WHITE PAPER

RECOMMENDING APPROVAL

OF THE

CITY AND COUNTY OF HONOLULU'S HONOULIULI WASTEWATER TREATMENT PLANT APPLICATION FOR A MODIFIED NPDES PERMIT UNDER SECTION 301(h) OF THE CLEAN WATER ACT

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OPENING COMMENT TO THE TENTATIVE DENIAL OF A 301(H) VARIANCE FOR THE HONOULIULI DISCHARGE

The following comment to the U.S. Environmental Protection Agency, Region 9 (EPA), tentative decision to deny the City and County of Honolulu's (City) request for a 301(h) variance for the discharge from the Honouliuli Wastewater Treatment Plant was collectively written by James K. Honke; Hans J. Krock, PhD; James S. Kumagai, PhD; and Victor D. Moreland, PhD. We are engineers who have been involved in Hawaii's water quality programs in various ways since 1970. We have followed with interest the City's programs, especially those associated with the discharges of primary effluent.

Honolulu's Mayor, Mufi Hannemann, has publicly stated that he would direct the City to go to secondary treatment if the scientists said the primary discharges were harming the environment or putting public health at risk. In the early 1990s when the EPA issued a tentative decision to grant variances for the City's two primary effluent discharges, the Sierra Club and others sued the City. In settling the suit on the Sand Island discharge, the City and plaintiffs agreed that a study, funded by the City, should be conducted by an independent commission on the impacts of the primary discharges into Mamala Bay (i.e., Sand Island and Honouliuli) to determine if there were any, and, if so, what actions should be taken. The Mamala Bay Commission was appointed by both parties and $9 million dollars were expended to conduct the study. The result was the Mamala Bay Study which did not recommend secondary treatment for either discharge. Based on the data collected and analyzed, the Commission concluded that secondary treatment was not warranted. Their findings support the findings of the City's monitoring program.

The EPA granted a 301(h) variance for the Honouliuli discharge in 1991 when the wastewater flows were about 23 mgd. Even with the large population increase in the tributary, area, the flows have increased only to about 27 mgd, most probably the result of the water conservation program adopted by the City's Board of Water Supply. Furthermore, the City applies secondary treatment to 13 mgd or about half of the 27 mgd wastewater flow so that the Board of Water Supply can provide tertiary treatment to reclaim up to 10 mgd of effluent for reuse through golf course irrigation or for industrial water. We are therefore astounded that the EPA now wants to reverse the course it took in 1991 when the first 301(h) variance was granted to the Honouliuli discharge and feel compelled to encourage the EPA to look at the environment holistically and not cause overall detrimental impacts.

INTRODUCTION

Hawai‘i has an environment that is unique among the 50 states. Hawai‘i is comprised of a group of islands surrounded by the Pacific Ocean and the closest land mass is more than 2000 miles away. The islands are the tops of mountains that rise from the ocean floor. Mauna Kea, the state's tallest mountain rises 13, 396 feet above sea level but measured from its base, it is over 33,000 feet tall. The total land mass of the islands is insignificant relative to the expanse of the ocean. There are no extensive continental shelves as exist off the east and west coasts of United States and the ocean bottom drops away steeply from shore. The land mass is too small to contribute sufficient nutrients to the ocean waters to support the types of fisheries that exist in the coastal marine waters of the continental states. Although the land mass, including the part extending to the ocean floor, is significant enough to cause some deflection of and cause eddies in the North Pacific (Subtropical) Gyre, the effects, which contribute to good mixing, are localized and temporary and there is a continuous net transport of any discharges and runoff from the land away into the open ocean.

With its unique environment, programs that have been the most sound and adopted on the Mainland may not be the most sound here, especially when the environment is considered holistically.

WATER QUALITY PROGRAM FOR O‘AHU (WQPO)

Background

To understand how the City and County of Honolulu (City) views the 301(h) waiver regulations, the history behind the City's water pollution control efforts must be understood. In 1969, the City saw a need to develop a comprehensive water quality management plan to address the water quality problems confronting O‘ahu and contracted with a consortium consisting of Engineering Science, Inc., Sunn Low Tom & Hara, Inc. (now M&E Pacific, Inc.), and Dillingham Corporation's Applied Oceanography Division to develop such a plan. A panel of environmental experts was appointed to guide the investigations and development of the plan. The result was the Water Quality Program for O‘ahu with Special Emphasis on Waste Disposal (WQPO) which has proven to be a document prepared with such great foresight that it is still applicable today despite all the changes that have occurred in the years since it was published.

At the time the WQPO was being developed the more significant wastewater discharges into the ocean on O‘ahu were as follows:

A. Sand Island system
   1. The major discharge was the raw sewage discharge through the old Sand Island outfall at about 38 feet depth and 3700 feet offshore. The tributary area as it still is today was from Red Hill to Kuli‘ou‘ou.
   2. The Army also had its own outfall for the Fort Shafter and Tripler sewage. The discharge was about 3000 feet off Sand Island in 18 feet of water.

B. Honouliuli system
   1. The tributary area from the Hālawa Heights/Foster Village area to Pearl City was serviced by the Pearl City Wastewater Treatment Plant (WWTP) located on the Pearl City Peninsula. The plant was a primary plant and the effluent was discharged through a short outfall into Middle Loch of Pearl Harbor.
   2. Waipahu was serviced by the stabilization ponds (later converted to aerated ponds) located on the Waipi‘o Peninsula. The effluent flowed through a ditch into Middle Loch of Pearl Harbor.
   3. Other WWTPs in this area that did not directly discharge into the ocean but into streams which flowed into Pearl Harbor were the Mililani, Pacific Palisades, the animal

quarantine station facilities. The Navy had the Fort Kamehameha treatment plant which discharged its effluent into the ocean at the entrance of Pearl Harbor. In addition, the Navy had plants at Iroquois Point and at Barbers Point Naval Air Station which discharged into the ocean.

C. Wai‘anae system

The Wai‘anae WWTP service area included only Wai‘anae. Primary treated effluent from the plant was discharged about 3000 feet offshore into 35 feet of water.

D. Windward system

1. The Kailua WWTP serviced Kailua town and discharged secondary effluent into the northern end of Kailua Bay about 500 feet offshore into 12 feet of water.
2. The four temporary plants Pōhākapu, Kūkanono, Mauanwili Park and Maunawili Estates discharged secondary effluent into Kawainui Marsh which empties into Kailua Bay.
3. The Kāne‘ohe WWTP which serviced only Kāne‘ohe town discharged its effluent about 2300 feet into Kāne‘ohe Bay in waters 26 feet deep.
4. The ‘Āhuimanu WWTP discharged secondary effluent into ‘Āhuimanu Stream which flows into Kāne‘ohe Bay. The Kāne‘ohe MCAS had a primary WWTP which discharged its effluent at a depth of 15 feet about 500 feet into Kāne‘ohe Bay.

A more comprehensive list of facilities existing at that time is provided in Table 1 - O‘ahu Facilities Existing in the 1970s.

The environmental impacts of some of these discharges were quite obvious and although there had been no significant outbreaks of illnesses attributable to them, public health was at risk. It was recognized that the existing waste disposal practices were not acceptable and that with ever increasing waste loads, continuing the emissions as existed would only result in greater environmental degradation in the future.

In the case of the discharge of raw sewage off Sand Island, the degradation in the vicinity of the discharge was almost total devastation. Dr. Norman Brooks who designed the new outfall (outfall currently in use today) was quoted as saying “I was appalled at the raw waste discharge, which is still going on and I felt it was, esthetically, the worst discharge I know of for any important city.” Pearl Harbor and Kāne‘ohe Bay, with their limited circulation and flushing, were severely impacted by the nutrient loads imposed on them.

Approach

Although the consortium had been retained by the City look at and formulate alternatives for its discharges, the consortium quickly recognized that in order to develop an enduring program, it had to adopt the concept of total environmental management as espoused by Barry Commoner’s principles that everything is interconnected and there is no free lunch.

The water quality management strategy adopted for the program, although emphasizing the municipal waste loads and their impacts, was comprehensive: addressing all sources of water

Table 1. Wastewater Treatment Facilities Existing in the 1970s

Facility	Owner	Constructed (year)	Flow (mgd)	Treatment Process	Receiving Waters
ʻĀhuimanu	CCH	1964	0.290	Aero-accelator & Pond	ʻĀhuimanu Stream/Kāneʻohe Bay
CCH Jail	CCH	1962	0.094	Trickling Filter	South Hālawa Stream/Pearl Harbor - East Loch
Kailua	CCH	1964	7.000	Trickling Filter	Kailua Bay
Kāneʻohe	CCH	1962, 1967, 1969	4.200	Trickling Filter	Kāneʻohe Bay
Kūkanono	CCH	1961	0.070	Extended Aeration & Pond	Leaching Wells/Overflow to Kaiwainui Marsh/Kailua Bay
Makakilo Heights	CCH	1962, 1963, 1970	0.600	Activated Sludge	Sugar Cane Irrigation or Stabilization Pond Leaching Wells
Maunawili 1 Park	CCH	1965	0.140	Extended Aeration & Pond	Maunawili Stream/Kaiwainui Marsh/Kailua Bay
Maunawili 2 Estates	CCH	1965	0.095	Extended Aeration	Maunawili Stream/Kaiwainui Marsh/Kailua Bay
Mililani	CCH	1968	0.930	Rapid Bloc	Kīpapa Stream/Pearl Harbor -West Loch
Nānākai	CCH	1964, 1965	0.125	Extended Aeration	Sugar Cane Irrigation Ditch or Leaching Well
Pacific Palisades	CCH	1962	0.675	Trickling Filter	Waimano Stream/Pearl Harbor - Middle Loch
Pearl City	CCH	1965, 1967	5.000	Primary	Pearl Harbor - Middle Loch
Pōhākapu	CCH	1957, 1958, 1960	0.426	Trickling Filter	Kawainui Stream/Kaiwainui Marsh/Kailua Bay
Wahiawā	CCH	1928, 1929, 1956, 1969	2.500	Activated Sludge	Wahiawā Reservoir/Kaiaka Bay when reservoir full
Waiʻanae	CCH	1967, 1968	1.720	Primary	Waiʻanae Coast
Waipahu	CCH	1972	NA	Aerated Pond	Pearl Harbor - West Loch
Waipiʻo	CCH	1960, 1961	0.250	Extended Aeration	Waikakalaua Stream/Pearl Harbor - West Loch
Whitmore Village	CCH	1969	0.200	Extended Aeration	Wahiawā Reservoir/Kaiaka Bay when reservoir full
ʻĀliamanu	DOD-A	1942	0.500	Trickling Filter	Salt Lake
Helemano Military Reservation	DOD-A	1944	0.500	Trickling Filter	Helemano Stream/Kaiaka Bay
Schofield Barracks	DOD-A	1946	4.000	Trickling Filter	Waikele Stream/Pearl Harbor - West Loch
Waiʻanae Military Reservation	DOD-A	NA	NA	Septic Tank	Waiʻanae Coast
Waipiʻo Radio Station	DOD-A	1955	0.100	Stabilization Pond	Subsurface Percolation
Wheeler Pond	DOD-AF	1968	0.150	Stabilization Pond	Waikele Stream/Pearl Harbor - West Loch
Degaussing Station	DOD-N	1970	0.004	Extended Aeration	Leaching Pit
Fort Kamehameha	DOD-N	1970	7.500	Activated Sludge	Pearl Harbor Entrance
Iroquious Point	DOD-N	1958	0.533	Primary	Pearl Harbor Entrance
Kunia Naval Reservation	DOD-N	1961	0.100	Trickling Filter	Drainage Ditch
Lualualei NAD	DOD-N	1960	0.200	Stabilization Pond	Drainage Ditch
Lualualei NRS	DOD-N	1957	0.060	Trickling Filter	Drainage Ditch
Mānana (Capehart Housing)	DOD-N	1959	0.1	Trickling Filter	Waiawa Stream/Pearl Harbor - Middle Loch
MCAS Kāneʻohe	DOD-N	1947	2.000	Primary	Kāneʻohe Bay
NAS Barbers Point	DOD-N	1943, 1969	1.5	Primary	Barbers Point Coast
NCS Wahiawā	DOD-N	1964	0.285	Trickling Filter	Poamoho Gulch/Kaiaka Bay
Hawaiʻi Kai	PRIVATE	1965, 3967	1.800	Primary	Sandy Beach Coast
Lāʻie	PRIVATE	1958	0.200	Trickling Filter	Drainage Ditch
Mākaha	PRIVATE	1968	0.150	Extended Aeration	Golf Course Irrigation
Mākaha Pond	PRIVATE	1970	0.293	Stabilization Pond	Seepage pit
Animal Quarantine	STATE	1967	0.18	Activated Sludge	North Hālawa Stream/Pearl Harbor - East Loch
Waimānalo	STATE	1962	0.067	Trickling Filter	Kahawai Stream/Waimanalo Coast
Waimano Home	STATE	NA	NA	Septic Tanks w/ filter beds	

CCH = City & County of Honolulu, DOD = Department of Defense, A = Army, AF = Air Force, N = Navy, NA = not available pollution – point, non-point, agricultural, and industrial discharges; identifying the ecological parameters of the receiving waters to characterize their ability to accept and assimilate waste loads discharged; and assessing the application of technology to render the waste loads suitable for discharge within the identified limitations of the receiving waters. The goal was to develop cost-effective alternatives for meeting the environmental and public health objectives developed through the assessment.

Recommendations

A. The major recommendations of the WQPO were:
   1. Discharge effluent where it has the least environmental impacts;
   2. Reclaim effluent for reuse through agricultural and landscape irrigation where needed; and
   3. Apply appropriate technology for each discharge.

B. The specific recommendations for the different systems were:
   1. For the Sand Island system, the municipal and Army discharges were to be combined and treated in an advanced primary treatment plant with effluent disposal through a deep ocean outfall.
   2. For the Honouliuli system, a major diversion of all sewage to a new Honouliuli WWTP was recommended. Treatment was to be at the secondary level with all effluent recycled for sugar cane irrigation in the Ewa Plains area. It was recognized that there was a limit to the amount of effluent that could be recycled. Therefore, as the flows increased to where no more effluent could be recycled, the plant expansion was to be at the primary level and the primary effluent disposed through a deep ocean outfall.
   3. For the Wai‘anae system, a secondary treatment facility was recommended and the existing outfall continued to be used. Reclamation of the treated effluent was not considered feasible because of the high chloride content. The ocean outfall was to be extended by 3000 feet to about the 100-foot depth when water quality dictated the need to do so.
   4. For the Windward system, four activated sludge WWTPs were recommended. These facilities were to be located in Kahalu‘u and at the existing sites of the Kāne‘ohe, Kailua, and Kāne‘ohe MCAS WWTPs. It was recommended that the effluent be diverted to and the combined effluent disposed through a new outfall off Mokapu Point.

The WQPO was finalized and published in 1972.

PUBLIC LAW 92-500

Secondary Treatment and Waivers

On the national level, although there were federal and, in some instances, state laws to prevent water pollution, they were largely ineffective because they were difficult to enforce. Then in 1972, a new era of pollution control began with the passage of the Federal Water Pollution

Control Act Amendments or PL 92-500. This act required all dischargers to the Nation's waters, industrial as well as municipal, to have discharge permits. It also set a national uniform minimum treatment standard, secondary treatment, for all discharges. Higher levels of treatment of the effluent being discharged could be required if water quality dictated a need. Senator Edmund Muskie, one of the prime authors of this historic piece of legislation, described the legislation as offering "Uniformity, Enforceability, and Finality". Hawaiʻi and other states, primarily west coast states, appealed to allow waivers from the secondary treatment requirements for discharges to the marine environment. Although deeply committed to protecting the environment from water pollution, Senator Muskie convened a hearing in Hawaiʻi in 1974 to hear the bases of the appeals.

There were many testimonies given supporting waivers for marine discharges in Hawaiʻi, especially the Sand Island discharge. It is apparent that Senator Muskie, so deeply committed to protecting the environment, did come, as he stated, to listen, for in 1977 the law was amended by adding Section 301(h) to allow such waivers. The 1977 amendments allowed the granting of waivers for the three pollutant parameters of BOD, Suspended Solids, and pH that are in the federal secondary treatment regulations. There were stringent conditions to demonstrate that the discharges would not degrade the receiving waters that had to be met before a discharge could qualify for a 301(h) waiver permit.

Compliance with PL 92-500

It would have been ironic had the City chosen to simply comply with PL 92-500 and not implement the recommendations in the WQPO. If secondary treatment had been applied to all of the existing wastewater treatment plants (WWTP) listed in Table 1 and the plants had continued to discharge effluent in the then existing locations, the water pollution problems of Pearl Harbor and Kāneʻohe Bay which were primarily a result of the impacts of the nutrient loads would not have been corrected.

The recommendations of the WQPO, to discharge effluent where it would have the least environmental impacts, i.e., the open and deep ocean where there is good mixing and transport, and to apply the appropriate technology, pointed the best and correct way to solving the problems.

Appropriate Technology

Even in the case of discharges into the open ocean at depths of less than 100 feet, it is questionable whether secondary treatment is really needed when the discharge is relatively small. A case study was the Hawaiʻi Kai WWTP. Monitoring of the effects of the open coastal discharge of the plant was conducted for more than a decade spanning both primary and secondary treatment. No statistically significant differences were found in any of the receiving water quality parameters measuring bacteriological, nutrient, pH, D.O., chlorophyll a, or turbidity between the time with primary treatment and the time after secondary treatment was initiated.

The discharge depth was about 12 m and although the plume surfaced all the time, it was patchy because of wave induced surging of the diffuser ports. Measured daytime T_{90} values of bacteriological indicators with or without secondary treatment were 15 to 18 minutes. Even with this rapid dieoff rate disinfection (with chlorine) was required to meet bacteriological standards at the zone of mixing boundary.

The response of the benthos in this area to the wastewater discharge, whether primary or secondary was somewhat surprising. Some time after the commencement of the discharge, the nearby beach began to be covered with a type of fondose algae started to proliferate on the ocean bottom. Odors were generated as the algae decayed. The initial assumption was that the nutrients in the discharged wastewater were favoring the growth of the benthic frondose algae (Dictyopeteris sp.) in its competition for space with coral (predominantly Pocillopora sp.). However, an influx of urchins (primarily Tripneustes sp.) cleared the area of the frondose algae and allowed the return of a coral based benthic community. In fact, it was found the growth rate of coral in the vicinity of the wastewater discharge was about 30 % faster than that of a similar control area and the urchin population was maintained at a high enough level (by feeding on benthic micro-algae) to prevent the return of the frondose algae. This condition has been maintained for the last three decades. The lessons that are pertinent from this study of the Hawaiʻi Kai wastewater discharge is:

A. An open coastal location in Hawaiʻi with good mixing and transport conditions for wastewater discharge is more important than the level of treatment.
B. Wastewater discharges into a recreational zone require disinfection with primary or with secondary treatment.
C. In open coastal areas, wastewater discharges with primary or secondary treatment can enhance coral growth.

It is noted that subsequent marine investigations in other locations in the state have shown that excessive growths of the same frondose algae also occur in areas where there are no wastewater discharges. It appears that the excessive growths occur if the sea urchin population is insufficient to control the algae.

For discharges of large volumes of effluent such as the one at Sand Island, continued discharge at the same location, even after application of secondary treatment, would have continued to overwhelm the receiving waters and would not have been appropriate. Although the sludge deposits on the ocean bottom would be eliminated, the nutrient impacts would have continued. The receiving waters would have continued to be stressed beyond their capability for assimilation. The appropriate technology in that case was a new deep ocean discharge which would allow sufficient dilution and net transport that would prevent nutrient impact. With such a discharge the appropriate treatment technology, as shown by years of monitoring by the City, is primary treatment. The same is true for the Honouliuli discharge if it were in shallow waters

For the Honouliuli system, the recommendation to implement reclamation by reuse for sugar cane irrigation never materialized. The City and other agencies had spent several years in the 1970s researching the effects of using sewage effluent to irrigate sugar cane. Cane, in Hawaiʻi, is generally grown on a two-year cycle with harvest coming after the second year. In the first year, the emphasis is on cane growth and nutrients (fertilizers) are beneficial. In the second year, the cane is "ripened" and the energy of the plant is directed from growth to producing sugar to be stored in the stalks. This is done by cutting off fertilizers. It was found that the nutrients in the sewage effluent could keep the cane in the growth phase and adversely affect sugar yields. By using sewage effluent the first year and then irrigating with fresh water the second year, the application of nutrients would mimic the fertilization cycle practiced by the sugar companies. It was also found that by using 25 percent sewage effluent mixed with 75% fresh water throughout the two year cycle, sugar yields would not be detrimentally affected. Because it would complicate its irrigation process and perhaps more significantly, its workers were complaining about having to work with sewage, the sugar company refused to accept sewage effluent for irrigation. Therefore, for many years the outfall which was supposed to be a backup disposal system was the only means of disposal and the plant construction was limited to primary treatment. It is noted that the recommendation of the WQPO was to provide primary treatment with disposal of the effluent through a deep ocean outfall for the portion of the wastewater that was not needed for irrigation.

Although the potential for reclamation by sugar cane irrigation did not materialize, with the land development projections for the "Second City" in Kapolei indicating several golf courses would be built, the City began to look forward toward reclamation through irrigation of the golf courses, parks and common areas. Therefore, in 1989, funds were requested to plan for a secondary treatment facility, which is the first treatment step in any reclamation system. Construction of the secondary facility was completed in 1997 and planning and design of a tertiary facility to produce R-1 reclaimed water (the equivalent of California's Title 22 reclaimed water) were begun. After receiving bids for the tertiary facility, the City opted to privatize that segment of the plant, and U.S. Filter, now a part of Veolia Water, was selected to finance, construct and operate the facility. Currently up to a total of 10 mgd of effluent is reused for irrigation by the golf courses and by the refineries and power plant at Campbell Industrial Park.

TENTATIVE DENIAL OF THE HONOULIULI WAIVER

Background

The U.S. Environmental Protection Agency has issued a Tentative Denial Document (TDD) of the City's application for a 301(h) permit to waive secondary treatment requirements (waiver). By denying the waiver, EPA would be requiring the City to construct and operate a secondary facility. The reason given for denying the waiver is to improve the quality of the receiving waters by reducing the impacts of the discharge on those waters and to protect public health.

The questions that must be answered are: Are these concerns real? Will there be any measurable improvements? Will this course of action result in other more significant impacts?

To qualify for a waiver, a municipality must demonstrate that the impacts of discharge of primary effluent will not cause environment harm. The City has had an ongoing monitoring program of all of its ocean discharges for more than three decades. The two that garner the most attention and effort are the Honouliuli and the Sand Island discharges for which waiver permits had been granted by the EPA in 1991. Millions of dollars have been spent by the City on its monitoring program to document the impacts of its discharges. In spite of the intensive efforts of the program, adverse impacts have not been found -- there have been no measurable chemical, biological and aesthetic impacts. If the impacts of the discharge are not discernible, we do not feel the concerns can be real. Further, if the impacts are not measurable, there can be no measurable improvements.

The physical presence of both the Honouliuli and Sand Island outfalls has had the impact of increasing the populations of fish and other marine life. This impact is considered positive. Because the suspended solids discharge in the effluent are too light to settle, there has been no deposition on the ocean floor and the sandy bottom is clean. With buoyancy of the discharge, the water at the bottom is clear. The protection afforded by the armor rocks installed to protect the outfall from ocean surges has attracted the marine life to this haven in the otherwise barren environment.

Mixing and Transport Characteristics

The open ocean areas in the vicinity of the C&C of Honolulu outfalls in Mamala Bay (as well as those off Kailua and Wai'anae) are subject to a complex interaction of wind driven and tide related forces which vary on time scales from hourly to seasonally. Several key aspects of these interactions were not known at the time the outfalls were designed and hence were not taken into account in the calculations done at that time of initial dilution and subsequent transport of the discharge plumes from these outfalls. Although more information about these interactions was known at the time of the Mamala Bay Study again several key aspects were not included in the numerical model studies of plume transport. Consequently, predictions from these models often did not correlate with field data and observations. Today, with the advent of further measurements and with better models, we have a better understanding of the main features of the pattern of transport and the forces involved.

The key aspect related to mixing and transport that was not known earlier was the complex interaction of the tide with the steep slope of the island bathymetry. Not only does this interaction result in the generation of high amplitude (sometimes 75 m or more) internal waves on the thermocline but it is also the main driver of the currents around the island. Interestingly, at different depths these current ellipses are related to different components of the tide. For example, the tide related current at about 350 m is primarily related to the S2 (solar) tidal component.

The dynamics of the thermocline are important because the vertical density profile is the major factor in the frequency of plume surfacing. Three conditions are required for the plume to impact the nearshore recreational area. (1) a surfacing plume, (2) an along shore current in the direction of the recreational area in question, and (3) an on-shore wind. [One of the errors in the numerical model used in the Mamala Bay Study was the use of an eddy diffusion coefficient that was one to two orders of magnitude too large (in comparison to actual measured values). This resulted in an unrealistic lateral spread of the plume which would not have required an on-shore wind to reach the beach.] When these three conditions occur the discharge from the treatment plant should be disinfected in order to protect recreational users. Disinfection would be required with or without secondary treatment.

No other water quality conditions in the discharge areas of the C&C of Honolulu outfalls (besides the bacteriological indicators controlled by disinfection as described) are detrimentally affected by the present level of treatment as evidenced by more than two decades of monitoring. There is no accumulation of solids in the benthos. There is no reduction in the dissolved oxygen levels. There is no accumulation of toxic substances in local fish. There are no algae blooms. There are no grease slicks. There are no fish kills. There are no changes in pH. In sum, the mixing and transport characteristics of the open coastal locations of the C&C of Honolulu outfalls are more than adequate to accommodate the discharges. Full secondary treatment would add significantly to the CO2 discharge to the atmosphere, would cause odor problems (at those plants with significant salt water infiltration), would increase the sludge volume (this sludge would not be treatable by anaerobic digestion in those areas with salt water infiltration – like Sand Island), would require large use of scarce energy and would add significantly to the sewer charge.

Water Quality Conditions

Outfall/Diffuser Characteristics

The Tentative Decision of the Regional Administrator Document (TDD) addresses the zone of initial dilution (ZID), as defined in 40CFR 125.58(dd), which refers to the region of initial mixing surrounding or adjacent to the end of the outfall pipe or diffuser ports, provided that the ZID may not be larger than allowed by mixing zone restrictions in applicable water quality standards. And the mixing zone, as defined in 40CFR 125.121(c), which refers to the zone extending from the sea's surface to seabed and extending laterally to a distance of 100 meters in all directions from the discharge point(s) or to the boundary of the zone of initial dilution as calculated by a plume model approved by the director, whichever is greater, unless the director determines that the more restrictive mixing zone or another definition of the mixing zone is more appropriate for a specific discharge. The Amended Section 301(h) Technical Support Document (ATSD) operationally delimits this volume of water in relation to the depth of the outfall (i.e., subtending the depth of the outfall on each side of the diffuser and above it). The ZID dimensions, calculated by the applicant to be a rectangle parallel to the 231^{o} azimuth, are 122 m (400 ft) wide and 660 m (2,165 ft) long, centered over and parallel to the diffuser. This calculation is consistent with EPA's guidance.

40 CFR 125.62(a) requires that the applicant's outfall and diffuser be located and designed to provide adequate initial dilution, dispersion, and transport of wastewater such that the discharge does not exceed, at and beyond the ZID, all applicable water quality standards and, for pollutants for which there are no EPA-approved standards, section 304(a) criteria. HAR Chapter 11-54-9 allows a zone of mixing (ZOM), which is a limited area around outfalls to allow for initial dilution of waste discharges. Although Hawaii's water quality standards allow narrative and numeric criteria to be met at the ZOM for secondary treated effluent, 301(h) regulations require facilities with variances from secondary treatment to meet water quality standards and criteria at

the ZID. Nevertheless, the HWWTP permit contains a ZOM situated around the ZID. Dimensions of the ZOM are 610 m (2,000 ft) wide and 1,128 m (3,700 ft) long.

EPA Region 9 issued a 301(h) wavier NPDES permit in May 1991, which indicates concurrence that the wavier application was appropriate and should be granted the wavier. The CCH applied for a renewal of this permit (301(h) wavier) in December 1995, and updated the application in August 2004. EPA has taken almost 11 years issue a document (TDD) relative to the Honouliuli Wastewater Treatment Plant application. If this had been performed in a timely manner a second permit would have been issued in 1996 (or denied at that time), again issued in 2001 (or denied at that time) and then issued in 2006 (or denied at that time). A timely response expectation certainly gives all the outward appearances of being a one way street (from outside to inside).

EPA calculated the most critical environmental situation. The Visual Plumes model computed the critical initial dilution of **118:1** at a trapping depth of 51 meters below the surface. EPA used the computed dilution ratio of 118:1 throughout this 301(h) review as the critical short-term initial dilution for the Honouliuli discharge. No information is provided to review the appropriate value of the parameters used to determine the critical initial dilution. Nor was the time period that could be impacted by this critical dilution provided. All scientific efforts are subject to appropriate and earnest reviews regardless of the source.

Suspended Solids

The TDD refers to a recalculated suspended solids (SS) worst-case increase using the revised (EPA) initial dilution of 118 (compared to applicant initial dilution of 210) with an SS_a of 0.5 mg/L and an SS_e of 95 mg/L. EPA obtained a worst-case increase in suspended solids of 0.80 mg/L and, consequently, calculated SS_f to be 1.30 mg/L. It is stated that the ATSD notes that seabed deposition could still be substantial, depending on the suspended solids mass emission rate and ambient currents at the discharge site, and should be evaluated. There has not been any accumulation of SS on the ocean floor over the outfall operational period and would be evidence that appropriate transport is occurring providing additional dispersal.

Bacteria

Enterococci, just one group of many fecal indicators, are not considered pathogens. They are merely indicators that pathogens may be present. The TDD address exceedances based on criteria from 40CFR 131.41(c)(2) for infrequent use coastal recreation waters and stated that these criteria apply to Hawaiʻi marine waters between 300 meters (1000 feet) for shore and three miles from shore. HAR Chapter 11-54-8(b) Water Quality Standards states that marine recreational waters are within 300 meters (one thousand feet) of the shoreline, including natural public bathing or wading areas. It does not expand the definition beyond that boundary. The TDD reference to three miles from shore, can only be associated with HAR Chapter 11-54-9.1 Water Quality Standards - "Territorial seas" which means the belt of the seas measured from the line of ordinary low water along that portion of the coast which is in direct contact with the open sea and the line marking the seaward limit of inland waters, and extending seaward a distance of three miles. Territorial seas are not stated as being recreational and are not incorporated in the marine recreational waters definition. The application of bacterial criteria for this situation does not have merit.

Chlordane/Dieldrin

Chlordane and dieldrin have been detected and is not disputed; however, there is a question as to detection methods being the most current and reliable. Chlordane exceeded the Hawai‘i (0.000016 μg/L) water quality criterion, but not the EPA (0.00081 μg/L) water quality criterion. We must ask if the reduction in the Hawai‘i water quality criterion was derived from scientific data and if not should it be used for comparison purposes. Dieldrin exceeded the Hawai‘i (0.000025 μg/L) water quality criterion, but exceeded the EPA (0.000054 μg/L) water quality criterion once. The best method to reduce the chlordane and dieldrin concentrations is to prevent their entrance into the collection system, since there is little reduction by secondary treatment. Another fact that speaks loudly is that neither chlordane nor dieldrin has been found in any of sampled fish tissue or sediments.

Whole Effluent Toxicity

The whole effluent toxicity (WET) testing results stated by EPA are what they are; however, the use of *Tripneustes gratilla* sea urchin (wana) has always been disputed due to the reproduction difficulties wana experience simply by being placed outside their natural environment without proper acclimation. Wana may travel about, but do not venture into the depths that the outfall placed and are not an appropriate organism to use for evaluation.

Ammonia

While the TDD states ammonia exceedances, there has been no evidence that an algal bloom has occurred anywhere within the vicinity of the Barbers Point Outfall (servicing Honouliuli Wastewater Treatment Plant). For algal populations to thrive they must have other environmental conditions (pH, light source, other nutrients, etc.) in addition to just ammonia. It certainly appears that ammonia is not a trigger for algal blooms.

Secondary Treatment Impacts

As to the question on the impacts of requiring secondary treatment, unlike continuing the primary discharge, there will be adverse impacts. Higher levels of treatment result in larger quantities of sludge solids that must be disposed. Alternatives for solids disposal include composting and reuse, landfilling and incineration. With our climate, our plants grow year round and there is much green waste to be disposed. The City chose green waste composting and reuse as its disposal alternative and at the present time there is more compost available than can be reused. Sludge compost would only add to this surplus. Landfilling the sludge would reduce the precious landfill space available for municipal refuse. Incineration comes with air quality impacts.

Another impact that we believe has not been addressed by EPA is the contribution of carbon dioxide (CO_2) into the atmosphere that would result if the waiver were denied. While the USA has been unwilling to acknowledge that greenhouse gases are contributing to global warming, the great majority of the scientists in our country and worldwide are in agreement that global warming is a dire problem that needs to be addressed. Were it not for the shielding of the earth from solar radiation by the particulates in our atmosphere, global temperatures would be much higher. Secondary treatment in which some of the organic constituents in the sewage are oxidized, releases CO_2. Further, since fossil fuel is used to generate electrical power on O‘ahu, additional CO_2 is released at the electrical power plants providing the electrical power to run the air blowers and other equipment essential to the process. The additional sludge produced must be treated and disposed and depending on the treatment process, additional CO_2 can be generated.

In the ocean, oxidation of the organic constituents discharged does occur as the marine microorganisms consume them for food. In the process CO_2 is produced. The big difference between secondary treatment and oxidation in the ocean is the CO_2 is sequestered in the ocean waters and not released into the atmosphere to contribute to global warming.

ALTERNATIVE TO SECONDARY TREATMENT

If the EPA continues to insist that improvements must be made, a far better alternative to secondary treatment would be to extend the outfall to deeper depths. With the limitations of construction methods 40 years ago, the Honouliuli outfall was at the limits of feasible construction. Today, tunneling methods have advanced making such construction feasible. The Hawai‘i Natural Energy Laboratory employed a new method of constructing a pipeline into deep waters using high density polyethylene pipe anchored to the bottom with weights. Such advances in construction make the alternative of a longer and deeper outfall much more attractive than secondary treatment.

CONCLUSIONS

In the late 1960s the City and County of Honolulu took the initiative to develop a comprehensive water quality management plan to protect and enhance our unique island water environment. The resulting Water Quality Management Program for O‘ahu was published in 1972. The program, which was the model used by the State of Hawai‘i in developing the rules and regulation applicable to protecting the waters of the entire state, has withstood the test of time. Its validity has been demonstrated by the successes achieved by the City following and adhering to the recommendations of the program. The successes include the restoration of the receiving waters into which the discharges were then occurring, namely Kāne‘ohe Bay, Pearl Harbor and off Sand Island and the absence of impacts in the deep ocean regime to which the discharges were redirected. The successes were documented in the paper, The CWA: 25-Years of Success, published by the Hawai‘i Water Environment Association in 1997 to commemorate the 25th anniversary of the Clean Water Act (CWA) as PL 92-500 and its amendments came to be called. The paper is attached to this document.

The CWA initially required secondary treatment for all discharges. It was fortunate that it was amended to include Section 301(h) to allow less than secondary treatment for marine discharges, for it allowed communities like Honolulu the flexibility to implement ways to improve their water environment in the most cost-effective manner while still meeting the goals of the act.

If the EPA were required to prepare an environmental impact statement in accordance with NEPA requirements, we believe that the tentative denial would be reversed. The environmental and financial costs that would be committed for no concomitant benefits would make it the least desirable alternative. It would behoove EPA to keep in mind Barry Commoner's principles that everything is interconnected and there is no free lunch.