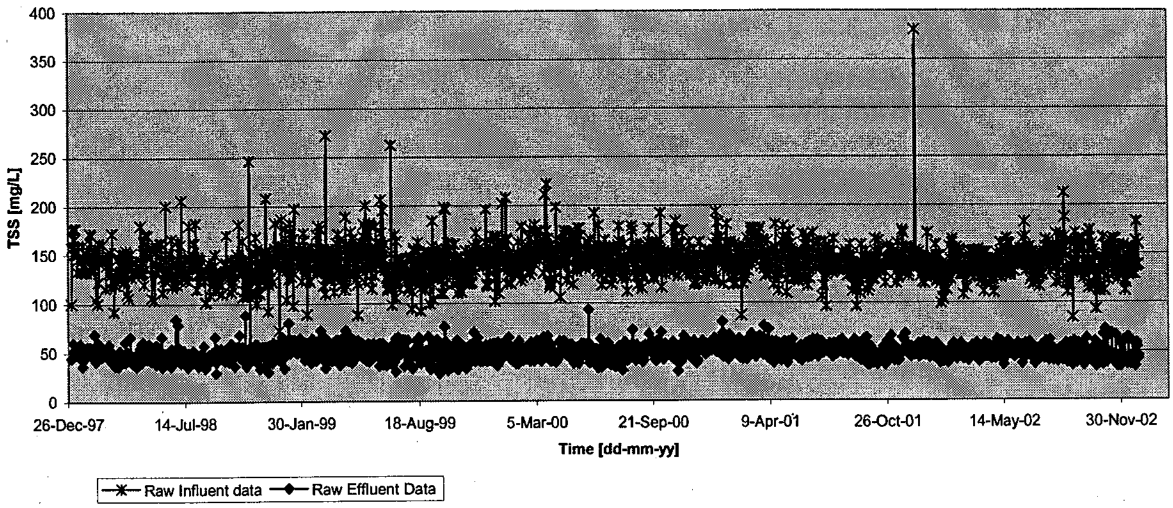
Figure II.A.3.a1
Influent/Effluent BOD_5 vs Time



effluent BOD_5, when compared against the influent BOD_5, shows a narrower variability and a lower average, as anticiapted, with several points scattered in the range of the average influent BOD_5.

A time series for influent and effluent TSS, see Figure II.A.3.a2, also shows the the narrower spread of the effluent TSS when compared against the influent TSS. Unlike the infuent/effluent BOD_5 time series, there is a greater separation between the TSS influent/effluent readings.

FIGURE II.A.3.a2
INFLUENT/EFFLUENT TSS vs TIME



The spike in both BOD5 and TSS occurred on the same date (December 13, 2001), suggesting a discrete discharge that has not repeated itself.

A time series using a thirty day, running averaged value versus time was also determined for both BOD_5 and TSS; see Figures II.A.3.a3 and II.A.3a4. This analysis does show some cyclic tendency. At this time, the cause of the cyclic tendency is not known. Figure II.A.3.a4, however, suggests a summer/winter pattern, which could be assoicated with I/I.

FIGURE II.A.3.a3
BOD_5 Removal vs Time

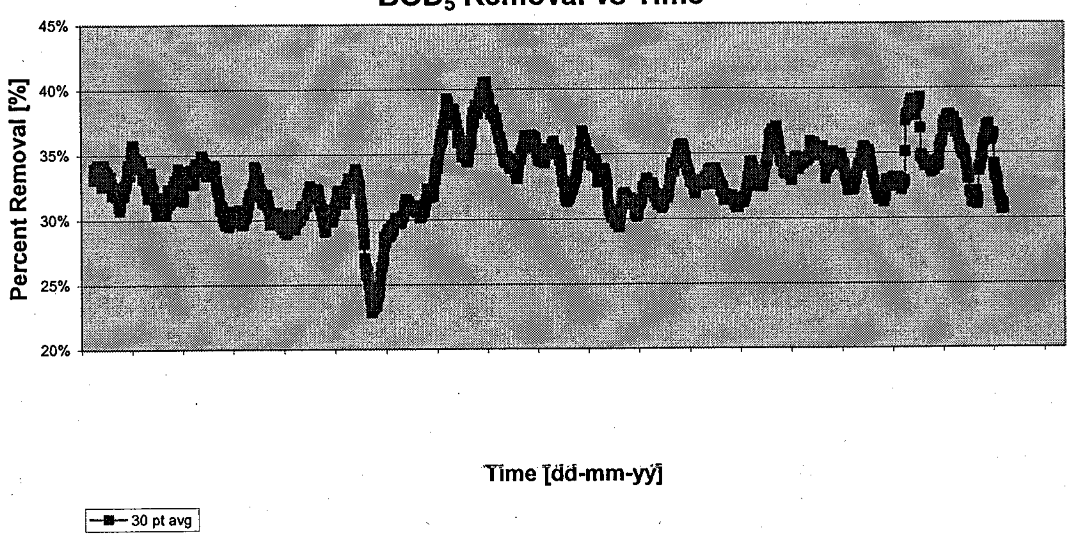
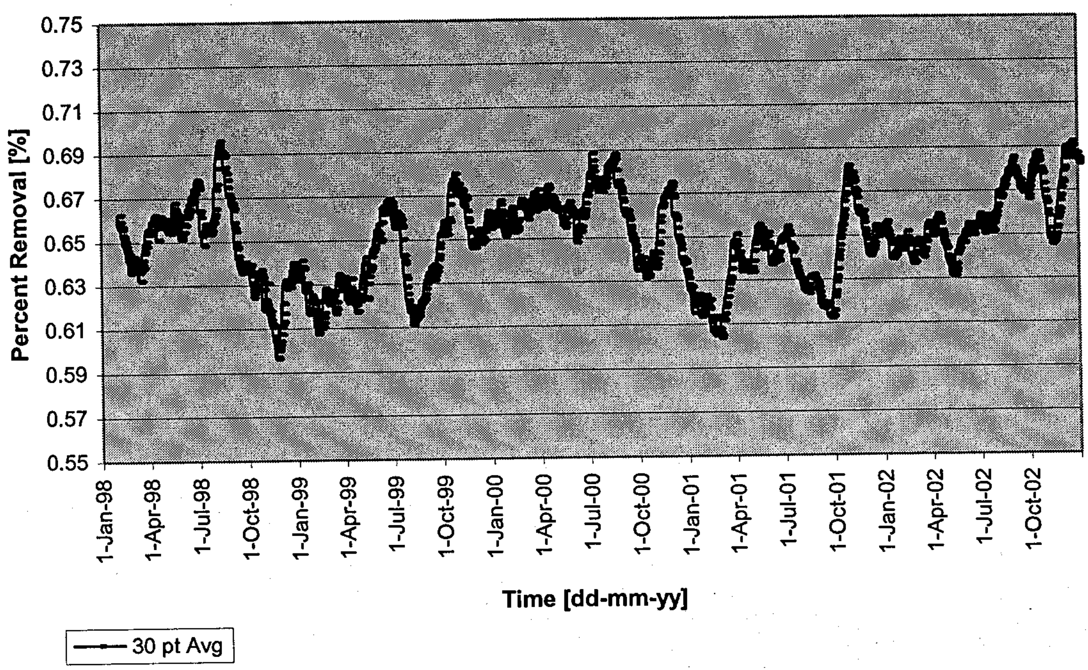


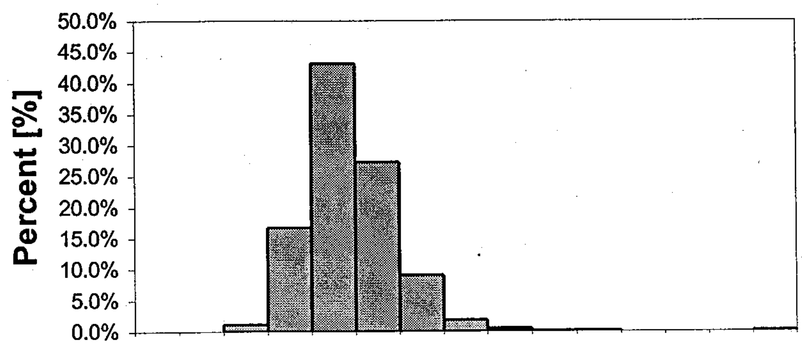
FIGURE II.A.3.a4
TSS REMOVAL VS TIME



The influent/effluent histograms for BOD_5 and TSS were also determined; see Figures II.A.3.a5 and II.A.3.a6, respectively. These figures again show the higher variability between influent and effluent data sets, suggesting that the treatment is having an effect. The figures shows a slight skewness associated with the influent rather than the effluent, suggesting the presence of higher, and sporadic, particularly for influent BOD_5 concentrations. With the quantity of data available, it was anticipated to see a normal distribution. The nearly normal distribution of the effluent BOD5 also suggests the treatment process is being effective.

FIGURE II.A.3.a5
BOD_5 HISTOGRAM

INFLUENT BOD_5



EFFLUENT BOD_5

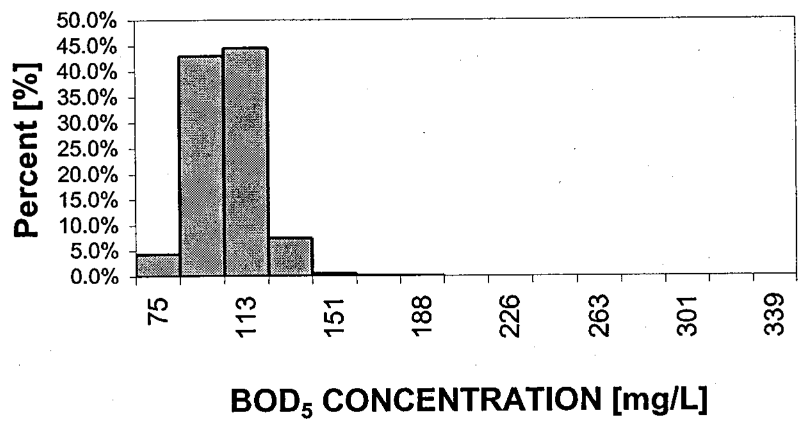
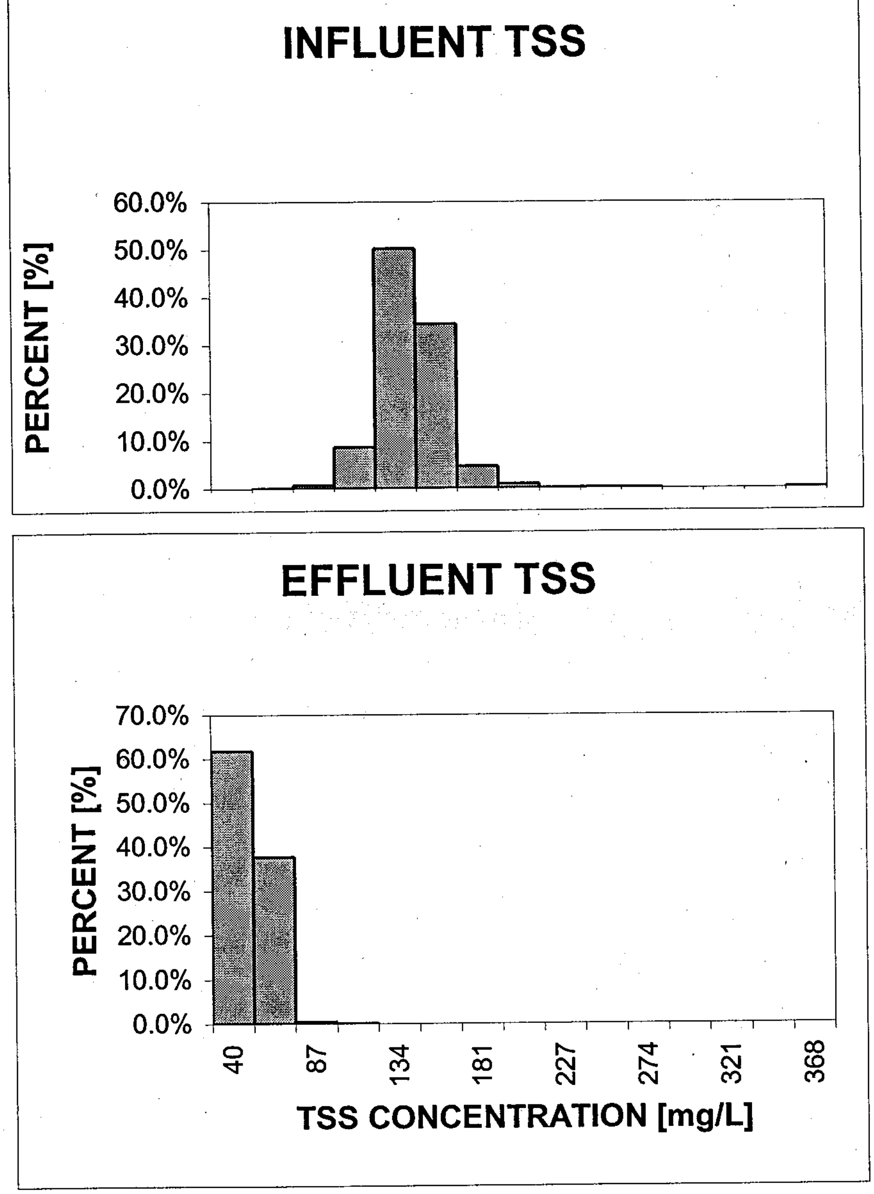


FIGURE II.A.3.a6



The histogram clearly shows the close proximity of the influent and effluent BOD_5 distribution concentrations, especially when compared to the influent and effluent TSS histogram. The overlaps between the influent and effluent BOD_5 histogram, particularly for such low strength influent, suggests that for a significant percent of time, the effluent concentrations are similar to the influent, though probably not at the same time.

The difficulty of removing 30% is pronounced with a weaker strength influent. The City, however, has instituted an interim metal salt injection systems for clarifiers 5 and 6 to be used as needed to meet permit limits. Clarifiers 5 and 6 were selected based on the present hydraulics of the plant. It is assumed that clarifiers 1 and 2, the clarifiers closest to the influent screenings, readily remove the larger more settable materials. Clarifiers 3 and 4 remove the next tier of material. Eventually, clarifiers 5 and 6 are left to treat the remaining material, characterized as smaller and less settable. For this reason, the interim metals salts injection system was erected to assist in removing those materials that are most difficult to remove.

b. If your effluent does not meet the primary or equivalent treatment requirements, when do you plan to meet them? Provide a detailed schedule, including design, construction, startup and full operation, with your application. This requirement must be met by the effective date of the new section 301(h) modified permit.

RESPONSE:
As specified in Appendix B, several improvements are currently underway. Although the proposed improvements would not significantly improve the level of treatment, it will increase reliability and afford means to address unanticipated conditions.

4. Effluent Limitations and Characteristics [40 CFR 125.61(b) and 125.62(e)(2)]

a. Identify the final effluent limitations for five-day biochemical oxygen demand (BOD5), suspended solids, and pH upon which your application for a modification is based:

_BOD5 ___ mg/L
_Suspended solids ___ mg/L
_pH ___ (range)

RESPONSE:

90 cw
90P

We are not requesting a change in the existing effluent limitations, despite the increase in design flow from 82 mgd to 90 mgd. We do not anticipated an increase in the flow to the plant in the next permit cycle, nor do we suspect the wastewater will in character. Given this, the requested effluent limitations are provided as:

Discharge Limitations				
Discharge Parameter	Average Monthly	Average Weekly	Maximum Daily	Units
Flow	report	report	report	MGD
Biochemical Oxygen Demand (5-day)	116 79,330	160 109,4214	report	mg/L[1] lbs/day[2]
	As a monthly average, not less than 30% removal efficiency from influent stream[3]			
Total Suspended Solids	69 47,187	104 71,124	report	mg/L[1] lbs/day[2]
	As a monthly average, not less than 60% removal efficiency from influent stream[3]			

For pH:

Based on federal secondary treatment standards in accordance with 40 CFR 133.102(c), we propose a range of 6.0 < pH < 9.0.

b. **Provide data on the following effluent characteristics for your current discharge as well as for the modified discharge if different from the current discharge:**

Flow (m3/sec):

_minimum
_average dry weather
_average wet weather
_maximum
_annual average

BOD5 (mg/L) for the following plant flows:

_minimum
_average dry weather
_average wet weather
_maximum
_annual average

Suspended solids (mg/L) for the following plant flows:

_minimum
_average dry weather
_average wet weather
_maximum
_annual average

Toxic pollutants and pesticides (ug/L):

_list each toxic pollutant and pesticide

_list each 304(a)(1) criteria and toxic pollutant and pesticide

pH:

_minimum
_maximum

Dissolved oxygen (mg/L, prior to chlorination) for the following plant flows:

_minimum
_average dry weather
_average wet weather
_maximum
_annual average

Immediate dissolved oxygen demand (mg/L).

<u>RESPONSE</u>:

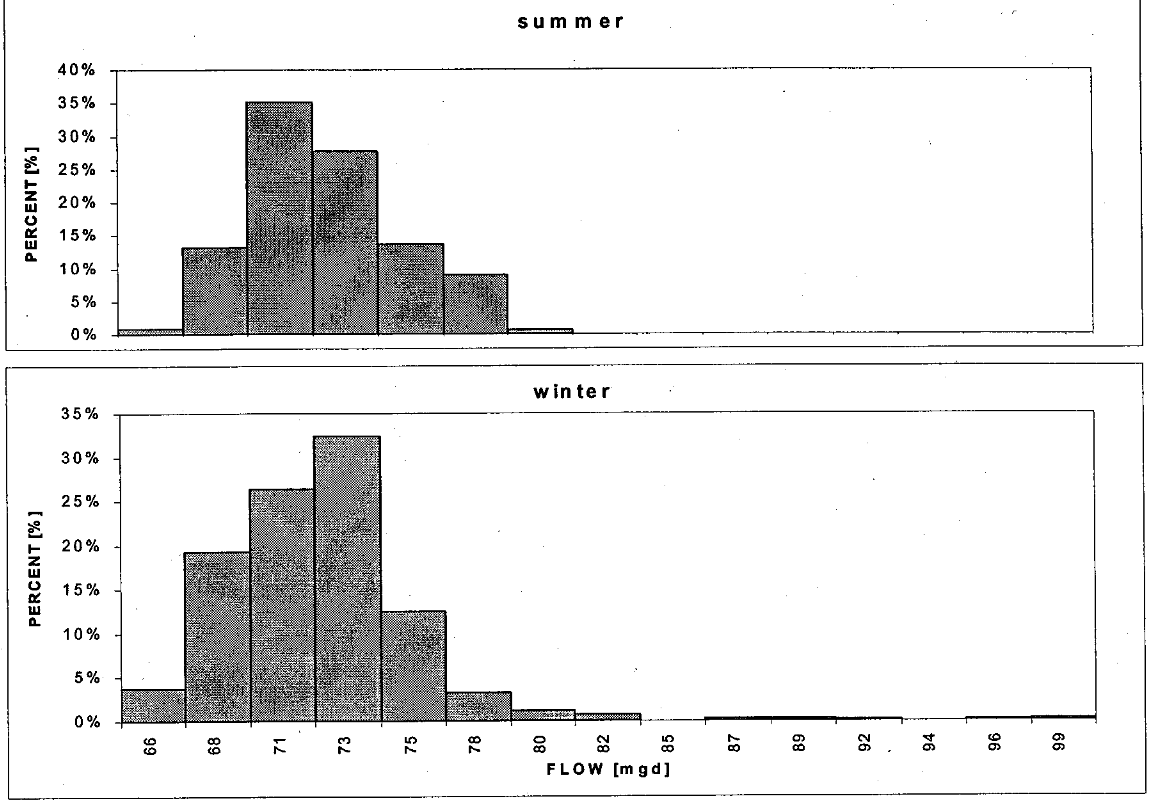
The following responses are based on compliance data from 1998 to 2002. Essentially, Hawaii experiences two seasons (Summer and Winter). Typically characteristics used to define the seasons are temperature, trade wind patterns (specifically the reliability of the trade winds), and precipitation. Based on this, Summer, or dry weather, extends from May to September. Winter, or wet weather, extends from October to April.

Flow (m3/sec):

- minimum – 2.84 m^3/s (or 64.8 mgd)
- average dry weather - 3.16 m^3/s (or 72.2 mgd)
- average wet weather – 3.15 m^3/s (or 71.9 mgd)
- maximum – 4.37 m^3/s (or 99.8 mgd)
- annual average – 3.15 m^3/s (or 72 mgd)

It is interesting to note the average dry and wet weather flows are similar. The difference is the infrequent "high" flow events as seen in Figure II.A.4b1

FIGURE II.A.4b1
FLOW HISTOGRAM



BOD5 (mg/L) for the following plant flows:

- minimum - 66 mg/L
- average dry weather - 106.5 mg/L
- average wet weather - 103.7 mg/L
- maximum - 191 mg/L
- annual average - 104.9 mg/L

Suspended solids (mg/L) for the following plant flows:

- minimum - 28 mg/L
- average dry weather - 48.8 mg/L
- average wet weather - 49.9 mg/L
- maximum - 108 mg/L
- annual average - 49.5 mg/L

Toxic pollutants and pesticides (ug/L):

- list each toxic pollutant and pesticide
- list each 304(a)(1) criteria and toxic pollutant and pesticide

All parameters we tested per permit requirements; see Appendix J for the listing of parameters, frequency, etc. See Table II.A.4.b1 and II.A.4.b2 for all parameters (influent and effluent) we detected from the time the permit was placed into effect.

TABLE II.A.4.b1

INFLUENT TOXIC POLLUTANTS AND PESTICIDES

Analyte	Site	Date	Result	Qualifier	Unit	PQL
Zinc	Influent	3/2/98	92		ug/L	20
Zinc	Influent	8/3/98	73		ug/L	20
Zinc	Influent	2/9/99	79		ug/L	20
Zinc	Influent	8/16/99	95		ug/L	20
Zinc	Influent	2/14/00	62		ug/L	4
Zinc	Influent	8/7/00	76		ug/L	4
Zinc	Influent	2/12/01	66		ug/L	2
Zinc	Influent	8/13/01	64		ug/L	2
Zinc	Influent	5/6/02	59		ug/L	2
Zinc	Influent	8/12/02	120		ug/L	10
Toluene	Influent	3/2/98	4		ug/L	3
Toluene	Influent	2/9/99	9.6		ug/L	2
Toluene	Influent	8/16/99	1.7	J	ug/L	2
Toluene	Influent	2/14/00	1.6	J	ug/L	2
Toluene	Influent	8/7/00	1.4	J	ug/L	2
Toluene	Influent	2/12/01	0.9	J	ug/L	2
Toluene	Influent	5/6/02	1.3		ug/L	1
Toluene	Influent	6/27/02	2.0		ug/L	1
Toluene	Influent	8/12/02	2.5		ug/L	1
Thallium	Influent	8/3/98	3.0		ug/L	2
Thallium	Influent	2/9/99	2.4		ug/L	5
Thallium	Influent	8/7/00	0.2	J	ug/L	4
Thallium	Influent	8/13/01	0.84	J	ug/L	2
Thallium	Influent	5/6/02	0.21	J	ug/L	2
Thallium	Influent	8/12/02	5.9		ug/L	2
Tetrachloroethene	Influent	8/3/98	6		ug/L	2
Tetrachloroethene	Influent	2/14/00	0.6	J	ug/L	2
Tetrachloroethene	Influent	8/7/00	0.7	J	ug/L	2
Tetrachloroethene	Influent	8/12/02	0.88	J	ug/L	1
Silver	Influent	3/2/98	15		ug/L	1
Silver	Influent	8/3/98	7.0		ug/L	0.5
Silver	Influent	2/9/99	5.4		ug/L	0.5
Silver	Influent	8/16/99	3.7		ug/L	0.5
Silver	Influent	2/14/00	4.5		ug/L	0.4
Silver	Influent	8/7/00	4.9		ug/L	4
Silver	Influent	2/12/01	4.7		ug/L	2
Silver	Influent	8/13/01	4.2		ug/L	2
Silver	Influent	5/6/02	3.3		ug/L	2

TABLE II.A.4.b1
INFLUENT TOXIC POLLUTANTS AND PESTICIDES
(continue)

Analyte	Site	Date	Result	Qualifier	Unit	PQL
Silver	Influent	8/12/02	4.3		ug/L	0.5
Selenium	Influent	3/2/98	3.0		ug/L	2
Selenium	Influent	8/3/98	2.8		ug/L	2
Selenium	Influent	2/12/01	0.7	J	ug/L	2
Selenium	Influent	8/13/01	1.5	J	ug/L	2
Selenium	Influent	5/6/02	2.4		ug/L	2
Selenium	Influent	8/12/02	3.9		ug/L	2
Phenol	Influent	2/9/99	3		ug/L	10
Phenol	Influent	2/14/00	3	J	ug/L	10
Phenol	Influent	8/7/00	3	J	ug/L	10
Phenol	Influent	2/12/01	3	J	ug/L	10
Phenol	Influent	8/13/01	4	J	ug/L	10
Phenol	Influent	5/6/02	2	J	ug/L	10
Phenol	Influent	8/12/02	3	J	ug/L	10
Nickel	Influent	3/2/98	6.5		ug/L	5
Nickel	Influent	2/9/99	5.8		ug/L	5
Nickel	Influent	8/16/99	4.0	J	ug/L	5
Nickel	Influent	2/14/00	7.8		ug/L	4
Nickel	Influent	8/7/00	9.4		ug/L	4
Nickel	Influent	2/12/01	9.1		ug/L	2
Nickel	Influent	8/13/01	9.6		ug/L	2
Nickel	Influent	5/6/02	5.3		ug/L	2
Nickel	Influent	8/12/02	4.2		ug/L	1
Methylene Chloride	Influent	3/2/98	4		ug/L	2
Methylene Chloride	Influent	8/3/98	4		ug/L	2
Methylene Chloride	Influent	2/9/99	0.9		ug/L	2
Methylene Chloride	Influent	2/14/00	2.3	B	ug/L	2
Methylene Chloride	Influent	8/7/00	6.2	B	ug/L	2
Methylene Chloride	Influent	2/12/01	1.5	JB	ug/L	2
Methylene Chloride	Influent	5/6/02	2.0	B	ug/L	1
Methylene Chloride	Influent	8/12/02	0.42	JB	ug/L	1
Mercury	Influent	2/9/99	0.11		ug/L	0.2
Mercury	Influent	8/16/99	0.1	J	ug/L	0.2
Mercury	Influent	2/12/01	0.23		ug/L	0.2
Mercury	Influent	8/13/01	0.20		ug/L	0.2
Mercury	Influent	5/6/02	0.21		ug/L	0.2
Mercury	Influent	8/12/02	0.22		ug/L	0.2
Lead	Influent	2/9/99	2.5		ug/L	5
Lead	Influent	8/16/99	2.0	J	ug/L	5
Lead	Influent	2/14/00	3.6	J	ug/L	4
Lead	Influent	8/7/00	2.2	J	ug/L	4
Lead	Influent	2/12/01	2.4	B	ug/L	2
Lead	Influent	8/13/01	2.1		ug/L	2

TABLE II.A.4.b1
INFLUENT TOXIC POLLUTANTS AND PESTICIDES
(continue)

Analyte	Site	Date	Result	Qualifier	Unit	PQL
Lead	Influent	5/6/02	3.3		ug/L	2
Lead	Influent	8/12/02	3.0		ug/L	1
Heptachlor Epoxide	Influent	2/9/99	0.010		ug/L	0.009
Heptachlor Epoxide	Influent	5/6/02	0.009		ug/L	0.009
Heptachlor	Influent	2/9/99	0.556		ug/L	0.009
Gamma-BHC	Influent	3/2/98	0.06		ug/L	0.02
Gamma-BHC	Influent	2/9/99	0.029		ug/L	0.009
Gamma-BHC	Influent	8/16/99	0.01		ug/L	0.009
Gamma-BHC	Influent	2/14/00	0.015		ug/L	0.009
Gamma-BHC	Influent	8/7/00	0.022		ug/L	0.009
Gamma-BHC	Influent	8/13/01	0.015		ug/L	0.009
Gamma-BHC	Influent	5/6/02	0.013		ug/L	0.009
Gamma-BHC	Influent	8/12/02	0.009		ug/L	0.009
Ethylbenzene	Influent	5/6/02	0.36	J	ug/L	1
Ethylbenzene	Influent	6/27/02	0.43	J	ug/L	1
Ethylbenzene	Influent	8/12/02	0.38	J	ug/L	1
Endrin Aldehyde	Influent	8/12/02	0.009		ug/L	0.009
Di-n-Butyl Phthalate	Influent	8/16/99	6	JR	ug/L	10
Diethyl Phthalate	Influent	8/16/99	6	JR	ug/L	10
Diethyl Phthalate	Influent	2/14/00	3	J	ug/L	10
Diethyl Phthalate	Influent	8/7/00	4	J	ug/L	10
Diethyl Phthalate	Influent	2/12/01	4	J	ug/L	10
Diethyl Phthalate	Influent	8/13/01	3	J	ug/L	10
Diethyl Phthalate	Influent	5/6/02	3	J	ug/L	10
Diethyl Phthalate	Influent	8/12/02	4	J	ug/L	10
Dieldrin	Influent	3/2/98	0.09		ug/L	0.02
Dieldrin	Influent	2/9/99	0.018		ug/L	0.009
Dieldrin	Influent	8/16/99	0.03		ug/L	0.009
Dieldrin	Influent	2/14/00	0.018		ug/L	0.009
Dieldrin	Influent	8/7/00	0.086		ug/L	0.009
Dieldrin	Influent	2/12/01	0.045		ug/L	0.009
Dieldrin	Influent	8/13/01	0.026		ug/L	0.009
Dieldrin	Influent	5/6/02	0.232		ug/L	0.009
Dieldrin	Influent	8/12/02	0.028		ug/L	0.009
Cyanide, Total	Influent	2/12/01	9.8		ug/L	5
Cyanide, Total	Influent	8/13/01	8.6		ug/L	5
Cyanide, Total	Influent	8/12/02	3.1	J	ug/L	5
Copper	Influent	3/2/98	26		ug/L	5
Copper	Influent	8/3/98	18		ug/L	5
Copper	Influent	2/9/99	26		ug/L	5
Copper	Influent	8/16/99	21		ug/L	5
Copper	Influent	2/14/00	51		ug/L	2
Copper	Influent	8/7/00	57		ug/L	4

TABLE II.A.4.b1
INFLUENT TOXIC POLLUTANTS AND PESTICIDES
(continue)

Analyte	Site	Date	Result	Qualifier	Unit	PQL
Copper	Influent	2/12/01	61		ug/L	2
Copper	Influent	8/13/01	56		ug/L	2
Copper	Influent	5/6/02	34		ug/L	2
Copper	Influent	8/12/02	35		ug/L	2
Chromium, Total	Influent	3/2/98	7.9		ug/L	2
Chromium, Total	Influent	8/3/98	5.1		ug/L	2
Chromium, Total	Influent	2/9/99	7.7		ug/L	2
Chromium, Total	Influent	8/16/99	5.4		ug/L	2
Chromium, Total	Influent	2/14/00	7.3	B	ug/L	2
Chromium, Total	Influent	8/7/00	6.4		ug/L	4
Chromium, Total	Influent	2/12/01	6.0		ug/L	2
Chromium, Total	Influent	8/13/01	9.1	B	ug/L	2
Chromium, Total	Influent	5/6/02	4.4	B	ug/L	2
Chromium, Total	Influent	8/12/02	5.2		ug/L	2
Chloroform	Influent	3/2/98	2		ug/L	2
Chloroform	Influent	2/9/99	1.0		ug/L	2
Chloroform	Influent	8/16/99	1.4	J	ug/L	2
Chloroform	Influent	2/14/00	1.6	J	ug/L	2
Chloroform	Influent	8/7/00	1.1	J	ug/L	2
Chloroform	Influent	2/12/01	1.9	J	ug/L	2
Chloroform	Influent	8/13/01	2.4	JB	ug/L	5
Chloroform	Influent	5/6/02	1.9		ug/L	1
Chloroform	Influent	6/27/02	0.95	J	ug/L	1
Chloroform	Influent	8/12/02	2.0		ug/L	1
Chlordane	Influent	2/9/99	10.8		ug/L	0.1
Chlordane	Influent	8/7/00	0.126		ug/L	0.1
Chlordane	Influent	2/12/01	0.13		ug/L	0.1
Chlordane	Influent	8/13/01	0.07	J	ug/L	0.1
Chlordane	Influent	5/6/02	0.16		ug/L	0.1
Chlordane	Influent	8/12/02	0.10		ug/L	0.1
Cadmium	Influent	8/3/98	0.5		ug/L	0.5
Cadmium	Influent	8/12/02	0.20	J	ug/L	0.5
Bis(2-ethylhexyl)phthalate	Influent	3/2/98	12		ug/L	10
Bis(2-ethylhexyl)phthalate	Influent	2/9/99	2		ug/L	10
Bis(2-ethylhexyl)phthalate	Influent	8/16/99	25	R	ug/L	10
Bis(2-ethylhexyl)phthalate	Influent	2/14/00	4	J	ug/L	10
Bis(2-ethylhexyl)phthalate	Influent	8/7/00	2	J	ug/L	10
Bis(2-ethylhexyl)phthalate	Influent	2/12/01	3	J	ug/L	10
Bis(2-ethylhexyl)phthalate	Influent	8/13/01	6	J	ug/L	10
Bis(2-ethylhexyl)phthalate	Influent	5/6/02	2	J	ug/L	10
Bis(2-ethylhexyl)phthalate	Influent	8/12/02	6	J	ug/L	10
Beryllium	Influent	8/12/02	0.08	JB	ug/L	0.1
Benzene	Influent	3/2/98	7		ug/L	2

TABLE II.A.4.b1
INFLUENT TOXIC POLLUTANTS AND PESTICIDES
(continue)

Analyte	Site	Date	Result	Qualifier	Unit	PQL
Benzene	Influent	8/3/98	8		ug/L	2
Benzene	Influent	2/9/99	3.2		ug/L	2
Benzene	Influent	8/16/99	11		ug/L	2
Benzene	Influent	2/14/00	2.1		ug/L	2
Benzene	Influent	8/7/00	2.3		ug/L	2
Benzene	Influent	2/12/01	3.0		ug/L	2
Benzene	Influent	8/13/01	2.1	J	ug/L	5
Benzene	Influent	5/6/02	1.9		ug/L	1
Benzene	Influent	6/27/02	5.0		ug/L	1
Benzene	Influent	8/12/02	2.9		ug/L	1
Arsenic	Influent	3/2/98	2.9		ug/L	2
Arsenic	Influent	2/9/99	2.0		ug/L	2
Arsenic	Influent	8/16/99	1.0	J	ug/L	2
Arsenic	Influent	2/14/00	2.0		ug/L	2
Arsenic	Influent	8/7/00	1.7	J	ug/L	2
Arsenic	Influent	2/12/01	1.6		ug/L	2
Arsenic	Influent	8/13/01	3.3		ug/L	2
Arsenic	Influent	5/6/02	2.4		ug/L	2
Arsenic	Influent	8/12/02	1.2	J	ug/L	2
Antimony	Influent	8/3/98	2.9		ug/L	2
Antimony	Influent	2/9/99	2.0		ug/L	2
Antimony	Influent	8/16/99	1.1	J	ug/L	2
Antimony	Influent	2/14/00	0.43	B	ug/L	0.4
Antimony	Influent	8/7/00	0.5	JB	ug/L	4
Antimony	Influent	2/12/01	0.5	J	ug/L	2
Antimony	Influent	8/13/01	0.50	J	ug/L	2
Antimony	Influent	5/6/02	0.61	J	ug/L	2
Aldrin	Influent	2/9/99	0.011		ug/L	0.009
Aldrin	Influent	5/6/02	5.86		ug/L	0.009
4,4'-DDT	Influent	5/6/02	0.004	J	ug/L	0.009
4,4'-DDT	Influent	8/12/02	0.004	J	ug/L	0.009
4,4'-DDD	Influent	5/6/02	0.005	J	ug/L	0.009
1,4-Dichlorobenzene	Influent	3/2/98	5		ug/L	2
1,4-Dichlorobenzene	Influent	8/3/98	2		ug/L	2
1,4-Dichlorobenzene	Influent	2/9/99	1.5		ug/L	2
1,4-Dichlorobenzene	Influent	8/16/99	2.0		ug/L	2
1,4-Dichlorobenzene	Influent	2/14/00	2.5		ug/L	2
1,4-Dichlorobenzene	Influent	8/7/00	2.3		ug/L	2
1,4-Dichlorobenzene	Influent	2/12/01	2.1		ug/L	2
1,4-Dichlorobenzene	Influent	5/6/02	1.9		ug/L	1
1,4-Dichlorobenzene	Influent	6/27/02	1.9		ug/L	1
1,4-Dichlorobenzene	Influent	8/12/02	2.1		ug/L	1

Qualifiers:
J: Value is an estimate, greater than the MDL but less than the ML (low standard)
B: Target analyte detected in associated blank--for metals, B is used only if blank value is within a factor of 10X the sample result
R: Results rejected due to significant QC failure or failure to follow proper method

TABLE II.A.4.b2

INFLUENT TOXIC POLLUTANTS AND PESTICIDES

Analyte	Site	Date	Result	Qualifier	Unit	PQL
Zinc, Dissolved	Effluent	3/2/98	27		ug/L	20
Zinc, Dissolved	Effluent	8/3/98	31		ug/L	20
Zinc, Dissolved	Effluent	2/9/99	91		ug/L	20
Zinc, Dissolved	Effluent	8/16/99	32		ug/L	20
Zinc, Dissolved	Effluent	2/14/00	11		ug/L	4
Zinc, Dissolved	Effluent	8/7/00	25		ug/L	4
Zinc, Dissolved	Effluent	2/12/01	14		ug/L	2
Zinc, Dissolved	Effluent	8/13/01	7.8		ug/L	2
Zinc, Dissolved	Effluent	5/6/02	8.6		ug/L	2
Zinc, Dissolved	Effluent	8/12/02	35		ug/L	10
Zinc	Effluent	3/2/98	69		ug/L	20
Zinc	Effluent	8/3/98	73		ug/L	20
Zinc	Effluent	2/9/99	61		ug/L	20
Zinc	Effluent	8/16/99	70		ug/L	20
Zinc	Effluent	2/14/00	37		ug/L	4
Zinc	Effluent	8/7/00	43		ug/L	4
Zinc	Effluent	2/12/01	52		ug/L	2
Zinc	Effluent	8/13/01	43		ug/L	2
Zinc	Effluent	5/6/02	42		ug/L	2
Zinc	Effluent	8/12/02	76		ug/L	10
Tributyltin	Effluent	3/2/98	0.068		ug/L	0.044
Tributyltin	Effluent	2/9/99	0.066		ug/L	0.044
Toluene	Effluent	3/2/98	3		ug/L	3
Toluene	Effluent	8/3/98	10		ug/L	3
Toluene	Effluent	2/9/99	2.0		ug/L	2
Toluene	Effluent	8/16/99	1.5	J	ug/L	2
Toluene	Effluent	2/14/00	1.6	J	ug/L	2
Toluene	Effluent	8/7/00	0.9	J	ug/L	2
Toluene	Effluent	2/12/01	1.5	J	ug/L	2
Toluene	Effluent	8/13/01	1.0	J	ug/L	5
Toluene	Effluent	5/6/02	0.85	J	ug/L	1
Toluene	Effluent	6/27/02	2.2		ug/L	1
Toluene	Effluent	8/12/02	1.9		ug/L	1
Thallium, Dissolved	Effluent	8/16/99	1.6	J	ug/L	5
Thallium, Dissolved	Effluent	8/12/02	2.6		ug/L	2

TABLE II.A.4.b2
INFLUENT TOXIC POLLUTANTS AND PESTICIDES
(continue)

Analyte	Site	Date	Result	Qualifier	Unit	PQL
Thallium	Effluent	8/12/02	2.2		ug/L	2
Tetrachloroethene	Effluent	3/2/98	2		ug/L	2
Tetrachloroethene	Effluent	8/3/98	6		ug/L	2
Tetrachloroethene	Effluent	2/14/00	0.8	J	ug/L	2
Tetrachloroethene	Effluent	8/12/02	1.2		ug/L	1
Silver, Dissolved	Effluent	3/2/98	2.3		ug/L	1
Silver, Dissolved	Effluent	8/3/98	1.1		ug/L	0.5
Silver, Dissolved	Effluent	2/9/99	2.3		ug/L	0.5
Silver, Dissolved	Effluent	8/16/99	0.5	J	ug/L	0.5
Silver, Dissolved	Effluent	5/6/02	0.07	J	ug/L	2
Silver	Effluent	3/2/98	13.0		ug/L	1
Silver	Effluent	8/3/98	7.6		ug/L	0.5
Silver	Effluent	2/9/99	3.8		ug/L	0.5
Silver	Effluent	8/16/99	3.6		ug/L	0.5
Silver	Effluent	2/14/00	3.2		ug/L	0.4
Silver	Effluent	8/7/00	3.2	J	ug/L	4
Silver	Effluent	2/12/01	3.0		ug/L	2
Silver	Effluent	8/13/01	3.3		ug/L	2
Silver	Effluent	5/6/02	2.0		ug/L	2
Silver	Effluent	8/12/02	2.9		ug/L	0.5
Selenium, Dissolved	Effluent	3/2/98	3.0		ug/L	2
Selenium, Dissolved	Effluent	8/16/99	2.8	J	ug/L	5
Selenium, Dissolved	Effluent	2/14/00	2.6		ug/L	2
Selenium, Dissolved	Effluent	2/12/01	1.7	J	ug/L	2
Selenium, Dissolved	Effluent	5/6/02	1.9	J	ug/L	2
Selenium, Dissolved	Effluent	8/12/02	1.9	J	ug/L	2
Selenium	Effluent	3/2/98	3.5		ug/L	2
Selenium	Effluent	8/3/98	5.1		ug/L	2
Selenium	Effluent	2/14/00	1.1	J	ug/L	2
Selenium	Effluent	2/12/01	1.2	J	ug/L	2
Selenium	Effluent	8/13/01	1.0	J	ug/L	2
Selenium	Effluent	5/6/02	1.8	J	ug/L	2
Selenium	Effluent	8/12/02	2.0		ug/L	2
Phenol	Effluent	2/9/99	4	J	ug/L	10
Phenol	Effluent	2/14/00	4	J	ug/L	10
Phenol	Effluent	8/7/00	5	J	ug/L	10
Phenol	Effluent	2/12/01	4	J	ug/L	10
Phenol	Effluent	8/13/01	6	J	ug/L	10
Phenol	Effluent	5/6/02	4	J	ug/L	10
Phenol	Effluent	8/12/02	4	J	ug/L	10
Nickel, Dissolved	Effluent	2/9/99	2.2	J	ug/L	5
Nickel, Dissolved	Effluent	8/16/99	7.2		ug/L	5
Nickel, Dissolved	Effluent	2/14/00	6.1		ug/L	4

TABLE II.A.4.b2
INFLUENT TOXIC POLLUTANTS AND PESTICIDES
(continue)

Analyte	Site	Date	Result	Qualifier	Unit	PQL
Nickel, Dissolved	Effluent	8/7/00	6.1		ug/L	4
Nickel, Dissolved	Effluent	2/12/01	6.8		ug/L	2
Nickel, Dissolved	Effluent	8/13/01	4.5		ug/L	2
Nickel, Dissolved	Effluent	5/6/02	3.8		ug/L	2
Nickel, Dissolved	Effluent	8/12/02	3.3		ug/L	1
Nickel	Effluent	3/2/98	7.1		ug/L	5
Nickel	Effluent	2/9/99	3.3	J	ug/L	5
Nickel	Effluent	8/16/99	7.3		ug/L	5
Nickel	Effluent	2/14/00	6.2		ug/L	4
Nickel	Effluent	8/7/00	7.5		ug/L	4
Nickel	Effluent	2/12/01	7.5		ug/L	2
Nickel	Effluent	8/13/01	5.8		ug/L	2
Nickel	Effluent	5/6/02	5.2		ug/L	2
Nickel	Effluent	8/12/02	3.6		ug/L	1
Methylene Chloride	Effluent	3/2/98	4		ug/L	2
Methylene Chloride	Effluent	8/3/98	2		ug/L	2
Methylene Chloride	Effluent	2/9/99	0.6	J	ug/L	2
Methylene Chloride	Effluent	2/14/00	2.8	B	ug/L	2
Methylene Chloride	Effluent	8/7/00	0.8	JB	ug/L	2
Methylene Chloride	Effluent	2/12/01	0.7	JB	ug/L	2
Methylene Chloride	Effluent	5/6/02	0.25	JB	ug/L	1
Methylene Chloride	Effluent	8/12/02	0.69	JB	ug/L	1
Mercury	Effluent	2/9/99	0.14	J	ug/L	0.2
Mercury	Effluent	5/6/02	0.14	J	ug/L	0.2
Mercury	Effluent	8/12/02	0.14	J	ug/L	0.2
Lead, Dissolved	Effluent	2/9/99	1.3	J	ug/L	5
Lead, Dissolved	Effluent	8/16/99	1.7	J	ug/L	5
Lead, Dissolved	Effluent	8/12/02	1.8		ug/L	1
Lead	Effluent	8/3/98	8.4		ug/L	5
Lead	Effluent	2/9/99	1.7	J	ug/L	5
Lead	Effluent	8/16/99	1.8	J	ug/L	5
Lead	Effluent	2/14/00	1.9	J	ug/L	4
Lead	Effluent	8/7/00	0.8	J	ug/L	4
Lead	Effluent	2/12/01	1.7	JB	ug/L	2
Lead	Effluent	8/13/01	1.0	J	ug/L	2
Lead	Effluent	5/6/02	1.9	J	ug/L	2
Lead	Effluent	8/12/02	1.9		ug/L	1
Heptachlor Epoxide	Effluent	5/6/02	0.006	J	ug/L	0.009
Heptachlor	Effluent	2/9/99	0.117		ug/L	0.009
Gamma-BHC	Effluent	3/2/98	0.05		ug/L	0.02
Gamma-BHC	Effluent	2/9/99	0.015		ug/L	0.009
Gamma-BHC	Effluent	8/16/99	0.01		ug/L	0.009
Gamma-BHC	Effluent	2/14/00	0.014		ug/L	0.009

TABLE II.A.4.b2
INFLUENT TOXIC POLLUTANTS AND PESTICIDES
(continue)

Analyte	Site	Date	Result	Qualifier	Unit	PQL
Gamma-BHC	Effluent	8/7/00	0.014		ug/L	0.009
Gamma-BHC	Effluent	8/13/01	0.014		ug/L	0.009
Gamma-BHC	Effluent	5/6/02	0.011		ug/L	0.009
Gamma-BHC	Effluent	8/12/02	0.008	J	ug/L	0.009
Ethylbenzene	Effluent	5/6/02	0.54	J	ug/L	1
Ethylbenzene	Effluent	6/27/02	0.54	J	ug/L	1
Ethylbenzene	Effluent	8/12/02	0.27	J	ug/L	1
Endrin Aldehyde	Effluent	8/12/02	0.012		ug/L	0.009
Di-n-Butyl Phthalate	Effluent	8/16/99	4	R	ug/L	10
Diethyl Phthalate	Effluent	8/16/99	6	R	ug/L	10
Diethyl Phthalate	Effluent	2/14/00	4	J	ug/L	10
Diethyl Phthalate	Effluent	8/7/00	4	J	ug/L	10
Diethyl Phthalate	Effluent	2/12/01	4	J	ug/L	10
Diethyl Phthalate	Effluent	8/13/01	4	J	ug/L	10
Diethyl Phthalate	Effluent	5/6/02	3	J	ug/L	10
Diethyl Phthalate	Effluent	8/12/02	4	J	ug/L	10
Dieldrin	Effluent	3/2/98	0.06		ug/L	0.02
Dieldrin	Effluent	2/9/99	0.018		ug/L	0.009
Dieldrin	Effluent	8/16/99	0.02		ug/L	0.009
Dieldrin	Effluent	8/7/00	0.043		ug/L	0.009
Dieldrin	Effluent	2/12/01	0.031		ug/L	0.009
Dieldrin	Effluent	8/13/01	0.019		ug/L	0.009
Dieldrin	Effluent	5/6/02	0.189		ug/L	0.009
Dieldrin	Effluent	8/12/02	0.017		ug/L	0.009
Dibromochloromethane	Effluent	2/12/01	0.4	J	ug/L	2
Cyanide, Total	Effluent	8/12/02	1.9	J	ug/L	5
Copper, Dissolved	Effluent	3/2/98	9		ug/L	5
Copper, Dissolved	Effluent	2/9/99	4.2		ug/L	5
Copper, Dissolved	Effluent	8/16/99	4.3	J	ug/L	5
Copper, Dissolved	Effluent	2/14/00	25		ug/L	2
Copper, Dissolved	Effluent	8/7/00	23		ug/L	4
Copper, Dissolved	Effluent	2/12/01	38		ug/L	2
Copper, Dissolved	Effluent	8/13/01	30		ug/L	2
Copper, Dissolved	Effluent	5/6/02	12		ug/L	2
Copper, Dissolved	Effluent	8/12/02	1.1	J	ug/L	2
Copper	Effluent	3/2/98	20		ug/L	5
Copper	Effluent	8/3/98	16		ug/L	5
Copper	Effluent	2/9/99	17		ug/L	5
Copper	Effluent	8/16/99	22		ug/L	5
Copper	Effluent	2/14/00	45		ug/L	2
Copper	Effluent	8/7/00	43		ug/L	4
Copper	Effluent	2/12/01	58		ug/L	2
Copper	Effluent	8/13/01	48		ug/L	2

TABLE II.A.4.b2
INFLUENT TOXIC POLLUTANTS AND PESTICIDES
(continue)

Analyte	Site	Date	Result	Qualifier	Unit	PQL
Copper	Effluent	5/6/02	27		ug/L	2
Copper	Effluent	8/12/02	22		ug/L	2
Chromium, Total	Effluent	3/2/98	3.2		ug/L	2
Chromium, Total	Effluent	8/3/98	4.8		ug/L	2
Chromium, Total	Effluent	2/9/99	3.2		ug/L	2
Chromium, Total	Effluent	8/16/99	4.0		ug/L	2
Chromium, Total	Effluent	2/14/00	5.5	B	ug/L	2
Chromium, Total	Effluent	8/7/00	3.8	J	ug/L	4
Chromium, Total	Effluent	2/12/01	4.9	B	ug/L	2
Chromium, Total	Effluent	8/13/01	4.7	B	ug/L	2
Chromium, Total	Effluent	5/6/02	3.7	B	ug/L	2
Chromium, Total	Effluent	8/12/02	4.4		ug/L	2
Chromium, Hexavalent, Dissolved	Effluent	8/7/00	0.4	J	ug/L	2.5
Chloroform	Effluent	3/2/98	2		ug/L	2
Chloroform	Effluent	2/9/99	0.8	J	ug/L	2
Chloroform	Effluent	8/16/99	0.8	J	ug/L	2
Chloroform	Effluent	2/14/00	1.0	J	ug/L	2
Chloroform	Effluent	8/7/00	0.7	J	ug/L	2
Chloroform	Effluent	2/12/01	1.2	J	ug/L	2
Chloroform	Effluent	8/13/01	1.7	JB	ug/L	5
Chloroform	Effluent	5/6/02	0.81	J	ug/L	1
Chloroform	Effluent	6/27/02	0.81	J	ug/L	1
Chloroform	Effluent	8/12/02	0.74	J	ug/L	1
Chlorobenzene	Effluent	2/12/01	0.4	J	ug/L	2
Chlordane	Effluent	2/9/99	2.96		ug/L	0.1
Chlordane	Effluent	2/12/01	0.08	J	ug/L	0.1
Chlordane	Effluent	5/6/02	0.106		ug/L	0.1
Chlordane	Effluent	8/12/02	0.067	J	ug/L	0.1
Cadmium., Dissolved	Effluent	8/3/98	0.8		ug/L	0.5
Cadmium., Dissolved	Effluent	8/16/99	0.6		ug/L	0.5
Cadmium	Effluent	8/16/99	0.6		ug/L	0.5
Cadmium	Effluent	8/12/02	0.30	J	ug/L	0.5
Bromoform	Effluent	2/12/01	0.4	J	ug/L	2
Bis(2-ethylhexyl)phthalate	Effluent	3/2/98	52		ug/L	10
Bis(2-ethylhexyl)phthalate	Effluent	8/16/99	14	R	ug/L	10
Bis(2-ethylhexyl)phthalate	Effluent	2/14/00	3	J	ug/L	10
Bis(2-ethylhexyl)phthalate	Effluent	8/7/00	2	J	ug/L	10
Bis(2-ethylhexyl)phthalate	Effluent	2/12/01	2	J	ug/L	10
Bis(2-ethylhexyl)phthalate	Effluent	8/13/01	2	J	ug/L	10
Bis(2-ethylhexyl)phthalate	Effluent	5/6/02	2	J	ug/L	10
Bis(2-ethylhexyl)phthalate	Effluent	8/12/02	5	J	ug/L	10
Beryllium, Dissolved	Effluent	8/16/99	0.2	J	ug/L	0.5
Beryllium	Effluent	2/14/00	0.09	J	ug/L	0.4

TABLE II.A.4.b2
INFLUENT TOXIC POLLUTANTS AND PESTICIDES
(continue)

Analyte	Site	Date	Result	Qualifier	Unit	PQL
Benzene	Effluent	3/2/98	7		ug/L	2
Benzene	Effluent	8/3/98	8		ug/L	2
Benzene	Effluent	2/9/99	8.6		ug/L	2
Benzene	Effluent	8/16/99	12		ug/L	2
Benzene	Effluent	2/14/00	4.8		ug/L	2
Benzene	Effluent	8/7/00	2.8		ug/L	2
Benzene	Effluent	2/12/01	5.3		ug/L	2
Benzene	Effluent	8/13/01	3.2	J	ug/L	5
Benzene	Effluent	5/6/02	2.3		ug/L	1
Benzene	Effluent	6/27/02	3.7		ug/L	1
Benzene	Effluent	8/12/02	3.6		ug/L	1
Arsenic, Dissolved	Effluent	2/9/99	1.8	J	ug/L	2
Arsenic, Dissolved	Effluent	8/16/99	1.8	J	ug/L	2
Arsenic, Dissolved	Effluent	2/14/00	1.1	J	ug/L	2
Arsenic, Dissolved	Effluent	8/7/00	1.1	J	ug/L	2
Arsenic, Dissolved	Effluent	2/12/01	1.4	J	ug/L	2
Arsenic, Dissolved	Effluent	5/6/02	1.4	J	ug/L	2
Arsenic, Dissolved	Effluent	8/12/02	0.80	J	ug/L	2
Arsenic	Effluent	3/2/98	2.6		ug/L	2
Arsenic	Effluent	8/16/99	1.2	J	ug/L	2
Arsenic	Effluent	2/14/00	1.8	J	ug/L	2
Arsenic	Effluent	8/7/00	1.5	J	ug/L	2
Arsenic	Effluent	2/12/01	2.0		ug/L	2
Arsenic	Effluent	8/13/01	2.6		ug/L	2
Arsenic	Effluent	5/6/02	2.0		ug/L	2
Arsenic	Effluent	8/12/02	0.80	J	ug/L	2
Antimony, Dissolved	Effluent	2/9/99	1.3	J	ug/L	2
Antimony, Dissolved	Effluent	8/16/99	1.3	J	ug/L	2
Antimony, Dissolved	Effluent	2/14/00	0.28	J	ug/L	0.4
Antimony, Dissolved	Effluent	8/7/00	0.3	J	ug/L	4
Antimony, Dissolved	Effluent	2/12/01	1.8	J	ug/L	2
Antimony, Dissolved	Effluent	8/13/01	0.63	J	ug/L	2
Antimony, Dissolved	Effluent	5/6/02	0.73	J	ug/L	2
Antimony	Effluent	8/3/98	2.4		ug/L	2
Antimony	Effluent	2/9/99	1.7	J	ug/L	2
Antimony	Effluent	2/14/00	0.52	B	ug/L	0.4
Antimony	Effluent	8/7/00	0.3	JB	ug/L	4
Antimony	Effluent	2/12/01	0.6	J	ug/L	2
Antimony	Effluent	8/13/01	0.70	J	ug/L	2
Antimony	Effluent	5/6/02	0.67	J	ug/L	2
Aluminum, Dissolved	Effluent	3/2/98	200		ug/L	50
Aluminum, Dissolved	Effluent	2/9/99	47		ug/L	50
Aluminum, Dissolved	Effluent	8/16/99	85	J	ug/L	100

TABLE II.A.4.b2
INFLUENT TOXIC POLLUTANTS AND PESTICIDES
(continue)

Analyte	Site	Date	Result	Qualifier	Unit	PQL
Aluminum, Dissolved	Effluent	2/14/00	9.4		ug/L	4
Aluminum, Dissolved	Effluent	8/7/00	16		ug/L	4
Aluminum, Dissolved	Effluent	2/12/01	12		ug/L	2
Aluminum, Dissolved	Effluent	8/13/01	9.2		ug/L	2
Aluminum, Dissolved	Effluent	5/6/02	19		ug/L	2
Aluminum, Dissolved	Effluent	8/12/02	16		ug/L	2
Aldrin	Effluent	5/6/02	4.66		ug/L	0.009
Acrolein	Effluent	5/6/02	2.6		ug/L	1
1,4-Dichlorobenzene	Effluent	3/2/98	4		ug/L	2
1,4-Dichlorobenzene	Effluent	8/3/98	3		ug/L	2
1,4-Dichlorobenzene	Effluent	2/9/99	1.8	J	ug/L	2
1,4-Dichlorobenzene	Effluent	8/16/99	2.1		ug/L	2
1,4-Dichlorobenzene	Effluent	2/14/00	2.4		ug/L	2
1,4-Dichlorobenzene	Effluent	8/7/00	2.4		ug/L	2
1,4-Dichlorobenzene	Effluent	2/12/01	2.9		ug/L	2
1,4-Dichlorobenzene	Effluent	5/6/02	1.8		ug/L	1
1,4-Dichlorobenzene	Effluent	6/27/02	1.8		ug/L	1
1,4-Dichlorobenzene	Effluent	8/12/02	1.9		ug/L	1
1,3-Dichlorobenzene	Effluent	2/12/01	0.4	J	ug/L	2
1,2-Dichlorobenzene	Effluent	2/9/99	0.4		ug/L	2
1,2-Dichlorobenzene	Effluent	8/16/99	0.4	J	ug/L	2
1,2-Dichlorobenzene	Effluent	2/14/00	0.5	J	ug/L	2
1,2-Dichlorobenzene	Effluent	2/12/01	0.7	J	ug/L	2

Qualifiers:
J: Value is an estimate, greater than the MDL but less than the ML (low standard)
B: Target analyte detected in associated blank--for metals, B is used only if blank value is within a factor of 10X the sample result
R: Results rejected due to significant QC failure or failure to follow proper method

pH:

- minimum – 6.67 SU
- maximum – 7.76 SU

The monitored minimum and maximum effluent pH, using data from 1998 to 2002, were 6.67 and 7.76, respectively. The average and sample standard deviation were 6.98 and 0.10, respectively. The number of data points used to obtain these statistics was 1,759 monitoring events.

Dissolved oxygen (mg/L, prior to chlorination) for the following plant flows:

- minimum
- average dry weather
- average wet weather

- maximum
- annual average

This is not a parameter normally monitored.

Immediate dissolved oxygen demand (mg/L).

This is not a parameter normally monitored.

5. Effluent Volume and Mass Emissions [40 CFR 125.62(e)(2) and 125.67]

a. **Provide detailed analyses showing projections of effluent volume (annual average, m^3 /sec) and mass loadings (mt/yr) of BOD_5 and suspended solids for the design life of your treatment facility in five-year increments. If the application is based upon an improved or altered discharge, the projections must be provided with and without the proposed improvements or alterations.**

RESPONSE:

See Table II.A.5.a1 for flow projections and mass loadings for BOD_5 and suspended solids for 5-year increments until the year 2025. Improvements currently underway at the treatment plant address capacity rather than increased level of treatment. As part of the activity, UV disinfection is being installed. In both cases, however, the removal, or impacts, of BOD_5 or suspended solids above current designs is not anticipated through these improvements.

The City will not be petitioning changes to the existing effluent BOD_5 or suspended solids limits, despite a design flow change from 82 mgd to 90 mgd. The bases is that actual flows have not shown a significant change, nor is it anticipated there will be significant changes in the population base to

TABLE II.A.5.a1 PROJECTED EFFLUENT VOLUME, [m³/s] AND MASS LOADING (mt/yr)				
Year	FLOWS [m^3/s]	FLOWS [mgd]	BOD_5 LOADING[1] [mt/day][3]	SUSPENDED SOLIDS LOADING[2] [mt/day][3]
2000	2.96	67.56	10,819	6,436
2005	3.40	77.59	12,426	7,391
2010	3.56	81.27	13,015	7,742
2015	3.74	85.28	13,657	8,124
2020	3.86	88.09	14,107	3,391
2025	3.97	90.51	14,495	8,622

[1] assumed an effluent concentration of BOD_5 of 116 mg/L. [2] Assumed an effluent Suspended Solids concentration of 69 mg/L. [3] Metric ton (mt) = 2,205 lbs.

b. Provide projections for the end of your five-year permit term for 1) the treatment facility contributing population and 2) the average daily total discharge flow for the maximum month of the dry weather season.

RESPONSE:
Based on the 2000 census, the population projection to the year 2025 using State DBEDT 2025 Series, and the City's General Plan population guidelines by Development Plan areas, the resident population for the tributary areas of the Sand Island wastewater treatment system was obtained. The daily visitor population, derived from the DBEDT 2025 Series projection was added to the resident population to arrive at the de facto population, which is used as thedesign population for 5-year increments of the treatment and disposal system to the year 2025.

The resident population of the South and North Honolulu tributary areas was 328,724 in 2000. By the year 2025, the resident population is projected to reach 387,100. The Fort Shafter sewer system served an estimated population of 14, 217 in 1990 and 9,258 in 2000 and is assumed to remain constant to the yar 2025, or until the 2010 Census results are published. The daily visitor population served by the Sand Island wastewater system was estimated to range from ~~82,900 in 1990 to 116,700 in 2025 based on the State DBEDT Series 2025~~ projection. The service population for the treatment and ocean disposal systems was 412,282 in 2000 and is projected to increase to 513,100 in 2025. The current projected service population estimate for 2025 is 156,000 less than the

1971 projected figure of 669,000 people for 2020. On the other hand, the 1989 population projection based on the State "M-K" Series for the year 2010 was 476,000, relatively close to the current State "2025" Series projection of 459,700.

The population growth rate potential in the Primary Urban Center Development Plan area is assumed to increase more in the South than in the North Honolulu tributaries. The South Honolulu tributary had a slight increase of its 1990 resident population of 211,914 compared to 214,867 in 2000, whereas the North Honolulu tributary had a slight loss of its 1990 population of 115,159 compared to 113,857 in 2000. The population in the next 25 years I projected to increase by 18 percent. The service population of Fort Shafter system was reduced by about 30 percent from 1990 to 2000. For the 25-year period, 2000-2025 the North Honolulu system tributaries are projected to increase from 113,857 to 139,800 residents, and the population in the South Honolulu system to increase from 214,867 to 247,300.

Growth potential in the East Honolulu Sustainable Community Plan Area of the South Honolulu tributaries, represented by Kuliouou Neighorbhood area less Kuliouou, which is served by the Hawaii Kai system, is limited. The 2000 population of 16,998 residents in that area is projected to increase by 800 people to 17,800 in 2025.

Using the State DBEDT 2025 Series, population projections for the years 1990 to 2025 for Oahu, the de factor population for the Sand Island wastewater system is estimated to increase from 412,282 in 2000 to 513,100 in the year 2025. The proposed expansion of the Sand Island Wastewater Treatment Plant was based on the proposed de facto population and other design considerations.

The projected annual average daily flows for the Sand Island Wastewater Treatment Plant and sewer sub-systems are shown below. The designed average flow of most wastewater treatment plant is based on the average daily significant flow; i.e., an average maximum daily flow observed for the plant.

TABLE II.A.5.b1 PROJECTED ANNUAL AVERAGE DAILY FLOWS, [mgd] HONOLULU SUBDISTRICT					
System Year	South Honolulu[1] Ala Moana WWPS	North Honolulu[1] Hart Street WWPS	Fort Shafter-Tripler[2,4] Fort Shafter SPS	Sand Island[3] Parkway WWPS	Sand Island[6] WWPS
2000	47.89	18.52	1.04[5]	0.11	67.56
2005	57.18	17.85	2.42	0.14	77.59
2010	60.25	18.46	2.42	0.14	81.27
2015	63.57	19.15	2.42	0.14	85.28
2020	65.14	20.39	2.42	0.14	88.09
2025	66.95	21.00	2.42	0.14	90.51

[1] assumed all tributary areas have sewer and connected to the WWTP. [2] Include flows from Moanalua Gardens. [3] Based on ultimate design flows. [4] Capacity assigned for the Fort Shafter sewer system. [5] Estimates only. [6] Flows are not additive because of discrepancies in flow meter readings.

6. **Average Daily Industrial Flow (m³/sec). Provide or estimate the average daily industrial inflow to your treatment facility for the same time increments as in question II.A.5 above. [40 CFR 125.66]**

RESPONSE:

TABLE II.A.6

SIGNIFICANT INDUSTRIAL DISCHARGERS TO THE SAND ISLAND WWTP

Industrial Contributor	Average Flow [mgd]	Average Flow [m^3/sec]
A&P Laundry	.0109	0.000477557776
Aloha Tofu Factory	.0450	0.001971568800
American Linen (Lagoon Drive)	.000	0.000000000000
American Linen Supply (Waiwai Lp)	.1740	0.007623399360
Chelsea Catering	.0184	0.000806152576
Coca-Cola Bottling Company	.1191	0.005218085424

TABLE II.A.6 SIGNIFICANT INDUSTRIAL DISCHARGERS TO THE SAND ISLAND WWTP (continue)		
Industrial Contributor	Average Flow [mgd]	Average Flow [m^3/sec]
Del Monte Fresh Produce Hawaii	.0286	0.001253041504
Dust-Tex Honolulu, Inc.	.0500	0.002190632000
Foremost Dairies – Hawaii	.0350	0.001533442400
Gategourmet, Inc.	.0234	0.001025215776
Hagadone Printing Company	.00069	0.000030230722
Hakuyosha Hawaii, Inc.	.0082	0.000359263648
Hawaii Hochi, Ltd.	.0017	0.000074481488
Hawaii Plating	.0002	0.000008762528
Hawaiian Sun Products, Inc.	.0113	0.000495082832
The Honolulu Advertiser (Kapiolani)	.000	0.000000000000
International In-Flight Catering Co.	.0248	0.001086553472
Itoen (USA), Inc.	.0205	0.000898159120
Daiichiya – Love's Bakery, Inc.	.0149	0.000652808336
LSG Lufthansa Service / Sky Chefs	.0271	0.001187322544
Meadow Gold Dairies – Ice Cream Plant	.0030	0.000131437920
Meadow Gold Dairies – Milk Plant	.0637	0.002790865168
Qualex, Inc.	.0102	0.000446888928
UniTech Services, Inc.	.0025	0.000109531600
United Laundry Services, Inc.	.126	0.005520392640
Total	0.81919	0.035890876562

7. Combined Sewer Overflows [40 CFR 125.67(b)]

a. Does (will) your treatment and collection system include combined sewer overflows?

b. If yes, provide a description of your plan for minimizing combined sewer overflows to the receiving water.

RESPONSE:

This section is not applicable because the existing treatment and collection system does not include combined sewer overflows.

8. Outfall/Diffuser Design. Provide the following data for your current discharge as well as for the modified discharge, if different from the current discharge: [40 CFR 125.62(a)(l)]

--Diameter and length of the outfall(s) (meters)

--Diameter and length of the diffuser(s) (meters)

--Angle(s) of port orientation(s) from horizontal (degrees)

--Port diameter(s) (meters)

--Orifice contraction coefficient(s), if known

--Vertical distance from mean lower low water (or mean low water) surface and outfall port(s) centerline (meters)

--Number of ports

--Port spacing (meters)

--Design flow rate for each port, if multiple ports are used (m3/sec)

RESPONSE:

The Sand Island Deep Marine Outfall has not changed its configuration since service was initiated in the late seventies. Given this, the information below has been submitted previously.

TABLE II.A.8
Sand Island WWTP Outfall Characteristics

Station [ft]		Pipe Length	Pipe Diameter	No. of Ports	Port Dia	Avg Port Depth	Port Spacing	Port Angle	Port Depth	Orifice Contract Coeff	Design Flow
From	To	[m]	[m]		[cm]	[m]	[m]	[deg]	[m]	[ ]	[m^3/sec/port]
Outfall											
0+00	91+20	2,780	2.13	0							
Diffuser											
91+20	96+72	168.2	2.13	46	7.62	69.8	7.32	0	70.1	0.932 to 0.957	0.031
96+72	106+68	303.6	2.13	83	8.08	71.3	7.32	0	70.1		0.031
106+68	106+92	7.3	2.13 to 1.68	2	8.08	70.7	7.32	0	70.1		0.031
106+92	115+80	270.6	1.68	74	8.48	70.4	7.32	0	70.1		0.031
115+80	116+04	7.3	1.68 to 1.22	2	8.48	70.0	7.32	0	70.1		0.031
116+04	125+18	278.6	1.22	75	8.97	70.2	7.32	0	70.1		0.031
End Ports	125+18			2	15.75	69.8		0	70.1		0.092
TOTAL	3,398	1,035.6		284							8.80

B. Receiving Water Description

1. Are you applying for a modification based on a discharge to the ocean [40 CFR 125.58(n)] or to a saline estuary [40 CFR 125.58(v)]? [40 CFR 125.59(a)].

RESPONSE:

This application is based on a discharge to the ocean.

Much of what was presented in the previous application is repeated.

Location of Discharge

The Sand Island Wastewater Treatment Plant (SIWWTP) discharges primary treated effluent into the Pacific Ocean in a broad indentation of the southern coastline of Oahu known as Mamala Bay. This section discusses the location of the SIWWTP outfall in relation to the general features of Mamala Bay, and also describes the bathymetry and other basic hydrographic considerations, including total volume of flow into and out of the bay. The discharge is not located in a saline estuary.

The question is relatively short. However, this response provides an opportunity to explain the characteristics of the discharge area (Mamala Bay) which may be unfamiliar to the reader. These characteristics are important to understanding subsequent explanations in several sections and therefore, it is believed to be helpful to the reader that this background information be provided at the beginning of the discussion on the receiving water. The information has not changed since the 1983 reapplication.

Oceanographic Extent of Mamala Bay

Mamala Bay is located on the southeast coast of Oahu, extending from Diamond Head in the east to Barbers Point in the west, covering an estimated shoreline distance of about 21.9 miles (35.2 kilometers). Based on the United States Geological Survey (USGS) 7.5 minute topographic maps, the approximate location at the Diamond Head boundary is 157°49'W (longitude) and 20°30'N (latitude), while the approximate location at the Barbers Point shoreline boundary is 158°06'30"W (longitude) and 21°18'N (latitude).

Bathymetry

According to Steams' Geology of the State of Hawaii , the geomorphology of Oahu is best described as basaltic volcanic domes or shields, forming what is known as the Hawaiian Ridge. As the island sank, ancient shoreline terraces, shaped previously by littoral processes, were submerged (Atlas of Hawaii). The nearshore bathymetry, beyond the fringing reefs of Mamala Bay is known as the Kahipa-Mamala shelf. This shelf has been dated somewhere in the Kansan age (i.e., second of four classical glacial stages of the Pleistocene epoch which started two million years ago and ended with the Holocene Epoch 11,000 years ago). The Kahipa-Mamala shelf is typical of submerged shelves in Hawaii which, based on dredged samples, are chiefly drowned coral reefs and marine sediments resting on volcanic or sedimentary rocks.

The Kahipa-Mamala shelf extends to a depth of approximately 350 feet (107 meters), at an estimated 1.5 miles (2.4 km) offshore from Diamond Head to the Pearl Harbor channel from where it varies up to 3.6 miles (5.8 km) offshore just southwest of Barbers Point. The Sand Island ocean outfall diffuser lies on this shelf at a depth of about 230 feet (70 meters) and begins approximately 1.7 miles (2.7 km) offshore.

Drainage Basin Features

In general, runoff containing nutrients and sediment discharged into Mamala Bay come from a drainage basin which is bounded to the north (inland) by an east-west line extending from Windward Oahu to the Schofield Saddle, onto the west by a line from Barbers Point to the ridge line of the Waianae Mountains, and to the east by the Koolau Mountain Range, and a line oriented to the northeast to the Koolau Mountain ridge line. The entire Mamala Bay drainage area covers approximately 221 square miles (572 square kilometers), or approximately 36 percent of the land surface of Oahu, and encompasses the Honolulu Plain.

Over half of the Mamala Bay runoff drains into the Pearl Harbor lochs, whereas the remaining drainage area is comprised of the westerly portion of the Ewa Plain including Barbers Point, and the Honolulu-Waikiki drainage area to the east.

Perennial streams were identified statewide in the draft Hawaii Stream Assessment. According to this report, there are six perennial streams flowing into the Pearl Harbor lochs, two perennial streams flowing into Keehi Lagoon, one perennial stream flowing into Honolulu Harbor and a stream system flowing into the Ala Wai Canal. The geographical locations of these streams are illustrated in Figure II.B.1.1.

Besides perennial streams, there are non-point sources, e.g., local drainage systems (including overland flow) and intermittent streams contributing storm runoff either into the perennial streams or directly into receiving waters.

The water balance of the bay can be estimated to indicate the magnitude of the net transport components. The Engineering Science *et al.* (reference II.B(25)) study estimated the volume of Mamala Bay at approximately 13.9 x 10^9 cubic yards or 2.8 x 10^{12} million gallons (1.06 x 10^{16} cubic meters). Based on a tide range of 2.1 feet (0.6 meters), the average tidal exchange was estimated at 16,000 million gallons per day (mgd). Including shoreline areas (pearl Harbor, Keehi Lagoon, Honolulu Harbor, Kewalo Basin, and Ala Wai Harbor and Canal), the average tidal exchange increases by approximately another 5,200 mgd.

Estimated loss due to net evaporation (excess over precipitation) is 60 mgd. The estimated average contribution due to runoff for the entire drainage basin is 260 mgd, about 1.6 percent of the Mamala Bay tidal exchange and approximately five percent of the shoreline tidal exchange. A more recent estimate of the total mean annual freshwater flow at the five principal shoreline locations is shown in Table II.B.1-1 is about 168.4 mgd; i.e., a difference of about 100 mgd from the total Mamala Bay runoff. This difference is probably attributed to the larger drainage area which encompasses the entire bay used for the Engineering Science *et al.* runoff estimate of 260 mgd. Using average current velocities (shown in reference II.B(25)), the average tidal exchange volume crossing the seaward boundary of Mamala Bay was estimated at 27,200 mgd. Including sewage discharge at the time of the study (1971) an estimated 5,600 mgd shoreward component of deep flow is required to preserve a mass balance. More ocean current measurements would be useful for improving the net transport estimate.

TABLE II.B.1-1
MAMALA BAY PRINCIPAL SHORELINE FEATURES[1]

Subbasin Receiving Water	Overland Drainage Area[2] (sq mi)	Peak Runoff Flow[3] (cfs)	Mean Annual Freshwater Flow[2] (mgd)
1. Ala Wai Canal	16.7	24,030	21
2. Kewalo Basin	0.77	755	0.7
3. Keehi Lagoon	15.95	31,300	20.6
4. Honolulu Harbor	11.0	17,200	11.1
5. Pearl Harbor	111	Not Available	115
Total	155.42	--------	168.4

Note:
1. Note that values are approximate and that the intent of this table is to present the order of magnitude of the subbasin drainage characteristics.
2. Reference 1993 Revised Total Maximum Daily Estiamtes for Six Water Quality Limited Segments, Island of O'ahu, Hawaii.
3. Peak Discharge is according to the Honolulu Drainage Standards, as referenced by the 1990 Water Quality Management Plan for the City and County of Honolulu.

In conjunction with physical and hydrological aspects of the Mamala Bay drainage area, land use has a profound effect on the quantity and types of pollutants into the Bay. However, pollutants carried to Mamala Bay by stream and surface runoff have not been well documented. Land use in the Mamala Bay drainage basin varies widely: (1) conservation and forest reserves in the mountains, (2) agriculture in the Schofield Saddle, Ewa and Pearl Harbor Plains, (3) military bases at Pearl Harbor, Schofield and Barbers Point, (4) urban-residential, resort and commercial areas throughout the basin, (5) industrial park centers at Pearl Harbor, Barbers Point and Honolulu (near Keehi Lagoon and Sand Island), and (6) recreation parks scattered throughout the basin. Agricultural land is presently being converted to urban land as evidenced by the communities in Mililani, Waipio and Kunia.

State DOH Hydrographic Classification

Hawaii's harbors, bays, and nearshore water quality are impacted by the natural and human-induced mass pollution. In the past, point source discharges from industrial and municipal processes had caused wide-spread pollution in these receiving waters. With the enactment of the National Pollutant Discharge Elimination System (NPDES) permit, effluent limitations were made to abate impacts of point source discharges. However, the high mass pollutant emissions from non-point sources continue to degrade water quality in receiving waters. Those basins that cannot meet state water quality standards (WQS) of the Hawaii Administrative Rules (HAR), Chapter 11-54, without additional action to control non-point sources were identified by the state.

In 1973, the state had divided all coastal waters of "designated" basins in Hawaii, for the purpose of planning and water quality management (as required in Section 303(e), P.L. 92-500, of the Federal Water Pollution Control Act of 1972), into what are known as the water quality limited segments (WQLSs) and effluent limitation segments (ELSs). Water quality limited segments are receiving water (e.g. coastal) areas where the Department of Health (DOH) has determined the existing water quality does not meet applicable water quality standards, and/or is not expected to meet applicable water quality standards; even after effluent limitation requirements on point sources discharges are applied. Effluent limitation segments are those remaining coastal areas where water quality is being met and will continue to meet applicable water quality standards or where water quality will meet applicable water quality standards after application of effluent limitation requirements.

In its Section 208 Water Quality Plan, the City and County of Honolulu (CCH) has identified four WQLS (Ala Wai Canal, Kewalo Basin, Honolulu Harbor, and Keehi Lagoon) and one in HA-IV (Pearl Harbor) within the Mamala Bay drainage basin.

Of the WQLSs, only one is considered fully water quality limited, namely Ala Wai Canal. For this WQLS, a Total Maximum Daily Load (TMDL) was approved December 1996 for total nitrogen and total phosphorous, metals, suspended solids, pathogens and turbidity. A TMDL is the average daily weight of the pollutant that can be assimilated such that the waterbody can meet the water quality standard. The conclusion of the study was that the most effective way to reduce nutrient and sediment loads entering nearshore waters is through erosion control.

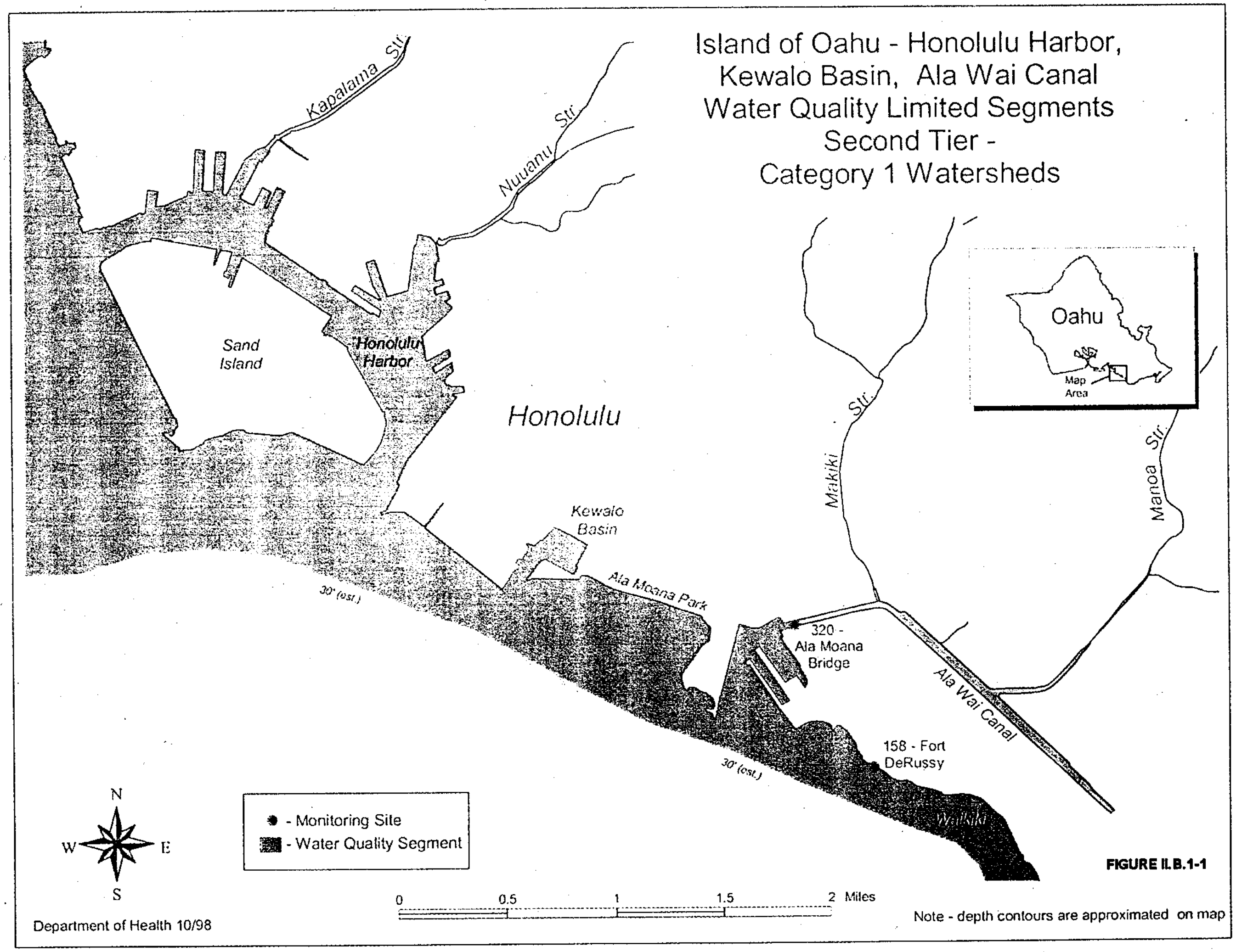


FIGURE II.B.1-1

2. **Is your current discharge or modified discharge to stressed waters as defined in 40 CFR 125.58(z)? If yes, what are the pollution sources contributing to the stress? [40 CFR 125.59(b)(4) and 125.62(f)].**

RESPONSE:

The current discharge is not to stressed waters; see Section III.D.8.

3. **Provide a description and data on the seasonal circulation patterns in the vicinity of your current and modified discharge(s). [40 CFR 125.62(a)].**

RESPONSE:

Current Conditions

The basic descriptions of seasonal circulation patterns provided in the 1983 reapplication questionnaire are repeated here. These are primarily based on three documents that provided much of the information that is still relevant concerning circulation patterns in Mamala Bay. The original four sources of information for the 1983 reapplication are references II.B(13), (18), (36) and (11). In addition to these sources, information is presented from the 1990 current monitoring undertaken by Look Laboratory at the University of Hawaii.

The conclusions of the 1983 reapplication were that:

"the studies have shown that the circulation is complex, varies seasonally in some locations but not others, and that the relative importance of the modifying forces such as tides, winds, and offshore eddies varies with location. In most nearshore locations, the semi-diurnal tide and the underlying "permanent" current are the main driving forces influencing the circulation. The diurnal tide and a combination of seasonal and annual changes tend to make the current patterns more complex. The surface layers (approximately the top 5 meters) are influenced by the prevailing winds." (M&E Pacific, 1983).

The prevailing near surface circulation pattern around the Hawaiian Islands is shown in Figure II.B.3-1 based on the *Atlas of Hawaii* (Armstrong 1983).

Two comprehensive studies of general circulation patterns in the Hawaiian Islands include Laevastu, Avery, and Doak, Tech Rpt 64-1 and the Engineering Science *et al.* (Chin, Roberts, 1985) report. This latter report described circulation conditions around Oahu, and the significant findings are cited below:

"The speculation, based upon the present evidence, is that an East Pacific Gyre exists and that the position of this gyre changes seasonally. During late spring, summer, and early fall months the East Pacific Gyre is probably centered south-southeast of the island of Hawaii. If so, this gyre would produce a general north or northwest flow in the area of the Hawaiian Archipelago. Though the Hawaiian Islands would break up this basic flow into more complex patterns around the islands, the water would generally approach the island of Oahu from the southeast. During the winter months the location of the East Pacific Gyre probably moves southward. This would allow the westwind drift north of the Hawaiian Archipelago to also move slightly southward. The result would be that the flow approaching the Hawaiian Archipelago would be basically from the northeast and therefore the flow would reach Oahu from the north or northeast.

During the winter months of November through February the flow approaches the windward coast of Oahu from the northeast. This flow is divided off Kaneohe Bay. The northern portion moves northwest toward Kahuku Point. The southern portion is diverted around the east coast of Oahu, flows parallel to the east coast of Oahu, Maunaloa Bay, and continues moving around Diamond Head in to Mamala Bay. As will be shown later, this flow becomes increasingly influenced by the wind as it moves toward Mamala Bay. Once in the bay the net westward transport decreases and the influence of the coast line configuration (bathymetry) deflects this flow to the southwest. During both the winter and summer months (excepting kona storms) a southwest transport would be expected in Mamala Bay from off Kewalo Basin to Keehi Lagoon. The southwest transport off Barbers Point turns westward offshore and moves toward Kaena Point. The result is weak anti-cyclonic eddies may form off the southern portion of the Waianae coast.

During the late spring, summer, and early fall months of April to October, the flow approaches Oahu from the southeast. The northern portion of this flow moves around Makapuu Point, flows parallel to the shore across Waimanalo Bay, across Kailua Bay, and is deflected to the north by Mokapu Point. Once around Mokapu Point this flow probably deflects shoreward again under the influence of the tradewinds and moves parallel to the shore northwestward to Kahuku Point. At Kahuku Point it begins flowing to the north again slowly shifting to the west far offshore. The southern portion of the flow dividing at Makapuu Point moves along the entire south coast of Oahu into Mamala Bay, resulting in a southwest transport leaving the bay during the summer months. At Barbers Point a portion of this flow probably meets water moving southeastward along the Waianae coast. The result is a possible formation of cyclonic eddies off Barbers Point and off the Waianae coast primarily during the late spring and early fall. Eddies would more likely occur with the changing tide during the periods when the tradewinds are strong. The configuration of the coast line off both the windward side of Oahu and the leeward side from Makapuu Point to Barbers Point strongly influences the flow throughout the year in the shallow areas (less than 30 ft deep) close to the shoreline. Behind prominent points, as Kawaihoa Point (Koko Head), eddy patterns may develop and change with each changing tide." Reference II.B(16).

These prevailing currents and eddy conditions described above are shown in Figure II.B.3-1. Note that the predominant direction is from east to west in both seasons (summer and winter). Locations of large scale (30 to 80 kilometers across) eddies is shifted between seasons, but in both cases are at least tens of kilometers south of Oahu's southern shore.

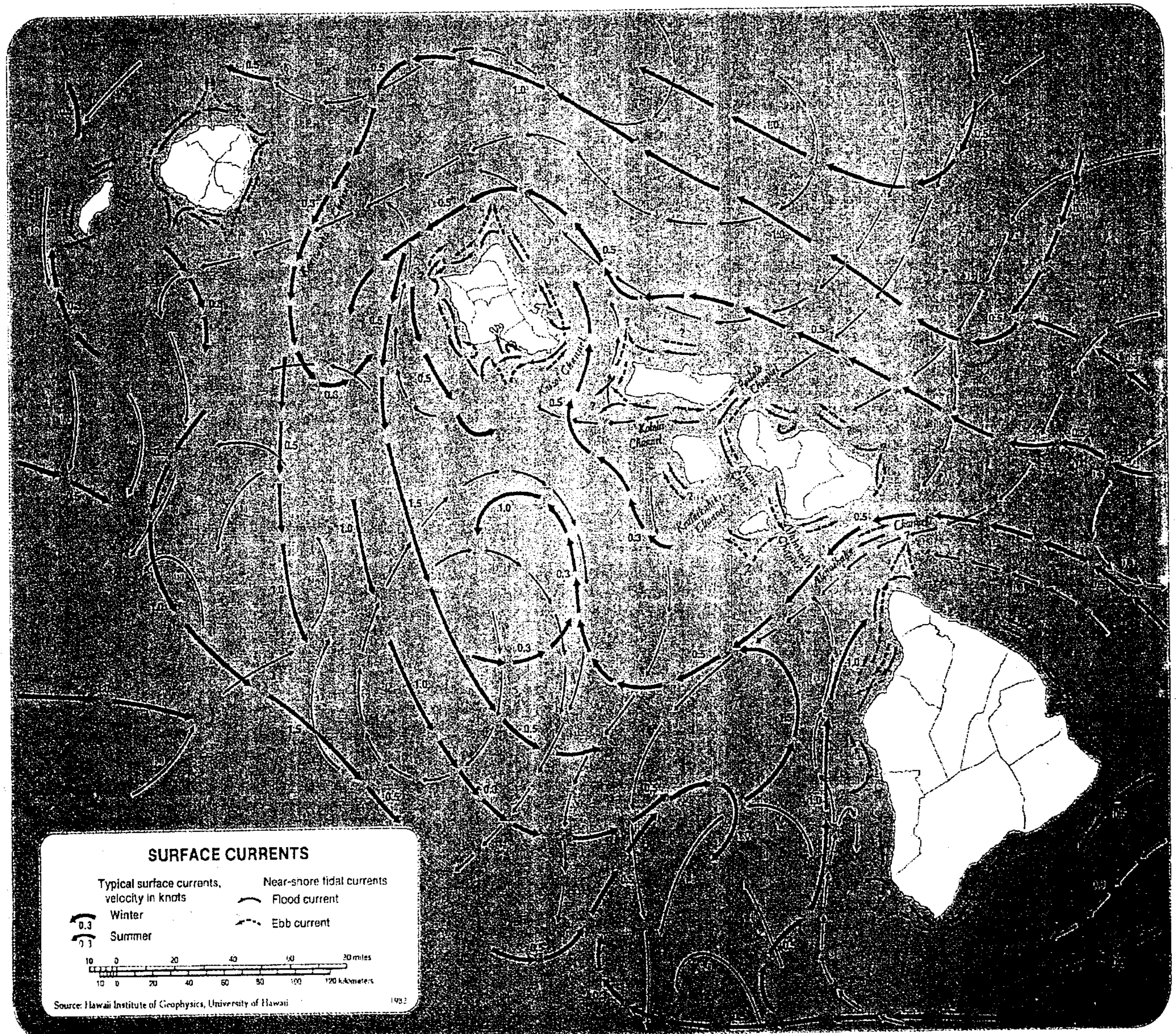


FIGURE II.B.3-1

PREVAILING CURRENTS IN HAWAIIAN WATERS

TABLE II.B.3-1
ESTIMATES OF THE CONTRIBUTION TO THE TOTAL CURRENTS DUE TO THE SEMI-DIURNAL AND DIURNAL TIDES

Location	Depth Range (ft)	Month	Average Total Current				Average Tidal Current				Phase of Maximum* Velocity Related to Honolulu Tide*		Estimated Tidal Contribution to the Total Current (percent)
			Ebb Tide		Flood Tide		Ebb Tide		Flood Tide				
			Avg Vel (kts)	Avg Dir (ºC Mag)	Avg Vel (kts)	Avg Dir (ºC Mag)	Estimated Semi-Diurnal Amplitude (kts)	Estimated Diurnal Amplitude (kts)	Estimated Semi-Diurual Amplitude (kts)	Estimated Diurnal Amplitude (kts)	Semi-Diurnal (hrs)	Diurnal hrs)	
Sand Island Outfall	(0-40)	Jun-Jul	0.50	195	0.45	260	0.22	0.10	0.29	0.15	+ ½	0	69
Waikiki	(0-30)	Jul	0.60	107	0.50	136	0.20	0.15	0.20	0.10	- 1	+ 1/2	60
Pearl Harbor Entrance	(0-100)	Nov	0.40	172	0.40	282	0.16	0.10	0.18	0.10	0	- 1/2	58
Sand Island Deep	(150-250)	Nov	0.20	171	0.25	230	0.17	0.11	0.23	0.14	- ½	0	86
Sand Island Deep	(250-350)	Dec-Jan	0.25	178	0.20	190	0.19	0.12	0.21	0.10	- ½	+ 1/2	83
Sand Island Deep	(150-250)	Sep	0.20	185	0.25	170	0.19	0.11	0.21	0.13	0	+ 1	89
Barbers Point	(0-60)	Aug-Sep	0.65	158	0.40	192	0.30	0.10	0.25	0.15	- 1	- 1½	71
Barbers Point, East	(0-40)	Jul	0.25	133	0.20	260	0.20	0.08	0.17	0.15	- ½	- 1	81
Barbers Point, West	(0-40)	Jul	0.60	260	0.40	155	0.22	0,10	0.26	0.05	- 1½	-2	67

A) Phase represents the amount of time (hrs) to add (+) or sublract (-) from the lime at which the change of Honolulu tides occur.

Source: Engineering Science; Sun, Low, Tom, and Hara; June 1971

The Engineering Science *et al* (1971) study (Chin & Roberts, 1985) analyzed the components of currents within approximately 10,000 feet of the Oahu coast and concluded that the tidal contribution to the total current is significant. Table II.B.3-1 shows the tidal component can range between approximately two-thirds to four-fifths of the total current. The tidal current, therefore, masks the prevailing Pacific North Equatorial Current flow which is generally westerly, resulting in near-shore current patterns as shown in Figure II.B.3-1 (Armstrong, 1983).

The 1983 reapplication described the importance of tidal components:

"Hawaii has predominately semidiurnal tidal variations with a pronounced diurnal inequality. The average tidal change per 24 hours is 0.72 m (2.36 ft.). The semidiurnal tidal wave approaches Oahu from the northeast as a progressive wave, with the flow separating and moving around the island.

Common amplitudes of the semidiurnal currents are 20 to 30 cm/sec (Wyrtki, Meyers, McClair, and Patzert, 1977). At most locations in Hawaii the maximum current occurs in the interval between two hours before Honolulu high water and one hour after. The velocities associated with the diurnal tidal current are much smaller than those corresponding to the semidiurnal tide. At most current meter stations, the diurnal component was only 10 to 15 cm/sec (Wyrtki, Meyers, McClair, and Patzert, 1977). The coherence with the Honolulu sea level was also low.

Measurements off Diamond Head (Laevastu, Avery, and Doak, Tech Rpt 64-1) indicate the predominance of the semidiurnal tidal currents, with flood tide currents moving west and ebb currents moving east, parallel to the shoreline. Similar measurements northwest of Barbers Point show semidiurnal tidal current reversals, but with the opposite flood and ebb tide flow directions. This indicates that the area of convergence of the flood current and divergence of the ebb current lies between Diamond Head and Barbers Point. This convergence/divergence area is located west of Pearl Harbor in the vicinity of Ewa Beach. Between Sand Island and Diamond Head the currents reverse in phase with those at Diamond Head, but with more irregularities in the current meter records.

This combination of "permanent" flow across Mamala Bay and the tidal flow can be expected to produce reversing currents with a net southwest transport. (The net transport directions in Mamala Bay are shown in Figure II.B.3-2). The effects of wind and bathymetry, however, also influence circulation in Mamala Bay. Small scale eddies resulting from flow past prominent points such as Diamond Head may cause irregularities in the observed currents and have been observed in Mamala Bay during past studies."

Generally, the contribution of the tide to current velocity is highest (from approximately 80 to 90 percent based on Table II.B.3-1) in the deeper subsurface layer (200 feet to 300 feet depth) off Sand Island. In the surface layer (less than 100 feet depth) the estimated tidal contribution declines (e.g. to approximately 60 percent) but is still significant. One can expect the tidal correlation to decrease in the shoreward direction as other factors such as land-generated stream discharge, rip currents, and wind-driven surface currents create more complex conditions. The basic conclusion of the 1983 reapplication is still valid:

"There appears to be little seasonal variation in the tidal currents or the underlying geostrophic flow. The Sand Island outfall is not adjacent to any tidal current convergences or divergences that might shift seasonally and affect the currents, so the only anticipated seasonal change would be in the wind influenced surface layers." Reference II.B(I).

In summary, Figure IIB.3-2 shows the seasonal and tidal circulation conditions in the Mamala Bay near the Sand Island outfall based on reference ILB(II). According to this figure, the net drift component throughout the year is to the south through southwest, and is generally strong, however, not consistent.

Density and Temperature Conditions

Waters of different densities arise in various regions of the Pacific Ocean in accordance with temporal variations in temperature (solar insolation) and salinity (reference n.B(12)). The cold and relatively desalinized currents move from higher latitudes to lower latitudes. Changes in global atmospheric circulation conditions also contribute to regional differences in density gradients. The greatest annual variation in density occurs at depths generally less than 100 meters. The annual variation of density is between 0.4 to 2.6 sigma-T units (Muromtsev, 1958), but this is a generalization, and less variation is observed in some regions and more in other regions.

The maximum density gradients in surface layers in the Central Pacific occur in the summer. Values between 0.1 to 0.06 sigma-T units per meter were reported (Muromtsev, 1958).

The thermal structure of the Central Pacific Ocean near Hawaii exhibits a mean deep ocean temperature of 24 °C at about the 90-meter depth. The surface temperature ranges between 23 to 27°C; and at the 200 meter depth, it is approximately 18°C (Muromtsev, 1958). The 20°C isotherm is located near the center of this gradient, i.e., near 100-meter depth. This isotherm can be used as a reference position to measure the gradient of the thermocline in the open ocean and the thickness of the upper boundary layer. The gradient of the thermocline is approximately 0.55°C/meter. The thickness of the upper boundary layer is usually between 40 to 100 meters.

Note, however, these values are for open ocean conditions and not for the shallower waters of Mamala Bay; particularly at nearshore stations.

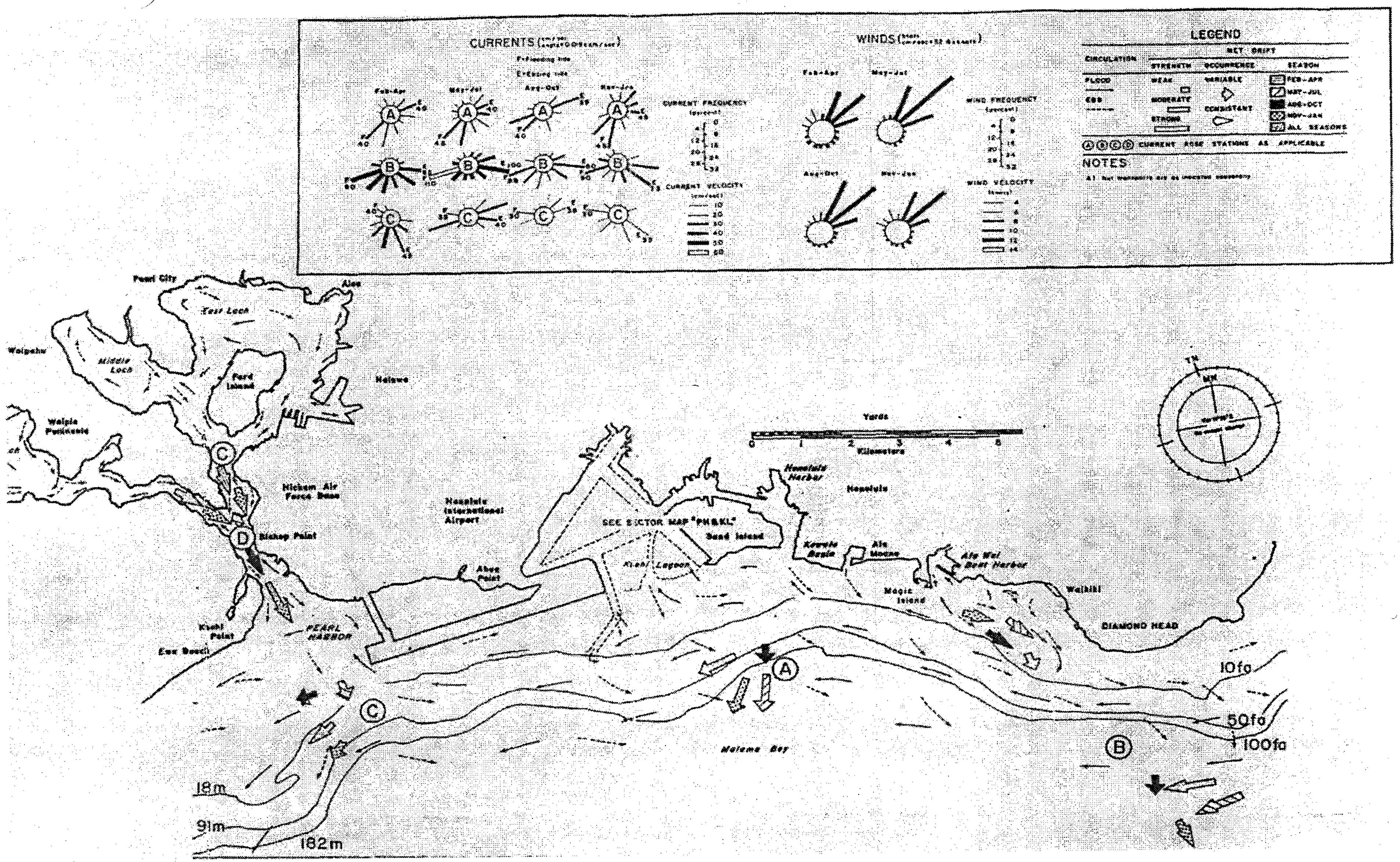


FIGURE II.B.3-2

SEASONAL CIRCULATION PATTERNS IN MAMALA BAY

In comparison with ambient ocean temperature, the average effluent temperature ranges approximately 24.5°C to 27°C, which can be less than or warmer than average ocean surface temperatures. Ocean temperatures change throughout the year, and at times the effluent temperature will be different than the surrounding ocean, but not by more than a few degrees. The change in effluent temperature as it travels down the outfall to the diffuser is insignificant (to initial dilution calculations) because time is short (approximately 30 minutes) and concrete is a good insulating material.

The density structure within Mamala Bay is even more sensitive to changes in the ocean temperature and salinity due to its more restricted volume (than the Pacific Ocean).

Temperature fluctuations occur diurnally as well as seasonally. The diurnal fluctuations may be relatively rapid, and as much as 4°C (reference II.B(I)).

The 1983 reapplication reported:

"The greatest diurnal fluctuation in the density structure is found just beneath the mixed layer depth. Off Sand Island, this depth annually ranges from approximately 100 feet (30 meters) in September to 350 feet (107 meters) in February. The amplitude of these diurnal oscillations in the summer months has caused changes in the mixed layer depth of up to 175 feet (53 meters) in a few hours.

Examination of the temperature and salinity data taken at the same location off Sand Island in August 1970 and one year later in 1971 indicated that the year to year variations were less than the diurnal variations in stratification between the surface and the 300-foot (91 meter) depth. At each depth the observed diurnal variations were from one to 18 times greater than the year to year variations" (M&E Pacific, 1983).

While the diurnal variations in stratification are large, in general, the minimum stratification occurs in the winter and maximum stratification occurs in the late summer/early fall. The conclusions of the 1983 reapplication are as follows:

"The WQPO results showed minimum and maximum stratification conditions occurring in all seasons due to the sometimes pronounced semidiurnal variations. However, in general, minimum annual stratification occurs in February, and maximum stratification occurs during August, September and October.

Data taken during the WQPO indicated that in the surface to 200-foot (61 meter) layer, warmer temperatures were associated with a flooding tide and westward flow, and colder temperatures were associated with an eastward flow during ebb tides. The reverse pattern occurred below the mixed layer depth.

Off leeward Oahu in Mamala Bay, internal oscillations in the pycnocline seem to be most pronounced during months when the vertical density stratification is the greatest. These oscillations are most prevalent just beneath the mixed layer, which is approximately 100 to 150 feet (30 to 45 meter) deep in the summer and 300 to 350 feet (91 to 107 meter) deep in the winter. The principal period of the internal oscillations, is approximately that of the semidiurnal tidal period. This periodicity was determined by spectral analysis of the 1970-1971 WQPO continuous temperature measurements, which showed a primary oscillation period of 12.6 hours, corresponding to the period of the semidiurnal tide."

"The oscillations are believed to be caused principally by deep, cold, alongshore and onshore transports occurring during flooding tides being deflected upward by the shoaling bathymetry. The R.M. Towill Corporation (1972), based upon calculations using the temperature conservation equation, estimated that the resultant weak vertical transport of cold water had velocity components ranging from 3 to 171 ft/hour (3×10^{-4} to 1.4×10^{-2} cm/sec). The mean of all estimates of vertical velocities was 30 ft/hour (2.5×10^{-3} cm/sec)." Reference II.B(1).

4. Oceanographic conditions in the vicinity of the current and proposed modified discharge(s). Provide data on the following: [40 CFR 125.62(a)].

--Lowest ten percentile current speed (m/sec)

--Predominant current speed (m/sec) and direction (true) during the four seasons

--Period(s) of maximum stratification (months)

--Period(s) of natural upwelling events (duration and frequency, months)

--Density profiles during period(s) of maximum stratification

RESPONSE:

There is no evidence that the oceanographic condition has changed. More recent reports (Mamala Bay Study, 1996, and Noda, 1999) generally support what has been presented previously and is presented here for expediency.

- Lowest ten percentile current speed (m/sec): 0.0221 m/s (2.1 cm/s) for bottom depths and 0.144 m/s (14.4 cm/s).

- Predominant current speed (m/sec) and direction (true) during the four seasons: the net transport is in the westerly direction. Due to the complexities (cyclic, stratification, etc.) of the receiving water, a predominant is difficult at best to establish.

- Period(s) of maximum stratification (months): maximum stratification occurs during the summer months (August/September/October). However, we have seen the most stratified profile could occur throughout the year and predominantly in July.

- Period(s) of natural upwelling events (duration and frequency, months): upwelling is anticipated to occur during the flood tidal phase, when the tidal currents approach shallower depth, they tend to raise "deeper water" closer to the surface.

- Density profiles during period(s) of maximum stratification: see II.B.6.

5. Do the receiving waters for your discharge contain significant amounts of effluent previously discharged from the treatment works for which you are applying for a section 301(h) modified permit? [40 CFR 125.57(a)(9)]

RESPONSE:

Circulation Considerations

General circulation in terms of current speed and direction is described in Section II.B.3. Net transport and current persistence is described in Section II.B.4. These previous two sections are interrelated to the discussion of the plume behavior in this section. This section will discuss the amount of advective transport for each season, and the possibility that previously discharged effluent entrained in the process of dispersion in the zone of dilution (ZID) may re-enter the ZID (i.e., become re-entrained) at a later time.

The significant conclusions of the previous two sections (II.B.3 and II.B.4) relative to reentrainment considerations are summarized as follows:

1) The underlying permanent current is in the west to southwest direction through the Hawaiian Archipelago and is of the range from 5 cm/sec.
2) The underlying current is masked closer to the islands by the diurnal and semi diurnal tides, whose effect is to rotate nearshore currents in a clockwise direction such that current vectors tend to form elliptical paths. Paths that generally align with the bathymetric contours, and with maximum speeds ranging about 20 to 40 cm/sec.
3) The semidiurnal tides in Hawaii have a diurnal inequality, and the chronological order of the semidiurnal and diurnal tidal currents change in direction and speed results in variability of the elliptical paths of particle transported by these tidal currents.
4) The combination of permanent flow and rotating tidal current creates a resultant current that changes direction within a certain range but never quite reversing itself in a single tidal cycle.
5) The tidal currents are more dominant at subsurface depths (e.g. 200 feet or 61 meters) and the current vectors are generally aligned with offshore contours, as opposed to the shoreline configuration; but this influence diminishes in the shoreward direction.
6) The influence of the winds and shoreline features can cause the formation of large-scale eddies at depths near the surface (e.g. less

than 100 feet depth) and at areas closer to the shore.

In contrast to the nearsurface and nearshore current patterns that are variable, complex and not well defined (at the present), deep current data is available to help determine particle transport direction. Deep current data is the most relevant information for stratified ocean conditions. One conventional approach to displaying this information is the use of progressive vector diagrams.

Seasonal Progressive Vector Patterns

The ocean conditions that are prevalent over the majority of the year (see discussion of initial dilution in Part III.A.1) will allow an estimate of effluent transport from the zone of initial dilution. Figures II.B.5-1 and II.B.5-2 show the progressive vector diagrams based on selected Sand Island current meter data on four months, that corresponds (approximately) to the four seasons, and the seasonal density profiles for input in the dilution model presented in Section III.

Each progressive vector diagram resembles a trajectory of a water particle moving past a station. The diagrams show the coordinates of points in x-y dimensions. These are shown as east/west and north/south directions, respectively, on the accompanying progressive vector diagrams. These coordinates are determined from the following formulae:

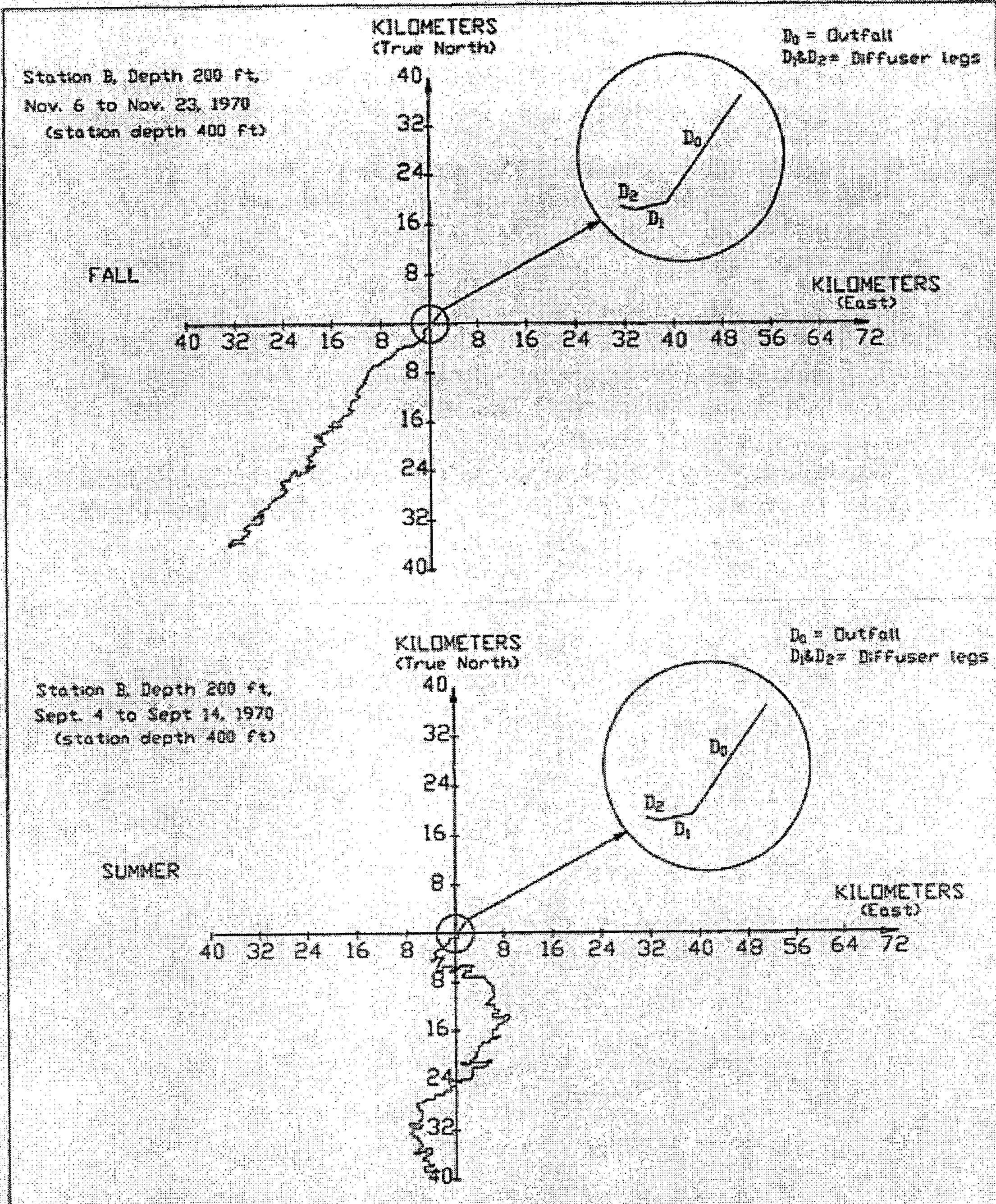


FIGURE II.B.5-1 PROGRESSIVE VECTOR DIAGRAMS AT STATION B FOR SAND ISLAND IN SEPTEMBER AND NOVEMBER, 1970

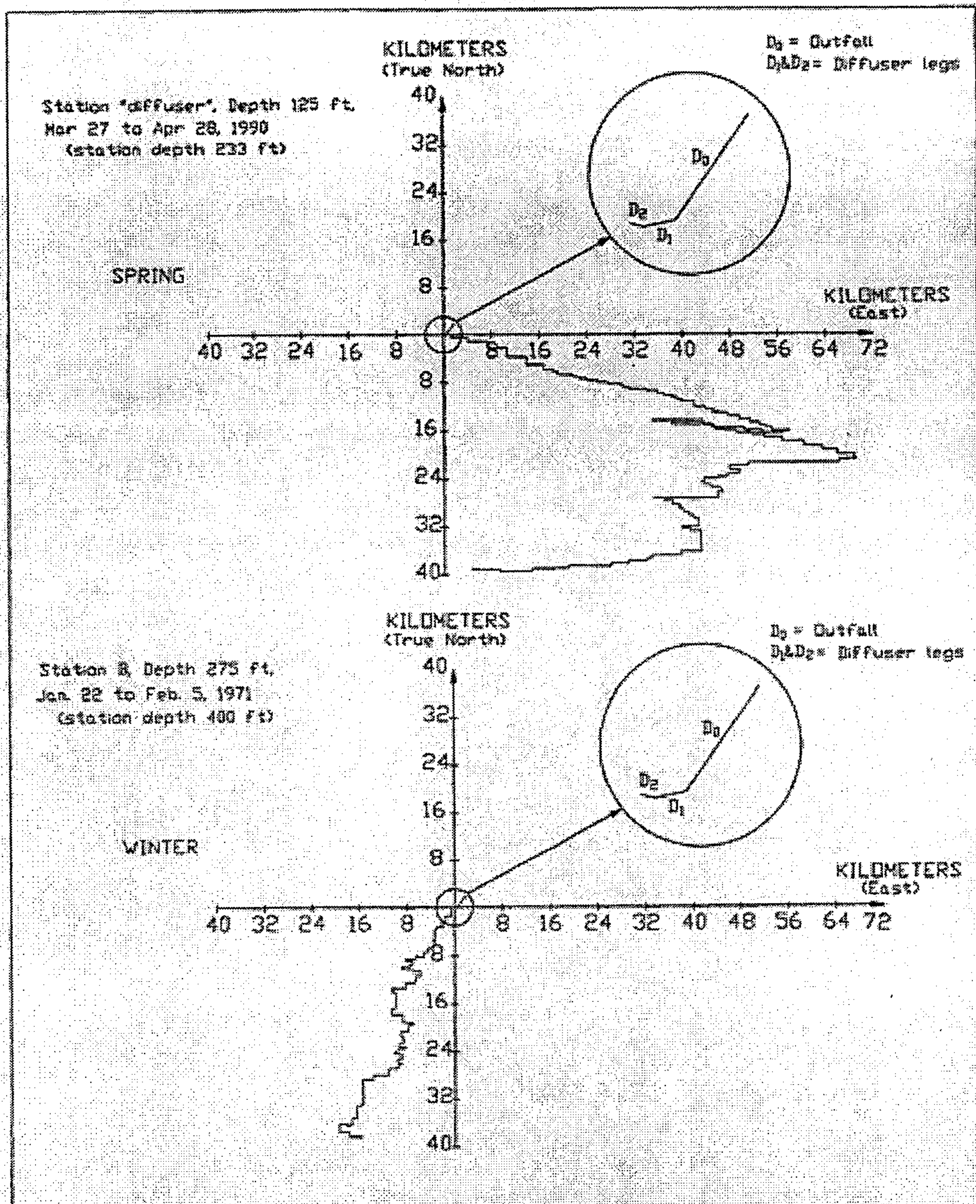


FIGURE II.B.5-2 PROGRESSIVE VECTOR DIAGRAMS AT STATION 'DIFFUSER' AND STATION B FOR SAND ISLAND

$$x_n = x_{start} + f \sum_1^n u_n \quad (3)$$

$$y_n = y_{start} + f \sum_1^n v_n \quad (4)$$

where n = the number of meter recording intervals
u = east-west velocity component
v = north-south velocity component
f = scale factor to convert speed and time interval data into distance

The time interval for the 1970 data was four minutes. For the 1990 data, 15 minutes is used.

The x-y start positions are assumed to be station 114 along the diffuser alignment. The legs of the diffuser are shown on the figures.

These equations estimate the trajectory of a particle based on the current vectors at a fixed location. It represents the history of flow (i.e., flow path) beyond the initial point of observation. To obtain a true trajectory, one would have to identify the particle path by conducting a number of simultaneous current observations at different locations. However, over short time intervals, and distances not far from the current meter, the sensitivity to differences in current conditions at other locations are not expected to be significant.

Diurnal Progressive Vector Patterns

Progressive vector diagrams using shorter summed meter recording intervals are shown in Figures II.B.5-3 and II.B.5-4 for the same March-April 1990 data set used in Figure n.B.5-2. Each vector represents a 1-hour period, while progressive vector diagrams are constructed for individual 24-hour days. Approximately 31 consecutive days of recorded data is considered reliable. Therefore, each figure shows plots of about 15 progressive vector diagrams, and each progressive vector diagram originates at the same position. Individual 24-hour progressive

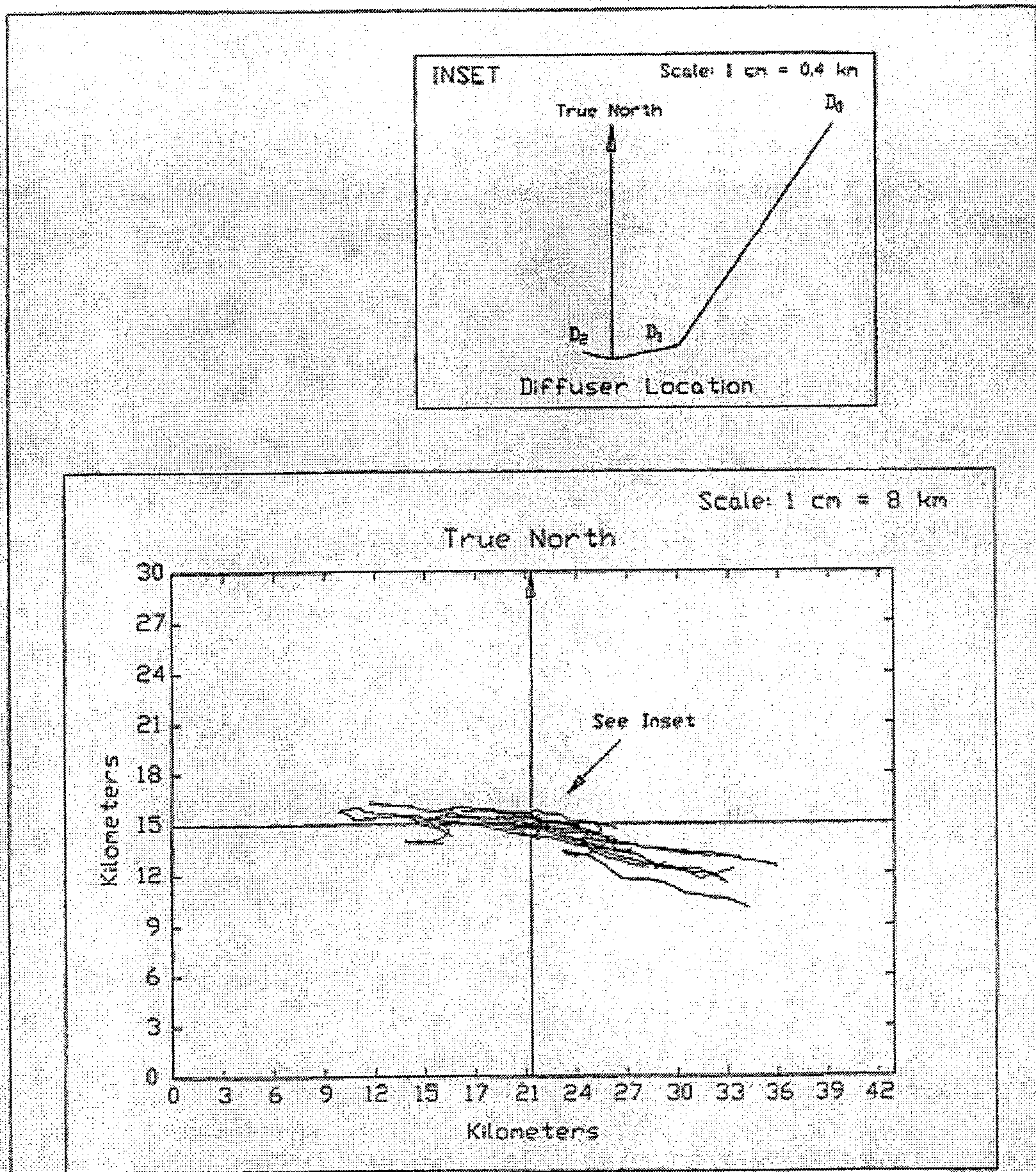


FIGURE II.B.5-3 24-HOUR PROGRESSIVE VECTOR DIAGRAM FOR SAND ISLAND FROM MARCH 28 TO APRIL 12, 1990

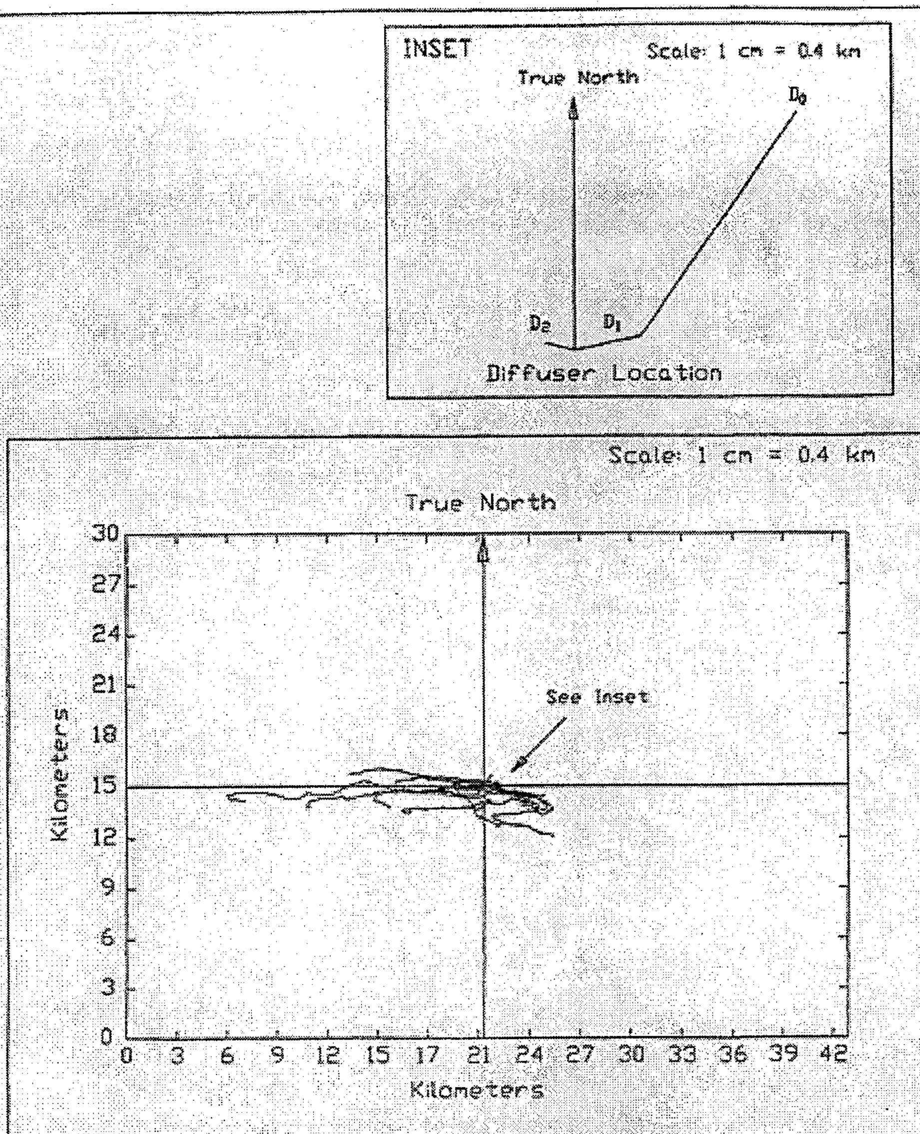


FIGURE II.B.5-4 24-HOUR PROGRESSIVE VECTOR DIAGRAM FOR SAND ISLAND FROM APRIL 13 TO APRIL 28, 1990 vector diagrams can be considered to represent the track of discrete particles emanating from the same point along the diffuser.

This 24-hour interval represents approximately one full diurnal tidal cycle, capturing the current variability at subsurface depths at the diffuser. Farfleld dissolved oxygen calculations in the 1983 reapplication estimated that the dissolved oxygen concentration reaches its maximum depression (i.e., minimum concentration) in 8 to 12 hours. Therefore, the particle trajectories within 12 to 24 hour time frames are important for demonstrating the likelihood of effluent re-entrainment in the ZID."

The conclusion of Figures II.B.5-3 and IIB.5-4 is that, during this time period, particles move towards the southeast to westerly directions from the diffuser, and the general net transport is out of the zone of initial dilution before a 24-hour period. Tidal current reversals are not truly reciprocating, but are rotating as seen by the offsetting vectors. Therefore, entrained effluent generally moves away from the diffuser and not back through the same zone. Out of the thirty-one (31) 24-hour progressive vectors, only eight (8) progressive vectors displayed tendencies toward reentrainment (i.e., reciprocating tidal current) movement during the study period, and for these situations, a net drift to the south is still discernable.

6. Ambient water quality conditions during the period(s) of maximum stratification: at the zone of initial dilution (ZID) boundary, at other areas of potential impact, and at control stations. [40 CFR 125.62(a)]

a. **Provide profiles (with depth) on the following for the current discharge location and for the modified discharge location, if different from the current discharge:**

--BOD5 (mg/L)

--Dissolved oxygen (mg/L)

--Suspended solids (mg/L)

--pH

--Temperature (°C)

--Salinity (ppt)

--Transparency (turbidity, percent light transmittance)

--Other significant variables (e.g., nutrients, 304(a)(1) criteria and toxic pollutants and pesticides, fecal coliform bacteria)

RESPONSE:
The following profiles were obtained, predominantly, from the existing permit monitoring stations (specifically, D2, D3, E2, and E3). Figure II.B.6.a1 and

II.B.6.a2 shows for the monitoring stations required by the existing permit and previous permit, respectively. For the existing monitoring stations, stations D2, D3, E2, and E3 represent stations near the zone of initial dilution and stations E1 and E6 represent reference stations. For the previous permit, stations B3, B5, ZM1, and ZM4 represent zone of initial dilution station and stations B1 and B6 represent reference stations.

From the previously submitted annual assessment reports, the most stratified episodes and stations were determined to be:

MOST STRATIFIED WATER COLUMN AS DERIVED FROM ANNUAL REPORTS	
Station	Date sampled
ZM1	July 8, 1998
E2	November 9, 1999
E2	July 11, 2000
E2	October 11, 2001
E6	July 2, 2002

--BOD5 (mg/L): This parameter was not monitored.

--Dissolved oxygen (mg/L): see Figures

--Suspended solids (mg/L): This parameter was not monitored.

--pH : see Figures

--Temperature (°C): see Figures

--Salinity (ppt): see Figures.

--Transparency (turbidity, percent light transmittance)

--Other significant variables (e.g., nutrients, 304(a)(1) criteria and toxic pollutants and pesticides, fecal coliform bacteria): not applicable.

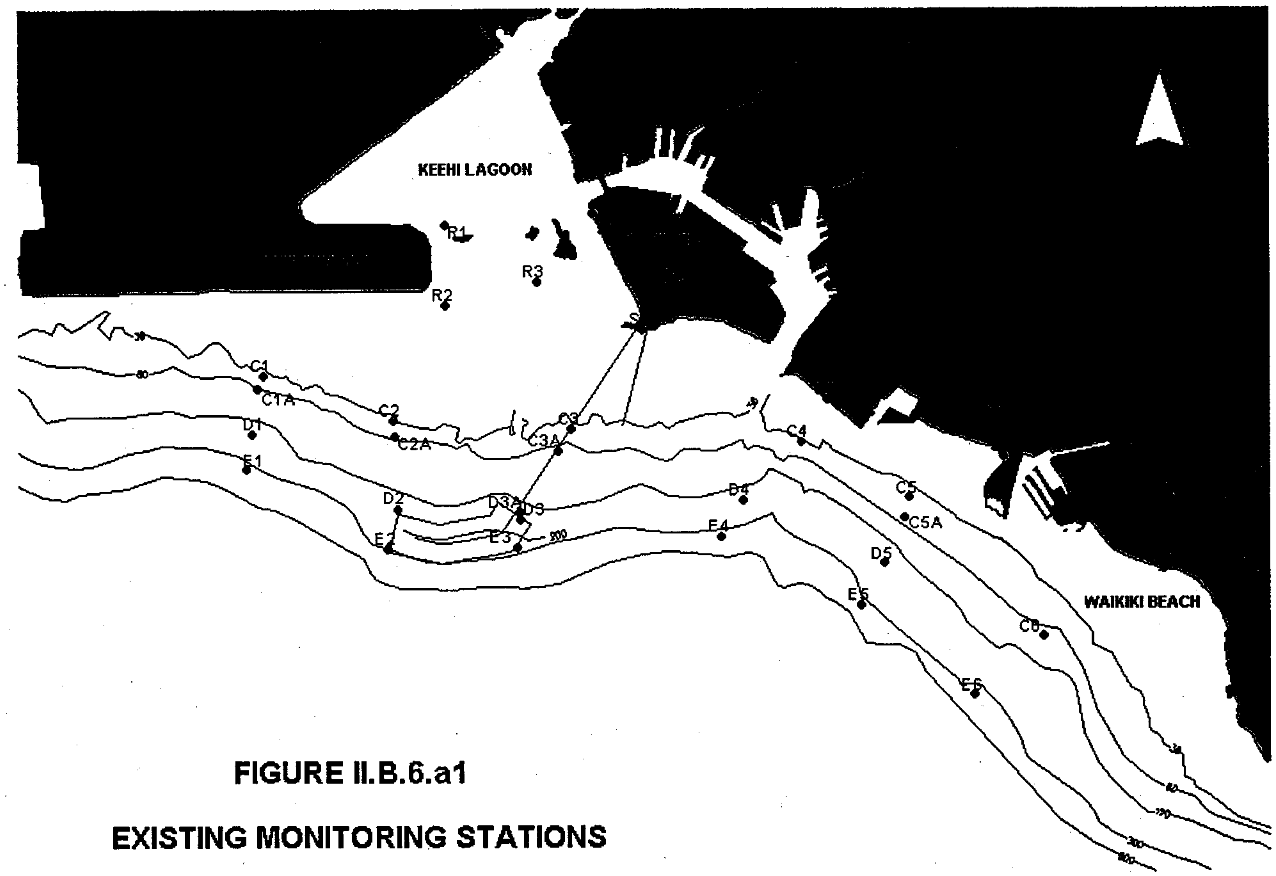


FIGURE II.B.6.a1

EXISTING MONITORING STATIONS

4000 0 4000 8000 Feet

1:60000

Date Prepared: 3/27/2002

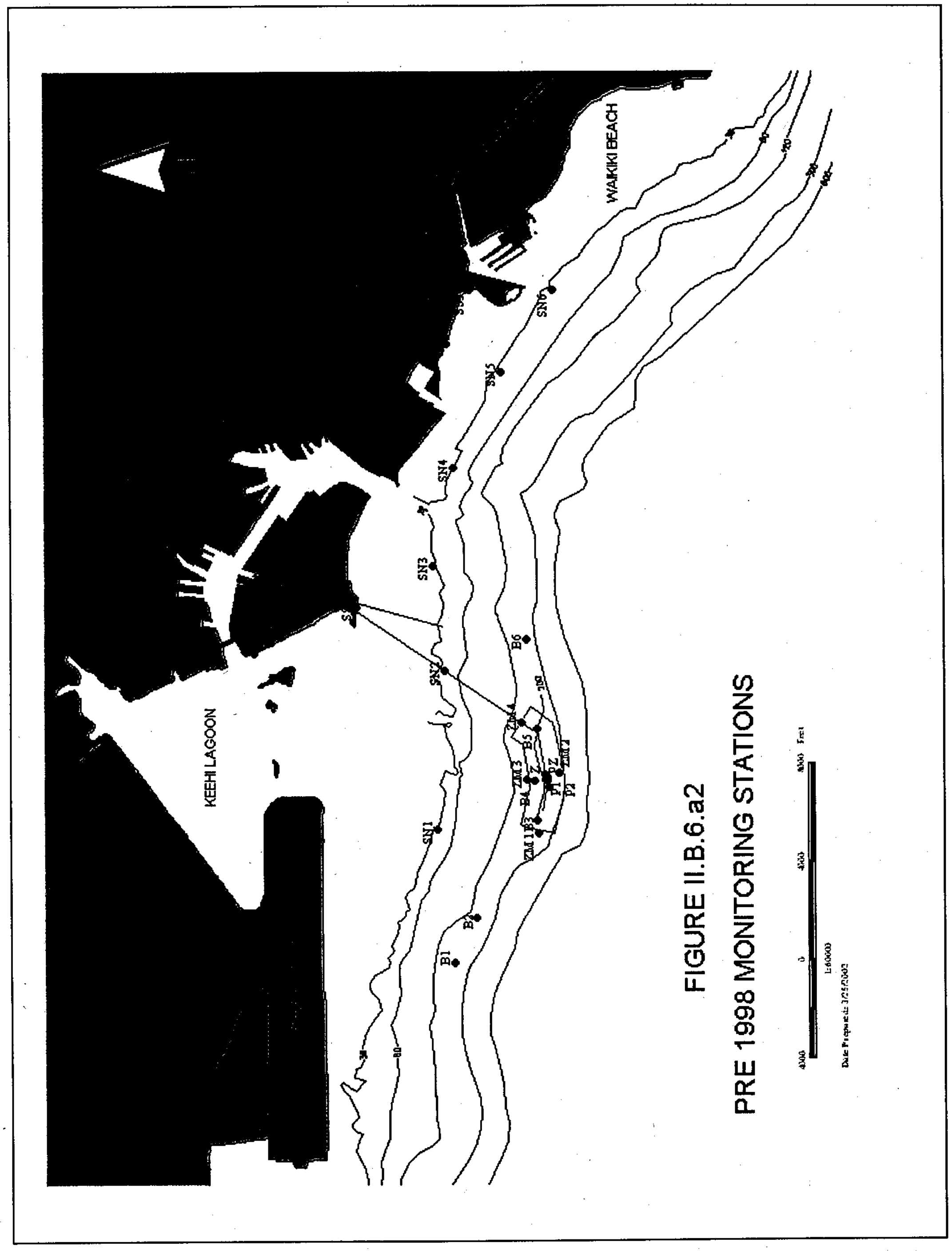
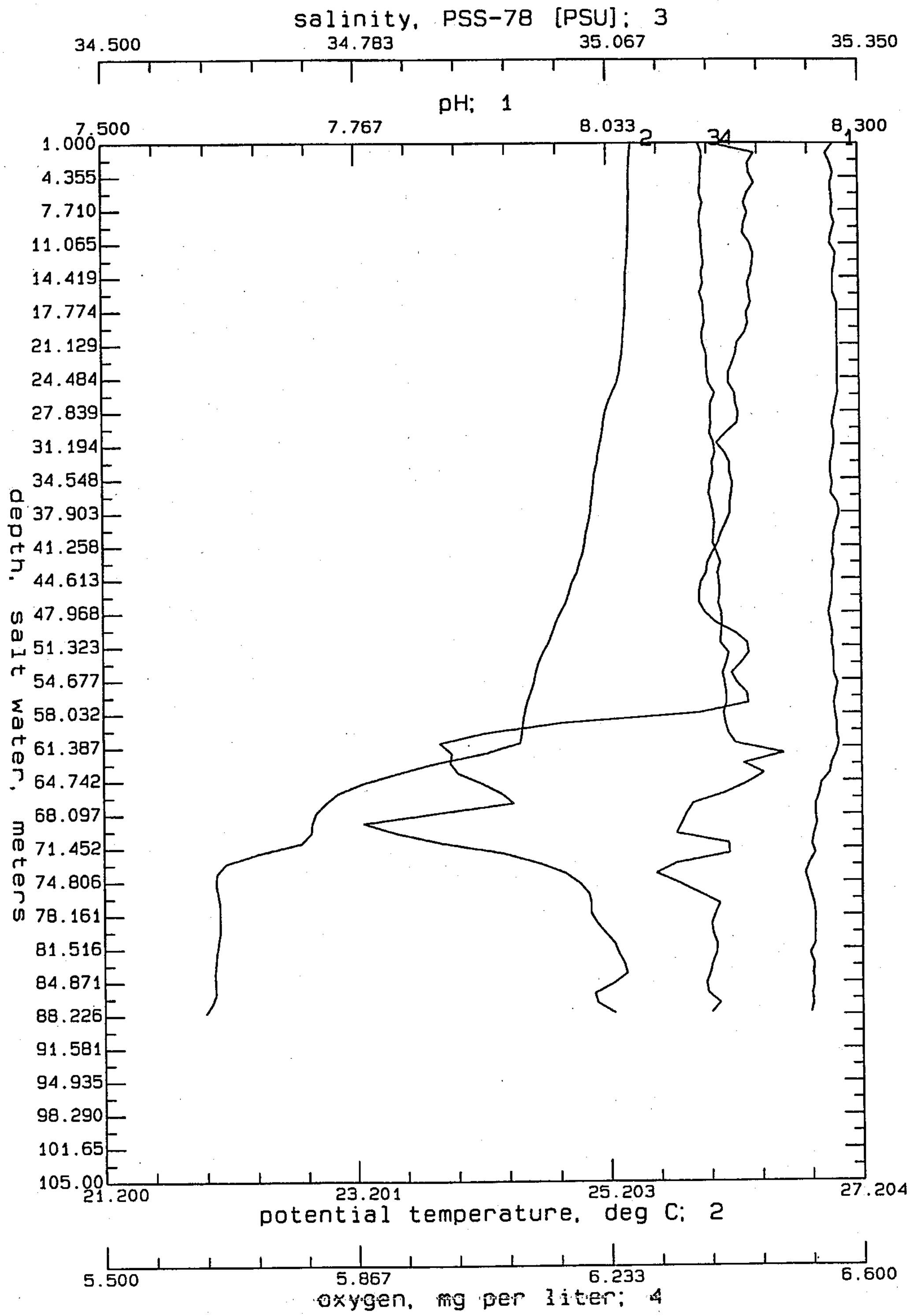
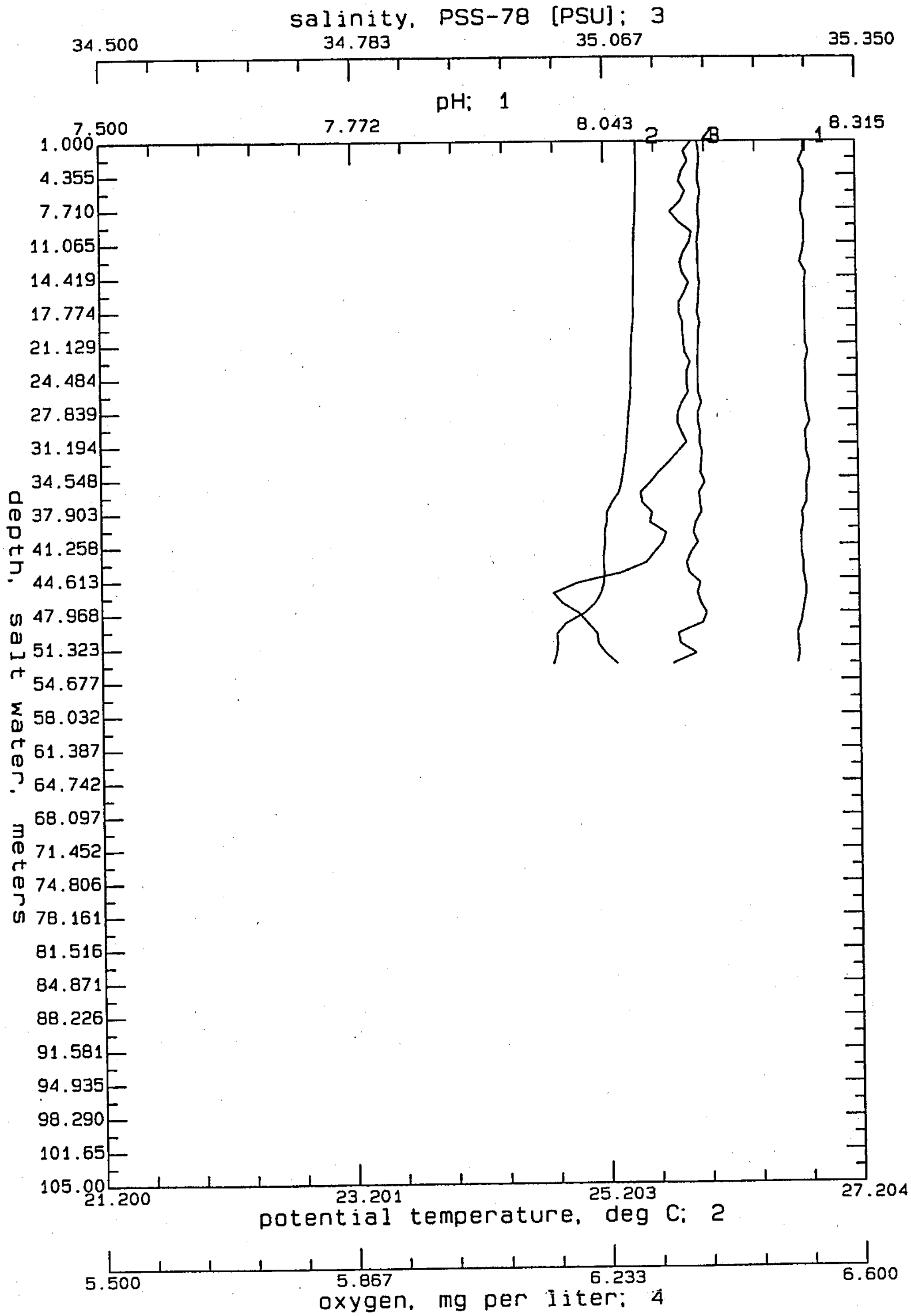


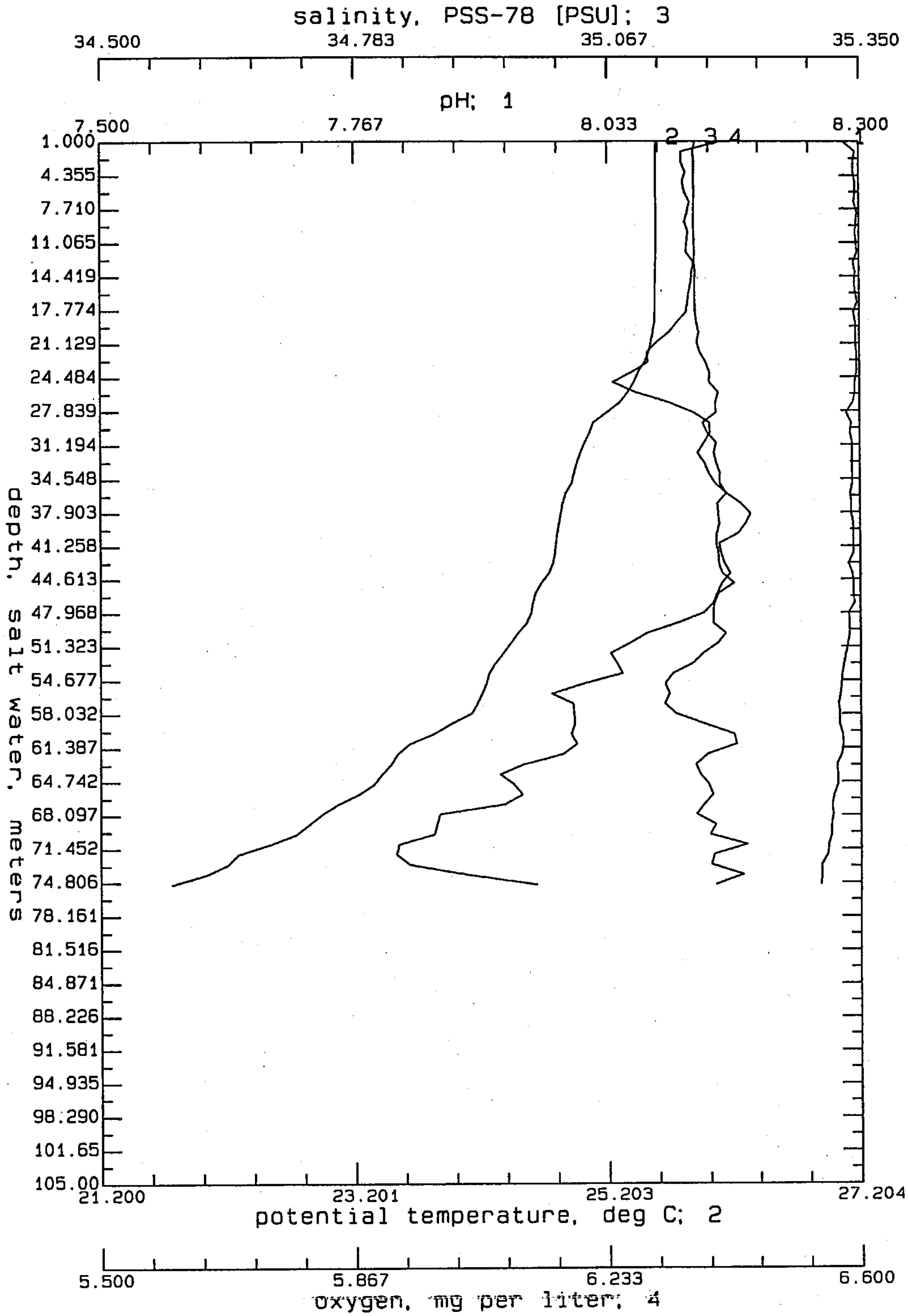
FIGURE II.B.6.a2
PRE 1998 MONITORING STATIONS



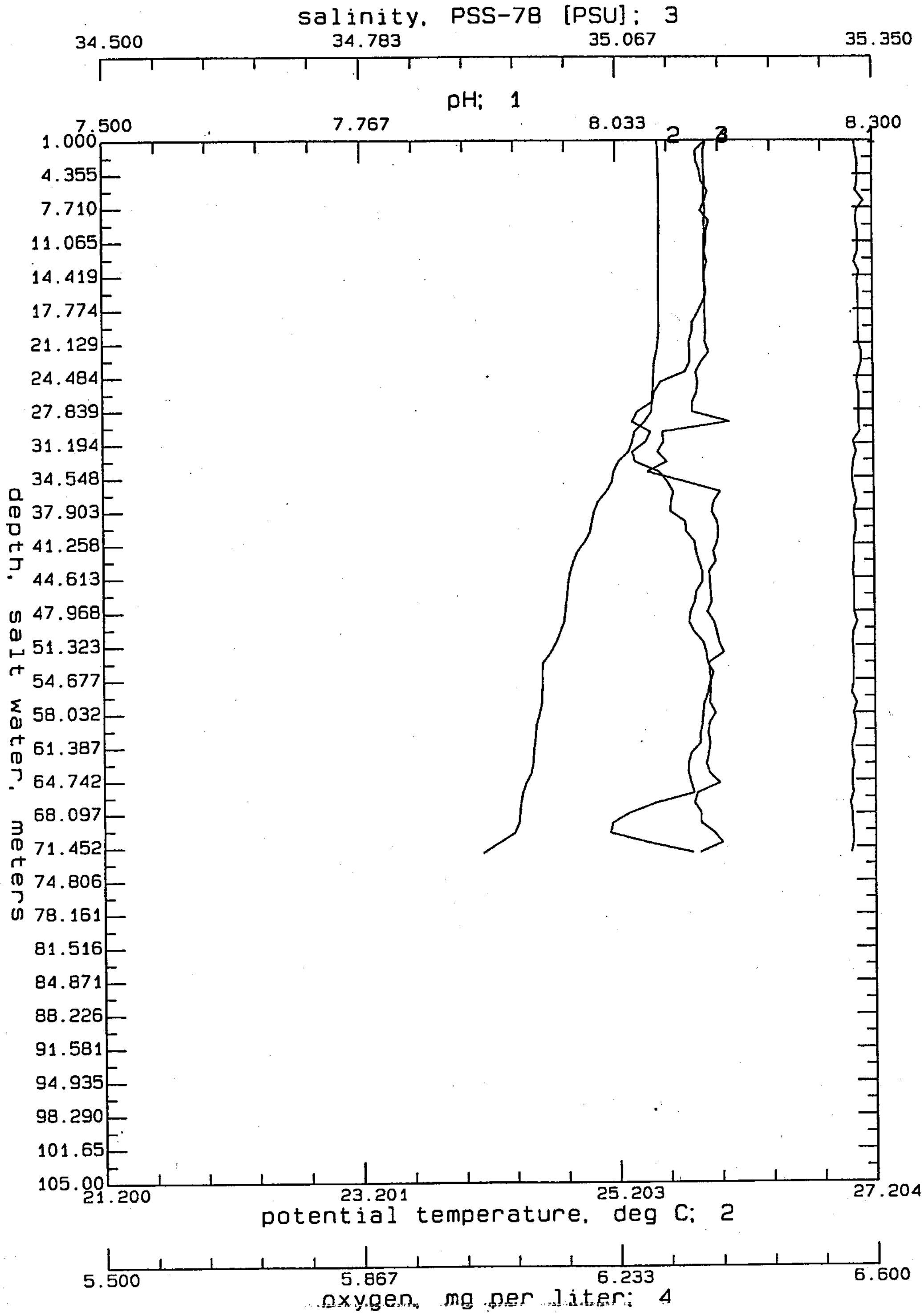
SA070806.CNV: 08July98; Station ZM1



SA070809.CNV: 08July98; Station ZM4



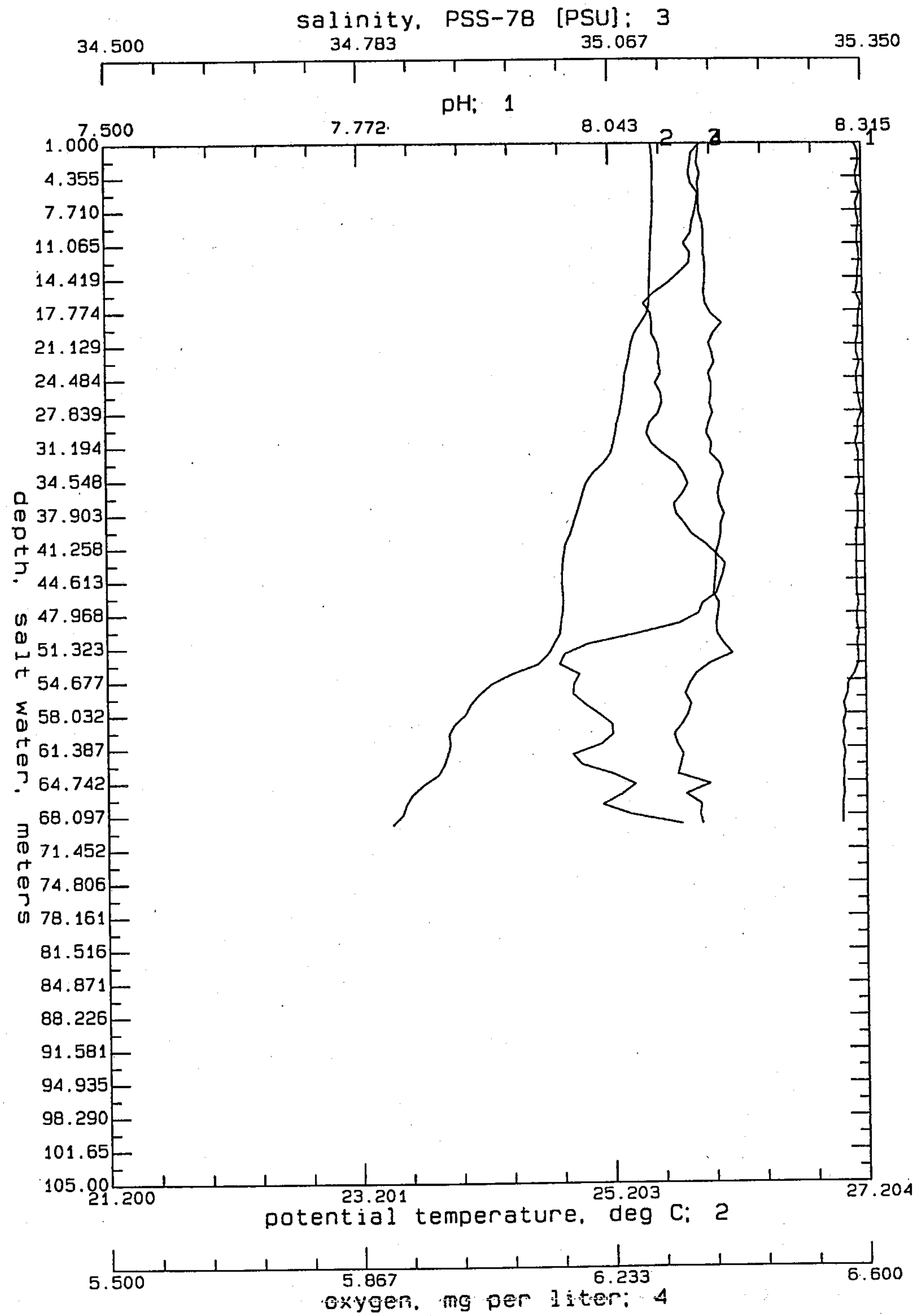
SA070903.CNV: 08July98; Station B3



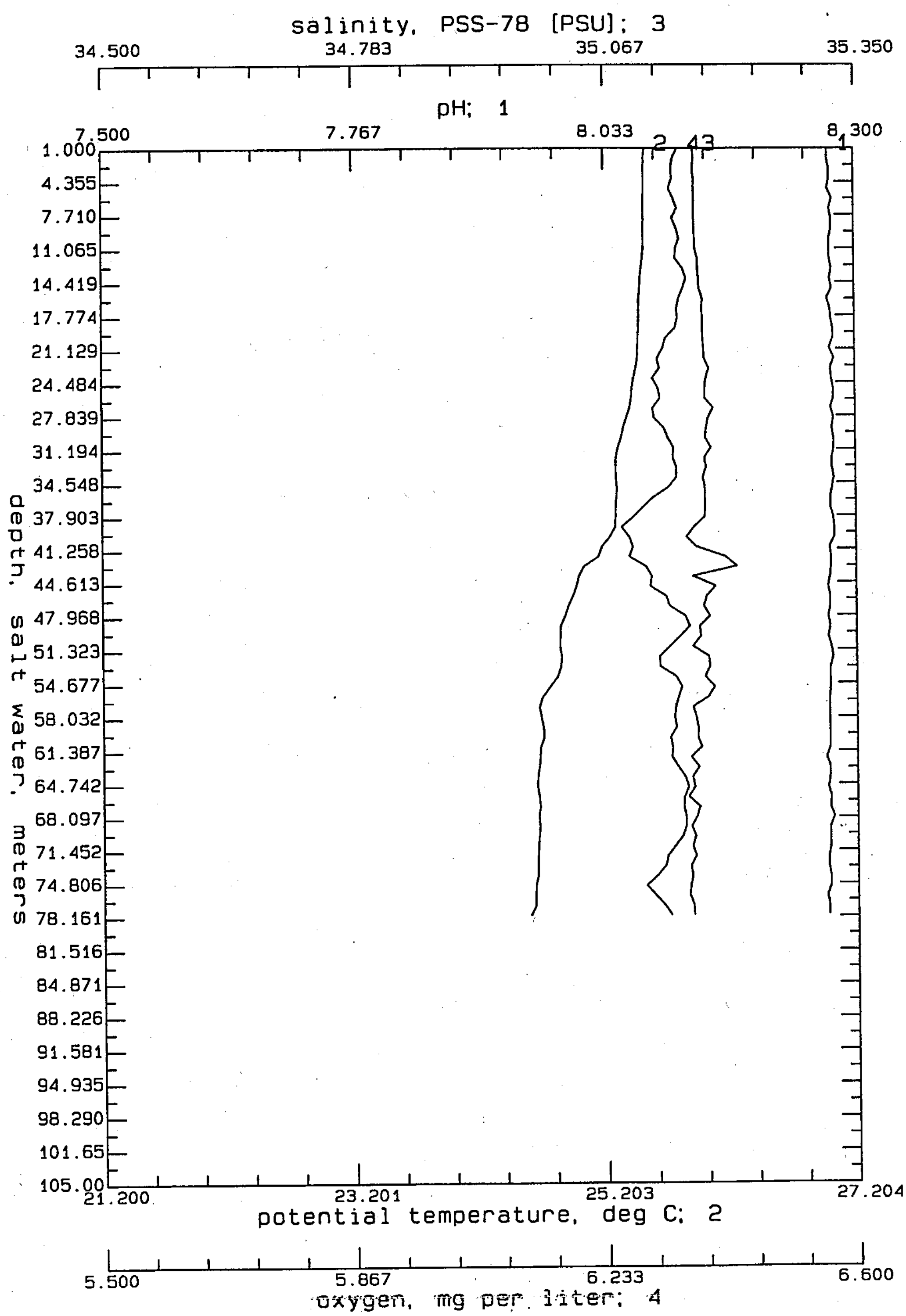
SA070905.CNV: 08July98; Station B5

FIGURE II.B.6.a

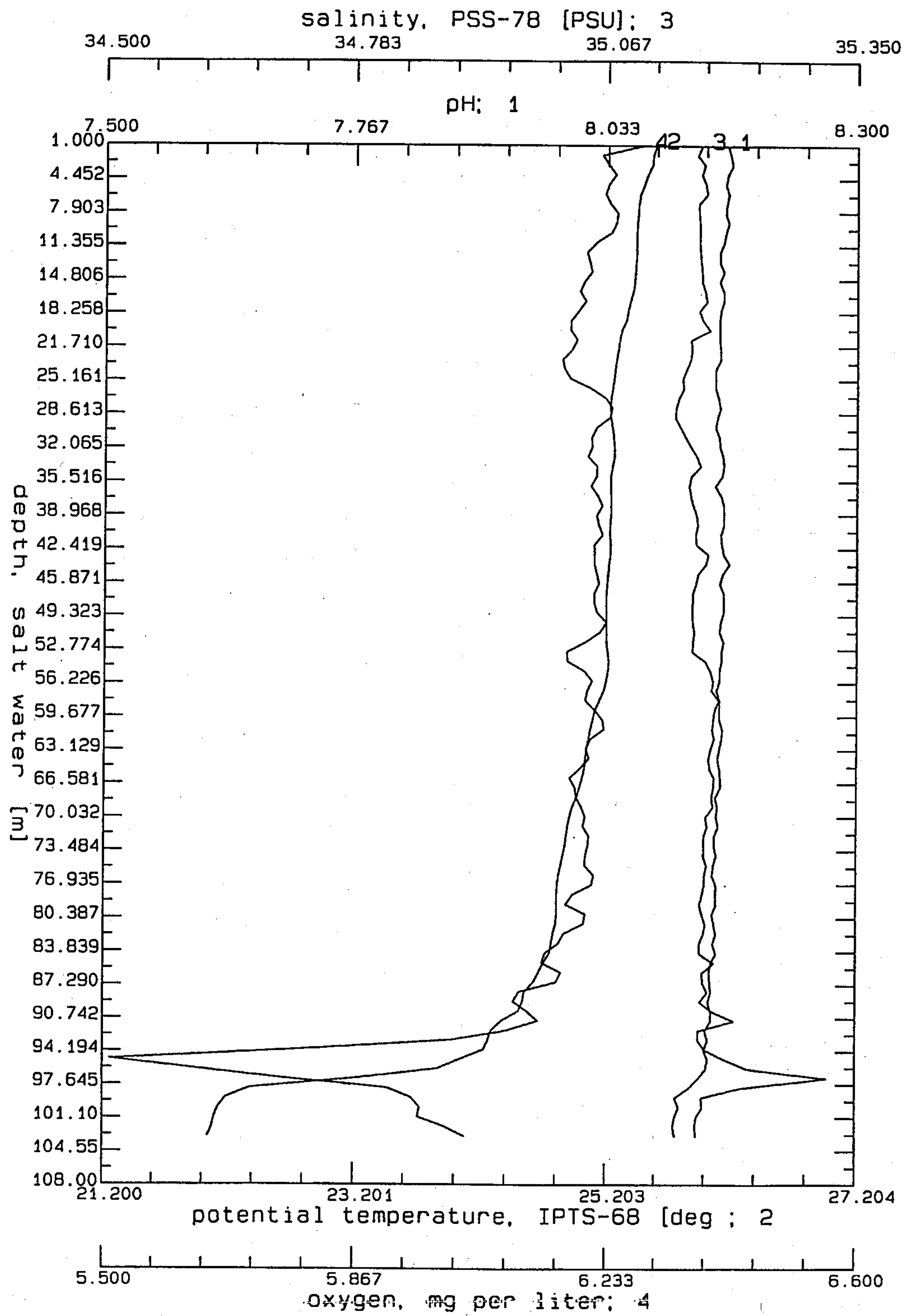
CTD PROFILE - REFERENCE STATION



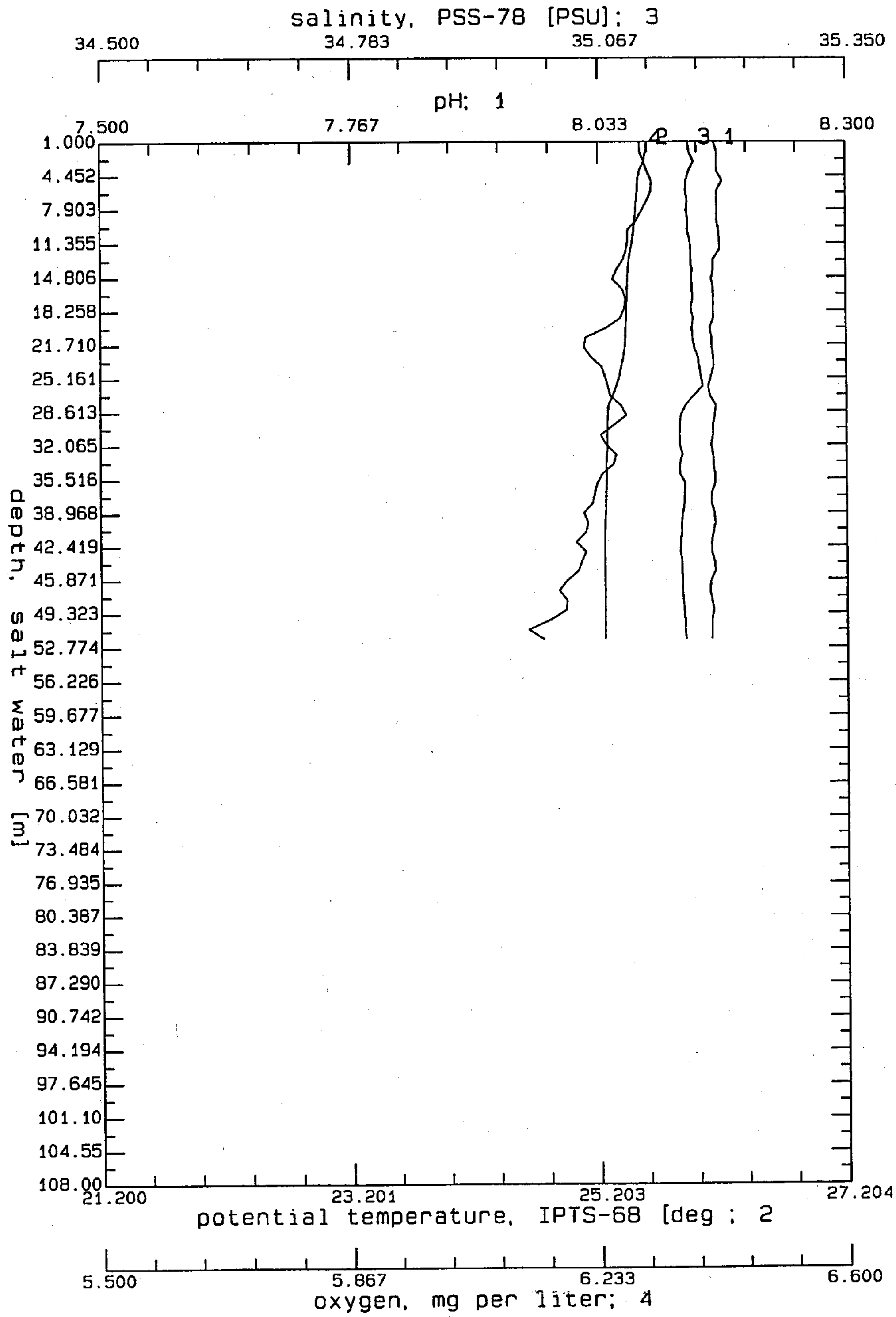
SA070901.CNV: 08July98; Station B1



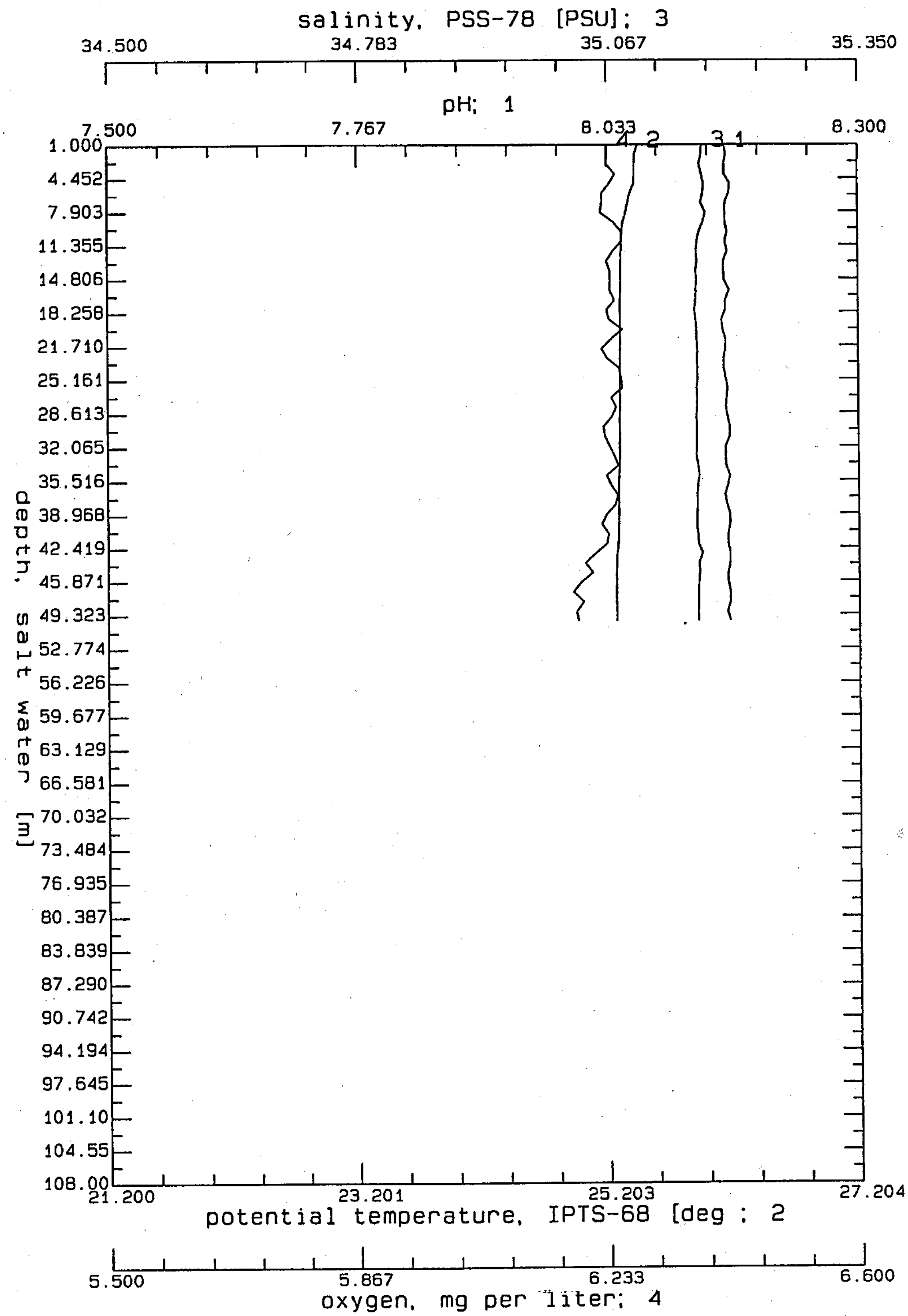
SA070906.CNV: 08July98; Station B6



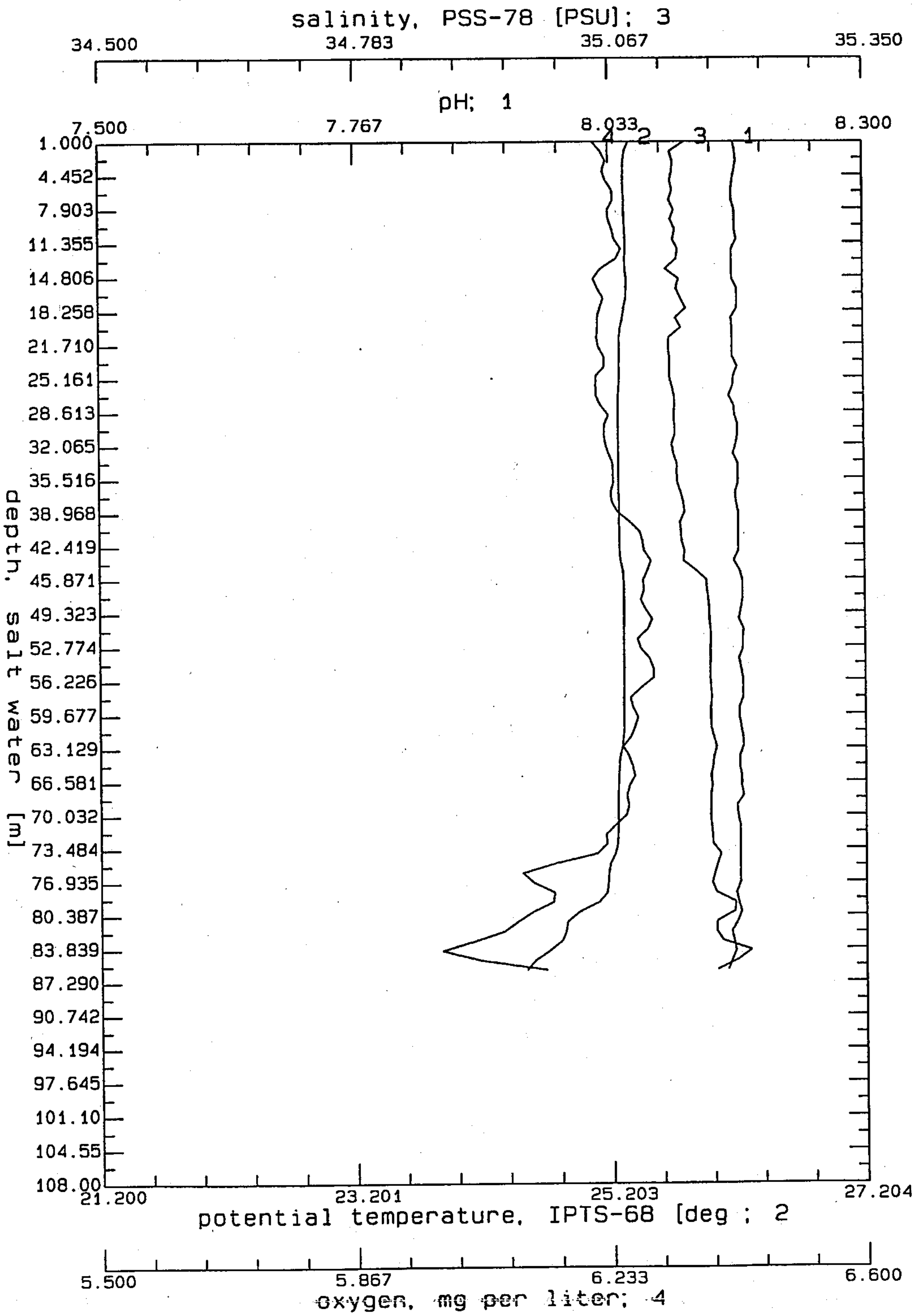
SA110919.CNV: 09November99: Station E2



SA110918.CNV: 09November99; Station D2



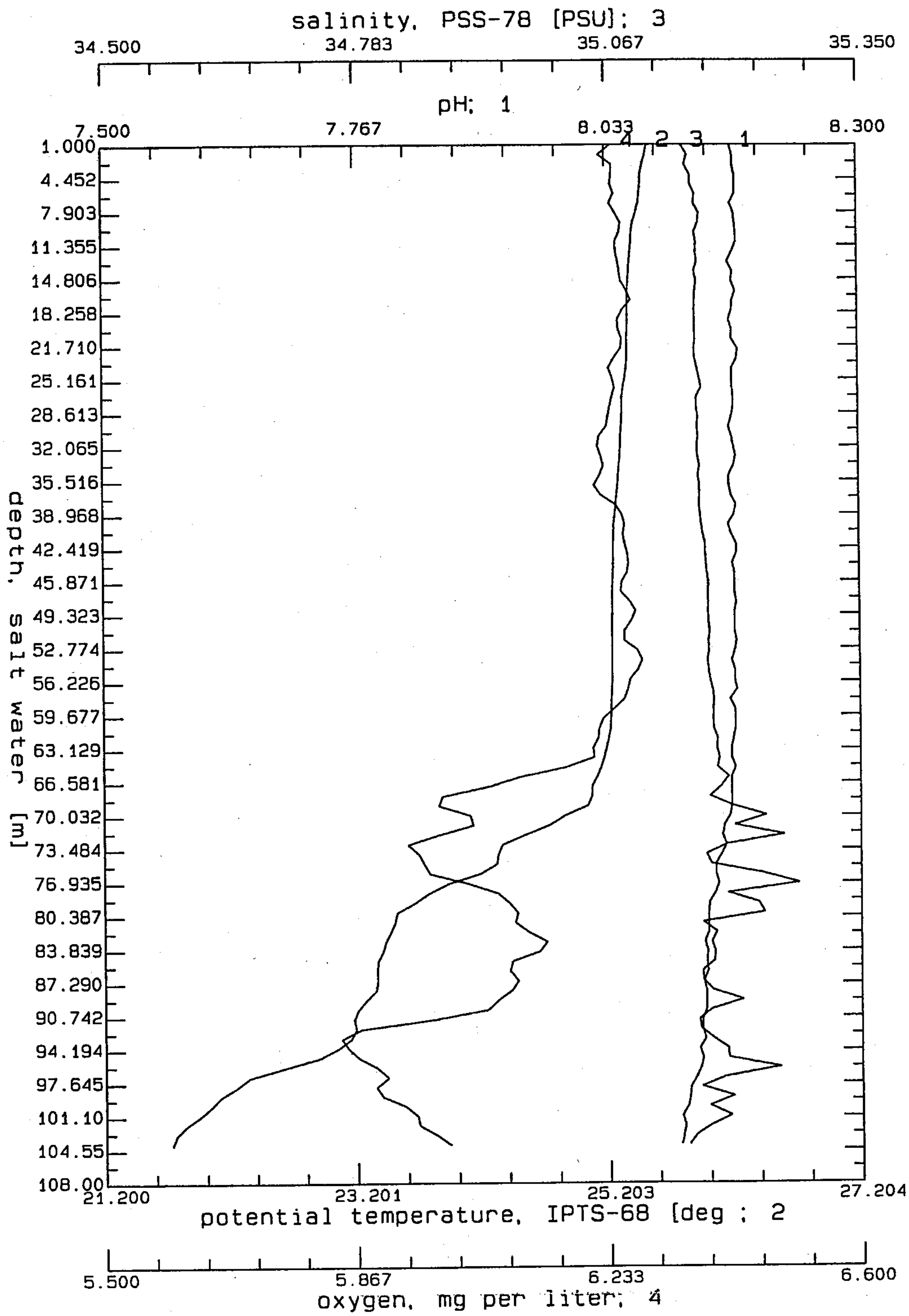
SA110913.CNV: 09November99; Station D3



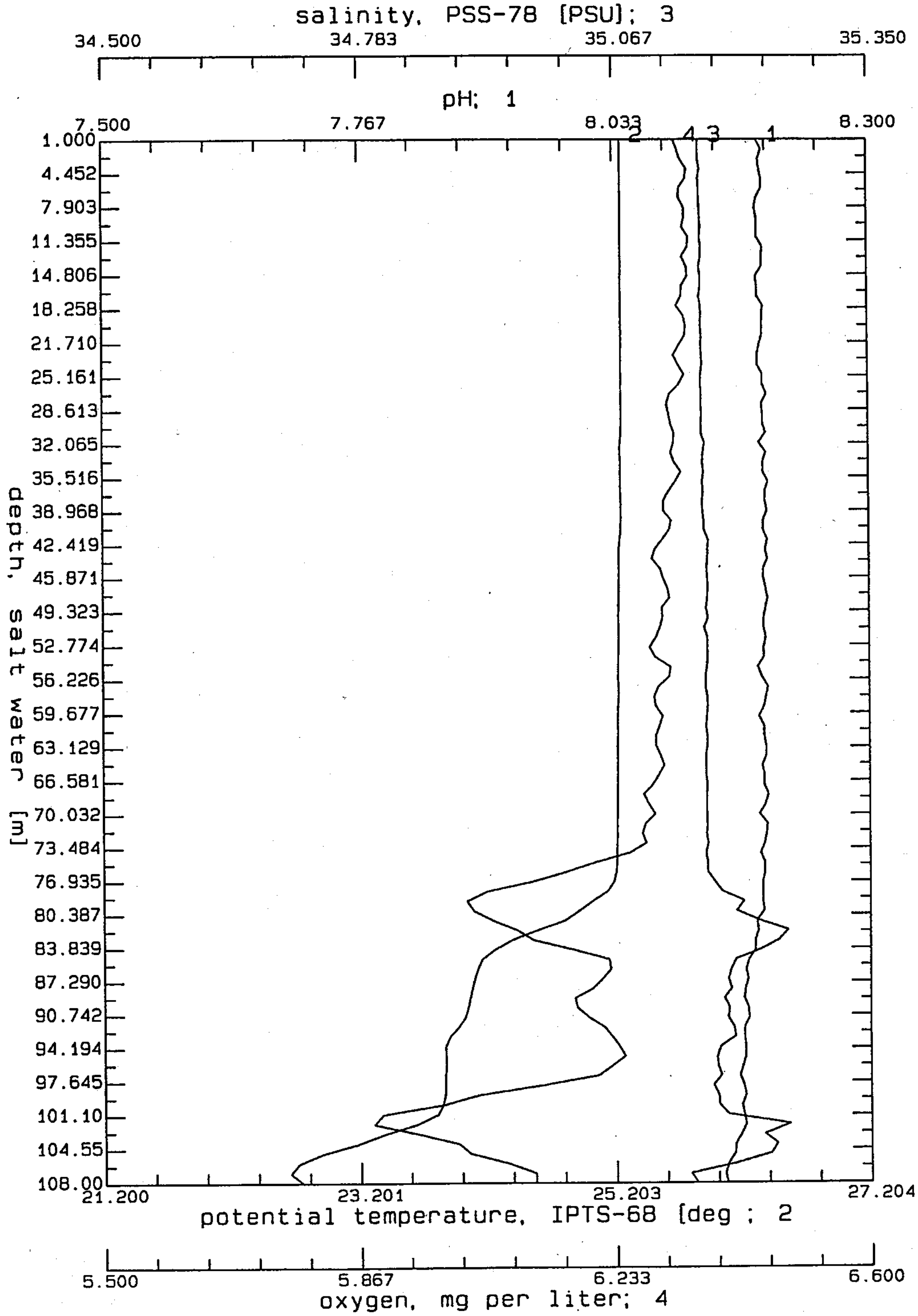
SA110911.CNV: 09November99; Station E3

FIGURE II.B.6.a

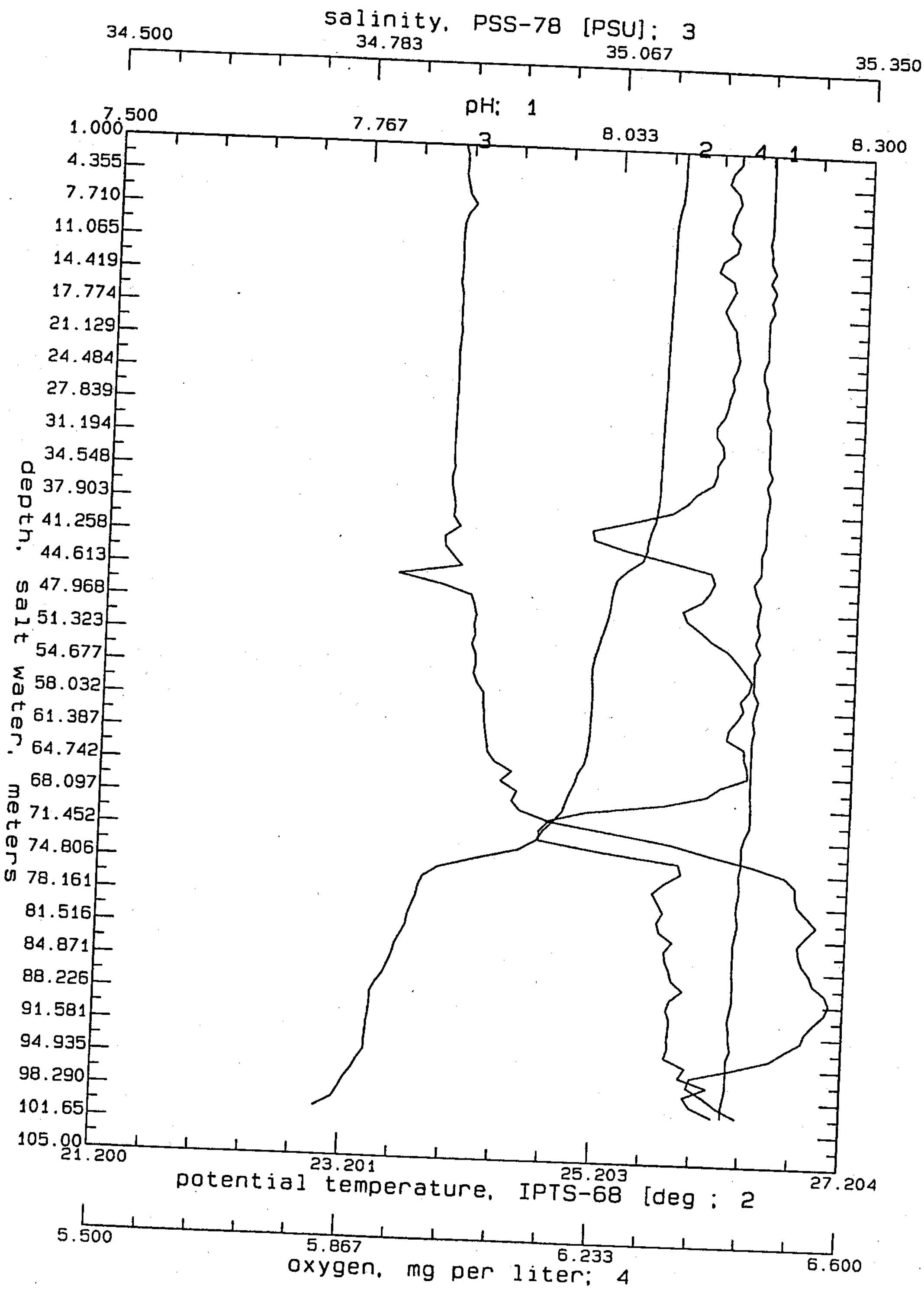
CTD PROFILE - REFERENCE STATION



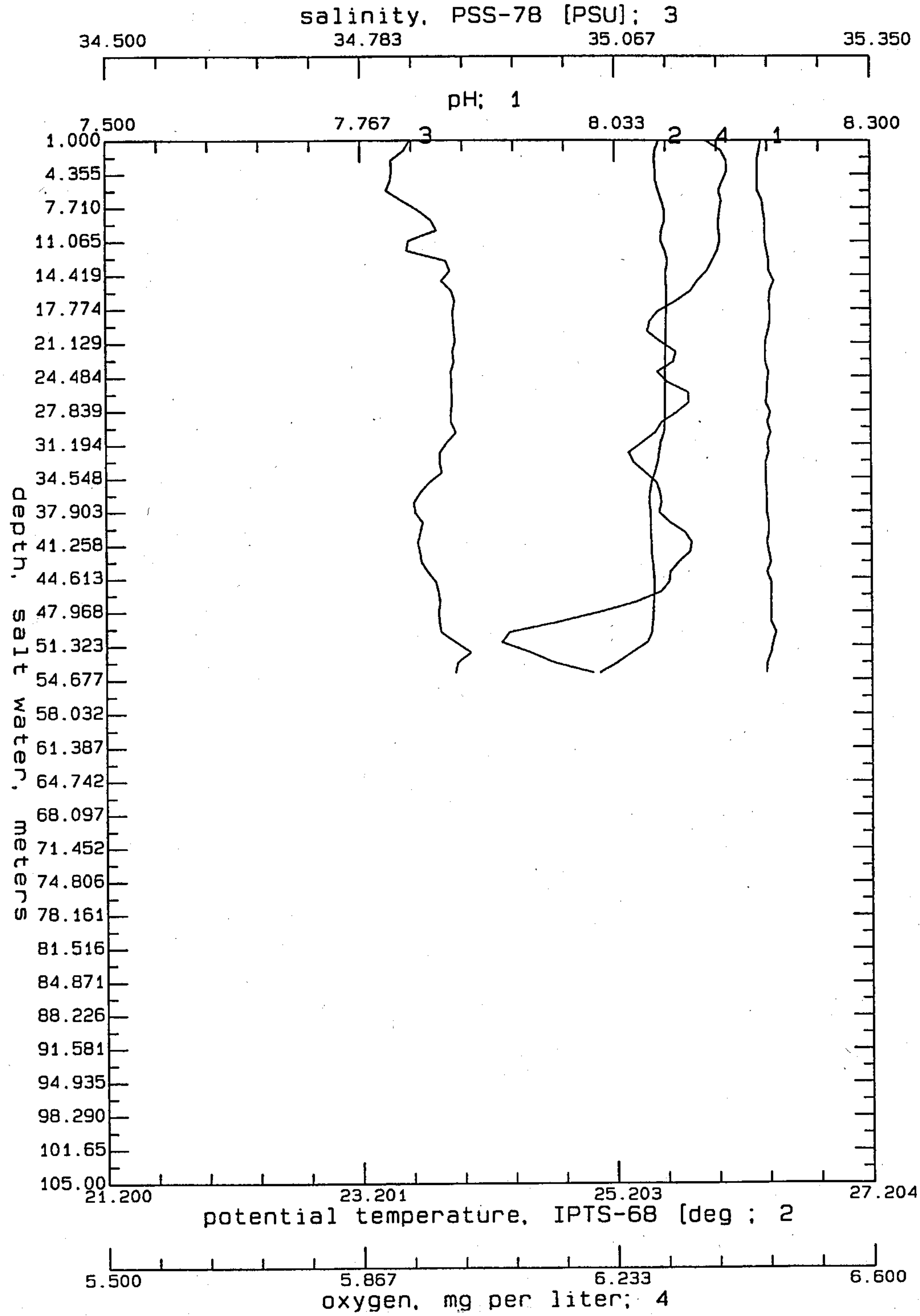
SA110920.CNV: 09November99; Station E1



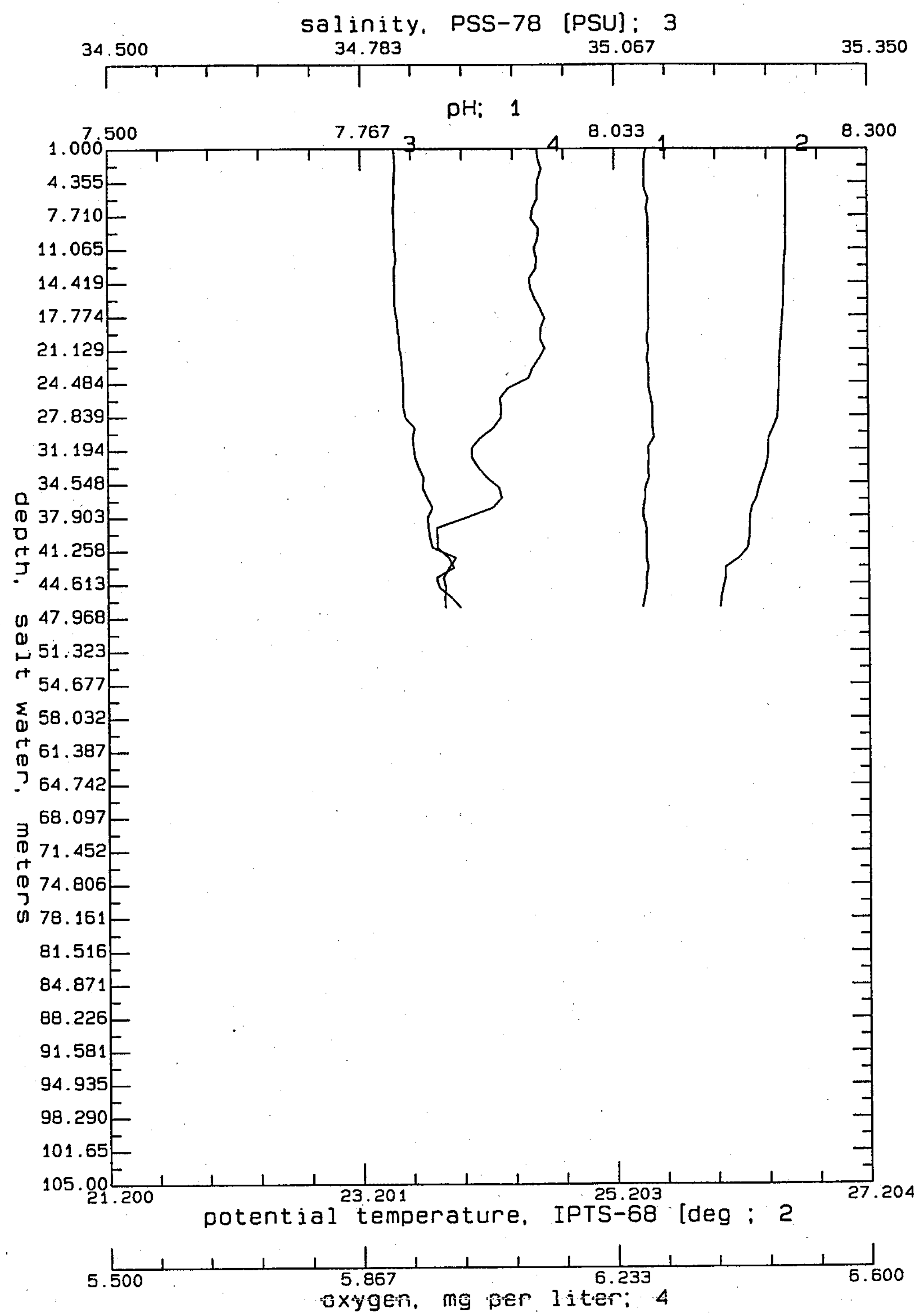
SA110903.CNV: 09November99; Station E6



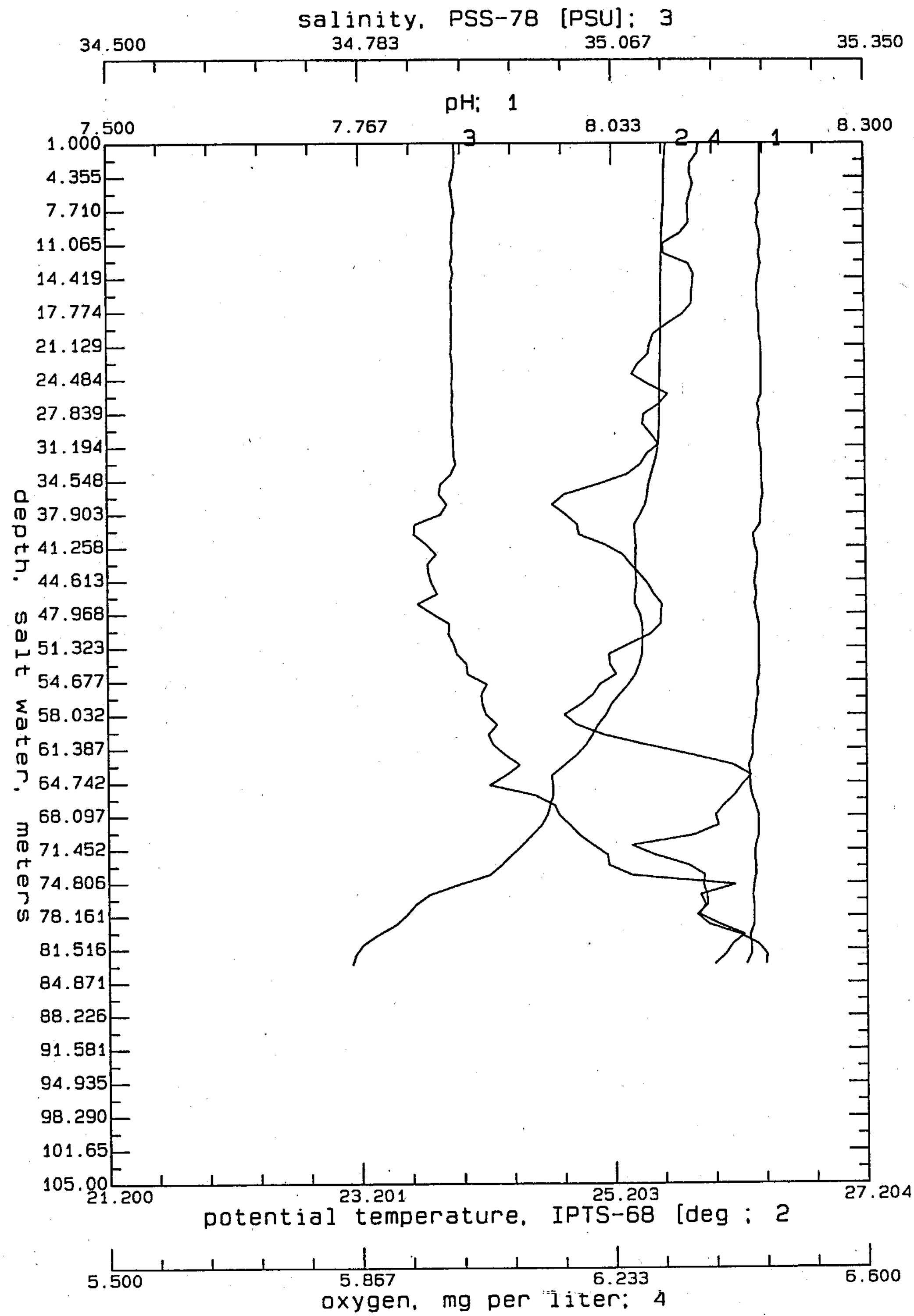
SA071122.CNV: 11July00: Station E2



SA071121.CNV: 11July00; Station D2



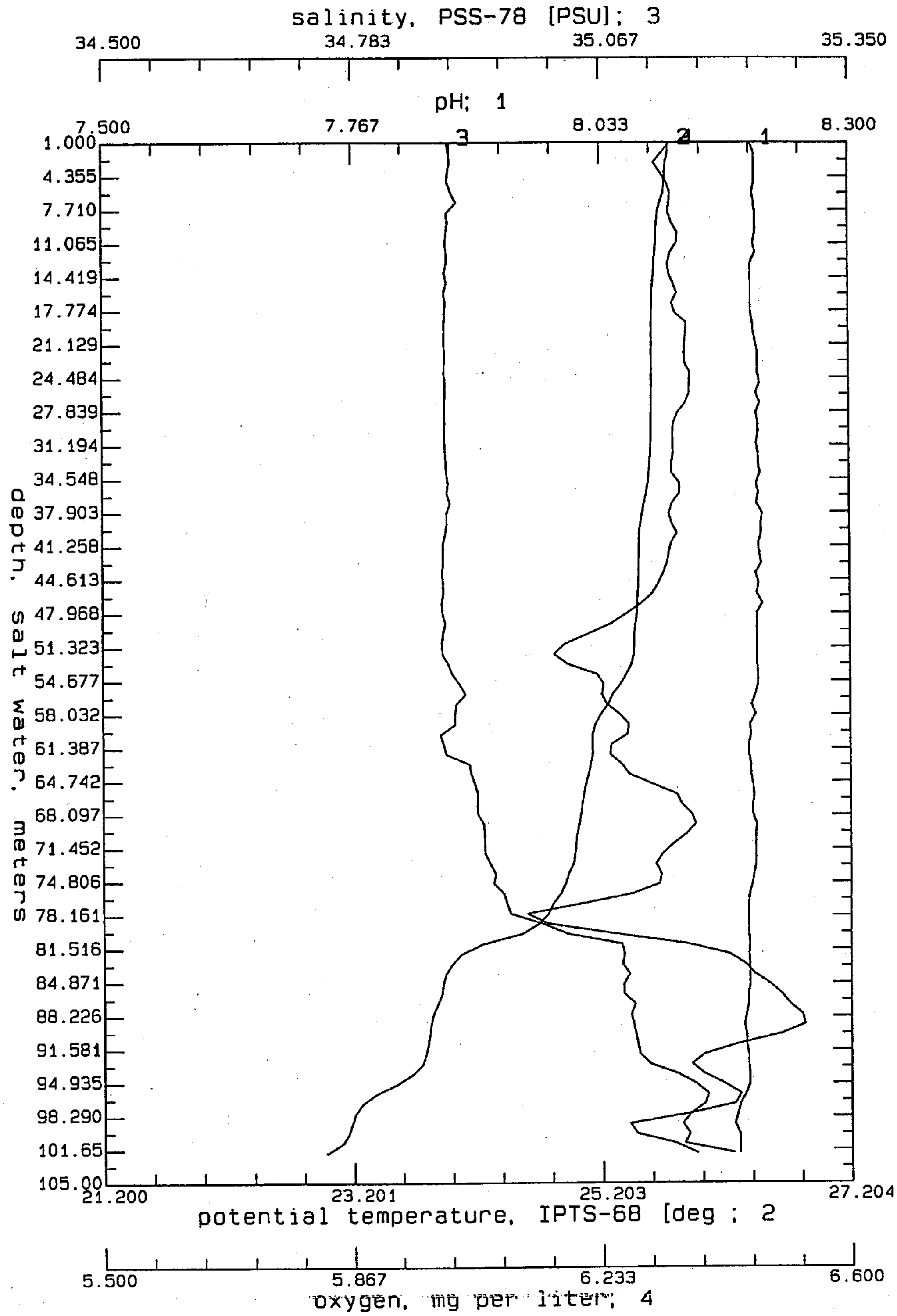
SA070213.CNV: 20July02; Station D3



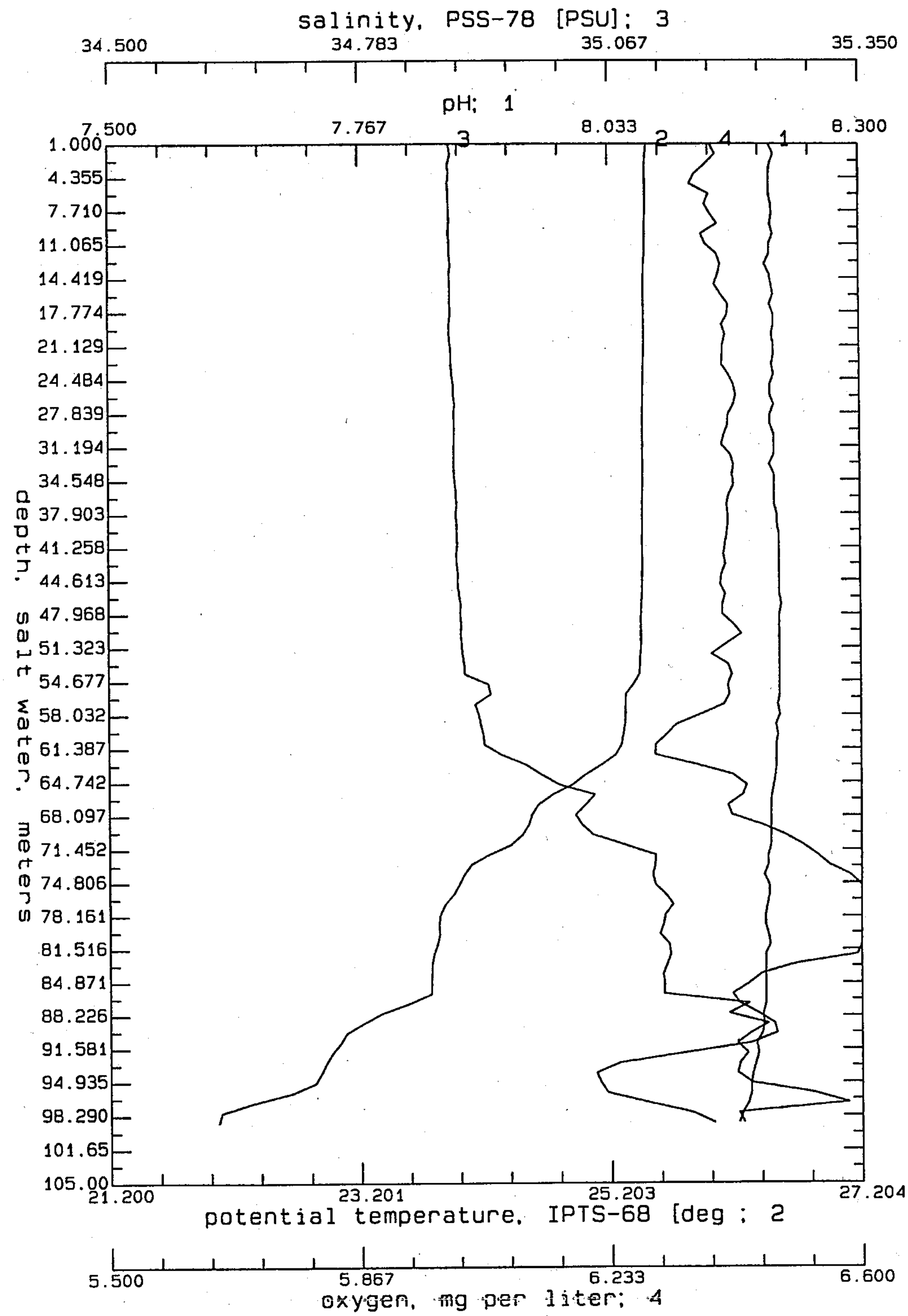
SA071111.CNV: 11July00: Station E3

FIGURE II.B.6.a

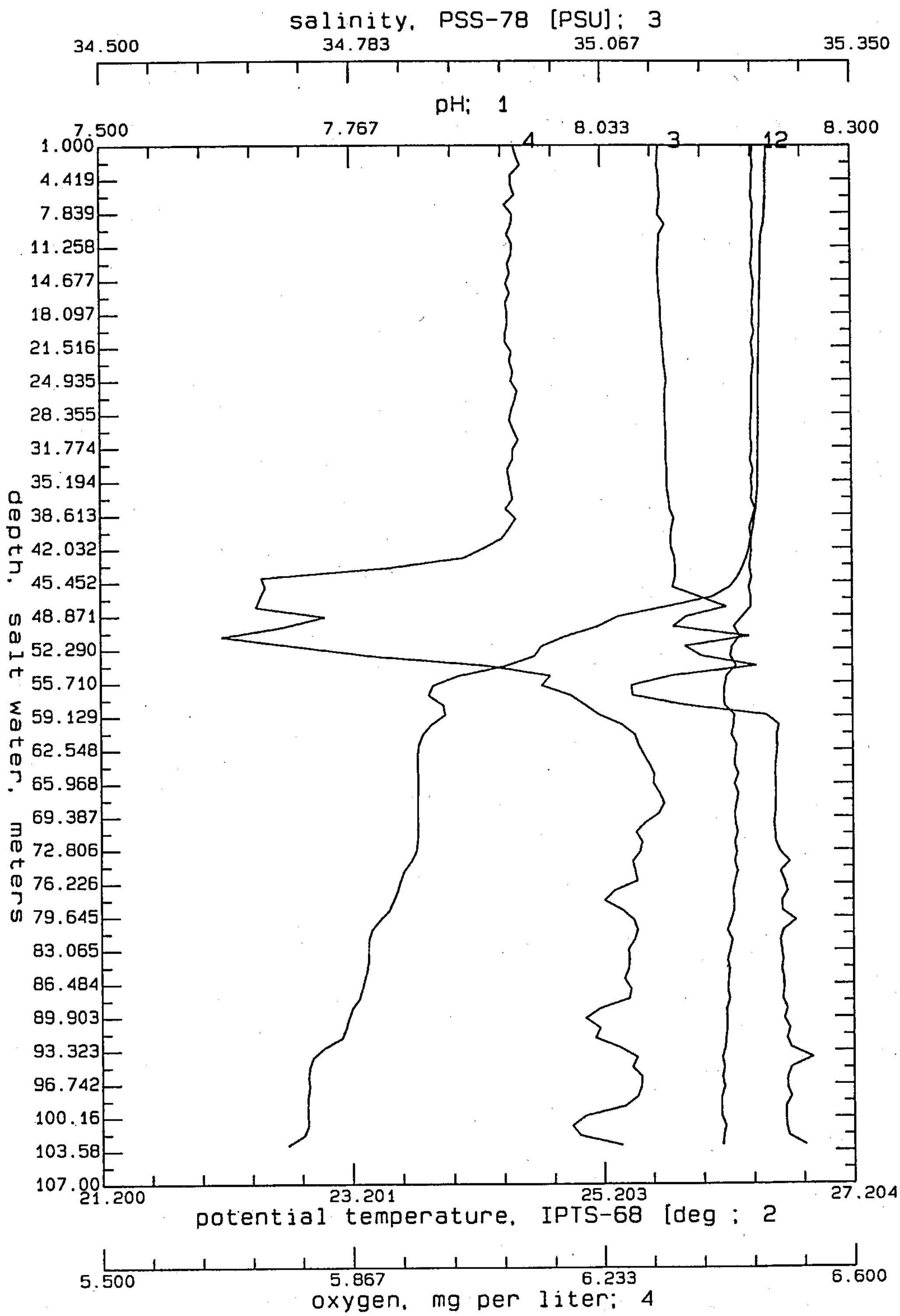
CTD PROFILE - REFERENCE STATION



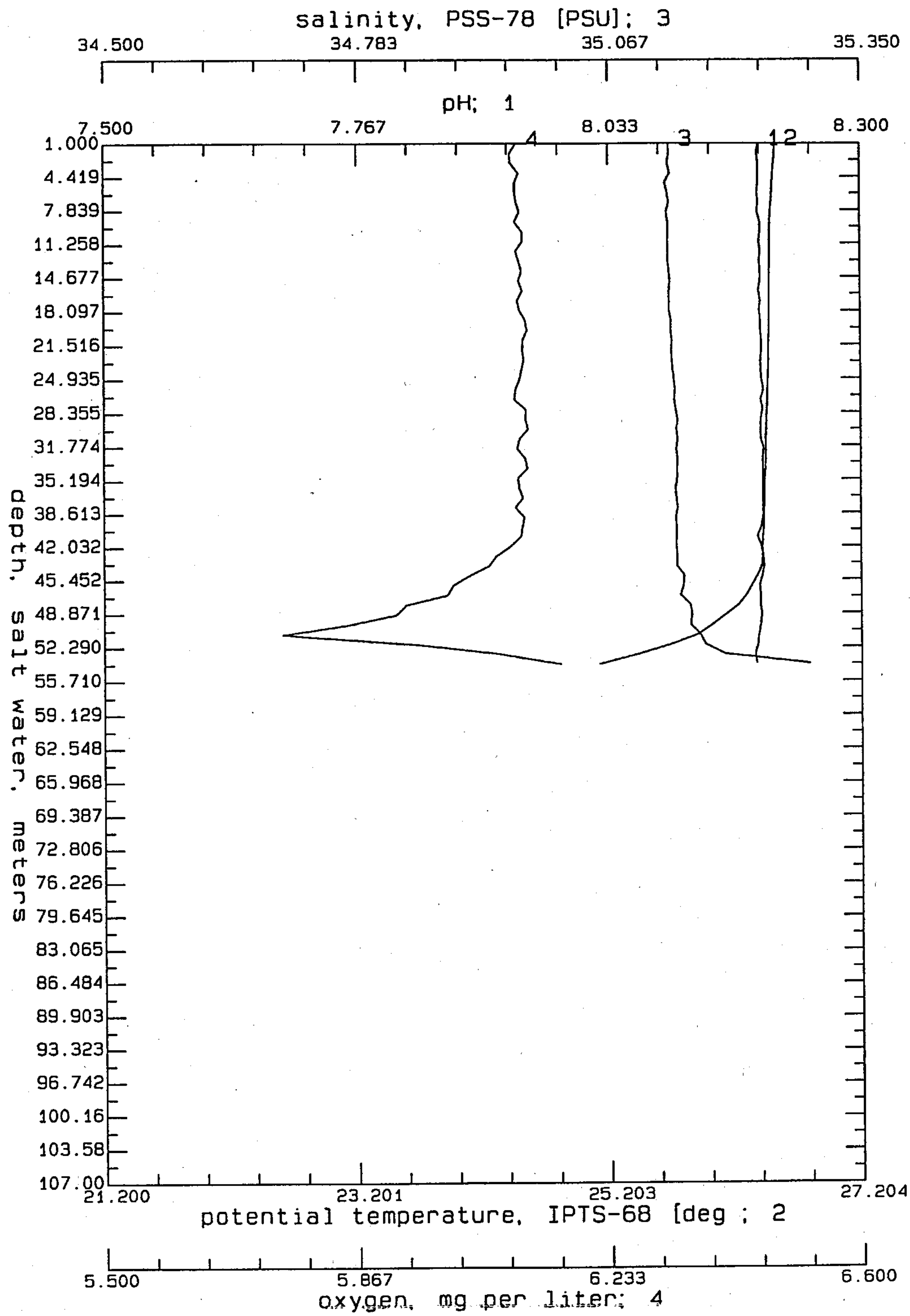
SA071123.CNV: 11July00; Station E1



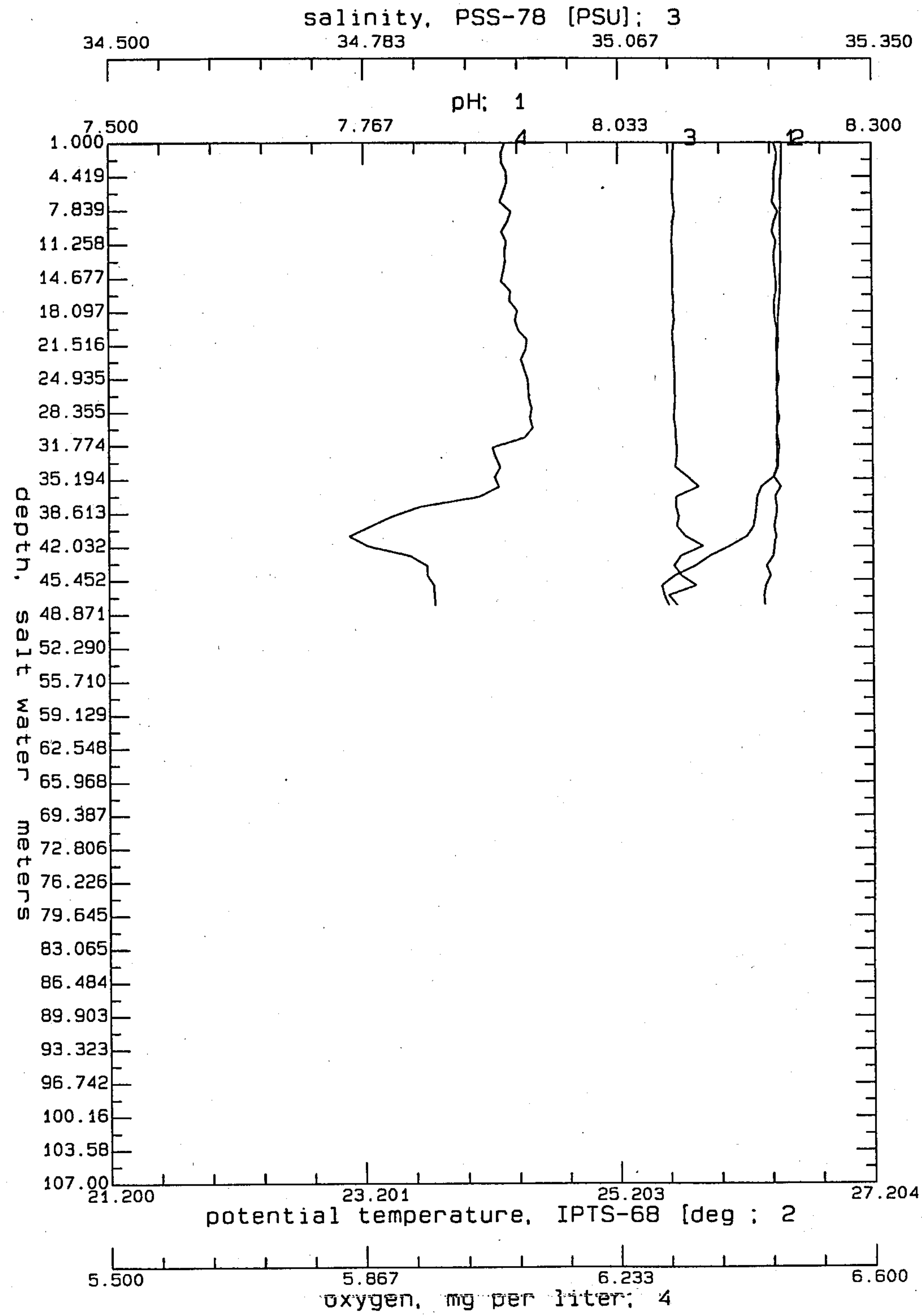
SA071103.CNV: 11July00; Station E6



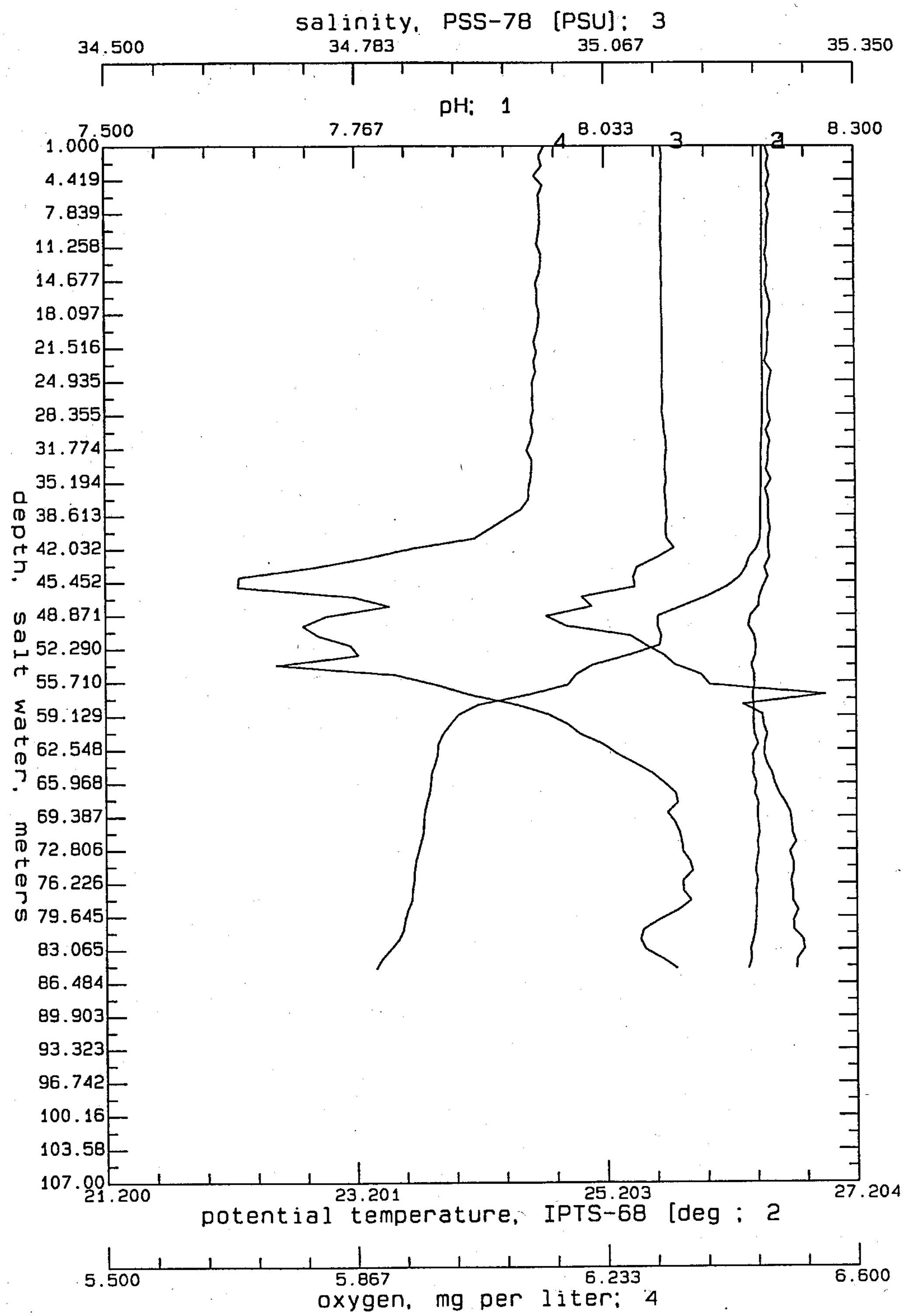
SA101122.CNV: 11October01; Station E2



SA101121.CNV: 11October01; Station D2



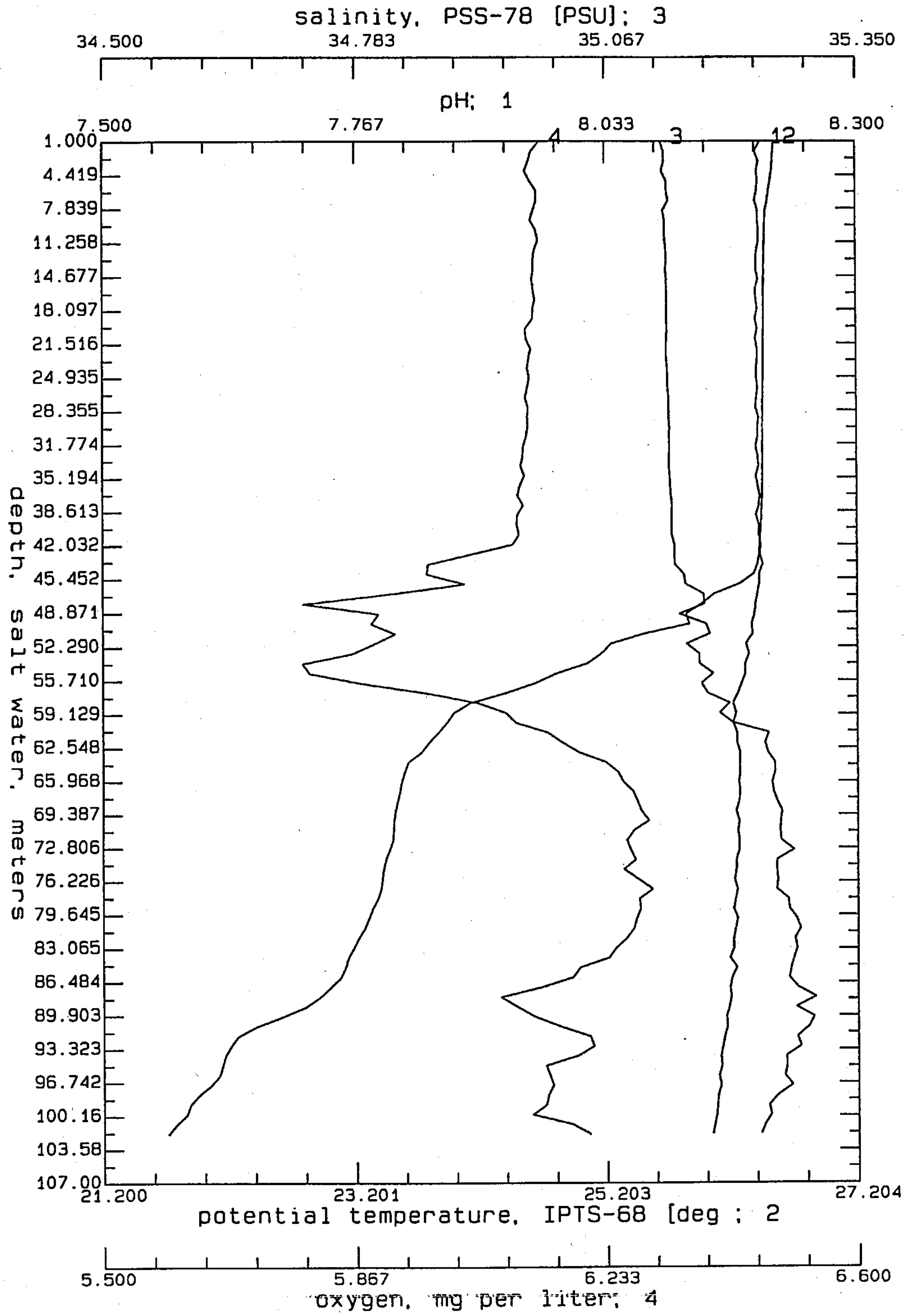
SA101113.CNV: 11October01; Station D3



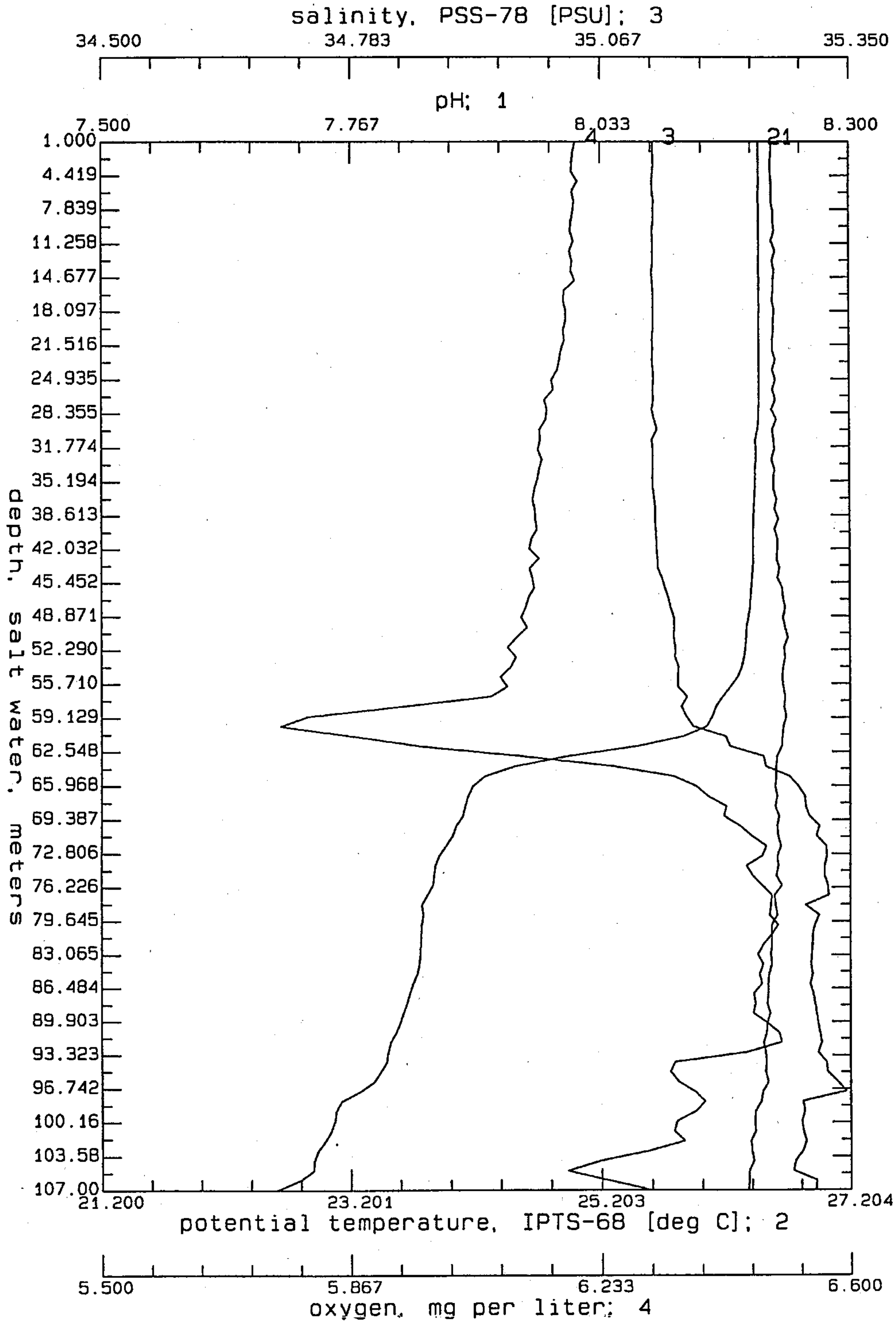
SA101111.CNV: 11October01; Station E3

FIGURE II.B.6.a

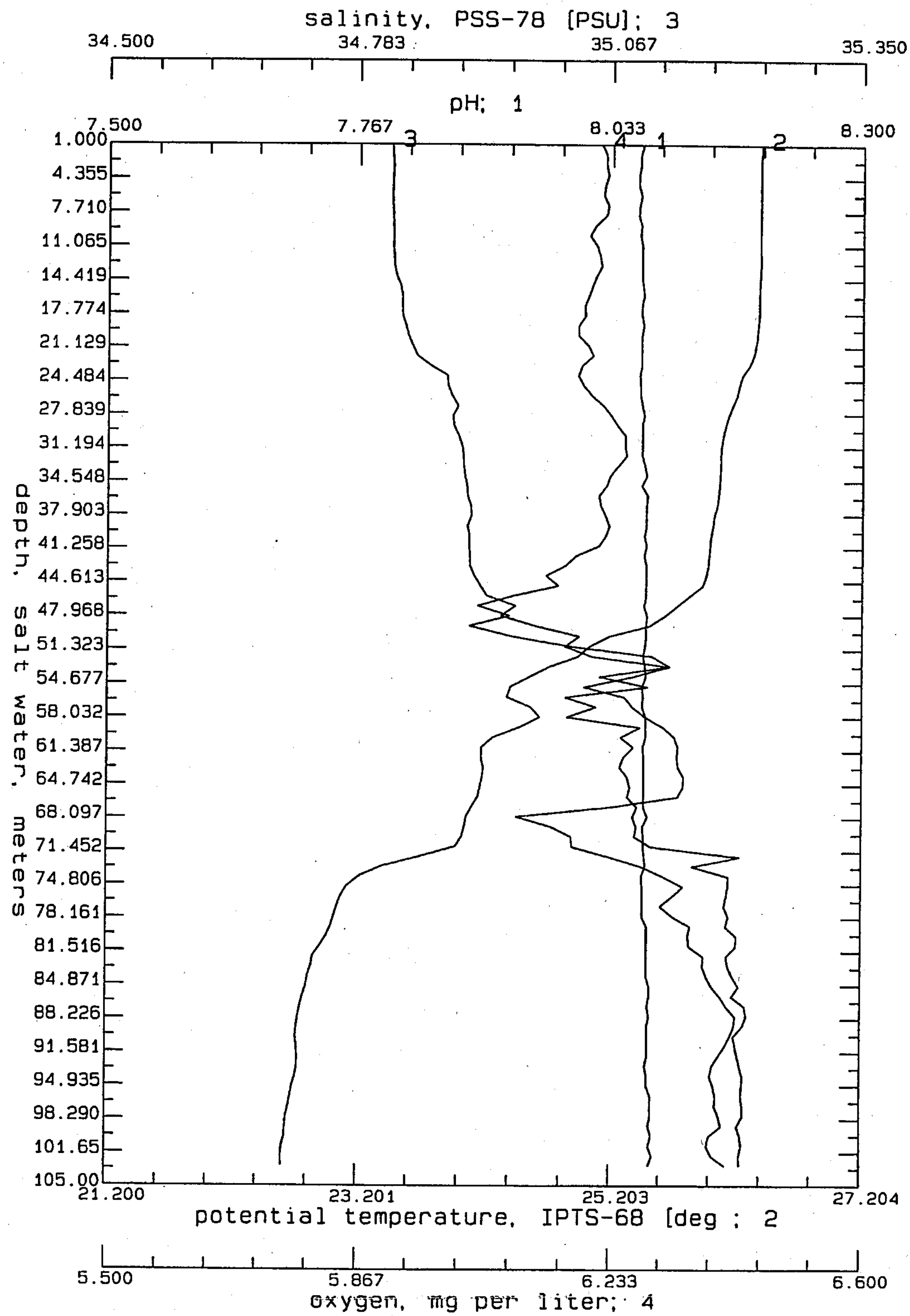
CTD PROFILE - REFERENCE STATION



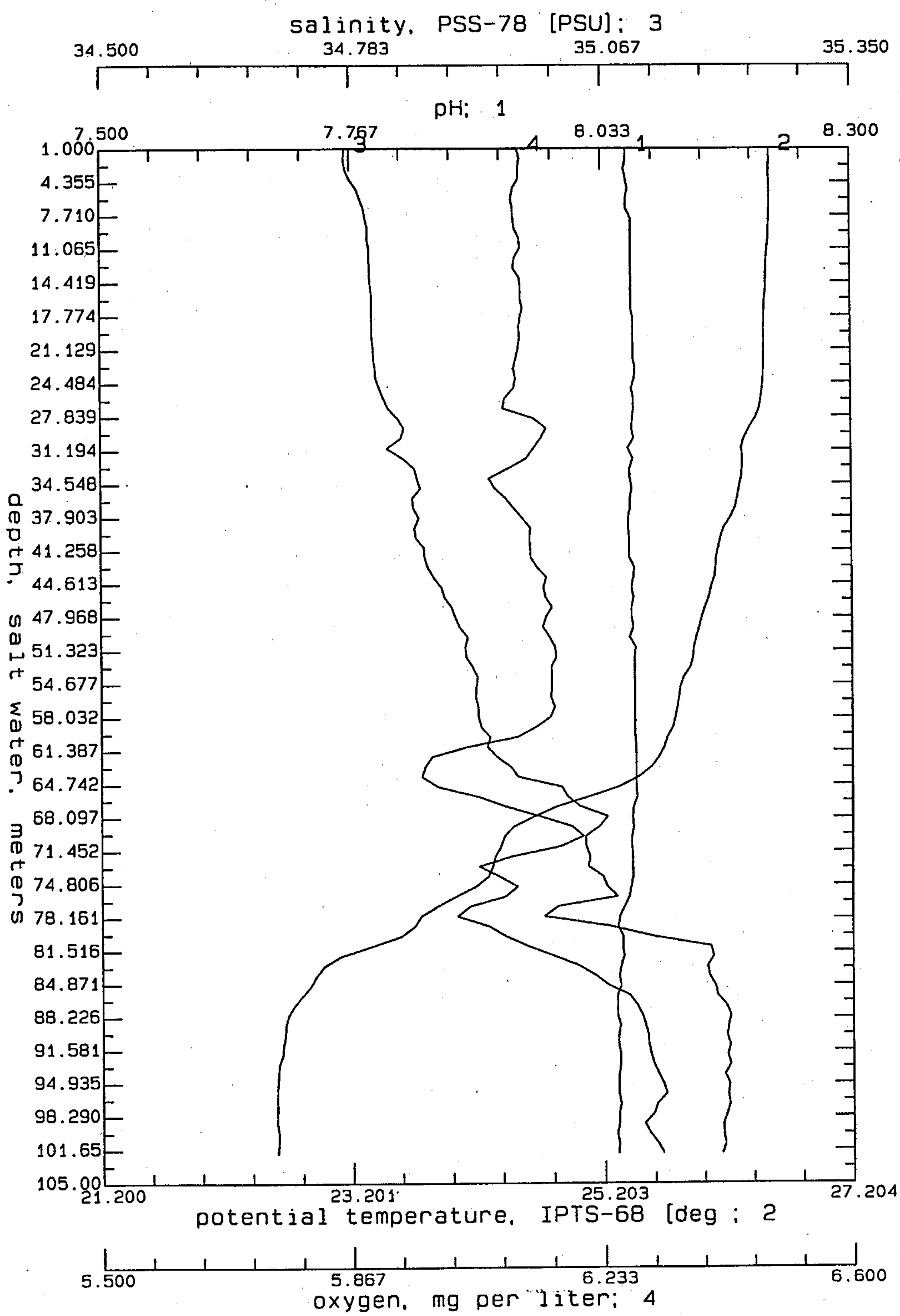
SA101123.CNV: 11October01; Station E1



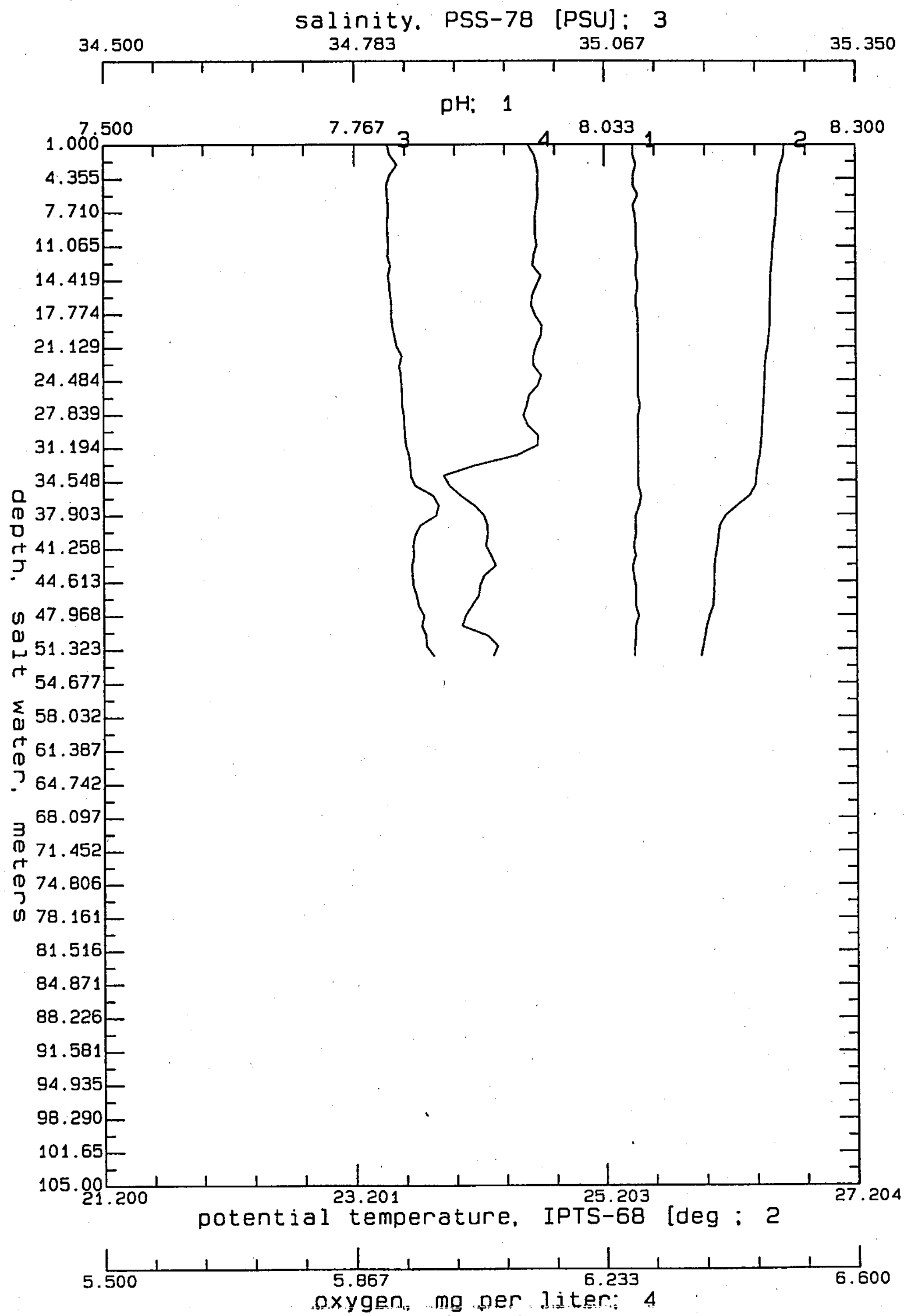
SA101103.CNV: 11October01; Station E6



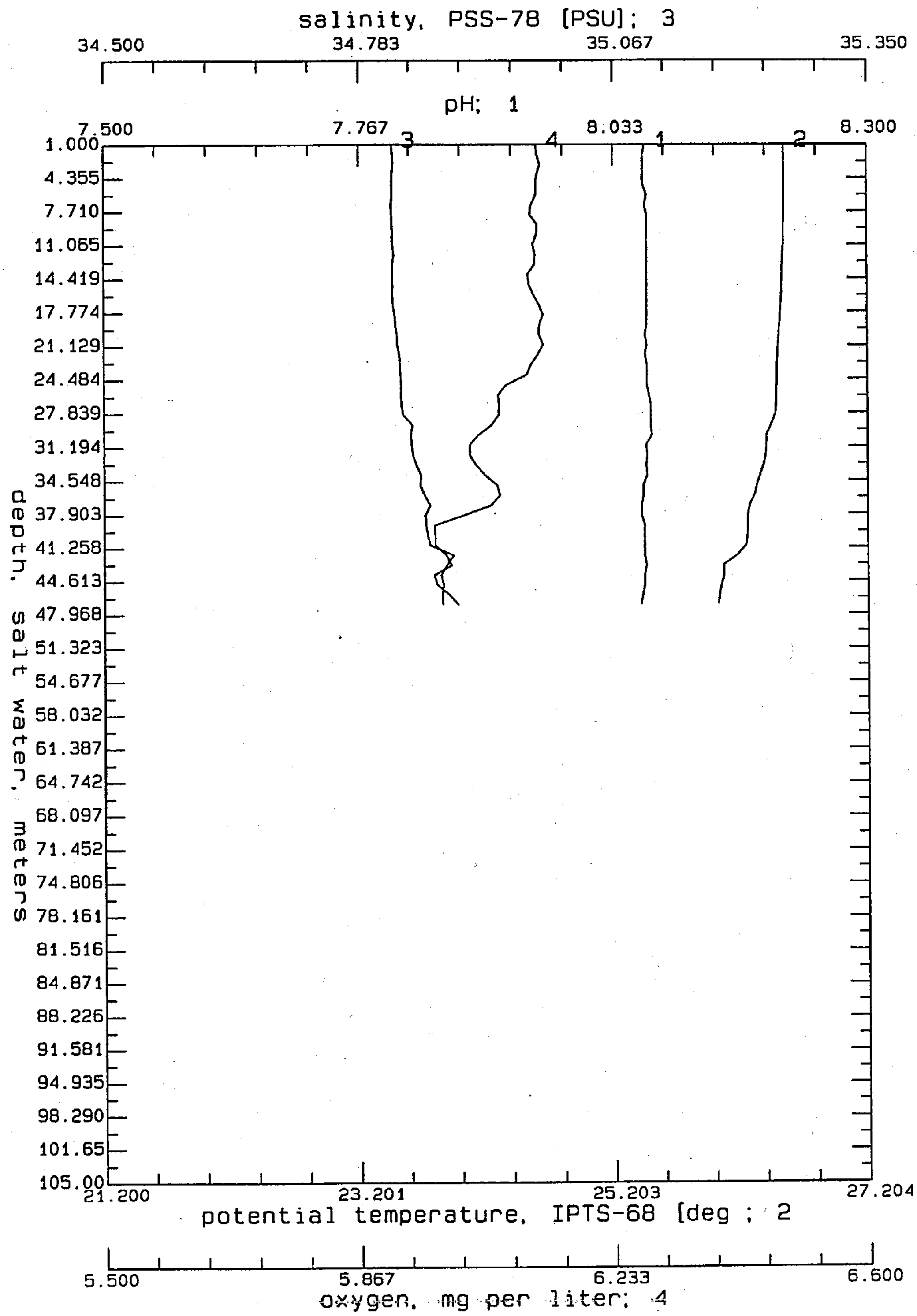
SA070203.CNV: 20July02; Station E6



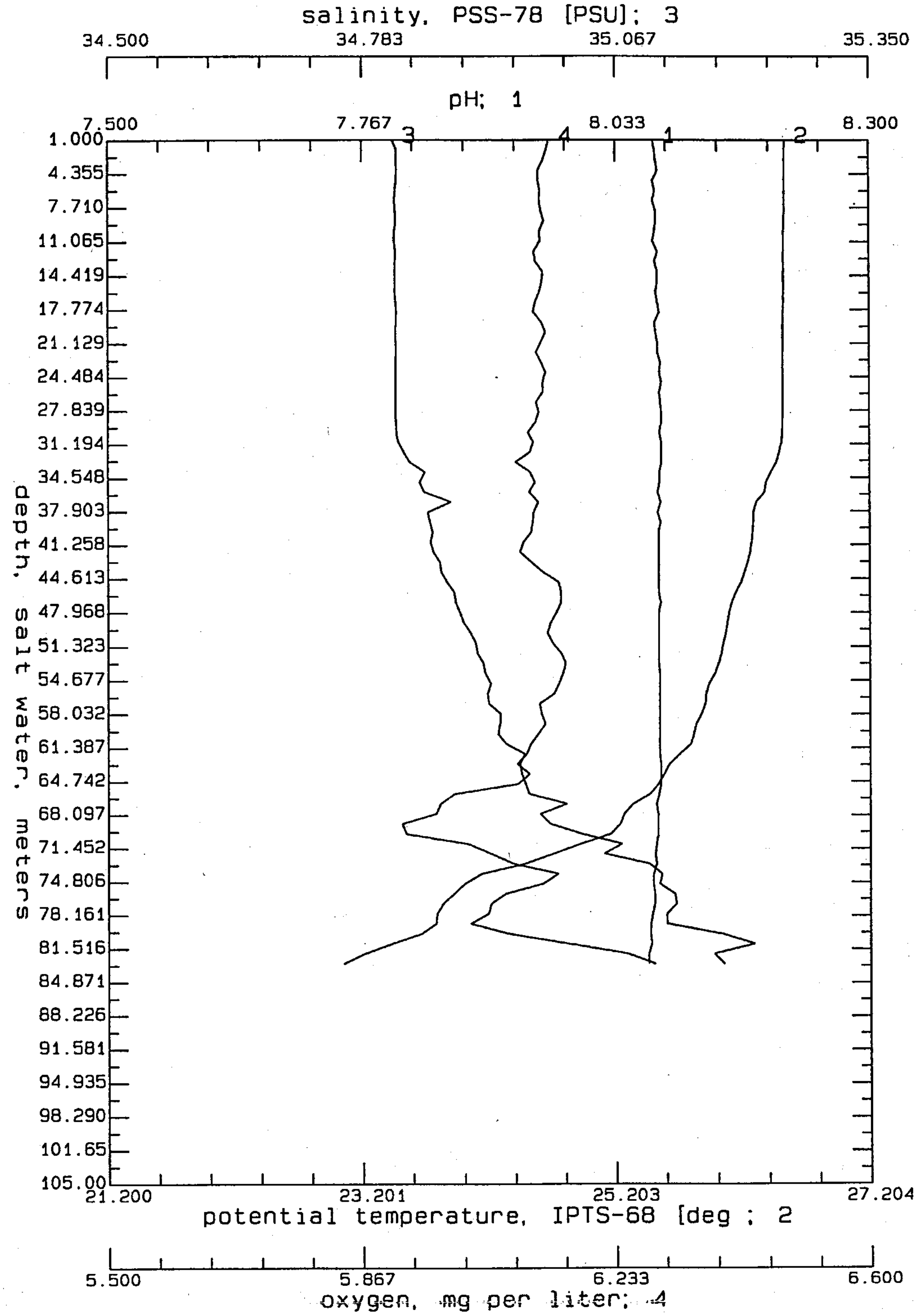
SA070219.CNV: 20July02; Station E2



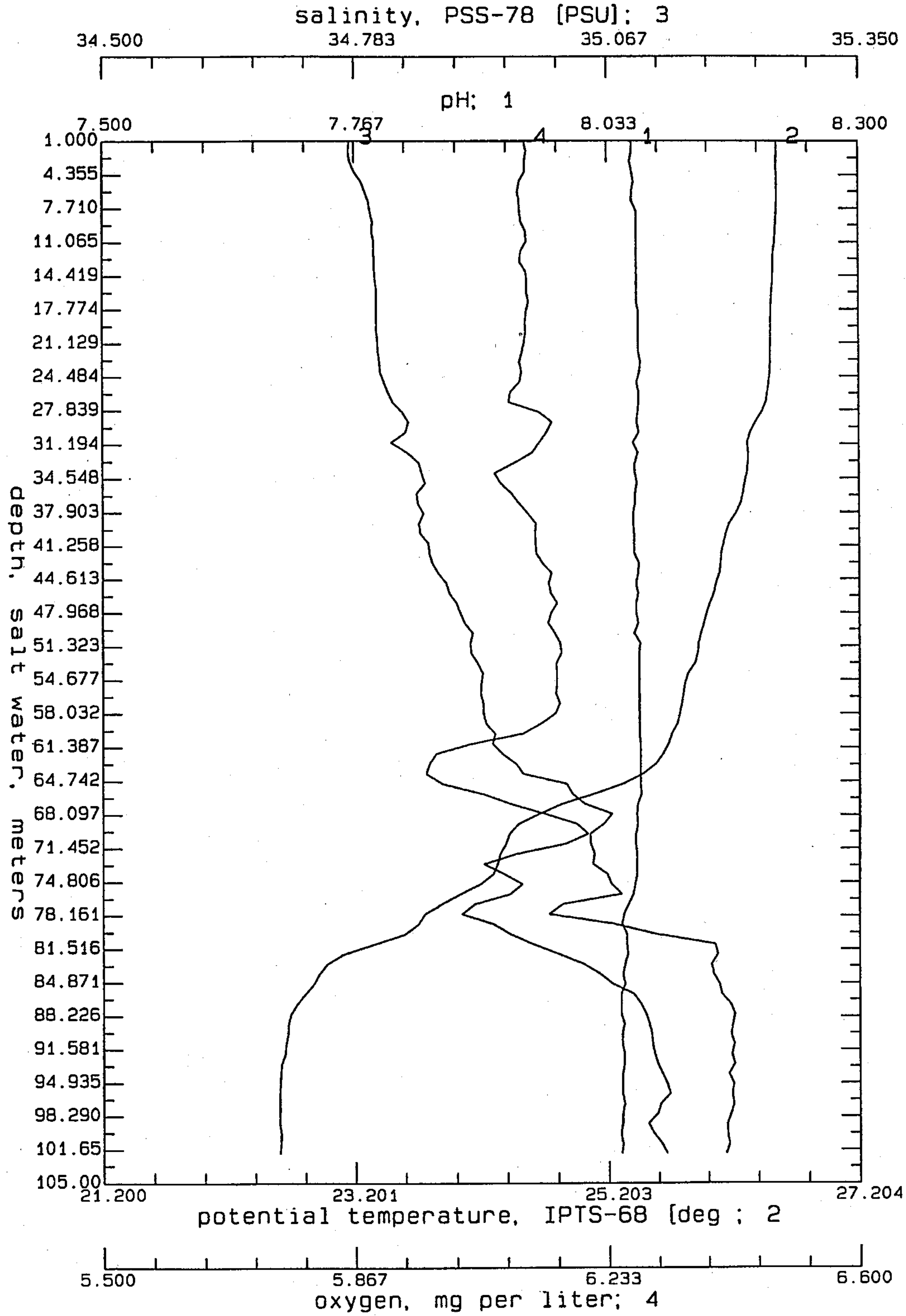
SA070218.CNV: 20July02; Station D2



SA070213.CNV: 20July02; Station D3



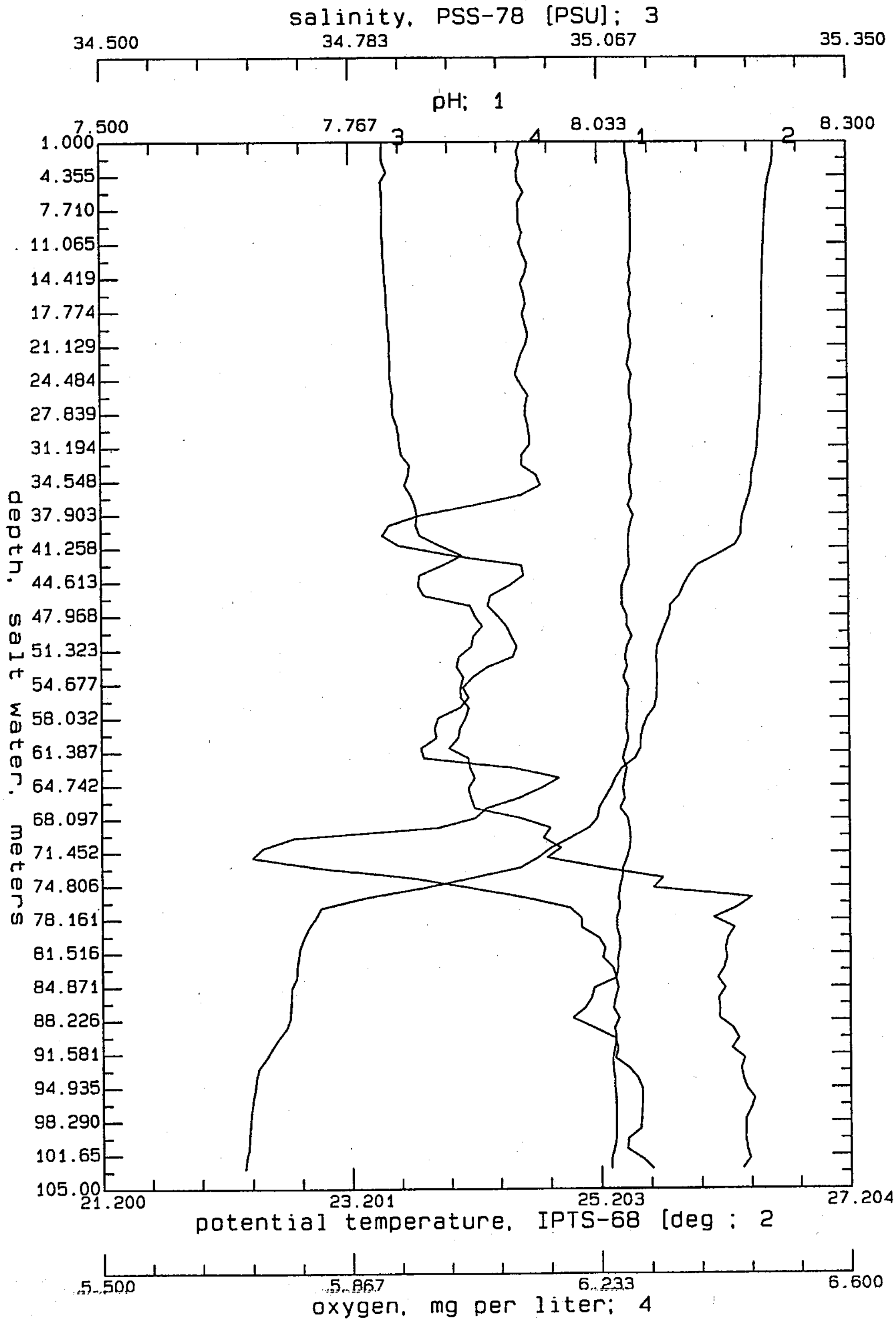
SA070211.CNV: 20July02; Station E3



SA070219.CNV: 20July02: Station E2

FIGURE II.B.6.a

CTD PROFILE - REFERENCE STATION



SA070220.CNV: 20July02; Station E1

b. Provide available data on the following in the vicinity of the current discharge location and for the modified discharge location, if different from the current discharge: 40 CFR 125.61(b)(1)]

-- Dissolved oxygen (mg/L)
-- Suspended solids (mg/L)
-- pH

--Temperature (°C)

--Salinity (ppt)

--Transparency (turbidity, percent light transmittance)

--Other significant variables (e.g., nutrients, 304(a)(1) criteria and toxic pollutants and pesticides, fecal coliform bacteria)

RESPONSE:

No applicable. The current discharge is the location is the discharge location.

c. Are there other periods when receiving water quality conditions may be more critical than the period(s) of maximum stratification? If so, describe these and other critical periods and data requested in 6.a. for the other critical period(s). [40 CFR 125.62(a)(1)].

RESPONSE:
We know of no other period or forces that would impact water quality conditions. The Mamala Bay Study studied the cause and effect associated with Kona weather events but did not find an elevated risk impacting water quality associated with this weather pattern.

7. Provide data on steady state sediment dissolved oxygen demand and dissolved oxygen demand due to resuspension of sediments in the vicinity of your current and modified discharge(s) (mg/L/day).

RESPONSE:

We do not anticipate a change and provide the follow taken from the previous permit application.

Measurements of oxygen flux in the vicinity of the Sand Island diffuser and at a control station located at a depth of 72 meters off Waikiki are reported by Dollar (Dollar 1986). In-situ measurements were made between May 15, to June 30, 1984, and March 11 to April 1, 1985. The sampling grid was parallel to the diffuser alignment extending approximately 140 meters from the end (flapgate structure) and transverse to the axis of the diffuser 70 meters in both upslope and downslope directions (the diffuser parallels the 70 meter isobath). Consequently, the data can be grouped by distance from the diffuser, and location (quadrant) depending whether a station is upslope (north), downslope (south), or parallel to the net ocean current (west). The data obtained in these sampling schemes are show below:

Average Dissolved Oxygen Flux (mmol $m^{-2}day^{-1}$)		
Sample Location	1984	1985
South	2.00	1.0
North	2.99	0.85
West	2.04	0.42
5 meters from flapgate	2.55	0.7
20 meters	2.90	No data
35 meters	2.08	No data
50 meters	2.22	No data
65 meters	2.30	No data
70 meters	No data	0.53
140 meters	No data	0.82
Note: To conert from mmol $m^{-2}day^{-1}$ to mgm^{-2}day^{-1} is 32; 2.0 mmol m^{-2} day^{-1} X 32 = 64 mg m^{-2} day^{-1}		

Average dissolved oxygen flux at the control station was 0.5 mmol m^{-2} day^{-1} in 1984 and 0.25 mmol m^{-2} day^{-1} in 1985.

The measurements by Dollar are direct measurements that "result from all sediment processes as functions of proximity to the outfalls." A calculation of a "diffusive flux enhancement" was made to indicate the extent surface metabolic activity and sediment stirring has no measured dissolved oxygen flux rate. The calculation indicated the order of magnitude of about one centimeter and is very small for he zone of mixing. The enhancement of oxygen flux in this layer is estimated to be approximately 1.2 5 mmol m^{-2} day^{-1} into the sediment. Therefore, the conclusion is that dynamic processes caused by the outfall involve only the uppermost layers of sediment and do not significantly affect the steady state sediment column oxygen demand.

C. Biological Conditions

1. **Provide a detailed description of representative biological communities (e.g., plankton, macrobenthos, demersal fish, etc.) in the vicinity of your current and modified discharge(s): within the ZID, at the ZID boundary, at other areas of potential discharge-related impact, and at reference (control) sites. Community characteristics to be described shall include (but not be limited to) species composition; abundance; dominance and diversity; spatial/temporal distribution; growth and reproduction; disease frequency; trophic structure and productivity patterns; presence of opportunistic species; bioaccumulation of toxic materials; and the occurrence of mass mortalities.**

The supporting information requested above is detailed in Appendix G which contains more extensive information on the biological conditions in Mamala Bay and the Sand Island outfall environs. The Appendix summarizes the diversity of habitats which exist and describes the various biological communities of the region. The descriptive material goes beyond that collected in the City and County of Honolulu's Ocean Monitoring Programs and includes a series of Attachments which present even more detailed data on sediment quality (Attachment G-1), historical observations of fish living near the outfall diffuser using a remotely operated video recorder (Attachment G-2), a compendium of the historical nearshore SCUBA diving biological transect survey results performed over a number of years to assess coral reef habitat, megabenthic invertebrates and fish communities (Attachment G-3), and marine infaunal benthic communities (Attachment G-4). The descriptive material includes a discussion of many species which listed as rare and endangered and seldom seen, including marine birds, mammals, and sea turtles.

The discussion on plankton summarizes some key research results which indicate that plankton are highly variable in their abundances and that wastewater discharges have little quantifiable impact on their communities.

Fish communities are summarized in terms of historical surveys and relative changes over time. The material presented supports the finding that fish communities are highly variable and that trends showed little relationship to wastewater discharge practices.

Marine birds are described in general and no specific details are available on birds which are rarely observed in offshore waters except when roosting on buoys. These species are not normally addressed in monitoring programs, but they are important in terms of their predation on fish and they serve as sentinels for bioaccumulation of some organo-chlorine contaminants in marine environments. There are no species of concern to this application.

The green sea turtle is a listed threatened species protected under the federal Endangered Species Act which may frequently be observed the study area and are found in relative high numbers in Kanehoe Bay. The biggest threat to local populations has been natural disease and commercial fishing which can entangle turtles in nets or catch them incidentally during long-line fishing. Other protected sea turtle species may visit the area, but their occurrence is rare.

Marine mammals are infrequent visitors to the outfall area, but like the birds are important components of the marine community which are not monitored. Spinner dolphin populations moving through are the most often observed marine mammal along with humpback whales and their calves in season.

Appendix G also presents information on listed threatened and endangered species which have the potential the potential to be impacted either directly or indirectly (through consumption of prey items contaminated by toxic pollutants).

Appendix H addresses bioaccumulation of toxic materials in local fish that are representative of both commercial and recreational fisheries.

Appendix I contains a detailed discussion of fish health and summarizes the findings of fish histopathology studies electively undertaken by CCH to gain a better understanding of fish health and assess if there are any signs of chronic effects from that might be related to wastewater discharge practices.

Distinctive Habitats

There are no distinct habitats of limited distribution, either within or beyond on the ZID of the Sand Island outfall. Distinctive habitats such as coral reefs do exist shoreward of the diffuser site at depths ranging from 10 to 20 meters (AECOS, Inc., 1979) with live coral coverage ranging from 0-60% with the most frequently observed value of 20% or less. The outfall pipe's armored rock form the most distinctive habitat in the area and provide habitat, holes, crevices, and attachment sites for various species. It forms a large artificial reef which increases productivity and faunal diversity.

DESCRIPTION OF BIOLOGICAL CONDITIONS

(Note that references cited here are contained in the reference listings for the application which are all contained in Section IV including the references in the Appendices)

The City and County of Honolulu's existing monitoring program is performed under the provisions of its 301(h)-modified National Pollutant Discharge Elimination System (NPDES) Permit requires the City to conduct an Ocean Monitoring Program of the Barber's Point Outfall. The present comprehensive program includes a core benthic monitoring program to characterize sediments and benthic infauna, rig-fishing to collect fish for bioaccumulation analyses, and a regional monitoring program to collect benthic and sediment samples. The hard-bottom diving survey of nearshore areas to assess the impacts on nearshore coral-reef areas was discontinued because it did not provide meaningful quantifiable data that showed any discernible impact of the outfall discharge. The City is not required to monitor plankton (nor are any other Hawaiian or west coast coastal dischargers) or make observations of marine birds, reptiles or mammals. However, information on plankton, turtles, marine birds and marine mammals has been included in this application and is summarized below and in Appendix G.

The City has conducted monitoring of the Sand Island outfall since 1986 in a consistent and routine manner using the same team of scientists with only minor changes. Most notably was the addition of Dr. Richard Swartz, a noted benthic ecologist who joined the University of Hawaii team in 1999.

PLANKTON

Plankton consist of the small drifting plants (phytoplankton) and animals (zooplankton) of the water column. Phytoplankton are responsible for most of the primary productivity in the sea. Their rate of production is driven by the rate of nitrogen input (mainly through upwelling) to the euphotic zone (Dailey, et al., 1993). Wastewater can be a major local source of nitrogen input if it reaches the euphotic zone. In the case of the Sand Island outfall, the nitrogen input contributed by the effluent is relatively minor on a regional scale (Laws, 1993)

PHYTOPLANKTON

Phytoplankton are tiny plants that are responsible for most of the photosynthetic production of organic matter in the sea and an important components of marine food chains. The abundance of phytoplankton is commonly measured by the concentration of chlorophyll *a*, a pigment found in all plants.

The City of Honolulu is not required to monitoring plankton, but does conduct water column measurements related to water clarity such as light transmittance and secchi depth and nutrients and chlorophyll a to demonstrate compliance with State of Hawaii Water Quality Standards. Analysis of such data has shown that wastewater discharge effects on light transmittance are not measurable in comparison to natural seasonal changes in coastal waters (CCH, 2003).

ZOOPLANKTON

The City is not required to monitor zooplankton. However, the known patchiness and seasonal variability of zooplankton make sampling difficult and hard to interpret.

The only reported study of zooplankton that has been done under the 301(h) program for a deep water marine discharge (69 meters deep) was undertaken by the City and County of Honolulu as part of their 301(h) application for the Sand Island Treatment Plant which serves most of the greater Honolulu area (Aecos, 1982). This one year study consisting of monthly sampling at several stations yielded inconclusive results. It showed that there was high variability and no apparent outfall influence. Further studies were not required as part of the 301(h) monitoring program, indicating the difficulty in drawing conclusions from such sampling data.

MARINE ALGAE

Dr. Isabella Aiona Abbott of the University of Hawaii at Manoa Department of Biology is the recognized expert on local algae, particularly the use of algae as food. Dr. Abbott has indicated that commercial limu or ogo is grown in aquaculture at ponds on the north end of the island. There are four species of *Gracilaria* that are grown. Two are native species, a third has been brought in from Florida, and a fourth is now entering the market.

The old name *Gracilaria bursapastoris* is now *Gracilaria parvispora.* This is the most widely used species. Other species include *G. cornipafolia* (sp?), *G. ticki* (sp?) and *G. cornia* (sp?). All are used in a finely chopped state with raw fish.

There is no commercial harvesting of ogo for the markets. It is from aquaculture because the resource was being threatened.

SHELLFISH RESOURCES

There are about 1,000 species of marine mollusks in Hawaii ranging in size from the giant triton (16 inches) to such tiny forms as *Tricolia variabilis* at 0.10 inches.

There is no harvesting of shellfish in the nearshore waters inshore of the Sand Island outfall.

CORAL REEF COMMUNITY

In a 1994 report prepared to support the renewal of the Sand Island Treatment Plant 301(h)-modified NPDES Permit, Dr. Richard Brock prepared a summary description of fish and macrobenthic invertebrate communities and addressed other biological conditions in Mamala Bay (Brock, 1994). With regard to distinctive habitats in Mamala Bay, he noted the following:

> "Among the distinctive habitats in Mamala Bay are coral reefs. However, relative to many other locations around Oahu (e.g,, Kahe Point, Ko'Olina, Hanauma Bay, Maile, Nanakuli, Makaha, etc.), coral reefs are not well-developed in Mamala Bay. Dollar (1979) found an overall mean coverage of 13.6 percent for 29 stations established through the central part of Mamala Bay. The qualitative study by AECOS, Inc, (1979a) suggests that coral cover is not particularly great at most sites examined in less than 20m depth in Mamala Bay. However, as noted by AECOS, Inc, (1979a), coral coverage may locally attain 60 to 80 percent but the

scale of this coverage is usually small, not encompassing areas greater than 200 m^2."

"At three permanently marked stations, Brock (1994a) has coral coverage estimates that range from 2 to 26 percent an a transect with an overall mean of 11 percent. Personal qualitative observations made through much of Mamala Bay since 1950 to present suggest that in the depth range from shore to the 20m isobath, mean coral coverage is about 5 to 7 percent overall (Brock, personal observations). Thus on scales greater than several hundred square meters ,coral reefs as a distinctive habitat are not well-developed in the shallow waters (less than 20m of depth) of Mamala Bay. As noted previously, below 20 m in depth much of the substratum of Mamala Bay is comprised of sand and coral rubble. Hard substratum is a necessary requisite for the settlement and growth of hermatypic (reef) corals. Since this substratum type is not a major component of the deeper areas, coral communities are not well developed in these areas. thus the hard bottom that is necessary for the growth of coral is rare or absent. "

FISH

The Sand Island outfall structure attracts large numbers of fish. In the past, observations of fish were made by biologists from a submersible (1981-1986) and more recently by viewing video footage taken of three transects along the outfall pipe (Brock, 1998). There are a lot more species seen on the outfall than are observed over the normally seen , soft bottoms of a similar depth (Russo, 1989). A listing of the fish observed over the years in the vicinity of the outfall diffuser are listed in Appendix G along with a comparable list from the nearshore diving surveys. A listing of the species in common between the offshore and nearshore areas has also been provided in Appendix G. The purpose of developing such a list is to identify those species which might move from the outfall to nearshore areas and become part of the recreational fishery which is popular at the Reef Runway.

The information on fish collected in the monitoring program does not lend itself to statistical analysis and should be considered qualitative. The only statistically significant information that can be derived is the relative number of fish per unit area surveyed as reported in the annual assessment reports (Brock, 1998).

During all the years of fish observations and catching fish for bioaccumulation, there has been no observed incidences of external signs of disease and the parasite incidence appears to be exceedingly low. There have been no instances of fin erosion or tumors observed in fish (Alvin Muranaka, CCH Oceanographic Team, personal communication).

RIG-CAUGHT FISH

Rig fishing using a hook-and-line technique is performed to catch fish near the outfall diffuser and at reference sites in Maunalua Bay for analysis to determine the bioaccumulation of toxic pollutants (See Appendix H).

This program is designed to catch fish that are more representative of hard substrate areas since trawling or other net capture techniques would not be effective at sampling fish in an area with the variable substrate that exists in the area. Two important local species of fish are analyzed [Akule (Bigeye scad) and Ta'ape (Bluestrip snapper)].

MARINE BIRDS

Marine birds are not a conspicuous and ecologically important component of the Mamala Bay coastal environment compared to areas more remote that provide a more protected nesting and feeding areas (the Northwestern Hawaiian Islands). They are highly mobile and mostly migratory, and may exhibit very high seasonal abundances. They are visual feeders, and typically consume substantial quantities of food, and forage over large areas. They may breed locally (Pearl Harbor) and have specific habitat requirements.

There are no observed instances of birds feeding in the area of the outfall (Alvin Muranaka, personal communication). There are no known species of birds on the Federal and State endangered species lists that are likely to be found in the vicinity of the outfall.

MAMMALS

The waters off the island of Oahu contains relatively few species of marine mammals (Tomich, 1986). Humpback whales, *Megaptera noveaeangliae*, of which there are about 1000 animals inhabiting the north Pacific winter in Hawaiian waters, particularly in the deeper waters off of Maui. Humpbacks have been recorded off Oahu during the months of November through April (Tomich, 1986) and have been observed by members of the City's Oceanographic Team.

The great mobility of marine mammals requires that their habitat utilization must be considered much beyond the local study area of Mamala Bay. Some cetaceans can transit the local study area in a few hours.

EXISTING BENTHIC CONDITIONS

Sampling of the benthic environment around the City's new outfall is conducted annually at fifteen stations established along three depth contours (20,50 and 100 meters) (the depth of the diffuser is around 60 meters). Samples are collected for analysis of benthic infauna, sediment grain size characteristics, and sediment chemical parameters (including concentrations of priority pollutants). A detailed discussion of benthic conditions including geochemistry and biota can be found in Appendix G.

Annual Benthic Faunal Sampling Reports are prepared by the researchers of the University of Hawaii Water Resources Research Center who conduct the studies under contract to CCH. The same contractors have performed the analyses of the benthic biota and prepared the written reports since 1986, making for a very consistent data base that lacks the biases often found when personnel are changed. There are detailed descriptions of benthic conditions and extensive supporting materials which describe the offshore benthic characteristics measured during the surveys in each of the Project Reports.

Supplementing the benthic sampling results in the past have been observations of fisheries and macroinvertebrates made based on video footage of the outfall diffuser area made using a Remote Operated Vehicle (ROV) and diving surveys of fixed transects in the shallower nearshore areas. The results of these surveys are presented in Appendix G.

REMOTE OPERATED VEHICLE (ROV) RECONNAISSANCE SURVEY

Recent ROV (using the City-owned ROV) observations made of the benthic environment offshore near the outfall have been particularly helpful in interpreting the data collected from the monitoring program. A video camera was used to examine pipe and ballast rock on the ocean outfall and diffuser and to make observations along the length of the outfall and diffuser as part of an annual inspection.

General observations are made of physical and biological features of the outfall-associated community. The hard substrate outfall structure and rock ballast is viewed and the video footage is used to qualitatively evaluate fish populations.

Invertebrates species photographed during the survey were typical of the Mamala Bay 's outer shelf habitat. A list of the survey species can be found in Appendix G.

Urchins are the dominant invertebrate found on the ballast rock of the Sand Island outfall.

Fishes observed over sand bottom are listed in Appendix G and from the nearshore diver surveys in Attachment G-4.

MARINE TURTLES

Prior to Hurricane Iniki, green sea turtles (*Chelonia mydas*) were usually seen in the vicinity of Sand Island Transect 6 (located off the Honolulu International Airport Reef Runway at depths ranging from 9.1 to 11.6 meters) (Brock, 1994a).

These turtles have not been observed in this particular area since the hurricane and Brock (1994) speculated that his is due to the loss of resting habitat as a resulting of infilling by coral rubble. However, during the September 1993 field work during transect studies in the nearshore waters, green turtles were seen in other areas (about 200 m east) of transect sites 5 and 6 near the Reef Runway (Brock, 1994a).

OUTFALL PIPE AS AN ARTIFICIAL REEF

The characteristic of the Mamala Bay coastal shelf and the lack of the relief and structure make the outfall pipe structure itself an important structure which serves an artificial reef which exerts a significant impact on the adjacent community from both physical and biological interactions. The pipe can disrupt the flow of bottom currents and increase local water movement as water flow is changed as the pipe disrupts laminar flow across the bottom producing turbulence.

The pipe attracts certain larger predatory species such as reef-associating fishes and macro-invertebrates. It is not known to what degree these interactions may, in turn, influence the adjacent sedimentary structure and benthic community composition. Prior to wastewater discharge, placement of the pipe and reef onto the BIP sand bottom community was probably enough to alter the fish community.

There are few larger sessile invertebrates that are typical of hard substrate climax communities. Corals, sponges, and other attached invertebrates are not present on the pipe or adjacent armor rock in noticeable abundance. This confirms what is known from other regions where observations have shown that the rates of recruitment decrease as a function of depth.

BENTHIC INFAUNA (See Appendix G for details)

Benthic infaunal populations are known to respond to wastewater particulates when the deposition of material and resultant flux of particulate material to the seabed results in increased organic loading of sediments (ie higher total organic carbon) (Word, 1978, Pearson & Rosenberg, 1979). Deposited effluent particulates may also introduce contaminants such as trace metals and potentially harmful organic compounds (e.g., PCBs, pesticides) if they are present in significant concentrations in the effluent (this is not the case at Honouliuli). Infauna and epifauna are dependent upon the flux of organic material (from dead or decaying marine organisms and input from the land) to the sea floor as a source of food. However, excessive depositions can result in by-products of oxidative metabolism resulting in sediments becoming anoxic in areas of excessive organic loading (i.e., higher sulfides) resulting in unacceptable conditions for survival.

The benthic biota of the sand platform and shelf offshore of Sand Island near the Sand Island outfall have been described from thirteen site-specific surveys done since 1986 which are detailed and cited in Appendix G with a summary of results presented in the 2003 Annual Report Attachment G-3 of Appendix G.

The biotic composition and species abundance patterns of the outfall environment are very similar to those described for other sandy environments throughout Mamala Bay. The dominant species components, described in detail in the Annual Assessment Reports are molluscs and polychaetes that typifies the mid- to outer-Mamala Bay shelf.

Species Richness

Species richness during the benthic surveys shows that species richness normal given the sedimentary environment (sandy). Typical species per station is in the range of 75 to 150. Detailed trends over time and at individual stations sampled are presented in Appendix G, Attachment G-3.

Abundance

Total community abundance varies considerably by sampling station depth, sediment characteristics and by other factors none of which appear to be outfall-related. Detailed trends over time and at individual stations sampled are presented in Appendix G, Attachment G-3.

Dominant Species

Dominant species are defined as those species which comprise 75% of total infauna by abundance. Higher numbers indicate an equitable distribution of species while low numbers are indicative of few species present in high numbers. Low dominance numbers typify polluted areas where opportunistic species comprise a large portion of total community abundance. Trends may be affected by natural processes of disturbance and colonization that occur regularly in the coastal zone. Monitoring has shown no outfall-related changes in dominance.

Major Taxa, Species Composition, Indicator Species

Abundances of each of the major taxa (polychaetes, crustaceans, molluscs, echinoderms and other taxa) did not differ significantly between ZID (ZOM) stations and farfield sites (See Appendix G for details). Molluscs and polychaetes were the dominant group of organisms, a situation that typifies natural benthic communities of coastal sediments throughout the world (Knox, 1977). The relative proportions of the major taxa were representative of coastal benthic communities in Hawaii. Dominant species in the diffuser region were typical members of benthic communities of the outer shelf.

Polychaetes

Differences in polychaete densities were not statistically significant between diffuser and beyond-diffuser stations and reference sites. Time series plots and comparisons between stations are presented in Attachment G (Attachment G-3) along with detailed lists of species identified at the various sampling stations.

Species of capitellid polychaetes (considered to be "pollution-tolerant" or opportunistic many of which are found in high numbers in organically enriched environments, were low in abundance during the surveys, even in the outfall diffuser region. Few *Capitella capitata,* (a small surface deposit feeding species that has a short generation time and, following colonization, can rapidly expand its numbers in areas of rich organic loading) or other indicators of organic enrichment have been found.

Crustaceans

Amphipods and ostracods were the major crustacean community components in the ZID study and in monitoring. These crustaceans brood their young, can be motile, with many species are sensitive to organic flux and sediment chemistry redox conditions.

There has been no evidence that these stress-sensitive species have been negatively impacted by proximity to the outfall. There were not differences between near- and -beyond diffuser stations in the abundance or species richness of crustaceans (See Attachment G-3 for details).

Molluscs

Molluscs have been shown to have abundance and diverse populations in the region of the outfall diffuser. In 2002, fifty five new taxa were found for the first time in the survey work. There have been no significant differences over time in abundance or species diversity related to proximity to the outfall. Spatial patterns appear to be depth-related. There has been no indication over the fourteen years of study the mollusk species richness is being adversely affected by the Sand Island discharge.

Echinoderms

There are few echinoderms living in the sediments in the offshore waters of Mamala Bay. Abundance is very patchy and can range from a couple to as many a 50 animals per sample. Most samples have only one or two representative species. Such conditions are typical for Hawaiian offshore waters.

Characterization of Sand Island Sediments

Appendix G, Attachment G-1 contains a detailed assessment and discussion of sediment quality as measured by the monitoring program. Comparisons with other sediment sampling efforts in and around Mamala Bay are made to put what is known about sampling data in perspective. The analysis shows that sediment contaminant levels are low and that the outfall discharge is not contributing to any increase in sediment loads that could be detrimental to the marine community. There is a lack or organic enrichment and little increase over background of sediment metals. Trace organic compounds are detectable at times, but there does not appear to be any association with the effluent based on the particular constituents measured in the effluent compared to what has been detected in sediments. Other influences such as dredge disposal may be having effects on sediment quality in the Bay and impact benthic biota. Nearshore sediments have been shown to have much higher concentrations of some constituents and there have been "hot spots" for sediment contamination found during regional sampling efforts. However, overall, sediment quality in Mamala Bay is not indicative of any outfall-related impact.

2. a. Are distinctive habitats of limited distribution (such as kelp beds or coral reefs) located in areas potentially affected by the modified discharge? [40 CFR 125.62(c)]

b. If yes, provide information on type, extent, and location of habitats.

Benthic Environment

Over fifteen years of benthic sampling near the Sand Island ocean outfall has revealed no "distinctive habitat of limited distribution" for the soft-bottom macrobenthic community or for the historically performed nearshore diving surveys of transects adjoining the shoreline adjacent to the outfall. Additional benthic sampling and nearshore diving surveys on the south shore of Oahu in the vicinity of the Barbers Point ocean outfall has found benthic and nearshore community characteristics to be similar to those found near the Sand Island outfall. Thus the offshore and nearshore communities near the outfall appear to be widely distributed and typical for both the offshore and nearshore regions of the south coast of Oahu.

The only distinctive habitats of note is the local patches of coral reef located shoreward of the Sand Island discharge and the estuarine waters of Pearl Harbor which were well described in the 1994 application and are described below. The only noteworthy change is the fact that it appears that the percentage of coral coverage in the nearshore is slowly increasing as noted in the 1998, Year 9 nearshore transect survey report for transects 2,4 and 5 (Brock, 1998), which is detailed in Appendix G.

Coral Reefs

There are distinctive habitats in the form of coral reefs located shoreward of the Sand Island discharge. A second distinctive habitat type is the large estuary located in Pearl Harbor, the mouth of which empties into Mamala Bay.

Distinctive aquatic habitats are often of limited distribution and may include marine environments whose protection is of special concern because of their ecological significance. Among the distinctive habitats in Mamala Bay are coral reefs. However, relative to many other locations around Oahu (e.g., Kahe Point, Ko'Olina, Hanauma Bay, Maile, Nanakuli, Makaha, etc.), coral reefs are not well-developed in Mamala Bay. Dollar (1979) found an overall mean coverage of 13.6 percent for 29 stations established through the central part of Mamala Bay. The qualitative study by AECOS, Inc. (1979a) suggests that coral cover is not particularly great at most sites examined in less than 20m depth in Mamala Bay. However, as noted by AECOS, Inc. (1979a), coral coverage may locally attain 60 to 80 percent but the scale of this coverage is usually small, not encompassing areas greater than $200m^2$. At three permanently marked stations, Brock (1994) has coral coverage estimates that range from 2 to 26 percent on a transect with an overall mean of 11 percent. Personal qualitative observations made through much of Mamala Bay since 1950 to present suggest that in the depth range from shore to the 20m isobath, mean coral coverage is about 5 to 7 percent overall (Brock, personal observations). Thus on scales greater than several hundred square meters, coral reefs as a distinctive habitat type are not well-developed in the shallow waters (less than 20m of depth) of Mamala Bay. As noted previously, below 20m in depth much of the substratum of Mamala Bay is comprised of sand and coral rubble. Hard substratum is a necessary requisite for the settlement and growth of hermatypic (reef) corals. Since this substratum type is not a major component of the deeper areas, coral communities are not well developed in these areas, thus the hard bottom that is necessary for the growth of coral is rare or absent.

Perhaps one of the most unique aquatic habitats of Mamala Bay is the Pearl Harbor estuary system. Pearl Harbor has a water surface area of more than $21km^2$ and at one time accommodated more than 50 Hawaiian fish ponds (AECOS 1979a). Parts of the harbor have been heavily modified by the military, but wetland habitat is still present particularly in Middle and West Lochs. Freshwater input to the harbor is high, ranging from 50 MGD during the dry season to 100 MGD during the wet season (Cox and Gordon 1970). This large volume of freshwater creates an estuarine environment in the landward portions of the harbor that is one of the largest such areas in the state of Hawaii.

The most complete study of the aquatic resources of Pearl Harbor was completed by Evans (1974). Particularly important from the standpoint of distinctive habitats, is the fact that the estuarine portions of Pearl Harbor are an important nursery area for many commercially important fish species including striped mullet or ama'ama *(Mugil cephalus),* a number of jacks or ulua (family Carangidae) as well as the baitfish or nehu *(Stolephorus purpureus).* Pearl Harbor is a primary source of this baitfish which is used by and is the mainstay of the pole-and-line fishery for skipjack tuna (Uchida 1966). Some of the estuarine areas serve as important waterbird habitat for some of Hawaii's listed threatened and endangered species which rely on wetlands and freshwater habitat.

Since Pearl Harbor has a narrow and restricted entrance to Mamala Bay which is located about 7.2km from the Sand Island deep ocean outfall and has wastewater inputs near its mouth from the Fort Kamahamaha WWTP , the biota of Pearl Harbor will not be considered further in this application except where linkages are important (such as dredge disposal and its effects on sediment quality).

3. a. Are commercial or recreational fisheries located in areas potentially affected by the discharge? [40 CFR 125.62 (c) and (d)]

b. If yes, provide information on types, location, and value of fisheries.

Most of the state's population is concentrated on Oahu (roughly 72% of the state's 1.2 million) population resides there and it supports the main commercial fishing fleet. The wider coastal shelf on Oahu supports a wide ranging fishery locally that employs hand lining, spearing and trapping for bottomfish. The state's two largest embayments, Pearl Harbor and Kaneohe Bay on Oahu account for more than 80% of the state's estuarine habitat. Pelagic fisheries are more prevalent on the drier leeward (western) coast where the Sand Island outfall is located.

Commercial Fishing

Since 1948 the Hawaii State Division of Aquatic Resources has required the licensing of commercial fishermen along with a monthly reporting of catches made. The reporting requires the inclusion of amount of each species caught, the area (statistical square) in which those catches were made, and (3) the value of the catch that was sold. There are numerous well-known shortcomings with the reporting system; among these are (1) the under reporting of catches, (2) the assignment of catches made in one statistical square to another and the fact that the system is only in place for Hawaii's 3,970 commercial fishermen and does not include any of the catch from Hawaii's recreational fishermen. Despite these shortcomings, these commercial fishery landings are the only long term data set available for Hawaii's fisheries. The most recent data is added to the historical data and reported in the CCH's Annual Assessment Report for the Sand Island WWTP.

The Hawaiian commercial fishery may be conveniently divided into three ecologically distinct, categories; these are the high-seas pelagic fishery which targets highly migratory species such as tunas and billfish, the deep bottom fish fishery which focuses on a complex of snapper species that reside at depths from 50 to 150 fathoms (90 to 270 m) and the inshore fishery which is the fishery of our coral reefs. The pelagic fishery is carried out by trolling, live bait (i.e., skipjack pole-and-line) and longline methods and occurs primarily in oceanic settings well away from land (usually outside of 2 miles from shore and as much as 1,500 miles from shore). The bottom fish fishery takes place around steep submarine drop-offs often associated with offshore banks (such as Penguin Bank offshore of Molokai) using baited handlines and the inshore or coral reef fishery targets more than 100 species from Hawaii's reefs using a variety of capture methods.

Inshore Fishery

Inshore fisheries are diverse in terms of the gear and methods used and the species captured. The Hawaii State Division of Aquatic Resources has developed a map of statistical squares in which catches are reported. There are ten squares to cover the inshore waters of Oahu. Statistical square 400 encompasses the area from Diamond Head on the east along the shore in a westerly direction to approximately midway along the Honolulu International Airport Reef Runway and extending 3.2 km (2 miles) offshore. The water surface area is about 43 km^2 (excluding Pearl Harbor) and within this area includes the Sand Island discharge.

As seen in Table IIC.3.1 commercial fisheries landed 23,536,443 lbs. in 2000 worth $59.2 million (DNR, 2003). Note that the bulk of these landings were from offshore waters from federally managed fisheries that are not covered by this permit application. This includes the largest fishery, pelagic longlining (15.9 million pounds worth $42.6 million), which has also been the subject of a recent ESA Section 7 consultation resulting in a Biological Opinion setting terms and conditions for the conduct of this fishery in order to reduce sea turtle take. These restrictions have contributed to a drop in landings of swordfish for the years 2001 and 2002 (Brooks Takanaka, United Fishing Agency, personal communication). Additionally, the deepwater handline fishery in the North West Hawaiian Islands, which represents a large proportion of the "deepbottom handline" fishery. These are two of the twelve listed fishing methods used on commercial catch report forms (there are 12 line fishing methods, 11 net methods, five types of traps, and three categories of commercial marine organism collection by divers).

The 2001 (latest compilation) total reported catch from statistical square 400 amounts to 3,972 kg with a value of $18,000. A major part of the catch was comprised of two coastal pelagic species, the mackerel scad or opelu *(Decapterus macarellus)* and the big-eye scad or akule *(Selar crumenophthalmus)*, 40 percent was made up of other inshore species and only 18 percent was pelagic or bottomfish species. The two coastal pelagic species are schooling forms that are not tied to any one reef or reef area but travel in the neritic zone around the islands. Most of the commercial catches of akule are made by use of a "spotter" aircraft that locates schools of fish that are subsequently captured by use of surround nets. Hawaii's commercial akule fishery is among the best in the state and presently sustainable (Kushima and Miyasaka, 2001). Commercial akule fishermen use several types of gear. These are 1) hook and line, 2) surround gill net, and 3) purse seine or bag net.

COMMERCIAL FISH CATCH ANNUAL ASSESSMENT

The NPDES permit requires that fish catch statistics be reviewed annually in order to assess changes in fish abundance and distribution in the vicinity of the outfall. The information used in this section is from Hawaii Department of Land and Natural Resources (DLNR), Division of Aquatic Resources (DAR), which maintains statistics on commercial fishing catch records based on questionnaires returned to DAR by fishing vessel captains.

As shown in Figure II.C.3-1, the Sand Island Outfall is located in catchment area 400 (CA-400). Outfalls under the jurisdiction of the City and County of Honolulu are also located in catchment areas 401,403,407 and 408. Catchment areas 402 (CA-402) and 409 (CA-409), due to the absence of outfalls within their boundaries, have been used as control areas to compare fish takes of species naturally plentiful in Oahu waters. Area 409 has been used as the site from which control fish are taken for fish tissue priority pollutant analysis. The annual reports each year review these catch records and present graphical presentations of the total reported catch in CA-400, CA-402 and CA-409 including pelagic, coastal/pelagic, reef, benthic and other fish species since records are available starting in 1970 through the current year of available data. Currently this data spans a 33 year period through 2002. Pelagic species, which include tuna and marlin, are generally found far offshore, while coastal/pelagic fish, such as snapper, are located mid-range offshore. Reef species, such as scad, are associated with coral reefs; benthic fish include such species as the goatfish. Areas 400, 402, 409 and the total inshore catch for Oahu and the state wide inshore and offshore fish catches are compared statistically with the past permit period (1998 through 2002) in Table II.C-1.

Pelagic and Coastal/Pelagic

The catch of Pelagic species in the inshore areas examined is less than five percent of the catch in areas 400 and 409, but 12.8 percent in CA-402 where deep water comes much closer to shore. The catch in area 402 was dominated by coastal varieties at 55 percent. The catch in areas 400 and 409 were 31 and 16 percent respectively for coastal varieties.

Reef and Benthic

The percentage catch of reef and benthic species varies with the habitat in each area and with the total catch. In 2001 the low total catch in area 409 resulted in reef species dominating with 46 percent of the catch, despite the limited reef structure in the area. Benthic species made up most of the rest of the catch in CA-409 at 33 percent. In Area the distribution was more even with reef and benthic species making up 38 and 28 percent of the catch respectively. In Area CA-402 the percentages were 23 and 9 percent. Areas 400 and 409 have poorly developed reef structure due the lack of local vertical relief and subsequent reef destruction by sand scour. The outfall in area 400 is a significant portion of the total relief in the area. The fish catch in area 402 may be enhanced slightly by the artificial reef established in the southern part of area 403. In years when the total catch is small the percentage of Benthic species tends to increase significantly, as appears to be the case in area 409.

Other Species

Other species are generally a low percentage of the catch except historically when the catch was unusually large when they have amounted to a high of over 50 percent of the catch in CA-400 and up to 15 percent of the catch in CA-409. In recent years such species have only been significant in years when the total fish catch was high. This category has generally amounted to less than 10 percent of the catch and in CA-402 less than five percent of the catch. It is noted that since 1983 none of the three areas have reported significant catches of 'other' species. This may indicate improved identification of species, better record keeping and/or better reporting.

General

The Sand Island Outfall, near the center of CA-400 is an area well known and often frequented by sport and commercial fishermen. Area 400 is centered on the most heavily populated area in Hawaii and has the greatest boat traffic of any stretch of coast in the state. Being close to three major marinas it is heavily fished by sport fishermen. Fish caught by sport fishermen are not included in the fish catch statistics. In the early 70's, when raw sewage was being discharged into shallow waters near Sand Island, the commercial catch in area CA-400 was much higher than at present. However, after 1976 when the wastewater discharge was changed to deep water much further off shore and fishing pressure increased, the area was apparently over fished and yields fell to very low levels. Fishermen had to travel farther for a profitable catch. With decreased fishing pressure~ fish catches increased moderately in the late 80's. Area 400 generally yields a commercial catch approaching CA-402 and significantly greater than CA-409, neither of which have outfalls. In 2001 the catch in CA-400 was more than double that in CA-409 and over 60 percent that in CA-402.

The outfall attracts and supports a reasonably constant standing crop of fish, which contributes to its popularity among sport fishermen. Another factor that may be contributing to the relatively abundant fish catch in area 400 is the presence of Pearl Harbor, which due to restrictions on access by the military, is lightly fished and may be providing a reservoir of fish for nearby coastal waters. The outfall, with a discharge of over 25 metric tons of nutrients a day would appear to be an important food source for fish growth in this part of Mamala Bay. The Sand Island outfall discharges at a depth 225 to 240 feet, approximately 9,000 feet from shore. Fish from the outfall and from the Maunalua Bay reference stations were tested for priority pollutants in the fish flesh. The results are presented Appendix H.

Recreational Fishing Information

Unlike commercial fishing, which requires a license, Hawaii does not have does not have a recreational marine license requirement, so it is difficult to determine how many recreational fishermen are actually out there. Most of the nearshore fisheries are mainly recreational and the State does not have a mandatory reporting program for recreational (or subsistence) fishing as it does for commercial fishing. There is no information on how many fishermen using various kinds of fishing gear are involved, how often they go fishing, or how often they interact with sea turtles, and what the results of the interactions are is not known. Information for most popular inshore fishing styles such as gillnetting, ulua slide-baiting, dunking, whipping, casting, lobster nets, trolling, and shallow bottomfishing are simply not available. However, there was a recent that helped provide some information on recreational fishing.

Recreational Fishing

In a review of statewide recreational fishing, Smith (1993) divides the state into four "complexes": Kauai, Oahu, Maui, and Hawaii (the "Big Island"). On Kauai the southwestern coast supports more reef and coastal pelagic fisheries.

Recreational fishers in Hawaii, fishing in both salt and fresh water, spent $130 million in 1996, the last time such economic information was collected (U.S. Fish and Wildlife Service estimate)(NOAA, 2001).

The most recent, comprehensive survey of recreational fishing in Hawaii estimated that 260,000 saltwater anglers spend a total of cumulative 3,100,000 days of fishing in 1996 (USFWS et al.1998). (Of this total, 130,000 anglers were state residents who spent 2,600,000 days fishing, or 85% of total fishing effort.) Recreational fishermen fish throughout the main islands in the southeastern part of the archipelago in all seasons and times of day. Most inshore fishing is from the shoreline and boats using hook-and-line, nets, spears, and traps and occurs within the 100 fm isobath; due to the steep bathymetric relief in the Hawaiian Islands, this is mostly within state waters.

The akule (*Selar crumenophthalmus*) or Big-eye Scad is a popular food fish that belongs to the Family Carangidae (Jacks). This family consists of more than 25 species in Hawaii and includes the papio, ulua, and opelu. Juvenile of the species (fish less than 8.5 inches) are commonly known as hahalalu. Akule have been recorded growing to a maximum length of approximately 11 inches and inhabit the waters from shore out to about the 500-foot depth. Annual the appearance of juvenile akule or hahalalu during "hahalalu season" triggers a noticeable increase in recreational fishing by shoreline fishermen because of the thrill of the catch akule provide and their good eating qualities. This is why it is one of the target species for bioaccumulation studies (See Appendix H).

A summary listing of the species of fish found near the outfall that are of recreational or commercial importance is identified in Table II.C.3-2.

Table IIC.3 A.1 Summary Statistics of Historical Commercial Fish Landings

Pounds, 1970-2002 Annual Statistics				Area	Pounds, 1998-2002 Annual Statistics			
Mean	Median	Minimum	Maximum	Fishery Type	Mean	Median	Minimum	Maximum
				400				
1,244	333	31	11,326	PELAGIC	767	412	197	2,404
2,347	1,163	68	13,111	BENTHIC	4,527	3,743	1,329	9,237
19,148	13,123	152	98,827	COASTAL/PEL.	18,222	21,595	4,586	28,078
12,578	9,957	438	61,399	REEF	6,782	5,111	2,566	13,067
14,454	2,944	0	97,728	OTHER	38	0	0	99
50,872	36,111	5,645	208,987	TOTAL	30,336	35,865	8,740	47,082
				401				
1,153	198	11	11,311	PELAGIC	616	195	141	2,272
1,617	595	26	12,782	BENTHIC	1,449	1,491	125	3,700
18,434	14,050	747	97,033	COASTAL/PEL.	17,364	20,670	4,550	26,586
12,718	9,811	348	60,391	REEF	5,971	4,290	2,041	11,410
16,998	2,649	0	97,599	OTHER	28	0	0	96
50,919	34,072	3,523	205,842	TOTAL	25,428	29,870	7,306	40,388
				402				
1,115	386	22	7,307	PELAGIC	1,182	386	330	4,214
1,525	710	35	11,527	BENTHIC	1,953	1,919	376	4,667
24,113	19,962	2,387	68,519	COASTAL/PEL.	31,346	33,987	11,906	45,458
13,005	11,847	726	38,926	REEF	13,019	9,138	5,197	23,959
10,616	6,013	0	35,625	OTHER	12	0	0	40
50,374	49,107	9,609	111,854	TOTAL	47,512	55,738	18,009	68,798
				409				
1,555	881	50	11,062	PELAGIC	1,423	1,547	936	1,819
3,121	1,989	490	12,866	BENTHIC	3,089	3,627	1,982	3,954
45,854	41,708	2,737	101,163	COASTAL/PEL.	54,877	41,067	19,312	95,976
~~16,000~~	~~14,981~~	~~6,814~~	~~45,657~~	~~REEF~~	~~13,548~~	~~14,655~~	~~7,657~~	~~16,442~~
3,979	4,149	0	10,381	OTHER	121	151	0	230
70,509	69,518	16,897	132,403	TOTAL	73,058	63,263	38,978	113,896

				Oahu inshore				
33,062	23,631	4,726	160,819	PELAGIC	39,649	39,710	28,860	52,832
27,677	25,362	8,087	55,260	BENTHIC	41,396	43,378	25,362	55,260
232,729	208,701	53,249	544,734	COASTAL/PEL.	303,233	328,136	104,136	465,736
138,706	144,793	70,807	228,572	REEF	178,630	166,434	144,793	228,572
49,837	36,439	231	151,835	OTHER	1,529	618	231	5,395
482,011	458,178	216,895	863,324	TOTAL	564,437	576,261	303,541	787,142

				Oahu Offshore				
2,731,139	2,355,353	799,599	7,106,515	PELAGIC	1,117,759	1,100,142	799,599	1,553,664
34,221	27,466	3,880	110,710	BENTHIC	20,573	17,565	12,150	28,597
26,906	22,602	0	112,306	COASTAL/PEL.	5,186	6,047	1,276	8,613
17,291	4,903	1,009	96,529	REEF	2,066	1,804	1,009	4,098
15,003	9,328	209	62,716	OTHER	9,532	1,217	209	44,184
2,824,560	2,444,036	836,057	7,176,859	TOTAL	1,155,116	1,133,718	836,057	1,574,731
				State Inshore Total				
279,992	276,315	75,235	545,585	PELAGIC	474,207	499,359	327,968	545,585
108,787	104,456	45,834	181,511	BENTHIC	129,432	133,579	91,585	170,670
775,962	766,477	247,806	1,664,699	COASTAL/PEL.	1,027,492	897,533	517,636	1,664,699
285,558	289,880	152,664	434,140	REEF	330,473	313,869	263,362	434,140
95,392	93,607	757	219,754	OTHER	27,877	3,587	757	104,741
1,545,691	1,605,121	804,250	2,853,847	TOTAL	1,989,482	1,899,979	1,201,604	2,853,847
				State Offshore Total				
6,341,137	6,149,662	2,566,185	11,994,048	PELAGIC	3,587,439	4,057,845	2,566,185	4,394,638
372,539	324,385	130,647	869,864	BENTHIC	207,066	197,928	130,647	267,689
148,759	117,666	951	942,917	COASTAL/PEL.	40,502	34,030	16,122	95,286
74,711	57,352	13,637	182,438	REEF	28,048	23,861	13,637	49,096
73,210	49,754	5,812	292,828	OTHER	49,621	10,981	5,812	191,331
7,010,355	6,951,199	2,750,311	12,468,365	TOTAL	3,912,675	4,358,710	2,750,311	4,642,952

Table II.C-2
Fish Observed Near the Sand Island Outfall
(all listed species observed offshore and inshore)
and Listed as Being of Commercial Importance and Reportable to the Divison of Aquatic Resources by Licensed Commercial Fisherman
(shown by *)

Scientific Name	Common Name	Hawaiian Name	FAMILY
Ctenochaetus strigosus*	Goldring Surgeonfish	Kole	Acanthuridae
*Naso unicornis**	Bluespine Unicornfish	Kala	Acanthuridae
*Acanthurus xanthopterus**	Yellowfin Surgeonfish	Pualu	Acanthuridae
Naso lituratus	Orangespine Unicornfish	Umaumalei	Acanthuridae
Naso brevirostris	Spotted Unicornfish	Kala lolo	Acanthuridae
*Naso hexacanthus**	Sleek Unicornfish	Opelu lolo	Acanthuridae
Zanclus cornatus	Moorish Idol	Kihikihi	Acanthuridae
Acanthurus dussumieri	Eye-strip Surgeonfish	Palani	Acanthuridae
Acanthurus nigrofuscus	Brown Surgeonfish	Ma'i'i'i	Acanthuridae
Zebrasoma flavescens	Yellow Tang	Lau'i-pala	Acanthuridae
Acanthurid sp.			Acanthuridae
*Acanthurus olivaceous**	Orangeband Surgeonfish	Na'ena'e	Acanthuridae
*Acanthurus triostegus**	Convict Tang	Manini	Acanthuridae
*Acanthurus nigroris**	Bluelined Surgeonfish	Maiko	Acanthuridae
Apogon kallopterus	Irridescent Poacher	Upapalu	Apogonidae
*Aulostomus chinensis**	Trumpetfish	Nunu	Aulostomidae
Rhineacanthus aculeatus	Blackbarred Triggerfish		Balistidae
Melichthys niger	Black Durgon	Humuhumu-'ele'el	Balistidae
Sufflamen bursa	Lei Triggerfish	Humuhumu lei	Balistidae
Sufflamen fraenatus	Bridled Triggerfish	Humuhumu-mimi	Balistidae
Melichthys vidua	Pinktail Durgon	Humuhumu-hi'u-k	Balistidae
Plagiostremus ewaensis	Ewa Blenny		Blenniidae
Cirripectus variolosus			Blenniidae
Exallis brevis	Shortbellied Blenny	Pao'o	Blenniidae
Caranx melamypgus	Blue Crevally	Omilu,hosi ulua	Carangidae
Chaetodon ornatissimus	Ornate Butterflyfish	Kikakapu	Chaetodontidae
Forcipiger flavissimus	Forcepsfish	Lau-wiliwili-nukun	Chaetodontidae
Chaetodon miliaris	Milletseed Butterflyfish	Lau-wiliwili	Chaetodontidae
Chaetodon multicinctus	Multiband Butterflyfish	Kikakapu	Chaetodontidae
Chaetodon quadrimaculatus	Fourspot Butterflyfish	Lau-hau	Chaetodontidae
Heniochus diphreutes	Pennant Fish		Chaetodontidae
Heniochus diphreutes	Bannerfish		Chaetodontidae
~~*Chaetodon sp.*~~	~~Butterflyfish~~	~~Kikakapu~~	~~Chaetodontidae~~
Chaetodon unimaculatus	Teardrop Butterflyfish	Lau-hau	Chaetodontidae
Chaetodon ephippium	Saddled Butterflyfish		Chaetodontidae
Chaetodon keinii	Blacklip Butterflyfish	Kikakapu	Chaetodontidae

Paracirrhitus arcatus	Arc-eye Hawkfish	Pili-ko'a	Cirrhitidae
Cirrhitops fasciatus	Redbar Hawkfish	Pili-ko'a	Cirrhitidae
Cirrhitus pinnulatus	Hawkfish		Cirrhitidae
Psilogobius mainlandi	Mainland Goby		Gobiidae

Table II.C-2

Fish Observed Near the Sand Island Outfall (all listed species observed offshore and inshore) and Listed as Being of Commercial Importance and Reportable to the Divison of Aquatic Resources by Licensed Commercial Fisherman

(shown by *)

(conitnue)

Scientific Name	Common Name	Hawaiian Name	FAMILY
Ptereleotris heteropterus			Gobiidae
Anampses chrysosephalus	Psychedelic Wrasse	-	Labridae
Macropharyngodon geoffroy	Shortnose Wrasse	-	Labridae
Coris venusta	Elegant Coris		Labridae
Stethojulis balteata	Belted Wrasse	Omaka	Labridae
Thalassoma duperreyi	Saddle Wrasse	Hinalea lau-wili	Labridae
Halichoeres ornatissimus	Wrasse	Ohua	Labridae
*Thalassoma sp.**	Wrasse	Hinalea	Labridae
Halichoeres ornatissimus	Wrasse	Ohua	Labridae
Gomphosus varius	Bird Wrasse	Aki-lolo,	Labridae
Bodianus bilunulatus	Hawaiian Hogfish	A'awa	Labridae
Labroides phthirophagus	Hawaiian Cleaner Wrasse	-	Labridae
Labridae (unid)	Wrasse		Labridae
Pseudojuloides sp.	Wrasse	-	Labridae
Cheilinus bimaculatus	Twospot Wrasse	-	Labridae
Coris gaimard	Yellowtail Coris	Hinalea-'aki-lolo	Labridae
Pseudocheilinus octotaenia	Eightline Wrasse	-	Labridae
Pseudojuloides cerasinus	Smalltail Wrasse	-	Labridae
Pseudocheilinus tetrataenia	Fourline Wrasse	-	Labridae
Monotaxis grandoculis	Bigeye Emperor	Mu	Lethrinidae
Aprion virescens	Gray Snapper	Uku	Lutjanidae
Lutjanus fulvus	Snapper		Lutjanidae
*Lutjanus kasmira**	Bluestripe Snapper	Ta'ape	Lutjanidae
Cantherhines dumerili	Barred Filefish	O'ili	Monacanthidae
Cantherhines sandwichiensis	Squaretail Filefish	O'ili-lepa	Monacanthidae
Cantherhines dumerili	Barred Filefish	O'ili	Monacanthidae
Pervagor spilasoma	Fantail Filefish	O'ili-'uwi'uwi	Monacanthidae
Pervagor melanocephalus	Blackheaded Filefish	O'ili-'uwi'uwimona	Monacanthidae
Alutera scripta			Monocanthidae
*Mulloidichthys flavolineatus**	Yellowstripe Goatfish	Weke	Mullidae
*Mulloides vanicolensis**	Yellowfin Goatfish	Weke'ula	Mullidae
*Parupeneus multifasciatus**	Manybar Goatfish	Moano	Mullidae
*Parupeneus pleurostigma**	Sidespot Goatfish	Malu	Mullidae
Gymnothorax flavimarginatus	Yellowmargin Moray	Puhi-paka	Muraenidae
Gymnothorax meleagris	Black Moray	Puhi-paka	Muraenidae
Gymnomuraena zebra	Zebra Moray	Puhi-paka	Muraenidae
Gymnothorax eurostus	Brown Moray	Puhi-paka	Muraenidae
Gymnothorax undulus	Moray	Puhi-paka	Muraenidae
Gymnothorax undulatus	Undulating Moray	Puhi-paka	Muraenidae

Gymnothorax sp.	Moray	Puhi-paka	Muraenidae
Ostracion whitleyi	Trunkfish	Moa	Ostraciidae

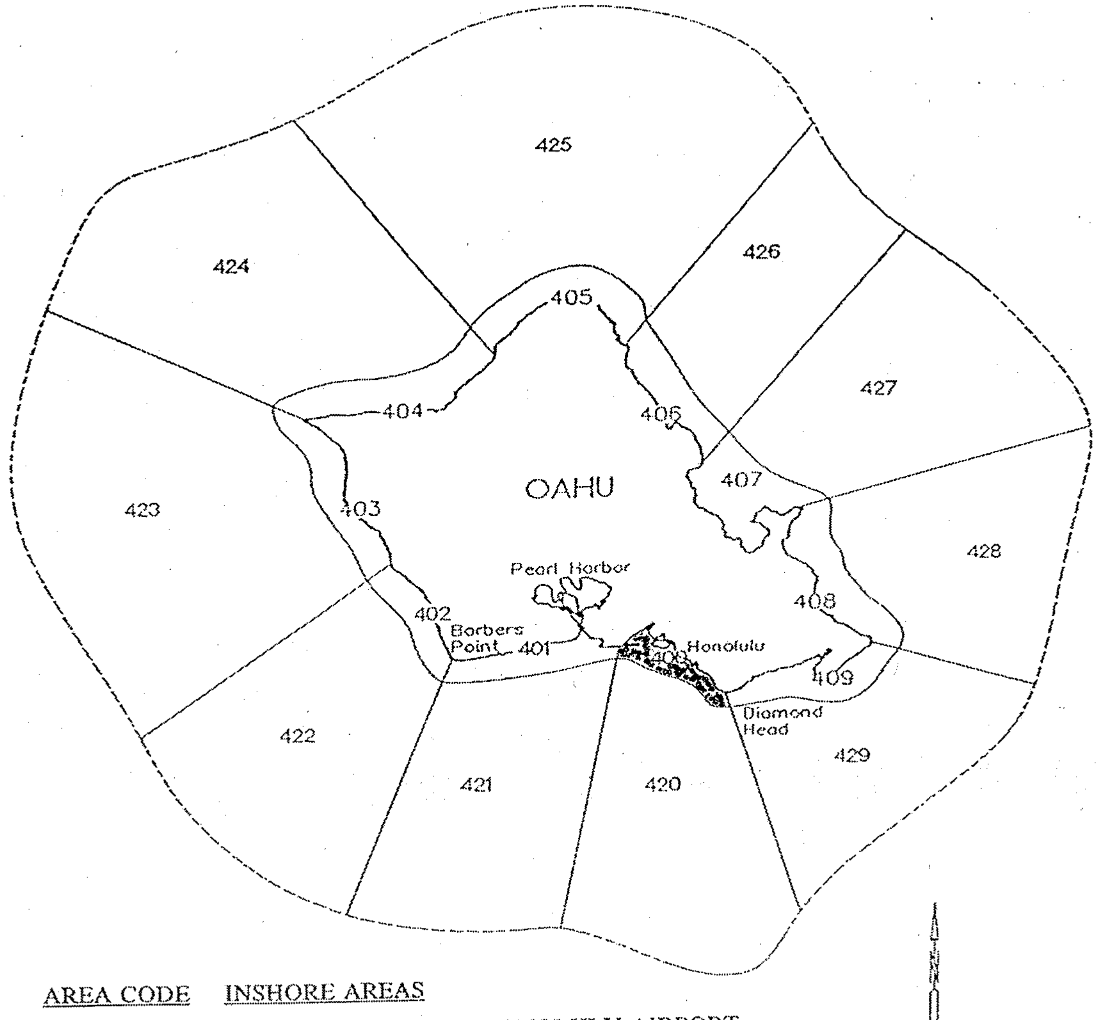
Table II.C-2

Fish Observed Near the Sand Island Outfall (all listed species observed offshore and inshore) and Listed as Being of Commercial Importance and Reportable to the Divison of Aquatic Resources by Licensed Commercial Fisherman

(shown by *)

(conitnue)

Scientific Name	Common Name	Hawaiian Name	FAMILY
Centropyge sp.	Angelfish		Pomacanthidae
Centropyge potteri	Potter's Angelfish	-	Pomacanthidae
Holacanthus arcuatus	Bandit Angelfish	-	Pomacanthidae
Centropyge fisheri	Fisher's Angelfish	-	Pomacanthidae
Plectroglyphidodon johnstonianus	Johnston Island Damselfish		Pomacentridae
Plectroglyphidodon imparipennis	Blue-eye Damselfish		Pomacentridae
Stegastes fasciolatus	Pacific Gregory		Pomacentridae
Pomacentrid sp.	Damselfish		Pomacentridae
Abudefduf abdominalis	Hawaiian Sergeant	Mamo	Pomacentridae
Chromis vanderbilti	Blackfin Chromis	-	Pomacentridae
Chromis sp.	Chromis		Pomacentridae
Dascyllus albisella	Hawaiian Dascyllus	Alo'ilo'i	Pomacentridae
Chromis verator	Threespot Chromis	-	Pomacentridae
Chromis hanui	Chocolate-dip Chromis	-	Pomacentridae
Chromis agilis	Agile Chromis	-	Pomacentridae
Chromis ovalis	Oval Chromis	-	Pomacentridae
Priacanthus cruentatus	Bigeye	Aweoweo	Priacanthidae
Scarus rubrioviolaceus	Redlip Parrotfish	Palukaluka	Scaridae
Scarus psittacus	Palenose Parrotfish	Uhu	Scaridae
Scarus perspicillatus	Speckled Parrotfish	Uhu'ahu'ula,uhu-uli	Scaridae
Calotomus carolinus	Stareye Parrotfish	Ponuhunuhu	Scaridae
Scarus sordidus	Bullethead Parrotfish	Uhu	Scaridae
*Scorpaenopsis cacopsis**	Scorpionfish	Nohu	Scorpaenidae
Pseudanthias sp.			Serranidae
Pseudanthias thompsoni			Serranidae
Cephalopholis argus	Bluespot Grouper		Serranidae
Saurida variegatus	Lizardfish	Ulae	Synodontidae
Arothron sp.		Keke	Tetraodontidae
Arothron hispidus	Stripebelly Puffer	Keke	Tetraodontidae
Arothron hispidus	Stripebelly Puffer	Keke	Tetraodontidae
Arothron melaegris	Puffer	Keke	Tetraodontidae
Canthigaster jactator	Hawaiian Whitespotted Puffer	Keke	Tetraodontidae
Canthigaster coronata	Crown Toby	Pu'u oloa	Tetraodontidae
Canthigaster rivulata	Maze Toby		Tetraodontidae
Canthigaster cinctus	Toby	Pu'u	Tetraodontidae
Canthigaster sp.	Toby	Pu'u oloa	Tetraodontidae



AREA CODE	INSHORE AREAS
400	DIAMOND HEAD TO HONOLULU AIRPORT
402	BARBERS POINT TO MAILI POINT
409	DIAMOND HEAD TO MAKAPUU POINT

SECTOR CONTAINING SIWWTP OUTFALL

Source: Hawaii Department of Land and Natural Resources, Division of Aquatic Resources

FIGURE II.C-3-1

FISH CATCHMENT AREA

D. State and Federal Laws [40 CFR 125.61 and 125.62(a)(1)]

1. Are there water quality standards applicable to the following pollutants for which a modification is requested:

--Biochemical oxygen demand or dissolved oxygen?

--Suspended solids, turbidity, light transmission, light scattering, or maintenance of the euphotic zone?

-- pH of the receiving water?

RESPONSE:

The State of Hawaii has adopted Water Quality Standards applicable for dissolved oxygen, turbidity, light transmission (extinction) and pH of the receiving water. There are other Water Quality Standards for toxic pollutants, nutrients limits, and other physical characteristics such as temperature and salinity. According to the State classification, the receiving waters of Mamala Bay are Class A, "Wet", Open Coastal Waters. The applicable standards for three pollutant categories (and other water quality standards) can be found in the Hawaii Administrative Rules, Title 11, Chapter 54, Water Quality Standards, contained in Appendix F.

The specific water qualities standard for a waiver can be sought are as follows:

TABLE II.D.1
MARINE WATER QUALITY CRITERIA "WET"

Parameter (1)	Geometric mean not to exceed the given value (2)	Not to exceed the given value more than ten percent of the time (3)	Not to exceed the given value more than two percent of the time (4)
Total Nitrogen (µg N/L)	150.00*	250.00*	350.00*
Ammonia Nitrogen (µg NH_4-N/L)	3.50*	8.50*	15.00*
Nitrate + Nitrite (µg [NO_3+NO_2] - N/L)	5.00*	14.00*	25.00*
Total Phosphorus (µg P/L)	20.00*	40.00*	60.00*
[1]Light Extinction Coefficient (k units)	0.20*	0.50*	0.85*
Chlorophyll a (µg/L)	0.30*	0.90*	1.75*
Turbidity (NTU)	0.50*	1.25*	2.00*

* "Wet" criteria apply when the open coastal waters receive more than three million gallons per day of fresh water discharge per shoreline mile.

[1] Light extinction coefficient (LEC) is only required for dischargers who have obtained a waiver pursuant to Section 301(h) of the Federal Water Pollution Control Act of 1972 (33 U.S.C. 1251), as amended, and are required by EPA to monitor it.

pH Units - shall not deviate more than 0.5 units from a value of 8.1, except at coastal locations where and when freshwater from stream, storm drain or groundwater discharge may depress the pH toa minimum level of 7.0.

Dissolved Oxygen - Not less than seventy-five per cent saturation, determined as a function of ambient water temperature and salinity.

Temperature - Shall not vary more than one degree Celsius from ambient conditions.

Salinity - Shall not vary more than ten per cent from natural or seasonal changes considering hydrologic input and oceanographic factors.

The City has, because of the absence of detailed procedures, developed its own methodology to determine compliance.

2. If yes, what is the water use classification for your discharge area? What are the applicable standards for your discharge area for each of the parameters for which a modification is requested? Provide a copy of all applicable water quality standards or a citation to where they can be found.

RESPONSE:

The State Water Quality Standards classifies State Waters in general categories we either inland waters, or marine waters. Marine waters are further categorized as “embayments,” “open coastal,” and “oceanic waters.”

Each water body is assigned a specific "class," having a defined set of "designated uses," such as recreation, support for aquatic life, and science and education. To protect these ‘designated uses” specific water quality criteria were developed for each class.

For the proposed discharge, the category and class are “open coastal waters,” Class A Marine Waters, and Class II Marine Bottom Ecosystems.

For Class A Marine Waters, the protected uses and restrictions are as follows:

Protected Uses:

- Recreational purposes and aesthetic enjoyment
- Other uses compatible with protection and propagation of fish, shellfish, and wildlife, and with recreation of these waters.

Restrictions:

- Entering discharge must receive best degree of treatment
- No sewage discharge within embayments
- No new industrial discharge (with exceptions)

For Class II Marine Bottom Ecosystems, the protected uses and restrictions are as follows:

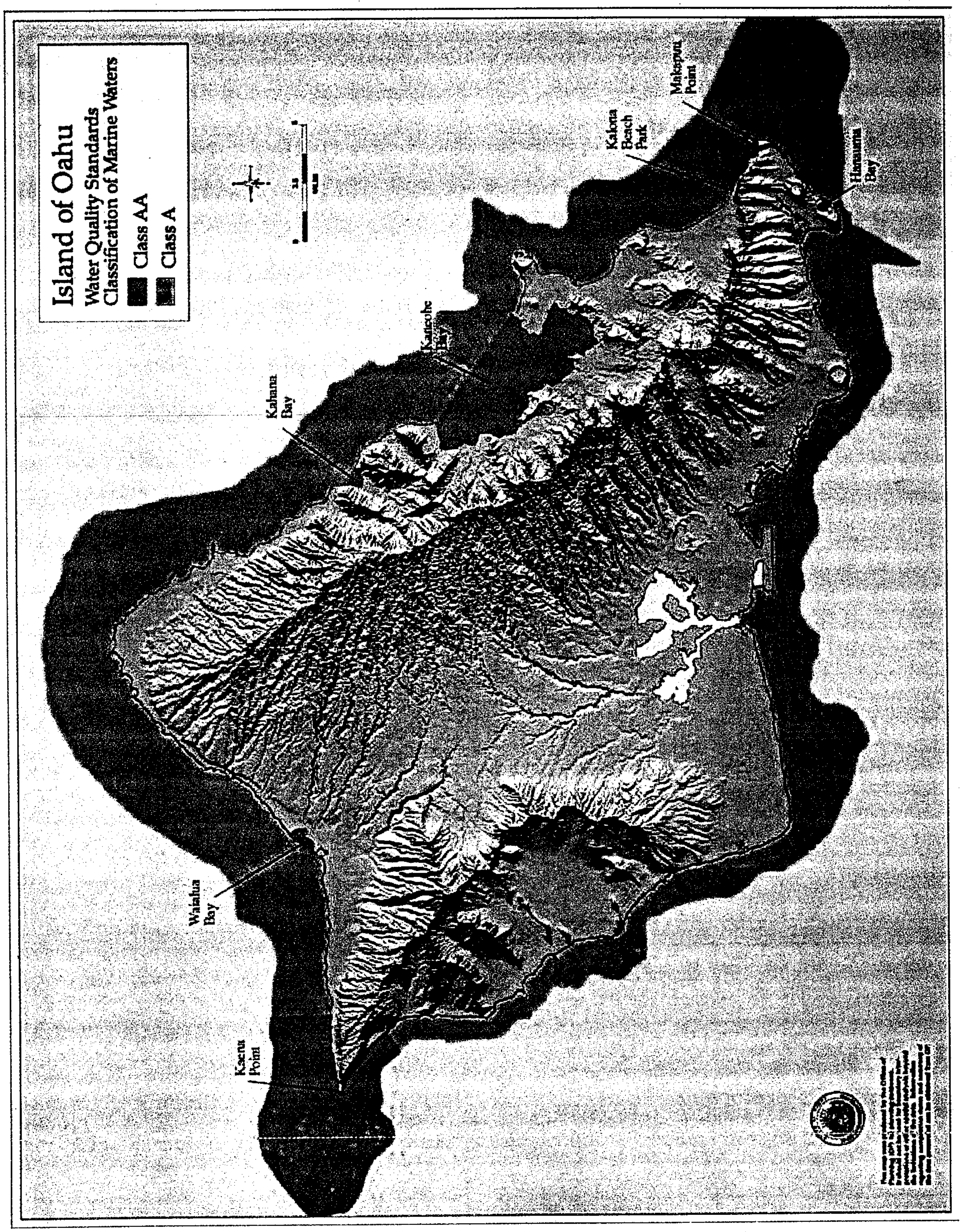
Protected Uses:

- All uses compatible with the protection and propagation of fish, shellfish, and wildlife.
- Recreation

Restrictions:

- Any action which may permanently or completely modify, alter, consume or degrade marine bottoms may be allowed with director's approval, bust must consider environmental impact and public interest.

FIGURE II.D.2.1



3. Will the modified discharge: [40 CFR 125.59(b)(3)].

- **Be consistent with applicable State coastal zone management program(s) approved under the Coastal Zone Management Act as amended, 16U.S.C.1451 et seq.? [See 16U.S.C. 1456(c)(3)(A)]**
- **Be located in a marine sanctuary designated under Title III of the Marine Protection, Research, and Sanctuaries Act (MPRSA) as amended, 16 U.S.C. 1431 et seq., or in an estuarine sanctuary designated under the Coastal Zone Management Act as amended, 16 U.S.C. 1461 ? If located in a marine sanctuary designated under Title III of the MPRSA, attach a copy of any certification or permit required under regulations governing such marine sanctuary. [See 16 U.S.C. 1432(f)(2)]**
- **Be consistent with the Endangered Species Act as amended, 16 U.S.C. 1531 et seq.? Provide the names of any threatened or endangered species that inhabit or obtain nutrients from waters that may be affected by the modified discharge. Identify any critical habitat that may be affected by the modified discharge and evaluate whether the modified discharge will affect threatened or endangered species or modify a critical habitat. [See 16 U.S.C. 1536(a)(2)].**

RESPONSE:

Yes, see correspondences sent to various agencies, Appendix L.

4. Are you aware of any State or Federal laws or regulations (other than the Clean Water Act or the three statutes identified in item 3 above) or an Executive Order which is applicable to your discharge? If yes, provide sufficient information to demonstrate that your modified discharge will comply with such law(s), regulation(s), or order(s). [40 CFR 125.59 (b)(3)].

RESPONSE:

We are unaware of any State or Federal laws or regulations or an Executive Order applicable to our discharge.