III TECHNICAL EVALUATION REQUIREMENTS

Physical Characteristics of Discharge §40 CFR 125.62(a)J Description

1. *What is the critical initial dilution for your current and modified discharge(s) during 1) the period(s) of maximum stratification? and 2) any other critical period(s) of discharge volume/composition, water quality, biological seasons, or oceanographic conditions?* (Unchanged Cross reference - III.A.1, Page IILA-1.)

   Response:

   Background. The Honouliuli wastewater treatment and deep ocean outfall and diffuser system are located on the southwestern coast of Oahu, Hawaii, between Barbers Point and Pearl Harbor, as shown on Figure IH.A.1-1. The outfall and diffuser system was designed in 1976, and construction was completed in February 1979, with the wastewater discharge starting in January 1982.

   The outfall portion of the Honouliuli wastewater treatment system consists of a land portion following a straight alignment from the treatment plant to the shoreline and an offshore portion running from the shoreline out to a diffuser section located at a depth of about 200 feet below Mean Lower Low Water (MLLW). The overland portion consists of a 9,167-foot 84-inch reinforced concrete pipe (RCP) while the offshore (ocean) section consists of an 8,766-foot, 78-inch RCP. The offshore portion is fully buried from the shoreline to a depth of about 83 feet below MLLW. Between 83 and 91 feet below MLLW, the outfall transitions from being fully buried to above ground and buried by large rocks. The outfall is fully buried in the nearshore zone in order to protect it from wave forces and possible dragging of ship anchors.

   The outfall pipe terminates in a diffuser section, which is also constructed of RCP. The diffuser section is 1,750 feet long running along the 200-foot-depth contour. The diffuser pipe has three different diameter sections, starting at 78 inches in order to match the outfall diameter; then it is reduced to 66 inches in the midsection and 48 inches in the final section. The reduction in the diffuser diameter section serves the purpose of maintaining adequate flow velocities in the diffuser as flow is being discharged through the various ports in the diffuser. Maintaining adequate velocities is important to prevent sediment particles from settling in the diffuser section. The diffuser section has 42 discharge ports at the nearshore side with diameters of 3.41 inches each, 50 discharge ports in the middle section with diameters of 3.58 inches each, 54 discharge ports at the offshore side with diameters of 3.74 inches each, in addition to two end ports with diameters of 6 inches each, for a total number of 148 discharge ports. The variation in the diameters of the ports helps to evenly disperse the effluent. The discharge ports are cast, at the spring line, into the sides of the diffuser pipe. The ports are cast in pairs, opposite each other and spaced at 24 feet apart, as shown on Figure III.A.1-2. The outfall is designed to handle flows ranging from 14 to 112 million gallons per day (mgd).

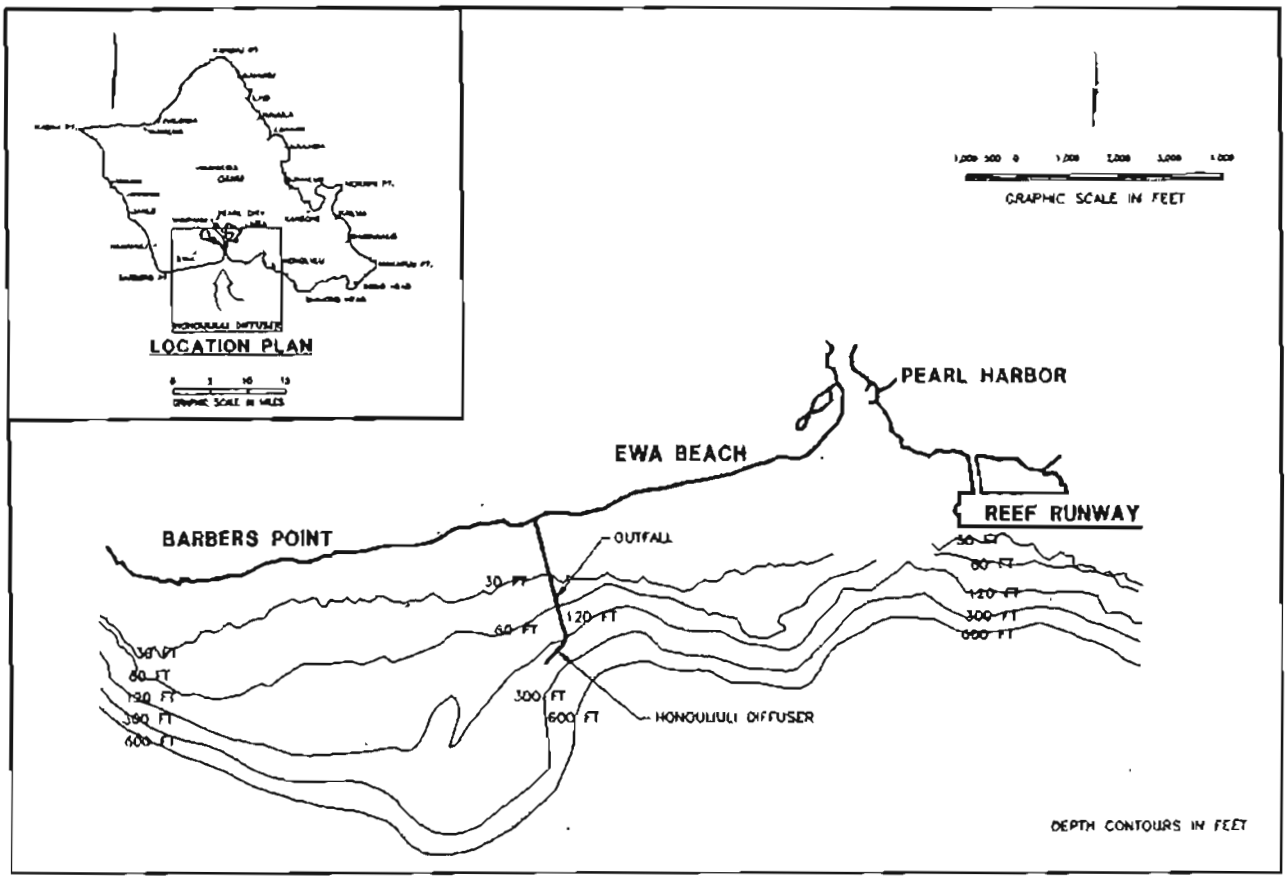


Figure III.A.1-1 Honouliuli Outfall and Diffuser

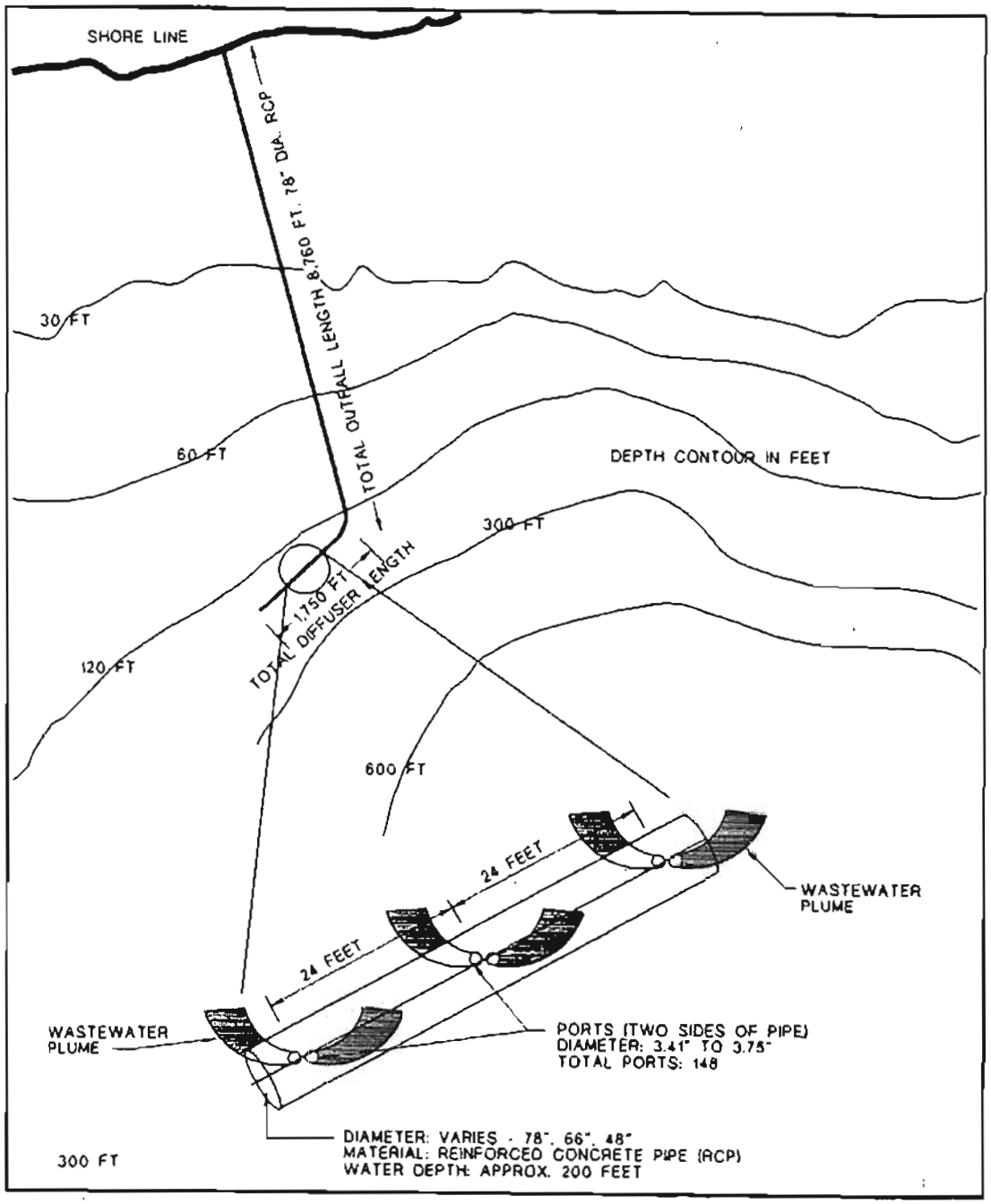


Figure III.A.1-2 Honouliuli Diffuser, Ports Configuration

Critical Initial Dilution. Initial dilution refers to the rapid, turbulent mixing that occurs between seawater and effluent discharged at depth. It takes place close to the point of discharge. The understanding of this process can be used to predict the initial dilution attained under given conditions. Such information enables comparison of effluent constituent concentrations, subsequent to initial dilution, to water quality standards and thus can assist in evaluating the effluent discharge's effect on the marine environment. Critical initial dilution (CID) is defined as the minimum projected dilution based on site-specific environmental conditions. The mixing occurs primarily due to the buoyancy of the effluent in the denser seawater. This initial mixing created by the density difference is very effective in rapidly diluting the effluent plume. Following the initial dilution, the diluted effluent is subjected to further mixing, which is usually of much less importance. While the initial dilution obtained in a typical well-designed diffuser is of the order of 200 or more within few minutes after discharge, the further mixing obtainable in the receiving waters in a matter of hours is usually only a factor of approximately five or ten. Of more importance than the further dispersion is the transport by the currents and whether the plume will surface or remain trapped below the surface by density gradients. Since the outfall being evaluated is utilized for discharging sewage, trapping of the plumes is critical to prevent wastewater from reaching the shoreline.

- Marine Mixing Zone Concepts. When sewage effluent is injected into the marine environment, it has buoyancy and momentum. This energy is used in an initial mixing or dilution process. As the effluent is discharged through the ports of a diffuser, it will have a horizontal and vertical velocity and will behave as a jet. In a short period of time, and due to the density differential between the lighter effluent and denser seawater, the effluent jet loses its horizontal momentum and becomes a plume which rises and entrains ambient water and, thus, is diluted. The mixing process slows considerably when the plume reaches a position of neutral buoyancy with the ambient water or when it surfaces, at which time the dilution process becomes more dependent on the ambient marine currents. The mixing zone is, therefore, a region where rapid mixing takes place between effluent and ambient waters.

  Initial Dilution Model. The initial dilution model "PLUMES" third edition, April 14, 1994, was utilized for the functional performance evaluation of the existing diffuser. "PLUMES" is a computer model developed by the Environmental Protection Agency (EPA) for use in predicting initial dilutions and trapping levels for marine outfalls. The model considers a buoyant plume element issuing at an arbitrary angle into a stratified environment. By following this element, the characteristics of a continuous plume in a flowing environment are described. Density, velocity, temperature and salinity are assumed *to* be average properties of the element. The quantities of mass, momentum and energy are conserved. The density of the ambient water and the plume element is calculated and compared at each time step. Initially, the effluent segment has horizontal

and vertical velocities, temperature and salinity components, and is injected as a jet into a stratified environment with ambient current speed. The jet originally has a diameter equal to the port diameter and is tracked by the computer model in two dimensions, depth and horizontal distance.

As the effluent jet travels through the ambient water, the horizontal velocity decreases while the vertical velocity increases due to buoyancy, thus transforming the jet into a plume that will rise until it reaches neutral buoyancy (trapping level) or it surfaces. Entrainment brings ambient mass (momentum, temperature and salinity) into the jet/plume element. In the model, the entrained mass is added into the element's mass, which becomes the new mass. The new temperature and salinity of the element are the averages of the old values and the entrained ambient values weighed by their relative masses. The new density, and thus buoyancy, creates a vertical acceleration on the plume segment. Because the element is considered to be one of a chain, each following the preceding element, drag is assumed to be negligible, and the vertical velocity is incremented. The horizontal velocity is found by conservation of horizontal momentum with the entrained water having the velocity of the ambient current. The segment length is changed in proportion to the total velocity to conserve mass. The diameter is changed to correspond to the new mass and density. Finally, dilution is calculated by comparing the initial volume to that of the plume element at the depth of neutral buoyancy or at the surface. When the density differential between the plume element and the ambient water reaches zero (point of neutral buoyancy) or the plume surfaces, then the farfield dispersion calculations begin until the diluted effluent reaches a specified distance from the discharge point, at which time the model terminates. Unlike earlier generation models, "PLUMES" considers the overlapping of plumes from adjacent diffusers.

Input Data. Data incorporated into the model consisted of receiving water temperatures, salinities and current speeds; diameter, depth, angle with the horizontal plane and spacing of the diffuser's ports; diffuser diameter; flow rates and effluent density. From the above input, the model calculates the receiving water densities and the density differentials between the effluent and the surrounding water with respect to depth and thus, the initial dilutions and trapping levels.

Data on the physical characteristics of the outfall and diffuser, such as number and diameter of ports, spacing of the ports, diffuser's diameter, etc., were easily obtained and entered into the model. An average diffuser and port diameter of 66 and 3.58 inches, respectively, were used in the analyses. This is a reasonable assumption to use since diffusers are designed to discharge approximately equal amounts of effluent through their ports, A hydraulic analysis of the Honouliuli diffuser was performed using a typical average daily flow of 25.91 mgd. The flows through the various ports varied from 0.0071 cubic meters per second (m^3/sec) to 0,0079 m^3/sec for a maximum difference of about 11 percent. The

results of the analysis show that the HonouliuH diffuser is hydraulicaily a well-designed diffuser.

The following is a brief description as to how the input data were obtained.

* Effluent Flow Rates. In developing the effluent flow rates for use in the computer model "PLUMES," a detailed review of the Honouliuli Waste water Treatment Plant (WWTP) daily effluent flow rates for the entire year of 1994 was performed. A typical effluent flow rate varies throughout the day based on the water use habits of the population and industries being served. An average diurnal flow distribution graph is presented on Figure III.A.1-3. A typical diurnal flow distribution pattern has a morning peak occurring at 10 a.m. followed by an evening peak at 9 p.m. The evening peak is 130 percent of the average flow, and the morning peak at 123 percent of the average flow. The initial dilution evaluation will be 130 percent of the average daily flow and represents a worst-case estimate of initial dilution.

  The peak daily flow for every month in 1994 adjusted by the diurnal peak factor was selected for the computer evaluation in order to determine most conservative scenario for calculating the initial dilutions. Waste water flow projections for the "Honouliuli Wastewater Treatment Plant Service Area Collection System" were performed by Wilson Okamoto & Associates, Inc., in March 1995. Ratios of the flows for the years 2000 through 2020 were used to project the flows utilized in the analyses. Table III.A.1-1 depicts the flow rates used in the initial dilution evaluation.

Table III.A.1-1. Effluent Flow Rates for 1994, 2000, 2005, and 2010

	Peak Daily Flow (mgd)					Peak Hourly Flow (mgd)			
	Year				Diurnal Peaking Factor	Year			
Month	1994	2000	2005	2010		1994	2000	2005	2010
January	27.20	29.41	33.17	35.09	1.3	35.36	38.24	43.12	45.62
February	34.10	36.88	41.58	44.00	1.3	44.33	47.94	54.05	57.20
March	36.40	39.36	44.39	46.96	1.3	47.32	51.17	57.70	61.05
April	26.99	29.19	32.91	34.82	1.3	35.09	37.95	42.79	45.27
May	27.10	29.31	33.05	34.96	1.3	35.23	38.10	42.96	45.45
June	27.13	29.34	33.08	35.00	1.3	35.27	38.14	43.01	45.51
July	29.18	31.55	35.58	37.65	1.3	37.94	41.03	46.26	48.95
August	29.04	31.40	35.41	37.47	1.3	37.76	40.83	46.04	48.72
September	28.58	30.91	34.85	36.87	1.3	37.15	40.17	45.30	47.93
October	29.79	32.21	36.33	38.44	1.3	38.72	41.87	47.21	49.96
November	29.36	31.75	35.80	37.88	1.3	38.17	41.28	46.54	49.25
December	29.22	31.60	35.63	37.70	1.3	37.99	41.08	46.32	49.02

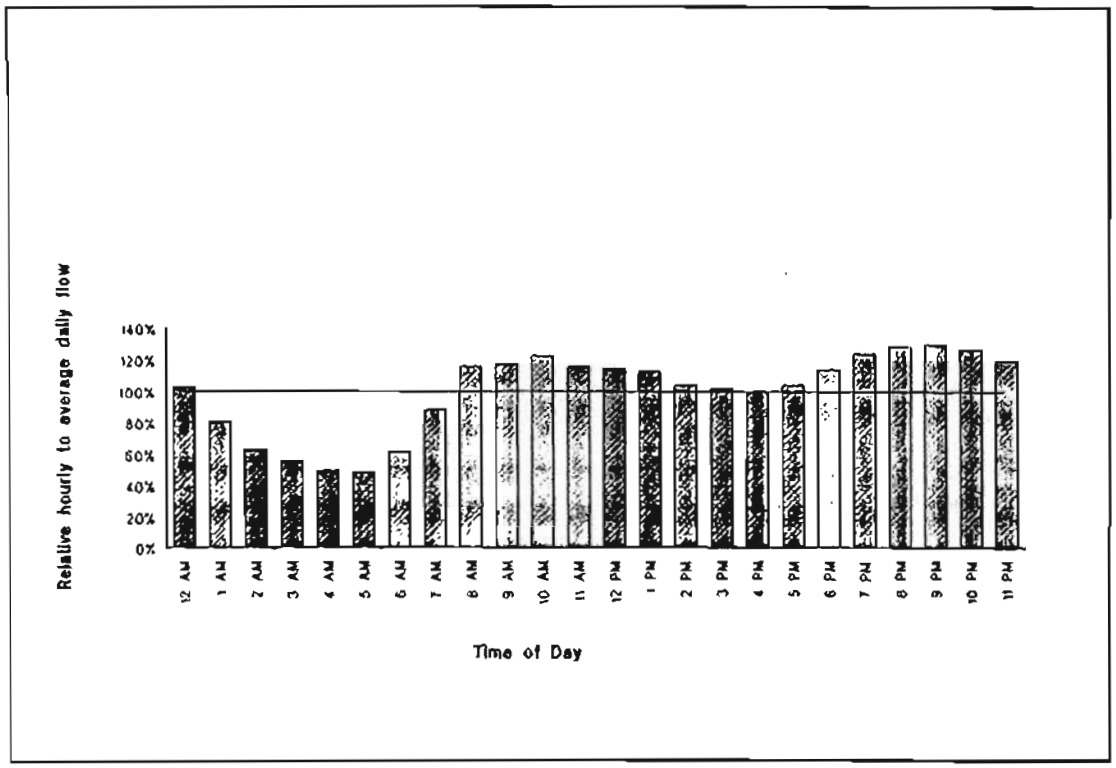


Figure III.A.1-3 Diurnal Flow distribution

Density Stratification. The density differential between the discharged effluent and receiving water is a significant factor in the rate of initial dilution. When the lighter effluent is discharged into the denser receiving water, the effluent after the loss of the initial jet momentixm starts rising, and starts mixing with the receiving water. The effluent plume keeps on rising and mixing with the receiving water until the density of the mixed plume reaches the density of the receiving water, at which time the plume's rise stops. If there is very little or no density gradient, the plume will ultimately rise to the surface. Consequently, the greater the plume rises, the greater the opportunity to mix with the receiving water and the greater the initial dilution. Under condition of high-density gradient, the effluent plume will be trapped at that depth of equal density, and the initial dilution will be less. Because density is primarily dependent on salinity and temperature, it changes with seasons.

Year-round temperature and salinity data of the receiving waters shown in Table III.A.1-2 were used in the computer model. These data were obtained from the "Water Quality Program for Oahu with Special Emphasis on Waste Disposal" (Engineering Science et al., 1971) and "Oceanographic Data Collection and Analysis, Barbers Point Ocean Outfall System" (R.M. Towill, 1974b).

Table III.A.1-2. Temperature and Salinity Data

	Winter		Spring		Summer		Fall	
Depth (feet)	Temp. (°C)	Salinity (o/oo)	Temp (°C)	Salinity (o/oo)	Temp rcj	Salinity (o/oo)	Temp (•C)	Salinity (o/oo)
0	23.8	34.88	23.1	34.18	26.7	34.80	26.5	34.68
IB	23.7	34.88	22.9	34.48	26.3	35.06	26.5	34.68
33	23.7	34.88	22.8	34.56	26.3	34.96	26.4	34.82
49	23.6	34.78	22.8	34.56	26.1	34.54	26.4	34.82
66	23.6	34.86	22.9	34.46	26.0	34.58	26.4	34.82
82	23.6	34.86	22.7	34.64	26.0	34.60	26.4	34.68
98	23.5	34.92	22.7	34.64	26.0	34.68	26.4	34.76
115	23.5	34.90	22.7	34.64	25.9	34.72	26.3	34.76
131	23.5	34.90	22.7	34.64	25.8	34.76	26.0	34.76
148	23.5	34.86	22.7	34.64	25.6	34.66	25.9	34.54
164	23.3	35.00	22.7	34.64	25.4	34.78	25.8	34.52
180	23.3	34.96	22.7	34.64	25.3	34.72	25.6	34.56
197	23.2	35.06	22.7	34.66	24.8	34.62	25.4	34.50

Critical Initial Dilution and Trapping Levels. The results projected by the dilution model in Table III.A.1-3 show the minimum or critical initial dilution and trapping level during each season.

The model predicts maximum stratification to occur during winter months when the trapping level is 48 meters below the surface. The increased flow in later years result in the minimum critical dilution factor of 210, occurring in year 2010. Another critical period of discharge may occur during summer months when the plume is predicted to surface due to low-density stratification. Onshore winds and currents may move the plume to shore during these conditions.

Table 111.A. 13. Initial Dilution and Trapping Levels

	Winter		Spring		Summer		Fall	
Year	Initial Dilution	Trapping Level (meters)	Initial Dilation	Trapping Level (meters)	Initial Dilution	Trapping Level (meters)	Initial Dilation	Trapping Level (meters)
1994	236	48	1100	Surfaced	353	34	462	20
2000	228	48	1026	Surfaced	338	34	440	20
2005	216	48	925	Surfaced	316	33	411	19
2010	210	48	881	Surfaced	307	33	397	19

The critical initial dilutions presented in Table III.A.1-3 can be considered as the worst-case dilutions. A better assessment of waste dynamics can be obtained by examining average dilution rates generated by the same model. A thorough study by Noda (1993) examined average dilution rates on a monthly basis, and predicted the frequency of time which the plume would surface using hourly data. During the months of January, June, and August, there was virtually no probability of the plume reaching the surface. On a yearly basis, the plume would be expected to surface 25 percent of the time. The average initial dilution during periods of submergency was 725, and the average trapping depth was slightly over 40 meters. During periods when the plume does surface, the annual average dilution is 1,853. Monthly average dilutions for wastewater plumes which are submerged and surfaced are provided in Table III.A.1-4.

Table III.A.1-4. Monthly Average Dilution Factors for Submerged and Surfacing Plumes*

Month	Submerged Plumes	Surfaced Plumes	% Frequency Submerged
January	756	No Surfacing	100
February	950	1,795	57.6
March	1,141	1,461	62.6
April	762	2,093	57.9
May	881	1,397	83.3
June	627	No Surfacing	99.9
July	673	2,009	81.4
August	384	No Surfacing	100
September	667	1,961.	85.4
October	552	2,146	91.3
November	1,933	1,889	18.3
December	626	1,980	60.0

* Adapted from Noda (1993).

The computer model was run to analyze the effects of wind and currents on the farfield dispersion of the wastewater plume to predict the frequency of wastewater reaching shoreline areas. Analysis of the transport of submerged or surfaced plumes, after the initial dilution phase, showed that wastewater could be expected to reach the nearest shoreline area in Ewa Beach-Barbers Point between 0.1 to 0.2 percent of the time annually. This frequency is equivalent to one-third to two-thirds of one day per year. The projected dilution at the shoreline during this period is 3,122 for submerged plumes and 2,093 for surfaced plumes.

Based on the combination of very low impact probabilities and very high dilution of the waste plume, Noda concluded that wastewater would be undetectable at the shoreline and that shoreline impacts would be minimal and insignificant.

2. *What are the dimensions of the zone of initial dilution for your modified discharge(s)?* (Unchanged: Cross reference - III.A.2, page III.A.7)

Response:

Zone of Dilution, The zone of initial dilution (ZID) is rectangular prism whose surface projection parallels the alignment of the diffuser with a width equal to twice its depth and a length that extends a distance equal to its depth beyond the ends of the diffuser. This prism includes the water column between and inclusion of the bottom and the surface. The ZID for the Honouliuli diffuser is calculated for each season. Dimensions are shown on Figure UI.A.2-1. The center of the zone is located at 21°17'06" N and 158° 01' 41" W, and its axis

parallels the azimuth of 231°, along the center line of the diffuser (Figure III.A.2-1).

Hawaii state standards mandate establishment of a zone of mixing (ZOM). Waters outside the ZOM are required to meet applicable water quality standards. A ZOM is usually larger than a ZID since it typically allows for longitudinal dispersion of the discharges. The existing ZOM is found to be adequate. Its dimensions are 1,128 meters long and 610 meters wide, centered over and parallel to the diffuser (Figure Ifl.A.2-1).

3. *What are the effects of ambient currents and stratification on dispersion and transport of the discharge plumefwastefield?* (Methodology - Update; Cross reference - Appendix II)

Response:

A detailed discussion of ocean currents and stratification presented previously in Chapter II, Part B, Section 4, is summarized here as it pertains to dispersion and transport of the discharge plume and wastefield.

The tide is the principal circulation component in Mamala Bay, with the exception of the wind-driven surface layers. The tidal influence is somewhat modified by a "permanent" westward flow, generated by an eastern central Pacific anti-cyclonic gyre. The semidiurnal tide approaches Oahu from the northeast, diverges, and moves around the island. The convergence point for the flood currents is thought to be west of Pearl Harbor, in the vicinity of Ewa Beach. The ebb current diverges in the vicinity of Barbers Point and converges on the windward side of the island. Measurements off Diamond Head indicate the predominance of tidal currents. Flood tide currents flow northwest, and ebb currents flow southeast. Measurements just northwest of Barbers Point indicate similar semidiurnal reversal, but the flood and ebb tides are in opposite directions. In the immediate vicinity of the diffuser outfall, the ebb and flood flow directions occasionally changed within a few cycles of each other. This variation was the most consistent in the surface and mid-depth layers, while the

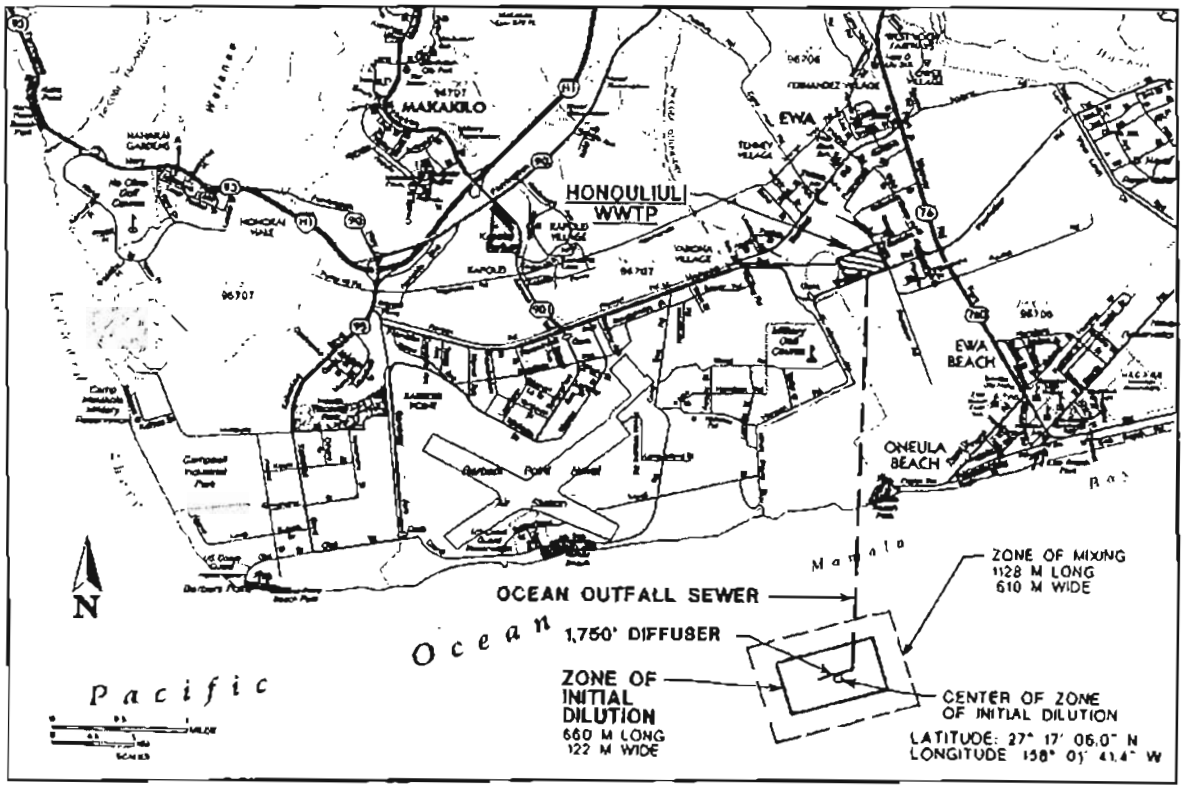


Figure III.A.2-1 ZID and ZOM Barbers Point Outfall

deep daily net transport remained consistently oriented southward. The general tidal patterns in the outfall area remain approximately the same throughout the year, though the tidal convergence/divergence zone may produce daily net movements that can be quite varied. This combination of "permanent" flow across Mamala Bay and tidal flow typically produces reversing currents with a net southwest transport. The effects of wind and bathymetry, however, also influence circulation in Mamala Bay. Eddies resulting from flow past prominent points, such as Diamond Head, may increase the degree of irregularity observed in the currents. Current velocities have been observed to decrease with depth.

The influence of the diurnal tidal cycle translates the centerline of the rising plume in the direction of the ongoing ocean currents. Once the terminal height of rise is achieved, the configuration and translation of the sewage waste field by ocean currents are dependent on whether or not the waste field is submerged*

The relation of the submerged waste field to the diffuser follows the diurnal tidal fluctuation currents, which flow toward the south and west with a velocity equal to the net transport. This phenomenon also usually occurs in surfacing plumes, but with less regularity in relation to size and configuration due to the effects of wind and eddies at the near-surface and surface layers. These turbulent surface effects typically increase the overall size of both the waste field and the dilution.

Assuming that the thickness of the sewage wastewater field is one-fourth to one-third of the water depth and defining the width of the section transacted by the ocean current as the length of the diffuser, the estimated dilution based on dilution water supply limitations are as follows:

$$S_a x Q = h \times b \times u$$

where: S_a = Predicted initial dilution
Q = Volumetric flux of treated wastewater
h = Thickness of waste field = 60.96 meters/3 = 20 meters
b = Width transacted by current - 538 meters
u = Current velocity (net transport) =
2.4 cm/sec (summer, near-surface)
3.9 cm/sec (winter, near-surface)
3.1 cm/sec (summer, subsurface)
5.4 cm/sec (winter, subsurface)

The dilutions predicted by the analytical model for the worst-case situation of the subsurface plumes (Table IIIA.3-1) are similar to the dilutions predicted when limited by the supply of dilution water, due to similar assumptions of maximum stratification and minimum current flow.

An analysis of dilution water supply based only on the net transport is conservative, because it does not account for the higher model velocities (25 to 35

cm/sec) associated with the dominant semidiurnal flood and ebb tide flows. Because the net transport is the vector average over many tidal cycles, the previous analysis would also account for any possible re-entrainment of the sewage plume.

The zone of initial dilution (ZID) (near-field) is the area surrounding the diffuser where the effluent plume would rise through the water column until it reaches a point of neutral buoyancy, and no further rise though the water column is possible or until it reaches the water surface. The farfield area starts at the edge of the near-field area and covers the entire area of the receiving waters in Mamala Bay. The farfield plume analyses start immediately after the discharged effluent plume has reached its trapping level or the water surface. The amount of mixing is dependent on the velocity of ambient currents, ambient density stratification, the size of the effluent plume and the proximity to local depth contours.

Table III.A.3-1. Projected Minimum Dilution Resulting front Current Flow

Year	Honouliuli Maximum Design Flow* (m^3/sec)	Near-surface		Subsurface	
		Winter	Summer	Winter	Summer
1995	1.441	291	179	403	231
2000	1.536	273	168	378	217
2005	1.631	257	158	356	204
2010	1.726	243	150	337	193
2015	1.820	230	142	319	183
2020	1.916	219	135	303	174

* Based on revised City & County of Honolulu population projections (Chapter II, Part A).

The farfield plume will either be a submerged or a surfaced plume. The driving force for the submerged farfield plume dispersion and transporting is the ocean currents at the trapping level. For all practical purposes, wind will have no effect on plumes submerged in excess of 3 meters below the water surface. The surfaced plume, however, is affected by the ocean currents and the surface wind. Both of these forces act simultaneously on the surfaced plume to determine its transport.

For the submerged plume, the computer model "PLUMES" is used to predict the amount of dilution achieved by the time the plume reaches the closest shoreline area, directly towards the shore, thus minimizing the time it takes the plume to reach the shore. For the surfaced plume, the model assumes no further dilution occurs after the plume surfaces.

Predicted Farfield Dilutions. The results of the initial dilution modeling for the Honouliuli diffuser are presented in Table HI.A.3-2. The predicted results include the dilutions based on the year 1994 flows and the years 2000, 2005 and 2010 projected flows.

Table 111. A. 3-2. Farfield Dilutions

Year	Winter Farfield Dilution	Spring Farfield Dilution	Summer Farfield Dilution	Fall Farfield Dilution
1994	647	1857	1074	1333
2000	620	1733	1023	1278
2005	579	1563	949	1200
2010	563	1489	916	1160

4. *Will there be significant sedimentation of suspended solids in the vicinity of the modified discharge?*

Response:

Results of the field experiments conducted near the Honouliuli outfall (Dollar, 1986) showed that less than 1 percent of the particulate material released from the diffuser reaches the sediment (sandy) surface that comprises the sea floor (Figure IH.A.4-1). Calculations of settling rate based on effluent particle size and current velocities performed by Tetra Tech (1987) produced virtually the same result. Examination of the sediment surface throughout the area near the outfall showed no significant buildup of organic sewage material (Dollar, 1993). These results indicate that the great majority (>99 percent) of particulate material that is discharged from the outfall is dispersed in the water column, and does not reach the sediment surface. Analyses of cores of sandy sediment collected at various distances from the diffuser showed that there was virtually no incorporation of sewage particles below the surface of the sand that comprises the sea floor (Dollar, 1986). Rather, results of field experiments showed that the small fraction of particulate material that reaches the bottom is rapidly digested on the sediment surface by the benthic community. Digestion of the particulate sewage material "recycles" the sewage material to the water column in a dissolved, rather than particulate form. Zapka and Krock (1983) have shown that the fraction of inorganic particles which may settle during quiescent periods are regularly resuspended by long period waves, and subsequently dispersed by tidal and other currents. In sum, budgeting the input and fate of sewage particles showed that discharge of sewage effluent did not cause any substantial or significant alteration of the structure of function of the bottom-dwelling communities (Dollar, 1993).

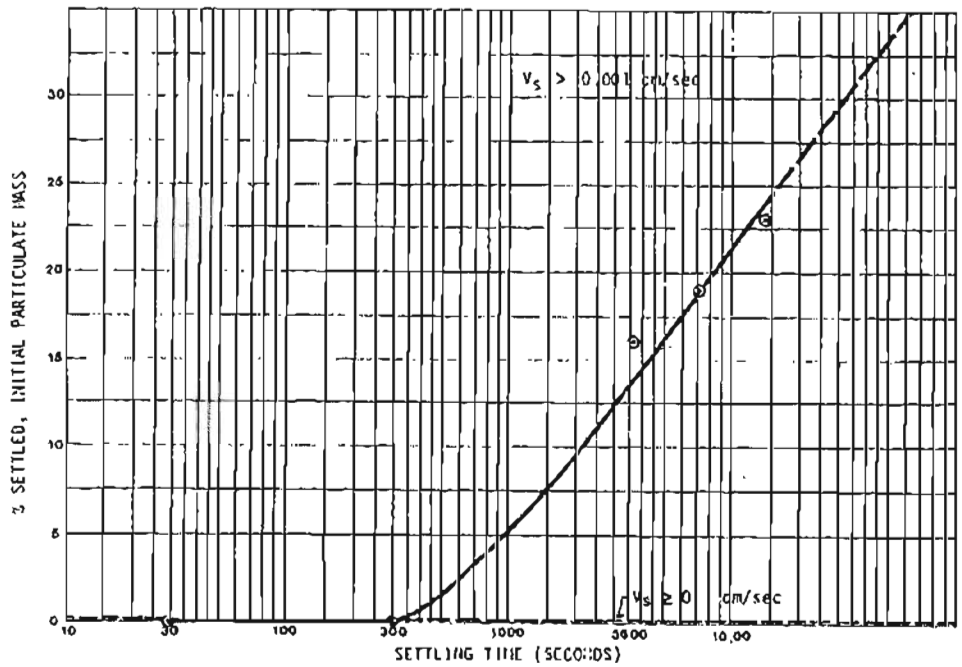


Figure III.A.4-1 Settling Velocity Curve for Honouliuli Outfall

5. **Sedimentation of Suspended Solids.**

5a. *What fraction of the modified discharge's suspended solids will accumulate within the vicinity of the modified discharge?* Cross reference - III.A.4A, page ra.A-12.

Response:

The suspended solids effluent limitation of 95 mg/l combined with the projected average annual daily flow rate of the planning period would generate estimated TSS mass emission rates (MER) shown in Table HLA.5-1. The volatile settleable solids deposition from the projected 1989 primary effluent emissions amount to approximately 277 kg/d during winter or an average annual rate of 168 kg/d. This represents 3 and 2 percent, respectively, of the total suspended solids emitted. As discussed in the Subsection b, these settling percentages are very conservative due to the significant effects of resuspension.

Table tll.A.5-1. Projected Mass Emission Rate for Total Suspended Solids

	Year					
	1995	2000	2005	2010	2015	2020
Flow (m^3/sec)	1.23	1.32	1.50	1.58	1.67	1.75
MER (kg/day)	10,098	10,852	12,278	12,978	13,703	14,360

The above data are based on permit limit concentration of 95 mg/l.

5b. *What are the calculated area(s) and rate(s) of sediment accumulation within the vicinity of the modified discharge(s) ($g/m^2/yr$)?*

Response:

Offshore Transport. The Honouliuli outfall effluent discharge plume rises from the discharge depth of 61 meters to an average height of about 20 meters from the bottom. As the outfall plume rises, the suspended solids will be carried to the waste field elevation. As the waste field is transported away from the diffuser area, the suspended solids will interact with the sea water and some will begin settling toward the bottom.

Guidelines in the EPA's "Revised Section 301(h) Technical Support Document" (1982) suggest that particles with settling velocities less than 0.001 cm/sec should not settle out because of the colloidal nature. The results of experiments simulating Honouliuli WWTP primary effluent indicate that only 31 percent of the solids from the simulated primary effluent could be expected to settle out under quiescent conditions (Figure III.A.4-1). This contrasts with the projected

sediment deposition data, which indicated that during the more critical winter season, only 3 percent of the suspended solids actually settled out. Furthermore, this 3 percent figure could only be attained if resuspension-initiated transport was ignored. Also, the 3 percent settleable fraction reflected pretreated sewage only and include additional naturally occurring nonpoint sources of discharge. Any hypothetical settleable solid accumulation calculations would be extremely conservative since they cannot quantify resuspension effects, which are very significant in this marine environment.

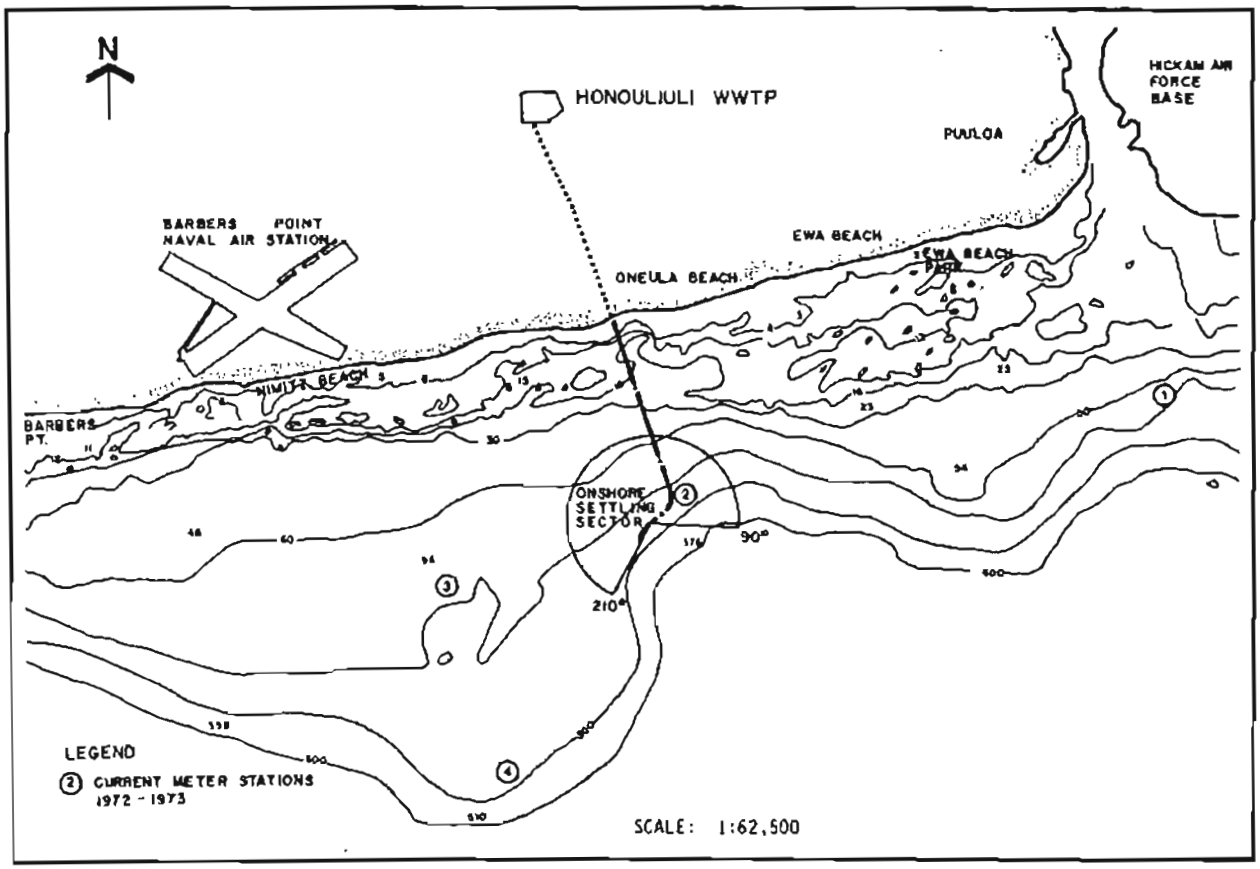
Analysis of Offshore Sewage Sediment Transport. Onshore and offshore settling areas can be defined by the bathymetry of the outfall area (Figure III.A.5-1). The available current records (Appendix D) indicate that the lowest net transport velocity recorded was 2.1 cm/sec. The bottom slope in the offshore sector generally ranges from 5 to 15 percent. As indicated on Figure III.A.5-2, any offshore deposition would require a minimum threshold settling velocity of less than 0.1 cm/sec. The settling velocity experiments recorded no particles with settling velocities less than 0.1 cm/sec (Figure III.A.4-1).

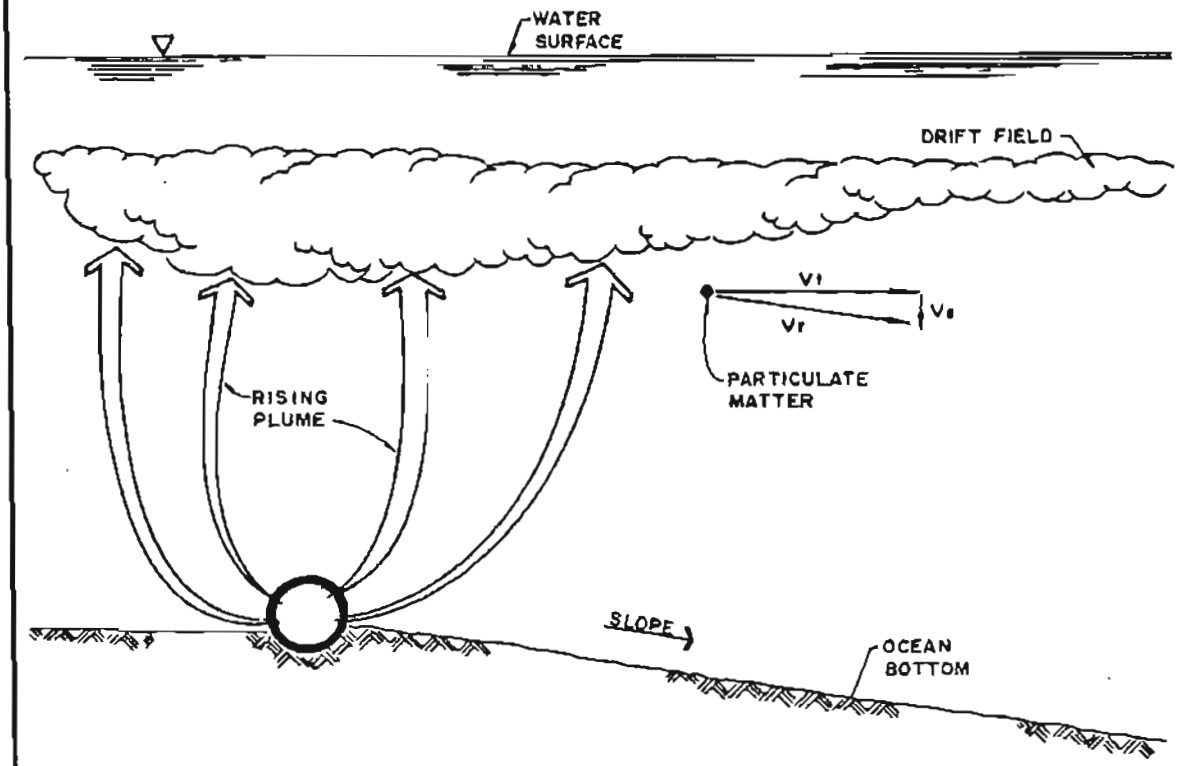
Because of the high variability of current velocities, some offshore settling could hypothetically occur during extremely prolonged quiescent periods. As subsequently discussed in this section, resuspension effects are significant. The combined effects of resuspension and the net transport should result in very negligible long-term sediment accumulation offshore.

Shoreward Transport. The EPA analysis (Technical Evaluation Report [TER] by Tetra Tech, 1980) states: "Shoreward water movement occurs at mid-depths during up welling throughout the year and can occur at the surface due to Kona winds for periods of up to three weeks."

The three-week figure developed in the TER assumes that the 17 percent occurrence of Kona winds in the winter months (December to February) occurred on consecutive days. "Kona weather" in Hawaii is generally applied to the periods in the winter when the tradewinds are not dominant. During much of this time, the winds are calm or variable and tidal currents dominate the current regime, even in the surface layers.

Wind measurements at Honolulu International Airport over the last 15 years were examined to determine the actual persistence of Kona winds that influence shoreward transport. In this analysis, Kona winds were defined as having an onshore component (100° T clockwise around to 270° T). The longest duration of Kona winds was determined for each winter month, and the results are tabulated in Table III.A.5-2.


N
HONOULIULI WWTP
HICKAM AIR FORCE BASE
PUULOA
BARBERS POINT NAVAL AIR STATION
EWA BEACH
EWA BEACH PARK
ONEULA BEACH
NIMITZ BEACH
BARBERS PT.
ONSHORE SETTLING SECTOR
90°
210°
LEGEND
② CURRENT METER STATIONS 1972 - 1973
SCALE: 1:62,500



V_t = Minimum net transport velocity vector (winter, at mid-depth) = 2 cm/sec

V_s = Particle settling velocity vector

V_r = Resultant velocity vector

V_s for V_r to be parallel to the ocean bottom:

Bottom Slope	.05	.15
V_s cm/sec	.10	.30

If $V_t \times S \leq V_s$, no settling should occur

Table III.A.5-2. Persistence of Onshore Kona Wind Conditions, Winter Seasons, 1964 to 1980*

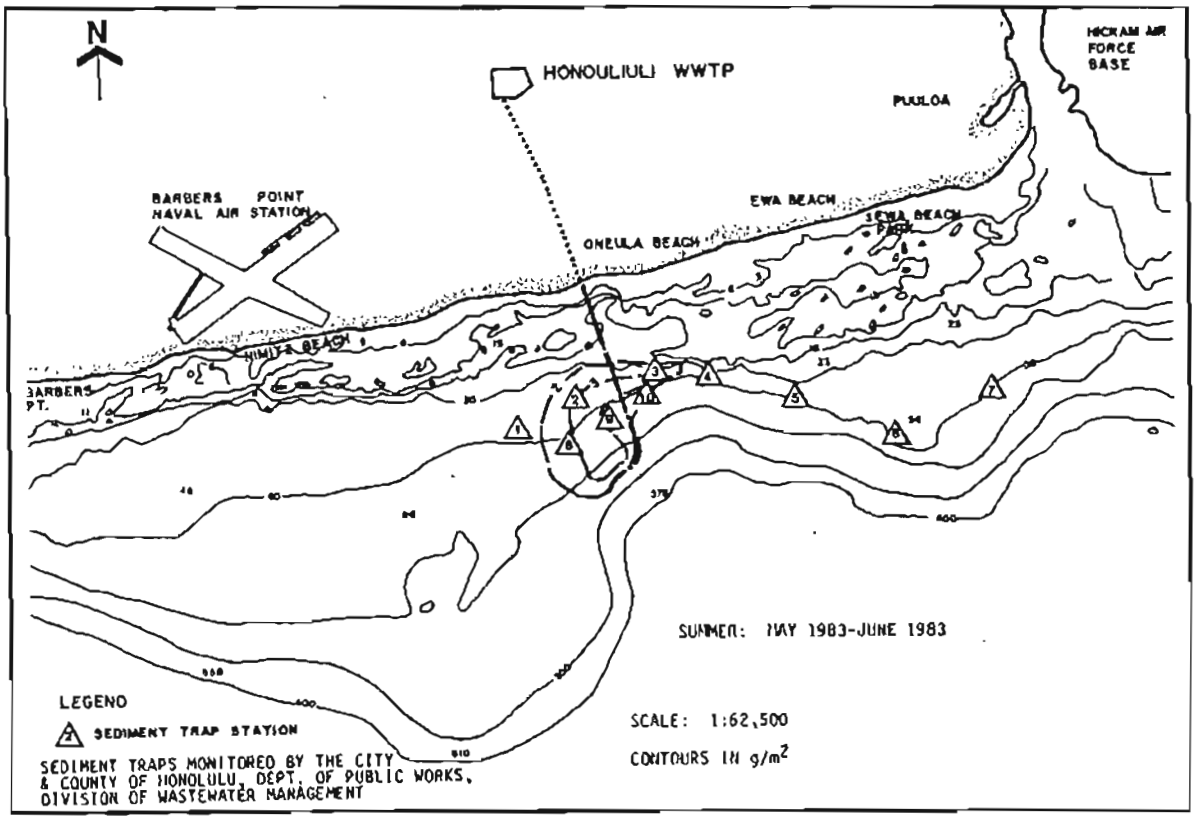
Worst-Case Persistence (duration in days)	No. of Months in this Category (duration in days)
0	1
1	3
2	6
3	4
4	7
5	6
6	3
7	5
8	-
9	4
10	1
11	2
12	1
13	1
14	-
18	1
Average persistence per winter month:	6 days
Worst-cast persistence in 15 years:	18 days

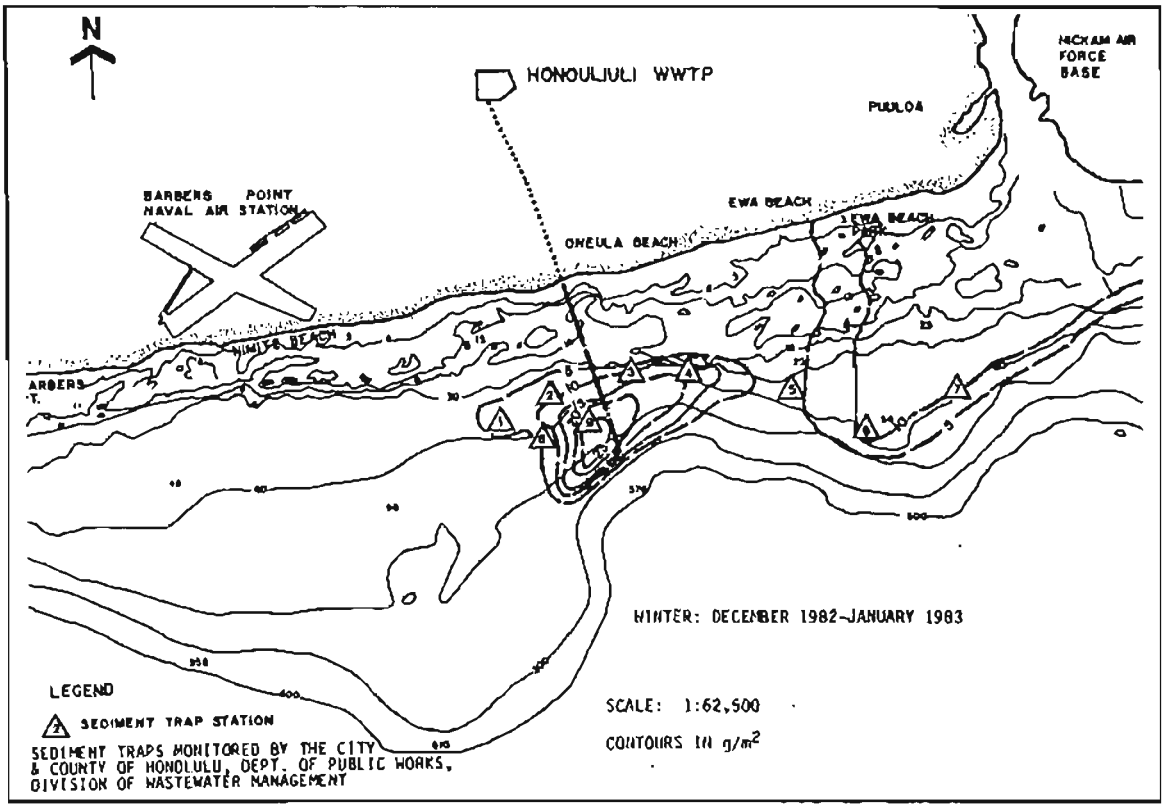
*Note: Each month gets one entry in the above table, the worst case for that month.

The assumption that all of the Kona wind days of a winter season may occur consecutively results in a worst-case analysis that is not normally encountered (Table III.A.5-2). While 15 or more consecutive days of Kona wind are possible, the probability of this occurrence is relatively small. As a conservative estimate, a 15-day critical period has been designated for shoreward sediment accumulation.

Sediment Trap Data. Sediment deposition representative of winter weather was collected during December 1982 through January 1983. Sediment deposition was sampled again during May through June of 1983 to reflect summer current patterns. Each sediment trap was monitored for a period ranging from four to five weeks. Data derived from the sedimentation experiments can be used to validate modeling results presented subsequently in this section.

The spatial distribution of the 1989 15-day accumulation of primary effluent settleable solids are illustrated on Figures III.A.5-3 and III.A.5-4,


N
HONOULIULI WWTP
HICKAM AIR FORCE BASE
PUULOA
BARBERS POINT NAVAL AIR STATION
EWA BEACH
EWA BEACH PARK
ONEULA BEACH
HIMITA BEACH
BARBERS PT.
SUMMER: MAY 1983-JUNE 1983
LEGEND
SEDIMENT TRAP STATION
SEDIMENT TRAPS MONITORED BY THE CITY & COUNTY OF HONOLULU, DEPT. OF PUBLIC WORKS, DIVISION OF WASTEWATER MANAGEMENT
SCALE: 1:62,500
CONTOURS IN g/m2


N
HONOULIULI WWTP
PUULOA
HICKAM AIR FORCE BASE
BARBERS POINT NAVAL AIR STATION
EWA BEACH
ONEULA BEACH
NIMITZ BEACH
WINTER: DECEMBER 1982-JANUARY 1983
LEGEND
SEDIMENT TRAP STATION
SEDIMENT TRAPS MONITORED BY THE CITY & COUNTY OF HONOLULU, DEPT. OF PUBLIC WORKS, DIVISION OF WASTEWATER MANAGEMENT
SCALE: 1:62,500
CONTOURS IN g/m2

The sediment trap deposition contours are representative of 15 consecutive days of onshore winds and currents. As previously indicated, these occurrences are rare; thus, the projected depositions presented are extremely conservative. Most importantly, the sediment traps do not allow for additional resuspension-initiated transport which has been subsequently shown to be very significant.

Despite the amplifying factors which make the sediment trap estimates conservatively high, the sediment trap projections for the summer season appear extremely small. These low summer sediment deposits verify the lack of onshore deposition during consistent tradewind periods.

Other Sources of Suspended Solids. Suspended solids in ocean water consist of phytoplankton, microzooplankton, detritus, terrigenous sediments and particles, and, in this case, grit and organic particles from the outfall discharge. The organics include the naturally occurring oceanic deposition, as well as the outfall-supplied organics. However, the naturally occurring organic deposition is generally of a smaller magnitude. A conservative analysis would attribute the entire organic sediment trap deposition to the outfall discharge.

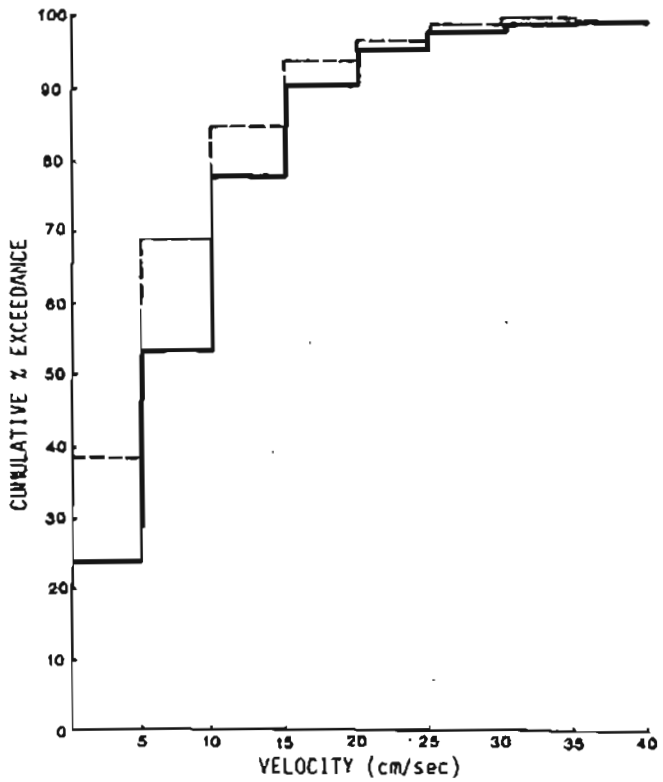
Significant naturally suspended solids emissions can be traced to the Pearl Harbor estuary. The EPA-mandated 208 Nonpoint Source Pollution Assessment has estimated a mass emission rate of 5,000 kg/day from the Pearl Harbor estuary, which is similar in magnitude to the 8,320 kg/day sewage emission rate. Although the terrigenous solids are weighted in distribution toward lighter and less-spherical particles, a significant portion of this 5,000 kg/day should settle out.

Resuspension and Additional Transport. The sediment trap data reflect the mass rate of settleable solids that are deposited but may not represent the actual accumulation on a sloping ocean bottom subject to additional resuspension-initiated transport.

Although shoreward currents would result in some settleable solids deposition on the landward side of the diffuser, resuspension effects would also make onshore deposition in the long-term also a function of the offshore-oriented net transport.

The primary effluent presently emitted from the Honouliuli WWTP should fall between the 80 and 50 percent organic content estimates. The selection of the more conservative latter figure for design estimates would require a minimum resuspension threshold current velocity of 2.5 cm/sec.

The use of a 25 percent volatile solids content would incorporate a factor of safety of 1.2. This volatile content requires a resuspension threshold velocity of 5 cm/sec. As indicated in bottom current frequency distribution records (Figure III.A.5-5), this threshold velocity is exceeded 77 and 61 percent of the time for winter and summer current readings, respectively.



METER DEPTH: 98 FT
BOTTOM DEPTH: 110 FT

CURRENT METER 3 - WINTER
12/15/72-1/23/73

CURRENT METER 2,4 - SUMMER
8/21/72-9/26/72, 4/20/73-6/15/73

The intensity of resuspension in deep waters can be corroborated with similar sediment transport studies conducted at the 70 m deep Sand Island outfall diffuser (Zapka and Krock, 1983), located 9 miles to the east of the Honouliuli outfall. Although there were no storms or other unusual water conditions, the common wave climate exhibited a considerable amount of wave energy in the period bands of 16 seconds and greater. These studies have indicated that long period waves are the primary vertical motion-initiation agents for sand particles. After the particles are lifted off the bottom, they are then subjected to additional translocation by ambient currents. The study concluded that sand is being moved on a more or less continuous basis at the diffuser site. These long period waves are generated from distant sources, thus they should affect all southern coastline of adequate depth in the Hawaiian Archipelago. Because the 61 m deep Honouliuli outfall diffuser is located at a shallower depth than the Sand Island outfall diffuser, the wave-generated particle motion-initiation effects here should be of at least equal, if not greater, intensity.

A frequency distribution of bottom current velocity peaks at the Sand Island diffuser exceeded the threshold velocity of 5 cm/sec 100 percent of the time (Zapka and Kxock, 1983). Because of the low inertial mass of the sand grains, short-term peak velocity currents are sufficient to initiate resuspension (Zapka and Krock, 1983, pp 11-12 to 11-16). The durations and magnitudes of resuspension peak velocities for the lighter sewage particles should be correspondingly smaller. Because the resuspension threshold velocity is exceeded 77 and 61 percent of the time during winter and summer, respectively, and the frequency of exceeding is based on average velocities instead of instantaneous peak velocities, particles which settle are quite likely to be resuspended within a short period.

Of special concern are settleable solids deposition in the nearshore coral reef areas. The assumed current regime leading to adverse deposition on the coral reefs was disputed in previous discussions on current patterns; however, assuming that material is deposited on the coral reefs, which are generally located in water depths out to 80 feet, the wave-initiated resuspension effects previously mentioned should be of even greater intensity. The Honouliuli site is exposed to three wave types, as summarized in Table HI.A.5-3.

Table III.A.5-3. Wave Heights and Period at Honouliuli Outfall

Wave Type	% Occurrence	Average Height (feet)	Average Period (seconds)	Mean Approach Direction (°)
Tradewind	75.3	4.8	8.6	0.78
Kona waves	10.3	3.5	6.2	187
South swell	53.0	2.6	13.0	194

The Kona waves and south swell approach directly, while the trade wind waves are subject to diffraction as they approach the site. Even though the tradewinds do not approach directly, observations at the site indicate that they are the predominant wave type in the area.

Assuming a yearly average wave height of 3 feet and a period of 7.5 seconds at the site (conservative in light of the wave statistics), each wave crest or trough would generate the maximum bottom velocities listed in Table III.A.5-4.

Wave-induced resuspension of the bottom deposits will therefore occur, on almost a continuous basis, out to at least the 70-foot depth, utilizing the TER's conservative .49 ft/sec resuspension speed, and even further to beyond the 100-foot depth if 0.16 ft/sec is utilized. Once suspended, the sediments will be transported by the prevailing currents.

Table III.A.5-4. Wave-Induced Bottom Currents Versus Depth

Water Depth (feet)	Maximum Water Speed (ft/sec)
10	78 / 2.56
20	49/ 1.6
30	37/1.2
40	29/ 0.95
50	23 / 0.75
60	20/.65
70	15/ 0.49
80	12 / .39
90	10/ .32
100	8/.26

Data based on linear wave theory.

Further inshore, persistent surf maintains fine sands in a semipermanent layer of zero visibility, which may extend beyond the surf break over 300 m offshore (AECOS, 1980, pp 3-5). If fine sand can be kept in suspension in this zone, there is little probability that sewage particles would settle.

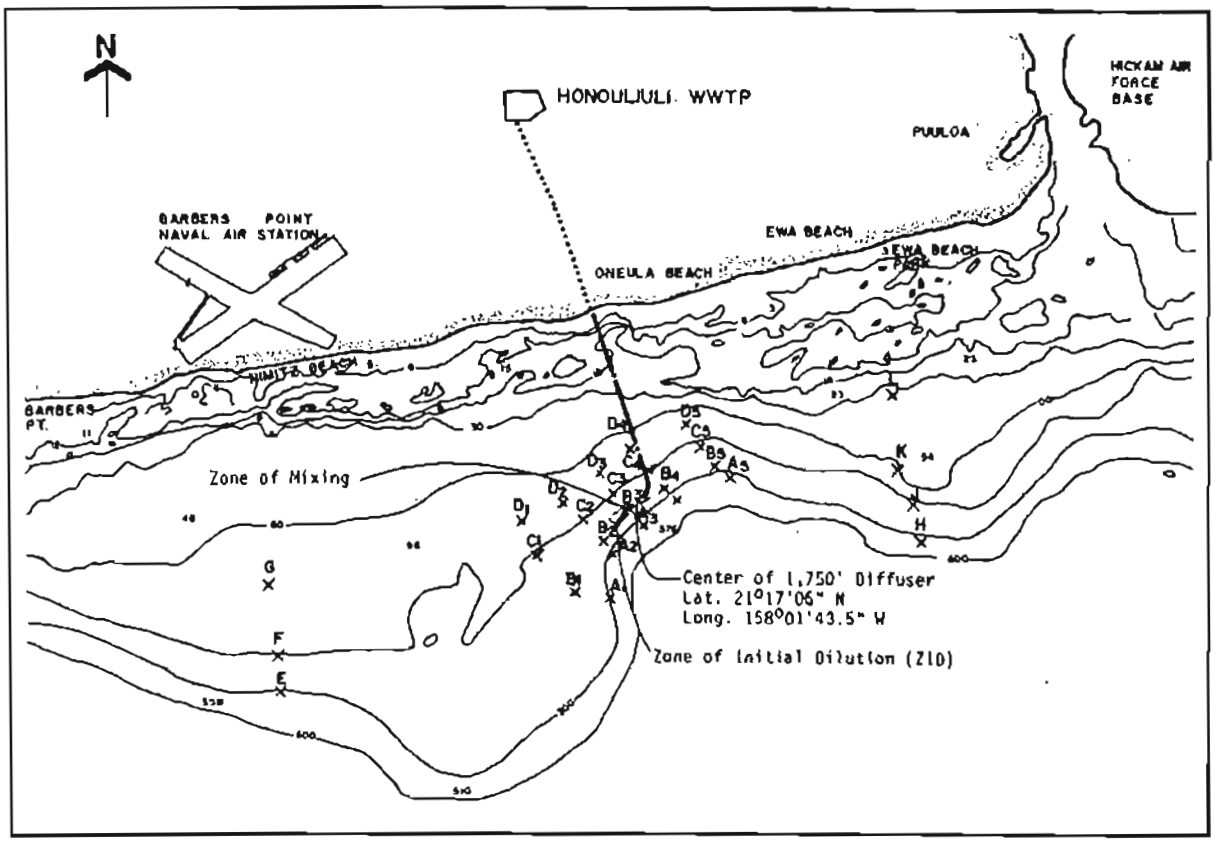
The levitation of particles is not necessary for the transport of sediment particles on a sloping bottom. Bed transport via a rolling motion of particles would serve as a supplemental, albeit minor, transport mechanism.

Existing Seabed Accumulation. If there were no resuspension and currents were weak so that a "pooling" effect results, then there should be some evidence of sediment accumulation from the existing "discharge" of the Pearl Harbor estuary. Under most weather and tidal conditions, this outflow moves in a westerly to southwesterly direction through the area shoreward of the Honouliuli diffuser. Because the Pearl Harbor outflow contains fine suspended solids, it can serve as a direct indicator of the potential for fine sediment accumulation in the area of concern noted by the evaluators of the Honouliuli waiveT application.

The suspended solids in the Pearl Harbor outflow that impinges on the general area of the Honouliuli outfall consist of silt and clay-size particles, as well as associated organic material and planktonic organisms. The sedimentary material found in the area of concern with regard to possible sediment accumulation from the Honouliuli outfall consists primarily of medium- to fine-sized sand. Sampling locations of recent field investigation are given on Figure III.A.5-6. The results of particle size determinations are given in Table III.A.5-5, while the results of analyses for nutrients, oxygen demand, and total sulfides are shown in Tables III.A.5-6 and HI.A.5-7. The benthic sediment data exhibit a high variability. The near diffuser stations do demonstrate a trend of slightly higher oxygen demand. In one instance, however, the oxygen demands for two out of three replicate samples of control station F exceeded the levels of the near diffuser stations. These analyses indicate sedimentary material consisting principally of medium to fine sand, with small amounts of silt-sized particles. The oxygen demand, TKN, total P, and total sulfide concentrations are significantly lower in this open coastal area than inside Pearl Harbor.

Sediment Deposition Model. The EPA model for computing seabed deposition rates of outfall particulates in coastal marine environments (SEDDEP) is used to model sedimentation rates near the Barbers Point outfall.

The model is based on: 1) an output grid system; 2) sediment deposition characteristics; and 3) ocean current data. The grid system defines the boundaries for the analysis, identifies the diffuser location, and provides bathymetric information. The sediment deposition information includes the sediment particle groups' settling velocities, the percentages of total MER each group represents, the instantaneous MER, and the wastefield depth.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HICKAM AIR FORCE BASE
PUULOA
BARBERS POINT NAVAL AIR STATION
EWA BEACH
EWA BEACH PARK
ONEULA BEACH
NANAKULI BEACH
BARBERS PT.
Zone of Mixing
Center of 1,750' Diffuser
Lat. 21°17'06" N
Long. 158°01'43.5" W
Zone of Initial Dilution (ZID)

Current meter data for use in the analysis were obtained from the University of Hawaii's current meter at the East Bottom Station. Duration of current measurement is approximately 10 days. The variables chosen for inputs are the maximum monthly MER and the "summer" trapping depth obtained from the initial dilution analysis in Part III.A.1. Average hourly values are calculated from the total data record, which is tabulated at 15-minute intervals.

The program uses current vectors to calculate the displacement of sediment particles with time prior to their deposition on the ocean floor. The vector is provided as a scalar velocity (cm/sec) and an angle that represents the direction, referenced to the grid. The grid system used for the SEDDEP analysis is shown on Figure III.A.5-7.

The results, including a total input listing of the SEDDEP analyses, are shown in Attachment 2 of Appendix F. The conclusion of the SEDDEP model results is that, if actual current conditions are considered, total deposition of sediment within Mamala Bay will be only 3 percent of the total. Ocean currents will displace the vast majority of sediment seaward before deposition occurs. This assessment does not consider the effects of resuspension.

5c. *What is the fate of settleable solids transported beyond the calculated sediment accumulation area?*

Response:

The nearshore bathymetry of the area is complicated and is marked by shelves, valleys, and ridges within a relatively small area. On the broad scale, *The Atlas of Hawaii* (Armstrong, 1983) shows that directly to the south the bottom drops off rapidly to a depth of about 1,200 feet and then levels off in a 10-mile-wide shelf of a 5-percent slope down to the 2,400-foot-depth contour. To the west and southwest, the bottom drops off at slopes of about 9 percent or greater.

in order for a particle that is being transported to the south to settle, it must have a minimum settling velocity, V_s, of a magnitude such that the ratio V_s/V_t where V_t is the transport velocity, is greater than the bottom slope. As shown on Figure III.A.5-2, for the sample used the greatest settling velocity is on the order of 0.1 cm/sec. Therefore, for a bottom slope of 5 percent, a particle with this settling velocity could reach the bottom if the net transport is less than 2 cm/sec (0.1 + 2 = 0.05). Because the offshore net transports are usually greater than 2 cm/sec (see Figure III.A.5-5) and are oriented toward the southwest, particles being transported offshore should not settle on this deep ocean shelf.

Previous plume dilution analyses have been conservative, ignoring the additional effects of secondary dispersion.

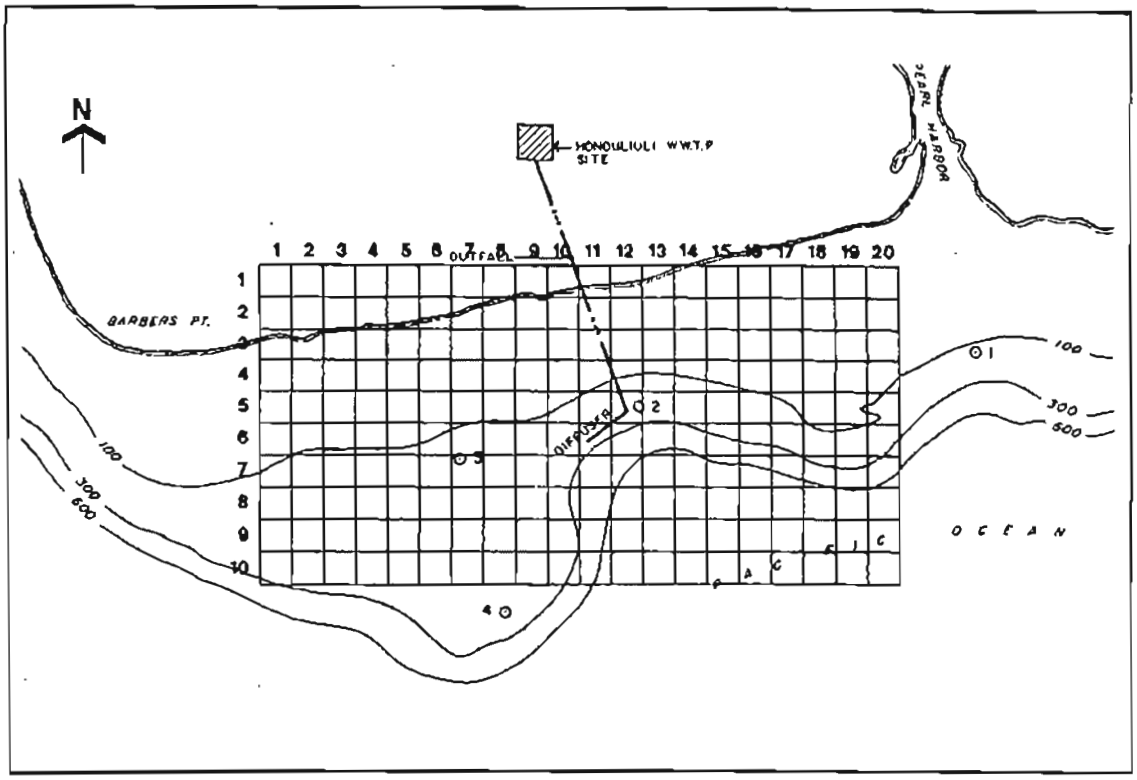

Figure III.A.5-7 Grid for Sedimentation Model

As previously noted in Chapter II, Part B, Section 4, the net transport at different depths are of different directions, which could shear and dilute the effluent plume to a very significant degree. The particles transported offshore would be dispersed over deep abyssal areas of extremely large extent so that sediment accumulation would be insignificant. The additional decay of the organic matter during its descent in the water column would adjunctly reduce deep benthic oxygen demands even further.

Table III.A.5-5. Honoullull Sediment Analysis - Particle Size Distribution

Station #	Depth (feet)	Class	Unified Soil Classification by Mesa Size, % Passing									
			SG	1/2"	3.8"	4	8	10	16	20	40	80
B-5	170	A	2.57		99.0	99.0	99.0	98.0	96.0	90.0	67.0	29
G	100	A	2.59	96.5	95.0	91.0	85.0	83.0	68.0	66.0	29.0	7
A-3	306	A	2.74	98.0	97.0	94.0	89.0	88.0	83.0	77.0	53.0	9
B-3	198	A	2.74	99.0	99.0	98.0	97.0	96.0	94.0	91.0	72.0	30
B-2	180	D	2.69			98.0	96.0	95.0	87.0	77.0	53.0	22
C-3	114	A	2.72			100.0	99.0	98.0	95.0	92.0	76.0	49
L	30	C	2.49	98.1	97.8	97.6	96.8	96.7	95.7	93.7	74.7	5.5
K	54	B	2.71		1.00.0	99.0	94.0	91.0	71.0	56.0	10.0	1.6
D-3	96	E	2.74				100.0	100.0	99.0	97.0	83.0	39
B-4	200	A	2.72	97.0		96.0	94.0	94.0	91.0	88.0	62.0	22
B-1	158	A	2.66			99.0	96.0	95.0	85.0	77.0	44.0	1.0

Coarse sand	4 to 10 mesh size
Medium sand	10 to 40 mesh size
Fine sand Silt and clay	40 to 200 mesh size > 200 mesh size

Class A = Medium fine sand with traces of coarse sand, silt, and clay
Class B = Medium sand with traces of coarse sand, silt, and clay
Class C = Fine sand with traces of coarse sand, silt, and clay
Class D = Medium to fine sand with traces of coarse sand
Class E = Fine sand with medium sand and traces of silt and clay

Source: Dames & Moore. 1972. *Geological and Geophysical Reconnaissance, Proposed Sand Island Outfall.* Prepared for I
Corp. (See Figure III.A.5-6 for station location.)

Table III.A.5-6. Results of Sediment Analyses
Barbers Point Outfalt - January 1983

Station and Sampling Date		Parameter (mg/dry kg) Oxygen Demand	TKN	Total-P	Total Sulfide
B2	1/4/83				
	Replicate A (180*)	150	170	8.7	1.7
	Replicate B (200')	180	170	17.6	2.1
	Replicate C (180')	130	210	10.4	2.3
B3	1/4/83				
	Replicate A (204')	410	260	17.6	3.4
	Replicate B (204')	370	280	15.5	5.6
	Replicate C (204')	340	270	15.5	3.5
F	1/4/83				
	Replicate A (120')	380	130	12.7	1.7
	Replicate B (120')	460	170	10.2	1.8
	Replicate C (120')	650	160	25.0	1.6
J	12/29/82				
	Replicate A (110')	160	160	14.3	1.2
	Replicate B (110*)	210	150	11.2	0.8
	Replicate C (110')	300	180	11.2	2.6

Table III.A.5-7. Results of Sediment Analyses
Barbers Point Outfall — April 1983

Station and Sampling Date		Parameter (mg/dry kg) Oxygen Demand	TKN	Total-P	Total Sulfide
B2	4/14/83	490	110	8.3	10.7
	Replicate A (200')	400	120	8.8	7.2
	Replicate B (200")	370	100	7.3	4.9
	Replicate C (200')				
B3	4/14/83				
	Replicate A (212')	530	110	8.8	3.9
	Replicate B (212')	416	120	10.4	2.7
	Replicate C (212)	460	120	8.5	3.2
F	4/14/83				
	Replicate A (130')	300	280	8.1	<1
	Replicate B (130')	200	190	5.4	<1
	Replicate C (130')	240	480	9.2	<1
J	4/13/83				
	Replicate A (132')	370	130	4.5	<1
	Replicate B (132')	270	120	4.7	<1
	Replicate C (132')	320	130	4.3	<1

B. Compliance with Applicable Water Quality Standards and CWS §304(a)(1) Water Quality Criteria [40 CFR 125,61 (b) and 125.62 (a)]

This section was required of applicants assuming that a specific 301(h) permit and monitoring program had not been issued and actual field monitoring data were limited. Thus, it was based on theoretical modeling results. Actual field monitoring is a more accurate means of assessing compliance with water quality standards and objectives contained in the Hawaii Administrative Codes (Appendix E).

The City & County of Honolulu has been conducting an extensive ocean monitoring program since 1981, and has prepared several comprehensive reports on water quality (M&B, 1989) and four recent annual reports summarizing the findings to date. These reports contain specific sections on compliance with water quality standards and present permit conditions which are reviewed by the state DOH and U.S. EPA, Region IX. In addition, the data are computer-coded and submitted to EPA for entry into the Ocean Data Evaluation System (ODES), a national database developed specifically for the 301(h) program. The specific methods used to determine compliance with water quality standards are contained in Appendix E.

Comment: See this section for compliance with State and Federal standards

1. *What is the concentration of dissolved oxygen immediately following initial dilution for the period(s) of maximum stratification and any other critical period(s) of discharge volume/composition, water quality, biological seasons, or oceanographic conditions?*

   Response:

   The lowest concentration of dissolved oxygen immediately following initial dilution during the periods of maximum stratification has been shown (by field monitoring) to be 5.796 mg/l, which is a reduction of .052 mg/l. (See Appendix F, Attachment 3, for detailed discussion.) This assumes the lowest initial dilution and lowest measured ambient dissolved oxygen concentration measured at the trapping depth. The largest difference to date measured by field monitoring in recent years is a difference of 0.255 mg/l between the downcurrent reference station (HBI) and edge of the zone of mixing (Station HM4), which resulted in 3.3 percent reduction in oxygen saturation (as measured in January 1995). At this time, the minimum percent saturation at the impacted station was 82.31 percent, well above Hawaii's requirement that waters shall not fall below 75 percent of saturation.

   The dissolved oxygen concentration for future discharge volumes can be predicted using the following equation:

$$DO_f = DO_a + \frac{DO_e - IDOD - DO_a}{S_a}$$

where DO_f = final dissolved oxygen concentration of receiving water at plume trapping level (mg/1)

DO_a = ambient dissolved oxygen concentration (5.85 mg/1), assumed at the trapping depth

DO_e = dissolved oxygen of effluent (0.0 mg/1)

IDOD = immediate dissolved oxygen demand (5.0 mg/1)

S_a = critical initial dilution (210)

A discussion of critical initial dilution values are presented in Section III.A.1, Based on data in Table III. A. 1-4, the recommended minimum (or critical) initial dilution is 210:1 under future maximum stratification conditions.

Thus, projected minimum DO concentration from this equation is 5.80, a reduction of less than 0.1 percent of the ambient minimum concentration.

State DOH dissolved oxygen water quality criteria require the concentration be not less than 75 percent of saturation. Dissolved oxygen saturation concentration for ocean water depends on temperature and salinity of the water. Average winter (at maximum stratification) water temperature at offshore locations is approximately 24.5°C, and average winter salinity is approximately 35 thousand parts per million (35,000 ppm). The saturated concentration of oxygen under these conditions is 6.81 mg/1; 75 percent of the saturated concentration is 5.11 mg/1.

The projected DO concentration through the modeling period is in compliance with State Water Quality Criteria.

2. *What is the farfield dissolved oxygen depression and resulting concentration due to BOD exertion of the wastefield during the period(s) of maximum stratification and any other critical period(s)?*

Response:

The farfield dissolved oxygen depression, as measured by field monitoring, has shown that the percent saturation has averaged 82.3 percent during the most critical periods (winter), which is also the annual minimum. Minimum dissolved oxygen values of 5.70 have been measured at the edge of the zone of mixing

(Station HM4). Oxygen depression has only been 0.25 mg/l during the critical period. (See Appendix F, Attachment 3, for details.)

The model used to predict farfield dissolved oxygen depletion is given in the guidance document (reference III.B(2)) as:

$$DO(t) = DOa + \frac{DO_f - DO_a}{D_s} - \frac{L_{fc}}{D_s}(1 - e^{-k_c t}) - \frac{L_{fm}}{D_s}(1 - e^{k_n t})$$

where DO(t) = Dissolved oxygen concentration in a submerged wastefield as a function of travel time, t, mg/L

DO_a = ambient dissolved oxygen concentration, mg/L

DO_f = dissolved oxygen concentration at the completion of initial dilution, mg/L

k_c = CBOD decay rate constant

k_n = NBOD decay rate constant

L_{fc} = ultimate CBOD concentration above ambient at completion of initial dilution, mg/L

L_{fm} = NBOD concentration above ambient at completion of initial dilution, mg/L

D_s = dilution attained subsequent to initial dilution as a function of travel time

The values of minimum ambient dissolved oxygen (DO_a = 5.85 mg/L) and final dissolved oxygen (DO_f = 5.80 mg/L) are discussed in the previous Section III.B.1. The initial dissolved oxygen deficit (IDOD) is estimated to be 5.0 mg/L (EPA, 1994).

Dissolved oxygen depletion, with time, is the result of both carbonaceous (CBOD) and nitrogenous (NBOD) components.

The outfall is located in open coastal water; therefore, the oxygen demand due to nitrifying bacteria should be negligible because there are few nitrifying bacteria available. Therefore, for this analysis, the NBOD components (e.g., L_{fm}) will be assumed to be zero.

Final BOD_5 concentration in the receiving water, following initial dilution, can be calculated by the equation:

$$BOD_f = BOD_Z + (BOD_e - BOD_a) / S_a$$

where BOD_f = final BOD_5 concentration (mg/l - L_{fc})

BOD_a = ambient BOD_5 concentration (mg/L)

BOD_5 = effluent BOD_5 concentration (mg/L)

S_a = initial dilution (flux-averaged)

A worst-cast condition, assuming BOD_e = 238 mg/L (based on the peak month in the year 2000), and greater than the Modified BOD Limit, BOD_e = 200 mg/L, will be utilized.

As discussed in Section III.A.I, the "critical" case initial dilution (S_a) is projected to be 210. The ambient BOD_5 concentration (BOD_a) is generally very low in ocean waters, and thus was assumed as 0 mg/l for these calculations. Final BOD_5 concentrations, following initial dilution, are projected to be:

$$BOD_f = 0 + \left(\frac{238 - 0}{210} \right) = 1.13 \text{ mg/L}$$

This five-day value can be converted to the ultimate BOD by multiplying by a factor of 1.46. Thus, L_{fc} = 1.46 x 1.13 = 1.65.

The decay rate (K_c) for CBOD recommended by the Revised Section 301 (h) Technical Support Document is 0.23/day (base e) at 20°C. Corrections for the local receiving winter ambient water temperature of 24.5°C require that K_c be adjusted to equal 0.28/day (EPA, 1994).

Dilution (D_s) attained subsequent to initial dilution is a function of the plume travel time (t) and the lateral diffusion. For open coastal areas, dilution can be predicted using the 4/3 Law, which states that the lateral diffusion coefficient increases as the 4/3 power of the wastefield width.

The farfield dilution (D_s) was obtained from Figure B-5 of the 1994 EPA 301 (h) guidance document. The initial field width (b) utilized was 2,000 feet.

The projected maximum DO depletion and deficit is 0.09 mg/l, which occurs 2 hours following initial dilution (Figure IILB.2-1). The minimum DO concentration is 5.76 mg/l.

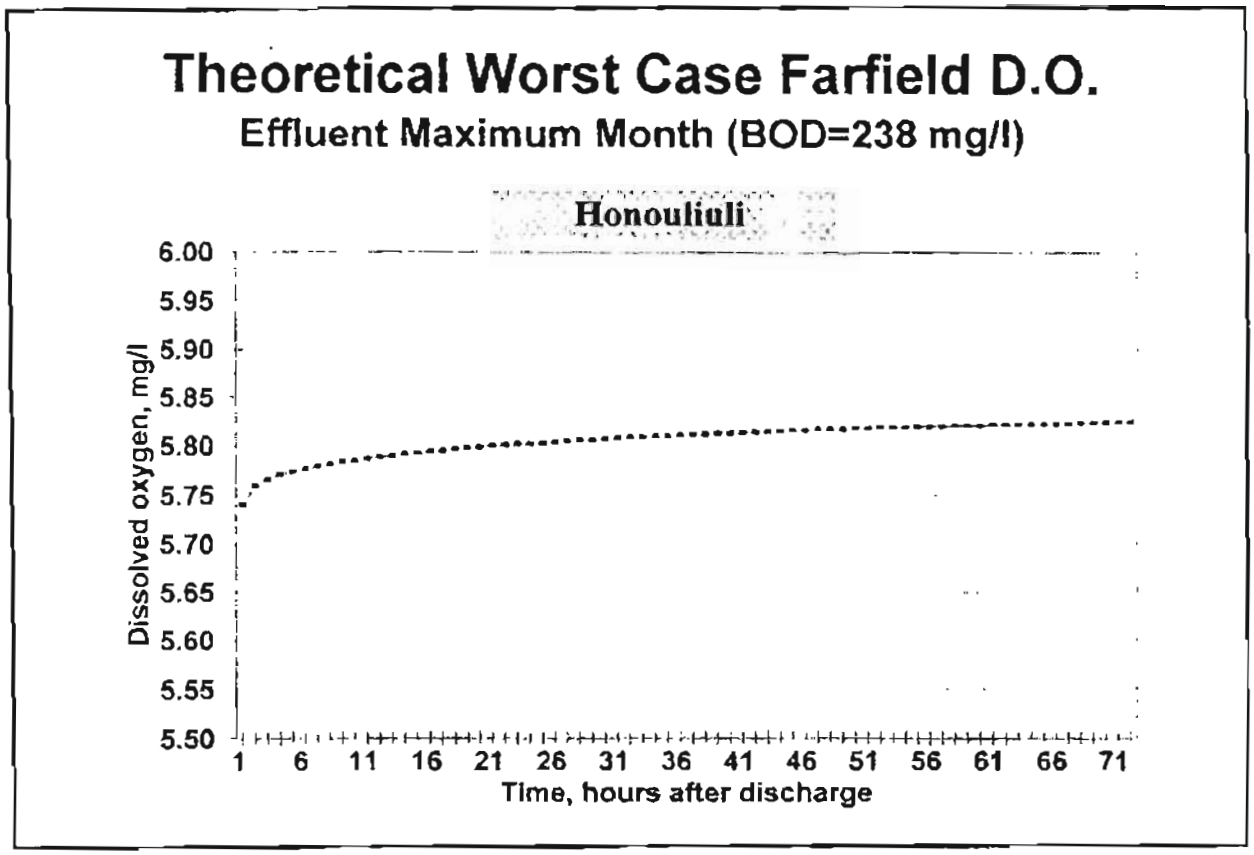

Figure III.B.2-1 Oxygen Reduction Resulting From Effluent Plume

The farfield dissolved oxygen concentration complies with State Water Quality standards, which required a minimum winter DO of 5.11 mg/1.

3. *What are the dissolved oxygen depressions and resulting concentrations near the bottom due to steady sediment demand and resuspension of sediments?*

Response:

Actual field data show depressions to be less than 0.20 mg/1 for a 24-hour period. Calculations using EPA methodology show similar results. (See Appendix F, Attachment 3 for details.)

4. *What is the increase in receiving water suspended solids concentration immediately following initial dilution of the modified discharge(s)?*

Response:

The suspended solids concentration following initial dilution can be estimated by a mass balance calculation. The equation is as follows:

$$SS_f = SS_a + (SS_e - SS_a)/S_a$$

where:

SS_f = Suspended solids concentration at completion of initial dilution (mg/1)

SS_a = Ambient suspended solids concentration 0.5 (rng/1)

SS_e = Effluent suspended solids concentration 95 (mg/l) S_a

S_a = Flux-averaged initial dilution (210)

Ambient suspended solids concentrations are not measured as part of the existing monitoring program, and there is no state standard. The surrogates used are turbidity, light extinction, and Secchi depth. It is assumed from historical measurements that ambient concentrations are on the order of 1 to 6 mg/1.

Effluent suspended solids concentrations for the improved discharge at the end of the permit term are projected to be 59 mg/1 on an average annual basis with a concentration of 95 mg/1 for the peak month emissions. The minimum initial dilution, 210, is used for the discharge. Using these values when SS_e = 95 mg/1, SS_f is 0.95 mg/1.

5. *What is the change in receiving water pH immediately following initial dilution of the modified discharge (s)?*

Response:

Examination of receiving water column samples indicates that the ambient pH ranges from 7.75 to 8.06. This data is taken from the Control Stations HB1 and HB7, which record ambient water quality data. An initial dilution of 100 from Table VI-11 of the EPA Technical Support Document (EPA, 1994) is assumed for this calculation.

Field monitoring of pH has shown that there is less than a 0.10 difference between reference and zone of mixing stations for pH. (See Appendix B.)

The monthly average effluent pH has ranged from 6.61 to 7.13 over the past five years, and receiving water pH has ranged from a minimum of 7.9 to a maximum of 8.26. The mean is generally between 7.9 and 8.2. No excessive or reduced pH has been measured that can be associated with the discharge.

The Honouliuli treatment facility experienced violations of the effluent pH requirements for the months of May through August in 1994. Enforcement of the city's sewer use ordinance limits emissions from industrial sources. An investigation of incidents of illegal discharge is under way.

In summary, it can be seen that even with a range of effluent pH and alkalinity, compliance with applicable standards will be achieved.

6. *Does (will) the modified discharge comply with applicable water quality standards for:*

- Dissolved oxygen?
- Suspended solids or surrogate standards?
-pH?

Response:

The applicable water quality standards of the modified discharge are outlined in the Hawaii Administrative Codes HAR 11-54, adopted 1992 (see Appendix E).

Dissolved Oxygen. As described in Section II-B.2, the "worst-case" farfield dissolved oxygen depression is not expected to fall below 6.25 mg/1 based on a minimum ambient (profile averaged) dissolved oxygen concentration of 6.3 mg/1. As described in Section II-B.3, the near-bottom dissolved oxygen depletion is not expected to be significant.

Based on the conservative analysis provided herein, and the fact that no oxygen depletion problems have been observed around the existing outfall, the discharge

will be in compliance with water quality standards and will not result in dissolved oxygen deficiency problems.

Suspended Solids and Surrogate Standards, As described in Section II.A.3, a minimum removal efficiency of 30 percent of suspended solids will be achieved in accordance with the requirements of 40 CFR 125.58. There are no Hawaii state standards for suspended solids in the receiving water. However, turbidity is a surrogate standard.

The State of Hawaii requires dischargers which have obtained a 301(h) waiver to demonstrate compliance with the state marine water quality criterion for light extinction. Compliance with this and the turbidity criterion for 1994 and the period 1990 to 1994 is summarized in Appendix E. Compliance with the light extinction coefficient could not be confidently determined due to the low number of sample points (16) compared to a required minimum of 30 data points. (For details on how compliance is determined, see Appendix E. For data used to determine compliance, see Appendix B.)

The Hawaii state standards for turbidity and the light extinction coefficient are closely tied to standards for nutrients and chlorophyll a, which are all designed to prevent eutrophication. The calculation of compliance is described in detail in Appendix E, Attachment 2, The calculations are based on long-term trends and are quantitative.

As shown in Appendix E, the turbidity and light extinction coefficient standards from the Honouliuli discharge are well below what is required to meet Hawaii state water quality standards. Under future discharge conditions, there is expected to be no substantial change in compliance which is met with a large margin of safety (30 to 40 percent below most standards).

pH. As described in Section III.B.5, maximum change of pH immediately following initial dilution was estimated to be 0.2 when considering a range in the discharge pH of 6 to 9 and the range of ambient pH of 7.7 to 8.5. This is in compliance with the Hawaii state standards.

Bacteriological Standards. The critical standard for Hawaii state compliance for the Honouliuli outfall are the bacteriological requirements because the improved discharge will have no final effluent disinfection. The outfall design was based primarily on the distance offshore required to provide compliance with stringent bacteriological standards imposed within 1,000 feet from the shoreline. The Hawaii state bacteriological standards are based on five-day/month sampling. A summary of compliance over the past five years is shown in Appendix G.

Toxicity. The toxicity of the improved discharge is expected to continue to decrease and will continue to remain low, with respect to existing Hawaii state toxicity criteria. Results of toxicity testing are presented in Appendix G.

III.B.

Provide data to demonstrate that all applicable state water quality standards, and all applicable water quality criteria established under Section 304(a)(a) of the Clean Water Act for which there are no directly corresponding numerical applicable water quality standards approved by EPA, are met at and beyond the boundary of the ZID under critical environmental and treatment plant conditions in the water surrounding or adjacent to the point at which your effluent is discharged. [40 CFR 125.62(a)(1)]

Response:

In accordance with 40 CFR 125.69(b)(2), a letter has been sent to the Hawaii Department of Health, requesting that they provide certification that the proposed improved discharge will comply with all applicable Hawaii water quality standards. A copy of the letter is presented in Appendix E, Attachment 3.

Provide the determination required by 40 CFB 125.61(b)(2) for compliance with all applicable provisions of State law, including water quality standards or, if the determination has not yet been received, a copy of a letter to the appropriate agency(s) requesting the required determination.

Response:

Refer to Section III.B and Appendix E, Attachment 2.

C. Impact on Public Water Supplies [40 CFR 125.62(b)]

1. *Is there a planned or existing public water supply (desalinization facility) intake in the vicinity of the current or modified discharge?*

   Response:

   There is currently no existing or planned public water supply which derives its waters from nearshore marine sources on the island of Oahu.

2a. *If yes, what is the location of the intake (s) (latitude and longitude)?*

   Response: This question is not applicable,

2b. *If yes, will the modified discharge(s) prevent the use of intake(s) for public water supply?*

   Response:

   This question is not applicable.

3c. *Will the modified discharge(s) cause increased treatment requirements for public water supply (s) to meet local, state, and EPA drinking water standards?*

   Response:

   This question is not applicable.

F. Establishment of a Monitoring Program (40 CFR 125.63]

1. *Describe the biological, water quality, and effluent monitoring programs which you propose to meet the criteria of 40 CFR 125.63. Only those scientific investigations that are necessary to study the effects of the proposed discharge should be included in the scope of the 301(h) monitoring program (40 CFR 125.63(a)(l)(i)(b)].*

   Response:

   The existing monitoring program is contained in the NPDES permit (Appendix A). This program will be continued until the new permit is issued or upon modification by the EPA. The City & County of Honolulu is not requesting any specific modifications to the present monitoring program pending resolution of ongoing discussions regarding toxicity testing requirements. There may be issues arising out of the findings of this report which will need to be addressed. The City would prefer to wait and see the results of this study.

   The details of the present monitoring program are described in the existing NPDES permit and in the 1994 Annual Assessment report. Also, the rationale and logic for use of various methods and the various parameters that are to be measured are well described in the Sand Island 301(h) modified NPDES permit application, which was submitted in August 1994 to EPA Region IX and the Hawaii DOH. The data submitted with those reports contain sufficient details on the city's programs and resources to continue to conduct the existing monitoring programs.

   A copy of the requested changes and supporting documentation is provided in Appendix I.

2. *Describe the sampling techniques, schedules, and locations, analytical techniques, quality control and verification procedures to be used.*

   Response:

   The City & County of Honolulu has extensive documentation on their existing monitoring program, which has been provided to the EPA and the State of Hawaii. This information will not be repeated here. Also, the annual report contains descriptions of all of the techniques utilized. In addition, the City & County of Honolulu's Department of Wastewater Management laboratory located at the Sand Island WWTP has a full-time QA/QC officer and extensive documentation and ongoing program to assure that the highest-quality data are obtained.

D. Biological Impact of Discharge [40 CFR 125.62(c)]

1. *Does (will) a balanced indigenous population of shellfish, fish, and wildlife exist*

   Immediately beyond the ZID of the current and modified discharge(s)?
   In all other areas beyond the ZID where marine life is actually or potentially affected by the current and modified discharge(s)?

Response:

Introduction. Available data from the City & County of Honolulu's marine monitoring program clearly indicate the existence of a balanced indigenous population (BIP) of shellfish, fish and wildlife immediately beyond the ZID of the existing discharge. Proposed modifications to increase the loading of biochemical oxygen demanding substances is not predicted to have any significant impact on marine water quality or the BIP. The city presently plans on maintaining the current level of treatment (primary and secondary) and maintain existing effluent quality by the control of toxic pollutants through source control. Water conservation efforts have resulted in a higher strength wastewater which may result in higher concentrations of some constituents, but the concentrations will not be high enough to cause a violation of water quality standards.

Since 1990, the city has been conducting water quality and benthic surveys in a consistent manner in a program designed to conform to guidelines established for the 301(h) Marine Monitoring Program. From the evidence at hand, it is clear that conditions have not "changed"[1] as a result of the Honouliuli discharge over the past eighteen years since the first survey was conducted in 1986. Based on the knowledge gained by the work of the contract scientists of the University of Hawaii and the city's own ocean monitoring crew, the measured changes appear to be those associated with natural forces (including Hurricane Iniki in 1992).

Much of the evidence for the lack of demonstrated changes in the biological community rests on the burgeoning database of wastewater and sediment quality, fish and invertebrate samples collected since the early 1990s.

This application makes a sincere attempt to use these data to explore the relationships(s) between waste discharge and environmental effects, and to provide appropriately responsive answers to this questionnaire. While violations still occur for some permit conditions, these have not posed a threat to water quality or the biological community. This conclusion has been supported by a major court finding in

1993 by Judge Fong in the 10th Circuit Court (Civil Nos. 90-00218-HMF and 00793-ACK).

Judge Fong found that:

> There is no evidence that the Honouliuli discharge currently poses a threat to public health or the environment.
>
> The city's noncompliance is significantly mitigated by the lack of quantifiable harm and the city's good faith reliance on the validity of the interim effluent limitations set by the DOH.
>
> The court can conclude, however, that there has been little measurable effects from the discharge on the environment in Mamala Bay in the studies done to date.

The city believes that present conditions compare very favorably with historical conditions, and that these useful facts make a favorable decision easy by present standards and the challenges that the city has faced in securing the present permit.

One of the more important concepts of the 301(h) permit waiver requirements is that potentially affected waters shall not differ substantially from control localities which are unaffected by the discharges in the vicinity.

Important points in the evaluation of existing data are: • there is a great deal of natural variability south to north compared to the mean value for the entire set; • there are few differences between the data from ZID, ZID boundary, and control stations; • there are even greater differences between years that appear to be unrelated to wastewater discharge. All of the analyses indicate the need for a better understanding of natural variability and directed change, both long- and short-term.

Monitoring of the sand bottom animal communities near the Barbers Point ocean outfall and at reference stations at greater distances from the outfall have been carried out in 1986, 1990 through 2003. The monitoring program was designed to evaluate whether any changes in the benthic community may be occurring as a result of the proximity to the outfall diffuser. Physical-chemical measurements of the sediments, together with consistent use of measures to quantitate, the benthic organisms have been sampled and analyzed annually since 1990 to evaluate outfall impacts. The results are reported in annual benthic sampling reports prepared by Nelson and others at the University of Hawaii (Nelson et al., 1987a, 1991, 1992a, 1993, 1994a, and 1995).

Physical-chemical measurements include sediment grain size, sediment organic content, oxidation-reduction potential of the sediments (an indicator or oxygen availability), and sediment oil and grease content (a surrogate marker for effluent particulate matter). There has been no indication of noteworthy changes in any of these parameters over the study period. There has been no indication of an accumulation of organic matter resulting from wastewater effluent at the stations near the diffuser. Additional information is provided in Appendix C.

Sediment Analyses. Physical characteristics relating to sediments in the vicinity of the Honouliuli outfall have been described in Appendix C and in the annual benthic reports (Nelson et al., 1995).

Monitoring program measurements of physical parameters made annually over the period 1986 to 2003 showed no evidence of a buildup of organic matter in the vicinity of the Barbers Point ocean outfall diffuser. This conclusion is confirmed by each of the physical and chemical parameters measured. These are discussed in detail in Appendix C and in Section II.C.

Sediment grain size is described in Appendix C.

Oxidation-Reduction Potential in Sediments, Mean sediment oxidation-reduction potential (ORP) values over the sampling period 1986 to 2003 shows no statistically significant difference among sample dates or among stations in this parameter (two-way ANOVA). In general, there is no evidence to suggest the present outfall is exerting more than a localized effect in the immediate vicinity of the discharge.

Total Organic Carbon Levels in Sediments. Mean total organic carbon values over the period 1990 to 2003 indicate there is clearly no difference in the mean between stations when looking at the long-term trends (See Appendix C).

In general, there is no evidence to suggest the present outfall is exerting more than a localized effect in the immediate vicinity of the discharge (Nelson, 1995).

Oil and Grease Levels in Sediments. Over the years, the maximum values of mean sediment oil and grease (O&G) are often found within the ZID or at ZID-boundary. At Station HB4, there was no trend in mean O&G values in relation to the diffuser. At reference stations HB1 and HB7, values have sometimes been the highest measured as in 1992 and 1991.

Trace Metals. There has been no consistent pattern in trace metals concentrations which can be considered to be related to the outfall discharge (Section II.C). Concentrations have varied considerably over time by as much as an order of magnitude for some metals, and there is no consistency in the patterns found. Generally, the levels are all consistent within any single sampling period with the order of magnitude difference being between sampling years. Within a given sampling period, the difference in average sediment concentrations may vary by as much as eight-fold. Overall, given the low concentrations of trace metals found in the effluent, it does not appear that the outfall is contributing to sediment accumulation of metals. Concentrations have not increased over time and appear to have been decreasing during the past few years. Whether this decrease is related to source-control efforts or to analytical differences cannot be determined. A thorough discussion of trace metals in sediments is presented in Appendix J. Data and figures for the dependent changes are located in this appendix.

Benthic Infauna. The benthic infauna is discussed at length in Appendix C and supporting attachments. Provided here is a summary of some general features of the long-term database. The annual monitoring reports are also useful sources of statistical information and multivariate analysis. The results and discussion sections from these reports are presented as Attachment 2 of Appendix C.

The spatial patterns of organism abundance and species richness in relation to the

outfall have varied, depending on the taxonomic grouping. No pattern of reduction of either abundance or species richness at stations near the diffuser was observed for total non-mollusks, crustaceans, or mollusks over time.

The original 1986 outfall study (Nelson et al., 1987) and its conclusions formed the basis for the BIP determination for the granting of the original 301(h) modified NPDES permit. Independent review by EPA's contractor (Tetra Tech, 1987) confirmed that the evidence for a lack of effect on the benthic community by the diffuser effluent was compelling. Nelson et al. (for each annual survey) conducted cluster analyses of non-mollusk data which indicated that for most years surveyed all of the seven sampled stations are relatively similar to one another in terms of species composition and relative abundance (Nelson et al., 1987, 1990, 1991, 1992, 1993, 1994, and 1995).

There are a large number of summary graphs and tables which support the finding that a BIP exists near the Honouliuli outfall and within and beyond the zone of initial dilution. Rather than present these in the text of this questionnaire, they have been put in Attachment 5 of Appendix C. These figures include summaries of the number of species per station and mean number of species at each station over time, abundances changes over time by station and by survey, graphs in trends in diversity, evenness and dominance over the period 1990 to 1995, and trends in the abundance and number of species of various taxonomic groups.

Species diversity (H) and evenness 0) were relatively similar among all stations for both total non-mollusks and for mollusks. The Pearson and Rosenberg model (1978) of benthic organic enrichment states that in the transition zone on an organic enrichment gradient a few species will increase and be extremely dominant, while overall diversity and evenness are low. For example, Swartz et al. (1986) showed that the polychaete *Capitella* sp. made up 85 percent of abundance of the benthic community at a station within 1 kilometer of sewage outfalls off Los Angeles, 56.2 percent of the community at 3 kilometers from the outfalls, and only 0.6 percent of abundance at 5-kilometer distance. Over the years, the range of values for capitellid polychaetes has ranged from 0.6 to 2.2 percent (Nelson et al., 1992). There is no indication of a strong increase in capitellid dominance at stations near the outfall. Normally only one or two individuals are found per station if they are present at all.

In an analysis of the 1986 sampling data, Tetra Tech (1987) compiled a comparison among stations of the percentage composition of opportunistic and pollution-tolerant species, as defined by Pearson and Rosenberg (1978). The Tetra Tech report concluded that there was no evidence of an increase in the proportional representation of these species at stations near the ZID in 1986. Nelson in 1993 prepared a similar analysis for the 1992 survey data using the same nonmollusk species utilized in the Tetra Tech report. Percentage composition of opportunists was extremely similar at six of seven stations, with reference station HB1 having a somewhat higher value. Thus in 1992, there continued to be no evidence of an increase in pollution-tolerant species at stations near the ZID.

The benthic fauna of the Barbers Point outfall area is generally similar to that of the Sand Island Outfall area. Benthic communities adjacent to the Sand Island Ocean Outfall have also been studied with similar methodologies since 1986 by the same taxonomists and statisticians. The magnitude of discharge from Sand Island Outfall is approximately three times greater than for Barbers Point, but the conclusions concerning the impact of the effluent on the benthic community have been similar for the two areas over the years. This is a useful means of predicting future conditions that are likely under

increased loadings from Honouliuli.

Conclusions from the benthic studies at the Sand Island ocean outfall show no strong response patterns of benthic infauna. These parallel results from the Sand Island Outfall in a similar depth range and with similar benthic communities lend additional support to the results from the Barbers Point study.

Neither the response patterns of the benthos nor the physical sediment data would support the hypothesis that organic enrichment is occurring in the vicinity of the Barbers Point ocean outfall. Compositions of the benthic community within the ZID, on the boundary of the ZID and at reference stations from 3.7 to 3.8 kilometers from the diffuser, while displaying year to year variation, have remained generally similar to one another throughout the seven-year period studied to date,

According to Nelson, 1993: "Analysis of benthic communities has shown that the abundance, the number of species, the diversity of species, the evenness of individuals distributed among species in the community, and the species composition of the benthic community have no pattern of change which could be attributed to an influence of effluent from the diffuser." Studies done since that time have confirmed the trends noted through 1993.

Of particular note for predicting the impact of increased wastewater loads in the future, as projected flows for the Honouliuli service area increase, is the fact that the benthic community in the area of the Barbers Point outfall is generally similar in species composition to that in the area of the Sand Island outfall. The benthic community in the area of the Sand Island ocean outfall, as that in the region of the Barbers Point outfall, has shown no indications of changes attributable to the diffuser effluent, in spite of much higher effluent discharge rates at Sand Island. The Sand Island renewal application for a 301 (h) modified NPDES permit was submitted in August 1994 and contains a summary of the benthic studies done around this outfall. These studies lend additional support to the conclusion that Barbers Point ocean outfall has no significant impact on benthic population.

The monitoring data over the period 1986 to 2003 indicate that a balanced indigenous population (BIP) of benthic organisms has been maintained even at stations immediately adjacent to the Barbers Point ocean outfall diffuser.

Fish and Macroinvertebrates. Available data on populations of fish and macroinvertebrates in the vicinity of the Honouliuli outfall indicate the presence of a BIP. There is some indication that abundances of certain species differ in the immediate vicinity of the outfall which serves as an artificial reef and enhanced area of potential prey species (Appendix G), but this is not felt to represent a major community imbalance. Patchy distributions, low abundances, and transitory nature of several of the fish species can result in variable sample catches, and thus, it is difficult to attribute differences among stations to outfall-related impacts. In general, the species composition and abundances in the vicinity of the outfall are characteristic of shelf assemblages found in similar bottom environments throughout Mamala Bay.

Based on Barbers Point coral reef surveys, a BIP of these organisms exists immediately beyond the ZID,

Status of Fisheries. There are two basic fisheries, the nearshore coral reef fisheries, and

the pelagic or offshore fisheries. The offshore fishery, which is dependent upon use of long lines, operates far offshore (up to 75 miles) and is focused on the valuable pelagic species such as tuna. The nearshore fishery, excluding the northwest Hawaiian Islands lobster fishery, was worth just 4 percent of the pelagic catch (Dollar, 1993).

Marine recreational fishermen are not licensed, and catch records are not available. The commercial catch record near the Honouliuli outfall is recorded as one of a fishing block, which is one of many such statistical areas around Oahu (Figure G-2-1 of Attachment 2 of Appendix G). This statistical area extends from the shore seaward about 2 miles and stretches almost 11 miles along the coast.

Brock (1993) did an analysis of commercial fisheries for the periods 1971 to 1972, 1981 to 1982, and 1991 to 1992, for statistical square 401 representing the pre-outfall, newly initiated outfall discharge, and the latest operating conditions. He noted several things from this analysis:

1) The catches made in this square are trivial relative to those statewide, accounting for 0.3 to 0.8 percent of the totals for the state.

2) The annual catch was very low in terms of productivity, with an annual catch of Q.7g/m2.

3) Changes noted in the fishery are not significant, and the variation is probably related to the effort expended and reported rather than from changes in abundance in species.

4) There are no significant shellfish resources harvested in the area because they are not present.

Brock (1993) concluded that: "The commercial fisheries data suggest that the coral reef fisheries in the vicinity of the Honouliuli discharge have not been significantly impacted by its operation. Reef fish densities from the time preceding outfall construction have not significantly changed since that outfall became operational."

Brock has also completed studies of the nearshore areas off Ewa Beach as part of the outfall monitoring program. Results for the two surveys done in 1991, 1993, and 1994 are shown in Table III.D.1-1.

Table III.D.1-1. Summary of the Biological Parameters Measured at Stations Sampled in August 1991, May and September 1993, and April 1994

Transect	% Algal Cover			% Coral Cover			No. of Coral Species			No. of Invert. Species			No. of Fish Species			No. of Fish Individuals			Biomass (g/m^2)		
	1991	1993	1994	1991	1993	1994	1991	1993	1994	1991	1993	1994	1991	1993	1994	1991	193	1994	1991	1993	1994
BP-1-A	4.2	6.4	6.3	23.9	20.9	27.2	3	5	2	4	4	8	47	41	39	745	375	387	406	249	222
BP-1-B	6.1	3.7	3.2	29.4	27.2	25.4	3	3	3	2	4	4	42	44	42	453	488	371	374	490	202
BP-2A	0.5	0	0	3.6	1.8	1.2	3	2	2	6	7	3	10	6	5	21	6	7	7	9	2
BP-2B	0.3	0	0	2.7	1.3	1.0	3	2	2	4	4	6	6	12	11	12	21	36	2	11	25
BH-3A	3.0	0.1	0.1	8.0	1.2	1.4	4	3	4	8	9	6	38	28	26	367	82	191	343	70	255
BP-3B	0.3	1.8	3.0	11.6	8.3	9.5	5	4	4	6	6	8	30	17	18	187	161	109	121	311	445
BP-4A		0.3	0.2		17.9	19.3		3	2		6	7		49	51		537	1,563		374	1,305
BP-4B		0.7	0		0.2	3.3		2	2		2	2		2	10		3	15		1	12
Mean	2.4	1.6	1.6	13.2	9.9	11.0	4	3	3	5	5	6	29	25	25	298	209	335	209	189	309

Note: Coral and algal percent cover, as well as the number of coral species, are from the photoquadrats and other data from the 4 m x 20 m area visually assessed at each transect site. Note that Transects BP-4A and BP-4B were first sampled in September 1993.

Source: Brock, R.E. 1994a. *Community structure of fish and macrobenthos at selected sites fronting Sand Island, O'ahu, Hawai'i, in relation to the Sand Island ocean outfall, year 4 - 1993.* Water Resources Research Center, University of Hawaii, Honolulu. Project Rept. PR-94-14. 36p.

Coral Reef Monitoring Results, The city has contracted with the University of Hawaii to conduct a shallow-water survey of the community structure of fish and macrobenthos at three study sites in water depths ranging from 5 to 37 feet deep inshore of the outfall terminus at distances ranging from 1.6 to 2.9 kilometers from the terminus of the outfall. More details on the locations and methods involved are contained in Appendix C and in the project reports produced to date (Brock, 1992a, 1994f, and 1995b, 1996 through 2002).

The three study sites were sited to capitalize on presumed gradients of impact from wastewater effluent moving toward the shore and the coral reef communities. Data from the surveys have shown that scour and wave impact are some of the largest influences on the benthic communities. A comparison of the data from the first three surveys indicated that no statistically significant change has taken place at these permanent sites and supports the contention that the operation of the outfall is not having a quantifiable impact on the coral reef resources inshore of the outfall (Brock, 1994b).

Plankton. Evaluation of the existence of a BIP of plankton in the vicinity of Honouliuli's discharge is limited by insufficient data. However, there is no evidence to suggest adverse impacts to either phytoplankton or zooplankton populations resulting from the effluent based on field observations. Dr. Laws measured chlorophyll a concentrations and nutrient data in the vicinity of the outfall (Laws, 1993), and concluded that there was no significant outfall influence on phytoplankton growth. Some nutrient enrichment is noted, but the input is small compared to other sources in the region such as outflow from Pearl Harbor. Zooplankton data were collected in Mamala Bay and in a remote area many years ago (ABCOS, 1983a), and these studies were inconclusive with regard to the influence of wastewater discharges on plankton populations.

The overwhelming influence of large-scale climatic and other physical and biological factors on plankton populations makes the possibility of significant adverse effects from wastewater discharge unlikely. Initial dilution of the effluent and flushing characteristics of the area result in relatively minor changes in water quality conditions (mainly nutrient inputs) that may affect plankton populations. The effects of seasonal changes, nutrient availability, light levels and water column stability, as well as plankton life-cycle characteristics and biological interactions, are of such magnitude that localized nutrient or low-level toxic inputs are insignificant to plankton populations. High variability in populations of both phytoplankton and zooplankton in response to natural phenomena indicates localized impacts resulting from wastewater discharge through the outfall would be unlikely to effect significant changes on plankton populations.

Bioaccumulation of Toxic Materials. Toxic pollutants contained in the present and expected levels in the improved discharge do not and should not adversely impact the BIP through either acute or chronically toxic effects or be bioaccumulated to levels which might adversely affect food webs or human health.

Effluent Toxicity. This renewal application presents the results of both dry and wet weather priority pollutant analyses of effluent as required, but it must be recognized that there can be a seasonal difference in flow (but not toxicants) to the Honouliuli treatment plant. These priority pollutant analyses have consistently shown that there are very few toxic pollutants present in the effluent. To date, analyses have not shown the presence of toxic organic compounds, or pesticides. The trace metals, copper and zinc, are the only priority pollutants to be consistently found above the limits of detection. All detectable toxicants were found at levels which were well below those levels needed to be in compliance with State of Hawaii water quality standards (See Appendix J for more information).

Effluent toxicity is measured using various techniques to assess chronic toxicity. Both *Ceriodaphnia dubia* and Hawaiian marine species (various urchins) are used to assess toxicity. The results of these whole effluent toxicity tests show that the sea urchin tests are difficult to conduct for a variety of reasons, including inability to collect specimens, unacceptable control performance, and insufficient gametes to perform the test. For the ongoing WET test failures, the City has an action plan as describe in this application.

Chronically Toxic Effects. To assess whether the discharge of potentially toxic compounds will impact the BIP immediately beyond the ZID, an evaluation of expected water quality conditions was performed. The calculation of the priority pollutants and pesticides are presented in Appendix J.

To evaluate the potential for impacting the balanced indigenous population, a comparison was made between existing State of Hawaii water quality Standards (HAR Chapter 11-54) and the maximum effluent concentration of various priority pollutants. Few criteria exist for the priority pollutants are presented in Appendix J. Comparisons of maximum effluent concentrations (based on present effluent quality) with the ambient receiving water standard for aquatic toxicity show that no effluent values after initial dilution exceed receiving water standards

In evaluating those with the greatest potential for possibly causing adverse impacts, an average 200 for the outfall was applied. An explanation for the using this figure and the application of the dilution on the priority pollutants are provided in Appendix J. As indicated, after dilution, none of the compounds found in the effluent exceeded the State Water Quality Standards for aquatic toxicity. A detailed analysis of compliance was presented by the City & County of Honolulu in the 2003 Honouliuli WWTP Annual Assessment Report, which describes the methodology used to determine compliance.

Another analysis of toxic pollutants is included in the analysis of sediments (See Appendix J), as well as Attachment 3 of Appendix G addressing Bioaccumulation, At present, levels of the compounds in benthic fish muscle are all below available NAS guideline levels for whole fish and well below FDA action levels for the edible portion (Appendix G, Attachment 3), and there is nothing to indicate that this situation will change in the future.

Summary of the Potential for Toxics Bioaccumulation. The potential for toxic effects from pollutants present in the treated wastewater effluent will continue to be low, given the lack of industry within the Honouliuli service area. Enhanced source control efforts will be continued to maintain toxics at low levels. Continued and enhanced effort will be made to provide for pretreatment compliance and implementation of educational programs to control the entrance of toxics into the sewer collection system, with particular attention given to pesticides and other priority pollutants.

2. *Have distinctive habitats of limited distribution been impacted adversely by the current discharge and will such habitats be impacted adversely by the modified discharge?*

   Response:

   No distinctive habitats have been identified in areas potentially impacted by the existing or proposed discharges.

3. *Have commercial or recreational fisheries been impacted adversely by the current discharge (e.g., warnings, restrictions, closures, or mass mortalities) or will they be impacted adversely by the modified discharge?*

   Response:

   Recent commercial and sport fisheries catch records indicate no adverse effects on fishery resources in the vicinity of the Honouliuli outfall.. The area around the existing outfall is utilized by various fishermen, but existing catch records show that the percentage of the Oahu catch that is derived from this area is very low. The Honouliuli WWTP Annual Assessment Reports (1995 through 2003) provide a chapter on the fish catch statistics for the area in the vicinity of the Barbers Point Ocean Outfall.

4. *Does the current or modified discharge cause the following within or beyond the ZID: [40 CFR 125.62(c)(3)]*

   Mass mortality of fishes or invertebrates due to oxygen depletion, high concentrations of toxics or other conditions?

Response:

Mass mortalities of fish or invertebrates have not been reported in the area of the outfall. A review of the literature and inquiries to the Department of Land and Natural Resources, Department of Health, and fishery specialists at the University of Hawaii have indicated that no known mass mortalities had occurred.

An increased incidence of disease in marine organisms?

Response:

Fish caught for bioaccumulation analyses are visually examined for gross morphological evidence of diseases and ectoparasites. No unusual ectoparasites have been observed.

No cases of possible fin erosion have been observed to date in any of the various fish surveys.

No other external lesions or tumors have been noted. Additional information is provided in Appendix J.

An abnormal body burden of any toxic material in marine organisms?

Response:

The present and improved discharge does not cause any abnormal body burden of toxic pollutants, which is known to have adverse effects on the organism or consumers. The presence of PCB and DDT compounds, both historically discharged, still cause high body burdens; but loadings are now very low. Tissue burden levels of trace metals and pesticides, and priority pollutants are more related to regional influences from multiple sources. Sediments near the ZID do not contain toxicants, other than trace metals, at levels significantly different from the reference station's. Nonpoint sources of pesticides in the tributaries to Mamala Bay may be significant contributors to local toxicant body burdens of chlorinated compounds not present in the discharge. Pearl Harbor and local flood control and urban drainage channels may also contribute to local water quality impairment. It is anticipated that these issues will be discussed in more detail along with estimates of mass loadings in the study being completed by the Mamala Bay Study Commission to be finalized in December 1995.

A review of the pollutants detected in the effluent, sludge, fish and sediment is provided in Appendix J.

Any other extreme, adverse biological impacts?

Response:

No other extreme, adverse, biological impact is known to have occurred or is expected to occur. The existing monitoring program will be continued to detect any such impact should one occur.

5. *For discharge into saline estuarine waters: [40 CFR 125.62(c}(4)]*

   Does or will the current or modified discharge cause substantial differences in the benthic population within the ZID and beyond the ZID?

   Does or will the current or modified discharge interfere with migratory pathways within the ZID?

   Does or will the current or modified discharge result in bioaccumulation of toxic pollutants or pesticides at levels which exert adverse effects on the biota within the ZID?

   No section 301 (h) modified permit shall be issued where the discharge enters into stressed saline estuarine waters as stated in 40 CFR 125.59(h)(4).

   Response:

   This question does not apply because the discharge is not into saline estuarine waters.

6. *For improved discharges, will the proposed improved discharge(s) comply with the requirements of 40 CFR 125.62(a) through 1225,62(d)? [40 CFR 125.62{e)]*

   Response:

   This question is not applicable.

7. *For altered discharge(s), will the altered discharge(s) comply with the requirements of 40 CFE 125.62(a) through 125.62(d}? [40 CFR 125.62(e)}*

   Response:

   Available data do not indicate adverse ecological impacts due to the current discharge. Studies of the benthic infauna, observations and diving surveys of fish and macroinvertebrates suggest balanced indigenous populations of these organisms exist beyond the zone of initial dilution.

8. *If your current discharge is to stressed ocean waters, does or will your current or modified discharge: [40 CFR 125.62(f}J*

   Contribute to, increase, or perpetuate such stressed condition?

   Contribute to further degradation of the biota or water quality if the level of human perturbation from other sources increases?

   Retard the recovery of the biota or water quality if human perturbation from other sources decreases?

   Response:

   Honouliuli WWTP does not discharge into stressed ocean waters (refer to Section III.C).

G. Effect of Discharge on Other Point and Nonpoint Sources [40 CFR 125.64]

1. *Does (will) your modified discharge(s) cause additional treatment or control requirements for any other point or Nonpoint pollution runoff?* [Updated]

The Honouliuli WWTP outfall is one of three wastewater outfalls discharging into Mamala Bay. The other two are the City & County of Honolulu's Sand Island WWTP outfall and the U.S. Navy's Fort Kamehameha WWTP outfall. The construction of on an extended outfall for the Fort Kamehameha WWTP was completed in December 2003. The new outfall is approximately 13,000 feet long and is equipped with diffuser that will discharge treated wastewater in waters approximately 150 feet deep. However, the discharge through this new outfall/diffuser has not commenced pending the issuance of a new NPDES Permit for the discharge[1]. The locations of the three outfalls are shown in Figure III.G-1.

One of the 1987 amendments to Section 301(h) of the Clean Water Act prohibited modified discharges from interfering alone or in combination with pollutants from other sources with the attainment or maintenance of water quality standards. The cumulative effects of these three point sources and various nonpoint sources are being considered below in addressing the answer to this question

It is anticipated that no additional treatment or control requirements are needed for nonpoint sources. Treated effluent wastewater from Honouliuli and Sand Island WWTPs are being discharge to the receiving waters in Mamala Bay from the deep-ocean outfalls. As indicated previously, the Fort Kamehameha WWTP will be discharging away from its present location at the mouth of Pearl Harbor in deeper waters as soon as an NPDES Permit is issued.

Nonpoint sources are discharged to embayments or near shore areas. Importantly, "nonpoint sources are the primary concern with respect to near-shore areas, specifically bathing beaches[2]."

The Mamala Bay study lists seven major watersheds, Ala Wai Canal, Kewalo Basin, Keehi Lagoon/Honolulu Harbor, the Ewa Plain, and Pearl Harbor's East, Middle and West Lochs. The study states that approximately 243,000 acre-feet of runoff enters Mamala Bay annually. Sediment is by far the largest pollutant by weight, "with between 50,000 to 185,000 tons of suspended sediment washed off the Mamala Bay watersheds each year[3]." Much of the sediment is trapped in embayments, with the exception of the Ala Wai Canal, in which the report states that virtually all suspended solids are removed. The removal rate for the Ala Wai Canal is approximately 50 percent of settleable solids. The removal rate for the other embayments is estimated to be at 5 percent of settleable solids.

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[1] Preston Iha, Engineer, Navy Public Works
[2] Section 3.7.2 Executive Summary, Mamala Bay Final Report dated April 1996.
[3] Mamala Bay Study Project MB-3, pg 4-14

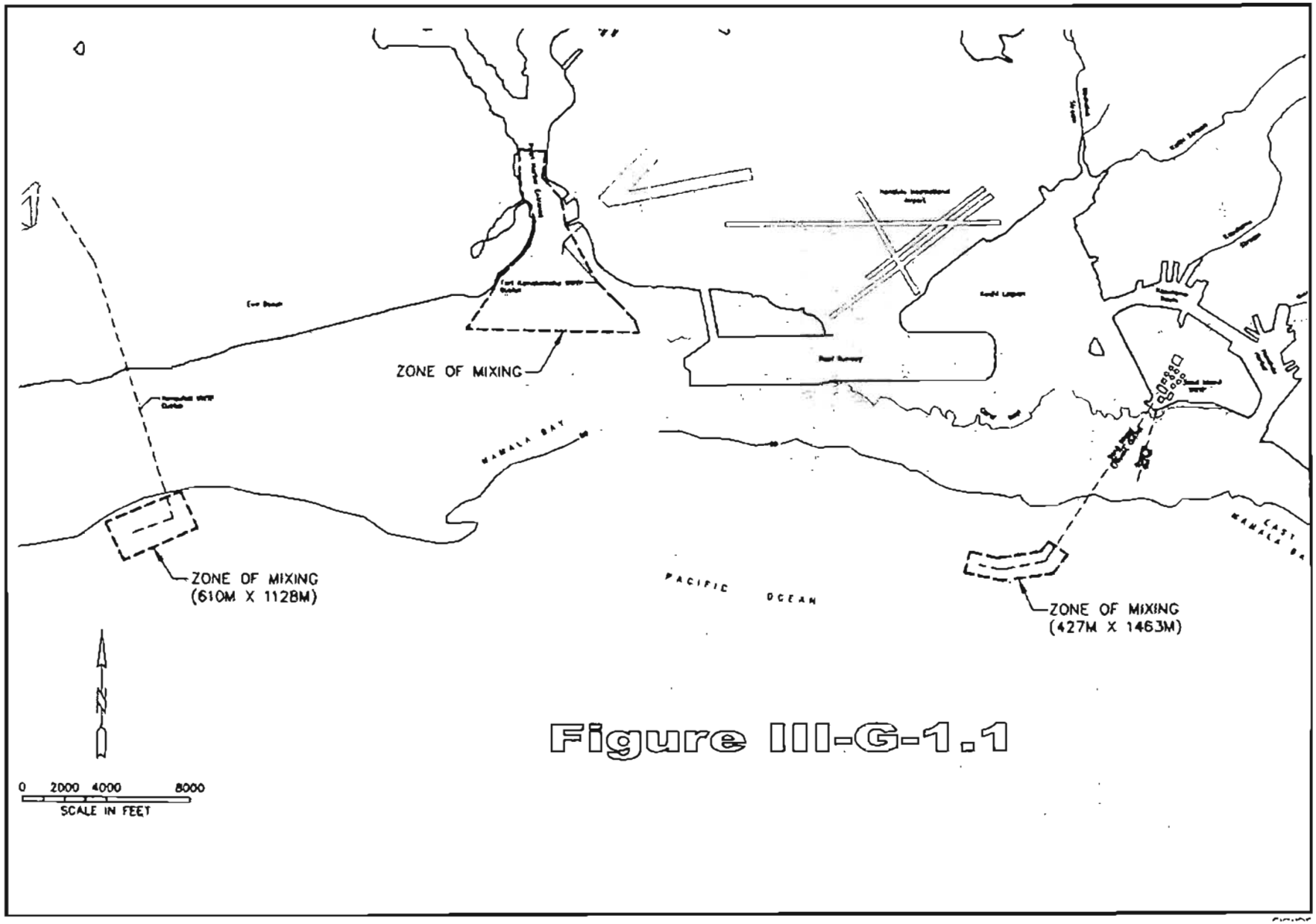


Figure III-G-1.1

This is based on Mamala Bay Study Project MB-3 Pollutant Source Identification. While the project did not calculate pollutant transport from water bodies to Mamala Bay, it did provide what it considered reasonable, conservative approximations of 50 percent delivery of TSS from the Ala Wai Canal and 5 percent delivery of TSS from other embayments. No mention was made of sediment from the Ewa Plains. Based on these criteria, and assuming a 5 percent delivery from the Ewa Plains, the loading from nonpoint sources through the embayments and Ewa Plains would be approximately 10,000 tons annually. For comparison, the total TSS loading from the Sand Island WWTP, the largest point source in Mamala Bay, is approximately 6,000 tons annually.

One of the weaknesses of the Mamala Bay Report with respect to nonpoint source pollution is that the study was based on a sampling of storm events over a short period of time (January 1994 to April 1995). Nonpoint source pollution is heavily dependent on rain events. Sediment deposits increase with large rain events, and studies based on short time frames can be highly misleading. The larger the storm water runoff the higher the sediment concentration, total sediment load, delivery ratio and loading to Mamala Bay.

The zone of mixing (ZOM) for each outfall is shown on Figure III-G-1.1. Water quality monitoring data on nutrient parameters from the ZOM boundaries of the Sand Island and Honouliuli WWTPs' outfalls from 1995 to 2003 were compared with the State of Hawaii water quality standards for open ocean waters (see Table III.G.1-1). The discharge from the Sand Island and Honouliuli WWTP outfalls met the State Water Quality Standards.

		Honouliuli		Sand Island	
Parameter	State WQS (WET), Open Coastal Waters	1995-1999	1999-2003	1995-1999	1999-2003
Total Nitrogen	150.00	97.8	88.1	80.62	83.000
NH4-N	3.50	1.54	1.57	5.5	2.100
NO2 + NO3-N	5.00	1.03	1.03	1.25	1.160
Total Phosphorus	20.00	9.15	6.17	6.9	6.460
Chlorophyll	0.30	0.162	0.135	0.128	0.123
LEC	0.20	0.033	0.055	0.048	0.059
Turbidity	0.50	0.14	0.12	0.13	0.151

Notes
1. Data stemmed from Jan 1995 to 2003, in 5 year segments
2. Statistical figures for the Honouliuli and Sand Island WWTPs789 were obtained from the 1999 and 2003 Annual Assessment Reports

Table III.G.1-1

The Navy's Fort Kamehameha WWTP outfall is presently discharging in waters that is classified as an estuary by the State. The waters in the vicinity of the outfall are considered impaired and are subject to the State water quality standards as listed under "Pearl Harbor

Estuary." Impaired is used in the context that the receiving water background nutrient levels exceeds the standards. Because current regulations do not allow dischargers to further degrade impaired waters, the Navy was mandated to look at alternatives. The decision was made to extend the outfall into deeper waters in open coastal waters, away from the impaired estuary at the mouth of Pearl Harbor.

The State Department of Health has issued interim limits for various nutrient parameters that is in effect while the Navy constructs the extended, deeper outfall. Water quality standards for open coastal waters will apply for the new outfall discharge[4]. As indicated previously, the Navy is awaiting the issuance of a revised NPDES permit to discharge through the new extended outfall.

The current discharge from the Fort Kamehameha facility is meeting the interim permit "end-of-pipe" (effluent) as listed below:

Table III.G.1-1 1

Parameter	Interim Discharge Limit
Nitrogen	390 lbs/day (annual average)
	664 lbs/day (daily maximum)
Total Phosphorus	80 lbs/day (annual average)
	120 lbs/day (daily maximum)

At the ZOM, the nutrient limits in the current permits exist only for Chlorophyll a and Turbidity. The Fort Kamehameha WWTP discharge was in compliance at the ZOM with the chlorophyll a and turbidity limit in 2003 and up to 2004 for the geometric mean. These are summarize below in Table III.G.1-1 3:

Table III.G.1-1 2

Nutrient Parameter	Geometric Mean (GM)	GM based on 2003 and 2004 data	Not to exceed 90% of the time	Not to exceed 98% of the time
Chlorophyll a	3.50 ug/L	0.84 ug/L	10.00 ug/L	20.00 ug/L
Turbidity	4.00 N.T.U.	1.43 N.T.U.	8.00 N.T.U.	15.00 N.T.U.

Note: Actual monitoring dates were 2/25/03, 5/8/03, 9/11/03, 12/04/03, 3/8/04 and 6/24/04.

[4] Muraoka, Julie. Environmental Engineer. Navy Region Hawaii. US Navy Regional Environmental Department

As required an environmental impact study was conducted[5]. In this report, the new outfall is projected to discharge the following nutrient levels:

Water Quality Parameter	Effluent Concentration (ug/L)	Dilution Factor at ZOM boundary	Ambient Concentration Near the Diffuser	Calculated Concentrations (ug/L)	DOH Water Quality Criteria (ug/L) (WET)
Nitrate + Nitrite Nitrogen	5,000	1,200:1	0.78	4.95	5.00
Ammonia Nitrogen	1,600	1,200:1	1.85	3.18	3.50
Total Nitrogen	8,200	1,200:1	94.20	101.03	150.00
Total Phosphorus	1,400	1,200:1	10.66	11.83	20.00

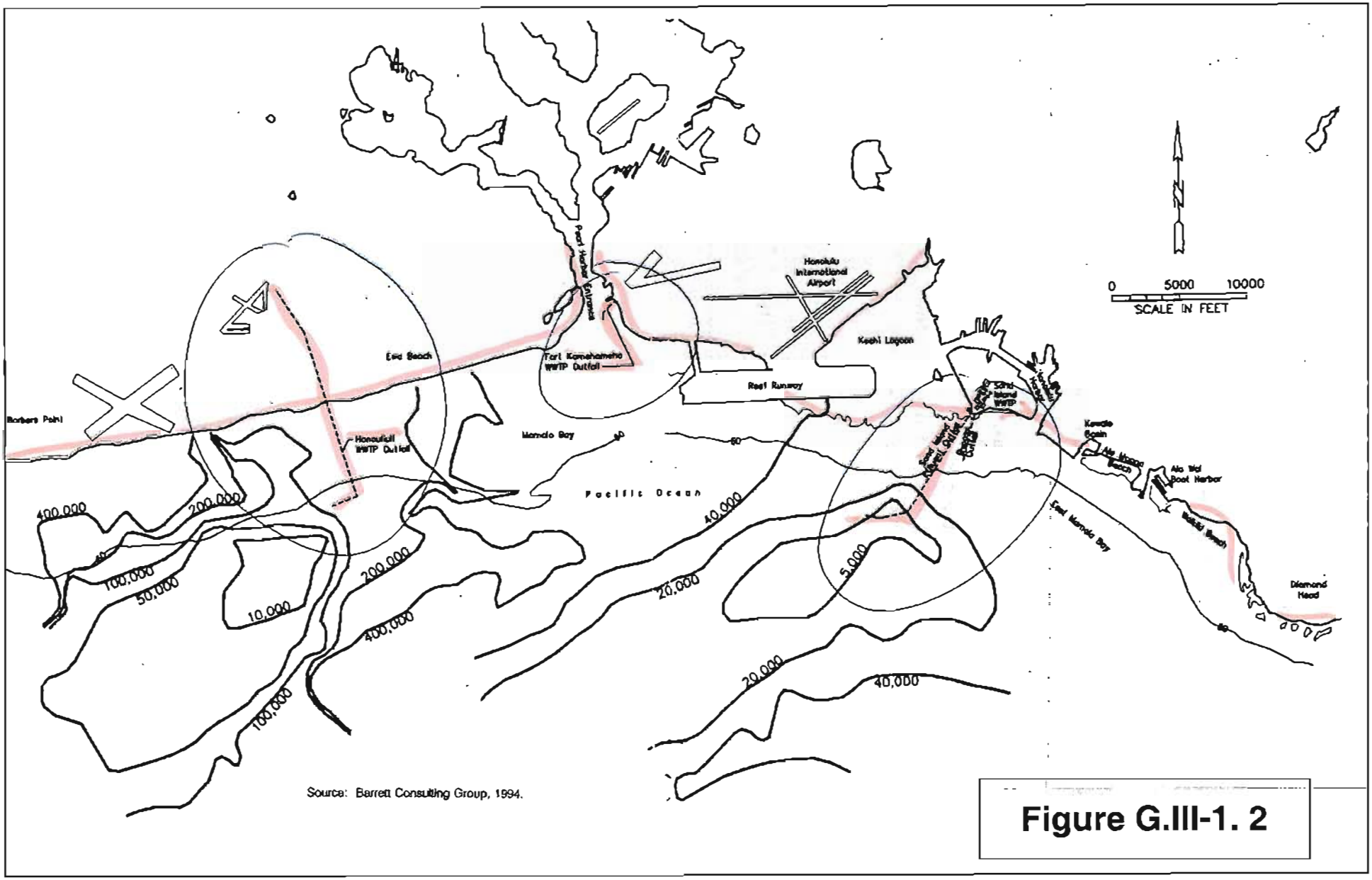
The new outfall will meet the State water quality standards on nutrients for open coastal waters.

The EIS for the outfall extension provides an estimate of the cumulative nutrient levels at the Fort Kamehameha outfall Zone of Mixing as a result of the Sand Island, Fort Kamehameha WWTP outfalls and ambient nutrient levels. The Navy determined that the discharge from the Honouliuli WWTP with a dilution of more than 1,000,0000:1 is negligible. The projections are presented below:

Water Quality Parameter	Ambient Concentrations (ug/L)	Cumulative Concentrations (ug/L)	DOH Criteria (Geometric Mean) (ug/L)
Ammonia Nitrogen	2.09	2.97	3.50
Nitrate + Nitrite Nitrogen	1.03	1.54	5.00
Total Nitrogen	95.36	97.13	150.00
Total Phosphorus	10.59	10.87	20.00

[5] US Department of the Navy. "Final Environmental Impact Statement, Outfall Replacement for Wastewater Treatment Plant at Fort Kamehameha. March 2001

The implication of the EIS report is that the treated wastewater discharge from the Honouliuli WWTP will not require any requirement from the Fort Kamehameha WWTP or the Sand Island WWTP to build addition treatment or control measurements to comply with the applicable State water quality standards on nutrients.



Source: Barrett Consulting Group, 1994.

Figure G.III-1. 2

As shown in the Figure, the farfield dilutions of the Honouliuli WWTP and Sand Island WWTP outfalls are 400,000 and 40,000, respectively.

Figure III.G.1-2 is also useful for evaluation of the potential for cumulative effects in terms of microbiological indicator contamination potential. For this evaluation, only Sand Island and Honouliuli outfalls are of key importance because the Fort Kamehameha WWTP disinfects the effluent. Data from the water quality monitoring program for Fort Kamehameha WWTP (for both fecal coliform and enterococci) has shown that concentrations of these bacteria increase with distance away from the outfall's diffuser (Belt Collins & Associates, 1992). From Figure III.G.1-2, it can be seen that the dilutions of surface plumes will be greater than 400,000 and 40,000 for Honouliuli and Sand Island plume dispersion. The net transport condition is to the southwest, away from public beaches and recreation areas. Therefore, cumulative effects are not significant, particularly when die-off (for a nonconservative parameter) factors are considered. However, it is noteworthy that after major storms, there is a high degree of shoreline bacterial indicator contamination noted from nonpoint sources. On a long-term basis, this is observed as a gradient from the mouth of Pearl Harbor extending along the Barbers Point area to the north (Lindstrom, 1993).

Another consideration is the accumulation of sediment (and benthic oxygen demand), and whether there is any potential overlap of deposition areas. Figure III.G.1-3 shows the predicted annual (steady-state) sediment deposition (g/m^2) from the references M&E Pacific (1983a and 1983b). The conclusion is that there is no overlap of deposition areas between the three outfalls.

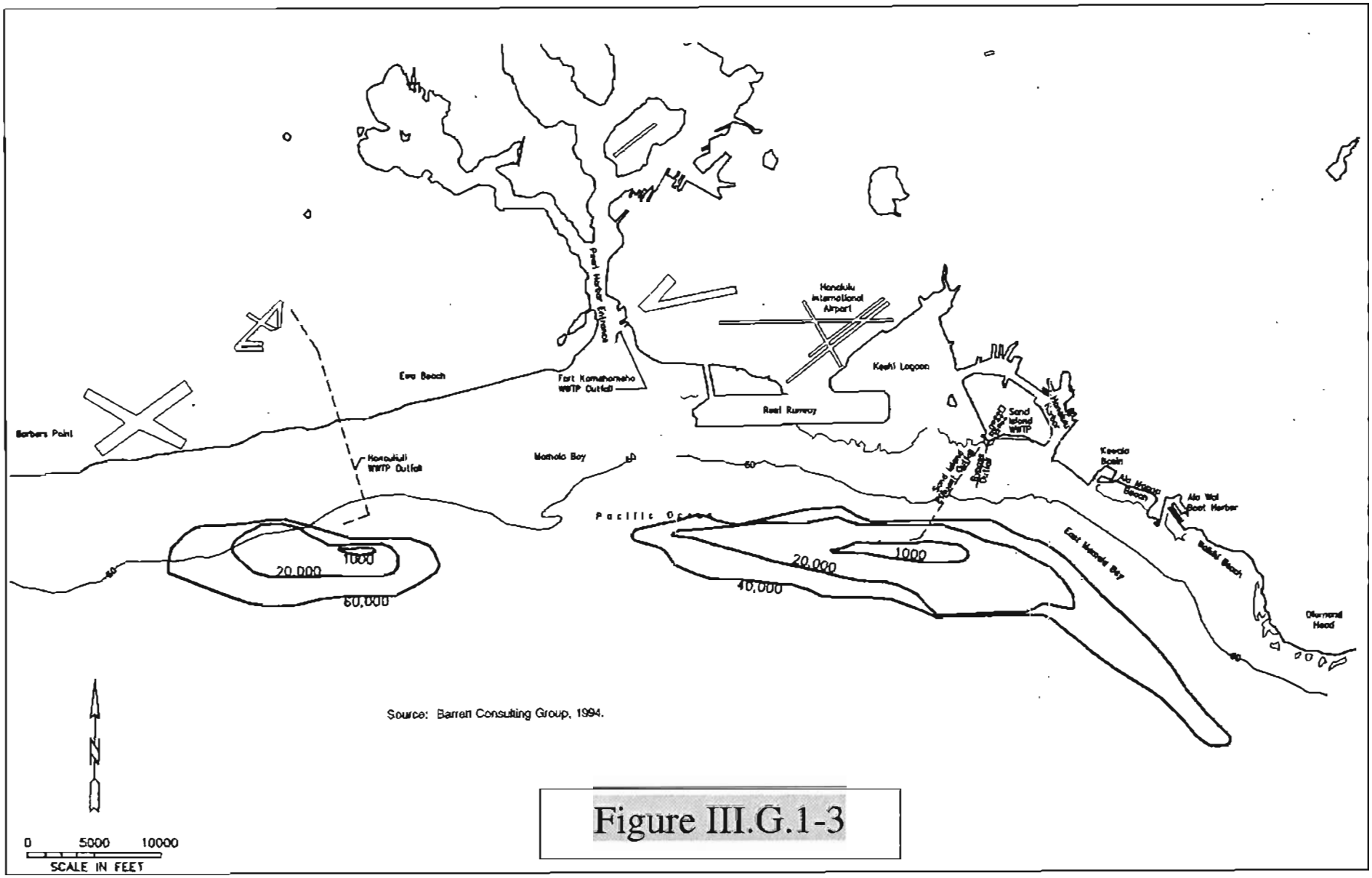


Figure III.G.1-3

2. Provide the *determination required by 40 CFR 125.64(b) or, if the determination has not yet been received, a copy of a letter to the appropriate agency(s) requesting the required determination.*

Response:
The letter requesting the required determination is shown in Appendix E.

H. Toxics Control Program and Urban Area Pretreatment Program [40 CFH 125.65 and 125.66]

1a. *Do you have any known or suspected industrial sources of toxic pollutants or pesticides?* [40 CFR 125.65] [Updated]

Response:

Honouliuli WWTP receives industrial discharges from approximately 800 permitted dischargers. Typically, permitted dischargers have a pretreatment device requirement. The numbers of permitted dischargers are currently declining due to more facilities combining into larger and shared grease interceptors. In addition, some facilities that were formerly permitted have be re-evaluated and are not required to have a pretreatment device (i.e. authentic sushi restaurant did not have significant levels of fats, oil and grease and therefore not required to have a grease interceptor). Portions of the service area are located in former agricultural areas, which may contribute to minimal nonpoint source pesticide contaminants; however, the majority of industrial users (IUs) are small retail establishments or food service companies, which do not contribute toxic materials to the wastewater inflow. Some exceptions may include photo processors and printers whose wastewater could include heavy metals, but in recent years digital photography and printing are gaining popularity. Three significant industrial users (SIUs) are permitted to discharge to Honouliuli WWTP. These are: Frito-Lay of Hawaii (average discharge of 58,000 gpd), Honolulu Advertiser (starting up, undetermined at this time), and Pepsi Bottling Company (average discharge of 15,000 gpd). The Honolulu Advertiser has relocated their printing facility from the Sand Island WWTP tributary to the Honouliuli WWTP tributary. The new facility is currently under construction. The building is complete but the printing press is expected to be in full operation in August 2004. The newer technology printing press is anticipated to have fewer pollutants than the previous press at the former location. Other potential sources of toxic substances may include the liquid hauled waste from private dischargers which is processed by Honouliuli WWTP at an average rate of 16,000 gpd.

1b. *If no, provide the certification required by 40 CFR 125.66(a)(2) for small discharges, and required by 40 CFB 125.66(c)(2) for large dischargers.* [40 CFR 125.66]

Response:

This question is not applicable.

1c. *Provide the results of wet and dry weather effluent analyses for toxic pollutants and pesticides as required by 40 CFR 125.66(a)(l).* [40 CFR 126.55]

Response [Update]:

The City & County of Honolulu performs regular monitoring of the priority pollutants defined in 40 CFR 125.58(p) and (aa). These monitoring events

were held typically in January and July of each year. The City is performing more than the minimum permit requirement. (The permit requires the monitoring of the influent and effluent priority pollutants and other pesticides semi-annually (once during the wet season, and once during the dry season) during the first year of the permit. Thereafter, annual measurements will be made, alternating between the wet season one year, and the dry season the next year). January is generally the wettest month, and July is the driest. Appendix J contained the detected concentrations of pollutants in effluent for sampling years, 1986 (September), 1989 (August), 1991 (July), 1992 (January & July), 1993 (January & July), 1994 (January & July), 1995 (January, July and October), 1996 (January & July), 1997 (January), 1998 (January & July), 1999 (January and July), 2000 (January & July), 2001 (January & July), 2002 (July) and 2003 (January & December). The effluent detected concentration results were addressed in Appendix J. Below are the brief discussion on the influent priority pollutant and pesticides detected in the influent wastewater at the Honouliuli WWTP:

The table below provides the detected concentrations in the influent priority pollutant and pesticides:

Site HWWTP Influent	

Analyte	Date	Result	Unit	PQL	Qualifier
1,2-Dichlorobenzene	1/22/2001	0.6	ug/L	2	JB
1,3-Dichlorobenzene	1/22/2001	0.7	ug/L	2	J
1,4-Dichlorobenzene	1/12/1994	2.6	ug/L	0.5	
	10/17/1995	4	ug/L	2	
	1/17/1996	4	ug/L	2	
	1/13/1997	5	ug/L	2	
	1/12/1998	5	ug/L	2	
	7/6/1998	4	ug/L	2	
	1/25/1999	3	ug/L	2	
	7/19/1999	4.7	ug/L	2	
	1/25/2000	5.4	ug/L	2	
	7/17/2000	2.2	ug/L	2	
	1/22/2001	5.2	ug/L	2	
	7/23/2001	3.9	ug/L	2	
	7/15/2002	4.5	ug/L	1	
	1/21/2003	5.8	ug/L	2	
	12/2/2003	6.5	ug/L	2	
4,4`-DDD	7/18/1994	0.13	ug/L	0.02	
4,4`-DDT	7/18/1994	0.22	ug/L	0.02	
4,4'-DDT	1/22/2001	0.021	ug/L	0.009	
	7/23/2001	0.008	ug/L	0.009	J
Acrolein	7/16/1995	0.6	ug/L	0.5	
	1/22/2001	1.1	ug/L	1	
	7/15/2002	0.3	ug/L	1	J
	1/21/2003	1.7	ug/L	1	
	12/2/2003	2.5	ug/L	1	
Aldrin	7/16/1995	0.071	ug/L	0.052	
Aluminum, Dissolved	7/18/1994	150	ug/L	5	
	1/16/1995	126	ug/L	5	
	7/15/1996	65.9	ug/L	10.3	
Antimony	1/25/2000	0.5	ug/L	0.2	B
	7/17/2000	0.5	ug/L	2	J
	7/23/2001	0.33	ug/L	2	J
	7/15/2002	0.55	ug/L	2	JB
Arsenic	1/12/1994	13	ug/L	5	
	7/16/1995	2	ug/L	2	
	7/6/1998	2.2	ug/L	2	
	7/19/1999	2.1	ug/L	2	
	1/25/2000	0.9	ug/L	2	J
	7/17/2000	0.9	ug/L	2	J
	7/23/2001	0.80	ug/L	2	J
	7/15/2002	1.7	ug/L	2	J
	1/21/2003	1.4	ug/L	2	J
	12/2/2003	1.5	ug/L	2	J
Beryllium	1/13/1997	0.7	ug/L	0.5	
	1/22/2001	0.2	ug/L	0.2	
	1/21/2003	0.10	ug/L	0.1	

Bis(2-ethylhexyl)phthalate	7/13/1992	14	ug/L	10	
	7/16/1995	46	ug/L	17	
	10/17/1995	34	ug/L	11	
	1/17/1996	39	ug/L	11	
	7/15/1996	23	ug/L	10	
	1/13/1997	24	ug/L	10	
	1/12/1998	32	ug/L	10	
	1/25/1999	12	ug/L	10	
	7/19/1999	4	ug/L	6	J
	1/25/2000	11	ug/L	10	B
	7/17/2000	10	ug/L	10	
	1/22/2001	14	ug/L	10	
	7/23/2001	16	ug/L	10	
	7/15/2002	18	ug/L	10	
	12/2/2003	14	ug/L	10	
Butyl Benzyl Phthalate	12/2/2003	2	ug/L	10	J
Cadmium	1/13/1997	4	ug/L	1	
	1/12/1998	2.2	ug/L	1	
	1/22/2001	0.3	ug/L	0.5	J
	7/23/2001	0.12	ug/L	2	J
	7/15/2002	0.21	ug/L	2	J
	1/21/2003	0.22	ug/L	0.5	J
	12/2/2003	0.33	ug/L	0.2	
Chlordane	7/17/2000	0.06	ug/L	0.1	J
	7/23/2001	0.47	ug/L	0.1	
	7/15/2002	0.30	ug/L	0.1	
	12/2/2003	0.11	ug/L	0.1	
Chlorobenzene	1/22/2001	0.5	ug/L	2	J
	7/15/2002	0.1	ug/L	1	J
Chloroform	1/12/1994	0.8	ug/L	0.5	
	1/25/2000	1.5	ug/L	2	J
	7/17/2000	0.5	ug/L	2	J
	1/22/2001	1.0	ug/L	2	J
	7/15/2002	1.3	ug/L	1	
	1/21/2003	1.1	ug/L	2	J
	12/2/2003	1.0	ug/L	2	J
Chlorpyrifos	1/21/2003	0.34	ug/L	0.15	
Chromium, Hexavalent, Dissolved	1/16/1995	22	ug/L	10	
Chromium, Total	7/18/1994	7	ug/L	2	
	1/16/1995	3.2	ug/L	2	
	7/16/1995	6.1	ug/L	2	
	10/17/1995	19	ug/L	2	
	1/17/1996	5	ug/L	5	
	7/15/1996	3.6	ug/L	1	
	1/13/1997	13	ug/L	2	
	1/12/1998	6.3	ug/L	2	
	7/6/1998	6.6	ug/L	2	
	1/25/1999	4.4	ug/L	2	
	7/19/1999	6.2	ug/L	2	
	1/25/2000	5.1	ug/L	1	
	7/17/2000	4.5	ug/L	2	

	1/22/2001	11	ug/L	1	
	7/23/2001	4.9	ug/L	2	B
	7/15/2002	6.0	ug/L	2	
	1/21/2003	6.3	ug/L	2	
	12/2/2003	6.6	ug/L	2	
Copper	1/12/1994	70	ug/L	50	
	7/18/1994	31	ug/L	5	
	1/16/1995	39.9	ug/L	5	
	7/16/1995	51	ug/L	5	
	10/17/1995	40	ug/L	5	
	1/17/1996	70	ug/L	5	
Copper	7/8/1991	90	ug/L	10	
	1/28/1992	60	ug/L	20	
	7/13/1992	70	ug/L	20	
	1/23/1993	60	ug/L	20	
	7/15/1996	46.6	ug/L	1.2	
	1/13/1997	35	ug/L	5	
	1/12/1998	51	ug/L	5	
	7/6/1998	45	ug/L	5	
	1/25/1999	30	ug/L	5	
	7/19/1999	42	ug/L	5	
	1/25/2000	52	ug/L	1	
	7/17/2000	49	ug/L	2	
	1/22/2001	57	ug/L	2	
	7/23/2001	50	ug/L	2	
	7/15/2002	62	ug/L	2	
	1/21/2003	43	ug/L	2	
	12/2/2003	79	ug/L	2	
Copper, Dissolved	7/18/1994	9	ug/L	5	
	1/16/1995	15.8	ug/L	5	
	7/16/1995	17	ug/L	5	
	10/17/1995	13	ug/L	5	
	1/17/1996	12	ug/L	5	
	7/15/1996	18	ug/L	1.2	
Cyanide, Total	1/22/2001	14	ug/L	5	
	7/23/2001	7.3	ug/L	5	
	7/15/2002	2.5	ug/L	5	J
	12/2/2003	3.2	ug/L	5	J
Delta-BHC	7/16/1995	0.59	ug/L	0.052	
Demeton/Systox	1/25/1999	2.7	ug/L	1	
Demeton-O	7/16/1995	1.2	ug/L	0.3	
Dieldrin	1/12/1998	0.04	ug/L	0.02	
	1/22/2001	0.012	ug/L	0.009	
	7/15/2002	0.019	ug/L	0.009	
	1/21/2003	0.012	ug/L	0.009	
	12/2/2003	0.058	ug/L	0.009	
Diethyl Phthalate	1/23/1993	43	ug/L	10	
	7/18/1994	11	ug/L	5	
	7/15/1996	12	ug/L	10	
	1/13/1997	11	ug/L	10	
	7/6/1998	10	ug/L	10	

	1/25/1999	13	ug/L	10	
	7/19/1999	1	ug/L	6	J
	1/25/2000	8	ug/L	10	J
	7/17/2000	7	ug/L	10	J
	1/22/2001	9	ug/L	10	J
	7/23/2001	7	ug/L	10	J
	7/15/2002	9	ug/L	10	J
	12/2/2003	7	ug/L	10	J
Ethyl benzene	7/18/1994	7	ug/L	2	
Ethylbenzene	1/25/2000	0.9	ug/L	2	J
	12/2/2003	0.3	ug/L	2	J
Gamma-BHC	1/25/2000	0.008	ug/L	0.009	J
	7/17/2000	0.009	ug/L	0.009	
	1/22/2001	0.017	ug/L	0.009	
	7/23/2001	0.015	ug/L	0.009	B
	7/15/2002	0.007	ug/L	0.009	J
Heptachlor	1/16/1995	0.031	ug/L	0.02	
	7/23/2001	0.039	ug/L	0.009	
Heptachlor Epoxide	12/2/2003	0.005	ug/L	0.009	J
Lead	1/12/1994	20	ug/L	5	
Lead	1/13/1997	5	ug/L	5	
	7/19/1999	6.2	ug/L	5	
	1/25/2000	3.5	ug/L	2	
	7/17/2000	2.3	ug/L	2	
	1/22/2001	3.2	ug/L	2	
	7/23/2001	2.3	ug/L	2	
	7/15/2002	2.2	ug/L	2	
	1/21/2003	2.6	ug/L	1	
	12/2/2003	6.1	ug/L	1	
Malathion	7/16/1995	1.5	ug/L	1	
Mercury	7/15/1996	0.25	ug/L	0.1	
	1/25/1999	0.7	ug/L	0.5	
	1/22/2001	0.27	ug/L	0.2	
	7/23/2001	1.6	ug/L	0.2	
	7/15/2002	0.25	ug/L	0.2	
	1/21/2003	0.10	ug/L	0.2	J
	12/2/2003	0.29	ug/L	0.2	
Mercury	1/12/1994	0.4	ug/L	0.2	
Mercury, Dissolved	7/15/1996	0.13	ug/L	0.1	
Methylene Chloride	7/13/1992	7	ug/L	4	
	7/6/1998	7 B	ug/L	2	
	1/25/2000	1.3	ug/L	2	JB
	7/17/2000	2.2	ug/L	2	B
	1/22/2001	2.7	ug/L	2	B
	7/15/2002	0.3	ug/L	1	JB
	12/2/2003	0.8	ug/L	2	JB
Nickel	7/16/1995	7	ug/L	5	
	10/17/1995	12	ug/L	5	
	1/17/1996	5	ug/L	5	
Nickel	7/15/1996	2.9	ug/L	1.6	
	1/13/1997	29	ug/L	5	

	1/12/1998	6.9	ug/L	5	
	1/25/1999	5.1	ug/L	5	
	7/19/1999	5.9	ug/L	5	
	1/25/2000	4.9	ug/L	2	
	7/17/2000	4.2	ug/L	2	
	1/22/2001	10	ug/L	2	
	7/23/2001	4.4	ug/L	2	
	7/15/2002	5.0	ug/L	2	
	1/21/2003	5.2	ug/L	1	
	12/2/2003	5.4	ug/L	2	
Nickel, Dissolved	10/17/1995	9	ug/L	5	
	7/15/1996	3.2	ug/L	1.6	
Phenol	1/12/1994	13	ug/L	5	
	7/18/1994	6	ug/L	5	
	1/13/1997	21	ug/L	10	
	7/19/1999	4	ug/L	6	J
	7/17/2000	5	ug/L	10	J
	1/22/2001	3	ug/L	10	J
	7/15/2002	4	ug/L	10	J
	2/25/2003	18	ug/L	11	
	12/2/2003	3	ug/L	5	J
Selenium	1/16/1995	2	ug/L	2	
Selenium	7/15/1996	3.9	ug/L	2.4	
	1/12/1998	2.4	ug/L	4	
	1/25/1999	2.1	ug/L	2	
	1/25/2000	3.0	ug/L	2	
	1/22/2001	1.4	ug/L	2	J
	7/23/2001	1.1	ug/L	2	J
	7/15/2002	1.4	ug/L	2	J
	1/21/2003	1.1	ug/L	2	J
	12/2/2003	2.2	ug/L	2	
Silver	1/12/1994	10	ug/L	5	
	7/18/1994	4	ug/L	0.5	
	1/16/1995	2	ug/L	0.5	
	1/17/1996	3	ug/L	1	
	7/15/1996	3.6	ug/L	1.3	
	1/13/1997	5	ug/L	1	
	1/12/1998	11	ug/L	1	
	7/6/1998	4.6	ug/L	0.5	
	1/25/1999	2.7	ug/L	0.5	
	1/25/2000	2.4	ug/L	0.2	
	7/17/2000	2.8	ug/L	2	
	1/22/2001	4.7	ug/L	0.5	
	7/23/2001	4.2	ug/L	2	
	7/15/2002	5.0	ug/L	2	
	1/21/2003	4.4	ug/L	0.5	
	12/2/2003	3.8	ug/L	0.4	
Silver, Dissolved	7/15/1996	1.6	ug/L	1.3	
Tetrachloroethene	7/8/1991	4	ug/L	4	
	7/8/1993	5	ug/L	4	
	1/12/1994	1	ug/L	0.5	

	1/12/1998	4	ug/L	2	
	1/25/2000	1.3	ug/L	2	J
	1/22/2001	1.0	ug/L	2	J
	7/23/2001	0.6	ug/L	2	J
	7/15/2002	0.9	ug/L	1	J
Thallium	7/17/2000	0.2	ug/L	2	JB
	7/23/2001	0.12	ug/L	2	J
	7/15/2002	0.07	ug/L	2	JB
Toluene	1/12/1994	1.1	ug/L	0.5	
	7/18/1994	2	ug/L	1	
	10/17/1995	3	ug/L	2	
	1/17/1996	2	ug/L	2	
	1/13/1997	3	ug/L	2	
	7/19/1999	2.1	ug/L	2	
	1/25/2000	3.8	ug/L	2	B
	7/17/2000	1.5	ug/L	2	J
	1/22/2001	2.3	ug/L	2	
	7/23/2001	2.0	ug/L	2	
	7/15/2002	1.9	ug/L	1	
	1/21/2003	3.0	ug/L	2	
	12/2/2003	2.9	ug/L	2	
Tributyltin	7/15/1996	0.098	ug/L	0.05	
	1/13/1997	0.06	ug/L	0.05	
Zinc	7/8/1991	130	ug/L	20	
	1/28/1992	100	ug/L	20	
	7/13/1992	230	ug/L	20	
	1/23/1993	200	ug/L	20	
	7/8/1993	150	ug/L	20	
	1/12/1994	130	ug/L	50	
	7/18/1994	128.4	ug/L	10	
	1/16/1995	69	ug/L	10	
	7/16/1995	116	ug/L	20	
	10/17/1995	107	ug/L	20	
	1/17/1996	93	ug/L	20	
	7/15/1996	71.7	ug/L	0.5	
	1/13/1997	69	ug/L	20	
	1/12/1998	120	ug/L	20	
	7/6/1998	140	ug/L	20	
	1/25/1999	110	ug/L	20	
	7/19/1999	130	ug/L	20	
	1/25/2000	81	ug/L	2	
	7/17/2000	90	ug/L	2	
	1/22/2001	130	ug/L	10	
	7/23/2001	94	ug/L	2	
	7/15/2002	120	ug/L	2	
	1/21/2003	130	ug/L	10	
	12/2/2003	150	ug/L	10	
Zinc, Dissolved	7/18/1994	13.5	ug/L	10	
	10/17/1995	32	ug/L	20	
	7/15/1996	24.6	ug/L	0.5	

Data for the past starting years starting with 1986 show the detection of Dichlorobenzenes; pesticides, e.g., DDT, DDD, Aldrin, Chlordane and metals. More pollutants are now detected than as compared with the previous 1995 Honouliuli 301 (h) NPDES Permit reapplication, i.e., copper and zinc, mainly due to improvement with analytical methods resulting in lower detection limits.

Despite given the pollutants now being detected in the influent, the effluent concentrations of those listed in the State of Hawaii Water Quality Standards or the Federal criteria were not exceeded after applying the dilution via the Barbers Point Ocean outfall's diffuser discharge.

Id. *Provide an analysis of known or suspected industrial sources of toxic pollutants and pesticides identified in fl)(c) above in accordance with 40 CFR 125.66(b).*

Response [Updated]:

The City & County monitors all SIUs through the Regulatory Control Branch, Division of Water Quality,

Investigators of the SIU program are responsible for inspecting, monitoring, and reporting on all accounts characterized as SIUs. An industrial user is defined to be an SIU if the discharge can be define as one of the following:

- Discharges an average of 25,000 gallons per day or more of process wastewater to the publicly operated treatment plant (POTW) (excluding
  sanitary, noncontact cooling and boiler blowdown wastewater).
- Contributes to a process waste stream, which makes up 5 percent or more of
  the average dry weather hydraulic or organic capacity of the POTW.
- Is designated by the city on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for
  violating any pretreatment standard or requirement.

Once an SIU has been identified, the investigator will do an initial inspection of the facility. At this time, the investigator requests information regarding the discharge from the process, the plans of the facility, any sampling of the wastewater, and other pertinent information regarding the discharge from the facility. All the information gathered from the initial inspection is then reviewed to determine possible sampling sites, compliance with the sewer ordinance, pretreatment device requirements and reporting, and sampling requirements. A permit is issued with certain requirements for compliance. Upon subsequent inspections, a check list of the requirements, as stated in the SIU's permit, for sampling, reporting and maintenance is reviewed with the SIU.

In addition, SIU investigators are required to complete an annual report on all SIUs, as well as complete technical reviews for compliance. These involve

inspections to verify correct sampling reports for compliance with the sewer ordinance.

A summary of enforcement actions involving two of the SIUs within the Honouliuli WWTP service area is shown below, as excerpted from the 1997 to 2003 pretreatment program annual status reports. Please note the third SIU (Honolulu Advertiser) has not gone into full production yet and is currently being monitored during start-up.

Frito-Lay of Hawaii:

1997: SIU's rating for its 1997 Annual Compliance Evaluation was Pending Compliance. SIU as a follow-up submitted updated grease trap pumping records to satisfy pending compliance evaluation status. Letter of Warning for O&G violations (5) issued in June 1997. A Verbal Warning was issued for a pH violation. Second Letter of Warning issued for continuous O&G violations and failing to maintain compliance for a six-month period.

1998: SIU's rating for its 1998 Annual Compliance Evaluation was Satisfactory. Letter of Warning (one [1] O&G violation) issued in June 1998 for failing to maintain compliance for a six month period. A Verbal Warning was issued for a pH violation in October 1998. New sanitation procedures have been initiated and all residual oil and grease waste from fryer equipment and processing floor is removed prior to start of CIP.

1999: A Verbal Warning and Letter of Warning were issued for two (2) O&G violations. Product changeover and improper sanitation procedures caused the O&G violations. SIU reviewed changeover and sanitation procedures, and has increased monitoring during those times to prevent future violations. SIU received a Satisfactory rating for its 1999 Annual Compliance Evaluation.

2000: A Verbal Warning issued (08/21/00) for three (3) O&G violations. SIU unable to determine specific cause for the exceedance. Violation may have been due to sanitation of the potato processing line, which involves removal of chips and oil from fryers, followed by a hot rinse washdown of production equipment. SIU to review cleaning procedures with personnel to ensure proper disposal of O&G. SIU received a Satisfactory rating for its Annual Compliance Evaluation.

2001: Issued a Letter of Warning (02/05/01) for four (4) O&G violations. Probable cause was grease trap pumping frequency reduction to every three weeks. SIU scheduled cleaning immediately and returned to servicing the trap every two weeks. Three (3) Verbal Warnings were issued for delinquent submittal of SMRs in July and September, and for a pH violation. SIU received a Satisfactory rating for its Annual Compliance Evaluation.

2002: SIU reported an oil spill coming from their potato fryer (1/28/02) caused by equipment and/or power failures. Absorbents were used to clean and mop the spill

and SIU monitored O&G levels to verify that no significant accumulation of O&G present in GI. SIU requested (10/29/02) but was denied permission to skim oil out of their GI to reduce maintenance costs but Grease Interceptor Program Compliance ruling (#02-04-02) notes that self-cleaning is allowed provided the GI is no more than fifty (50) gallons in capacity, and SIU does not meet that criteria. SIU received a Satisfactory rating for its 2002 Annual Compliance Evaluation.

2003: A Verbal Warning was issued (05/23/03) for an O&G violation. SIU stated that improper CIP procedures may have caused the violation and it has implemented new management practices to avoid further violations. SIU reported an oil spill on (12/08/03) caused by a valve left open on the potato chip fryer when the machine was started. An estimated 100 gallons of cottonseed oil was released into the sewer drain. SIU had their grease interceptor pumped and was instructed by CCH to conduct a sampling event to determine extent of any pollutant discharge. Sampling results were in compliance and SIU conducted training of personnel on proper start up procedures of the fryer.

Pepsi Bottling Company:

1997: SIU was rated Satisfactory for 1997 Annual Compliance Evaluation. Issued Verbal Warning for two (2) O&G violations in May 1997, and also for not verbally reporting the violations. As instructed by the Department of Wastewater Management, SIU installed a neutralization system to pretreat its process wastewater. SIU also renovated its grease trap as part of the neutralization system implementation, and devised a preventive maintenance plan to prevent any overflow or slug discharge.

1998: SIU was rated Satisfactory for 1998 Annual Compliance Evaluation. Issued Verbal Warning (3/98) for two (2) O&G violations. A Letter of Warning issued (5/98) for three (3) O&G violations within a six month period exceeding oil and grease standards. The lubricating system on the bottle filling machine was left on at the end of production. This condition, in addition to the very low water flow as a result of non-production, caused the violations. SIU has adjusted the wiring of the lubricating system, optimizing the lubrication process to minimize the amount of lubrication needed, and allowing it to run only during production hours.

1999: Issued a Verbal Warning (7/99) for one (1) O&G violation. A Letter of Warning was issued (8/99) for two (2) O&G violations within a six month period exceeding oil and grease standards. Method used to lubricate bottle filling machine may have caused excessive O&G to be discharged. SIU re-adjusted the lubrication system to maximize the process and reduce the amount of lubrication needed during normal production hours. SIU was rated Satisfactory for 1999 Annual Compliance Evaluation.

2000: A Verbal Warning was issued (02/07/00) for two (2) O&G violations (09/4/99, 01/06/00), following the Letter of Warning (ERC 99-291) issued on 08/25/99. SIU unable to explain cause but will install oil absorbent logs to minimize O&G discharge. Logs will be monitored as part of normal grease trap

maintenance. Issued a Second Letter of Warning (ERC-206, 05/17/00) for continuous O&G violations - four (4) - and placed SIU on a six-month compliance schedule. Oil leak from the lubrication of the bottle filling machines caused the most recent violations. SIU has begun to repair and replace solder in the filler joints to prevent future leaks. Issued a Notice of Violations / Compliance Plan (ENOV 00-39, 10/27/00) for continuous O&G violations - eleven (11) - detected July 1999 - September 2000. SIU has established a Compliance Plan which includes 1) installing a catchment device under the can seamer to capture residual lubricating oil, 2) starting use of a bacteria-based oil digester product to reduce total level of O&G in the grease interceptor, and 3) installing an extended 90 degree length, 6-inch elbow tee into the grease interceptor for better extraction of oil free wastewater.

A Public Notice will be published in the daily newspapers, identifying SIU as being in Significant Non-Compliance with applicable pretreatment requirements for 2000. SIU in significant non-compliance (SNC) based on six (6) of seventeen (17) O&G sampling events within a six month period (March - August 2000), meeting the technical review criteria (TRC) for SNC.

SIU was given a Pending Compliance rating for its 2000 Annual Compliance Evaluation based on the establishment of a Compliance Plan as a follow-up to the issuance of ENOV 00-30 (10/25/00).

2001: Issued a Notice of Violations / Order to Show Cause (ENOV 01-25, 04/03/01) for continuous O&G violations from July 1999 - February 2001. A Show Cause meeting was conducted, and fines totaling $350,000.00 was established, based on 14 violations at $25,000 per violation. An incorrectly designated sampling location caused O&G concentration levels to be higher than the actual discharge to the CCH's wastewater collection system. SIU submitted timeline of its pretreatment activities, schematic of its grease interceptor, photographs, and drawings to illustrate what they have done to achieve and remain in compliance, including a change in the designated sampling location, allowing for representative sampling of its wastestream.

A Public Notice was published in the daily newspapers (05/08/01), identifying SIU as being in Significant Non-Compliance with applicable pretreatment requirements. SIU in significant non-compliance based on six (6) of seventeen (17) O&G sampling events within a six month period (March - August 2000), meeting the technical review criteria (TRC) for SNC. SIU was given a Satisfactory rating for its 2001 Annual Compliance Evaluation

2002: SIU was given a Satisfactory rating for its 2002 Annual Compliance Evaluation. No sampling or IWDP violations were reported.

2003: No sampling or IWDP violations were reported.

2a. *Are there any known or suspected water quality, sediment accumulation, or biological problems related to toxic pollutants or pesticides from nonindustrial sources to your modified discharges)?* [40 CFR 125.62] (New section: No cross reference.)

Response [Updated]:

There are no known or suspected water quality, sediment accumulation, or biological problems related to toxic pollutants or pesticides from nonindustrial sources to the Honouliuli WWTP's modified discharge. The city performs semiannual priority pollutant monitoring of the Honouliuli influent and effluent. Low-level concentrations of heavy metals, mostly attributed to domestic sewage loadings, pesticides and toxic organic compounds have been detected in the influent samples. Effluent analyses indicate generally lower concentrations attributed to removals during the treatment processes. Because advances were made in analytical technology since the last permit reapplication lower detection levels are attainable and thus, more pollutants have been detected, at low-level concentrations. Even at lower detected levels, Appendix J showed that the effluent concentrations met the State Water Quality Standards and Federal criteria for aquatic toxicity in salt water. Sediment and bioaccumulation results are also discussed in Appendix J.

2b. *If no, provide the certification required by Subpart 125.66(d)(2) together with available supporting data.* Status: New section.

A certification statement is provided below. Priority pollutant sampling data are presented and discussed in the response to question III.H.1.c.

2c. *If yes, provide a schedule for development and implementation of nonindustrial toxics control programs to meet the requirements of 40 CFR 125.66(d)(3)*

Response:

This question is not applicable.

2d. *Provide a schedule for development and implementation of a nonindustrial toxics control program to meet the requirements of 40 CFR 125.66(d)(3).*

Response:

A chronology of events relevant to the Nonindustrial Toxics Control Program (NITCP) is presented below:

- NITCP Draft Plan to EPA - April 15, 1992
- NITCP Report of Compliance - May 15, 1992
- Implementation of NITCP Draft Plan - May 15, 1993

- NITCP Report of Compliance - June 15, 1993

3. *Describe the Public Education Program you propose to minimize the entrance of nonindustrial toxic pollutants and pesticides into your treatment system,* (40 CFR 125.66(d)(l)]

Response [Updated]:

The City participates in educational efforts such as environmental displays at public events in which brochures and other materials containing information about City environmental programs and efforts are distributed to the general public. These environmental displays are a consistent part of the "Mini City Hall" displays included in many annual community functions.

The City also uses various other ways to educate the public on the reduction of non-industrial pollutants. Website, videos, handouts, newspaper articles, television stories, radio coverage, bus posters, and public service announcements are some of the many ways used to educate the community.

A Household Hazardous Waste Collection Program is conducted on a quarterly basis. In this program, the public is notified through various media outlets (e.g. newspaper, website) about locations where the City will accept and process, for proper disposal, chemical pesticides, herbicides, cleaning products and other potentially hazardous products. This is a free service provided by the City in an effort to minimize potential discharge of non-industrial, toxic and hazardous chemicals to the environment.

In addition, the City produced a national award winning video called "Fats, Oil and Grease Control" and conducted a public education campaign through the cooperation of four grocery store chains. This effort was conducted prior and during the Thanksgiving and Christmas holidays. It involved the distribution of thousands of flyers, inserted in customer grocery bags, instructing the public on proper disposal methods for fats, oil and grease generated during cooking and clean-up activities.

Department of Environmental Services (ENV) staff actively participate in numerous meetings of local organizations such as Hawaii Water Environment Association, American Society of Civil Engineers, American Public Works Association, Jaycees, Lions Club, American Society of Mechanical Engineers, education institutions, neighborhood boards and other nonprofit organizations.

ENV provides public information displays for National Engineers Week; Hawaii Water Environment Association Annual Conference; National Public Works Week; the Home, Food and New Products Show; and the Hawaii Visitors Bureau Conference on the Environment and for the Environmental Summit. The public information displays consist of a kiosk containing posters, leaflets, brochures, and personnel to provide information on wastewater operations, household hazardous waste "dos" and "don'ts" and collection points, nonpoint source pollution concepts, key phone numbers to report illegal dumping activities and an overview of the city's environmental activities.

In addition, individuals from the ENV participated in the volunteer water quality

monitoring pilot program for Kailua and Waimanalo bays—both by participating in sampling and by providing pretreatment public awareness. Volunteers from the ENV were involved in the storm drain stenciling program. ENV officials also attended the annual Water Environmental Federation Conference & Exposition. ENV personnel also conducted numerous tours of its facilities for students, visitors, and residents of Oahu.

4. *Do you have an approved industrial pretreatment program?*

Response[Updated]:

The city began its industrial pretreatment program in the early 1980s with efforts to identify and issue certificates to industrial users. The first approved program was accepted on July 29, 1982. This program has since evolved into a complex regulatory framework involving federal, state and city regulations which direct permitting inspection, monitoring and enforcement of all industrial users.

The city's efforts in industrial pretreatment are currently divided into four programs within the source control section. They are:

- **The Significant Industrial User (SIU) program.** Monitors those industrial users that are classified as significant users. When these industrial users are characterized as SIU, they are admitted into the program and are required to follow certain conditions for monitoring, sampling, and reporting. This program currently monitors 27 accounts with various processes.

- **The Liquid Hauled Waste Discharge program.** Monitors wastewater discharges that are transported and introduced by tanker truck into the city's treatment plants. This program conducts periodic compliance inspections, wastewater sampling, and reviews and inputs discharge reports. This program monitors 33 liquid waste haulers and 31 registered grease waste haulers (not allowed to discharge into the POTW).

- **The Pretreatment Device Inspection program.** Monitors and inspects industrial users' pretreatment devices. This program conducts inspections of grease interceptors, neutralization systems, silver recovery units and other specialized pretreatment devices. Personnel in this program also assist in the Industrial User Survey program.

- **The Industrial Wastewater Discharge Permit (IWDP) program.** In conjunction with the Industrial User Survey, permits the industrial users discharging wastewater into the city sewer system. The IWDP is issued to an industrial user to comply with pretreatment regulations based on the city sewer ordinance, state Department of Health statutes, and EPA pretreatment regulations. The Industrial User Survey program identifies industrial users by field canvassing, mail-out surveys using various directories and listing, and customer inquiries.

4.a *If yes, provide the date of U.S. EPA approval.*

Response[Updated]:

The original industrial pretreatment program was approved July 29, 1982. A revised program description was submitted to EPA Region IX and the State Department of Health on June 9, 1994. The submittal was accepted as an update to the approved pretreatment program, although no formal approval of the update submittal was issued.

4.b *If no, and if required by 40 CFR Part 403 to have an industrial pretreatment program, provide a proposed schedule for development and implementation of your industrial pretreatment program to meet the requirements of 40 CFR Part 403.*

Response:

This question is not applicable.

5. *Urban area pretreatment requirement {40 CFR 125.65}. Dischargers serving a population of 50,000 or greater must respond.*

5a. *Provide data on all toxic pollutants introduced into the treatment works from industrial sources (categorical and noncategorical).* J40 CFR 125.65]

Response[Updated]:

None of the industrial users within the Honouliuli WWTP service area is subject to federal categorical pretreatment standards. The significant industrial users (SIUs) are a potato chips, corn chips and similar snacks food processor, newspapers: publishing, or publishing and printing, and bottled and canned soft drinks and carbonated waters, which are subject to local pretreatment standards and local limits on discharge parameters. None of the SIUs discharges measurable levels of toxic priority pollutants.

Guidance Documents. The city is required by the EPA to implement all requirements of its pretreatment program set forth in 40 GFR 403.8. The program establishes pretreatment requirements and local limits for all applicable toxic constituents of the waste stream.

The pretreatment program has incorporated several documents to enforce the regulations set forth by 40 GFR 403. These documents, which include City Sewer Ordinance, Enforcement Response Plan, Rules and Regulations for the Pretreatment Program, Penalty Policy and Local Limits Evaluation, have been established as tools and guides for compliance and enforcement.

1) City Sewer Ordinance Amendment

An amendment to the City Sewer Ordinance was passed by the City Council of Honolulu on May 3, 2002. The amendment included provisions mandating the recycling of all grease interceptor waste and waste cooking oil from commercial facilities.

2) Local Limits Evaluation Report

Also contained in the Revised Ordinances of Honolulu 14-1.9, are local discharge limits, which apply to both industrial and nonindustrial users. The current local limits are shown in Table III.H.5-1. The City's island-wide local limits were evaluated as part of the Urban Area Pretreatment Program as required by the Sand Island WWTP NPDES permit. Honouliuli WWTP was included in this evaluation and the final report was submitted to EPA and the Hawaii DOH on October 26, 2001. The City is awaiting approval of this submittal before the local limits can be revised.

3) Enforcement Response Plan

The Enforcement Response Plan was submitted on October 30, 1992, to the EPA. This plan is used as a guide to escalating enforcement action for violations of conditions or restrictions set forth by the Sewer Ordinance. The plan provides approximate timelines and actions that can be taken against an industrial user without restricting the enforcement options necessary to prevent discharges which may pose a threat to the public, environment, treatment plants and city personnel. Enforcement actions currently being taken have escalated to cease and desist orders, as well as penalty fines. A penalty policy described below has been established as an internal guide to imposing fines on industrial users for noncompliances.

4) Penalty Policy. The Penalty Policy approved by the director of the Department of Wastewater Management on December 9, 1994, is used to calculate fines based upon significant noncompliance actions by a user. The formula was based on significant noncompliance actions by
a user and on the penalty policies of the U.S. EPA and Hawaii DOH.

5b. *Note whether applicable pretreatment requirements are in effect for each toxic pollutant. Are the industrial sources introducing such toxic pollutants in compliance with all of their pretreatment requirements? Are these pretreatment requirements being enforced? [40 CFR 125.65(b)(2)]*

Response:

1) Pretreatment Program Rules and Regulations

The rules and regulations of the pretreatment program provides for an appeals process for any enforcement action or revision of the rules and regulations. A public hearing was held, and the rules were approved on November 29, 1994. The provisions of this policy allow a party to appeal the enforcement action or certain department actions.

These documents are provided for the use of the pretreatment personnel, as well as reference material for the department. Because of ongoing regulatory changes, these documents must be continually reviewed and revised. Revised documents will be resubmitted to the appropriate agencies for approval, as appropriate.

All industrial users are required to adhere to discharge limits established under the pretreatment program. Table III.H.5-1 shows the proposed local limits now in effect.

Table III.H.5-1. Local Limits

Parameter (Pollutant of Concern)	Instantaneous Maximum Limits (mg/l)
Arsenic	0.5
Cadmium	0.69
Total Chromium	2.77
Copper	3.38
Total Cyanide	1.90
Lead	0.60
Mercury	0.5
Nickel	3.98
Selenium	2.0
Silver	0.43
Zinc	2.61
Phenolic compounds	2.0
Oil and grease	100

5c. *If applicable pretreatment requirements do not exist for each toxic pollutant in the POTW effluent introduced by industrial sources,*

- *Provide a description and a schedule for your development and implementation of applicable pretreatment requirements [40 CFR 125.65(c)],*

  or

- *Describe how you propose to demonstrate secondary removal equivalency for each of those toxic pollutants, including a schedule for compliance, by using a secondary treatment pilot plant. [40 CFR 125.65(d)].*

Response [Updated]:

Applicable pretreatment requirements exist for each toxic pollutant detected in the Honouliuli effluent. The pretreatment program requirements, along with primary treatment processes and low levels of industrial discharge, combine to produce effluent quality, which is equivalent or better than standard secondary effluent. The City's island-wide local limits were evaluated as part of the Urban Area Pretreatment Program as required by the Sand Island WWTP NPDES permit. Honouliuli WWTP was included in this evaluation and the final report was submitted to EPA and the Hawaii DOH on October 26, 2001. The City is awaiting approval of this submittal before the local limits can be revised .

In the 1995 301(h) Honouliuli reapplication, a list of "standard" priority pollutant concentrations was assembled from the secondary effluents of 40 POTWs (EPA, 1982a). Although the compilation was performed about twenty-two years ago, it has not been updated. Nevertheless, the study continues to provide the underlying basis for regulating pollutants under the current categorical pretreatment standards[1]. The survey data reported in Table III.H.5-2 of the previous reapplication was used in the table below to compare the Honouliuli effluent detected to the EPA findings.

[1] AMSA. "AMSA Redoubles Efforts on New 50-POTW Study" AMSA-Clean Water News – April 2004. <http://www.amsa-cleanwater.org/pubs/cleanwater/april04/4.cfm>

Analyte	Date	Result	Unit	PQL	40 POTW Secondary Effluent Concentration (see note 1) Mean	Max	Exceeds the maximum figure?
1,2-Dichlorobenzene	1/22/2001	0.4	ug/L	2	1	27	no
1,3-Dichlorobenzene	1/22/2001	0.4	ug/L	2	1	3	no
1,4-Dichlorobenzene	1/12/1994	2.1	ug/L	0.5			
	7/18/1994	2	ug/L	1			
	10/17/1995	3	ug/L	2			
	1/17/1996	3	ug/L	2			
	1/13/1997	2	ug/L	2			
	1/12/1998	2	ug/L	2			
	7/6/1998	2	ug/L	2			
	1/25/1999	3	ug/L	2			
	7/19/1999	2.6	ug/L	2			
	1/25/2000	3.2	ug/L	2			
	7/17/2000	4.3	ug/L	2			
	1/22/2001	2.8	ug/L	2			
	7/23/2001	1.9	ug/L	2			
	7/15/2002	2.3	ug/L	1			
	1/21/2003	2.8	ug/L	2			
	12/2/2003	2.1	ug/L	2			
4,4'-DDD	7/15/2002	0.004	ug/L	0.009			
4,4'-DDT	7/23/2001	0.005	ug/L	0.009			
Acrolein	1/22/2001	1.4	ug/L	1			
	1/21/2003	1.3	ug/L	1			
	12/2/2003	1.7	ug/L	1			
Aldrin	7/16/1995	0.086	ug/L	0.052			
Aluminum, Dissolved	7/18/1994	125	ug/L	5			
	1/16/1995	164	ug/L	5			
	7/15/1996	38	ug/L	10.3			
	1/13/1997	135	ug/L	50			
	1/12/1998	190	ug/L	50			
	7/6/1998	330	ug/L	50			
	1/25/1999	180	ug/L	50			
	7/19/1999	130	ug/L	100			
	1/25/2000	62	ug/L	2			
	7/17/2000	48	ug/L	2			
	1/22/2001	75	ug/L	50			
	7/23/2001	54	ug/L	2			
	7/15/2002	55	ug/L	2			
	1/21/2003	44	ug/L	2			
	12/2/2003	59	ug/L	2			
Antimony	1/25/2000	0.5	ug/L	0.2	1	69	no
	7/17/2000	0.4	ug/L	2	1	69	no
	7/23/2001	0.36	ug/L	2	1	69	no
	7/15/2002	0.55	ug/L	2	1	69	no
	1/21/2003	1	ug/L	2	1	69	no
	12/2/2003	1.8	ug/L	2	1	69	no
Antimony, Dissolved	1/25/2000	0.4	ug/L	0.2			
	7/17/2000	0.4	ug/L	2			
	7/23/2001	0.25	ug/L	2			
	7/15/2002	0.27	ug/L	2			
Arsenic	1/12/1994	12	ug/L	5	1	72	no
	7/19/1999	2.5	ug/L	2	1	72	no
	1/25/2000	1.2	ug/L	2	1	72	no
	7/17/2000	0.9	ug/L	2	1	72	no
	1/22/2001	1.2	ug/L	2	1	72	no
	7/23/2001	1.3	ug/L	2	1	72	no
	7/15/2002	1.5	ug/L	2	1	72	no

Analyte	Date	Result	Unit	PQL	40 POTW Secondary Effluent Concentration (see note 1) Mean	Max	Exceeds the maximum figure?
Arsenic, Dissolved	7/19/1999	2.1	ug/L	2			
	1/25/2000	1.5	ug/L	2			
	7/17/2000	1.4	ug/L	2			
	1/22/2001	1.3	ug/L	2			
	7/23/2001	1	ug/L	2			
	7/15/2002	1.1	ug/L	2			
	1/21/2003	1.1	ug/L	2			
Asbestos	7/8/1991	49	MSL	19			
	1/28/1992	2	MFL	(blank)			
	7/13/1992	2	MFL	(blank)			
Benzene	12/2/2003	0.3	ug/L	2			
Beryllium, Dissolved	1/25/2000	0.07	ug/L	0.2			
	7/17/2000	0.04	ug/L	2			
	1/21/2003	0.15	ug/L	0.2			
	12/2/2003	0.07	ug/L	0.1			
Bis(2-ethylhexyl)phthalate	7/18/1995	26	ug/L	17	1	370	no
	1/17/1996	15	ug/L	11	1	370	no
	7/15/1996	10	ug/L	10	1	370	no
	1/13/1997	12	ug/L	10	1	370	no
	1/25/1999	28	ug/L	10	1	370	no
	7/19/1999	11	ug/L	5	1	370	no
	1/25/2000	7	ug/L	10	1	370	no
	7/17/2000	5	ug/L	10	1	370	no
	1/22/2001	8	ug/L	10	1	370	no
	7/23/2001	6	ug/L	10	1	370	no
	7/15/2002	7	ug/L	10	1	370	no
	12/2/2003	7	ug/L	10	1	370	no
Cadmium	1/16/1995	3.6	ug/L	2	2	82	no
	1/13/1997	1	ug/L	1	2	82	no
	1/12/1998	2	ug/L	1	2	82	no
	7/6/1998	0.8	ug/L	0.5	2	82	no
	1/25/1999	0.8	ug/L	0.5	2	82	no
	7/23/2001	0.12	ug/L	2	2	82	no
	7/15/2002	0.15	ug/L	2	2	82	no
	1/21/2003	0.16	ug/L	0.5	2	82	no
	12/2/2003	0.23	ug/L	0.2	2	82	no
Cadmium, Dissolved	1/13/1997	4	ug/L	1			
	1/12/1998	3.2	ug/L	1			
	7/6/1998	1	ug/L	0.5			
Chlordane	7/23/2001	0.19	ug/L	0.1			
	7/15/2002	0.21	ug/L	0.1			
	12/2/2003	0.1	ug/L	0.1			

Analyte	Date	Result	Unit	PQL	40 POTW Secondary Effluent Concentration (see note 1) Mean	Max	Exceeds the maximum figure?
Chloroform	1/12/1994	0.9	ug/L	0.5			
	1/25/2000	0.6	ug/L	2			
	7/17/2000	1.3	ug/L	2			
	1/22/2001	0.5	ug/L	2			
	7/15/2002	0.5	ug/L	1			
	12/2/2003	0.6	ug/L	2			
Chlorpyrifos	1/21/2003	0.12	ug/L	0.15			
Chromium, Hexavalent, Dissolved	1/18/1995	22	ug/L	10			
	7/17/2000	0.5	ug/L	5			
Chromium, Total	7/18/1994	5	ug/L	2	2	85	no
	1/16/1995	3	ug/L	2	2	85	no
	7/16/1995	3.2	ug/L	2	2	85	no
	10/17/1995	3.5	ug/L	2	2	85	no
	7/15/1996	3	ug/L	1	2	85	no
	1/13/1997	4	ug/L	2	2	85	no
	1/12/1998	3.6	ug/L	2	2	85	no
	7/6/1998	3.3	ug/L	2	2	85	no
	1/25/1999	3.7	ug/L	2	2	85	no
	7/19/1999	4.5	ug/L	2	2	85	no
	1/25/2000	3.8	ug/L	1	2	85	no
	7/17/2000	2.8	ug/L	2	2	85	no
	1/22/2001	6.7	ug/L	1	2	85	no
	7/23/2001	3.7	ug/L	2	2	85	no
	7/15/2002	4.3	ug/L	2	2	85	no
	1/21/2003	4.5	ug/L	2	2	85	no
	12/2/2003	4.7	ug/L	2	2	85	no
Copper	7/18/1994	18	ug/L	5	3	91	no
	1/18/1995	35	ug/L	5	3	91	no
	7/18/1995	41	ug/L	5	3	91	no
	10/17/1995	36	ug/L	5	3	91	no
	1/17/1996	25	ug/L	5	3	91	no
	9/7/1988	50	ug/L	20	3	91	no
	8/29/1989	40	ug/L	20	3	91	no
	7/8/1991	50	ug/L	10	3	91	no
	1/28/1992	40	ug/L	20	3	91	no
	7/13/1992	35	ug/L	20	3	91	no
	1/23/1993	26	ug/L	20	3	91	no
	7/8/1993	37	ug/L	20	3	91	no
	7/15/1996	35	ug/L	1.2	3	91	no
	1/13/1997	20	ug/L	5	3	91	no
	1/12/1998	28	ug/L	5	3	91	no
	7/6/1998	26	ug/L	5	3	91	no
	1/25/1999	38	ug/L	5	3	91	no
	7/19/1999	30	ug/L	5	3	91	no
	1/25/2000	29	ug/L	1	3	91	no
	7/17/2000	30	ug/L	2	3	91	no
	1/22/2001	38	ug/L	2	3	91	no
	7/23/2001	23	ug/L	2	3	91	no
	7/15/2002	41	ug/L	2	3	91	no
	1/21/2003	39	ug/L	2	3	91	no
	12/2/2003	42	ug/L	2	3	91	no

Analyte	Date	Result	Unit	PQL	40 POTW Secondary Effluent Concentration (see note 1) Mean	Max	Exceeds the maximum figure?
Copper, Dissolved	7/18/1994	7	ug/L	5			
	1/16/1995	16.5	ug/L	5			
	7/15/1996	6.7	ug/L	1.2			
	1/13/1997	11	ug/L	5			
	1/12/1998	14	ug/L	5			
	7/6/1998	14	ug/L	5			
	1/25/1999	18	ug/L	5			
	7/19/1999	13	ug/L	5			
	1/25/2000	4.3	ug/L	1			
	7/17/2000	5.4	ug/L	2			
	1/22/2001	3.3	ug/L	2			
	7/23/2001	3.9	ug/L	2			
	7/15/2002	4.3	ug/L	2			
	1/21/2003	1.5	ug/L	2			
	12/2/2003	3.8	ug/L	2			
Cyanide, Total	1/13/1997	18	ug/L	10	1	2,140	no
	7/15/2002	19	ug/L	5	1	2,140	no
Delta-BHC	7/16/1995	0.082	ug/L	0.052			
Demeton-O	7/18/1995	2.8	ug/L	0.3			
Dieldrin	1/22/2001	0.007	ug/L	0.009			
	7/15/2002	0.014	ug/L	0.009			
	1/21/2003	0.007	ug/L	0.009			
	12/2/2003	0.035	ug/L	0.009			
Diethyl Phthalate	7/13/1992	86	ug/L	10	1	7	yes
	1/23/1993	86	ug/L	10	1	7	yes
	1/25/1999	11	ug/L	10	1	7	yes
	7/19/1999	6	ug/L	5	1	7	no
	1/25/2000	5	ug/L	10	1	7	no
	7/17/2000	6	ug/L	10	1	7	no
	1/22/2001	6	ug/L	10	1	7	no
	7/23/2001	5	ug/L	10	1	7	no
	7/15/2002	6	ug/L	10	1	7	no
	12/2/2003	4	ug/L	10	1	7	no
Di-n-Butyl Phthalate	7/19/1999	1	ug/L	5	1	97	no
Di-n-Octyl Phthalate	7/19/1999	1	ug/L	5			
Ethylbenzene	7/18/1994	4	ug/L	2			
	7/8/1993	4	ug/L	4			
	7/17/2000	1.2	ug/L	2			
	12/2/2003	0.5	ug/L	2			
Gamma-BHC	7/23/2001	0.011	ug/L	0.009			
Heptachlor	1/18/1995	0.025	ug/L	0.02			
	7/23/2001	0.009	ug/L	0.009			
Heptachlor Epoxide	12/2/2003	0.004	ug/L	0.009			
Lead	10/17/1995	10	ug/L	5	200	217	no
	7/15/1996	1.8	ug/L	1.7	200	217	no
	1/12/1998	7	ug/L	5	200	217	no
	7/19/1999	7.8	ug/L	5	200	217	no
	1/25/2000	3.3	ug/L	2	200	217	no
	7/17/2000	1.4	ug/L	2	200	217	no
	1/22/2001	2.6	ug/L	2	200	217	no
	7/23/2001	0.65	ug/L	2	200	217	no
	7/15/2002	1.5	ug/L	2	200	217	no
	1/21/2003	2.2	ug/L	1	200	217	no
	12/2/2003	2.4	ug/L	1	200	217	no

Analyte	Date	Result	Unit	PQL	40 POTW Secondary Effluent Concentration (see note 1) Mean	Max	Exceeds the maximum figure?
Malathion	7/16/1995	1.6	ug/L	1			
Mercury	7/15/1996	0.16	ug/L	0.1	0.2	1.25	no
	7/15/2002	0.12	ug/L	0.2	0.2	1.25	no
	1/21/2003	0.04	ug/L	0.2	0.2	1.25	no
	12/2/2003	0.11	ug/L	0.2	0.2	1.25	no
Mercury, Dissolved	7/15/1996	0.16	ug/L	0.1			
	1/25/1999	0.5	ug/L	0.5			
Methylene Chloride	7/13/1992	11	ug/L	4			
	1/25/1999	6	ug/L	2			
	1/25/2000	1	ug/L	2			
	7/17/2000	17	ug/L	2			
	1/22/2001	0.8	ug/L	2			
	7/23/2001	1.1	ug/L	2			
	12/2/2003	0.7	ug/L	2			
Nickel	7/15/1996	2.5	ug/L	1.6	7	679	no
	1/13/1997	6	ug/L	5	7	679	no
	7/6/1998	6.2	ug/L	5	7	679	no
	7/19/1999	8	ug/L	5	7	679	no
	1/25/2000	4.2	ug/L	2	7	679	no
	7/17/2000	3.8	ug/L	2	7	679	no
	1/22/2001	8.8	ug/L	2	7	679	no
	7/23/2001	3.8	ug/L	2	7	679	no
	7/15/2002	4.6	ug/L	2	7	679	no
	1/21/2003	5.1	ug/L	1	7	679	no
	12/2/2003	4.5	ug/L	2	7	679	no
Nickel, Dissolved	7/15/1996	4	ug/L	1.6			
	1/13/1997	9	ug/L	5			
	7/19/1999	6.1	ug/L	5			
	1/25/2000	2.6	ug/L	2			
	7/17/2000	3.4	ug/L	2			
	1/22/2001	5.4	ug/L	2			
	7/23/2001	3.1	ug/L	2			
	7/15/2002	3.5	ug/L	2			
	1/21/2003	3.8	ug/L	1			
	12/2/2003	3.5	ug/L	2			
Phenol	1/12/1994	6	ug/L	5	1	87	no
	7/19/1999	3	ug/L	5	1	87	no
	7/17/2000	4	ug/L	10	1	87	no
	1/22/2001	3	ug/L	10	1	87	no
	7/15/2002	7	ug/L	10	1	87	no
	2/25/2003	21	ug/L	11	1	87	no
	12/2/2003	4	ug/L	5	1	87	no
Selenium	7/15/1996	3.8	ug/L	2.4			
	1/13/1997	4	ug/L	4			
	1/12/1998	7	ug/L	4			
	1/25/1999	2.8	ug/L	2			
	1/25/2000	3.4	ug/L	2			
	7/17/2000	1.6	ug/L	2			
	1/22/2001	1.6	ug/L	2			
	7/23/2001	1.3	ug/L	2			
	7/15/2002	1.5	ug/L	2			
	12/2/2003	1.3	ug/L	2			

Analyte	Date	Result	Unit	PQL	40 POTW Secondary Effluent Concentration (see note 1) Mean	Max	Exceeds the maximum figure?
Selenium, Dissolved	7/15/1996	4	ug/L	2.4			
	1/13/1997	4	ug/L	4			
	1/12/1998	3.1	ug/L	4			
	1/25/2000	4.5	ug/L	2			
	1/22/2001	1	ug/L	2			
	7/23/2001	1.1	ug/L	2			
	7/15/2002	2.2	ug/L	2			
	1/21/2003	0.8	ug/L	2			
	12/2/2003	0.9	ug/L	2			
Silver	1/12/1994	8	ug/L	5	1	30	no
	7/18/1994	1.9	ug/L	0.5	1	30	no
	1/16/1995	2.7	ug/L	0.5	1	30	no
	1/17/1996	1	ug/L	1	1	30	no
	7/15/1996	2.2	ug/L	1.3	1	30	no
	1/13/1997	4	ug/L	1	1	30	no
	1/12/1998	5.4	ug/L	1	1	30	no
	7/8/1998	1.8	ug/L	0.5	1	30	no
	1/25/1999	2	ug/L	0.5	1	30	no
	1/25/2000	1.6	ug/L	0.2	1	30	no
	7/17/2000	1.4	ug/L	2	1	30	no
	1/22/2001	3	ug/L	0.5	1	30	no
	7/23/2001	2.2	ug/L	2	1	30	no
	7/15/2002	2.4	ug/L	2	1	30	no
	1/21/2003	2.8	ug/L	0.5	1	30	no
	12/2/2003	2.3	ug/L	0.4	1	30	no
Silver, Dissolved	1/13/1997	3	ug/L	1			
	1/12/1998	1.3	ug/L	1			
	7/8/1998	1.2	ug/L	0.5			
	1/25/1999	2.2	ug/L	0.5			
	7/17/2000	0.1	ug/L	2			
	7/15/2002	0.12	ug/L	2			
Tetrachloroethene	1/25/2000	0.7	ug/L	2			
	7/17/2000	0.6	ug/L	2			
	1/22/2001	0.6	ug/L	2			
Thallium	7/15/2002	0.02	ug/L	2			
Thallium, Dissolved	10/17/1995	3	ug/L	2			
	7/17/2000	0.03	ug/L	2			
	7/23/2001	0.1	ug/L	2			
Toluene	7/8/1993	5	ug/L	4	1	1,100	no
	1/12/1994	1.1	ug/L	0.5	1	1,100	no
	7/18/1994	3	ug/L	1	1	1,100	no
	10/17/1995	3	ug/L	2	1	1,100	no
	7/19/1999	2.1	ug/L	2	1	1,100	no
	1/25/2000	2.3	ug/L	2	1	1,100	no
	7/17/2000	3	ug/L	2	1	1,100	no
	1/22/2001	1.2	ug/L	2	1	1,100	no
	7/23/2001	1.1	ug/L	2	1	1,100	no
	7/15/2002	2.3	ug/L	1	1	1,100	no
	1/21/2003	1.5	ug/L	2	1	1,100	no
	12/2/2003	2	ug/L	2	1	1,100	no
Tributyltin	1/16/1995	0.55	ug/L	0.1			
	7/15/1996	0.058	ug/L	0.055			

Analyte	Date	Result	Unit	PQL	40 POTW Secondary Effluent Concentration (see note 1) Mean	Max	Exceeds the maximum figure?
Zinc	9/7/1986	180	ug/L	20	18	3,150	no
	8/29/1989	130	ug/L	20	18	3,150	no
	7/8/1991	60	ug/L	20	18	3,150	no
	1/28/1992	70	ug/L	20	18	3,150	no
	7/13/1992	140	ug/L	20	18	3,150	no
	1/23/1993	70	ug/L	20	18	3,150	no
	7/8/1993	57	ug/L	20	18	3,150	no
	1/12/1994	70	ug/L	50	18	3,150	no
	7/18/1994	85.3	ug/L	10	18	3,150	no
	1/16/1995	50	ug/L	10	18	3,150	no
	7/16/1995	62	ug/L	20	18	3,150	no
	10/17/1995	44	ug/L	20	18	3,150	no
	7/15/1996	47	ug/L	0.5	18	3,150	no
	1/13/1997	44	ug/L	20	18	3,150	no
	1/12/1998	57	ug/L	20	18	3,150	no
	7/6/1998	92	ug/L	20	18	3,150	no
	1/25/1999	55	ug/L	20	18	3,150	no
	7/19/1999	80	ug/L	20	18	3,150	no
	1/25/2000	43	ug/L	2	18	3,150	no
	7/17/2000	52	ug/L	2	18	3,150	no
	1/22/2001	91	ug/L	10	18	3,150	no
	7/23/2001	39	ug/L	2	18	3,150	no
	7/15/2002	77	ug/L	2	18	3,150	no
	1/21/2003	90	ug/L	10	18	3,150	no
	12/2/2003	100	ug/L	10	18	3,150	no
Zinc, Dissolved	7/18/1994	15.3	ug/L	10			
	7/15/1996	8.4	ug/L	0.5			
	1/13/1997	30	ug/L	20			
	1/12/1998	37	ug/L	20			
	7/6/1998	47	ug/L	20			
	1/25/1999	35	ug/L	20			
	7/19/1999	34	ug/L	20			
	1/25/2000	76	ug/L	2			
	7/17/2000	13	ug/L	2			
	1/22/2001	15	ug/L	10			
	7/23/2001	7.7	ug/L	2			
	7/15/2002	21	ug/L	2			
	1/21/2003	18	ug/L	10			
	12/2/2003	12	ug/L	10			

Notes:

Notes:
1. "Mean" and "Max" figures were reported in Table III.H.5-2 of the 1995 Honouliuli WWTP 301(h) NPDES Permit Reapplication, prepared by Harding Lawson Associates. The original source of these figures came from the following document: U.S. Environmental Protection Agency (USEPA). 1982a. Fate of priority pollutants in publicly owned treatment works. EPA 440/182/303. U.S. EPA Office of Water, Effluent Guidelines Division, Washington, D.C. Prepared by Burns and Roe Industrial Services Corporation.
2. The "Mean" and "Max" figures for the metals were compared with the total metal concentrations (rather than with the dissolved fraction).

The Honouliuli effluent data detected was for results on sampling performed on the following dates:

Samplings	
Source	Date
Honouliuli	12/2/2003
Honouliuli	1/21/2003
Honouliuli	7/15/2002
Honouliuli	7/23/2001
Honouliuli	1/22/2001
Honouliuli	7/17/2000
Honouliuli	1/25/2000
Honouliuli	7/19/1999
Honouliuli	1/25/1999
Honouliuli	7/6/1998
Honouliuli	1/12/1998
Honouliuli	1/13/1997
Honouliuli	7/15/1996
Honouliuli	1/17/1996
Honouliuli	10/17/1995
Honouliuli	7/16/1995
Honouliuli	1/16/1995
Honouliuli	7/18/1994
Honouliuli	1/12/1994
Honouliuli	7/8/1993
Honouliuli	1/23/1993
Honouliuli	7/13/1992
Honouliuli	1/28/1992
Honouliuli	7/8/1991
Honouliuli	8/29/1989
Honouliuli	9/7/1986

It should be noted that in the previous application, it appears that there was an error for Selenium. The reported maximum concentration of 0.50 ug/L was less than the mean of 1 ug/L. Thus, Selenium was not compared. The data from the survey on the 40 POTWs are compared with the detected effluent concentrations from Honouiiuli WWTP. All effluent concentrations were below the maximum reported from the survey except for Diethyl Phthalate. This chemical appears to be used in industrial processes as a solvent and plasticizer. It is also used as an ingredient in mosquito repellant and insecticidal sprays[2]. The State water quality standards on aquatic toxicity for salt water does not list limits for Diethly Phthalate.

[2] Lewis, Richard. Condensed Chemical Dictionary, 12th Edition. Van Nostrand Reinhold. 1993.