1995-01-08-MA-FEA-Maui Ocean Center

AECOS No. 780

MAALAEA TRIANGLE AND MAUI OCEAN CENTER
Final
ENVIRONMENTAL ASSESSMENT FOR A SEA WATER SYSTEM AND DRAINAGE IMPROVEMENTS

Prepared For:

MOC / MTP
c/o
Chris Hart and Partners
1955 Main Street, Suite 200
Wailuku, Maui 96793

Prepared By:

AECOS, Inc.
970 N. Kalaheo Avenue, Suite C300
Kailua, Hawaii 96734

December 1994

MAALAEA TRIANGLE
AND MAUI OCEAN CENTER
Final
ENVIRONMENTAL ASSESSMENT
FOR A SEA WATER SYSTEM
AND DRAINAGE IMPROVEMENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

Section I.

INTRODUCTION

I.A. PROJECT SUMMARY

This Environmental Assessment (EA) considers a sea water circulation system and land drainage improvements associated with a proposed development on and adjacent to the parcel known as the Maalaea Triangle (TMK 3-6-01: 01 & 19) at Ma'alaea, Maui (Figure I-1). The proposed Maui Ocean Center (MOC) is planned for the south end of the parcel, and various commercial developments and parking will occupy the remainder of the land. While all of the proposed commercial development is to be located on private land, the sea water system for the Maui Ocean Center and the drainage culvert improvements required for site and off-site drainage will require use of State land at Ma'alaea Small Boat Harbor, and use of submerged land seaward of the harbor for placement of a sea water intake structure and pipe.

Applicant	Maalaea Triangle Partnership & Maui Ocean Center
Planning Consultant	Chris Hart & Partners 1955 Main Street, Suite 200 Wailuku, Hawaii 96793
Agent / Environmental Consultant	*AECOS*, Inc. 970 N. Kalaheo Ave., Suite C300 Kailua, Hawaii 96734
Land Owner	Maalaea Triangle Partnership 75-B North Church Street Wailuku, Maui, Hawaii 96793 & State of Hawaii
Tax Map Key (TMK)	3-6-01: 1, 2, & 19
Land Use Classifications:	Community Plan: B and OS Zoning Districts: B-2, M-1. State Land Use: Conservation (R) and Urban.
OEQC Bulletin Publication Date(s)	Draft EA - Sept. 8, 1994; Sept. 23, 1994.
Accepting Agency:	Dept. of Land and Natural Resources 1151 Punchbowl Street Honolulu, Hawaii 96813

I.B. DOCUMENT SCOPE AND PROJECT RATIONALE

This environmental assessment (EA) encompasses the sea water intake and discharge structures (i.e., intake manifold structure and pipes providing flow to and from the sea, and a pump vault and pumps) and culvert structures to be built or modified along the shore of Ma'alaea Small Boat Harbor. Information is provided on the Maalaea Triangle development, particularly where this development bears on impacts to the environment caused by the sea water or site drainage systems. The present document, however, specifically addresses those aspects of the proposed commercial developments which require permits or approvals from Maui County Planning Department, Department of Land and Natural Resources (DLNR), Department of Health (DOH), and U.S. Army Corps of Engineers (USACOE) because of the use of State lands, use of submerged lands, construction within the Shoreline Setback Area, and construction in the Conservation District seaward of the shoreline. The Maui Ocean Center and Maalaea Triangle development have been previously addressed in a Project Assessment Report (Chris Hart & Partners, 1994) presented to the Maui County Planning Department in support of amendments to the Special Management Area (SMA) permit No. 89/SM1-003. The latter document included descriptions of the sea water system and site drainage systems. In approving the SMA amendment request, the Maui Planning Commission concluded that the Maui Ocean Center and the Maalaea Triangle Project were consistent with the SMA rules and criteria pursuant to the requirements of the State CZM Act, provided that the applicants adhere to the conditions attached to the permit (see Appendix D).

This document considers impacts on the environment from construction and operation of a sea water system for the Maui Ocean Center at Ma'alaea. Sea water will be used in various marine displays at the MOC. The sea water intake will be located perhaps as much as 1200 feet offshore of Kapoli Park (that is, at a point southwest of the harbor entrance) in water between 15 and 20 feet deep. Two 12-inch diameter intake pipes will be laid across the reef flat and under the shore near the base of the south breakwater. The system is designed to draw approximately 800 gpm (50 liters/sec) of sea water from the adjacent ocean, pass this water through marine display features at MOC, and return the water through an effluent discharge pipe terminating within a culvert behind the shore of Ma'alaea Small Boat Harbor. Between 60 and 70% of the flow will be filtered within the facility. Impacts considered in Section IV of this EA are (short term) those of the construction of the intake and pipe across the shore, and (long term) those of the water quality of the discharge on the receiving water. Alternatives considered are presented in Part I.E. below.

The drainage structure into which the sea water effluent will be directed is to be built as a part of the Maalaea Triangle site drainage. In addition, improvements to a second,

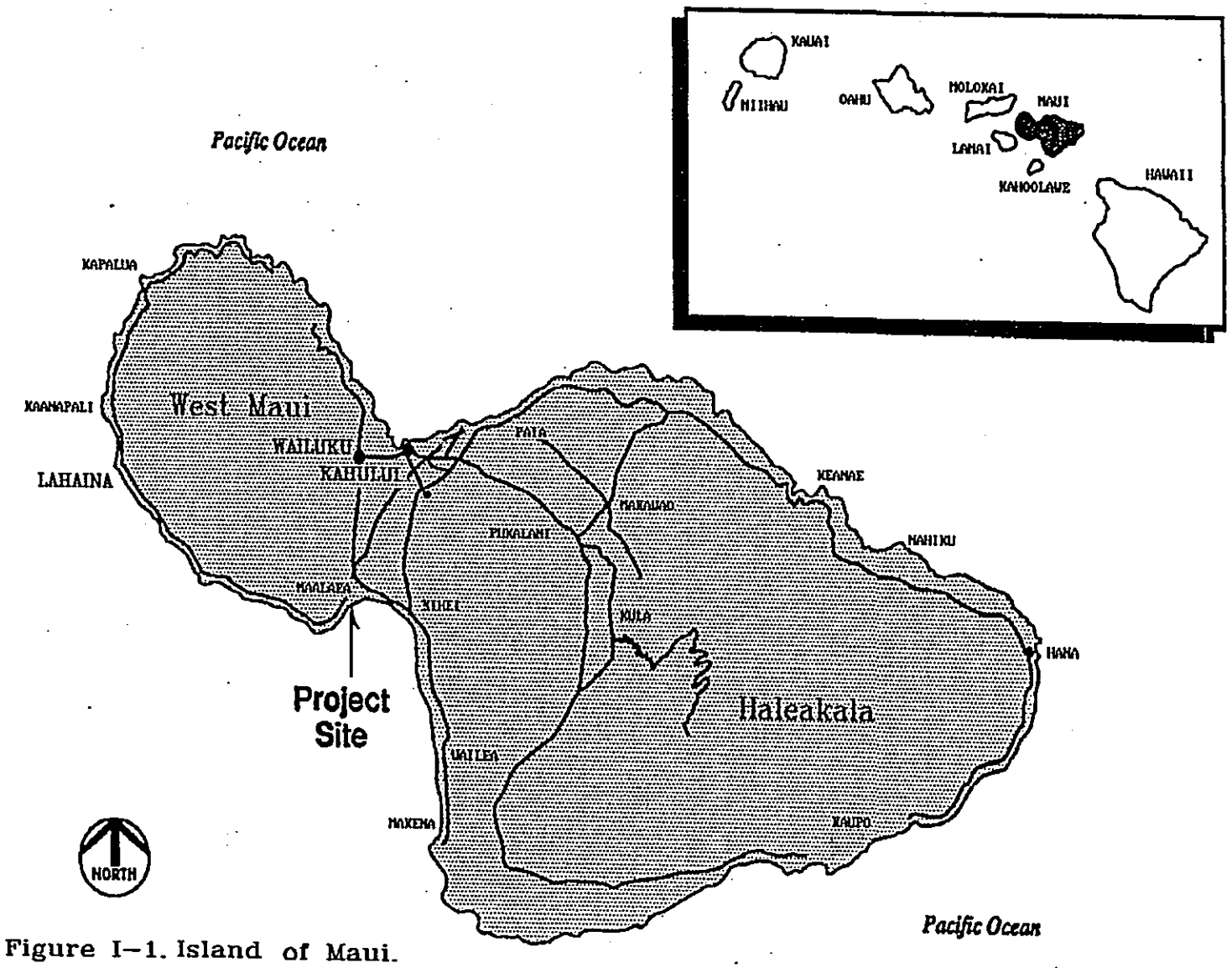


Figure I–1. Island of Maui.

existing drain on the shore at the U.S. Coast Guard facility are also proposed to handle onsite drainage from the developed Maalaea Triangle parcel. Construction and long-term use of both of these structures are considered in this document.

I.C. ENVIRONMENTAL CERTIFICATIONS AND PERMITS

Drainage improvements and the proposed sea water intake and discharge system are all described in detail in Section II. Drainage improvements include changing existing swales across the Maalaea Triangle parcel to underground drains and constructing new drainage systems along Maalaea Road with new outlets at the wharf in Maalaea Harbor. The sea water system consists of two pipes to be used for water transmission between a point offshore and a pump vault located behind the shore on State property. All of the land portion of the pipe, as well as the section crossing the shore, will be buried. Offshore, the pipe will be bolted to the solid limestone bottom of the reef flat. A sea water discharge pipe will terminate within the new storm drain on Maalaea Road, which will then serve to convey this water to the Harbor shore.

I.C.1. Federal Policies and Controls

Federal jurisdictions are limited in this project site to construction activities within the navigable waters of the United States (The River and Harbor Act of 1899, Section 10). The installation of water intake systems is permited under U.S. Department of the Army, Nationwide Permit No. 7. However, the nature of the construction activities associated with the installation (for this project described in Section II) must be reviewed by the U.S. Army Corps to determine if an individual permit is more appropriate. Application for the permit will generate requirements under the Coastal Zone Management Act of 1972 to insure compliance with the State of Hawaii CZM program, and under Sections 401 and 402 of the Clean Water Act, for water quality certification from the State of Hawaii. Consultation with National Marine Fisheries under Section 7 of the Endangered Species Act may also be requested in the permitting process if impacts to endangered marine species are anticipated.

I.C.2. State of Hawaii Policies and Controls

The Maalaea Triangle and Ma'alaea Harbor are located on land that is in the State Urban District. However, the intake pipe is proposed to be laid across the shoreline and lands classified by the Department of Land and Natural Resources (DLNR) as Conservation District, Resource (R) Subzone (§13-2-13). A Conservation District Use Application (CDUA) must be made to the State of Hawaii, Department of Land and Natural Resources to obtain a permit (CDUP) for the portion of the pipe within the Conservation District.

The Hawaii Coastal Zone Management Act (Act 188, SLH 1977) established basic State policy in actions affecting the coastal zone and delegates authority for regulating development within the SMA and SSA to the counties (see Section I.C.3).

The sea water discharge will be subject to the provisions and requirements of the National Pollutant Discharge Elimination System (NPDES) administered by the State of Hawaii, Department of Health (see HAR §11-54-03).

This Draft Environmental Assessment (EA) has been prepared and is being filed with the State of Hawaii, Office of Environmental Quality Control (OEQC) in compliance with requirements enacted in Act 241 SLH 1992 (House Bill 3946) for projects for which a negative declaration is anticipated. The law requires that Environmental Assessments undergo a formal 30-day review period including publication announcements in the OEQC Bulletin and inclusion of public comments and responses in a final EA prior to agency determination that either an EIS or a negative declaration is appropriate.

I.C.3. County of Maui Policies, Controls, and Development Plans

Portions of the proposed project are within the County of Maui, Shoreline Setback Area (SSA) and the Special Management Area (SMA) requiring issuance of a Shoreline Setback Variance and a SMA Permit from the Maui County Planning Commission. The Maui County Planning Commission initially granted SMA approval to the Maalaea Triangle project in 1989. The proposed project is consistent with the county General Plan, the Kihei-Makena Community Plan, and the County Comprehensive Zoning Ordinances. The project is within lands designated Business/Commercial (B) and Open Space (OS) on the Kihei-Makena Community Plan Land Use Map and Community Business (B-2) and Light Industrial (M-1) on the County Zoning map. The intake pipe would cross lands designated Light Industrial (M-1), Resort Commercial (B-R), and Park (PK) on the County of Maui zoning map.

I.D. LIST OF AGENCIES AND OTHER CONSULTED PARTIES

Following is a list of agencies and other parties provided copies of a brief project description prior to preparation of the draft Environmental Assessment per HAR §11-200-9. A copy of the pre-assessment consultation letter, dated May 6, 1994, is included in Appendix A1 along with all written responses received (marked below by ✓). Also listed are parties that responded to the draft EA (marked below by ☑). The latter comments and response letters generated are included as Appendix A2.

✓ U.S. Army Corps of Engineers
Pacific Ocean Division, Bldg. 230
Fort Shafter, Hawaii 96858

✓ U.S. Department of Agriculture
Soil Conservation Service
P.O. Box 50004
300 Ala Moana Blvd.
Honolulu, Hawaii 96850

U.S. Department of Commerce
National Marine Fisheries Service
2570 Dole Street
Honolulu, Hawaii 96822

✓ U.S. Department of Interior
Fish and Wildlife Service
P.O. Box 50156
300 Ala Moana Blvd.
Honolulu, Hawaii 96850

✓ Department of Education
1390 Miller Street
Honolulu, Hawaii 96813

✓ ☑ Department of Land and Natural Resources
1151 Punchbowl Street
Honolulu, Hawaii 96813

Department of Land and Natural Resources
Land Management Division - Maui
54 So. High Street
Wailuku, Hawaii 96793

✓ ☑ Department of Land and Natural Resources
Aquatic Resources Division - Maui
70 So. High Street, Room 201
Wailuku, Hawaii 96793

✓ ☑ State Historic Preservation Division
Department of Land and Natural Resources
33 So. King Street, 6th Floor
Honolulu, Hawaii 96813

☑ Office of State Planning
P.O. Box 3540
Honolulu, Hawaii 96811-3540

☑ Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

✓ Department of Business,
Economic Development and Tourism
220 So. King Street, 11th Floor
Honolulu, Hawaii 96813-4541

✓ Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813
Rex D. Johnson

✓ Office of Hawaiian Affairs
711 Kapiolani Blvd., Suite 500
Honolulu, Hawaii 96813

✓ University of Hawaii
Water Resources Research Center
2540 Dole Street, Holmes Hall 283
Honolulu, Hawaii 96822

☑ University of Hawaii
Environmental Center
2550 Campus Road, Crawford 317
Honolulu, Hawaii 96822

County of Maui
Planning Department
200 So. High Street
Wailuku, Hawaii 96793

County of Maui
Department of Parks & Recreation
200 So. High Street
Wailuku, Hawaii 96793

✓ ☑ County of Maui
Department of Public Works
200 So. High Street
Wailuku, Hawaii 96793

County of Maui
Economic Development Agency
200 So. High Street
Wailuku, Hawaii 96793

☑ County of Maui
Board of Water Supply
P.O. Box 1109
Wailuku, Maui, Hawaii 96783-7109

☑ Lesley Ann Bruce
250 Hau'oli Street
Ma'alaea, Maui, Hi 96793

☑ Mr. Craig Edwards
Recording Secretary
Ma'alaea Community Association
100 Hauoli St., No. 401
Wailuku, Hawaii 96793

✓ Mr. Harvey Janis
President
Ma'alaea Community Association
100 Hauoli St., No. 401
Wailuku, Hawaii 96793

Mr. Bill Richardson
President
Ma'alaea Charter, Inc.
P.O. Box 5041
Kahului, Hawaii 96732

Mr. Robert K. Luuwai
Commodore
Ma'alaea Boat & Fishing Club
786 Kaulona St.
Makawao, Hawaii 96768

Chris Hart & Partners
1955 Main Street, Suite 200
Wailuku, Hawaii 96793

I.E. PROJECT ALTERNATIVES CONSIDERED

Several alternatives with respect to the MOC sea water system and the Maalaea Triangle drainage system have been considered and are discussed here.

Alternative storm water discharge: Storm water discharges from the Maalaea Triangle site and from offsite flowing through the site are presently directed into Ma'alaea Harbor. These discharges contribute to poor water quality and siltation within the harbor. The drainage plan proposed herein would direct all offsite and onsite drainage which presently crosses or arises on the Ma'alaea Triangle parcel to one existing and one new outlet within Maalaea Harbor. Early plans had considered rerouting the offsite run-off to a gully at Kapoli Park, southwest (and outside) of the harbor. In a letter dated April 7, 1989, the Department of Land and Natural Resources (DLNR) questioned the wisdom of redirecting runoff closer to potentially sensitive marine environments off this coast and recommended that drainage waters continue to be discharged into the Maalaea Harbor. This same view was expressed earlier by the National Marine Fisheries Service (by letter dated February 1, 1989).

Alternative routes for the sea water intake: Construction related impacts for the sea water intake lines to supply the Maui Ocean Center marine displays could be reduced by a routing through the harbor. A suitable intake area offshore could be reached by extending the pipes seaward through the harbor mouth. This alternative was not considered feasible because the State and U.S. Army Corps of Engineers are in the process of selecting a design for expanding the harbor. All possible pipe routes within the harbor would be subject to removal if the harbor is reconfigured or enlarged. Pipes on the harbor bottom would also be in the way of harbor dredging either as part of expansion plans or maintenance. Pipes in the harbor basin and/or entrance channel

would be vulnerable to damage by boat anchors. The routing selected is in the least environmentally sensitive area outside of the harbor.

Alternative water sources for MOC: Although detailed geological work has not been undertaken, the possibility exists that sea water for the MOC could be obtained on site from a deep well. While such a source might be used to supplement sea water flowing through the system and would be particularly attractive at times when offshore waters become turbid, well water may not be suitable for many of the displays (for example those with live corals). Also, the quality of the water obtained from a well may not be as good as that from offshore. It is unlikely that the volume of water required could be disposed of in an injection well at this site.

Section II

PROJECT DESCRIPTION

II.A BACKGROUND - MAALAEA TRIANGLE DEVELOPMENT

II.A.1 The Commercial Development

The Maalaea Triangle property is a triangular shaped parcel situated approximately 100 feet north and mauka of Ma'alaea Small Boat Harbor. Maalaea Road borders its makai and eastern boundaries and Honoapiilani Highway borders the mauka (west) boundary (see Figure II-1). The parcel (TMK: 3-6-01: 1 & 19) is 18.484 acres in size and was acquired by Maalaea Triangle Partnership in December 1986 from C. Brewer Properties, Inc. The land was previously used mostly for cultivation of sugar cane, although a few residential homes and commercial buildings occur along the eastern corner of the property. A small shrine known as the Ma'alaea Ebisu Jinsha is located on the harbor side west of the Maalaea Store property. The site of the Maalaea Store (TMK 3-6-01:25) is separately owned by the Uno family and not part of the Maalaea Triangle project.

On June 20, 1989 the Maui Planning Commission approved a SMA Permit Request by the Maalaea Triangle Partnership for a mixed-use, commercial development on the Maalaea Triangle parcel. On April 12, 1994 the Maui Planning Commission approved a SMA Permit amendment request to incorporate the Maui Ocean Center (MOC) as part of the Maalaea Triangle Project. The approved plans contain a total of 162,960 square feet of mixed-use commercial space including the Maui Ocean Center and other uses permitted within the B-2 zoning district. The plans also provide for approximately 982 parking stalls and extensive landscaping improvements. The architectural theme of the project emphasizes a fishing village character.

The conceptual site plan for the Maalaea Triangle project site, as approved by the County of Maui SMA Permit, is shown in Figure II-1. The site plans call for entry features and extensive landscaping including plantings, walkways, water features, moss rock walls, and thematic entry features for the entire Honoapiilani Highway frontage. The commercial buildings would be situated roughly parallel to Honoapiilani Highway but along Maalaea Road. This orientation would buffer strong prevailing winds and create protected landscaped courtyards and mall spaces. Linear building masses would be articulated with varying roof heights. The majority of buildings are planned to be one story high to preserve existing views from the highway towards Ma'alaea Bay and the harbor. The design and layout of the buildings would reflect a pedestrian oriented harbor town similar to parts of Lahaina (as along Front Street)

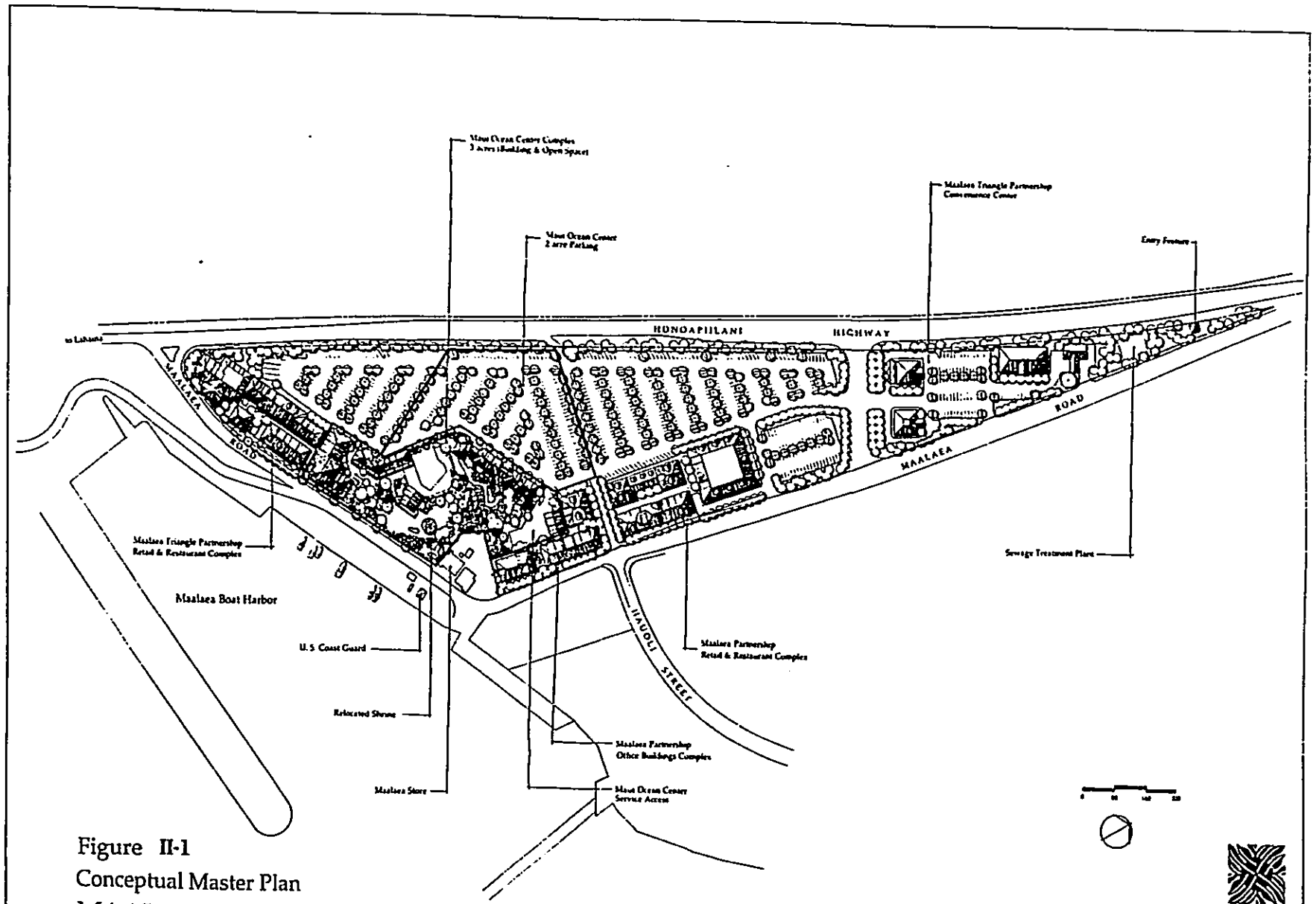


Figure II-1
Conceptual Master Plan
MAALAEA TRIANGLE & MAUI OCEAN CENTER
MAALAEA MAUI HAWAII

The commercial buildings within the project are located in three areas or nodes. The commercial frontage originally proposed for Maalaea Road fronting the middle of the harbor has been partly replaced by the Maui Ocean Center (see Section II.A.4). One commercial node would extend west along Maalaea Road to the (south) intersection with Honoapiilani Highway and consist of open street-level pedestrian oriented stores to complement the harbor activities and service the local Ma'alaea shoppers. The upper level of the harbor front complex would contain restaurants overlooking Ma'alaea Harbor and the bay. A second commercial node, located along Maalaea Road opposite the intersection with Hauoli Street, would be internally focused with courtyards and contain specialty shops oriented to the visitor shopper. On the north end of this node, a major store or marina theme facility is planned as an anchor tenant. The Maui Ocean Center, the old Maalaea Store, and a landscaped open space area surrounding the existing fishing shrine would separate these two commercial nodes.

The third commercial node is planned to be a convenience/shopping complex located on the Kihei end of the site, at the corner of the north intersection of Maalaea Road and Honoapiilani Highway. Uses envisioned for this area included a service station, fast food facility, financial institution, and convenience store.

II.A.2 Open Space Requirements

A condition included as part of the 1989 SMA approval requires that "...at least three acres of the project shall be kept in open space (i.e., through landscaping) as recommended in the Kihei-Makena Community Plan." These open space areas have been approved for the grounds surrounding the fishing shrine and along the perimeter of the project. The combined open space areas within the Maui Ocean Center (see Section II.A.4) is about 1.3 acres (mostly surrounding the shrine), of which one acre will be credited towards the three-acre open space requirement for the entire development.

II.A.3 Infrastructure Requirements

The Maalaea Triangle Partnership proposed and received SMA approval to develop initial infrastructure and site improvements for the Maalaea Triangle project site in order to facilitate development of the site into a commercial center. Infrastructure improvements, both on and off-site, are necessary to ensure appropriate levels of service for the project. Significant improvements will be required in water storage and transmission, roadways, drainage, and sewerage. Maalaea Triangle Partnership would act as project developer and implement the plans by developing and refining a project master plan, including design and use covenants, and by providing capital to design and construct infrastructure improvements such as roads, parking, sewer system, storm drains, water lines, electrical service, utilities, landscaping, entry features, and other amenities.

The site is bordered by Honoapiilani Highway and Maalaea Road. Honoapiilani Highway is a two-lane State highway connecting Wailuku and Lahaina (and points north). Maalaea Road is a substandard street maintained by the County of Maui. A traffic study was conducted for the project (Parsons, Brinckerhoff, Quade and Douglas, 1987) and has been recently updated (Parsons, Brinckerhoff, Quade and Douglas, 1994). Traffic volumes from turning movement counts made by DOT (1993) were utilized to evaluate existing operating conditions, recommend improvements to the road structures, and predict traffic conditions on the public roadways after the project is completed (see Section IV.B.1).

The water source for Ma'alaea is located in Mokuhau where several wells provide a total capacity of 10 million gallons per day (mgd). From this source, 25- and 18-inch transmission lines transport water south towards Kihei. An 8-inch line branches off to serve the Ma'alaea community further west. Storage is presently provided by one 50,000 gallon and two 12,000 gallon steel tanks located at an elevation of 120 feet west of Honoapiilani Highway. The anticipated average daily water demand for the proposed development is 90,000 gallons per day (gpd); maximum daily demand is 135,000 gpd. Maalaea Triangle Partnership has entered into a participation agreement with the Department of Water Supply to construct a new 300,000 gallon capacity tank above the existing storage tanks. The new tank would replace the old system and serve all of the Ma'alaea community (see Section IV.B.2).

Presently there are no sewage collection facilities in the Ma'alaea area. Existing single family residences use cesspools or septic tanks for sewage disposal. Condominiums and commercial establishments utilize small package treatment plants, cavitats, and septic tanks as the only available means of sewage disposal. The proposed project is estimated to generate about 50,000 gpd of waste water (ECM, Inc., 1994). Maalaea Triangle Partnership would install its own package sewage treatment facility to accommodate project needs. This facility would be located at the northern corner of the project site (Figure II-1), approximately 2,000 feet inland from the shoreline at an elevation of 52 feet (see Section IV.B.3). Effluent disposal would utilize injection wells. Two wells, each drilled to a depth of between 150 and 200 feet, would have the capacity to handle 100,000 gpd each providing 100% backup (ECM, Inc., 1994). The wastewater system would have a standby generator to provide emergency power when needed.

Site drainage improvements require provisions for redirecting offsite drainage which presently flows across the undeveloped parcel and for handling onsite runoff peak flow increases resulting from the greater amount of impermeable surfaces (roads, parking stalls, roofs) present after development of the site. Proposed improvements to the drainage are presented in Section II.B.1 The subjects of offsite and onsite drainage are discussed in detail in Section III.B.1 which describes land drainage in the project area, and Section IV.B.4 which describes impacts and mitigations for the drainage

improvements. The drainage and soil erosion control report (Warren S. Unemori Engineering, 1987) is included as Appendix B.

II.A.4 Maui Ocean Center

The Maalaea Triangle parcel would be subdivided for the purpose of selling an approximately five acre site in fee to Maui Ocean Center, Inc., a Hawaii corporation and one of six subsidiaries of Coral World International, Ltd., the parent company for Coral World Marine Parks. Entrepreneur Morris Kahn, together with world renowned reef biologist David Fridman, the founders of the Coral World Marine Parks, developed the concept of an ocean observatory where tourists could go underwater and observe up-close the reefs and fish of the Red Sea without getting wet. The company launched its first marine park, the Red Sea Underwater Observatory (also known as Coral World Eilat) in Israel in 1975. Since then, Coral World International has expanded to include four additional marine parks: Coral World St. Thomas in the U.S. Virgin Islands; Coral World Nassau, in the Bahamas; and Underwater World Perth and the Manly Oceanarium, both in Australia. Coral World International headquarters are located in Ramat-Gan, Israel. Each of the six subsidiaries is a chartered or incorporated company in the country where it operates. In 1992 over 1.3 million people visited Coral World Marine Parks, observing and enjoying the world under the sea, a world previously open only to divers.

The Maui Ocean Center (MOC) would combine the best aspects of aquariums, science and nature centers into a world class public display and education facility. It would be a unique public attraction displaying a wide variety of marine life and habitats, designed to provide an interactive and experiential introduction to the beauty of the Pacific Ocean. Visitors to the Maui Ocean Center would enjoy a combination of indoor and outdoor displays with emphasis on exploring and discovering the ocean and its complexity as well as the close relationship between the Hawaiians and the sea. Table II-1 lists proposed exhibit and theme concept areas.

Maui Ocean Center's covered floor space would not exceed 44,000 square feet. The project site for the Maui Ocean Center is approximately 5 acres, located near the center of the Maui Triangle property and fronting on the boat harbor (see Figure II-1). The Maui Ocean Center would occupy approximately three acres with the remaining two acres devoted to parking and internal roadways. An ocean water circulation system would provide continuous sea water flow through the project's aquarium tanks as described in detail below (see Section III.A.5).

The Maui Ocean Center would serve as a community resource and center for marine-oriented activities, including educational programs for Hawai'i school students from elementary through college levels. The facilities would be available for community

events such as receptions, meetings, dinners, and parties. Visitors to Maui notable in marine fields would be enlisted to host evening talks or other special presentations. Marine art displays, concerts, and other cultural events with a marine theme would be presented.

Table II-1. MAUI OCEAN CENTER
Exhibit and Theme Areas

EXHIBIT	THEME
Rocky Shore	Hawaiian shore and tide pool environments; native plants
Reef	Inhabitants of Hawaiian reef flat
Edge of Reef / Sand	reef front (15' high) and deep sand bottom
Reef Lab	"hands on" experiences with reef inhabitants; microscopes, etc.
Ocean Plaza	Landscaped open area overlooking harbor
Whale Discovery	Displays on marine mammals theme without live animals; telescopes directed offshore
Whale Theater	100-seat theater
Open Ocean	Deep ocean shark tank
Jelly Fish	Visually exotic display incorporating light, sound and movement
Hawaiian Plaza	terraced restaurant & museum
Gift Shop	Retail outlet

The site plan includes service facilities to support MOC daily operations and provide for animal care needs. A major component of the service facilities would be a mechanical ocean water circulation system that would pump sea water from the ocean for all exhibits and off-exhibit holding areas. The system would be open, providing constant flow through the project in order to accurately recreate natural environmental conditions.

II.A.5 MOC Sea Water System

The total volume of display tanks and aquaria planned for the Maui Ocean Center is 950,000 gallons divided among six systems as shown in Table II-2. In the table, "recirculation" rate refers to the time for the tank filtration to circulate the tank volume through a filter system. "Make-up" ratio refers to the proportion of the total tank volume supplied from the intake stream each day (24-hour period). Thus, a make-up ratio of 0.5 represents a turnover rate of 2 days (one half or 50% of the tank volume is replaced each day).

Over 80% of the total water volume is in the "Shark" tank. Because this system will utilize about 35% of the design flow and will not have as stringent water quality requirements as many of the other displays, this system will serve as a buffer at times when other displays might require increased flow to avoid water quality deterioration. Banks of high rate pressure sand filters will be incorporated into the recirculation system.

Table II-2 Maui Ocean Center aquarium capacities and flows.

TANK SYSTEM	VOLUME: (gallons)	(liters x 10^6)	RECIRCULATION RATE	MAKE-UP RATIO
Shark	766,000	2.9	4-6 hrs	0.5
Other Pelagic	40,000	0.15	1.5-3 hrs	0.5
Large Reef	70,000	0.26	1-2 hrs	4
Small Reef	10,000	0.035	nil	24
Other	20,000	0.080	2-3 hrs	0.5
Exterior	45,000	0.160	nil	4
Total	950,000	3.585		

The "Other Pelagic" displays comprise several tanks up to 10,000 gallons in size, each with its own make-up system (from a ring main) and recirculating filtration system. The "Large Reef" display comprises six display tanks between approximately 25,000 gallons down to 4,000 gallons in size. Make-up will be from ring main systems providing filtered and unfiltered water streams. Recirculation systems will be stand-alone pressure sand filters and/or bio-towers. Because the "Large Reef" displays will incorporate live coral, their water quality requirements will be the highest in the aquarium. The "Small Reef" displays are small tanks between 5 and 500 gallons each for individual displays (standard aquarium format). Tanks will be operated at adjustable water flow-through rates of down to 1 hour turnover times.

The "Other" and "Exterior" displays are various pools for displaying turtles and rays outdoors in the Ocean Plaza area. The "Other" systems may require recirculation and/or filtration, but final designs are still under review. The "Exterior" systems would utilize the overflow water from the interior displays/shark tank to provide a continuous flow of water through the pool(s).

Filtration systems will have the capacity to filter about 60 to 70% of the design flow. The filtration design is envisaged as a pressure sand system with filter rate adjustable to meet incoming load. The balance of the intake water will go into the reef display tanks where unfiltered sea water is desirable to maintain filter feeding animals. It is anticipated that at times when the offshore water quality is poor (generally as a result of

bad weather contributing to high turbidity), the filtration system will need to operate at reduced total flow. The possibility of developing a salt water well for supplementing flows at times of poor offshore water quality will be explored, but is not a viable alternative source of water for all of the MOC needs (see Section I.E).

II.B PROPOSED PROJECT

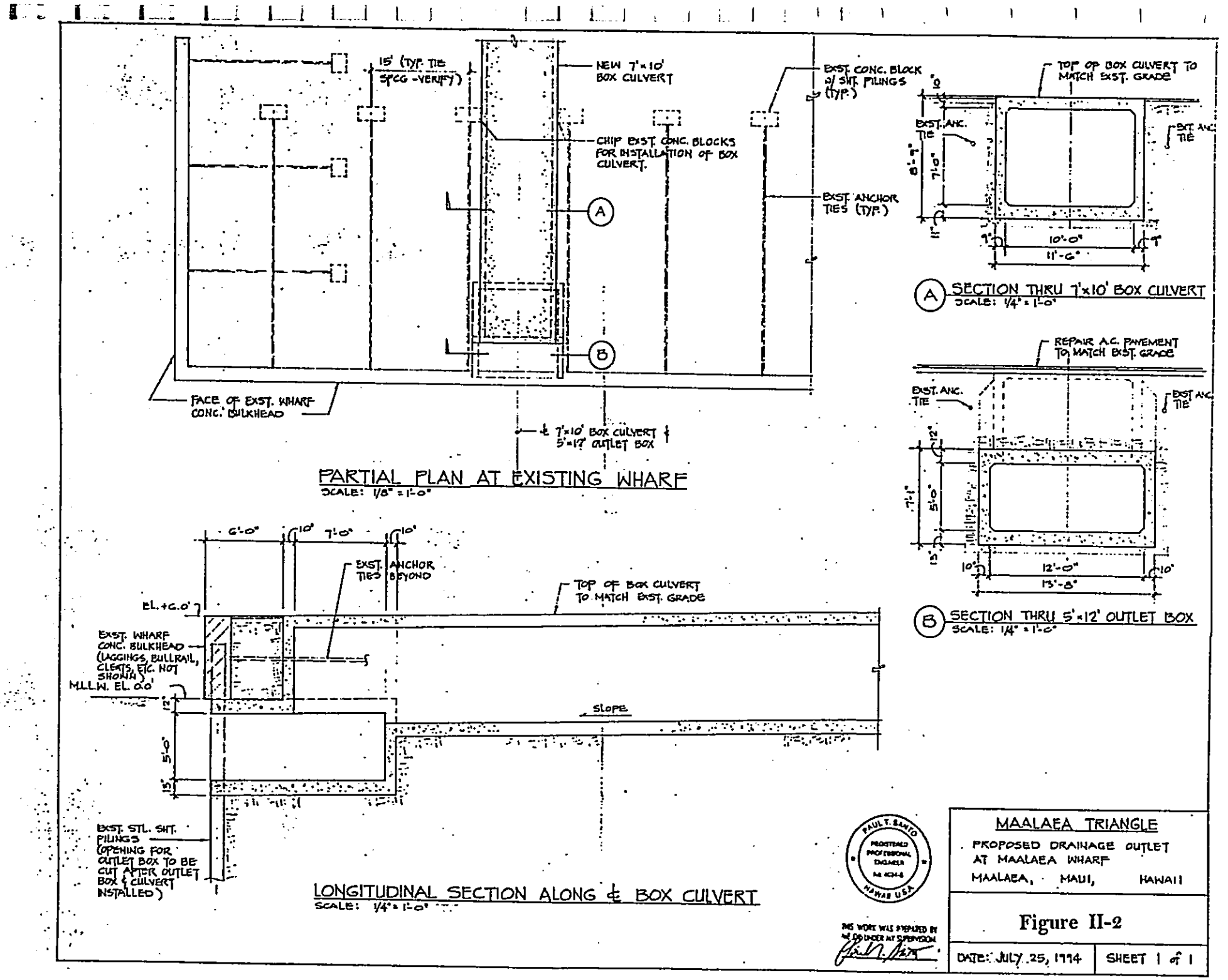
As noted on page 1, this Environmental Assessment focuses on the construction and long-term impacts of the site drainage improvements and the Maui Ocean Center sea water system. These projects are described in detail here.

II.B.1 Drainage Improvements

The applicant has had several meetings with officials at the Department of Transportation, Harbors Division and Department of Land and Natural Resources, Small Boat Harbors Division. Both agencies have concluded that the offsite run-off should continue to be directed into Ma'alaea Harbor (see Section III.B.1) and not redirected to a drainage outside the Harbor. Offsite surface run-off would continue to be conveyed across Honoapiilani Highway by means of existing 4' x 6' box culverts located along the western side of the Maalaea Triangle parcel. Two, new drain lines (described below) would be installed to intercept and convey this off-site flow to a new RCP drain line under Maalaea Road. This pipe will connect into a new 7' x 10' box culvert drain to be built under the access road to the sampan wharf next to the U.S. Coast Guard Station. The box culvert would drop flows into a 5' x 12' box culvert with an opening below sea level (MLLW) along the frontal face of the sampan wharf (Figure II-2). This structure would serve as the outlet for the system carrying most of the onsite and off-site run-off from the Maalaea Triangle parcel.

Onsite run-off for the northern portion of the Maalaea Triangle will feed into perforated drains under the parking lots. These drains will serve to percolate water accumulation into the deep soil. Only heavy rains on the site will produce a discharge from the perforated drains to outlets at the coast. A 72-inch RCP drain will conduct offsite drainage from an existing 4' x 6' box culvert under Honoapiilani Highway to and then down Maalaea Road (Drainage Basin No. 1).

Onsite runoff from the central and southern portions of the Maalaea Triangle (about half of the property area) will feed into perforated drains under the parking lots and excess water will be directed through a 24-inch RCP drain line downslope to Maalaea Road, then eastward under the right-of-way to the existing bridge/culvert under the road beside the Maalaea Store. A 90-inch RCP drain will conduct offsite run-off from an



MAALAEA TRIANGLE

PROPOSED DRAINAGE OUTLET AT MAALAEA WHARF

MAALAEA, MAUI, HAWAII

Figure II-2

DATE: JULY 25, 1994 | SHEET 1 of 1

existing 4' x 6' box culvert under Honoapiilani Highway through the middle of the Maalaea Triangle parcel to the drain running down the Maalaea Road right-of-way along the east side of the property (Drainage Basin No. 2).

Offsite run-off feeding onto the extreme southwest end of the Maalaea Triangle parcel (see Figure III-3) would continue to be conveyed across Honoapiilani Highway by means of existing box culverts into an existing 4' x 6' box culvert under Maalaea Road and the 42-inch RCP culverts where it would be allowed to discharge into Maalaea Boat Harbor as it presently does (Drainage Basin No. 3). No onsite surface run-off generated from the proposed development would be directed into this drainage system.

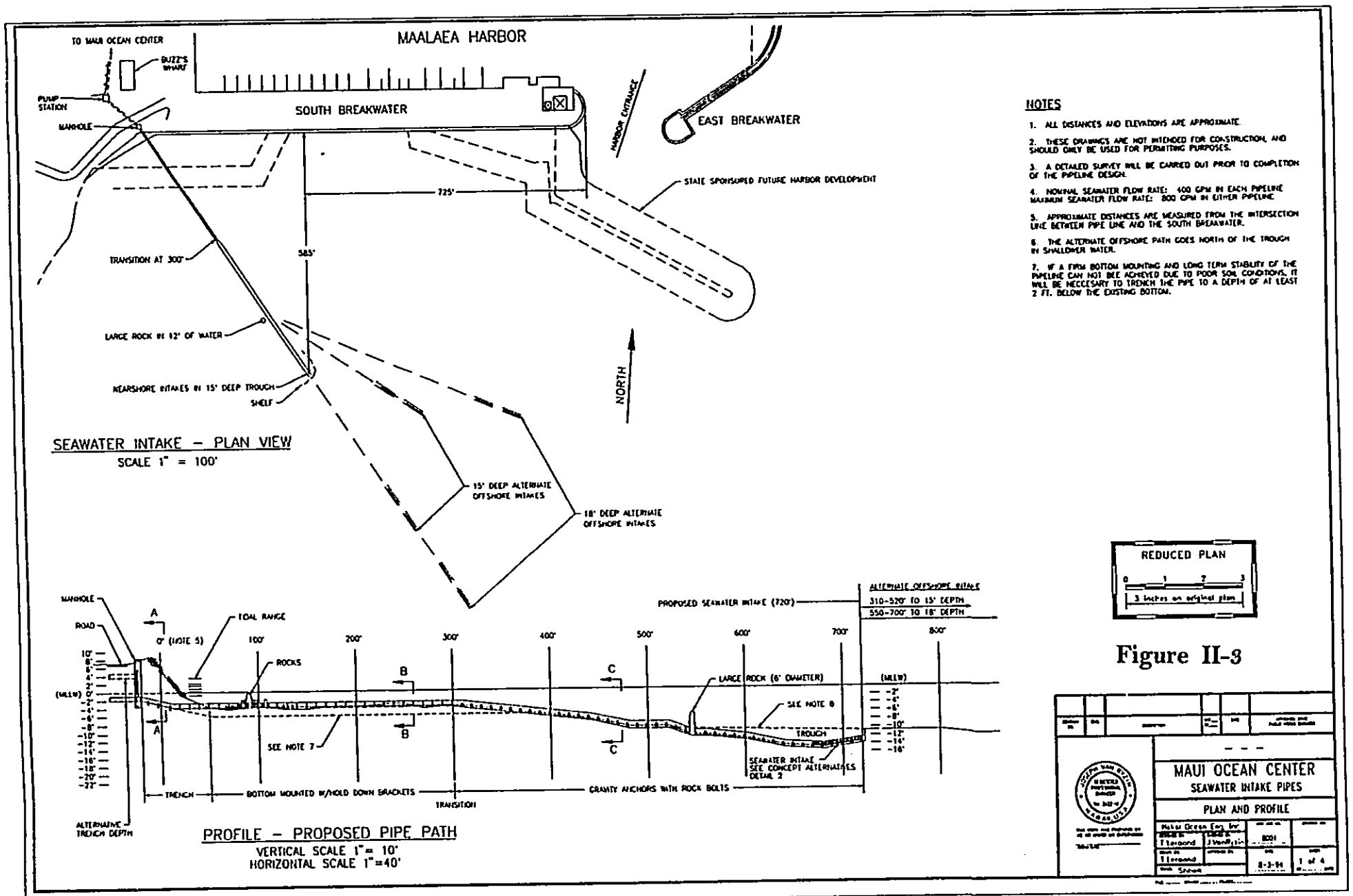
II.B.2 Sea Water System Intake Structures

A sea water intake system will be required to draw sea water into the facility for the maintenance of marine animals in the various display tanks. The design flow is 800 gpm (50 liters/sec). In order to insure as high a quality of water as possible for a maximum number of days each year, the system will have to draw from off the shoreline. Water at the shore contains higher nutrient levels, lower salinity, and greater turbidity because of run-off and ground water infiltration effects.

The site proposed for an intake structure is located approximately 720 feet (220 m) off the shore south of the harbor, where a water depth of 15 feet (4.5 m) can be reached (Figure II-3). The location presently considered satisfactory is a trough on the shore side of an area of slightly raised limestone. Alternative offshore intake locations at greater distances from the shore have been considered to draw water from greater depths. Two 12-inch (o.d.) HDPE (high density polyethylene) intake pipes would connect the intake structure with the pump system located on shore. Black HDPE pipes are rugged, flexible, durable, and do not corrode or affect the quality of the water. These pipes will be suction lines, directly coupled to the pump suction (as opposed to a wet sump system).

From the pump station to a point approximately 50 feet (15 m) off the shoreline, the pipes will be laid in a trench cut out of the limestone and loose rock bottom (Figure II-3). Depth of the trench will vary to maintain the position of the pipes at around 4 feet (1.2 m) below the existing beach and will rise to 2 feet (0.6 m) below MLLW at the manhole shown in Figure II-3 (Makai Ocean Engineering, 1994a).

Beyond the shore out to about 300 feet (90 m) the pipeline corridor will be leveled to a depth of at least 4 feet (1.2 m) below MLLW. Rocks will need to be moved aside at 80 feet (24 m) from shore, and excavation of a thin layer of coral rubble and cemented limestone bottom is required over shorter sections between 170 and 300 feet (50 to 90



NOTES

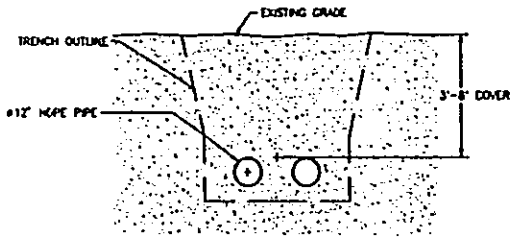
1. ALL DISTANCES AND ELEVATIONS ARE APPROXIMATE.
2. THESE DRAWINGS ARE NOT INTENDED FOR CONSTRUCTION, AND SHOULD ONLY BE USED FOR PERMITTING PURPOSES.
3. A DETAILED SURVEY WILL BE CARRIED OUT PRIOR TO COMPLETION OF THE PIPELINE DESIGN.
4. NOMINAL SEAWATER FLOW RATE: 400 GPM IN EACH PIPELINE MAXIMUM SEAWATER FLOW RATE: 800 GPM IN EITHER PIPELINE
5. APPROXIMATE DISTANCES ARE MEASURED FROM THE INTERSECTION LINE BETWEEN PIPE LINE AND THE SOUTH BREAKWATER.
6. THE ALTERNATE OFFSHORE PATH GOES NORTH OF THE TROUGH IN SHALLOWER WATER.
7. IF A FIRM BOTTOM MOUNTING AND LONG TERM STABILITY OF THE PIPELINE CAN NOT BEE ACHIEVED DUE TO POOR SOIL CONDITIONS, IT WILL BE NECCESARY TO TRENCH THE PIPE TO A DEPTH OF AT LEAST 2 FT. BELOW THE EXISTING BOTTOM.

REDUCED PLAN
0 1 2 3
3 inches on original plan

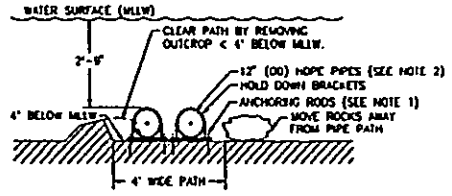
Figure II-3

MAUI OCEAN CENTER
SEAWATER INTAKE PIPES
PLAN AND PROFILE

Makai Ocean Eng. Inc.
Designed: T.Leonard
Drawn: T.Leonard
Checked: J.Vanderzwaag
Approved: T.Leonard
Date: 8-3-94
Scale: 1" = 100'
8001
1 of 4



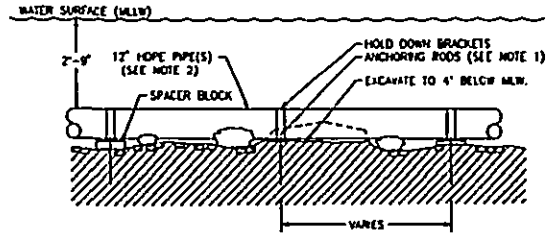
SECTION A–A
SCALE 1" = 2'



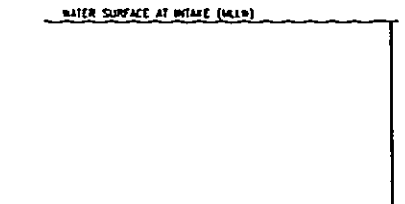
SECTION B–B
SCALE 1" = 2'

NOTE 1. TYPE OF ANCHORING ROD WILL BE DETERMINED BASED ON A DETAILED BOTTOM SURVEY. ROCK BOLTS, SCREW ANCHORS OR MANTA RAY ANCHORS ARE VIABLE OPTIONS.

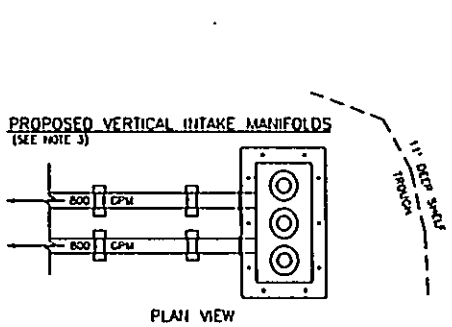
NOTE 2. MATERIAL OPTIONS INCLUDE DUCTILE IRON/STEEL PIPING OR SLEEVING SHOULD SITE/DESIGN CONDITIONS DICTATE.



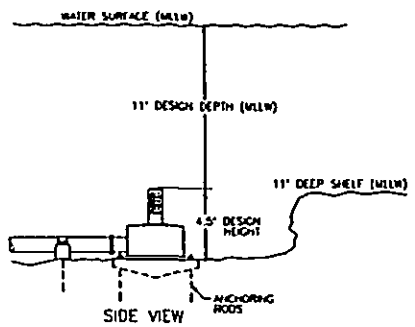
DETAIL 1 NEAR–SHORE ANCHORING
SCALE 1" = 2'



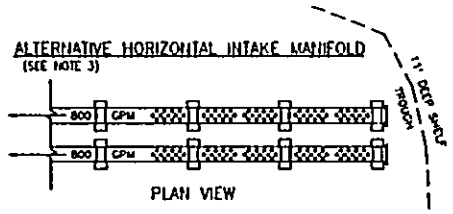
SECTION C–C
SCALE 1" = 2'



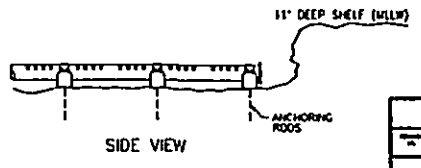
PLAN VIEW



SIDE VIEW



PLAN VIEW



SIDE VIEW

NOTE 3. THE SEAWATER INTAKE WILL BE DESIGNED TO POSE NO DANGER TO SWIMMERS AND SCUBA DIVERS. FLOW VELOCITIES WILL BE KEPT LOW TO PREVENT SWIMMERS FROM GETTING STUCK ON THE MANIFOLD IF THEY ACCIDENTALLY OR PURPOSELY COVER THE HOLES.

DETAIL 2 SEAWATER INTAKE – PROPOSED AND ALTERNATIVE CONCEPT
SCALE 1" = 4'

Figure II-4

MAUI OCEAN CENTER
SEAWATER INTAKE PIPES
CONCEPTUAL–SECTIONS & DETAILS

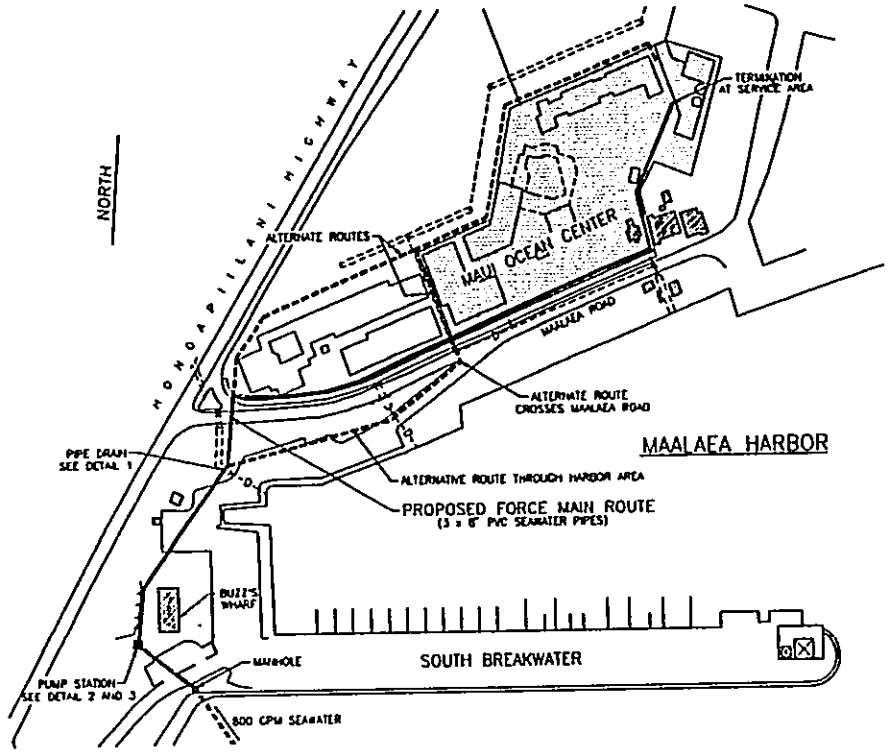
m) from shore. The anchoring of the pipes will be set at short intervals to keep stresses on the pipe low when loaded with current and breaking waves. In the nearshore region (inner 300 feet) where depth to firm bottom (suitable for anchoring) ranges between 4 and 6 feet below MLLW, the pipes can be rock bolted in place at a depth of 4 feet as shown in Detail 1 of Figure II-4. Spacer blocks or similar stystems may be used to maintain a continuous pipe elevation. The outer 420 feet (130 m) will be deployed on the existing hard bottom as shown in Section C (Figure II-4) (Makai Ocean Engineering, 1994a).

The sea water intake structures are shown in Detail 2 of Figure II-4. The proposed intake has vertical segments of perforated pipe attached to a concrete intake chamber connected at the end of the pipelines. The concrete chamber will be rock bolted to the bottom in a 15.5 feet (4.7 m) deep trough about 600 feet (180 m) south of the harbor south mole. The water flow velocity will be kept low so as to pose no danger to swimmers or other animals that might contact the surface. Flow velocities in any given area over the intake manifold will be too low to hold fishes, hands, or persons against the manifold by suction pressure. A horizontal intake manifold is also being considered. Such a manifold (also shown in Figure II-4) would be easier to install, will not protrude as much above the bottom, and thus will experience smaller environmental loads from waves.

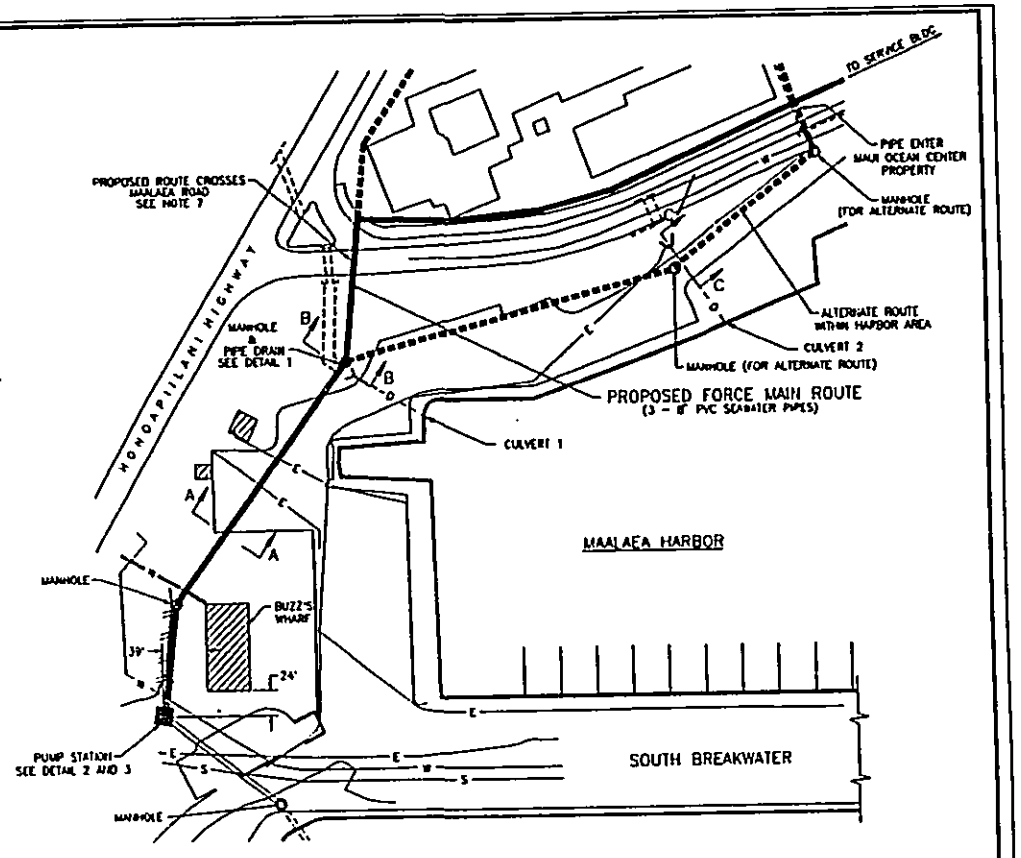
II.B.3 Sea Water System Pump Vault

The intake pipes will connect directly to two pumps to be located in a pump vault behind the shoreline (Figure II-5 and II-6). The pumps will be self-priming and rated at 50% of the design flow, or 400 gpm each. Each pump will draw water from either of the two sea water suction lines and discharge water into two out of three discharge lines (allowing one line to be out of service at any time for cleaning, etc.).

The pump vault will be located along the edge of the paved parking area behind (mauka of) Buzz's Wharf restaurant in an area utilized as a "dry dock" for boat repair on craft hauled out of the harbor. The portion of the site that is not paved is landscaped in a small garden. All pipes will be buried underground between the offshore point described above and the pump vault, and from the vault to the Maui Ocean Center (Figure II-5). Nearly all of this latter route, located behind Buzz's Wharf restaurant and passing on the seaward (makai) side of the public restrooms, is currently paved up to the swale of a drainage channel (for Drainage Basin No. 3 as described in Section III.B.2). Surfaces will be refinished to existing material and grade after the pipes are buried.



SITE MAP – MAALAEA HARBOR, MAUI, HAWAII
SCALE 1" = 100'



DETAILED PLAN – PIPE ROUTE AND UNDERGROUND UTILITIES
SCALE 1" = 50'

Figure II-5

NOTES

1. ALL DISTANCES AND ELEVATIONS ARE APPROXIMATE
2. THESE DRAWINGS ARE NOT INTENDED FOR CONSTRUCTION, AND SHOULD ONLY BE USED FOR PERMITTING PURPOSES.
3. A DETAILED SURVEY OF ALL UNDERGROUND UTILITIES AND THE ELEVATIONS ALONG THE SELECTED PIPE ROUTE WILL BE CARRIED OUT PRIOR TO COMPLETION OF THE PIPELINE DESIGN.
4. DESIGN SEAWATER FLOW RATE 800 GPM (TOTAL FLOW)
5. PIPELINE DESIGN CRITERIA
   NUMBER OF PIPELINES: 3 (50 % REDUNDANCY)
   DESIGN FLOWRATE: 400 GPM (EACH PIPE)
6. PUMP STATION DESIGN CRITERIA
   NUMBER OF PUMPS: 2 (0 % REDUNDANCY)
   DESIGN FLOWRATE: 400 GPM (EACH PUMP)
7. THE ROUTING ALONG MAALAEA ROAD WILL BE WITHIN MAALAEA TRIANGLE PROPERTY OR WITHIN THE PUBLIC RIGHT OF WAY.

TABLE OF DISTANCES AND ELEVATIONS

STATION	LOCATION	ELEVATION (GRADE/INVERT)
SL 0'	MANHOLE	EL. 7' / -2'
SL 125'	PUMP STATION	EL. 9' / -1.5' ENTRY, 5.8' EXIT
SL 475'	PIPE DRAIN CULVERT 1	EL. 4' / 2.5'
SL 1600'	TERMINATION	EL. 30' / 28.8'
--	--	--

LEGEND

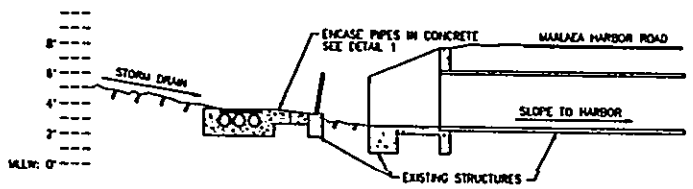
- PROPOSED ROUTE (3 - 8" PVC)
- ALTERNATE ROUTE
- SEAWATER SUCTION LINE (2 - 12" HDPE)
- E — ELECTRICAL CONDUIT (EXISTING)
- W — WATER LINE (EXISTING)
- S — SEWER LINE (EXISTING)
- D — DRAINAGE LINE (EXISTING)

REDUCED PLAN
0 1 2 3
3 inches on original plan

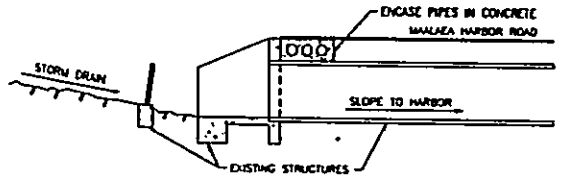
MAUI OCEAN CENTER
SEAWATER LAND DISTRIBUTION
PLAN – PIPELINE ROUTING
Helber Hastert & Fee, Inc
Planners
8-3-94
3 of 4

II.B.4 Sea Water System Discharge

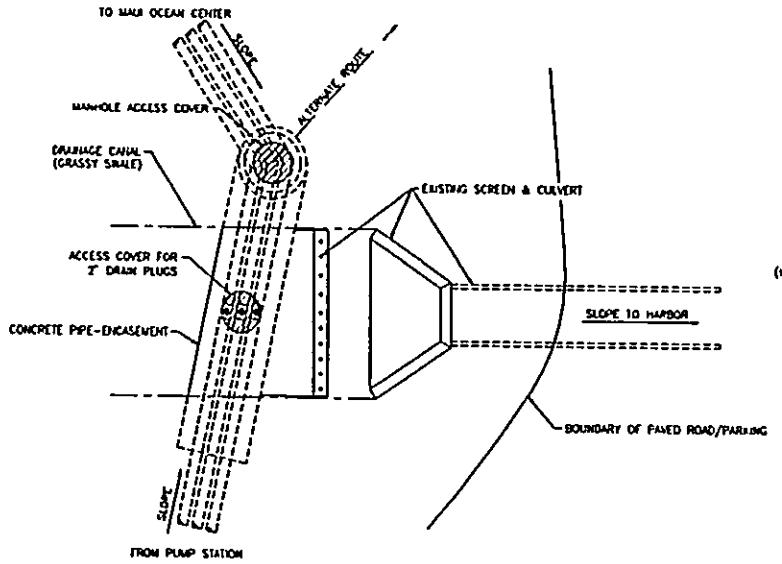
The sea water system proposed for the Maui Ocean Center will circulate water through the displays and this water will be eventually discharged back into the ocean. The point of discharge proposed is Ma'alaea Harbor. The discharge will actually empty into a pipe arch culvert (equivalent to 114-inch concrete pipe) connecting to the 7' x 10' box culvert proposed for the area behind the sampan wharf (Figure II-2), discharging at the shore through the submerged 5' x 12' box culvert set into the face of the wharf towards its western end. An alternative discharge would utilize one of the other drainage pipes located along the northwest side of the harbor. For example, the existing swale next to Ma'alaea Store will be modified (see Section II.B.1) to accommodate on-site and offsite drainage flows and passes through the Maui Ocean Center site. Placement of intake lines along Ma'alaea Road might also allow simultaneous placement of the discharge line to the culvert emptying into the back part of the harbor beside the boat ramp. These alternatives could provide better flushing of the inner parts of the harbor.



SECTION B–B CROSSING OF CULVERT 1
SCALE 1" = 4'

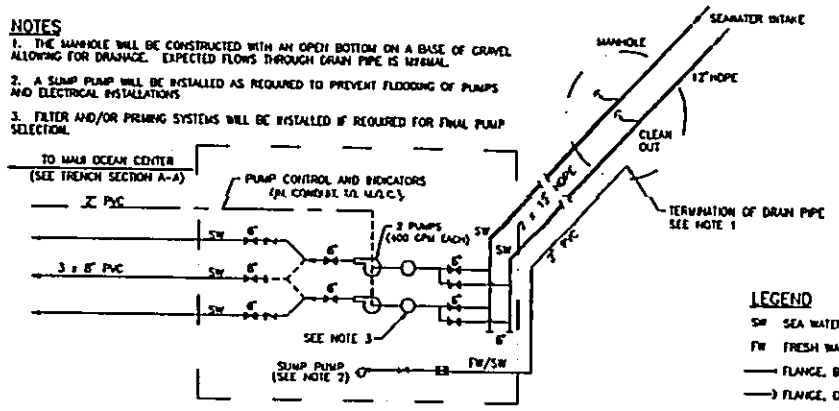


SECTION C–C CROSSING OF CULVERT 2
NOT TO SCALE

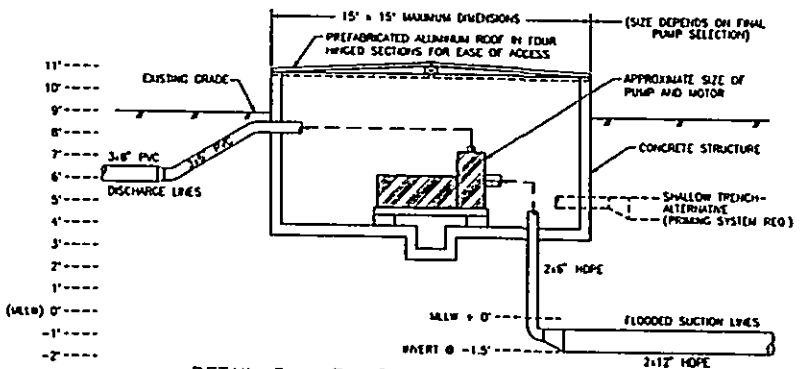


DETAIL 1 – CROSSING OF CULVERT 1
SCALE 1" = 4'

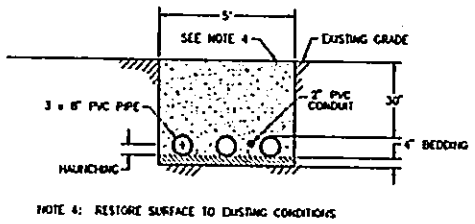
NOTES
1. THE MANHOLE SHALL BE CONSTRUCTED WITH AN OPEN BOTTOM ON A BASE OF GRAVEL ALLOWING FOR DRAINAGE. EXPECTED FLOWS THROUGH DRAIN PIPE IS MINIMAL.
2. A SUMP PUMP WILL BE INSTALLED AS REQUIRED TO PREVENT FLOODING OF PUMPS AND ELECTRICAL INSTALLATIONS.
3. FILTER AND/OR PRIMING SYSTEMS WILL BE INSTALLED IF REQUIRED FOR FINAL PUMP SELECTION.



DETAIL 2 – PUMP STATION SCHEMATICS
NOT TO SCALE



DETAIL 3 – PUMP STATION SIDE VIEW
APPROXIMATE SCALE



NOTE 4: RESTORE SURFACE TO EXISTING CONDITIONS

SECTION A–A TYPICAL TRENCH LAYOUT
SCALE 1" = 2'

LEGEND
SW SEA WATER
FW FRESH WATER
FLANGE, BLIND
FLANGE, OPEN
NPT Copped
PVC SCH.80 PIPE
PVC ELEC. CONDUIT
CONTROL: ELEC. OR HYDRAULIC
WATER FLOW DIRECTION
POLYETHYLENE PIPE (HDPE)
VALVE, BALL
VALVE, BUTTERFLY
VALVE, CHECK
VALVE, GATE
PRESSURE GAUGE
FILTER/PRIMING VESSEL
PUMP

Figure II-6

REDUCED PLAN
0 1 2 3
3 inches on original plan

MAUI OCEAN CENTER
SEAWATER LAND DISTRIBUTION
DETAILS & SCHEMATICS
Makai Ocean Eng. Inc.
Date 8-3-94
4 of 4

Section III ENVIRONMENTAL SETTING

III.A MA'ALAEA

Ma'alaea is a small village on the west side of Maui's Ma'alaea Bay (Figure III-1). Ma'alaea has been a landing place since ancient times, and from the end of the 19th Century was the site of a pier extending out from the shore. The pier fell into disrepair by 1902, and was replaced for a time by a wharf off McGregor Point (Joerger and Kaschko, 1979). Ma'alaea Boat Harbor was constructed in 1952 with a single breakwater and a 12-foot deep entrance channel and basin. The east breakwater was built in 1958. Although for decades a focal point of fishing interests because of its location along Honoapiilani Highway and the shelter offered by the protected waters, Ma'alaea and nearby Kanaio had small residential populations and little commercial development until the 1970s (USACOE, 1980). As one of only two small boat harbors on Maui, the harbor is now a busling center of activity for the fishing, charter, and tour boat industries.

Most of the beach front lots along Haouli Street have been developed as multi-story condominium projects. Only a few single family dwellings remain, mostly towards the end of Haouli Street near Ma'alaea County Beach Park. This park provides public parking and access to the west end of a four-mile stretch of sand shore known as Ma'alaea Beach. Kapoli Beach Park, at the base of the south mole, is undeveloped (no amenities). The beach at Kapoli is mostly boulders and used as an access point to offshore waters by snorkelers, divers, and surfers.

III.A.1 Archaeological, Historical, and Cultural Resources

A brief but informative historical accounting of Ma'alaea can be found in the report by Joerger and Kaschko (1979), reproduced in part in R.M. Towill Corp. (1982). The report addresses the harbor area, but not specifically the Maalaea Triangle parcel. A walk-through examination and surface archaeological reconnaissance of the latter was conducted as part of the original SMA application (Kennedy, 1986). No previously recorded historic sites are known from the parcel, nor is there any record of previous archaeological work performed on the site. State Historic Sites (DLNR) records show at least four nearby sites on adjacent properties that should be considered:

1) Petroglyphs (Site No. 50-09-1169)
2) Grinder stone (Site No. 1286; may be the same as No. 1440)
3) Piko stone (Site No. 50-09-1440)
4) He'iau site (Walker No. 1; presumably destroyed; State Site No. 1169(?))
5) Major site complex (Site No. 50-09-1287)

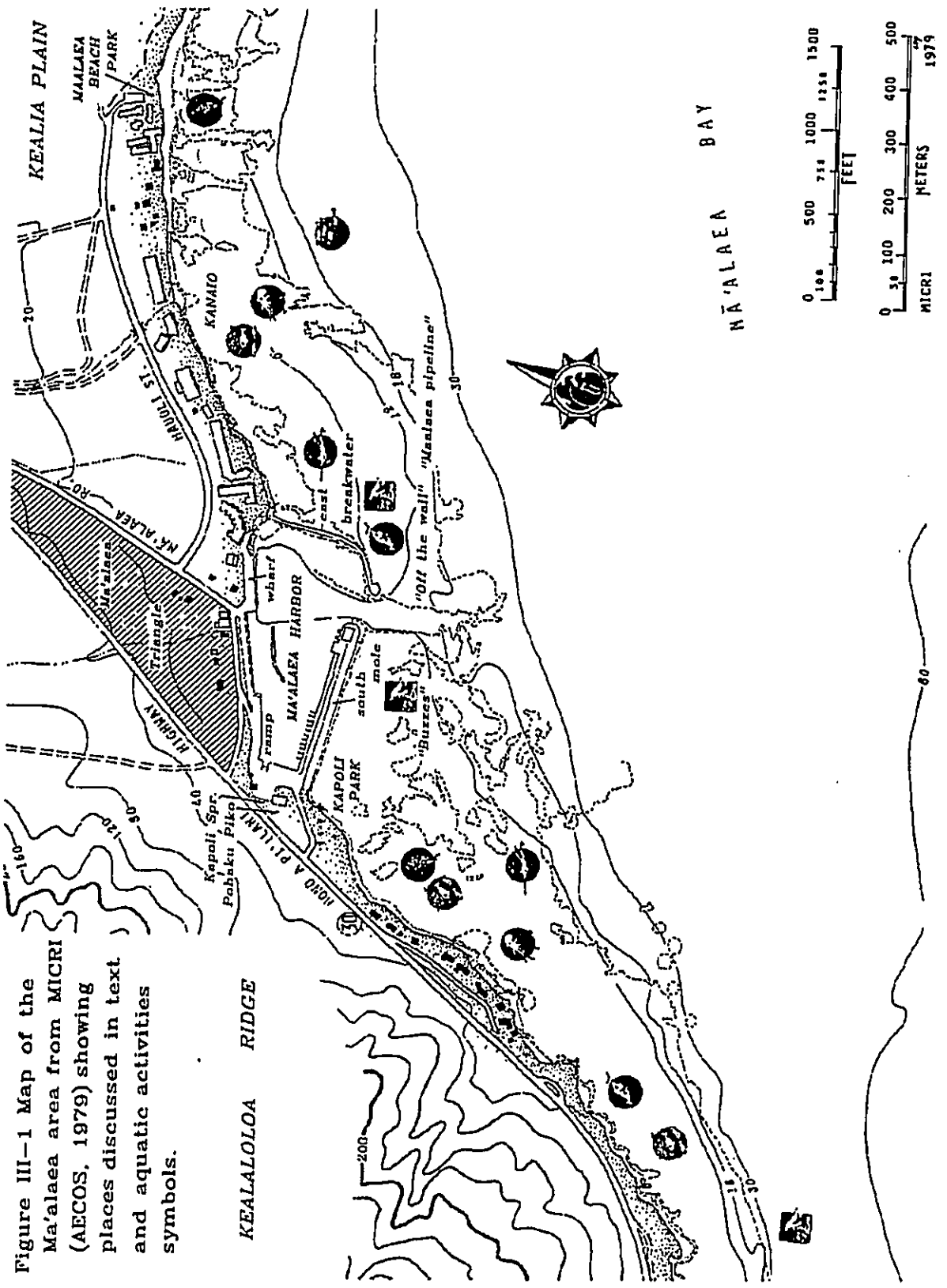


Figure III-1 Map of the Ma'alaea area from MICRI (AECOS, 1979) showing places discussed in text and aquatic activities symbols.

The harbor was built on an old canoe landing, which has been assigned State site no. 50-09-2947. A fishing shrine, known as the Ma'alaea Ebisu Jinsha, is situated on the makai section of the project site, within the five-acre parcel to be acquired by Maui Ocean Center, Inc. As far as can be determined, the shrine building was constructed between 1914 and 1920 and relocated at a later date. A previous shrine at the site was demolished. The shrine is Shinto in style and function: ceremonies conducted there by local fishermen are intended to ensure successful fishing ventures.

An inventory survey of the Maalaea Triangle parcel (TMK: 3-06-01:01) as required by the SMA Permit granted to MTP by the County of Maui was undertaken in May 1994. A series of 25 systematic subsurface mechanical trenches (see Appendix C, Figure C□7) were made across the property by Archaeological Consultants of Hawaii after consultation with Ms. T. Donham, Maui archaeologist with the Department of Land and Natural Resources. The preliminary excavation results yielded a paucity of subsurface cultural indicators, with complex stratigraphic sequences and midden material absent. Portable artifacts found were indicative of historic era activities. However, a minimum of two human burials were located in the process. Determinations regarding ethnicity, age, and morbidity are pending. The archaeologists concluded that these were isolated burials, not part of a cemetery population. These two sites are significant under Criteria D and E in the National Register of Historic Places guidelines (36 CFR Part 60.4) and determinations regarding disposition will have to be made in consultation with the Maui Burial Council.

III.A.2 Traditional Activities and Uses

The Maalaea Bay area is used extensively for public recreation. Ma'alaea Small Boat Harbor is one of only two berthing areas for small craft on Maui. The harbor is the home port of a charter sport fishing fleet, a small commercial fishing fleet, as well as Maui headquarters of the U. S. Coast Guard. The harbor also has a launch ramp which is heavily used by Maui's trailerboat fishermen (*AECOS*, 1980).

The long, continuous sand beach east from Kanaio is readily accessible to the public. The small shore break allows easy entry along its entire length. The ocean is relatively calm, and currents are relatively weak, allowing easy access into the water and safe swimming. The nearshore area is seasonally clear, and thus is an area of active snorkeling and diving (Clark, 1980). The shallow waters (to 30 feet deep) between Palalau and Kanaio are considered best for snorkeling and diving because of the highly diverse flora and fauna and seasonally clear waters. The waters off Kapoli Park are also utilized by snorkelers. The shallow water fauna of western Ma'alaea Bay is unusual in several respects. A large number of species uncommon elsewhere are relatively common in the bay. The variety of sponges and bryozoans, and the highly diverse assemblage of gastropod mollusks make Ma'alaea Bay an area of special interest for nature study,

photography, and scientific research (Maciolek, 1971). The rich and varied shell life found on the sand bottom occupying the outer bay includes a number of uncommon species difficult to collect elsewhere (Butler, 1975).

At least two reef areas near the harbor are popular with limu (edible seaweed) gatherers: the shallows off and south of Kapoli Park and the reef flat off Maalaea Beach Park. The popular seaweeds, limu manauea and limu huluhuluwaena, are sought in these areas (McDermid, 1990).

The Ma'alaea-Kanaio area is heavily fished by a variety of methods. Along the shore, pole-fishing for papio and ulua is intensive, and catches are considered good. Kite fishing for ulua occurs off Kanaio and an old seawall. Pole-fishing is common off the breakwater and docks of Ma'alaea Harbor. Good catches of aholehole and lobster are taken off the breakwater. Octopus is also caught, particularly off the eastern breakwater. Gill-netting yields excellent catches of mullet in the area between the old seawall and Ma'alaea Harbor. Nehu is captured for use as a bait offshore. In deeper waters, akule is fished by handline from small boats (*AECOS*, 1980).

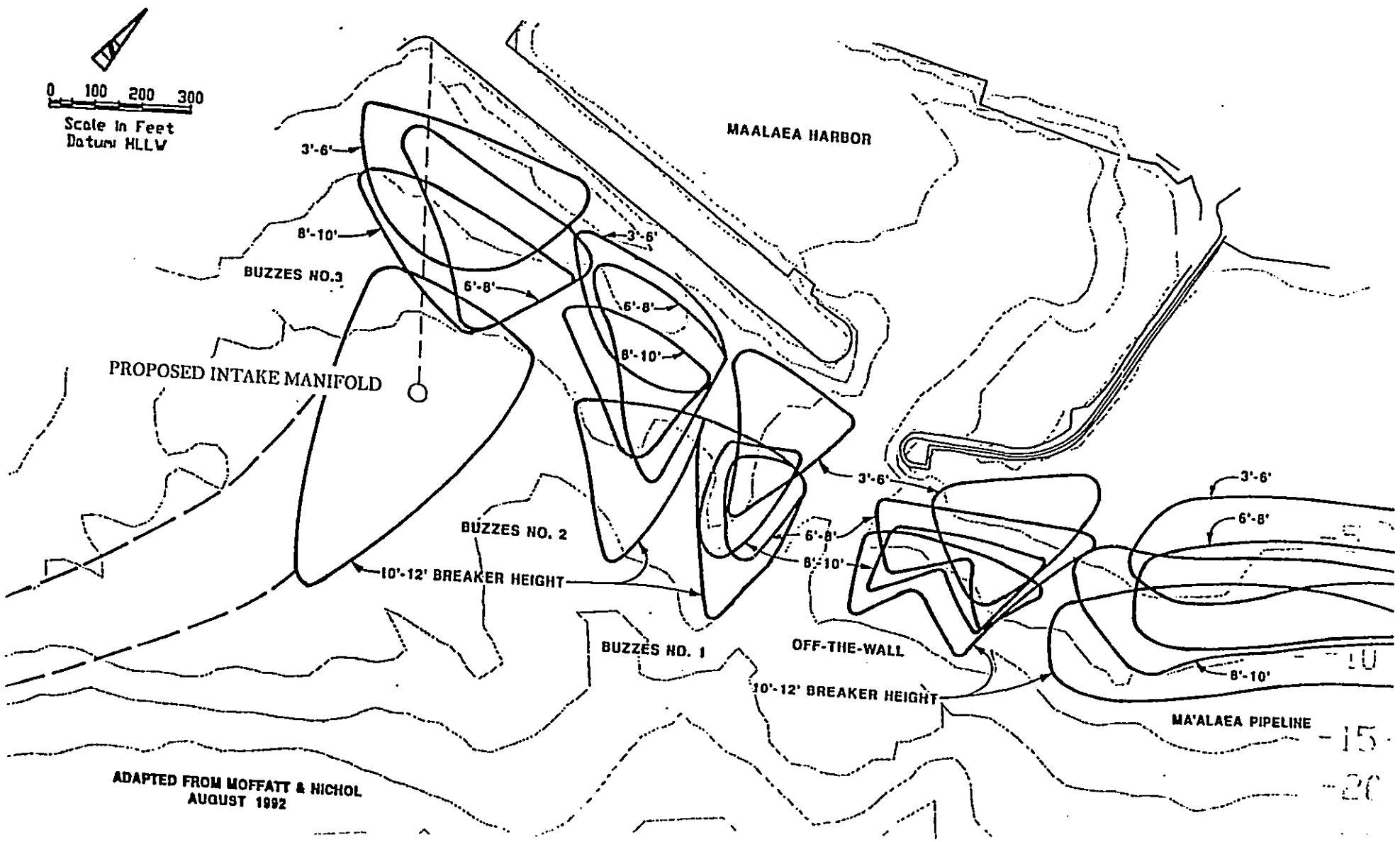
Surfing is an important recreational activity in the vicinity of the harbor. There are five surf sites in the immediate harbor area (Figure III-2)(Moffatt and Nichol, 1992). The "Maalaea Pipeline" site, to the east of the east breakwater, has been described to have among the best surfing waves in the world, although they do not occur frequently. Another popular surf site is called "off-the-wall", and is located off the end of the harbor's east breakwater. The proposed sea water intake pipe route passes through "Buzzes No. 3".

III.B TERRESTRIAL ENVIRONMENTS

III.B.1 Land Drainage

The Maalaea Triangle property slopes from an elevation of approximately 40 feet along the mauka (highway) boundary to approximately 10 feet at the makai boundary closest to the harbor. The general direction of the slope follows a northwesterly to southeasterly direction, with an average slope of approximately 5%.

Development of the Maalaea Triangle will entail improvements to the existing drainages that impact on the property and ultimately on Ma'alaea Harbor. The triangular parcel is crossed by flows from four mauka drainage areas. Project development will require diverting these flows through or around the parcel. Drainage from rain that falls directly on the developed surfaces of the project will be directed into


0 100 200 300
Scale in Feet
Datum MLLW
MAALAEA HARBOR
3'-6'
8'-10'
BUZZES NO.3
6'-8'
3'-6'
6'-8'
8'-10'
PROPOSED INTAKE MANIFOLD
BUZZES NO. 2
10'-12' BREAKER HEIGHT
BUZZES NO. 1
3'-6'
6'-8'
8'-10'
OFF-THE-WALL
10'-12' BREAKER HEIGHT
3'-6'
6'-8'
8'-10'
MA'ALAEA PIPELINE
ADAPTED FROM MOFFATT & NICHOL
AUGUST 1992

perforated drains under the parking lots. These structures will act as dry-wells and sediment traps for light to moderate rainfalls. Overflows occurring during heavy rains will be directed into the offsite drainage culverts as described in Section II.B.1. The following description of water courses in the area is based upon a site survey in May 1994 and information presented in the drainage studies conducted by Warren S. Unemori Engineering (1987; see Appendix B), as well as a review of topographic maps.

III.B.2 Water Courses

Several normally dry gulches terminate at the shore in the vicinity of Ma'alaea Harbor. These gulches drain Kealaloloa Ridge to the edge of the alluvial plain. The development over a century ago of sugar cane fields on the alluvial plain resulted in the natural stream courses being diverted to ditches that flow around or between the agriculture fields, sometimes connecting with the field irrigation and/or drainage systems. The Maalaea triangle parcel, and the lands mauka (directly across Honoapiilani Highway) are all former sugar cane fields.

The largest drainage in the Ma'alaea area, shown as a dotted blue line on U.S.G.S. 7.5 minute series topographic map, Maalaea Quadrangle, is an unnamed intermittent stream arising near Pu'u Moe (elev. 2433) and Pu'u Anu (elev. 2972) and flowing generally eastward in a steep-sided gulch some 200 to 300 feet deep. The stream turns southward on the alluvial plain and is diverted in the vicinity of Honoapiilani Highway to a ditch along the east side of the highway. This ditch parallels the highway to the Maalaea Road turnoff, then turns towards the coast at Kanaio, east of Ma'alaea Harbor. This drainage, although passing close to the triangle parcel (see Figure III-3), is outside of the project area and will not be affected by the project.

Southward along the flank of Kealaloloa Ridge from the intermittent stream described above are found numerous small gulches that drain to the cane fields, then connect to the ditch along Honoapiilani Highway that empties into Ma'alaea Bay at Kanaio. Further south the small gulches feed towards the Maalaea Triangle parcel. Several of these small drainages are combined into the drainage designated Drainage Basin No. 1 in the Unemori report (1987). The total area of this basin was calculated to be ~140 acres. Flow is reported to pass under Honoapiilani Highway (3' x 5' box culvert) and across the Maalaea Triangle parcel, then onto Maalaea Road along the east side of the parcel. Flow then proceeds down along the road into the harbor near the U.S. Coast Guard facility. Other than sheet flow across the road and over the sides of the dock, no drainage system per se exists in this area.

The largest stream course directly mauka of the project area is indicated on the USGS Maalaea Quadrangle map as a dotted blue line and designated Drainage Basin No. 2 in the Unemori report. The drainage area is given at ~217 acres but is closer to 290 acres,

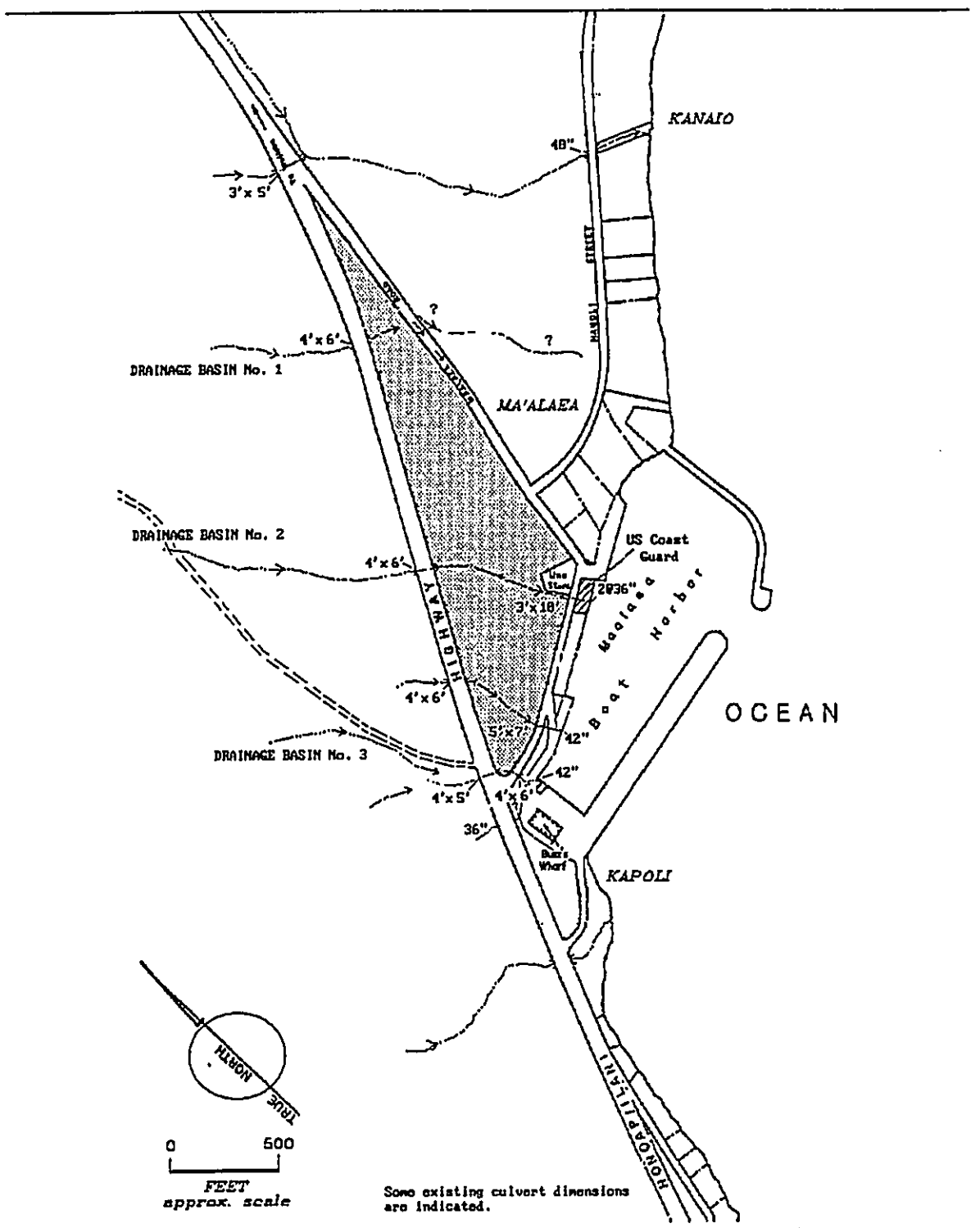


Figure III-3 Surface drainages into and around Ma'alaea Harbor and the Ma'alaea triangle parcel.

with flows arising on the east side of a small peak at the 1966 feet elevation. The dry stream course occupies a distinct gulch which opens onto an alluvial fan (cane fields) and is directed into a ditch that crosses under Honoapiilani Highway south of the middle of the Maalaea Triangle parcel (shown incorrectly on the topographic map). This stream course then turns southward between the Maalaea Fish Market and the Uno store, under old Maalaea Road through a 3' x 10' drainage structure, which feeds two 36-inch RCP culverts which pass under U.S. Coast Guard facility into the harbor.

Further west, a small drainage that opens into the harbor through a 42" RCP culvert at slip No. 33 appears to arise in the abandoned cane field across Honoapiilani Highway and is not clearly fed by any of the gulches draining uplands behind the field. This drainage can be traced through a 4' x 5' box culvert under the highway, across the southwest corner of the Maalaea Triangle parcel, to a 5' x 7' box culvert under old Maalaea Road to the 42" RCP under the harbor access road. This drainage may have been the outlet for Drainage Basin No. 3 at one time, but flow was redirected as part of cane field development. The highway culvert is poorly maintained and now nearly filled with silt.

The drainage area designated Drainage Basin No. 3 has an area of ~158 acres according to the Unemori Report and arises near the 1900-foot elevation on Kealaloloa Ridge. Our examination of the topographic map suggests the area may be closer to 88 acres, arising from surface flows no higher than about 1100 feet elevation. This drainage passes through a cattle ranch above the highway, through a 4' x 5' box culvert under Honoapiilani Highway near the southern intersection with old Maalaea Road, a 4' x 6' box culvert under Maalaea Road, and then a 42" RCP culvert west of the public restrooms at the Harbor to open into the harbor near the boat ramp.

Drainages further to the south along Kealaloloa Ridge enter Ma'alaea Bay outside of the Harbor. These drainages are outside of the project area. A fairly large drainage channel some 10 to 15 feet deep cuts through the cliff south of the harbor and would direct runoff across the sand and boulder beach just south of Kapoli Park. This outlet is fed by two normally dry gulches arising at around the 1300-foot elevation.

Onsite runoff is calculated to be 14.5 cfs (10-yr storm), and will increase to 44.4 cfs once the parcel is developed. Offsite runoff which crosses under Honoapiilani Highway onto the parcel from Drainage Basins 1, 2, & 3 is estimated to be 962 cfs. (Warren S. Unemori Engineering, Inc., 1987). The drainages which enter Ma'alaea Harbor contribute to siltation problems in the artificial basin. At times silt deposits off these pipes become severe enough to warrant dredging. An example of this condition is the storm of January 1980 when enough silt was deposited to strand boats after the storm (R. M. Towill Corp., 1982).

III.B.3 Vegetation

The Ma'alaea area is extremely dry much of the time, and discovery and identification of many plants in the field can be expected to vary with the season. A cursory investigation of plant species in the harbor area was made by USFWS (1980). Stoecker and Stoecker (1972) listed species found around the steam generating station at Ma'alaea (see Westinghouse Electric, 1975), east of the project area. A survey of locations potentially impacted by the proposed MOC/MTP sea water system and drainage improvements was conducted on May 9, 1994. Results of this survey are discussed here and a list of species for the site and Ma'alaea Harbor is provided as Appendix Table C•1.

The Maalaea Triangle parcel in May 1994 was covered with buffel grass (*Cenchrus ciliaris*) and scattered 'uhaloa (*Waltheria indica*), with burnt stalks of cane (*Saccharum officinarum*) prominent. In the dry channels of the "stream" courses which cross the property, the diversity of species was seen to increase because of greater soil moisture and possibly less disturbance when the parcel was planted in cane. This habitat was seen to support Guinea grass (*Panicum maximum*), balsam pear (*Mormordica charantia*), 'uhaloa, spiny amaranth (*Amaranthus spinosus*), castor bean (*Ricinus communis*), young koa-haole (*Leucaena leucocephala*), and hairy abutilon (*Abutilon grandifolium*).

Soil moisture increases downstream in Drainage No. 2 and surface water was evident in several places in May as small pools up to several centimeters deep. Some of this water comes from waste ice dumped beside the channel from the adjacent ice plant. Some of the moisture is above the buildings and would seem to represent a spring or a surface expression of underground flow in the stream bed. In this part of the stream bed (representing only about the last 50 to 60 feet of channel above the Maalaea Road culvert) the growth of Guinea grass approaches normal size. Chinese violet (*Asystasia gangetica*) is abundant on the banks. Close to Ma'alaea Road, just before the box culvert under the road, Job's tears (*Coix lachryma-jobi*) dominates the stream bed, indicating that water, or at least saturated soil, is permanent here. In the channel between the Maalaea Store and the fish market (and ice plant) occur a number of ornamental plants: ti (*Cordyline fruticosa*), plumeria (*Plumeria obtusa*), banana (*Musa* x *paradisica*), coconut (*Cocos nucifera*), laua'e fern (*Microsorium scolopendria*), parrot's beak heliconia (*Heliconia rostrata*), and African tulip tree (*Spathodea campanulata*). Several weedy plants are growing here also: red pualele (*Emilia fosbergii*), koali (*Ipomoea ? littoralis*), balsum pear, plush grass (*Chloris radiata*), and koa-haole seedlings.

The proposed routing of the intake pipe for the Maui Ocean Center would cross mostly paved surfaces (road and parking areas) at the back (western part) of the Boat Harbor, and cross the shore between Kapoli Beach Park and the base of the south breakwater. In this location, only a narrow strip of land (10 to 20 feet wide) exists between the roadway

and the beach, on which grows several kiawe trees (*Prosopis pallida*) and a sparse ground cover of Australian saltbush (*Atriplex semibaccata*).

Further south along the shore is a gully for drainage south of Drainage Basin No. 3 (see Fig. III-3). This area typifies the "natural vegetation" of the lowlands around the harbor and mauka of the cane fields. Kiawe trees form an overstory that is nearly complete. The ground cover is mostly buffel grass, with Guinea grass (in low spots) and Chinese violet, both common to abundant. A common weedy plant in May 1994 was 'aheahea (*Cheno-podium murale*). Also present here was lion's ear (*Leonotis nepetifolia*). No threatened or endangered species of plants were observed or have been reported from the harbor area, except endemic ma'o or Hawaiian cotton (*Gossypium tomentosum*) which is consistently mentioned by USFWS (1980, 1993) as "reported" but noted as not observed. A checklist of the flora is given in Appendix C, Table C•1.

III.B.4 Terrestrial Fauna

No special terrestrial faunal studies were undertaken for the Maalaea Triangle project or the Maui Ocean Center. A survey of the area was conducted by the Fish and Wildlife Service for harbor improvements (USFWS, 1980; R.M. Towill Corp., 1982). Two species of exotic birds, the mynah (*Acridotheres tristis*) and house sparrow (*Passer domesticus*) were observed in the area. The project site is a former cane field, and the following exotic species are known to inhabit this part of Maui and might be found on the property: ring-necked pheasant (*Phasianus colchius torguatus*), grey francolin (*Francolinus pondiceri-anus*), lace-necked dove (*Streptopelia chinensis*), and barred dove (*Geopelia striata*). The Dept. of Land and Natural Resources, Forest and Wildlife Office lists the housefinch (*Carpodacus mexicanus*), mockingbird (*Mimus polyglottos*), northern cardinal (*Cardinalis cardinalis*), Japanese white-eye (*Zosterops japonica*), and possibly spotted munia (*Lochura punctulata*) as part of the local avian assemblage. Hawaiian owl or pueo (*Asio flammeus sandwichensis*) and possibly barn owl (*Tyto alba*) may visit the site. Mammals and reptiles are limited to introduced species (e.g., feral dog, cat, rats)(R.M. Towill Corp., 1982). The pueo is not listed by the State of Hawaii or the Federal government on Maui (the pueo is State listed as endangered on O'ahu). However, none of the area impacted by the project is critical habitat for this species.

III.C MARINE ENVIRONMENT - PHYSICAL OCEANOGRAPHY

III.C.1 Bathymetry

The approximate bathymetry in Ma'alaea Bay is illustrated in Figure III-4. The bathymetry in the vicinity of Ma'alaea Harbor was surveyed by the U.S. Army Corps of

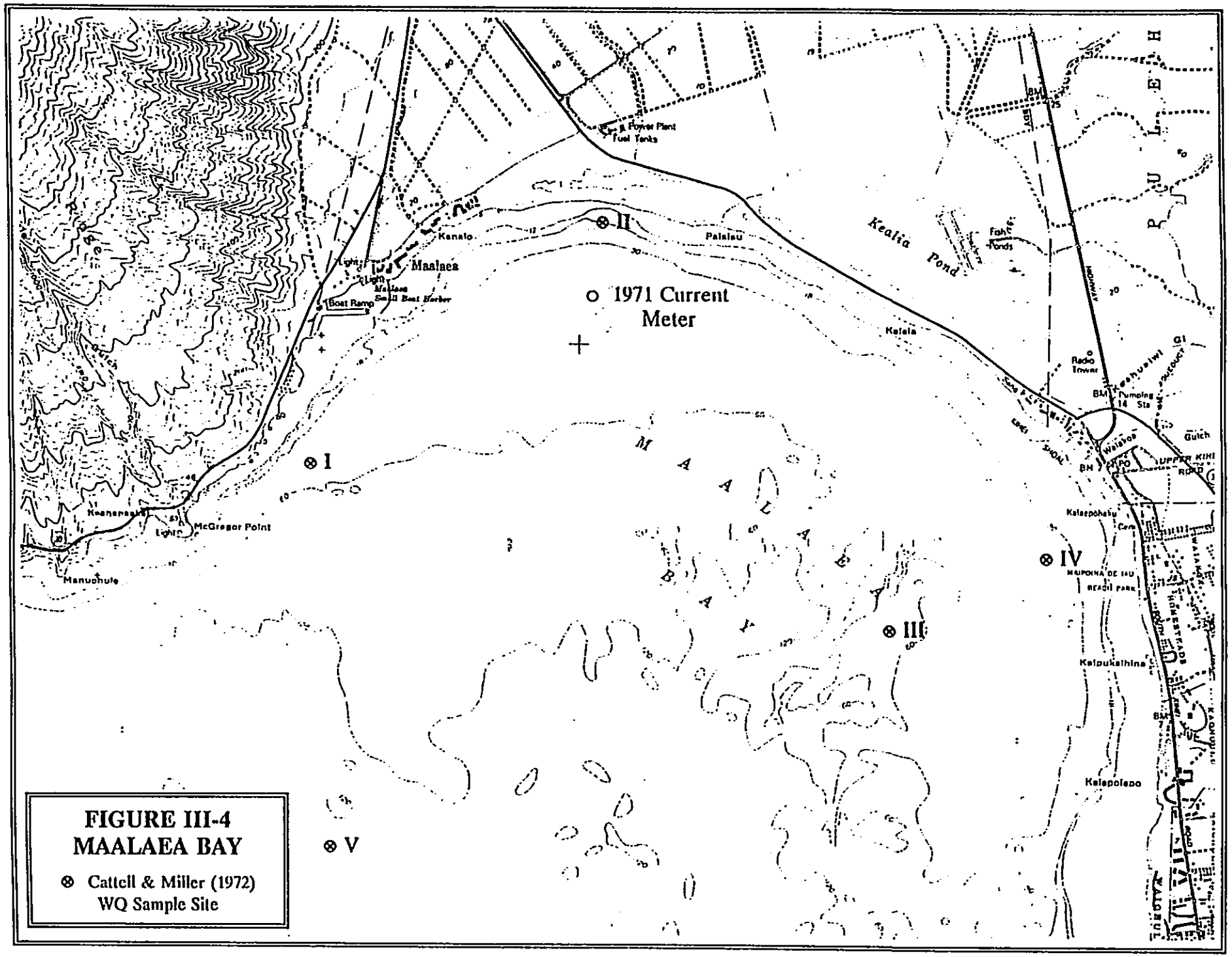


FIGURE III-4
MAALAEA BAY

⊗ Cattell & Miller (1972)
WQ Sample Site

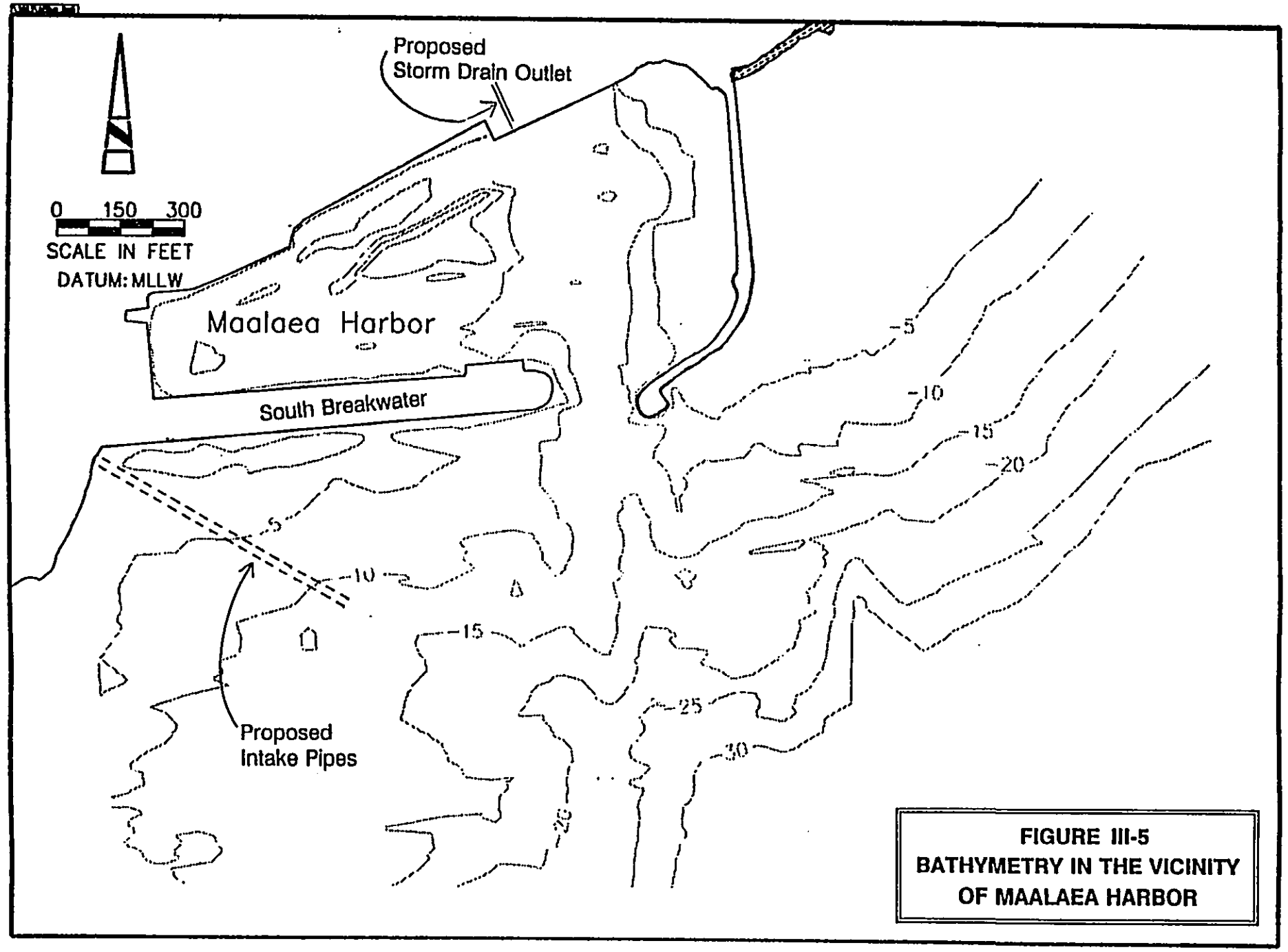


FIGURE III-5
BATHYMETRY IN THE VICINITY OF MAALAEA HARBOR

Engineers (R.M. Towill Corp., 1989) and is illustrated in Figure III-5. The bottom generally consists of a hard coralline reef with scattered coral heads and small channels. Directly offshore of the south breakwater, the bottom out to 200 feet offshore grades from smooth rounded rocks and cobbles next to the breakwater to a flat limestone reef with scattered patches of coral rubble. Water depths are 2 to 4 feet, and wave energy is relatively high. Beyond this high energy area, from 200 to 600 feet offshore of the south breakwater, the water depth ranges from -4 to -12 feet, and the bottom consists of a limestone reef with scattered patches of mixed and sand and rubble. The bottom relief is relatively flat, with occasional depressions, overhangs, and ledges.The entrance channel is 10 to 15 feet deep, extends approximately 500 feet south of the breakwater, and is 150 to 200 feet wide. The channel bottom is relatively flat, with no abrupt slopes marking the sides. The bottom typically consists of a thin covering of calcareous sand and some rubble overlying hard limestone reef materials (USACOE, 1980).

Adjacent to and paralleling the east breakwater is a scoured zone approximately 100 feet wide and three feet deep. The bottom is flat and composed of burrowed, honeycombed limestone.

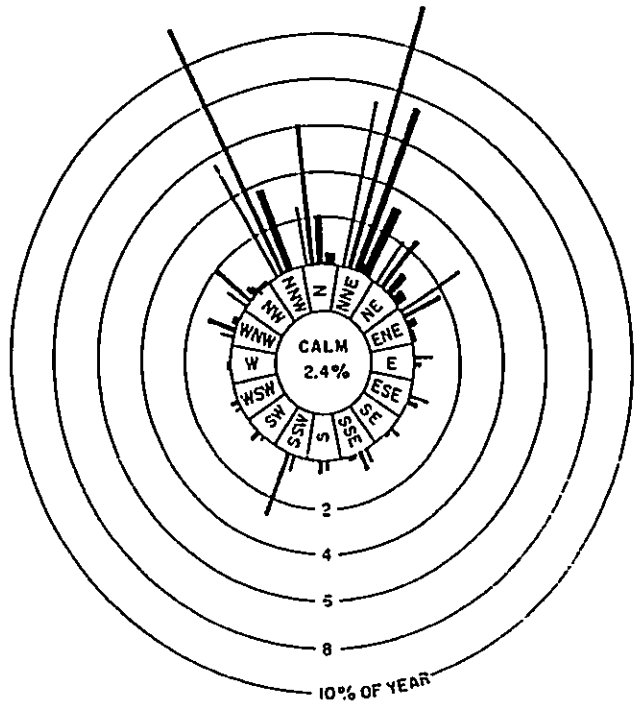
III.C.2 Winds

The predominant winds in the Hawaiian islands are the northeast tradewinds, which occur approximately 75% of the year. The tradewinds are relatively constant during the spring and summer; typical speeds are 10 to 20 miles per hour. On Maui, local wind conditions are heavily influenced by regional topography. At Ma'alaea Harbor, the northeast trade winds become northerly as they are funneled between the volcanoes of east and west Maui. Figure III-6 presents wind roses for the Ma'alaea Bay vicinity. Figure III-6A presents data from the Puunene Naval Air Station, located 4 miles northeast of Ma'alaea (Wang and others, 1994). The diagram indicates that winds are dominantly from the NNW to NNE directions. Figure III-6B shows the more northerly shift in the winds at Ma'alaea Bay as compared to Kahului Airport (Westinghouse Electric Corporation, 1972).

During the winter, the northeast tradewinds weaken, and Kona or south to southwesterly winds may occur. Kona winds range from light and variable to gale force winds produced by local low pressure systems.

III.C.3 Waves

The wave exposure of the project area is described for two categories of waves: typical annually occurring waves, and extreme waves.



LEGEND:

- 3-7 MPH
- 8-18 MPH
- 19-24 MPH
- 25 MPH OR GREATER

DATA FROM U.S. WEATHER BUREAU
AT PUUNENE NAVAL AIR STATION
PERIOD OF RECORD - 2 YEARS

MAALAEA SMALL BOAT HARBOR
MAALAEA, MAUI, HAWAII

WIND DIAGRAM

U.S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE III-6A
WIND ROSE FOR THE
PUUNENE NAVAL AIR STATION

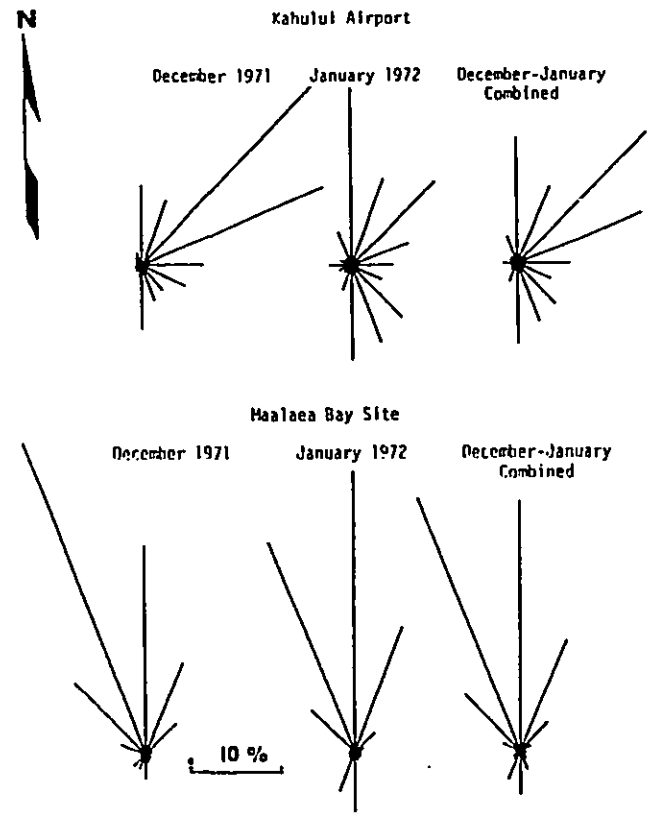


FIGURE III-6B
DECEMBER 1971 AND JANUARY 1972,
WIND ROSES FOR KAHULUI AIRPORT
AND MAALAEA BAY

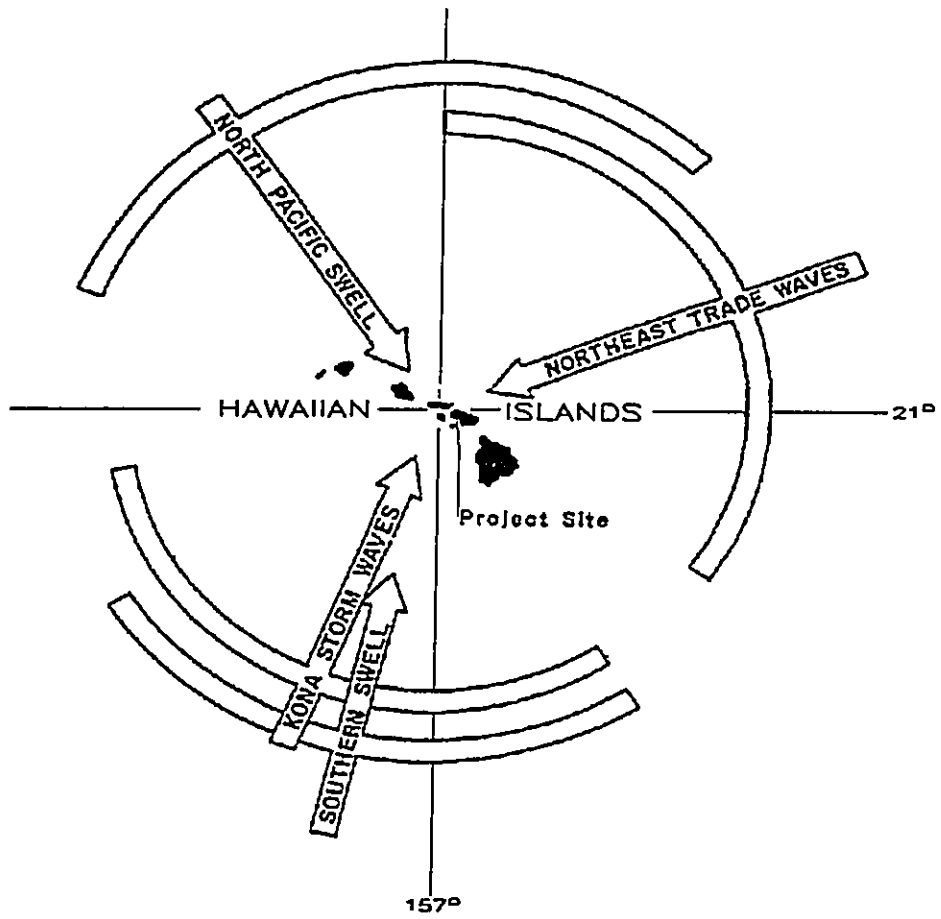


Figure III-7. Generalized wave types for the Hawaiian Islands.

Typical Waves: There are four general categories of waves that approach the Hawaiian islands (Figure III-7): northeast tradewind waves, Kona storm waves, North Pacific swell, and southern swell. Ma'alaea Harbor is on the leeward side of Maui, and is thus affected by only southern swell, and "Kona" or low pressure system, storm waves arriving from the south or southwest. Southern swell is generated by large extra-tropical storms in the South Pacific and Indian Ocean. The wave heights in deep water are 3 to 6 feet with periods of 14 to 18 seconds, while breaking wave heights can range from 10 to 15 feet. Kona storm waves usually approach from the south or south-southwest. Kona wave periods range from 8 to 10 seconds, and heights may reach 10 to 15 feet.

Sources of wave information for specific use in the vicinity of Ma'alaea Harbor are limited. The most complete information is available in a recent study completed by the U.S. Army Corps of Engineers (USACOE) to analyze the wave response of improvements proposed for the harbor (Lillycrop, et al., 1993). In this study, the Monitoring Completed Coastal Projects (MCCP) Program (USACOE, 1987) slope

array at Barbers Point, O'ahu was determined to have the best data applicable to Ma'alaea. Of the available data sources for the Hawaiian Islands, the Barbers Point data was the only directional data for a coastal exposure applicable to Ma'alaea Harbor (Lillycrop et al., 1993). To apply the Barbers Point data to Ma'alaea Harbor, the measurements were unrefracted from the 28 to 1300 foot depths to yield the relevant deepwater wave climate, transferred to an appropriate location in front of Maui, and then refracted back in to Ma'alaea Harbor.

Figure III-8 and Table III-1 present the percent occurrences of deepwater waves from directions ranging from 135 to 270 degree azimuth. Table III-1 also illustrates the percent of occurrence of various wave heights. A refraction analysis was then completed for 22.5 degree direction bands centered about the 135, 157.5, 180, 202.5, 225, 247.5 and 270 degree azimuths, and wave periods and heights ranging from 9 to 20 seconds, and 3 to 8 feet, respectively. This analysis revealed that because of the sheltering effects of Kahoolawe, Lanai, Molokai and West Maui, waves coming from 247.5, 225.0, 202.5 and 180 degrees produce the most wave energy in the harbor vicinity. Waves coming from 247.5, 225 and 180 degrees travel in nearly straight line paths to the harbor, while waves from 202.5 degrees are refracted towards the harbor. Given the percentage of wave occurrences presented in Figure III-8 and Table III-1, the most significant wave directions are therefore 225.0 degrees (50.8%), 202.5 degrees (19.9%), and 247.5 degrees (16.4%). Waves from 180 degrees occur only 2.2 percent of the time (Lillycrop et al., 1993).

Table III-1. Deep-water wave heights for Ma'alaea.

Percent Occurrence of Wave Heights Versus Direction								
	Wave Direction, deg (from which waves approach)							
Wave Height ft	135.0	157.5	180.0	202.5	225.0	247.5	270.0	Total
0.00-1.00	0.00	0.00	0.01	0.02	0.02	0.02	0.00	0.07
1.01-2.00	*	0.03	0.91	3.97	4.32	1.33	0.28	10.84
2.01-3.00	*	0.07	0.86	5.34	11.05	4.16	2.04	23.52
3.01-4.00	0.00	0.01	0.28	4.26	11.60	3.81	2.24	22.20
4.01-5.00	0.00	0.00	0.04	2.28	8.63	2.28	1.88	15.11
5.01-6.00	0.00	0.00	0.02	1.13	5.14	1.52	0.77	8.58
6.01-7.00	0.00	0.00	*	1.81	3.38	0.96	1.22	7.37
7.01-8.00	0.00	0.00	0.09	0.96	3.64	0.83	0.82	6.34
8.01-9.00	0.00	0.00	0.00	0.19	3.00	0.21	0.66	4.06
9.01 +	0.00	0.00	0.00	0.00	0.00	1.25	0.65	1.90
TOTAL	0.01	0.11	2.21	19.96	50.78	16.37	10.56	100.0

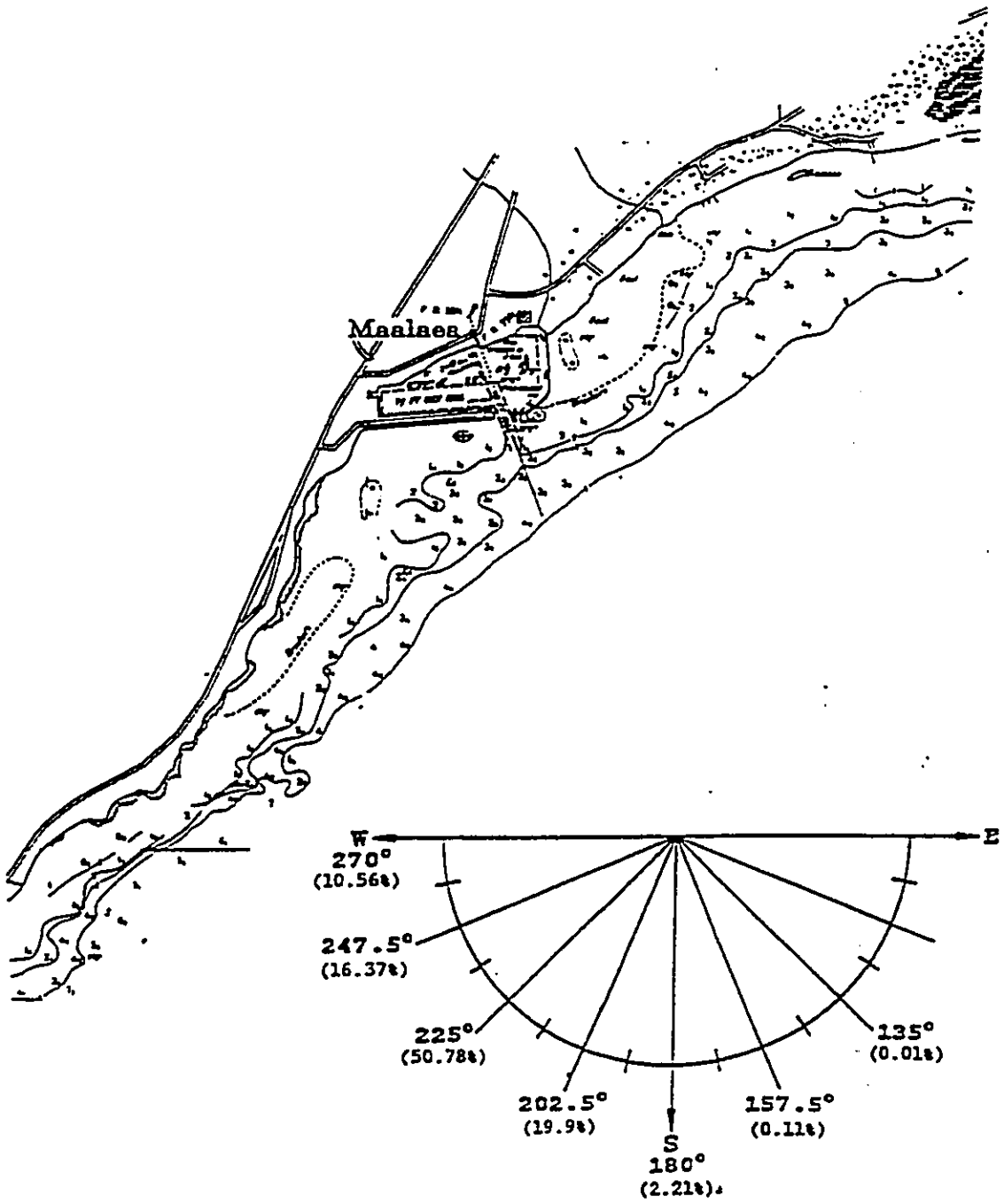


FIGURE III-8
PERCENT OCCURRENCE OF DEEPWATER WAVE CONDITIONS BY DIRECTION

Extreme Waves: High wave heights with long recurrence intervals or return periods can be statistically estimated from a relatively short term wave record. The return period is the average expected duration between occurrences of a given wave height. Data from the Barbers Point CDIP Buoy, moored in 600 feet of water, is most representative of the wave climate applicable to Ma'alaea. Applying a Weibull distribution to data from the Barbers Point CDIP buoy yields the following estimates of return period for extreme deepwater wave heights off Ma'alaea Harbor:

Return Period in Years	Wave Height in Feet
10	13
25	14
50	15

These results assume that a high wave occurrence lasts at least 24 hours.

The project area is also exposed to severe wave attack from passing tropical storms and hurricanes. The U.S. Army Corps of Engineers (1967) hindcasted wave heights generated by 17 severe storms during the period from 1947 - 1965, and seven of these affected the south and/or west shores of the islands. Marine Advisers (1963) also hindcasted deepwater wave conditions off the west coasts of Lana'i and Moloka'i produced by the ten worst storms during the 15-year period from 1947 - 1961. Sea Engineering, Inc. (1980) hindcasted the deepwater wave characteristics for the Kona storm of January 1980. Storm wave data from these sources applicable to Ma'alaea Harbor are summarized in Table III-2.

Table III-2. Historic storm wave characteristics.

Date	Deepwater Wave Height (feet) (Maui Area)	Deepwater Wave Period (seconds)	Wave Approach Direction
12-20-55	14.8	11	West
09-05-57 (*Della*)	18.9	21	West
12-02-57 (*Nina*) 01-18-59	20.0	13	South & West
08-06-59 (*Dot*) 01-07-62	14.0	10	South & West
01-17-63	22.5	12	South & West
01-11-80	13.6	11	South & West
	12.0	10	Southwest
	17.0	9	Southwest

Hurricanes form near the equator, and in the central North Pacific usually move toward the west or northwest. During the primary hurricane season of July, August and September, hurricanes generally form off the west coast of Mexico and move westward across the Central Pacific. These tropical storms or hurricanes usually pass south of the

Hawaiian Islands, with a northward curvature near the islands. However, they generally stay far enough offshore to only cause high surf or heavy rainfall as they pass. Late season tropical storms and hurricanes follow a somewhat different track, forming south of Hawai'i and moving north toward the islands.

There are many recorded tropical storms or hurricanes which have approached the Hawaiian Islands during the past over 35 years. Most of these storms passed well south or west of the islands, or weakened in intensity as they reached Hawai'i, but there have been notable exceptions. Hurricanes *Hiki, Della, Nina* and *Fico* passed within about 200 miles of the islands, *Iniki* and *Dot* passed over Kaua'i, and *Iwa* passed within 30 miles of Kaua'i. Hurricane *Susan*, with sustained wind speeds estimated at 120 knots was pointed directly at the island of Hawai'i approaching from the southwest but died before coming within 200 miles of the islands. Most recently, Hurricane *Iniki* passed directly over Kaua'i and caused heavy damage. Table III-3 and Figure III-9 present historical hurricane characteristics and storm tracks.

The report Hurricanes in Hawaii (Haraguchi, 1984), prepared for the U.S. Army Corps of Engineers presents hypothetical model hurricanes for the Hawaiian Islands. The model Hawaiian Hurricane is defined as the probable hurricane that will strike the Hawaiian Islands in the future. The characteristics of the model hurricane are based on the characteristics of hurricanes *Dot* and *Iwa*.

Based on the characteristics of the model hurricane, the hypothetical deepwater hurricane wave conditions were determined using the following equations:

$$H_o = 16.5 \exp(R \cdot P/100)(1 + 0.208\, A \cdot V/\sqrt{U})$$
$$T = 8.6 \exp(R \cdot P/200)(1 + 0.104\, A \cdot V/\sqrt{U})$$

where,

- U = the maximum sustained wind speed in knots ($U = 65$ knots);
- P = $P_n - P_o$ in inches of mercury and P_n is the normal central pressure of 29.92 inches of mercury and P_o is the central pressure of the hurricane. ($P_o = 28.9$ inches of mercury);
- V = hurricane forward speed in knots ($V = 20$ knots);
- R = radius of maximum wind in nautical miles ($R = 19$ n.m.);
- A = a coefficient depending on the hurricane forward speed (Use $A = 1.0$).

The predicted wave height and period for the model hurricane are calculated to be 30 feet and 12 seconds.

TABLE III-3
HISTORICAL HURRICANE CHARACTERISTICS

Name	Date	Sustained Wind Speed (kts)	Lowest Sea Level Pressure (mbs)	Direction	Forward Speed (kts)	Eye Diameter (NM)
HIKI	8/50	65	983	WNW	5	10-20
DELLA	9/57	-	-	NW	6	-
NINA	11/57	80	-	NNW	8	-
DOT	8/59	65	984	NNW	9	20-30
FICO	7/78	100	955	WNW	10	30
SUSAN	10/78	120	954	NW	6	10-20
IWA	11/82	65	972	NE	32	20-30
INIKI	9/92	100	945	N	20	10

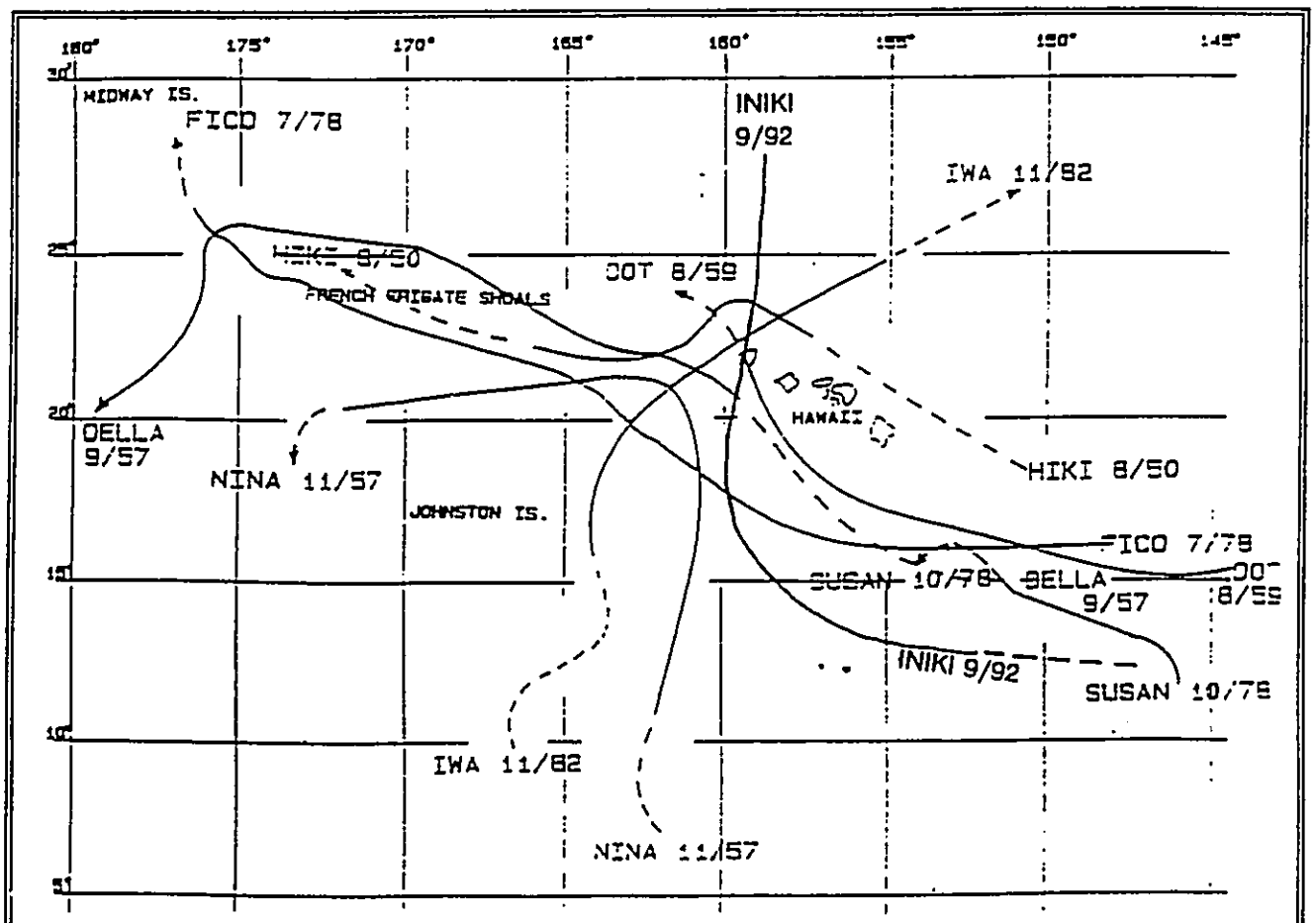


FIGURE III-9
HISTORICAL HURRICANE STORM TRACKS

This is a worst case condition, assuming that the hurricane passes very near to the west coast of Hawaii and the project site. The actual likelihood of this is estimated to be very low. It is more likely that the storm would pass some distance from the island, thus the wave height at the project site would depend on the storm track and decay distance over which the waves travel.

The selected extreme deepwater wave conditions are given in Table III-4, including the estimated 50-year wave based on Barbers Point wave data, a typical severe storm wave, and a model hurricane wave.

Table III-4. Selected extreme deepwater wave characteristics for the project area.

Wave Type	Wave Height (feet)	Wave Period (seconds)
50-Year Wave	15	14
Typical Extreme Storm Wave	20	13
Model Hurricane Wave	30	12

III.C.4 Tides

Tides in Hawaii are classified as semi-diurnal with small diurnal inequalities. The closest tidal bench marks to Ma'alaea are located at Olowalu and Makena, approximately 7 miles west and 11 miles southeast of Ma'alaea, respectively. Tidal data for Ma'alaea based on these locations is the following (USACOE, 1980):

Highest Tide (estimated)	3.5 ft
Mean Higher High Water	2.3 ft
Mean High Water	1.8 ft
Half Tide	1.0 ft
Mean Low Water	0.2 ft
Mean Lower Low Water	0.0 ft
Lowest Tide (estimated)	-1.0 ft

III.C.5 Currents and Circulation in Ma'alaea Bay

There is limited data available on currents and circulation in Ma'alaea Bay. The most detailed study was completed in December, 1971 by B.K. Dynamics and Westinghouse Environmental Systems Department for an environmental impact analysis of a proposed power generating facility along Ma'alaea Bay (Westinghouse Electric Corporation, 1972). The current study included four days of data collection with two current meters, and five days of drogue studies. The current meters were located in 40 feet of water, at

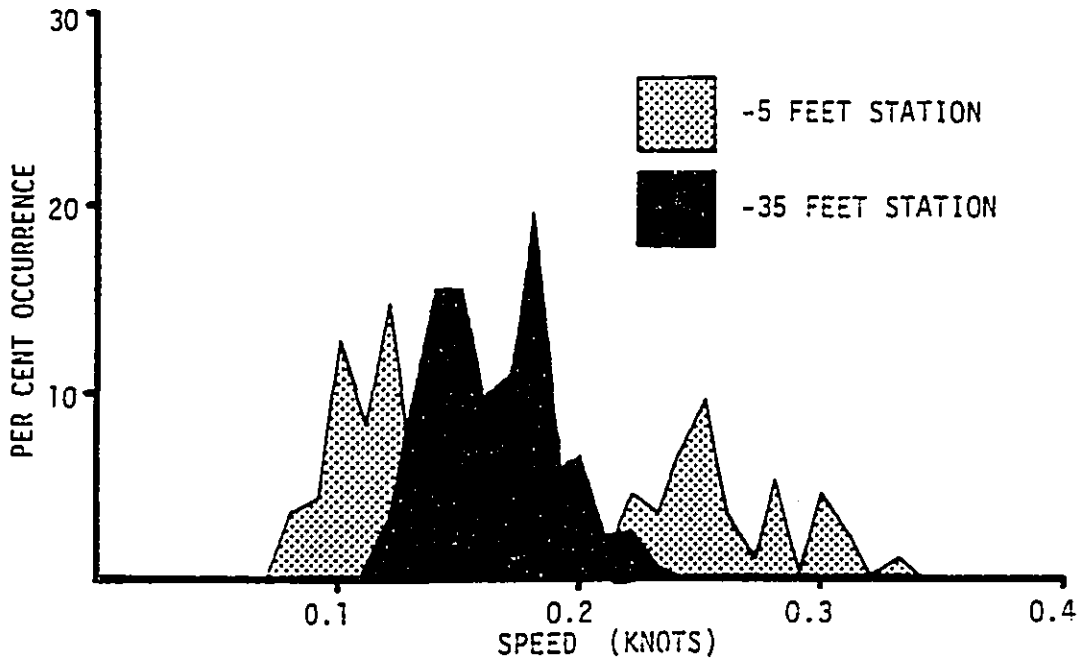
depths of -5 feet and -35 feet (see Figure III-4 for the location). The results of the current meter data are presented graphically in Figures III-10 and Appendix C. Figure III-10 shows the frequency of the current speed and direction, while Appendix Figure C•1 is a progressive vector diagram of the current meter data (Westinghouse Electric Corporation, 1972). When compared with the corresponding wind and tide conditions, the data indicate that tradewind conditions result in surface currents flowing to the southwest and subsurface currents to the west, and Kona conditions result in surface currents to the east and subsurface currents to the southeast. There were no discernable tidal effects.

Figures C•2 through C•6 in Appendix C present the results of the five days of drogue studies conducted between December 3 and 10, 1971; the dotted lines represent the paths of the drogues placed at -35 feet, while the solid lines represent the near surface drogues. Again, the data exhibited minimal tidal effects. During tradewind conditions, a counter-clockwise flow pattern occurred in the bay (Figure C•6), while during Kona conditions, a clockwise flow pattern occurred (Figures C•2 and C•4). In general, the currents were wind-driven. Surface currents always flowed with the wind, while subsurface currents required an estimated 6 to 10 hours to respond to a shift in wind direction from Kona to 20 mph tradewinds. Typical speeds were between 0.3 and 0.4 feet/second (9 to 12 cm/sec).

A simple analysis completed for the Westinghouse study indicates a residence time in Ma'alaea Bay of 11.5 hours during typical tradewind conditions (Westinghouse Electric Corporation, 1972). This analysis assumed the bay boundary was defined by a straight line drawn between McGregor Point and Kihei, a counter-clockwise flow pattern within the bay, an average bay depth of 14 feet, and an average current of 0.2 ft/sec (6 cm/sec). The residence time was calculated by estimating the volume of the bay, and assuming a counter-clockwise, calculating the amount of time to fill that volume given an average 0.2 ft/sec (6 cm/sec) inflow through half the bay mouth.

III.C.6 Circulation within Ma'alaea Harbor

Circulation within the harbor has been analyzed in detail in a recent study completed by the USACOE to assess the affects of proposed harbor improvements on circulation (Wang et al., 1994). For this study, a two layer numerical model of circulation in the harbor was developed, and verified and calibrated with five days of current and tide data collected in the harbor from July 27 to August 1, 1993. The current data was collected near-surface and near-bottom in the entrance channel and interior of the harbor (Figure III-11). A tide gauge was also located near the entrance channel. Figure III-12 illustrates the computed and measured current speeds in the entrance channel from July 27 to August 3, 1993 during typical tradewind conditions. The V velocity component is roughly parallel to the axis of the entrance channel. A negative V velocity is directed



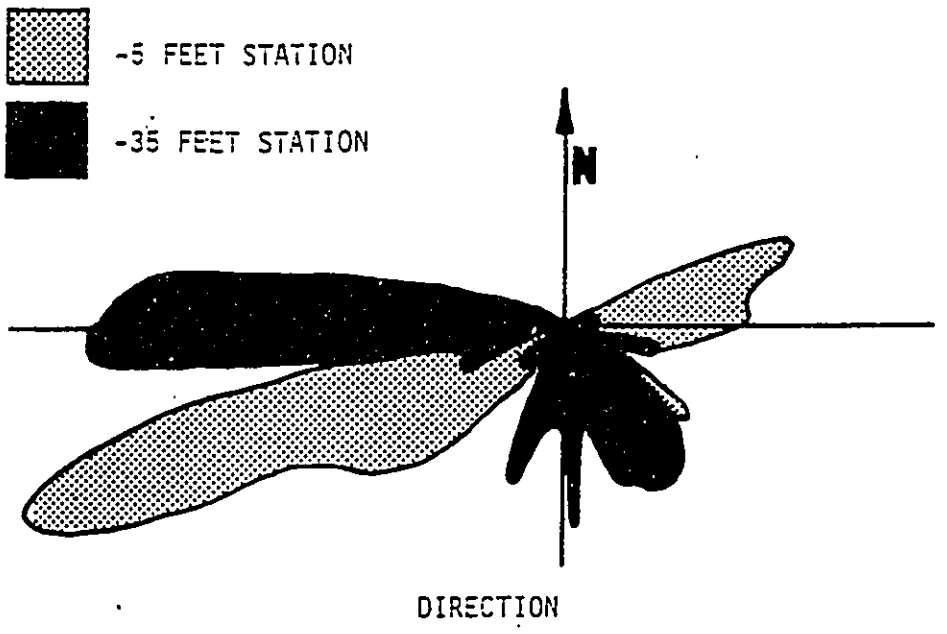


FIGURE III-10
FREQUENCY SORT OF CURRENT METER DATA

out of the harbor, while a positive V velocity is into the harbor. Thus, the data indicates that surface currents are predominantly out of the harbor at speeds around 2 cm/sec, while bottom currents are directed into the harbor at speed of approximately 3 cm/sec. Tidal fluctuations were superimposed on this general flow pattern. Figure III-13 illustrates the surface circulation computed for flood tide and northeast winds. Circulation outside the harbor is wind-driven, with water flowing from the northeast to southwest. Circulation within the harbor is also wind-driven, with a clockwise eddy created by the northeast winds pushing water against the south breakwater (Wang et al., 1994). Current speeds outside the harbor ranged from 10 to 15 cm/sec while speeds inside the harbor varied from 2 to 5 cm/sec.

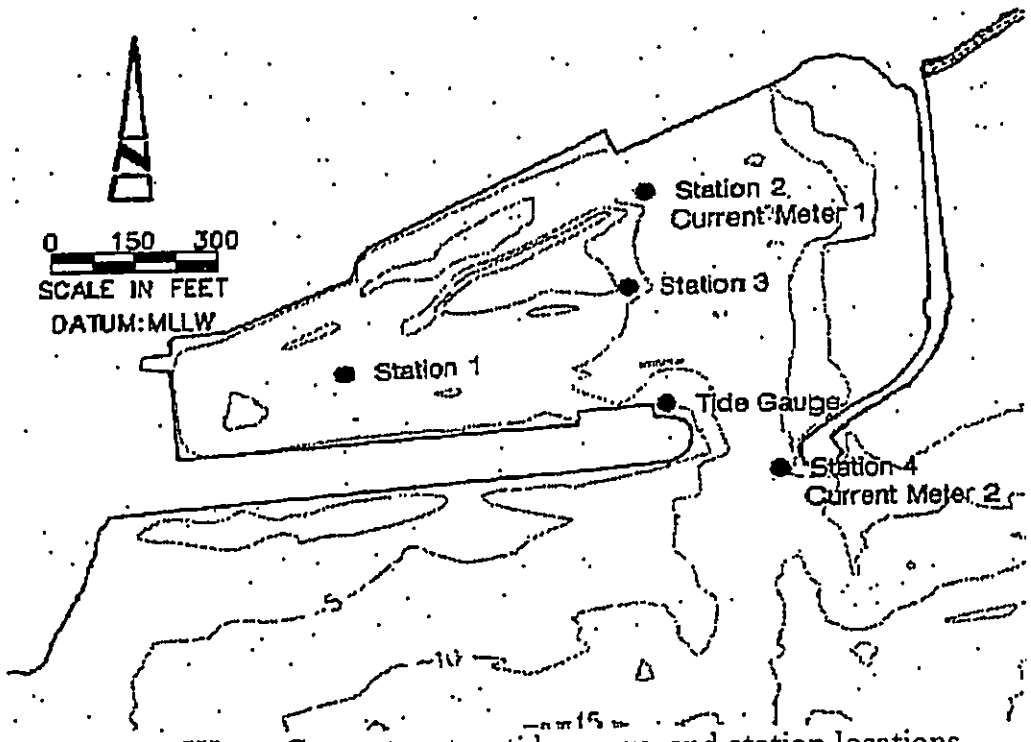


Figure III-11. Current meter, tide gauge, and station locations for Wang et al., 1994 study in Ma'alaea Harbor.

In summary, circulation in the harbor is primarily wind-driven, and during typical tradewind conditions is characterized by a surface layer of water flowing out of the harbor, a bottom layer of water flowing into the harbor, and a clockwise circulation pattern setup within the harbor.

The USACOE study also included an analysis of flushing in the bay (Wang et al., 1994). Flushing was defined as the time required for a conservative tracer C to decrease to 36.8% of its initial concentration C_0. The tracer was assumed to be present at an equal

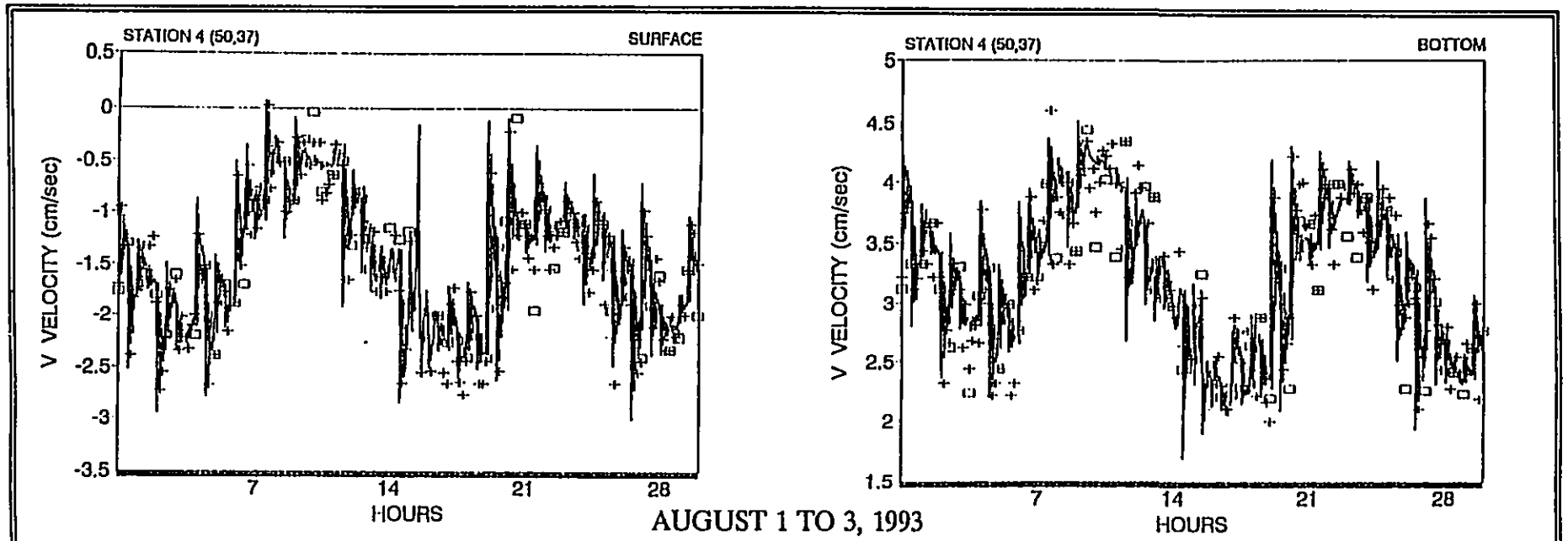
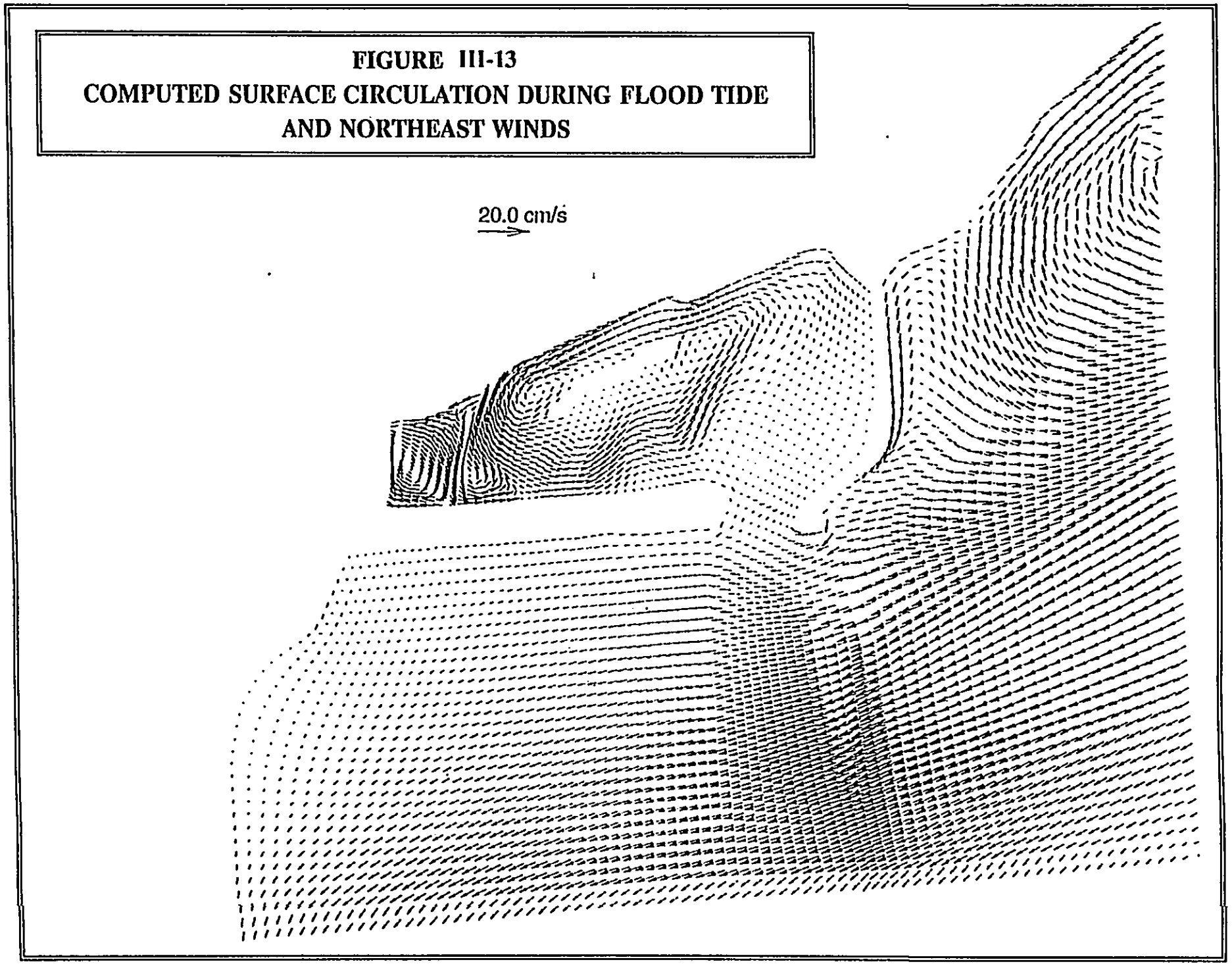


FIGURE III-12
COMPILED AND MEASURED CURRENT SPEED IN THE MAALAEA HARBOR ENTRANCE CHANNEL, JULY 27 TO AUGUST 3, 1993 (Wang and Others, 1994)

FIGURE III-13
COMPUTED SURFACE CIRCULATION DURING FLOOD TIDE AND NORTHEAST WINDS



concentration throughout the harbor (100 parts per thousand "ppt" were used in the analysis), and to not be present outside the harbor in the bay (0 ppt). Figure III-14 shows the dilution with time of the tracer at stations 1, 2 and 3. The average flushing time of the harbor was calculated to be 2.6 days, while at stations 1, 2, and 3 the flushing times were computed to be 2.9, 2.7, and 2.1 days, respectively. Thus, the harbor is relatively well flushed due to the wind-driven dynamics of the circulation; harbor water is blown out of the harbor in the surface layer, and is replaced with a steady inflow of water in the subsurface layer.

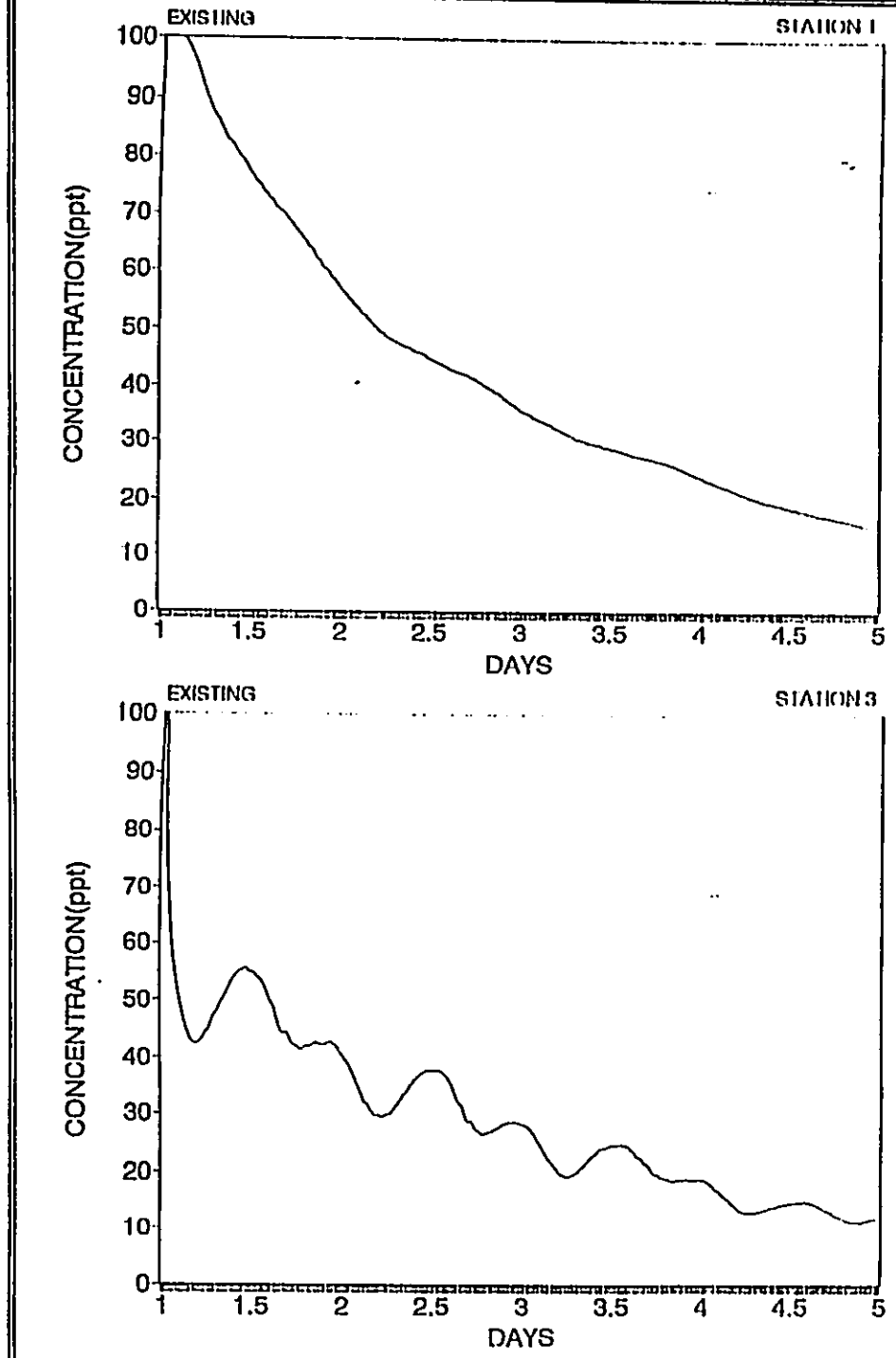
III.D WATER QUALITY

III.D.1 Previous Water Quality Measurements

Water quality measurements useful for characterizing a particular aquatic environment are infrequently collected, and usually in relation to coastal projects or specific water quality problems, seldom over long enough periods to be comprehensive. Older analytical results (two or more decades old) are difficult to track down, and sometimes difficult to relate to more modern methods. Nonetheless, when such data are available, these provide a means of assessing environmental quality and changes with time that might reveal problems otherwise not quantitatively measured.

A set of samples collected broadly across Ma'alaea Bay (see Figure III-4) in January-February 1972 (Cattell and Miller, 1972) provides a glimpse of the water quality in this broad bight from over two decades ago. The results are reproduced here in Appendix C, Table C-2. Stations were visited up to six times during a study conducted by Westinghouse Environmental Systems for the then proposed Maui Electric (MECO) Power Generating Station at Ma'alaea. The stations were located offshore between Kihei and McGregor Point, in some cases over 2 km from land. Measurements included salinity and temperature, inorganic nutrients, particulate organic carbon, chlorophyll α, and primary productivity, in addition to examination of plankton and larval fish. The results are condensed here from Westinghouse Environmental Systems (1972). The following passages summarize the results:

> Nitrate, ammonia and phosphate concentrations are comparable to those determined by other studies of offshore waters [Gordon, 1970; Sverdrup, Johnson, and Fleming, 1964]. Little variability occurred between the inshore Stations, with the exception of two high-nitrate concentrations at Station IV [off Kihei]. The outfall of a sewage treatment plant is located near this Station and may have contributed to the high values observed.
>
> There were no significant differences in chlorophyll-a concentration between Stations with the exception of Station IV [off Kihei]..., which had the highest average concentration (0.37 mg/m^3). ....the variation in chlorophyll-a



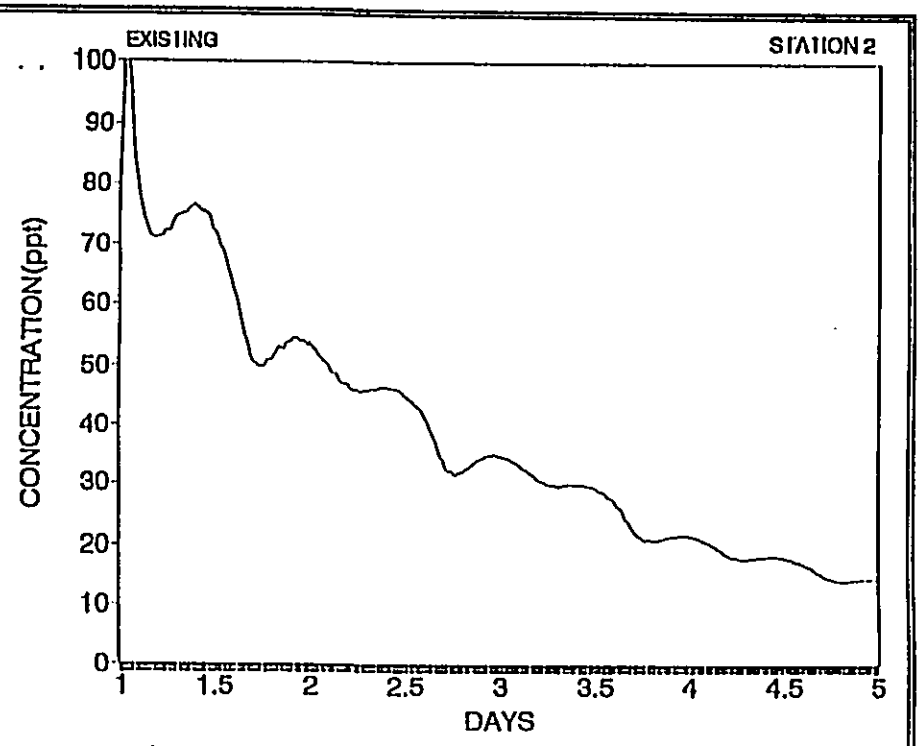


FIGURE III-14
HARBOR FLUSHING - CHANGE IN TRACER CONCENTRATION OVER TIME

> concentrations observed among the sampling Stations is quite small compared with other Hawaiian coastal regions... The average concentration for all Stations in Maalaea Bay was 0.28 mg/m^3. Primary productivity was low and ranged from an average of 1.1 to 3.8 mg C/m^3/hr. ....the relative productivity rates of Maalaea Bay are similar to those of the adjacent offshore ocean water [Cattell & Miller, 1972].

Temperature and salinity measurements were made in December 1972 to assess whether stratification of the water column existed. At some stations, temperature and salinity were measured down to -50 feet. No stratification was indicated (i.e., temperature and salinity were little different at the surface compared with deep samples). Temperatures ranged from 24.9 to 25.0 °C and salinity from 33.48 to 34.28 ppt. The lowest salinities were at Stations I and II (closest sample stations to Ma'alaea Harbor).

Several other surveys (ECI, 1977; M & E Pacific, 1979; *AECOS*, 1989) that included water quality measurements from Ma'alaea Bay are reviewed here, although these surveys were conducted in the Kihei to Wailea area (east side of Ma'alaea Bay). A series of water samples were collected along this coast in August 1977 (ECI, 1977). Sampled were nearshore waters off intermittent (dry) stream courses between Kihei Landing and Keawakapu Beach Park. Table III-5 gives a summary of the nutrient concentrations from this study conducted over 15 years ago.

The ECI (1977) report made comparisons with the earlier water quality surveys in Ma'alaea Bay (Cattell and Miller, 1972) and concluded that the reported values were reasonably typical. The greater concentrations of nitrate at Sites 1 and 2 (see Table III-5) were attributed to ground water in the Kihei area, although a salinity depression was only noted at Site 2. A conclusion reached in the report (ECI, 1977, p. 38) was that the "...nutrient regime in water of Maalaea Bay can be characterized as relatively stable with respect to ammonia and phosphorus coupled with highly variable nitrate values that presumably correlate with ground water seepage into the marine environment."

Table III-5. Mean nutrient concentrations, total inorganic nitrogen values, and N:P ratios for water samples from Kihei, Maui, August 20-21, 1977 (after ECI, 1977).

Site	TURBIDITY (ntu)†	NO_3+NO_2 (µg N/l)	NH_3 (µg N/l)	PO_4-P (µg P/l)	N:P Ratio
1 - Kihei Pier	0.36	37	6	5	20.7
2 - Kalepolepo	0.84	76	6	8	21.7
3 - Kalama Park	1.68	7	6	3	8.4
4 - Keawakapu	0.32	5	5	5	5.1

†Mean of 8 samples: morning and afternoon, at 50 and 100 m offshore, paired replicates

The 1977 study concluded that nutrient concentrations in nearshore waters were high and non-limiting to phytoplankton growth. It is worth noting that the inorganic nitrate and phosphate concentrations measured in 1989 were considerably greater than in the 1977 samples from the same general area (Kalama Park to Keawakapu). However, the 1977 study was conducted in a dry period (August) as compared with the 1989 study (February), when ground water discharge at the shore might have been less.

Marine water samples were collected in 1978(?) just north of Keawakapu by M & E Pacific (1979). Nitrite plus nitrate, total Kjeldahl nitrogen, and total phosphorus were measured. The means of eight replicates at two stations were 21 µg-N/l for nitrite plus nitrate, 12 µg-N/l for total Kjeldahl nitrogen (equivalent to total nitrogen less the nitrate + nitrite), and 75 µg/l for total phosphorus. The report concluded that "the concentrations ....appear to be high due to wind and storm run-off from adjacent shoreline areas", although it is not clear if this is meant as a general statement or only for reference to the time the samples were taken (not given, although most of the field work was accomplished in the latter half of 1978). The total phosphorus value certainly does appear to be high, and probably cannot be accounted for by runoff. On the other hand, the Kjeldahl nitrogen appears unusually low.

At Ma'alaea, the study by William A. Brewer & Associates (1987) provided measurements of salinity, temperature, and dissolved oxygen (DO) in and around Ma'alaea Harbor. These results are presented here as Table III-6. Measurements were made in the field on either April 15 or 16, 1987. These data indicate an influence of surface runoff and/or ground water movement into the harbor and nearshore waters. Salinities ranged from 22 to nearly 31 ppt (compared with 34 ppt for open ocean water). Brewer (1989) points out that the mean temperature of the harbor stations was 22.9 °C, whereas all measurements made in the ocean outside of the harbor had a temperature of 23.2 °C, concluding that the cooler water temperatures "in the harbor probably reflect subtidal fresh or brackish water discharges". While not the only explanation of lower temperatures in the harbor, the salinity data would certainly seem to indicate influence of surface or subsurface inputs of fresh or brackish water. Salinity at stations outside the harbor (Stations 6, 7, and 8) are all around 30 ppt, while salinity in the harbor shows a mean of 24.7 ppt., and a gradient from 26 ppt near the mouth to 22 ppt furthest inside at the boat ramp.

Measurements were made at each station at two depths to assess the extent of stratification of the water column. A very slight stratification is evident at Stations 3 and 4 (innermost parts of the harbor), but nowhere else, a fact attributed to high winds producing mixing of the water column. Dissolved oxygen values were generally moderate to high, between 71 and 97 percent of saturation. Values were lowest in the inner harbor, around the boat ramp.

Table III-6. Water quality measurements in and near Ma'alaea Harbor on April 16, 1987 (after William A. Brewer & Associates, 1987)

STA No.	LOCATION	DEPTH (m)	TIME	Temperature (°C)	Salinity (ppt)	Dissolved Oxygen (mg/L)
1	Off SeaFlite Terminal	0.1	0845	22.8	26.0	6.21
	(near Sta. 3)	2.0	0846	22.8	26.1	6.42
2		0.1	0851	23.2	25.1	5.60
		1.0	0852	23.0	25.2	5.23
3	At boat ramp	0.1	0905	23.1	22.0	5.10
	(Sta. 4)	1.0	0907	23.1	23.5	4.95
4		0.1	0919	22.9	23.9	5.95
		1.0	0919	22.8	24.7	5.90
5		0.1	0926	22.9	25.4	5.80
		0.5	0927	22.9	25.4	5.85
6	Seaward side of Sta. 1	0.1	0939	23.2	30.7	6.45
	(near Sta. 3)	1.0	0940	23.2	30.7	6.45
7	Kapoli Park	0.1	0947	23.2	30.4	6.40
	(at Sta. 2)	1.0	0947	23.2	30.6	6.45
8	Kapoli Park	0.5	1004	23.2	30.6	6.45

III.D.2 1994 Baseline Water Quality Sampling

In order to characterize existing water quality in the project area, a water quality monitoring program was established with the first sampling event undertaken on April 28, 1994, a second event on May 9, and a third on June 6. For this program, six sampling locations (Stations 1 through 6) were initially established (Figure III-15) and field measurements made of temperature and dissolved oxygen. A seventh station was added on May 9 at Maalaea Park (end of Haouli Street) to measure nutrients. Samples were collected and transported to the laboratory on O'ahu for measurement of pH, turbidity, total suspended solids, nitrate + nitrite, ammonia, total nitrogen, total phosphorus, silcate, and chlorophyll. At Station 1, a surface and a deep sample were collected. Complete results are given in Appendix C, Table C-3, and are summarized in various ways in the discussion which follows. Mean values (geometric means for turbidity, TSS, the nutrients, and chlorophyll) are presented in Table III-7. Stations are arranged in the table from most to least "oceanic" based on mean salinity. Note that Station 6, although outside the harbor, had the lowest mean salinity, indicating ground water influence in this area.

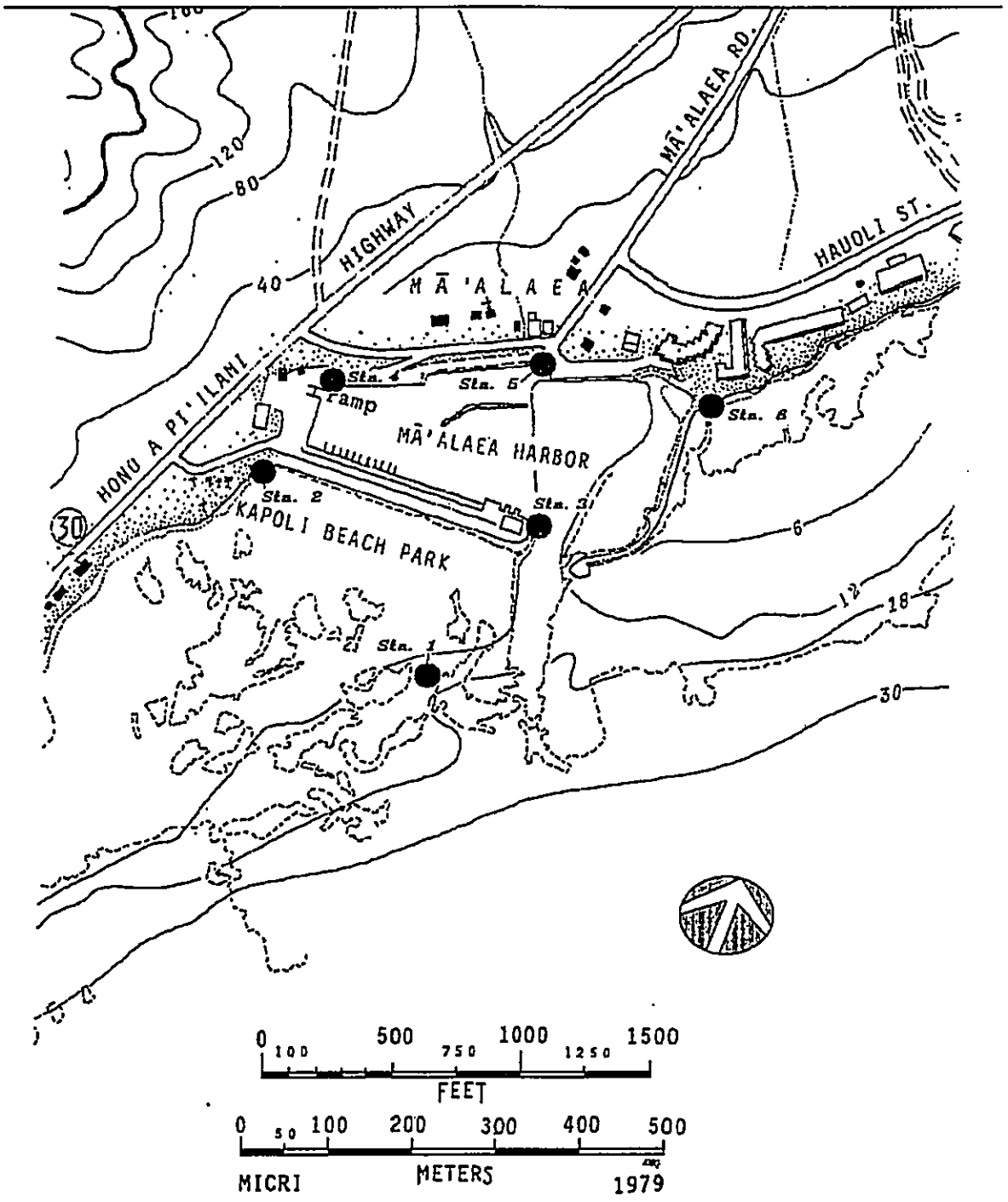


Figure III-15. Baseline water quality monitoring program, sample station locations.

The results of water quality monitoring in April through June, 1994 provide a picture of several factors and features which contribute to the water quality in the Ma'alaea Harbor area, but certainly do not cover all significant influences. Periods of infrequent runoff from the land and periods of south swell would have considerable influence on local water quality, but have not yet been sampled. Seasonal influences are also not represented.

Table III-7. 1994 Baseline Water Quality Survey at Ma'alaea Harbor
(see Figure III-15 for station locations and Appendix Table C•3).

	Sta. 1	Sta. 2	Sta. 3	Sta. 5	Sta. 4	Sta. 6
Temperature (°C)	--	25.5	25.8	25.5	26.0	26.7
Salinity (ppt)	34.42	33.63	33.54	32.43	31.17	29.59
Dissolved Oxygen (mg/l)	--	7.6	6.4	5.9	6.0	12.9
pH (pH units)	8.29	8.43	8.28	8.22	8.22	8.59
Turbidity (ntu)	0.77	2.48	1.46	3.11	13.7	2.67
Total suspended solids (mg/l)	2.0	5.2	2.9	5.7	28.6	6.4
Nitrate + nitrite (µg N/l)	22	24	82	217	251	171
Ammonia (µg N/L)	2	7	12	19	30	6
Total nitrogen (µg N/L)	137	168	219	342	507	446
Total phosphorus (µg P/L)	15	14	21	39	70	35
Silicate (µg Si/L)	212	551	628	1377	2113	1671
Chlorophyll α (µg/L)	0.39	1.00	0.83	1.08	9.9	2.45

Dissolved oxygen (DO) measurements demonstrate that differences from place to place are not great and values are generally close to saturation. An unusual values was obtained at Station 6: 11.8 mg/l on May 28, which is 174% of saturation (i.e., the water was supersaturated). Such a situation may exist where algae are contributing oxygen by active photosynthesis and physical mixing is minimal. This value (and the meter) were rechecked several times before the value was accepted as accurate. On June 5, a value of 14.0 mg/l (217% of saturation) was obtained at this location. Another indication of high photosynthetic activity in an aquatic environment would be an increase in pH resulting from uptake of carbon dioxide (a weak acid dissolved in water). This is precisely the case at Station 6, where the pH averaged 8.56, a relatively high value for sea water which usually yields values between 8.1 and 8.3. The pH was also elevated at Station 2. Both Station 6 and Station 2 are located in areas of dense macroalgal growth just off the shoreline. At Station 6, exposed boulders reduced exchange of water at the shore with water in the zone of breaking waves, which was not the case at Station 2. Although the DO meter failed on May 9, the tide was higher than on April 28, and the water near shore at Station 6 was not as isolated.

Turbidity and total suspended solids (TSS) values provide an indication of water clarity. Turbidity offshore was close to 1 ntu on all sampling occasions. Divers assessed horizontal visibility at around 6 meters (20 feet) when the samples were collected. At this station, a surface and a deep sample were analyzed for turbidity (and salinity and TSS on April 28 and June 7). Surface and near bottom samples showed very similar values, and the means in Table III-7 for this location combine both surface and near bottom sample results.

Nutrients measured in the water, particularly nitrate + nitrite (NO_3+NO_2), reveal distinct differences between the sampling locations. Nutrients are seen to increase with decreasing salinity. A gradient of increasing nitrate, ammonia, and total N extends from offshore into the harbor. Nitrate and total N at Station 6 were nearly as high as the water in the harbor, although quite variable depending upon tide level. Nitrates and silicates are usually high in ground water, and the values obtained at Ma'alaea would seem to indicate a strong ground water influence within the harbor as well as along the shore to the east.

III.E MARINE ENVIRONMENT, BIOLOGY

A baseline survey of Ma'alaea Harbor and the adjacent benthic areas off Kapoli Park by William A. Brewer & Assoc. (1987) provides descriptions of the biota within the marine environment potentially impacted by the proposed project. These observations were made April 15-16, 1987, and have been supplemented and updated by reconnaissance surveys conducted by *AECOS*, Inc. on April 28 and May 9, 1994 specifically in the areas of the proposed sea water intake pipe routing and the sea water discharge point in the harbor. Reference is also made to a 1980 U.S. Fish and Wildlife (USFWS) survey and report summarized in R.M. Towill Corp. (1982), and 1992-93 resurveys by USFWS (1993) for proposed improvements to Ma'alaea Harbor.

III.E.1 Ma'alaea Harbor

Much of Ma'alaea Harbor is soft bottom and supports a variety of borrowing forms typical of this substratum. Boulder revetments line the margin and provide substratum for many intertidal and subtidal forms. Remnants of the former reef flat also remain within the harbor where dredging has not been undertaken.

The intertidal habitat in the harbor is mostly basalt revetment stones and concrete surfaces, although a dark sand beach occurs in the northeast corner. Brewer (1987) lists 'a'ama crab (*Grapsus tenuicrustatus*) and common supratidal snails (*Nerita picea*, *Littorina pintado* and *L. scabra*) as conspicuous inhabitants around the USCG station. Near the low tide line, the fleshy green algae, *Ulva fasciata* and *U. reticulata*, were occasionally

found and filamentous blue-green algae was noted as "epiphytic" (probably epibenthic was intended, since *Ulva* seldom supports epihytes). Surveys in May and April 1994 found essentially the same species, with some additional forms seen further inside the harbor. Along the shore west from the USCG station a small oyster (*Ostrea* sp.) is common, and in the vicinity of the boat ramp, clusters of mussels (*Brachidontes crebristriatus*) are present near the water line. The 'alamihi crab (*Metopograpsus thukuhar*) is conspicuous everywhere on rocks just above and below the water line, replacing the 'a'ama crab which is present, but only common in the eastern part of the harbor. Algae are mostly limited to scattered, large growths of *Ulva reticulata* and some *Ulva lactuca*, but encrusting, pink *Porolithon onkodes* can be found on boulders. The desription in USFWS reports (1980, 1993) of opihi (*Cellana exarata*) being abundant in the harbor undoubtedly refers to the false limpet (*Siphonaria normalis*), which attains considerable size in this area.

Brewer (1987) noted *Pocillopora damicornis* (reported as *Poc. cespitosa*) as the "..only significant (and somewhat surprising) benthic organism observed in the harbor ...attached to the concrete sea wall ...west of the Coast Guard station." Observing along the shore west from the USCG station in 1994, we noted that coral cover does decline further into the harbor, with only small, scattered heads of *Poc. damicornis* present. The 1980 USFWS survey, although possibly impaired by low visibility (reported at 3 feet), reported no corals and no macroalgae anywhere along the northern edge of the harbor between the boat ramp and the east breakwater.

A reconnaissance of the inner shore near the site of the proposed new drain was conducted in May 1994 to provide a description of the biota in this area. The proposed drainage outlet site is along the face of the sampan wharf adjacent to the U.S. Coast Guard station. Within the corner between the wharf and the USCG Station occurs a small area (less than 10 m^2) of boulders and undredged reef. Coral growth includes at least two species: *Montipora verrucosa* and *Pocillopora damicornis*, and coverage is perhaps 10% within a limited area. Some *Montipora* colonies are over 25 cm across. Other benthic invertebrates observed were a hydroid (?*Halocordyle disticha*), burrowing urchin (*Echinometra mathaei*), and spaghetti worm (*Loimia medusa*). Algal growth is limited to sparse turf with silt and scattered large fronds of *Ulva reticulata*.

Fishes are certainly not abundant, but the harbor fauna includes more than the anchovy or nehu (*Stolephorus purpureus*) listed by Brewer (1987). In May 1994 the following species were observed beside the sampan wharf (roughly in order of observed abundance): aholehole (*Kuhlia sandvicensis*), manini (*Acanthurus sandvicensis*), mamo (*Abudefduf abdominalis*), moorish idol (*Zanclus cornutus*), box fish (*Ostracion meleagris*), 'ohua wrasse (*Stethojulis balteata*), 'opule wrasse (*Anampses cuvier*), puffer (*Canthigaster jactator*), alo'ilo'i (*Dascyllus albisella*), lau hau (*Chaetodon lunula*), lizardfish (*Synodus* cf. *variegatus*), toau (*Lutjanus fulva*), pualu (*Acanthurus* cf. *xanthopterus*), weke (*Mulloidichthyes*

vanicolensis), juvenile malu (*Parupeneus pleurostigma*), Jenkin's damsel (*Stegastes fasciolatus*), parrotfish (*Scarus* sp.), and cornetfish (*Fistularia commersoni*). Barracuda (*Sphyraena barracuda*), aholehole, and schools of mullet (*Mugil cephalus*) and a small silverside (?*Spratelloides delicatulus*) occur throughout the inner harbor. The paucity of fishes recorded from the harbor in 1987 may be attributed to the poor underwater visibility at the time of the survey. USFWS (1980) listed manini and nehu as abundant, and aholehole and barracuda as found in "occasional numbers". The report further mentions that Ma'alaea Harbor supports a "short, but intense seasonal, recreational fishery of hahalalu (*Selar crumenophthalmus*)."

A trapezoidal shaped reef remnant in the middle of the harbor was visited by USFWS biologists in 1993. This shoal is covered by sand and silt. The introduced red alga, *Hypnea musciformis*, covered much of the shallow bottom. A few small colonies of the corals, *Porites rus* and *Pocillopora damicornis*, and two species of sea urchins, *Diadema paucispinum* and *Echinometra mathaei*, were observed in this area. A list of eleven species of fishes reported from this reef (most seen around loose boulders of a breakwater set on the reef) by USFWS adds only the wrasse, *Thalassoma duperrey*, to the fishes described above from the vicinity of the proposed drainage outlet surveyed for this EA in April 1994.

A shallow, reef flat occurs inside the harbor along the east breakwater. This shallow flat, some 2 acres in extent, was surveyed by Brewer (1987) and USFWS (1993). The biota in 1987 was dominated by "dense, tangled stands of .....*Ulva fasciata, Ulva reticulata, Hypnea chordacea, Amansia glomerata, Gracilaria* cf. *bursapastoris*, and *Grateloupia filicina*, with 100% cover in some patches. USFWS (1993) found the reef flat to be heavily infested by the red alga, *Hypnea musciformis*, but *Bryopsis pinnata, Codium reediae, C. reticulata, Ulva fasciata*, and *Sargassum echinocarpum* were all noted by USFWS (1993). Large amounts of *Hypnea musciformis* can be seen (1994) on the small beach inside the harbor, indicating that this species remains abundant on the reef flat. Two species of fishes, manini and aholehole, were numerically dominant, but numerous juvenile wrasses and a moray eel were noted by Brewer. No live coral was seen. The entire area, but particularly the part closest to the harbor channel, was silted over, in contrast to that section of the same reef flat which lies outside of the harbor (east of the breakwater).

III.E.2 Reef Off Kapoli Park

The bottom off Kapoli Beach Park was surveyed in 1987 (William A. Brewer & Assoc., 1987) and by *AECOS* in 1994. Both surveys were qualitative. The shoreline is a mixed sand and basalt boulder beach, with boulders near the water line supporting *Ahnfeltia concinna* and *Chaetomorpha antennina*. False limpets (*Siphonaria normalis*) are abundant on the wave-splashed boulders. Boulders closer to the low tide line are densely covered by

algae, prominantly *Pterocladia capillacea*, but many other species as well, including some *Ulva*.

Approximately 8 to 10 meters south of the breakwater is the start of a shallow shelf some 10 to 20 meters across extending (and widening) southward. Although called a "bench" by Brewer (1987), this seems not to be the case, at least not in the sense of the term as defined by Wentworth (1939). The structure of the shelf was not determined, but has the appearance of large boulders laid off the shore with sand and boulder fill in behind. Ma'alaea Bay is known for shore and submerged beach rock formations (Kinzie, 1972). The outer edge is just exposed at low tide and the surface covered with algae, particularly *Pterocladia*, while *Ulva* is abundant on boulders close to the shore.

A sand channel is found immediately offshore between the shelf and the south breakwater, but the bottom is littered with basalt boulders, thus resembling the beach. The bottom beyond 20 meters (65 feet) offshore is an undulating surface of limestone which slopes only gently, forming a reef flat of sorts. Sand is present in narrow channels and depressions, but in shallow deposits. Algal coverage is substantial: nearly 100% over large areas close to shore, and thinning gradually away from shore. *Dictyota* spp. forming cushion-like growths are prominant, but many other species are present as well (see Table III-8). A total of 33 species were recorded on the April 29, 1994 swim from the shore out approximately 400 m (1400 feet) and back. William A. Brewer & Assoc. (1987) commented on the "...unusually high diversity and abundance of algal macrophytes." This area was surveyed in February and July of 1990 by McDermid (1990), although these surveys were directed at *Grateloupia filicina*, which was found off Kapoli Park. Maciolek (1971) identified 59 species from Ma'alaea Bay, and Kinzie (1972) found 83 species in surveys covering a wide area of Ma'alaea Bay.

Fishes are not very common. Further west off the shelf, the bottom tends to be more uneven, and a variety of sea urchins can be found in low spots and between boulders. Wana (*Echinothrix calamaris* and *E. diadema*), slate-pencil urchin (*Heterocentrotus mammillatus*), short-spined urchin (*Tripneustes gratilla*), burrowing urchin (*Echinometra mathaei*), and shingle urchin (*Colobocentrotus atratus*) were all noted in April 1994. Other echinoderms seen here or further offshore were black sea cucumber (*Holothuria atra*), reef sea cucumber (*Actynopyga mauritiana*), and brittle star (*Ophiocoma erinaceus*). Brewer (1987) recorded most of these forms, as well as two spiny lobster (*Panulirus marginatus*) and a "7-11" crab or alakuma (*Carpilius maculatus*). Corals are sparse, mostly *Poc. damicornis* and *Porites lobata*.

Although apparently quite variable depending upon where one swims offshore, a more or less distinct break in slope resembling a "reef front" occurs about 70 to 100 m out. The depth changes from perhaps two meters to three meters. In some places, the

TABLE III-8 Checklist of algae from around Ma'alaea Harbor.

Species name	Common name	1987	1990	1994
CYANOPHYTA				
Hormothamnion sp.		X		
Lyngbya sp.		X		
CHLOROPHYTA				
Boodlea composita				X
Bryopsis pinnata			X	
Bryopsis sp.		X		
Caulerpa serrulata		X		
Caulerpa sertularioides		X		X
Chaetomorpha antennina		X	X	X
Chlorodesmis hildenbrandtii		X		X
Cladophora fascicularis		X		X*
Cladophora patula		X		
Cladophora vagabunda			X	
Cladophora sp.		X		
Codium edule	wawae'iole	X	X	X
Codium reediae	'a'ala'ula		X	
Enteromorpha sp.	'ele'ele	X		
Halimeda discoidea		X		
Halimeda opuntia		X		X
Neomeris annulata		X		X
Ulva fasciata	palahalaha	X	X	X
Ulva lactuca				X*
Ulva reticulata		X	X	X*
PHAEOPHYTA				
Colpomenia sinuosa	puha		X	X
Dictyota acutiloba	alani	X		X
Dictyota bartayresii	alani	X		X
Dictyota friabilis		X		
Dictyota sandvicensis	alani			
Dictyota sp.			X	
Hincksia breviarticulata	hul'ilio	X		X
Lobophora variegata				X
Mesopora pangoensis		X		
Padina japonica			X	X
Rosenvingea intricata		X		
Sargassum echinocarpum	kala	X	X	X

Table III-8 (continues)

Species name	Common name	1987	1990	1994
Sargassum obtusifolium			X	
Sphacelaria furcigera		X		X
RHODOPHYTA				
Acanthophora pacifica			X	
Acanthophora spicifera		X	X	X
Ahnfeltia concinna	'aki'aki	X	X	X
Amansia glomerata		X	X	X
Amphiroa fragilissima		X	X	
Asparagopsis taxiformis	kohu	X		X
Coelothrix irregularis		X		
Corallina sp.		X		X
Galaxaura fastigiata		X		X
Galaxaura filamentosa		X		
Galaxaura rugosa		X		
Gracilaria bursapastoris	ogo	X		
Gracilaria coronopifolia	manauea		X	
Gracilaria sp.		X		
Grateloupia filicina	huluhuluwaena	X	X	
Grateloupia hawaiiana		X	X	
Haliptilon subulatum			X	
Halymenia formosa	lepe'ahina			X
Hydrolithon breviclavium		X		
Hydrolithon reinboldii		X		
Hypnea chordacea		X		
Hypnea musciformis			X	X
Jania sp.		X		X
Laurencia succisa	lipe'epe'e	X		X
Laurencia yamadana			X	
Liagora tetraspoifera				X
Lithophyllium kotschyanum		X		
Neogoniolithon frutescens		X		
Plocamium sp.		X		
Porolithon gardineri		X		X
Porolithon onkodes		X		X
Porphyra sp.		X		
Pterocladia capillacea		X	X	X
Pterocladia caerulescens		X		
Scinaia hormoides				X

Table III-8 (continues)

Species name	Common name	1987	1990	1994
Sporolithon erythraeum		X		
Spyridia filamentosa				X

In this table, an "X" in the column marked 1987 indicates a species listed by William A. Brewer (1987) from south and east of Ma'alaea Harbor as well as inside the harbor. An "X" in the column marked 1990 indicates a species noted by McDermid from the reef flats east and west of the harbor. An "X" in the column marked 1994 indicates species observed in April or May 1994 off Kapoli Beach Park (south of the harbor), except where marked by an * indicating a species seen only in the harbor.

bottom rises up, forming a distinctly shoaler ridge oriented along the reef front. This "reef front" is an area of increased vertical relief, and fishes are conspicuously more numerous here than elsewhere off Kapoli. Common are the wrasse (*Thalassoma duperrey*), moorish idol, and manini. Coral cover also increases sharply, perhaps to 15 or 20 % of the bottom over small areas. Common are *Montipora flabellata, M. verrucosa, Pocillopora meandrina, Porites lobata, P. compressa, Pavona varians, Leptastrea bottae, Pocillopora damicornis*, and the soft coral, *Palythoa tuberculosa*. The absence of a distinct reef front in this area is also suggested by the USFWS (1993) description of the "...south revetted mole extend[ing] from shore entirely on the outer reef flat and ...oriented parallel with the reef margin." That is, the USFWS biologists interpreted the present situation as if the harbor had obliterated most of the reef that once extended into the area off Kapoli Park from the east. However, the USFWS (1993) report described coral coverage reaching 50% of the bottom "...in deeper water further out on the reef slope [fronting the south revetted mole]".

Further offshore, the bottom falls away only slowly. At 300 meters (1000 feet) offshore, the depth is only 4 to 5 meters (13 to 16 feet). Large patches of sand lie between vast expanses of gently undulating limestone. The alga, *Acanthophora spicifera*, is common, thinning offshore. Eventually, the limestone is without much growth of any kind, although scattered bunches of limu kohu (*Asparagopsis taxiformis*) can be found. Corals also decrease in abundance with depth and distance from shore. Few fishes are seen, with the exception of the humuhumunukunkuapua'a (*Rhinecanthus rectangulus*): solitary individuals are found around widely scattered holes or isolated boulders on the bottom.

At depths of 5 to 6 meters (16 to 20 feet), the bottom remains low relief limestone, but with a silty sand veneer. Corals and other large benthic invertebrates are rare, as are fishes due to the lack of vertical relief or cover.

Kinzie (1972) conducted nine transects from the shore out to depths of -20 meters (65 feet) to quantify the benthic biota in Ma'alaea Bay. Two transects were located south of

Ma'alaea Harbor, the remainder were to the east. The transect closest to Kapoli Park (No. 2) was laid in an ESE direction from the shoreline about 450 feet SW from the base of the south breakwater. No corals were reported on any of the five 20 meter sections sampled along the No. 2 transect. Coral abundance increased further southward and off McGregor Point and Manuohule is luxurient on the reef front (Kinzie, 1972; *AECOS*, 1980).

III.E.3 Ma'alaea Bay

Several biological surveys have been conducted in upper Ma'alaea Bay. These are summarized in *AECOS* (1980) and William A. Brewer & Assoc. (1987). The marine biota west of the outlet from Kealia Pond at Palalau is unique in many ways in the Hawaiian Islands. The protection from ocean swells and a bottom profile sloping gently seaward may account for this uniqueness. A number of species seen mostly in deep water, occur in relatively shallow water in upper Ma'alaea Bay. At least 59 species of algae and 20 species of corals (including a normally deep water form, *Cycloseris vaughani*) are reported in relatively shallow waters off Kanaio and Palalau. The rich and varied algal flora on the nearshore beach rock formations and the molluscan fauna in both nearshore and deeper waters of the west bay include possibly the greatest number of species of any place in Hawaii (Maciolek, 1971). Kinzie (1972) was impressed by the rich and varied fauna of attached invertebrates (epibethos), such as sponges and bryozoans.

Coral cover is not extensive around or east from Ma'alaea Small Boat Harbor, a fact confirmed by a number of surveys. However, the USFWS (1990) survey concluded that the reef slope directly east of the harbor entrance was an area of "relatively rich coral habitat" and agreed with an earlier USACOE (1980) assessment that "...this area of reef slope is the richest and decidedly most valuable area adjacent to the harbor.". Brewer (1987) described corals on the reef east of the harbor as rare on the reef flat, and abundant only in a narrow band (65 to 85 m wide) at depths between 4 and 5 m (13 to 16 feet) along the reef front. USFWS (1980, 1993) surveys concentrated on this reef off the east breakwater. Corals associated with this zone included *Porites lobata, Porites compressa, Pocillopora meandrina, Poc. eydouxi, Poc. damicornis,* and *Montipora flabellata* (Brewer, 1987; USFWS, 1993). Coral cover was estimated at 10% immediately in front of the east breakwater, but between 50 and 75% on the reef frontal slope down to -8 m (-25 feet) where coverage declined abruptly (USFWS, 1993).

Kinzie (1972) reported *Montipora verrucosa, Pocillopora ligulata,* and *M. verrilli* as most common off Kanaio, and *Porites brighami, P. lobata,* and *Pocillopora meandrina* more common furthere east off Palalau. Several species (*P. brighami, Pocillopora molokensis,* and *Poc. eydouxi*) that are generally uncommon and usually restricted to deep waters are present in shallow waters of west Ma'alaea Bay. Around the harbor, Brewer (1987) listed only 7 species, USFWS (1993) 8 species, while Maciolek (1971) reported a total of

20 species and Kinzie (1972) a total of 16 for upper Ma'alaea Bay. Nonethless, coral coverage has been reportedly low throughout the area: highest off Kanaio at 15% and declining eastward to around 2 to 6% fronting Palalau (Kinzie, 1972).

The most prominent feature of the offshore beachrock substratum in Ma'alaea Bay is the spectacularly abundant and diverse sponge and bryozoan assemblages, unusual and perhaps unique in the Hawaiian Islands. While coral cover seldom reaches 10%, bryozoans contribute up to 9% bottom cover, and sponges make up as much as 38% cover in some places. At least six species of bryozoans are abundant, their upper surfaces usually lighly covered with silt. At least 13 species of sponges are common. Sponges and bryozoans are rare off the boat harbor, and the number of species as well as abundance increases eastward, reaching a maximum off Palalau. The only gastropod that is numerous on the beachrock bottom is *Hipponix* sp. Bivalves are also relatively diverse. *Isognomon* sp. is abundant; vermetid molluscs occur fairly regularly (Kinzie, 1972).

Sponges and bryozoans are also abundant in soft bottom areas of the deeper bay wherever hard surfaces are available for attachment, especially on rubble piles outside the harbor area. The soft bottom portions of Ma'alaea Bay are noted for their highly diverse gastropod mollusc fauna, which includes at least 32 species. A prized spindle shell, *Fusinus nicobaricus*, and *Cypraea gaskoini*, *Conus quercinus*, *C. leopardus*, and *C. pulicarius* are among the shell life frequently encountered. Shell collectors report a rich population of *Terebra*, miters, cones, and spindle shells on the soft bottom occupying depths between 30 and 70 feet in the middle bay (Butler, 1975). Some soft bottom areas of the outer bay are densely populated by the bivalve mollusc, *Pinna muricata*. The shells of this bivalve are used extensively as a substratum by other forms which attach to hard bottoms. The small mussel, *Brachidontes crebristriatus*, is extremely abundant on rock outcroppings near the boat harbor.

Sea urchins are abundant in the area of the harbor and eastward to Kanaio, reaching greatest density on a broken beachrock bottom with a great deal of rubble and coarse sand near Kanaio. *Tripneustes gratilla* is most abundant, particularly near the harbor. *Heterocentrotus mammillatus*, is also numerous. USFWS (1980) estimated the maximum abundance of *Echinometra mathaei* on the reef platform immediately in front of the east breakwater at 62 urchins/m^2, and noted that wana (*Echinothrix diadema*) was common in the deeper depressions on this part of the reef. Ophiuroids are common in Ma'alae Bay.

The submerged beachrock shelves in Ma'alaea Bay east of the harbor does not generally support an abundance of fleshy algae, which are densest in shallow waters off the boat harbor and off Kanaio, thinning out considerably towards the east. Most common are *Jania* sp., *Ulva reticulata*, *Grateloupia hawaiiana*, *Amansia glomerata*, and *Acanthophora*

spicifera. Sediment-resistant species such as *Halimeda discoidea* and *Codium edule* are found near the outlet of Kealia Pond. A sparse algal growth occurs on soft bottom areas of the deeper bay. (see McDermid, 1990)

The USFWS (1993) noted large feeding aggregations of herbivorous surgeonfishes (Acanthuridae), including *Acanthurus blochii, A. olivaceus, A. xanthopterus, Naso lituratus,* and *N. unicornis* foraging the reef slope off the east breakwater. Most common in this area were butterflyfishes (Chaetodontidae), damselfishes (Pomacentridae), and wrasses (Labridae). At least 55 species of fish inhabit hard bottom areas and sand bottom areas with some rock cover. From the harbor area to Kanaio, *Stethojulis balteata* and *Stegastes fasciolatus* were most common. Off Palalau, *Acanthurus nigroris* and *Mulloidichthys flavolineatus* were most common. Species normally restricted to deep water, such as *Chaetodon kleini,* occur in relatively shallow waters of the western bay. Few fish, except for transient open water species (*Aprion virescens, Decapterus* sp., *Selar crumenophthalmus, Caranx* spp., and *Decapterus macarellus*), are present over the broad soft bottom occupying the middle and outer bay. Large numbers of gobies are commensal in burrows of alpheid shrimp in soft bottom areas. An uncommon puffer (*Lagocephalus hypselogeneion*) is relatively common over sand bottom areas. Fishes are most abundant around rubble mounds and *Pinna* beds, which serve as islands of hard bottom on extensive areas of soft bottom. At least 18 fish species are associated with the *Pinna* beds and rubble mounds (Kinzie, 1972).

III.E.4 Threatened or Endangered Species

Despite the considerable effort in field studies and agency and community review that attended the State (DOT, 1982) and Federal (USACOE, 1980) EIS documents for improvements to Ma'alaea Harbor, the threatened green sea turtle (*Chelonia mydas*) was not mentioned once. While the harbor provides little or no habitat of value to this species, the extensive bottom of high algal coverage located southwest of the harbor would seem to provide forge habitat for turtles. The status of the green sea turtle population in this area is not known. No turtles were spotted on two snorkeling visits to the area in April/May 1994; and William A. Brewer & Assoc. (1987) also makes no mention of turtles in reporting the August 1987 underwater surveys. A recent field survey by USFWS (1993) sighted a single large (estimated at 136 kg weight) male *C. mydas* off the east end of the south mole.

Endangered hawksbill turtles (*Eretmochelys imbricata*) have been observed nesting along the shoreline of Ma'alaea Bay east of the harbor according to DLNR (Brooks Tamaye, pers. comm.).

The endangered humpback whale (*Megaptera novaeangliae*) is present in Ma'alaea Bay in the proximity of Ma'alaea Harbor approximately 6 months of the year from December

through May. Ma'alaea Bay has been identified as one of four major whale breeding, calfing, and nursing areas in Hawai'i. Ma'alaea Bay from Hekili Point to Pu'u Olai is designated by Maui County as a humpback whale sanctuary (USACOE, 1980) and is part of the Hawaiian Islands Humpback Whale National Marine Sanctuary established by the Federal Oceans Act of 1992 (Public Law 102-587). A significant number of the whales observed off leeward Maui are seen in the general area of Ma'alaea Bay.

Ma'alaea Harbor is located approximately 915 m (3000 feet) west of the Kealia Pond National Wildlife Refuge established in December 1992 to protect habitats deemed vital to the endangered Hawaiian stilt (*Himantopus mexicanus knudseni*) and endangered Hawaiian coot (*Fulica americana alai*) on Maui.

Section IV

IMPACTS AND MITIGATIONS

IV.A SOCIAL, CULTURAL, AND ECONOMIC IMPACTS

In analyzing the original SMA request, the Planning Department and Planning Commission of Maui County examined the existing conditions, potential impacts, and the proposed mitigation measures of the Maalaea Triangle commercial development in a variety of functional areas relating to the physical, social, and economic environment. Although the present environmental assessment document is primarily concerned with the impacts of the Maui Ocean Center sea water system and the Maalaea Triangle drainage improvements, the original impact assessments (Chris Hart & Partners, 1994) relating to the Maalaea Triangle project and the Maui Ocean Center are summarized below to demonstrate that earlier concerns and impacts of the entire project have been addressed.

IV.A.1 Cultural and Historical Sites

Maui Ocean Center, Inc. and Maalaea Triangle Partnership recognize the cultural importance of the Ebisu Jinsha shrine to the community of Ma'alaea. Representatives of Maui Ocean Center and Maalaea Triangle have met with caretakers and users of the Ebisu Jinsha in order to develop a preservation and site enhancement plan for the shrine. The proposed plan would involve relocating the shrine to the northwest and creating a passive open space setting surrounding it to ensure its integrity. An additional area of open space will be provided adjacent to the shrine within the Maui Ocean Center courtyard.

Subsurface testing for archaeological remains on the MTP/MOC site has been completed to satisfy requirements imposed under the County SMP. However, the State Historic Preservation Division (DLNR) has commented (see Appendix A) on the possibility of submerged cultural resources offshore of Kapoli Park and under paved areas along the proposed sea water pipe routes. This potential impact is discussed further in Section IV.C.1.

IV.A.2 Social Impacts

The Maalaea Triangle Project site is located directly adjacent to Ma'alaea Harbor, which is one of only two small boat harbors on Maui providing mooring for commercial fishing boats, charter boats, and private pleasure craft. A developed strip of residential condominiums lies east of the harbor along the shore of Ma'alaea Bay. The site and

adjacent mauka areas are primarily used for agricultural purposes: sugar cane (now abandoned in this area) and cattle ranching.

The intent of the Maalaea Triangle project is to provide business opportunities with a strong orientation to Ma'alaea Harbor and to retain features of value to the local community, resulting in positive social impacts on the area. The commercial project will have an architectural theme characteristic of a fishing village with the fishing shrine to remain as a focal point. The historic Maalaea Store is located on an adjacent parcel that is not part of the project and will not be displaced by the project.

The incorporation of the Maui Ocean Center into the Maalaea Triangle project would increase the project's orientation and emphasis on harbor and marine related activities, thus creating a stronger marine or sea village atmosphere in Ma'alaea. This reinforces the traditional role of Ma'alaea in the Maui community and will result in positive social benefits for the Ma'alaea community. In addition, the Maui Ocean Center would promote a greater awareness of Hawaii's unique marine environment amongst the residents of Maui and the State of Hawaii, as well as visitors from around the world. This deeper understanding and respect for the unique qualities of Hawai'i, should contribute to a sense of place and appreciation within residents and visitors alike.

The project will have no impacts on traditional uses of the area (Section III.A.2). However, during placement of the sea water system intake pipe through the nearshore environment off Kapoli Beach Park, disruption and damage to edible limu stocks is inevitable. The area of damage would be small relative to the resource available and complete recovery can be anticipated following completion of the construction phase.

IV.A.3 Economic Impacts

The subject property is unique in that it fronts Ma'alaea Harbor as well as Honoapiilani Highway, the primary transportation route between West Maui and the rest of the island. The long and short-term economic impacts of the project were assessed as positive for the following reasons:

- Construction of the improvements would generate short-term employment opportunities.

- Businesses that would be attracted to the project would be primarily local and resort-oriented commercial and retail uses and harbor-related retail and service businesses. These would create business and long-term employment opportunities for local residents.

- Infrastructure improvements associated with the project would improve traffic circulation and drainage to the benefit of the Ma'alaea Bay area.

- The creation of a commercial development would generate new tax revenue sources for the state and county.

Incorporation of the Maui Ocean Center, a major anchor tenant, into the Maalaea Triangle project is viewed as contributing to the Maalaea Triangle project's future success. The MOC would also provide an additional high quality and unique experience for visitors to Maui, thus increasing the island's attractiveness as a tourist destination.

IV.B INFRASTRUCTURE IMPACTS

IV.B.1 Roadway System and Traffic

According to the Parsons, Brinckerhoff, Quade and Douglas (1987, 1994) studies, the following mitigative measures are required to maintain acceptable operating conditions along Honoapiilani Highway once the project is built:

- Signalize the Honoapiilani Highway project access intersection. The forecast volumes meet the Peak Hour Volume traffic signal warrant.

- Provide a separate left-turn lane and protected left-turn phasing for southbound Honoapiilani Highway traffic wishing to turn into the project site at the Honoapiilani Highway project access intersection. The left-turn lane should be approximately 560 feet (including 180 feet of taper) in length.

- Provide a dedicated northbound right-turn lane on Honoapiilani Highway at the Honoapiilani Highway project access intersection. The right-turn lane should be approximately 485 feet long (including 180 feet of taper).

- Provide two lanes on the project access for traffic entering the project site to allow the "free" movement of right-turn traffic entering the project at the Honoapiilani Highway project access intersection.

- Provide separate lanes for left and right turn movements exiting the project site on the project access approach at the Honoapiilani Highway project access intersection. In addition, a setback to allow for a third westbound lane should also be provided. This third lane could be used in

the future as a through lane if development occurs to the west (mauka) of the highway or as a second left-turn lane if and when Honoapiilani Highway is upgraded to a four-lane facility.

- Widen Honoapiilani Highway to provide two northbound lanes across the Honoapiilani Highway project access intersection. The second northbound lane should begin just north of the Honoapiilani Highway Old Maalaea Road (south) intersection and end approximately 840 feet (including 540 feet of taper) beyond the Honoapiilani Highway project access intersection.

- Additionally, at the northbound right-turn only entrance on Honoapiilani Highway, a dedicated right-turn lane should be provided for deceleration and storage of vehicles. This lane should have a length of approximately 485 feet (including 180 feet of taper).

With the improvements described above, the roadway system in the Ma'alaea area would have adequate capacity to serve the forecast traffic demands.

IV.B.2 Potable Water System

The Department of Water Supply is in the process of replacing the existing water tanks for Ma'alaea with a new 300,000 gallon capacity tank at a higher elevation. On January 22, 1993, Maalaea Triangle Partnership entered into a participation agreement with the Department of Water Supply to construct this tank. According to §14.06.09 of the Maui County Code, minimum fire flow for commercial projects is 2,000 gallons per minute (gpm) for a duration of two hours. The new 300,000 gallon storage tank and 12-inch transmission line would satisfy this requirement.

IV.B.3 Sewer System

No municipal/county sewage collection or treatment facilities exist in the Maalaea area. Maalaea Triangle Partnership plans to install its own package sewage treatment facility to accommodate project needs. This facility would be located at the northern corner of the project site, approximately 2,000 feet (600 m) inland from the shoreline at an elevation of 52 feet. The design and construction of the waste water facilities would be in accordance with applicable provisions of Chapter 62 of the State Department of Health Rules and Regulations and County of Maui ordinances. Effluent would be processed through an activated-sludge treatment process and sized to meet a design flow of 50,000 gpd of waste water (ECM, Inc., 1994). The plant will actually consist of two complete factory prefabricated, extended-aeration systems with aeration, clarifications, aerobic digestion, and chlorine disinfection sized to handle flows of 25,000

gpd each. Effluent will be disposed of into injection wells. Two wells will be constructed, each capable of handling 100,000 gpd or twice the design flow. Well depth will be on the order of 150 to 200 feet (45 to 60 m) below ground surface (100 to 150 feet below sea level).

The movement of the treated effluent is expected to move seaward with the ground water flow. Dispersion of the effluent in the deep saline water within the fractured basaltic rock will substantially reduce the concentration of any nutrients before these ultimately seep into the ocean at considerable distance from the coast. Thus, the system will have no impact on Maalaea Harbor or nearshore coastal waters (ECM, Inc., 1994).

IV.B.4 Drainage System

Construction of the drainage system for the Maalaea Triangle site will involve trenching on Maalaea Road both west of the Maalaea Store (for a 24" drain line) and along most the length of this road between the north intersection with Honoapiilani Highway and the sampan wharf at Maalaea Harbor (for a drain that increases from 24" pipe to 90" pipe and finally a 7' x 10' box culvert at the outlet). This part of the construction will result in inconveniences to motorists using these routes. However, mitigation measures such as work at night, work in phases, and use of flagmen to control traffic should minimize delays imposed on users. Construction of the proposed drainage system will not impact traffic on the heavily traveled Honoapiilani Highway.

According to calculations in the Warren S. Unemori Engineering, Inc. (1987) report (Appendix B), the on-site, peak flow runoff generated by the project site after development would be approximately 44.4 cfs, a net increase of approximately 29.9 cfs (for the 2-inch, 10-year recurrence interval storm). The actual increase in runoff volume (as opposed to peak flow) due to the proposed changes from the MOC/MTP project site is only 1.61% (for a 24 hr, 100-year rainfall), because the project site is a small fraction of the entire drainage basin (Warren S. Unemori Engineering, Inc., 1994). The calculated increases in peak flow will be mitigated by the drainage system design. On-site runoff would be intercepted by grated-inlet type catch basins which would be located at appropriate intervals throughout the parking lots. The on-site runoff would first be conveyed into new subsurface detention/sedimentation facilities, consisting of large diameter perforated pipes installed beneath the parking lots before being conveyed and discharged into Ma'alaea Boat Harbor through either the two existing 36-inch culverts located in the vicinity of the U. S. Coast Guard Station or a new drain, incorporating curb-inlet type catch basins, to be installed on Maalaea Road terminating at the sampan wharf. The subsurface detention/sedimentation facilities would serve as a means of temporarily storing and slowing the release of surface runoff volume by percolation and allow sediment to settle prior to discharging into Ma'alaea Harbor. These systems would serve only the onsite drainage systems.

The project will have some impact on off-site drainage and its conveyance into the harbor. The discharge point of a majority of this drainage (that is, the portion from Drainage Basins No.s 1 & 2) would mostly be directed into a new outlet to be placed about 160 feet east of the existing outlet for Drainage Basin No. 2. The change in location is not particularly significant, although the discharge will be directed slightly more towards the harbor entrance than is presently the case. Drainage improvements will convey runoff more quickly into the harbor, a consequence of the desire to eliminate flooding of Maalaea Road at the bend next to the harbor. The MOC/MTP site cannot accommodate detention of the offsite flows and does not presently serve this function to any degree. Detention during unusual rainfall events presently occurs on Maalaea Road, causing considerable inconvenience to residents and harbor users.

IV.B.5 Flood Hazard

According to the Flood Insurance Rate Map, effective June 1, 1981, prepared by the U. S. Federal Emergency Management Agency, Federal Insurance Administration (FEMA, 1981), the majority of the MTP/MOC project site is situated in an area designated as Zone C, which is prone to minimal flooding. A portion of the project site surrounding the existing natural drainage way previously mentioned (see Section III.B.2.), lies within an area designated as Zone B, which is an area between the limits of the 100-year and 500-year flood. As discussed in Section II.B.1, the off-site storm water drainage that is currently carried through the existing open drainage channel across the site would be intercepted by a new 90-inch RCP drain line and conveyed under Maalaea Road to a new 7' x 10' box culvert drain line and outlets at the sampan wharf in Ma'alaea Harbor. Thus, the drainage basin presently contributing to the area indicated as a Zone B would be reduced from approximately 290 acres to local drainage of the MOC site. In accordance with the provisions of Chapter 19.62 of the Maui County Code all habitable structures within the project site would be built above the designated flood plain elevation.

The harbor area is designated Zone V18: an area of 100-year coastal flood from wave action. No habitable structures are proposed for this zone. The pump vault will be mostly underground and suitably weatherproofed to resist flooding from either waves or land drainage.

IV.C. SEA WATER SYSTEM CONSTRUCTION IMPACTS

IV.C.1 Historical and Archaeological Sites

The project site would be developed with all necessary precautions in relation to the possibility of buried deposits reflecting the pre-contact activity in the immediate area

suggested by the historic sites located on adjacent properties. A monitoring procedure would be established to accompany the grubbing and excavation phases of development as a precautionary measure to insure full compliance with County, State, and Federal regulations. The State Historic Preservation Office would be immediately notified if artifacts or human remains are uncovered. Only the piko stone, site No. 50-09-1440 (= 1286), is located in an area close to the proposed sea water system. This is a registered site consisting of one or two stones brought to the present location in front of Buzz's Wharf restaurant from a Hawaiian village site above McGregor Point (Clark, 1980). The proposed route between the pump vault and the MOC would not impact on this site.

An underwater archaeological reconnaissance survey will be conducted for the nearshore portion of the sea water intake lines as this includes areas that will require trenching and are composed of loose material (sand and rubble). Beyond 100 feet from shore the bottom is comprised of limestone mostly swept free of loose material by waves and the pipes will be laid on the surface and attached to the limestone bottom. A qualified archaeologist will monitor the excavations of the pump vault and the trenches for the intake and discharge lines between the shoreline and the Maui Ocean Center

IV.C.2 Terrestrial Environments

Because all of the land behind the shore across which the intake pipe must run to connect to the water features at the Maui Ocean Center is pavement or undeveloped, no significant impacts will occur as a consequence of construction in this area. The pump house is to be built in an area of pavement and landscaping behind Buzz's Wharf restaurant. Trenching across paved areas will disrupt access in some areas, but work will be undertaken mostly at night and otherwise phased so as not exclude the public from use of the shoreline, beach (at Kapoli), or harbor facilities. Upon completion, all surfaces will be restored to the condition existing prior to the start of construction.

IV.C.3 Marine Environments

The intake line will cross the shoreline through the boulder and sand of Kapoli Beach. (See Figure IV-1). A trench, on the order of 4 feet across and 1 to 6 feet deep, will have to be cut through the loose material and any limestone present under the beach deposits at the shore. Once the pipes are set in place, the natural rubble and boulder fill will be returned to fill the trench. There would be no visible evidence of the pipes crossing the shore after construction.

The trench through the beach will continue offshore for a distance of up to 50 feet. The result will be disturbance (effectively a removal) of a section of the marine bottom and it's associated biota. Recovery is expected to occur within several months following the

replacement of the material over the pipes laid in the trench. This is an environment which supports dense growths of benthic algae, although the area to be disturbed is small by comparison with the large area of similar bottom off this shore. The nearshore section follows a sand channel which supports generally less algae than the bottom a short distance to the south, although McDermid (1990) has pointed out that this sandy area may be a preferred environment for limu huluhuluwaena (*Grateloupia filicina*). No permanent habitat loss is anticipated to result from the proposed activity.

Figure IV-1. The beach at Kapoli Park.

The intake pipe will continue offshore, attached to the limestone substratum at intervals as required to prevent movement. Although attaching the pipe to the bottom without trenching beyond 50 feet would clearly minimize construction impacts and is the preferred approach, the pipe will be exposed and visible to ocean users over the lifetime of the project. Loss of the pipe from unusual storm activity will be more likely with an exposed pipe, particularly where the bottom consists of loose material not suitable for attaching anchor pins. The determination of whether suitable substratum exists for anchor pins cannot be made until test borings are taken. In the event that suitable conditions do not exist, then the project design team has recommended that the pipe be laid in a shallow trench (1 to 2 feet deep) out about 300 feet (90 m) from shore. The trench would be back-filled with the coral rubble and rock from the excavation. Based

on observations of marine growth in the area, the backfill will become naturally cemented in over time (Makai Ocean Engineering, 1994c). The MOC proposes to trench offshore only as far as required by bottom conditions.

Several alternative construction methods are being considered for installing the offshore pipe if trenching is required by substratum conditions. Up to about 50 feet (15 m) from shore, the trenching can be accomplished from the land. Beyond this point, where the water depth increases from about 3 or 4 feet (1 m), continued trenching will require either barge mounted machinery or a temporary causeway extending from shore. The causeway could be made from either large rocks or massive concrete blocks supporting a bridge-like structure or moved (walked out) with the progression offshore of the trenching. The temporary causeway would not be built of loose fill material that the waves could erode, but would be accomplished in a manner that does not result in substantial adverse construction impacts. During trenching, silt curtains could be deployed to minimize dispersion of particulates if the process generates a silt plume.

An alternative which attempts to minimize the negative impacts of the various options would be to trench from shore out to about 50 feet (15 m), attach the pipe against the bottom out to about 200 feet (60 m), then trench between 200 and 400 feet (60 to 120 m) offshore to provide protection and the lowest possible profile within the zone where depths range between 5 and 8 feet (1.5 to 2.5 m) and wave energies are likely to be greatest. Beyond 400 feet (120 m), the pipe would again be bolted to the bottom as shown in Figure II-4. If the cost is not prohibitive, the outside trenching could be accomplished with barge-mounted equipment. No adverse consequences are predicted for the benthic biota, because the bottom beyond 300 feet (90 m) has a poorly developed benthic community (mostly bare limestone supporting sparse and widely scattered growths of algae and corals).

IV.C.4 Threatened and Endangered Species

No species of land animal or plant that is listed as threatened or endangered is known from the project area. Construction of the project on land will involve mostly developed areas around the harbor and the former sugar cane field known as the Maalaea Triangle parcel. Although the Kealia Pond National Wildlife Refuge is located about one mile east of the project site, the proposed project will have no impact on the refuge or the water birds which reside or migrate through the refuge. No aquatic resources of interest to these species are found on lands directly impacted by the project, and the water quality impacts, expected to be beneficial to the harbor, will not influence water quality in Ma'alaea Bay in a manner that would affect the refuge or shoreline areas near the refuge.

Construction impacts will include some disturbance of the bottom off Kapoli Park with associated construction noise from trenching equipment (which may involve either or jack-hammers). These noises might be disturbing to humpback whales which are known to calve not far off Maalaea Boat Harbor. The use of heavy and/or noisy equipment would be limited to those months when whales are known to be out of the area (May through October).

The proposed intake line will not have an adverse impact on the green sea turtle (*Chelonia mydas*) or on habitat utilized by this species. Some destruction of foraging habitat will result from the trenching through the zone of dense algal growth close to shore off Kapoli Park, but the line will avoid the front edge of a nearby marine shelf which supports dense growths of *Pterocladia.* It is anticipated that the concomitant loss of food resource will be very small relative to that which exists along this segment of coastline, and recovery will occur over time once the surface is restored. Turtle resting areas have been reported from off this shore (actually off the harbor south mole). The intake structure will not impact on turtle activities. The intake structure will be designed to have insignificant negative pressure at the intake ports in the event that a turtle (or fish or swimmer) comes in contact with the structure.

IV.D OPERATIONAL IMPACTS

Operational impacts are those long term impacts that are a consequence of the operation of the water features at the MOC. Because the water features will be designed for continuous water flow, the water supplied by the intake system will be filtered in some cases, routed through the tanks, recirculated in some cases, then discharged after an average residence time of 20 hours (average of all display systems which range from 1 hour to 2 days residence time; see Table II-2). Two types of operational impacts are considered: 1) physical impacts arising from water motion set up by the pumping system, and 2) water quality impacts off the discharge point arising from physico-chemical changes in the water as it flows through the water features.

IV.D.1. Physical Impacts

Physically, the water drawn by pumps at the intake point and this same water discharged at the outlet point will be of insufficient volume or force to have any physical consequences on the environment at either location. The ends of the intake pipes will draw from a manifold structure designed to reduce the suction pressure over an area of concern to swimmers and divers (see Figure II-5). Discharge will be into a large (7' x 10') box culvert, the flow exiting below sea level through a 5' x 12' box culvert. Thus, the outflow will have minimal force and pose no danger or inconvenience to persons or craft in the harbor or tied to the wharf.

IV.D.2. Water Quality Impacts

The quality of the water discharged from the water features at the Maui Ocean Center will be a consequence of both the quality of the water supplied and any changes which occur as the water flows through the system. Measurements from the coastal waters (Sections III.D.1 and III.D.2) provide a characterization of the water to be drawn into the system. Recent studies of flow-through marine systems, such as the decorative marine ponds on the grounds of the Mauna Lani Resort on Hawai'i and the Ihilani Resort and Spa on O'ahu, can be used to characterize the water quality discharged from this type of feature (see *AECOS*, 1992, 1993, 1994). As a general rule for systems with a high turnover rate, the characteristics of the intake water is paramount in determining the quality of the effluent. At the MOC, the intake water from offshore will be of substantially better quality than the receiving water (Maalaea Harbor water) as shown in Table III-7.

Within the MOC, the supply water will feed into recirculating systems and the recirculating water will be filtered in most cases. Thus, some water will flow directly through the system, but most will be used to adjust turnover rates in the various tanks and insure maintenance of high water quality for the animals held in the marine displays. Increases in the levels of ammonia and suspended solids (or NFR) as water flows through the display tanks can be anticipated, as these parameters typically rise in aquatic animal culture systems. The decorative marine ponds at the Ihilani Resort and Spa (a direct flow-through from ocean water without filtration of any kind) also seem to produce a small rise in total phosphorus and chlorophyll α in the effluent, although this system is still under study and the results to date are preliminary (see *AECOS*, 1994).

Filtration systems will remove suspended solids and, as a consequence, much of the particulate organics (which influence the total N and total P values in the water). On balance, internal loop systems with filtration should produce better quality effluent water for most parameters than direct flow-through systems. However, the filters must be periodically cleaned or back-flushed, resulting in the generation of an effluent stream of concentrated particulates. This back-flush cannot be fed directly into the return water without producing spikes of elevated pollutants. At the MOC, the backflush water will feed into one or more holding tanks. These tanks will discharge slowly, but more or less continuously, into the discharge stream. Thus, some of the particulates removed by the filters will be returned to the sea water as it discharges. The holding tanks will allow for settlement of particulates and removal to land-fill (or other suitable disposal on land) of the resulting settled sludge.

The efficiency of removal of particles by the clarifier system cannot be easily predicted until the physical properties of these substances can be measured. Particulates settlement in marine systems tends to be inefficient because of the added buoyancy of

salt water as compared with fresh water and the tendency for particles to be small and with a density close to that of sea water. The design and operation of the treatment system will be constantly reviewed to ensure compliance with discharge limitations set by NPDES permit issued by the Department of Health. Substances in the discharge will be no different than substances found naturally in the water entering the harbor through the entrance channel. Monitoring of concentrations in the MOC discharge will be required to insure that quantities do not exceed levels capable of producing adverse impacts on the harbor ecology.

In essence, the MOC sea water system will incorporate three sorts of treatment systems or controls to insure that the discharge water meets water quality criteria requirements: (1) adjustable turn-over rates to direct new water into critical displays; (2) filtration loops tied to various exhibits within the flow-through system; and (3) settlement and removal of particulates (clarifiers) for filter back-flush effluents. At times when the offshore (source) water becomes highly turbid, intake water might be pumped through the system more directly (i.e., not into critical displays) to minimize turbidity in the displays and avoid over-loading of filters. In the worst cases of poor source water quality, pumping might be stopped or substantially reduced and the large shark tank used as a reservoir to supply the other displays.

Marine aquarium displays are actively managed all of the time for high water quality because of the need to protect an investment in animals and maintain a pleasing underwater scene for viewing. Water quality tolerances are usually narrower than for decorative marine ponds such as those currently popular at many resorts in Hawaii. While the discharge water quality from the latter is somewhat better known than that from large aquaria (*AECOS*, 1993, 1994), quality of the input water exerts more influence on the quality of the display and the quality of the effluent than anything else if turnover rates are kept high and animal densities do not greatly exceed natural levels.

IV.D.3 Harbor Water Quality

To assess potential water quality impacts of the Maui Ocean Center discharge on water quality in Ma'alaea Harbor, a numerical plume modeling analysis was completed using the Cornell Mixing Zone Expert System for a surface discharge. The proposed intake is off of the south breakwater at approximately the 15-foot depth contour; the aquarium water will be discharged into a box culvert along the north shore of Maalaea Harbor (see Figure II-2).

The input parameters to the model are listed in Table IV-1. The model was run for a proposed discharge rate of 800 gpm (4360 m^3/day), through a 10-foot (3 meters) wide open culvert, and represents general impacts of the discharge for the range of culvert dimensions considered for the project. The current speed of 1.5 cm/sec was assumed for

the receiving water at the discharge location based on model computations and current meter measurements at Station 2 in the Wang study (Figure III-11; Wang et al., 1994). For the currents generated in the harbor, Wang et al. used a wind speed of 12 knots or 6 m/sec with a wind direction of northeast, and a bottom friction coefficient (Manning's n) of 0.035.

For this analysis, it is assumed that because of the rapid flow and turnover rate of water in the aquarium system the discharge water quality will be little changed from the intake water quality. Water quality data measured by *AECOS*, Inc. at the intake pipe location and the proposed discharge location are therefore assumed to be representative of the discharge and receiving water (see Table III-7, *AECOS* Sta. 1 and 5). The model was run for both total suspended solids (TSS) and nitrates; discharge and receiving water concentrations used were 1.6 and 5.6 mg/L for TSS, and 20 and 200 µg/L for nitrates, respectively (Note: this model study was undertaken after completion of the first baseline sampling event; values in Table III-7 reflect means from three sampling events).

TABLE IV-1. Case study input parameters used for a plume model in Ma'alaea Harbor.

Environment Parameters	
Average water depth (m)	2.7
Water depth at discharge (m)	2.7
Current speed (m/s)	0.015
Current direction	Easterly
Manning's n friction coefficient	0.035
Wind speed (m/s)	6.0
Ambient water density (kg/m^3)	1022
Discharge Parameters	
Discharge configuration	flush discharge (surface discharge)
Rectangular channel geometry:	
Width	3.0
Water depth	0.15
Discharge rate (m^3/sec)	0.050
Effluent water density (kg/m^3)	1022
Tracer Concentrations	
Tracer	In Effluent Water / In Ambient Water
Total Suspended Solids (TSS) (mg/L)	1.6 / 5.6
Nitrate (NO_3+NO_2) (µg/L)	20 / 200

The plume model results are presented in Table IV-2. The model calculates a nearfield mixing and dilution zone that extends approximately 40 meters (130 feet) from the

discharge point. Within this zone, total suspended solids concentrations increase from 1.6 mg/L near the culvert, to 8.9 mg/L at a distance of 40 meters. Similarly, nitrate concentrations increase from 20 µg/L at the discharge site to 122 µg/L at 40 meters. The model predicts that the water quality in terms of total suspended solids is improved by over 30% along the plume centerline up to 40 meters from the culvert, while nitrate concentrations are improved by over 40 %. These results indicate that water quality is significantly improved in the immediate vicinity of the discharge location simply because the discharge from MOC will be better, on average, than the average water quality in the harbor at the discharge point. Improvements in suspended solids in the harbor will depend upon the efficiency of the proposed clarifier. However, it can be pointed out that times of worst discharge water quality resulting from the intake of turbid water from offshore will also be times of worst harbor (receiving) water quality from terrestrial runoff.

TABLE IV-2. Results of a plume case study for the proposed sea water discharge into Ma'alaea Harbor.

Plume Centerline Distance (m)	Plume Width (m)	Centerline Dilution	Concentration	
			TSS (mg/L)	NO_3+NO_2 (µg N/L)
0.2	3.1	1.0	1.6	20
1.1	3.3	1.2	2.3	50
2.2	3.5	1.3	2.5	62
3.3	3.7	1.5	2.9	80
4.6	3.9	1.6	3.1	88
6.0	4.0	1.8	3.4	100
13.0	8.7	2.0	3.6	110
27.0	8.8	2.2	3.8	118
40.0	8.9	2.3	3.9	122
86.0	45.0*	18.4	5.4	190

Notes:
(1) A CORMIX plume model for a surface discharge is used for the calculations.
(2) The edge of near-field region is calculated at distance of 40 meters.
(3) The plume width is defined as a Gaussian 1/e (37%) width, except the last value with "*", which is defined as a Gaussian s.d.: sqrt(pi/2) (46%) width.

The aquarium discharge will also slightly improve general harbor flushing and water quality. Wang et al. (1994) calculated flushing in Ma'alaea Harbor using their numerical model and calibrating it with measured data. They defined the flushing time as the time required for a conservative tracer concentration to decrease to 36.8 % (1/e) of its initial value, and calculated it to be 2.7 days at Station 2. Table IV-3 shows the calculated decrease in tracer concentration with time at Station 2, from the time series curve given

previously in Figure III-10. If this flushing rate is applied to the aquarium water being discharged into the harbor, one can calculate the rate at which the aquarium water is flushed out of the harbor, and the rate at which it accumulates in the harbor. The aquarium water accumulating in the harbor improves flushing by an amount equal to the percentage of total harbor volume that is aquarium water.

TABLE IV-3. Tracer concentration at Wang et al. Station 2 in Ma'alaea Harbor based on numerical results from Wang et al. (1994)

Time (days)	Average Concentration (%)
1.0	100
1.25	79
1.5	68
1.75	59
2.0	53
2.25	46
2.5	41
2.75	36

Note: Flushing time required for a conservative trace concentration to decrease to 36.8 % (1/e) of its initial concentration is calculated to be 2.7 days at Station 2.

TABLE IV-4. Calculated flushing time improvement at Station 2 with the proposed sea water discharge in Ma'alaea Harbor.

Time (days)	Aquarium Water Discharged In the Basin ($x10^3$ m^3)	Aquarium Water Accumulating In the Basin ($x10^3$ m^3)	Percentage Ratio $= V_1/V_0$ (%)	Average Concentration (%)
1.0	4.36	4.36	3.5	96.5
1.25	5.47	4.30	3.4	73.6
1.5	6.54	4.45	3.5	63.3
1.75	7.65	4.50	3.6	54.9
2.0	8.72	4.62	3.7	49.3
2.25	9.83	4.53	3.6	42.8
2.5	10.9	4.47	3.6	38.2
2.75	12.0	4.33	3.4	33.6

Notes:
(1) V_0 = water volume in Maalaea harbor basin (= 125,000 m^3), and
V_1 = effluent water volume remained in the basin.
(2) The flushing time estimated for the tracer concentration of 36.8 % is 2.57 days at Station 2.

The estimated improvement in flushing time in Ma'alaea Harbor at Station 2 is shown in Table IV-4. The total water volume of the harbor is estimated to be 125,000 m^3, assuming a basin area of 11.3 acres and an average water depth of 9 feet. According to the results, the water exchange rate at Station 2 is about equal to the proposed MOC

discharge rate; approximately the same volume of aquarium water remains in the harbor all the time. That is, the aquarium water at Station 2 accumulates in the harbor at approximately the same rate as the discharge rate of 800 gallons/day (4360 cubic meters/day). This corresponds to 3.6 % of the total water volume in the basin. Thus the tracer concentration at Station 2 is slightly improved with the proposed water discharge, and the harbor flushing rate is decreased slightly from 2.7 days to 2.57 days.

IV.D.4 Biological Impacts

The MOC sea water discharge into Maalaea Harbor will tend to improve conditions there for marine biota by continuously suppling sea water of a better quality than is present on average in the area of the discharge and mitigating adverse impacts from terrestrial runoff.

The sea water intake will not have any substantial impact on the plankton assemblages of Ma'alaea Bay. Studies of impacts on plankton have been required for much larger sea water systems such as the Kahe Generating Station on Oahu. Studies undertaken in the late 1970's (HECO, 1977) considered the mortality of plankters passing through the cooling system for the Kahe plant and concluded that mortality due to heating was negligible and mortality to zooplankton due to mechanical effects was on the order of 5 to 30%. Because of internal recirculation and filtration loops, plankton "mortality" through the MOC system would probably be higher than measured at Kahe: a low percentage of the plankters entrained would actually pass all the way through. The important consideration is the volume of water taken in relative to the volume available. At Kahe in the 1970's, when the cooling system was drawing 500,000 gpm (2.72×10^6 m^3/day), it was estimated that this represented only 0.4 to 2.4 % of the resident coastal water. Resident volume off Kahe was estimated at between 113×10^6 m^3/day and 692×10^6 m^3/day where there is some upwelling and a longshore current averaging 0.125 m/sec (0.25 kt). The MOC proposes to pump 800 gpm (4,320 m^3/day) - about 0.16% of the 1977 Kahe volume. The resident water volume of upper Ma'alaea Bay has been estimated by Westinghouse (1972) to be on the order of 204×10^6 m^3/day based upon an average longshore current of 0.06 m/sec (0.12 kts). The MOC would be taking in about 0.002% of the resident volume. Thus, the impact on the plankton of the bay would be negligible.

IV.D.5 System Operation and Maintenance Activities

The sea water system will have two pumps, although both will be operating all of the time to maintain an 800 gpm inflow of sea water to the MOC. Two suction (intake) lines will each have the capacity to carry the design flow of 800 gpm, allowing maintenance on one line while the other remains in operation. Beyond the pump house, triple force mains with 400 gpm capacity each will feed into the MOC system, requiring that two of

the lines be in use at any given time. For the most part, maintenance will require some attention to removing fouling from the intake area and pipes. The intake manifold is designed to allow direct access to the intake line. Mechanical removal of fouling would have no adverse consequences on the environment. Scrapings of biological fouling would either become part of the sedimentary bottom near the intake or be carried into the tanks, possibly requiring later removal by hand or by the loop filtration systems.

Most significant maintenance problems involve the removal of any excessive growth of fouling-type organisms from the aquaria and tanks to maintain a visually pleasing water feature. Experiences of decorative pond systems in Hawai'i have been quite variable with respect to excessive growth of fouling organisms, particularly of the green benthic algae (Chlorophyta, usually *Cladophora*, *Enteromorpha*, and/or *Ulva*). Systems that have particular problems in this regard are those with high nutrient inputs (some flow-through systems using ground water) and those with insufficient densities of herbivores, but most seem to require some hand removal of benthic algal growth about once a month. Hand removal of fouling organisms will prevent most of this biological material from becoming entrained in the effluent. Filter systems (see above) will remove some of this material, particularly the smaller particulates generated by cleaning activities and excess feed.

[blank page]

Section V.

REFERENCES CITED

AECOS, Inc. 1989. Biological and water quality studies in the marine environment for a proposed hotel development at Kama'ole, Maui. Prep. for Engineering Concepts, Inc. AECOS No. 564: 17 p.

_____ 1979. Maui Coastal Zone Atlas, representing the Hawai'i Coral Reef Inventory, Island of Maui. Part C. Prep. for U.S. Army Corps of Engineers, Pacific Ocean Division, Fort Shafter. 86 p.

_____ 1980. Hawai'i Coral Reef Inventory, Island of Maui. Part B. Prep. for U.S. Army Corps of Engineers, Pacific Ocean Division, Fort Shafter.

_____. 1992. Measurements of the quality of the effluent from decorative salt water pond systems in Hawaii. Prep. for Hardscapes Hawaii. *AECOS* No. 645: 19 p.

_____. 1993. Ihilani Resort and Spa, Ko Olina, Oahu, Hawaii. Final environmental assessment for a flow-through sea water system. Prep. for Hardscapes Hawaii. *AECOS* No. 635: 54 p. + appendices.

_____. 1994. Ihilani Resort and Spa, Ko Olina, Oahu, Hawaii. Draft environmental assessment for a sea water intake. Prep. for Pan Pacific Holteliers, Kapolei. *AECOS* No. 635B: 52 p. plus appendix.

B-K Dynamics, Inc. 1972. Physical Oceanographic Studies of Upper Maalaea Bay. prepared for Westinghouse Environmental Systems Department, Westinghouse Electric Corporation, Pittsburgh, PA. 47 p.

Butler, A. 1975. In murky Ma'alaea Bay. *Hawaiian Shell News*, January 1975: p. 5.

Cattell, S.A., and J. Miller. 1972. A report on the plankton ecology of Maalaea Bay. Prep. for Westinghouse Environmental Systems Department. Univ. Hawaii, Hawaii Inst. Mar. Biol.

Chris Hart and Partners. 1994. Project assessment report, Maui Ocean Center at Maalaea Triangle. Prep. in support of an amendment to Special Management Area Permit No. 89/SM1-003. 22 p. + figure and appendices.

Clark, J. R. K. 1980. The Beaches of Maui County. The University Press of Hawaii. 161 p.

DOT. 1993. Maalaea Harbor expansion, traffic impact study. State of Hawaii, Department of Transportation, Harbors Division. November 1993.

DOH. 1992. Hawaii Administrative Rules, Title 11, Department of Health, Chapter 54, Water Quality Standards. Effective October 29, 1992. 67 p.

ECI. 1977. A reconnaissance survey of nearshore marine environments at Kihei, Maui. Prep. for U.S. Army Engineer Division, Pacific Ocean by Environmental Consultants, Inc. ECI-140: 70 p.

ECM, Inc. 1994. Preliminary engineering report for Maalaea Triangle Wastewater Treatment Facilities at Maalaea, Maui, Hawaii, TMK: 2nd 3-6-01: 01 and 19. Prep. for Maalaea Triangle Partnership. 11 p.

FEMA. 1981. FIRM, Flood Insurance Rate Map, Maui County, Hawaii, Panel 235 of 400. Community Panel Number 150003 0235 B, Effective Date: june 1, 1981. Federal Emergency Management Agency, Federal Insurance Administration.

Haraguchi, P. 1984. Hurricanes in Hawaii. Prep. for U. S. Army Corps of Engineers, Pacific Ocean Division.

HECO. 1977. Final report, Kahe Generating Station, NPDES monitoring program. Vol. I, Text. Edited by Dr. John C. McCain, Environmental Dept., Hawaiian Electric Co., Inc.

Joerger, P. K., and M. W. Kaschko. 1979. A cultural history overview of the Kahoma Stream Flood Control Project, Lahaina, Maui and Maalaea Small Boat Harbor Project, Maalaea, Maui, Hawaii. Prep. for the Corps of Engineers, Pacific Ocean Division.

Kennedy, J. P. 1986. Letter report of an archaeological reconnaissance survey of parcel TMK: 3-9-01, 144 & 145 prepared for Mr. T. Witten of Phillips, Brandt, Reddick & Assoc. Archaeological Consultants of Hawaii, April 27, 1986. Note: the TMK for the property surveyed is TMK: 3-6-01:01.

Kinzie, R.A., III. 1972. A survey of the shallow water biota of Ma'alaea Bay, Maui, Hawaii. Prep. for Westinghouse Electric Corp. 50 p. plus appendix.

Lillycrop, L.S., S. M. Brators, E. F. Thompson, and P. Rivers. 1993. Wave response of proposed improvements to the small boat harbor at Maalaea, Maui, Hawaii. U. S. Army Engineer Waterways Experiment Station, Vicksburg, Miss. Misc. Paper CERC-93-4.

M & E Pacific. 1979. Environmental impact statement for the Kihei boat launching ramp facility at Keawakapu, Maui, Hawaii (Tax Map Key: 3-9-04). Prep. for State of Hawaii, Dept. of Transportation, Water Transportation Facilities Division. 64 p. plus appendices.

McDermid, K. 1990. Maalaea Boat Harbor algal survey. Prep. for U.S. Army Corps of Engineers, Honolulu Engineer District, Environmental Resources Branch. 10 p. + *appendix + addendum.*

Maciolek, J. 1971. Aquatic ecosystems of Kealia Floodplain and Maalaea Bay, Maui. Evaluation for perpetuation and public use. Univ. of Hawaii, Hawaii Inst. Mar. Biol., Tech. Rept. No. 27: 42 p.

Makai Ocean Engineering. 1994a. Offshore sea water intake pipelines, conceptual design. Prep. for: Maui Ocean Center, Maalaea Harbor, Maui. Aug. 3, 1994. 5 p.

_____. 1994b. Sea water land distribution, conceptual design. Prep. for: Maui Ocean Center, Maalaea Harbor, Maui. Aug. 3, 1994. 5 p.

_____. 1994c. Offshore sea water intake pipelines and seawater land distribution, comments and recommendations. Prep. for: Maui Ocean Center, Maalaea Harbor, Maui. Aug. 3, 1994. 3 p.

Marine Advisors, Inc. 1963. Severe storm wave characteristics in the Hawaiian Islands (1947-1961). Prep. for the State of Hawaii, Department of Transportation.

Moffatt & Nichol, Engineers. 1992. Maalaea Harbor: evaluation of project impacts on surf sites. Prep. for Sea Engineering, Inc., Waimanalo, Hawaii.

Owenby, J. R., and D. S. Ezell. 1992. Climatography of the United States, no. 81, monthly station normals of temperature, precipitation, and heating and cooling degree days, 1961-1990, Hawaii. U.S. DEpt. Commerce, National Oceanic and Atmospheric Administration.

Parsons, Brinckerhoff, Quade and Douglas, Inc., 1987. Maalaea Triangle traffic impact analysis report. Prep. for Maalaea Triangle Partners.

Parsons, Brinckerhoff, Quade and Douglas, Inc. 1994. Final traffic impact study, Maalaea Triangle, Maalaea, Maui, Hawaii. Prep. for Maalaea Triangle Partners. 23 p.

R. M. Towill Corp. 1982. Revised environmental impact statement for improvements to the Maalaea Boat Harbor, Maalaea, Maui. TMK: 3-6-01, 2, 34, 43, 49, 50, 3-8-14, 28, 31. Prep. for State of Hawaii, Department of Transportation, Harbors Division.

_____. 1989. Maalaea Small Boat Harbor, topographic and hydrographic maps. Prep. for U.S. Army Engineer Division, Pacific Ocean.

Sea Engineering, Inc. 1980. Hindcast analysis of deep water waves associated with the Kona Storm of January 1980.

Stoecker, D.B. and R.R. Stoecker. 1972. An ecological investigation of the proposed steam generating plant site at Maalaea Bay, Maui, Hawaii. Prep. for Westinghouse Environmental Systems Dept., February 1972.

USACOE. 1967. Report on survey of the coasts of the Hawaiian Islands, Harbors for Light-Draft Vessels. U. S. Army Corps of Engineers, Honclulu District.

_____. 1980. Maalaea Harbor for light-draft vessels, Maui, Hawaii, general design memorandum and final environmental impact statement. U. S. Army Corps of Engineers, Honolulu District.

U.S. Army Engineer District, Honolulu. 1994. Final supplemental environmental impact statement for Maalaea Harbor for light-draft vessels, Maui, Hawaii. Planning Division, Directorate of Engineering, Fort Shafter.

USFWS. 1980. Maalaea Harbor for light-draft vessels, navigation improvement project, Maalaea, Maui, Hawaii. Detailed Report. Dept. Interior, U.S. Fish and Wildlife Service, Div. Ecological Services. 13 p. plus figures and appendix.

_____. 1993. Draft Fish and Wildlife Coordination Act Report, Maalaea Harbor for Light-draft Vessels, Maalaea, Maui, Hawaii. Perep. for U.S. Army Corps of Engineeres, Pacific Ocean Division. U.S. Dept. of the Interior, Fish and Wildlife Service, Pacific Islands Office, Honolulu, Hawaii. 44 p.

Wang, H. V., A. Cialone, and P. River. 1994. Numerical hydrodynamic modeling and flushing study at Maalaea Harbor, Maui, Hawaii. U.S. Army Corps of Engineers, Waterways Experiment Station, Coastal Engineering Research Center.

Warren S. Unemori Engineering, Inc. 1987. Preliminary drainage and soil erosion control report for the proposed Maalaea Triangle, Maalaea, Maui, Hawaii, TMK: 3-6-01:01. Prep. for Maalaea Triangle Partnership. Revised November 1988 and January 1994.

_____. 1994. Transmittal to Chris Hart and Partners dated November 18, 1994.

Wentworth, C. K. 1939. Marine bench-forming processes II, solution benching. *J. Geomorph.*, 2: 3-25.

Westinghouse Environmental Systems. 1972. Environmental impact analyses for the proposed Maalaea Bay generating facility. Maui Electric Company.

William A. Brewer & Assoc. 1987. Baseline marine environmental surveys, Maalaea Harbor, Maui, Hawaii. Prep. for Ma'alaea Triangle Partnership. 28 p.

[blank page]

APPENDIX A1

Preparation Notice
COMMENTS AND CORRESPONDENCE

AECOS
970 N. Kalaheo Avenue, Suite C300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

May 6, 1994

(distribution list)

RE: Preparation of draft EA - Maui Ocean Center offshore sea water intake pipe, Maalaea Triangle drainage outlet improvements, and Maui Ocean Center sea water discharge.

Dear Sirs,

AECOS, Inc. is in the process of preparing an Environmental Assessment to accompany permit applications for a sea water system and drainage improvements associated with a proposed development on the parcel known as the Maalaea Triangle (TMK 3-6-01: 01 & 19) at Ma'alaea, Maui. When completed, the draft EA will be circulated for your review. The law requires that agencies and groups with potential interest or concerns in the project be consulted during the EA preparation period. This letter provides basic information about the project and invites your comments and/or recommendations to insure that the draft EA addresses all relevant issues.

The draft Environmental Assessment (EA) will consider the sea water intake and discharge system for the proposed Maui Ocean Center (MOC) to be located at the south end of the parcel, and at improvements on two land drainage systems located along the shore of Ma'alaea Small Boat Harbor that accommodate site and off-site drainage.

Sea water will be used in various marine displays at the MOC. The sea water intake will be located perhaps as much as 1200 feet offshore of Kapoli Park (that is, at a point southwest of the harbor entrance) in water between 15 and 20 feet deep. A 12-inch diameter intake pipe will be laid across the reef flat and under the shore near the base of the south breakwater. The pipe, and a pump house, will be buried under paved areas on the west side of the harbor to supply the needs of the MOC to be located on the north side of the harbor. Return sea water will be discharged into Ma'alaea Harbor through a new site drainage culvert planned for the shore directly east of the U.S. Coast Guard facility. Improvements to a second, existing drain on the shore at the U.S. Coast Guard facility are also proposed.

The subject EA will specifically address those aspects of the proposed commercial developments which require permits from Maui County Planning Department, DLNR, and U.S. Army Corps of Engineers because of the use of State lands, use of submerged lands, construction within the shoreline setback area, and construction in the Conservation District seaward of the shoreline.

Please provide written comments to the following address:

AECOS Inc.
970 N. Kalaheo Ave., Suite C300
Kailua, Hawaii 96734
Attn.: Eric Guinther

or transmit concerns or interest in participating in the EA process by calling (808) 254-5884.

Sincerely,

Eric B. Guinther

RECEIVED MAY 17 1994

University of Hawaii at Manoa

Water Resources Research Center
Holmes Hall 283 • 2540 Dole Street
Honolulu, Hawaii 96822

12 May 1994

Mr. Eric B. Guinther
AECOS
970 N. Kalaheo Ave., Suite C300
Kailua, Hawaii 96734

Dear Mr. Guinther:

Subject: Notice of Draft EA Preparation—Maui Ocean Center

The staff at WRRC has reviewed the Notice for the preparation of any environmental assessment for the Maui Ocean Center and offer the following comment:

Although sea water will be pumped and used, the return discharge into the ocean environment falls under the jurisdiction of the State of Hawaii Health Department and will require a NPDEDS permit. This agency should be consulted for their requirement and standards of discharge water quality and monitoring.

Thank you for the opportunity to comment.

Sincerely,

Roger S. Fujioka, Ph.D.
Director, WRRC

RSF:jmn

cc: H. Gee

RECEIVED MAY 18 1994

STATE OF HAWAII
OFFICE OF HAWAIIAN AFFAIRS
711 KAPIOLANI BOULEVARD, SUITE 500
HONOLULU, HAWAII 96813-5249
PHONE (808) 586-3777
FAX (808) 586-3799

May 12, 1994

Mr. Eric B. Guinther
AECOS Inc.
970 N. Kalaheo Ave., Suite C300
Kailua, HI 96734

Dear Mr. Guinther:

Thank you for your letter of May 06, announcing the preparation of a draft Environmental Assessment (EA) to accompany permit applications for a sea water system and drainage improvements associated with a proposed development on the parcel known as the Maalaea Triangle at Maalaea, Maui. We have no specific comments at this time. But we would certainly like to review the draft EA.

Sincerely yours,

Dante K. Carpenter
Administrator

LM:lm
cc Clayton H.W. Hee, Chairman
Board of Trustees

RECEIVED MAY 1 8 1994

JOHN WAIHEE
GOVERNOR OF HAWAII

KEITH W. AHUE,
CHAIRPERSON, HTPTY, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES
JOHN P. KEPPELER, II
DONA L. HANAMIKE

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF LAND MANAGEMENT
54 SOUTH HIGH STREET, ~~4TH FLOOR~~ Rm.101
WAILUKU, HAWAII 96793

May 16, 1994

Mr. Eric B. Guinther
AECOS, Inc.
970 N. Kalaheo Avenue
Suite C300
Kailua, Hawaii 96734

Dear Mr. Guinther:

Subject: Preparation of Draft Environmental Assessment - Maui Ocean Center Offshore Sea Water Intake Pipe, Maalaea Triangle Drainage Outlet Improvements, and Maui Ocean Center Sea Water Discharge.

This acknowledges receipt of your May 6, 1994 letter regarding the preparation of a draft Environmental Assessment for accompanying permits which will involve the Maui Ocean Center offshore sea water intake pipe, the Maalaea Triangle drainage outlet improvements, and the Maui Ocean Center sea water discharge. We have reviewed your letter and have the following comments:

1. The proposed Maui Ocean Center offshore sea water intake pipe is within the State Conservation District and will require a Conservation District Use Permit from the Department of Land and Natural Resources, Office of Conservation and Environmental Affairs;

2. The proposed intake pipe will cross over State-owned lands and will require an easement from the Department of Land and Natural Resources, Division of Land Management; and

3. The proposed drainage culvert planned for the shore directly east of the U.S. Coast Guard facility will also require an easement from the Department of Land and Natural Resources, Division of Land Management.

If you may have any questions, please contact this office at the above address or by telephone at 243-5352.

Very truly yours,

Alan Tokunaga

ALAN TOKUNAGA
Maui District Land Agent

cc: Mr. W. Mason Young
Mr. W. Kennison

United States Department of Agriculture

Soil Conservation Service

P. O. Box 50004
Honolulu, HI
96850-0001

May 24, 1994

RECEIVED MAY 2 7 1994

AECOS Inc.
970 N. Kalaheo Ave., Suite C300
Kailua, Hawaii 96734
Attn: Eric Guinther

Dear Mr. Guinther:

Subject: DRAFT ENVIRONMENTAL ASSESSMENT - Maalaea Triangle Drainage Improvements
Maui Ocean Center sea water intake and discharge System

We have completed our review of the proposed drainage improvements for the Maalaea Triangle and submitted our concerns and recommendations to the Maui County Planning Department. We are concerned about the potential sediment pollution of Maalaea Bay. Therefore, we recommended the development of an erosion control plan which accounts for the total drainage area and includes land upstream of the proposed project site.

As proposed, the return sea water will be discharged through a proposed drainage improvement east of the U.S. Coast Guard Facility and a second exisiting drain at the Coast Guard Facility. Will the proposed drainage improvement and existing drain be modified or enlarged in order to accommodate the addition flow of seawater?

Thank you for the opportunity to provide comments on this project. Should you have any questions, please contact Michael C. Tulang at (808) 541-2606.

Sincerely,

KENNETH M. KANESHIRO
Acting State Conservationist

cc: Neal Fujiwara, District Conservationist, Wailuku Field Office.

"To lead the way in helping our customers conserve, sustain, and enhance Hawaii's natural resources through efficient service of the highest quality."

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF EDUCATION
P. O. BOX 2360
HONOLULU, HAWAII 96804

OFFICE OF THE SUPERINTENDENT

Herman M. Aizawa, Ph.D.
SUPERINTENDENT

May 20, 1994

Mr. Eric B. Guinther
AECOS Inc.
970 N. Kalaheo Ave., Suite C300
Kailua, Hawaii 96734

Dear Mr. Guinther:

SUBJECT: Draft Environmental Assessment - Maui Ocean Center
Seawater Intake and Discharge System

We have reviewed the subject environmental assessment and have determined that the proposed development will have no impact on the schools in the area.

Thank you for the opportunity to comment.

Sincerely,

Herman M. Aizawa, Ph.D.
Superintendent

HMA:hy

cc: A. Suga, OBS
R. Murakami, MDO

RECEIVED JUN 0 1 1994

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER

DEPARTMENT OF THE ARMY
U S ARMY ENGINEER DISTRICT, HONOLULU
FT. SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF

May 26, 1994

Planning Division

Mr. Eric B. Guinther
AECOS Inc.
970 North Kalaheo Avenue, Suite C300
Kailua, Hawaii 96734

Dear Mr. Guinther:

Thank you for the opportunity to comment on the proposed Maui Ocean Center Project, Maalaea Triangle, Maui (TMK 3-6-1: 01 and 19). The following comments are provided pursuant to Corps of Engineers authorities to disseminate flood hazard information under the Flood Control Act of 1960 and to issue Department of the Army (DA) permits under the Clean Water Act; the Rivers and Harbors Act of 1899; and the Marine Protection, Research and Sanctuaries Act.

a. The joint State of Hawaii and Corps of Engineers project to expand the capacity of Maalaea Harbor is located across Old Maalaea Road from the proposed project. Impacts of the proposed sea water intake on the harbor expansion cannot be determined until further information is available.

b. Based on the information provided, a DA permit will be required for the project. Please contact our Operations Division at 438-9258 for further information and refer to file number PO94-054.

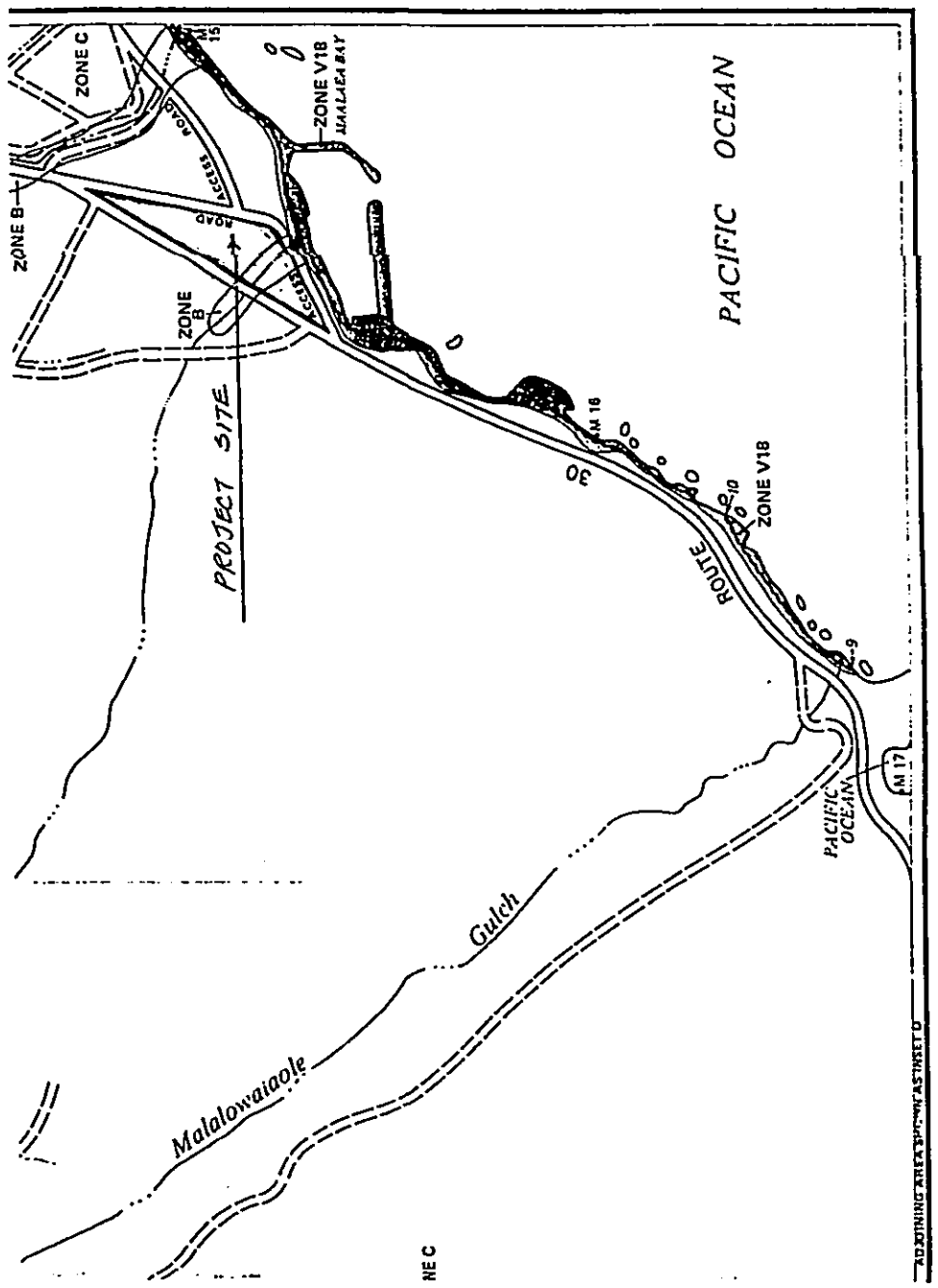
c. According to the enclosed Federal Emergency Management Agency's Flood Insurance Rate Map, panel 150003-0235B (dated June 1, 1981), the project site is located in Zone C (areas of minimal flooding) and Zone B (areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one foot or where the contributing drainage area is less than one square mile; or, areas protected by levees from the base flood).

Sincerely,

Ray H. Jyo, P.E.
Director of Engineering

Enclosure

RECEIVED MAY 31 1994



[redacted]

250 Hauoli Street #301, Wailuku, HI 96793

AECOS
970 N. Kalaheo Avenue, Suite C300
Kailua, Hawaii 96734
Att. Eric B. Guinther

May 29, 1994

RE: Preparation of draft EA - Maui Ocean Center offshore sea water intake pipe, Maalaea Triangle drainage outlet improvements, and Maui Ocean Center sea water discharge.

Dear Mr. Guinther:

The comments we have received relating to the intake pipe have been from the hawaiian members of the Ma'alaea Boat and Fishing Club. They have expressed reservations based on their cultural uses of the area through which the pipe is proposed to be installed. I recommend that you contact the Bobby Uluwai, Commodore of the club for information. It is our practice to support the Ma'alaea Boat and Fishing Club in their policies and recommendations for the harbor area.

We would appreciate more detail information on the location, size, velocity of water flow and water quality of the system. We might have further comments to make after we receive that information.

Thank you for contacting our association.

Sincerely yours,

Jack F. Mueller, Chairman
Infrastructure Committee

cc. President Harvey Janis
Ma'alaea Boat and Fishing Club

RECEIVED JUN 0 2 1994

JOHN WAIHEE
GOVERNOR

RECEIVED JUN 0 3 1994

REX D JOHNSON
DIRECTOR

DEPUTY DIRECTORS
KANANI HOLT
GLENN M OKIMOTO
JOYCE T OMINE
CALVIN M TSUDA

IN REPLY REFER TO
STP 8.6048

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

May 31, 1994

Mr. Eric B. Guinther
AECOS
970 North Kalaheo Avenue, Suite C300
Kailua, Hawaii 96734

Dear Mr. Guinther:

Subject: Draft Environmental Assessment
Maui Ocean Center Improvements
Maalaea, Maui, TMK: 3-6-01: 1 & 19

Any improvements that will involve work within our State highway right-of-way must be coordinated with and approved by our Highways Division. Since our Harbors Division continues to assist the Department of Land and Natural Resources in the planning and engineering of the Maalaea Boat Harbor facility, we wish to reserve comments until more detailed information becomes available.

We appreciate the opportunity to provide comments.

Sincerely,

Rex D. Johnson
Director of Transportation

250 Hauoli Street #301, Wailuku, HI 96793

AECOS
970 N. Kalaheo Avenue, Suite C300
Kailua, Hawaii 96734
Att. Eric B. Guinther

May 29, 1994

RE: Preparation of draft EA - Maui Ocean Center offshore sea water intake pipe, Maalaea Triangle drainage outlet improvements, and Maui Ocean Center sea water discharge.

Dear Mr. Guinther:

The comments we have received relating to the intake pipe have been from the hawaiian members of the Ma'alaea Boat and Fishing Club. They have expressed reservations based on their cultural uses of the area through which the pipe is proposed to be installed. I recommend that you contact the Bobby Uluwai, Commodore of the club for information. It is our practice to support the Ma'alaea Boat and Fishing Club in their policies and recommendations for the harbor area.

We would appreciate more detail information on the location, size, velocity of water flow and water quality of the system. We might have further comments to make after we receive that information.

Thank you for contacting our association.

Sincerely yours,

Jack F. Mueller, Chairman
Infrastructure Committee

cc. President Harvey Janis
Ma'alaea Boat and Fishing Club

JOHN WAIHEE
GOVERNOR

REX D. JOHNSON
DIRECTOR

DEPUTY DIRECTORS
KANAHELE HOLT
GLENN M. OKIMOTO
JOYCE T. OMINE
CALVIN M. TSUDA

IN REPLY REFER TO
STP 8.6048

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

May 31, 1994

Mr. Eric B. Guinther
AECOS
970 North Kalaheo Avenue, Suite C300
Kailua, Hawaii 96734

Dear Mr. Guinther:

Subject: Draft Environmental Assessment
Maui Ocean Center Improvements
Maalaea, Maui, TMK: 3-6-01: 1 & 19

Any improvements that will involve work within our State highway right-of-way must be coordinated with and approved by our Highways Division. Since our Harbors Division continues to assist the Department of Land and Natural Resources in the planning and engineering of the Maalaea Boat Harbor facility, we wish to reserve comments until more detailed information becomes available.

We appreciate the opportunity to provide comments.

Sincerely,

for Rex D. Johnson
Director of Transportation

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Office
P.O. Box 50167
Honolulu, Hawaii 96850

RECEIVED JUN 0 3 1994

In Reply Refer To: MEM

JUN 01 1994

Mr. Eric Guinther
AECOS, Inc.
970 N. Kalaheo Ave., Suite C300
Kailua, Oahu, HI 96734

Re: Preparation of a draft Environmental Assessment for the Maui Ocean Center offshore seawater intake pipe, Maalaea Triangle drainage outlet improvements, and Maui Ocean Center seawater discharge, Maalaea, Maui, Hawaii.

Dear Mr. Guinther:

The U.S. Fish and Wildlife Service (Service) has reviewed your May 6, 1994, notice announcing the preparation of a draft Environmental Assessment (EA) for the proposed Maui Ocean Center seawater intake and discharge system and improvements to an existing drainage outlet in Maalaea Small Boat Harbor. The notice does not identify the proposed project sponsor. The Service offers the following comments for your consideration.

Federally endangered hawksbill sea turtles (Eretmochelys imbricata) and federally threatened green sea turtles (Chelonia mydas) are known to exist within the proposed project area. Green sea turtles have been recorded using the coral reef fronting the harbor's south breakwater for resting. Several species of macroalgae known to be important food for green sea turtles in the main Hawaiian Islands have been recorded at and near the harbor. Hawksbill turtles have been observed nesting along the shoreline southwest of the harbor. The Service recommends that the draft EA address the immediate, long-term, and cumulative impacts to marine habitats and species, including sea turtles, from potential water quality changes resulting from the proposed project-related discharges into the harbor.

Information on the fish and wildlife resources of Maalaea Bay is presented in the Service's July 1993 draft Fish and Wildlife Coordination Act Report on the proposed Maalaea Harbor for Light-Draft Vessels. A copy of this report is enclosed for your reference. The Service recommends that relevant information in this report be considered and incorporated as appropriate into the draft EA. The Service also recommends that the draft EA discuss the potential effects of the proposed project, especially the drainage outlet improvements, on the proposed Maalaea Small Boat Harbor project.

Finally, the Kealia Pond National Wildlife Refuge (Refuge) is located approximately 915 meters (3000 feet) east of the proposed project site. The Refuge was established to support the recovery of federally endangered Hawaiian waterbirds and to provide long-term protection of waterbird habitats. The Refuge currently supports Hawaiian stilts (Himantopus mexicanus knudseni) and Hawaiian coots (Fulica americana alai) and also provides important habitat for many species of migratory shorebirds and waterfowl. Migratory shorebirds also use the shoreline sandflats at and adjacent to the harbor for loafing and feeding. The Service recommends that the draft EA consider potential impacts to these species and habitats, which may result from the proposed project.

The Service appreciates the opportunity to provide these comments. If you have questions concerning these comments, please contact Fish and Wildlife Biologist, Michael Molina, at 808/541-3441.

Sincerely,

FOR Brooks Harper
Acting Field Supervisor
Pacific Islands Office

Enclosure

RECEIVED JUN 9 6 1994

JOHN WAIHEE
Governor
MUFI HANNEMANN
Director
RICE EGGERS
Deputy Director
JEANNE K. SCHULTZ
Deputy Director
TAKESHI YOSHIHARA
Deputy Director

DEPARTMENT OF BUSINESS,
ECONOMIC DEVELOPMENT & TOURISM

Central Pacific Plaza 220 South King Street, 9th Floor Honolulu, Hawaii
Mailing Address: P.O. Box 2359 Honolulu, Hawaii 96804 Telephone: (808) 586-2466 Fax: (808) 586-2377

May 17, 1994

Mr. Eric B. Guinther
AECOS Inc.
970 North Kalaheo Avenue, Suite C300
Kailua, Hawaii 96734

Dear Mr. Guinther:

The Department of Business, Economic Development & Tourism is pleased to submit the enclosed comments on the Preparation of the Draft Environmental Assessment for the Maui Ocean Center Offshore Seawater Intake Pipe, Maalaea Triangle Drainage Outlet Improvements, and the Maui Ocean Center Seawater Discharge.

The comments were provided by the Land Use Commission. Questions regarding these comments may be directed to Esther Ueda, LUC Executive Officer, at 587-3826.

Thank you for the opportunity to comment.

Sincerely,

Mufi Hannemann

Enclosure

JOHN WAIHEE
GOVERNOR

ESTHER UEDA
EXECUTIVE OFFICER

STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM
LAND USE COMMISSION
Room 104, Old Federal Building
335 Merchant Street
Honolulu, Hawaii 96813
Telephone: 587-3822

May 16, 1994

SUBJECT: Director's Referral No. 94-162-A
Preparation of Draft Environmental Assessment (DEA) for the Maui Ocean Center Offshore Seawater Intake Pipe, Maalaea Triangle Drainage Outlet Improvements, and Maui Ocean Center Seawater Discharge, TMK No.: 3-6-01: 1 and 19, Maalaea, Maui

We have reviewed the DEA preparation notice for the subject project and have the following comments.

1) TMK No.: 3-6-01: 1 and 19 are located within the State Land Use Urban District. For your information, TMK No.: 3-6-01: por. 1 was reclassified by the County from the Agricultural District to the Urban District under Docket No. 87/DBA-8 (Maalaea Triangle Partnership) by Ordinance No. 1746 on August 22, 1988.

2) The area immediately northwest of the project site (TMK No.: 3-6-01: por. 18) was reclassified by the Land Use Commission from the Conservation District to the Agricultural District under LUC Docket No. A91-672/C. Brewer Properties, Inc. by Order dated December 1, 1992.

3) We suggest that the DEA include a map showing the project site in relation to the State Land Use Districts.

4) We are in receipt of a boundary interpretation (BI No. 94-10) submitted by Maalaea Triangle Partners to determine the Conservation District boundary in the vicinity of the project's proposed drainage outlet connection to Maalaea Harbor.

We have no further comments to offer at this time.

EU:BS:th

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

KEITH AHUE, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES

JOHN P. KEPPELER II
DONA L. HANAIKE

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION DIVISION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

June 7, 1994

RECEIVED JUN 14 1994

Mr. Eric Guinther
AECOS, Inc.
970 N. Kalaheo Ave., Suite C300
Kailua, Hawaii 96734

LOG NO: 11611
DOC NO: 9406KD06

Dear Mr. Guinther:

SUBJECT: Historic Preservation Concerns - Comments Preceding a Draft Environmental Assessment, Maui Ocean Center Offshore Sea Water Intake Pipe and Drainage Improvements Ma'alaea, Waikapu, Wailuku, Maui (OCEA File No. 94-638)
TMK: 3-6-01: 1, 19

Thank you for providing an opportunity to comment on the proposed sea water intake project prior to issuance of the Environmental Assessment.

The State Historic Preservation Division has reviewed documents relevant to an amendment and extension of a County of Maui Special Management Area Permit Application for this project. We requested that archaeological subsurface testing be conducted within the area of the Ocean Center. The County permit document indicated that the sea water intake would be located c. 450 feet offshore. Your correspondence indicates that the intake could be as much as 1200 feet offshore, to the southwest of the harbor entrance. A 12" pipe is to be laid across the reef to the shoreline.

The general area of the proposed intake pipe is located in an area of somewhat high probability for submerged cultural resources. It is between two high-traffic nineteenth century harbors - Ma'alaea Landing and McGregor's Landing. In addition, it is near a traditional canoe landing site that was in use for centuries. Furthermore, recent findings along the leeward coast of Maui have indicated that evidence of traditional Hawaiian fishing sites are still discernable as artifact concentrations on the sea floor. These sites generally occur in water less than 100 feet deep.

We have no information regarding the nature of submerged resources that may be present in the area to be impacted by the intake

pipeline. Due to the location of this pipeline, we feel that an underwater archaeological survey of the area is warranted, in order to determine the presence or absence of historic sites.

The land portion of the intake pipe is to be buried under a currently paved parking lot. This area was not included in the scope of work for the subsurface testing that was recently completed on the project site. Due to the present inaccessibility of the area, it is recommended that excavation of the trench for this pipe be monitored by a qualified archaeologist. Monitoring is also recommended for the excavation of the drainage pipe trench, to be located near the coast guard station.

If you have any questions regarding these comments, please contact Ms. Theresa K. Donham at 243-5169.

Sincerely,

DON HIBBARD, Administrator
State Historic Preservation Division

KD:jen

JOHN WAIHEE
GOVERNOR OF HAWAII

KEITH W. AHUE, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES
JOHN P. KEPPELER, II
DONA L. HANAIKE

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

P. O. BOX 621
HONOLULU, HAWAII 96809

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

REF:OCEA:SKK

JUN 15 1994

FILE NO.: 94-638
DOC. NO.: 4558

Mr. Eric Guinther
AECOS Inc.
970 N. Kalaheo Avenue, Suite C300
Kailua, Hawaii 96734

Dear Mr. Guinther:

SUBJECT: Preparation of Draft EA - Maui Ocean Center Offshore Sea Water Intake Pipe, Maalaea Triangle Drainage Outlet Improvements, and Maui Ocean Center Sea Water Discharge

Thank you for the opportunity to comment on this matter. We have reviewed your correspondence of May 6, 1994 and have the following comments.

Our Department's Division of Aquatic Resources (DAR) has reviewed the proposal through the County SMA permit amendment process. Information provided was more detailed than the May 6, 1994 correspondence and as such, the Division's comments reflect the more detailed concerns from this previous review.

The Division notes under heading 5.0 ASSESSMENT OF ASSOCIATED IMPACTS AND MITIGATION MEASURES, states that "the Maui Ocean Center would not affect the original assessment for the following functional areas" including "flora and fauna". Also, the text states there was not "any significant population of noteworthy edible marine organisms of sportfishing, subsistence, or commercial importance" as a result of "marine biological surveys conducted in and adjacent to Maalaea Harbor."

Furthermore, DAR notes from "calculations in the Preliminary Drainage and Soil Erosion Control Report" that "surface runoff volume generated by the project site after development would be 44.4 cfs" which is over three times the present surface runoff volume of 14.5 cfs.

RECEIVED JUN 16 1994

This increase in surface freshwater runoff discharge into Maalaea Harbor together with an unknown amount of sea-water discharged may impact aquatic life in the Harbor. DAR recognizes that along with possible changes to the composition of benthic community, fish species such as the baitfish, nehu (Stolephorus purpureus) that favor brackish conditions and associated predator fish (paio, kaku, etc.) may be affected by the increase in discharge water. We know of at least one local aku boat which nets the nehu and have observed public fishing activity (pole and line, nets, etc.) within the Harbor. Therefore, we recommend the concerns of the surface discharge be addressed with additional details during the required review of the ocean sea water intake and concerns about that structure and probable harm to organisms in the area.

In addition, precautions should be taken during construction to prevent eroded soils, petroleum products, debris, and other contaminants from excessively blowing, flowing, or leaching into Maalaea Harbor.

The Department's Commission on Water Resource Management understands the applicant is preparing an assessment to determine whether a watercourse on the Maalaea Triangle site is a regulated stream. This assessment will be used to determine whether the applicant needs to submit a stream channel alteration permit pursuant to Section 13-169-50.

Please feel free to call Roy Schaefer at the Office of Conservation and Environmental Affairs at 587-0377, should you have any questions.

Very truly yours,

KEITH W. AHUE

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
AND WASTE MANAGEMENT
LAND USE AND CODES ADMINISTRATION
250 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

June 9, 1994

Mr. Eric Guinther
AECOS
970 N. Kalaheo Ave., Ste. C300
Kailua, Hawaii 96734

SUBJECT: Preparation of Draft Environmental Assessment
MAALAEA TRIANGLE DRAINAGE OUTLET IMPROVEMENTS AND MAUI OCEAN CENTER SEA WATER DISCHARGE
TMK: 3-6-1:1 & 19

Dear Mr. Guinther:

We reviewed the subject application and have the following comments:

1. Comments from the Engineering Division:

   a. All proposed improvements within the County's right-of-way shall be submitted for review and approval, including construction plans, drainage and traffic reports prior to any grading or construction.

   The applicant is requested to contact the Engineering Division at 243-7745 for additional information.

2. Comments from the Wastewater Reclamation Division:

   This division has reviewed this submittal and has no comments at this time.

3. Comments from the Solid Waste Division:

   a. Alternative means of disposal of grubbed material and rock shall be utilized other than disposed of at the County landfills.

   The applicant is requested to contact the Solid Waste Division at 243-7875 for additional information.

RECEIVED JUN 16 1994

4. Comments from the Land Use and Codes Administration:

   This division has reviewed this submittal and has no comments at this time.

Very truly yours,

GEORGE N. KAYA
Director of Public Works &
Waste Management

RMN:ey
xc: Engineering Division
Solid Waste Division
Wastewater Reclamation Division

a:maaltri

APPENDIX A2

draft Environmental Assessment
COMMENTS AND CORRESPONDENCE

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
Office of Conservation and Environmental Affairs
Honolulu, Hawaii

SEP 12 1994

FILE NO.: MA-2741
Acceptance Date: 8/18/94
180-Day Exp. Date: 2/14/95
SUSPENSE DATE: 21 Days
DOC. NO.: 4849

MEMORANDUM

TO: Aquatic Resources; Conservation & Resources Enforcement; Forestry & Wildlife; Historic Preservation; Land Management; Natural Area Reserves System; State Parks; Water and Land Development; Water Commission; Boating and Ocean Recreation

FROM: Roger C. Evans, Administrator
Office of Conservation and Environmental Affairs

SUBJECT: REQUEST FOR COMMENTS
Conservation District Use Application

APPLICANT: Maui Ocean Center

FILE NO.: MA-2741

REQUEST: Seawater Intake System and Drainage Improvements

LOCATION: Maalaea, Maui

TMK(s): 3-6-1: 2

PUBLIC HEARING: YES X NO

DOCARE: Please conduct a field inspection on this project. Should you require additional information, please call Sam Lemmo at 7-0377.

If no response is received by the suspense date, we will assume there are no comments.

Attachment(s)

See attached
Henry M Schuler
9/30/94

RECEIVED
DLNR
OCEA
94 SEP 30 AM 9:58

State of Hawaii
Department of Land and Natural Resources
DIVISION OF AQUATIC RESOURCES

Date: September 29, 1994

TO: Paul Kawamoto, Program Manager, Aquatic Resources & Environmental Protection
FROM: Francis G. Oishi, Aquatic Biologist
SUBJECT: Comments on Conservation District Use Application, MA-2741

Comment Requested by: Roger Evans, Office of Conservation and Environmental Affairs
Date of Request: 09/12/94
Date Ref'd.: 09/15/94

Summary of Proposed Project

Title: Seawater Intake and Drainage Improvements

Project by: Maalaea Triangle Partners

Location: Maalaea, Maui

Brief Description:

The applicant proposes to lay two 12-inch pipelines into the nearshore waters off of the Maalaea small boat harbor. The proposed pipelines would draw seawater for a proposed aquarium facility mauka of the Maalaea small boat harbor (see attached map). Drainage improvements are also proposed for this aquarium facility as well as for offsite areas. The saltwater intake pipes would enter the sea from the shoreline adjacent to the beginning of the south breakwater and would run approximately 1,200 feet seaward to a depth of 15 feet. From the shoreline, the first 50 feet of pipelines are proposed to be buried; the remaining pipeline lengths would be secured to the bottom using brackets and bolts. However if it is determined that the existing geology would not be conducive to brackets and bolts, it is proposed that at least the first 300 - 350 feet (from shore) be buried to a depth of at least two feet.

Comments:

The greater the length of pipelines that need to be buried, the greater the extent of marine habitat destruction that will result. We would endorse the use of brackets and bolts as a means of securing the pipelines because it involves less dredging.

This proposal has been reviewed previously (comments of 8-8-94 and 3-2-94 are attached). The comments of 8-8-94 apparently involve the same subject document, i.e. the draft EA. As no additional information is presented, our previous comments additionally remain applicable.

attach.

COPY FOR YOUR INFORMATION

State of Hawaii
Department of Land and Natural Resources
DIVISION OF AQUATIC RESOURCES

Date: August 8, 1994

TO: Paul Kawamoto, Program Manager, Aquatic Resources & Environmental Protection
THROUGH: Richard Sixberry, Aquatic Biologist
FROM: Skippy Hau/Brian Kanenaka, Aquatic Biologists
SUBJECT: Comments on Draft EA, File No. SM-27

Comment Requested by: Roger Evans, Office of Conservation and Environmental Affairs
Date of Request: 07/05/94
Date Rec'd.: 07/06/94

Summary of Proposed Project

Title: Haalaea Triangle and Maui Ocean Center

Project by: Haalaea Triangle Partnership and Maui Ocean Center

Location: Haalaea, Maui

Brief Description:

The applicant intends to build a seawater circulation system and to improve land drainage associated with the proposed development of the Haalaea Triangle parcel. The Maui Ocean Center's seawater system and the drainage culvert improvements required for site and off-site drainage will require the use of State land, and use of submerged land seaward of the harbor for placement of a seawater intake structure.

Comments:

Our Maui Aquatic Biologist noted several discrepancies in the project documents that need to be fully explained before approval.

1) Appendix D, the conditions that are stipulated by the SMA approved permit are not attached.

2) There may be objections by fishermen if corals are damaged or destroyed and by surfers if wave patterns are altered due to placement of the intake pipe. The intake pipes should be anchored sufficiently to handle most southern storm conditions.

3) The applicant's proposed sewage treatment facility will not be connected to the County's sewage system. The text states that the "excess effluent would be discharged into seepage trenches and leach fields in amounts of 60,000 gallons per day". The additional amounts of nutrients through enriched groundwater and increase in runoff drainage has not been fully discussed. There is an existing problem with seasonal abundance of algae within Haalaea Harbor and along the shoreline near some of the Haalaea Condominiums.

Re: Comments on Draft EA, File No. SM-27

4) Further clarification of the possible saltwater well proposal as an alternative saltwater source is needed. Information on the size of the saltwater well and proportion of the facilities that may be dependent upon well water is needed because the larger the well, the greater the potential for impacts will be upon the existing groundwater flow into the ocean.

5) The adequacy of drainage plans cannot be determined until final designs for the completed Haalaea Triangle facilities are developed. The impacts of the drainage plans will need to be carefully reviewed because of existing agricultural uses such as cattle and old pineapple/sugar cane lands. Storm runoff, water turbidity, siltation and nutrient impacts from higher elevation agricultural lands could have some significant impacts to the Harbor, nearshore water quality, and aquatic resources. Runoff waters should be kept on site or kept in sedimentation/holding basins to allow evaporation and seepage into the ground. The proposed subsurface detention/sedimentation facilities will initially slow the release of surface runoff, but will likely increase total discharge volume into the Harbor. Drainage, whenever possible should be kept on site and reused for landscaping water needs. Runoff should be reduced and not maintained or increased from the present situation.

6) If any scientific or laboratory facilities are to be built, we would be concerned about adequate safeguards for the disposal of used laboratory chemicals. We would also be concerned about the risk of possible accidental species and disease introduction.

Finally, we continue to have concerns that the increase in surface fresh water runoff discharge during rain storms could change salinity levels in the Harbor to lower levels than ever experienced by the existing biota. Existing salinities in the Harbor would change with the proposed seawater discharge thereby impacting resident aquatic resources. Nutrient levels and temperature of the Harbor water would also change due to the discharge of seawater and increase in surface runoff.

Previous comments on the proposed project (dated March 2, 1994) are attached and remain applicable.

attach.

COPY FOR YOUR INFORMATION

State of Hawaii
Department of Land and Natural Resources
DIVISION OF AQUATIC RESOURCES

Date: March 2, 1994

TO: Paul Kawamoto, Program Manager, Aquatic Resources & Environmental Protection
THROUGH: Richard Sixberry, Aquatic Biologist
FROM: Brian Kanenaka, Aquatic Biologist BK
SUBJECT: Comments on SHA Permit Amendment, File No. 94-494

Comment Requested by Roger Evans, Office of Conservation and Environmental Affairs Date of Request 02/10/94 Date Rec'd. 02/10/94

Summary of Proposed Project

Title: Haalaea Triangle (Haui Ocean Center)

Project by: Haalaea Triangle Partnership and Haui Ocean Center

Location: Haalaea, Haui

Brief Oescription:

The applicant proposes to amend the SHA Permit for the Haalaea Triangle project (89/SHI-003) to incorporate the Haui Ocean Center into the Haalaea Triangle project plans. A permit transfer and extension of the construction period is also being requested. The Haui Ocean Center would be located on three acres and display a wide variety of marine life and their habitats. An ocean water circulation system would provide continuous sea-water flows to the project. The sea-water intake is proposed to be located south of the Haalaea Harbor southern breakwater. The discharge of the sea-water would coincide with the proposed drainage discharge to be located to the east of the Coast Guard station within Haalaea Harbor. A reservoir would be needed for times when the ocean is turbid with silt, primarily during heavy rains or heavy south swells.

Comments:

We note 5.0 ASSESSMENT OF ASSOCIATED IMPACTS AND MITIGATION MEASURES, states that "the Haui Ocean Center would not affect the original assessment for the following functional areas" including "flora and fauna". Also the text states there was not "any significant population of noteworthy edible marine organisms of sportfishing, subsistence, or commercial importance" as a result of "marine biological surveys conducted in and adjacent to Haalaea Harbor."

Furthermore, we note from "calculations in the Preliminary Drainage and Soil Erosion Control Report" that "surface runoff volume generated by the project site after development would be 44.4 cfs" which is over three times the present surface runoff volume of 14.5 cfs.

This increase in surface freshwater runoff discharge into Haalaea Harbor together with an unknown amount of sea-water discharged may impact aquatic life in the Harbor. We recognize that along with possible changes to the composition of benthic community, fish species such as the baitfish, nehu (*Stolephorus purpureus*) that favor brackish conditions

Re: Comments on SHA Permit Amendment, File No. 94-494

and associated predator fish (papio, kaku, etc.) may be affected by the increase in discharge water. We know of at least one local aku boat which nets thenehu and have observed public fishing activity (pole and line, nets, etc.) within the Harbor. Therefore, we recommend the concerns of the surface discharge be addressed with additional details during the required review of the ocean sea water intake and concerns about that structure and probable harm to organisms in the area.

Precautions should be taken during construction to prevent eroded soils, petroleum products, debris, and other contaminants from excessively blowing, flowing, or leaching into Haalaea Harbor.

AECOS
970 N. Kalaheo Avenue, Suite C300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

November 15, 1994

State of Hawaii
Department of Land and Natural Resources
Division of Aquatic Resources

Attn.: Paul Kawamoto

Re: Maalaea Triangle and Maui Ocean Center Draft Environmental Assessment for a Sea Water System and Drainage Improvements.

Dear Mr. Kawamoto,

We appreciate your responding to the subject draft EA and offer the following responses to the comments in two letters from your various departments.

August 8, 1994 from Skippy Hau/Brian Kanenaka

1) There is no Appendix D in the draft EA (although referenced), but one will be added to the final version.

2) Coral cover is minimal in the area of the proposed offshore intake pipeline. The pipes will be installed to withstand southern storm conditions and buried or closely attached to the substratum such that no influence of the pipes on waves or wave patterns is possible.

3) The latest revisions to the waste water treatment system design for the Maalaea Triangle include a design capacity of 50,000 gpd. Disposal will be into an injection well with a planned depth of between 150 to 200 feet into the brackish to saline water at least 100 feet below sea level. A back-up well will be constructed. The treated effluent will tend to move

seaward with the ground water flow, and dispersion within the ground will substantially dilute nutrients before these ultimately seep into Maalaea Bay at considerable distance off from the shore.

4) Although a well yielding high quality sea water could be used to supplement flows through the MOC, no such saltwater well is proposed. A well would have to penetrate far below the brackish water layer to yield good quality sea water, and at such depths (250 to 300 feet) would have no measurable effect on existing ground water flow into the ocean.

5) Two points are important to remember in assessing the Maalaea Triangle drainage plans: the site, which was previously in sugar cane, will be converted to an urban use with a high proportion of the land area put into impermeable surfaces (pavement, roofs, etc.); and 2) a majority of the drainage into the harbor is from off the site, and this drainage will be passed through to the harbor without much change to avoid flooding of the Triangle parcel and parts of Maalaea Road beside the harbor. We share your concerns regarding the impacts to water quality and aquatic resources from lands mauka of the highway. We certainly hope that you would express your concerns to the mauka land owners (State of Hawaii and C. Brewer). Implementation of proper soil erosion control programs on these properties would dramatically reduce impacts to the water quality in the harbor vicinity and help improve the quality of the water to be utilized by the Maui Ocean Center.

The drainage system for the project is designed to retain some runoff on site. Previous use of this land will not have much bearing on impacts because the surface is being covered by the parking areas and buildings and runoff directed deep into the soil. Adverse consequences from present and/or previous uses of mauka lands cannot be mitigated by this project. The proposed system will be more efficient at moving offsite floods through the area into the harbor. This means the runoff from the adjacent upslope lands will reach the harbor quicker than in the absence of the project, resulting in less damage and inconvenience from floods in low areas along Maalaea Road, but greater impacts on the harbor. All drainage "improvements" produce a trade-off between controlling floods in developed areas and increasing adverse impacts on coastal resources. The project can only handle the runoff generated on site. The County of Maui would not allow the project to be built without provisions to pass upslope runoff flow to either the shoreline or to a detention basin of adequate size to avoid flooding in the coastal area. The State would have

to provide the land for a detention basin, since the runoff is overwhelmingly from State lands and the area being protected is mostly State or County lands (roads and harbor facilities). The alternative of directing flows to the shore outside the harbor, was rejected by the State because the impact on marine resources would be greater.

It is unlikely that the proposed subsurface detention facilities for the Triangle project will increase total discharge to the harbor by much. During rain storms, the water presently not reaching the harbor because of evapotranspiration losses will be less and show up as surface or subsurface flow. This volume is not much different from storm to storm, being most of the rainfall received during small storms but only a small fraction of the rainfall received during large storms. The total amount of water participating is dependent upon rainfall, which is slight in this area, and not on the drainage system. The proportion of the rainfall that arrives at the harbor as surface runoff will be affected by the design of the drainage system. The engineering calculations predict an increase in peak flow (not necessarily total flow), which will be offset by the subsurface detention system. Spreading the release of fresh water into the harbor over a longer period of time is exactly what happens now: water which presently percolates to ground water seeps into the harbor long after the surface peak flow generated by a storm. Ground water flow may be reduced on balance by the conversion of the land from irrigated sugar cane to urban use. Salinity stress impacts will be reduced because of the improved mixing with sea water provided by the Maui Ocean Center discharge.

6) Disposal of chemicals would not be into the sea water discharge. Although species not native to Hawaii are not contemplated, displays containing species from elsewhere would have to be isolated from the flow through sea water system as is presently done at the Waikiki Aquarium. The process of importing and displaying exotics is well regulated in Hawaii.

7) Some parts of the harbor will experience changes in water quality from that which is presently the case. As pointed out above and in the EA, the alternative of discharging storm runoff into marine environments outside of the harbor is not preferable. The proposed discharge of MOC sea water will stabilize salinities at a level closer to that of sea water. Although clearly an improvement, the difference is really not enough to have any impact on aquatic species in the harbor. Nutrient levels and temperature

of the harbor water will be among the water quality parameters expected to improve because of the MOC discharge.

<u>September 19, 1994 from Francis Oishi</u>

Certainly the use of brackets and bolts to attach the proposed intake pipes would cause the least change to the substratum and minimize construction impacts. However, two considerations may outweigh these advantages: 1) a buried pipe is more stable against wave energies, minimizing the need for reinitiating construction impacts should a severe storm damage the pipe; and 2) because the depth out to nearly 300 feet from shore is under 6 feet and within a surfing area ("Buzzes No. 3"), the pipes should be installed flush with the existing bottom to avoid potentially hazardous situations. Trenching is not necessarily destructive of habitat. In areas of a smoothed and rather featureless limestone surface (which typifies the outer part of the proposed route), the refilled trench may offer more habitat than was present before trenching. In areas of mostly loose material, the substratum will be unchanged after trenching, and therefore no habitats are destroyed.

We trust that these responses have adequately addressed Division of Aquatic Resources concerns. We will make necessary changes in the EA to reflect the additional material and clarifications offered here.

Sincerely,

Eric B. Guinther

JOHN WAIHEE
GOVERNOR OF HAWAII

'94 SEP 27 AM 11:37

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

KEITH AHUE, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES

JOHN P. KEPPELER II
DONA L. HANAIKE

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION DIVISION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

September 21, 1994

MEMORANDUM

LOG NO: 12721
DOC NO: 9409KD17

TO: Roger C. Evans, Administrator
Office of Conservation and Environmental Affairs

FROM: Don Hibbard, Administrator
State Historic Preservation Division

SUBJECT: Historic Preservation Review of the Conservation District Use Application - Maui Ocean Center Seawater Intake and Drainage System, Waikapu, Wailuku District, Maui
OCEA File No. MA-2741
TMK: 3-6-01: 2

We have previously reviewed the proposed project (letter to Eric Guinther, June 7, 1994). Our comments have been incorporated into the Draft Environmental Assessment (Section IV.C.1, page 74) attached to the application.

The applicant has stated in the EA that in order to insure that this project will have "no adverse effect" on historic sites, archaeological monitoring will occur during excavation for the onshore drainage system improvements. In addition, the extent and nature of an underwater archaeological survey in the area of the seawater intake pipeline shall be determined in consultation with our office. We concur with these measures, and recommend that they be included as conditions of the CDUA, as follows:

1) Excavation for all onshore pipelines, culverts and underground utilities shall be monitored by a qualified archaeologist.

2) If evidence of historic sites is encountered during excavation or construction, all work in the vicinity of the find shall cease and the monitoring archaeologist shall be provided sufficient time to determine the nature and significance of the site, confer with the State Historic Preservation Division, and implement an acceptable mitigation plan.

3) A full report on the monitoring activities shall be prepared and submitted to the State Historic Preservation Division for review and approval within 90 days after completion of the project.

4) The applicant shall schedule an inspection of the proposed seawater intake sites (15 ft and 18 ft alternatives) with the State Historic Preservation Division prior to initiation of construction. The location of the alternate pipeline sites shall be clearly marked prior to inspection. Should evidence of historic sites be identified during the inspection, an underwater inventory survey shall be conducted by the applicant.

5) If an underwater inventory survey is conducted, a full report of the survey findings shall be completed and submitted to the State Historic Preservation Division for review and approval prior to initiation of the intake pipeline construction. Any additional data recovery work that may be recommended must also be successfully completed.

KD:jen

AECOS
970 N. Kalaheo Avenue, Suite C300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

November 17, 1994

State of Hawaii
Department of Land and Natural Resources
State Historic Preservation Division
33 So. King St., 6th floor
Honolulu, Hawaii 96813

Attn.: Don Hibbard, Administrator

Re: Maalaea Triangle and Maui Ocean Center Draft Environmental Assessment for a Sea Water System and Drainage Improvements.

Dear Mr. Hibbard,

Than you for your response to the draft EA and for noting that the document has incorporated your Division's earlier concerns regarding impacts on historic sites. The applicants will accept responsibility for archaeological monitoring as described in your letter to OCEA and anticipate that such monitoring will be made a condition of the CDUA.

Sincerely,

Eric B. Guinther

OFFICE OF STATE PLANNING

Office of the Governor

MAILING ADDRESS: P.O. BOX 3540, HONOLULU, HAWAII 96811-3540
STREET ADDRESS: 250 SOUTH HOTEL STREET, 4TH FLOOR
TELEPHONE: (808)587-2846, 587-2800
FAX: Director's Office 587-2846
Planning Division 587-2824

Ref. No. C-859

September 27, 1994

MEMORANDUM

TO: Mr. Keith W. Ahue, Chairman
Board of Land and Natural Resources

SUBJECT: Conservation District Use Application for the Maui Ocean Center Seawater Intake System and Drainage Improvements

We have reviewed the Conservation District Use Application for the Maui Ocean Center seawater intake and drainage improvements and have the following comments.

Given that the waters surrounding Maalaea Harbor are important surfing resources, the proposed placement of the intake structures in the harbor area might generate a conflict situation. In this regard, it is important that this matter be discussed and resolved. Coastal recreational resource policies in Section 205A-2, HRS, are aimed at protecting and preserving unique coastal recreational resources for the public benefit and need to be complied with.

In addition, since the project will require a Department of the Army Permit, it must receive a CZM federal consistency certification from our office. Through this review, we may have some specific conditions to our certification.

If there are any questions, please contact Harold Lao at 587-2883.

Norma Wong
Director

DLNR
OCEA

RECEIVED
94 SEP 29 P1:33
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

RECEIVED
94 SEP 29 PM 2:33

1337

Sea Engineering, Inc.

Makai Research Pier, 41-202 Kalanianaole Hwy, Suite 8, Waimanalo, Hawaii 96795 (808) 259-7966/FAX (808) 259-8143

December 1, 1994

Ms. Norma Wong
Office of State Planning
P.O. Box 3540
Honolulu, Hawaii 96811-3540

Subject: Ref. No C-859; Impacts of the Maui Ocean Center Seawater Intake System on Surfing Resources

Dear Ms. Wong:

This letter addresses impacts of the Maui Ocean Center seawater intake system on surfing resources in the area. The proposed seawater intake system consists of two 12-inch diameter high density polyethylene pipes extending 700 feet offshore to the intake structure located in a trough of water 15 feet deep (Figures II-3 and II-4, Environmental Assessment). As Figure 1 illustrates, the intake pipes and structure are located within the area identified as Buzzes No. 3 surf break (see Supplemental Environmental Impact Statement for Maalaea Harbor for Light-draft Vessels, Maui, Hawaii - Appendix E, Surf Site Analysis; 1994).

In general, a structure within a surf site could impact the site in two ways: by altering the surf, and by creating a new bottom feature that could affect surfers. In this case, the intake system is a relatively small structure, no larger than the surrounding rocks and coral, and therefore will not impact the nature of the waves. However, since the proposed intake pipes and structures lie above the bottom, a surfer that falls during a ride and is transported to the bottom by wave action could possibly hit the structures. From approximately 50 to 350 feet offshore, (water depths of 4 to 6 feet MLLW), the pipes will lie on the bottom and be attached to the substratum by hold-down brackets (Figure II-3, Environmental Assessment). The top of the pipes will be 1 foot above the bottom. From 350 feet to 700 feet offshore (water depths of 6 to 15 feet), the pipes will rest on concrete anchors held down with anchor rods. The pipes will lie 6 inches above the bottom; the top of the pipes will be 1.5 feet above the bottom (Figure II-3, Environmental Assessment). The proposed vertical intake manifolds are located in 15 feet of water in a natural depression in the bottom, approximately 6 feet inshore of a 4-foot high ledge (Figure II-4, Environmental Assessment). The manifold will rise 4.5 feet off the bottom, but will not rise above the surrounding shelf depth of 11 feet.

Thus, the intake pipes and manifolds will be new bottom features in the Buzzes No. 3 surf site. Although the pipes and manifolds are not larger than other naturally occurring bottom

features in the area such as rocks, coral and ledges, a surfer that falls during a ride and is transported to the bottom by wave action could possibly hit them. However, the system will be designed so that there are no pronounced protrusions and all exposed surfaces are rounded.

Sincerely,

Marc Ericksen
Sea Engineering, Inc.

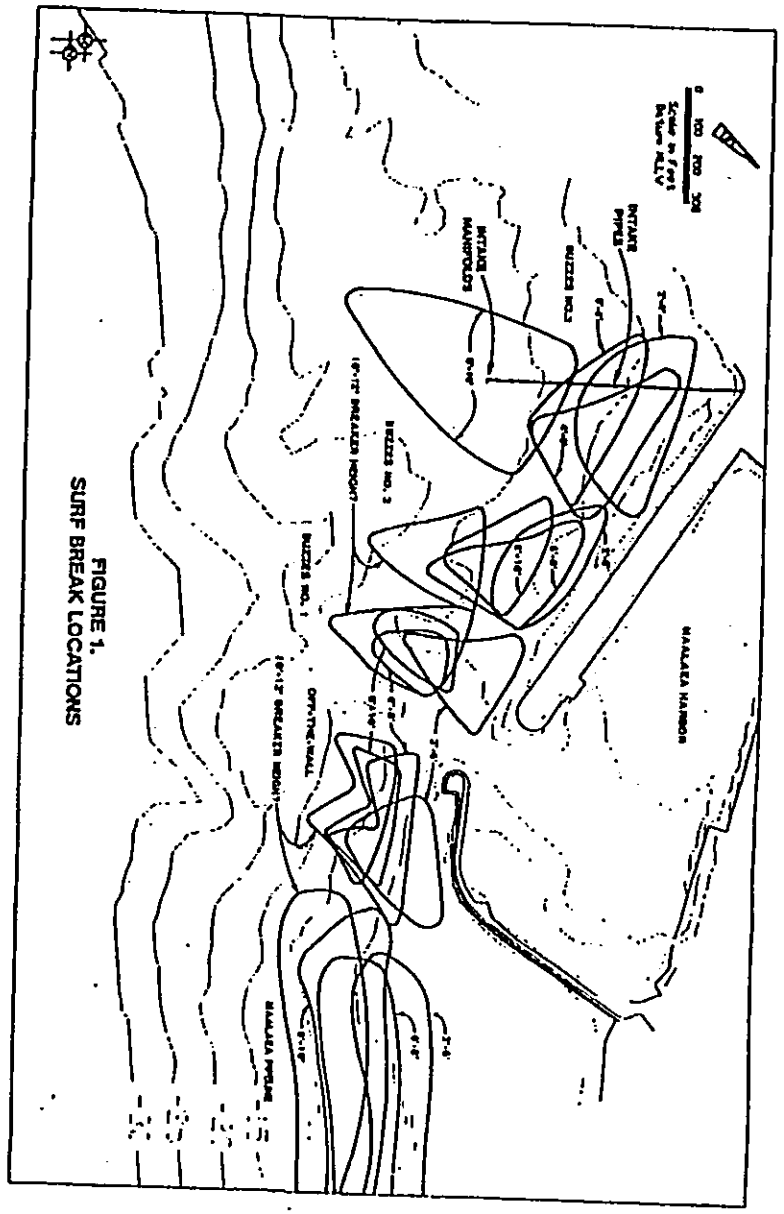


FIGURE 1.
SURF BREAK LOCATIONS

LETT

JOHN WAIHEE
GOVERNOR OF HAWAII

PETER A. SYBINSKY Ph.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HAWAII 96801

RECEIVED
'94 OCT 25 AM 8:01
DLNR
OCEA

In reply, please refer to:
94-024/epo

October 17, 1994

To: The Honorable Keith W. Ahue, Chairperson
Department of Land & Natural Resources

From: Peter A. Sybinsky, Ph.D.
Director of Health

Subject: Conservation District Use Application

Applicant: Maui Ocean Center
File No.: MA 2741
Request: Seawater Intake System and Drainage Improvements
TMK: 3-6-1: 2

Thank you for allowing us to review and comment on the subject request. We have no additional comments to offer on the subject request besides the comments that the Maui District Health Office provided in their March 21, 1994 letter to Mr. Brian Miskae, Director, Maui County Planning Department, regarding the Maalaea Triangle Shoreline Management Area (SMA) Amendments. A copy of this letter is enclosed.

Enclosure

c: Maui DHO

RECEIVED
'94 OCT 24 P1:06
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
MAUI DISTRICT HEALTH OFFICE
54 HIGH STREET
WAILUKU, MAUI, HAWAII 96793

MAR 23 1994

JOHN C. LEWIN, M.D.
DIRECTOR OF HEALTH

Lawrence Hirt, M.D., M.P.H.
DISTRICT HEALTH OFFICER

94-024

March 21, 1994

Mr. Brian Miskae
Director
Department of Planning
County of Maui
250 S. High Street
Wailuku, Hawaii 96793

Dear Mr. Miskae:

Subject: 89/SM1-003, Maalaea Triangle SMA Amendments, TMK: 3- 6-01: 01 & 19, Maalaea, Hawaii

We have reviewed the document on the subject project submitted by your office. Our comments are as follows:

Wastewater

The purpose of this request is to amend the Special Management Area (SMA) Permit for the Maalaea Triangle project (89/SM1-003) in order to: 1) Incorporate the proposed Maui Ocean Center into the Maalaea Triangle project plans; 2) Transfer the Permit Holder from Maalaea Triangle Partnership to Maalaea Partnership and Maui Ocean Center, Inc.; and 3) Extend the period to initiate construction for one year or until June 19, 1995. The subject project is located in the critical wastewater disposal area as determined by the Maui County Wastewater Advisory Committee. No new cesspools will be allowed in the subject area.

As infrastructure improvements will not be constructed in the near future and there is no existing sewer service system in the area, the Department of Health (DOH) concurs with the proposal to construct a package sewage treatment facility to accommodate project needs. The treated effluent should be reused for irrigation on the golf course and other non-human contact landscaping areas.

All wastewater plans must conform to applicable provisions of the Department of Health's Administrative Rules, Chapter 11-62, "Wastewater Systems". However, we do reserve the right to review the detailed wastewater plans for conformance to applicable rules.

Should you have any questions regarding the Wastewater comments, please contact Ms. Lori Kajiwara of the Wastewater Branch at 586-4290.

Nonpoint Source Pollution Concerns

Sediment from construction and agricultural activities are major sources of nonpoint pollution of Hawaii's waters, including Maalaea Bay. The project site is a critical area because of it's proximity to the ocean and because it serves as the drainage basin for the upper watershed, much of which is farmed. It is important to control on-site runoff, erosion, and sediment production both during and after project construction. It is also important to control the runoff, erosion, and sediment entering the project site from the upper watershed.

The following are suggested measures that can be added to your Soil Erosion Control Plan to minimize on-site runoff, erosion, and sedimentation:

a. Conduct grubbing, and grading activities during the low rainfall months (April-October).

b. Clear areas sequentially so that only a small portion of the total site is bare at any one time.

c. For all planted areas, include the application of soil amendments, high planting densities or seeding rates, fertilizer, and temporary irrigation to ensure rapid stand establishment.

d. Use vegetation, mulch, gravel and porous pavement wherever feasible to minimize impervious areas.

In addition, a grading permit should be obtained from the County of Maui prior to any construction activities. Grading permits include conditions that must be observed to minimize erosion.

Your application mentions that the project will not significantly add additional runoff water volume or sediment load to the Maalaea Bay system. It would be more favorable if the project would actually decrease total sediment load, as Maalaea Bay has well documented, area wide turbidity and sedimentation problems. In addition

to your proposed drainage improvements and subsurface detention/desilting facilities, we would like you to consider installing sediment/stormwater retention basin(s).

If you should have any questions regarding the Nonpoint Source Pollution Concerns, please contact Ms. Gail Ichikawa of the Environmental Planning Office at 586-4345.

Water Pollution

A National Pollutant Discharge Elimination System (NPDES) permit is required for any discharge to waters of the State including the following:

1. Storm water discharges relating to construction activities for projects equal to or greater than five (5) acres;

2. Storm water discharges from industrial activities;

3. Construction dewatering activities;

4. Cooling water discharges less than one million gallons;

5. Ground water remediation activities; and

6. Hydrotesting water.

Any person wishing to be covered by the NPDES general permit for any of the above activities should file a Notice of Intent with the Department's Clean Water Branch at least ninety (90) days prior to commencement of any discharge to waters of the State.

Any questions regarding this matter should be directed to Mr. Denis Lau of the Clean Water Branch at 586-4309.

Sincerely,

David H. Nakagawa

DAVID H. NAKAGAWA
Chief Sanitarian, Maui

xc: Art Bauckham
Environmental Planning Office

AECOS
970 N. Kalaheo Avenue, Suite C300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

November 17, 1994

Peter A. Sybinsky, Director of Health
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

RE: Maalaea Triangle and Maui Ocean Center Draft EA for a Sea Water System and Drainage Improvements.

Dear Dr. Sybinsky,

Thank you for responding the subject draft EA. We will incorporate your letter and attachment in the final EA for the project. We have reviewed the letter from the Maui Chief Sanitarian for issues relevant to those aspects of the Maalaea Triangle project covered in the draft EA, and can provide the following specific responses.

Wastewater

Additional detail on the waste water system to be employed by the Maalaea Triangle project will be provided in the EA. The latest revisions in the waste water treatment system for Maalaea Triangle include a design capacity of 50,000 gpd and disposal into an injection well with a planned depth of between 150 to 200 feet. A back-up well will also be constructed.

Nonpoint Source Pollution Control

Although the project site does collect some sediment washed in from the drainages upslope, the site itself is not really a "basin" in the sense you indicate. This sediment accumulates in the small drainage culverts beneath the highway, to be swept on with larger floods or removed by maintenance crews. The project will control on-site runoff, erosion, and sediment production, and include sediment/stormwater retention basins in the proposed drainage system for onsite runoff. The site has insufficient area to detain offsite flows and we would suggest that erosion problems caused by land use practices on State land are partly to blame for the sedimentation problems in the Maalaea area which you describe.

Water Pollution

We will make the appropriate applications for permits under NPDES.

Sincerely,

Eric B. Guinther

CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

AECOS
970 N. Kalaheo Avenue, Suite C300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

November 17, 1994

Peter A. Sybinsky, Director of Health
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

RE: Maalaea Triangle and Maui Ocean Center Draft EA for a Sea Water System and Drainage Improvements.

Dear Dr. Sybinsky,

Thank you for responding the subject draft EA. We will incorporate your letter and attachment in the final EA for the project. We have reviewed the letter from the Maui Chief Sanitarian for issues relevant to those aspects of the Maalaea Triangle project covered in the draft EA, and can provide the following specific responses.

Wastewater

Additional detail on the waste water system to be employed by the Maalaea Triangle project will be provided in the EA. The latest revisions in the waste water treatment system for Maalaea Triangle include a design capacity of 50,000 gpd and disposal into an injection well with a planned depth of between 150 to 200 feet. A back-up well will also be constructed.

Nonpoint Source Pollution Control

Although the project site does collect some sediment washed in from the drainages upslope, the site itself is not really a "basin" in the sense you indicate. This sediment accumulates in the small drainage culverts beneath the highway, to be swept on with larger floods or removed by maintenance crews. The project will control on-site runoff, erosion, and sediment production, and include sediment/stormwater retention basins in the proposed drainage system for onsite runoff. The site has insufficient area to detain offsite flows and we would suggest that erosion problems caused by land use practices on State land are partly to blame for the sedimentation problems in the Maalaea area which you describe.

Water Pollution

We will make the appropriate applications for permits under NPDES.

Sincerely,

Eric B. Guinther

RECEIVED

'94 OCT 11 PM 2:13

DLNR
OCEA

University of Hawai'i at Mānoa

Environmental Center
A Unit of Water Resources Research Center
Crawford 317 • 2550 Campus Road • Honolulu, Hawai'i 96822
Telephone: (808) 956-7361 • Facsimile: (808) 956-3980

October 7, 1994
EA:00091

Mr. Sam Lemmo
Department of Land and Natural Resources
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Lemmo:

Draft Environmental Assessment
Maui Ocean Center and Maalaea Triangle Sea Water System
and Drainage Improvements
Wailuku, Maui

The applicant, the Maalaea Triangle Partners and Maui Ocean Center, Inc., is proposing to construct a sea water circulation system which will support marine displays at the Maui Ocean Center (MOC) and drainage culvert improvements to support development activities planned for the parcel known as Maalaea Triangle.

We have reviewed this Draft EA with the assistance of Bruce Carlson of the Waikiki Aquarium, Hans-Jurgen Krock in Ocean Engineering, and Malia Akutagawa of the Environmental Center.

Water Quality

Results of water quality studies conducted over the past 20 years were submitted in this Draft EA; however no assessment was made of the effect of discharge water into the harbor. There was no numerical or predictive model of water quality. The document provided circulation data, but none of this information was used to predict water quality effects of the proposed project.

Maalaea Harbor - Class A Embayment Waters

Maalaea Harbor is designated as a Class A Embayment, waters primarily used for recreational and aesthetic purposes. Under Section 11-54-03, H.A.R. industrial discharge into Class A waters is impermissible. Also, discharge of filter backwash water into the harbor is prohibited.

It was briefly mentioned in the section on Water Quality Impacts that this backflush water would be primarily treated in holding tanks. (p. 78) The settlement of particulates resulting in bottom sludge will be deposited on land and the remaining top layer of sea water will be directly discharged into the harbor. No design specifications for the holding tanks were presented, no settling time estimated, no flushing rate predicted. If flushing rates are rapid and the holding tanks small in size, then treatment purposes are defeated. Section 11-54-03 requires that "the best degree of treatment or control compatible with the criteria" set for Class A waters must be met. Thus, a determination must be made on whether primary treatment of the backflush water is sufficient to meet water quality standards.

Potential Significance Requires an EIS

Without specific technical specificiations for the disposal management system, its efficacy cannot be reasonably evaluated. However, the need for an effluent management facility underscores the potential significance of effluent discharge into Maalaea Bay. Since those impacts may be significant, in conformance with Chapter 343-5(c), H.R.S. and Section 11-200-12, H.A.R. an Environmental Impact Statement must be prepared.

Drainage Impacts

It was stated that the anticipated on-site surface runoff volume after development of the Maalaea Triangle parcel would be 44.4 cfs, a net increase of 29.9 cfs. A letter by DLNR, Division of Aquatic Resources stated that the impact of this three-fold increase in surface runoff volume on aquatic life should be assessed in addition to the estimated amounts of sea water to be discharged from the Maui Ocean Center. The letter posed the question of whether this increased water input would change the marine species composition present in the harbor, since various marine organisms have different salinity thresholds.

Alternatives Considered

One of the alternatives to the sea water system considered was to retrieve water from a deep well on site. This was declared unsuitable for many of the marine displays, especially live coral. The Waikiki Aquarium has dispensed with ocean intakes and uses well water. A current study conducted by the Waikiki Aquarium reveals that the quality of well water is probably superior to ocean water, in that corals seem to thrive more in the former source.

It was mentioned in the Draft EA that Maalaea was subject to

sugar cane production. Is there a problem of leaching of residual pesticides and fertilizers into the offshore waters of Maalaea? If a well is drilled down to an average depth of 80 feet, it is highly unlikely that the water at this depth has been exposed to possible contaminants present in surface runoff. If the use of well water is not feasible, then we suggest that the applicant, in an environmentally sound manner, explore the possibility of extending the sea water intake pipe offshore to a depth of 30 feet or more where water quality is likely to be higher (as opposed to 15 feet of water proposed here). Intake of high quality water will also reduce the amount of particulates filtered.

Analysis of Marine Species in the Water Column

Extensive reviews of biological conditions on the ocean bottom and on benthic communities were made, but no information was given of organisms within the water column (i.e., planktonic growth).

Community Response to Project

In a letter drafted by the Maalaea Community Association concerns of Hawaiian fisherman regarding the placement of the sea water intake pipe and its effect on cultural uses of the area were expressed. The Draft EA does not address these valid community concerns but only addresses economic benefits and aesthetic enhancement of the area. This project may significantly impact the lifestyle of fishermen who frequent Maalaea. Under Section 11-200-12(1), H.A.R. the potential for an "irrevocable commitment to loss or destruction of any natural or cultural resource" is part of the Significance criteria and triggers the drafting of an Environmental Impact Statement.

Conclusion

The document was very thorough in describing certain environmental conditions such as water quality in the waters off of Maalaea over the past two decades, marine and terrestrial biota, waves, winds, currents, etc. However, further elaboration on project impacts on the environment must be made. The applicant should have corresponded more actively with Maalaea residents as to their feelings about the project and possible impacts on traditional and commercial fishing activities in the Maalaea area. Since this project has the potential of significantly impacting the marine environment as well as affecting the fishing practices of Maui residents, we recommend that an Environmental Impact Statement be prepared in compliance with Chapter 343-5(c), H.R.S. and Section 11-200-12, H.A.R.

Thank you for the opportunity to review this Draft EA.

Sincerely,

John T. Harrison
Environmental Coordinator

cc: OEQC
Maalaea Triangle Partnership and Maui Ocean Center, Inc.
Hans-Jurgen Krock
Bruce Carlson
Malia Akutagawa

AECOS
970 N. Kalaheo Avenue, Suite C300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

November 17, 1994

John T. Harrison
University of Hawaii at Manoa
Environmental Center
Crawford 317
2550 Campus Road
Honolulu, Hawaii 96822

Dear Dr. Harrison,

Thank you for reviewing and responding to the Environmental Assessment entitled *Draft Environmental Assessment, Maui Ocean Center and Maalaea Triangle Sea Water System and Drainage Improvements.* Allow me to respond to each of the points raised in your letter.

Water Quality

An assessment of the discharge of the MOC sea water system into Maalaea Harbor is the subject of EA Section IV.D, and specifically IV.D.3 Harbor Water Quality. This section includes the results of the numerical plume modeling analysis conducted for the EA by Sea Engineering, Inc. Predicting "water quality" is complicated by the fact that this term encompasses a number of parameters which may be of interest, but will each behave differently as sea water is passed from the intake through the MOC system and into the Harbor. The EA describes the processes that will influence many of the water quality parameters, makes comparisons with "similar" artificial systems, and relates how existing water quality (measured in the project area by *AECOS* on three occasions) would be likely to change. Predictions for suspended solids and nitrates are given at the top of page 80: i.e., the discharge would improve water quality in the harbor by reducing suspended solids and nitrates as indicated.

Maalaea Harbor - Class A Embayment Waters

You are incorrect in your interpretation of Section 11-54-03 (Hawaii Administrative Rules) as stated in your initial paragraph. The draft EA did not point out in Section I.C.1 or I.C.2 the circumstances that would trigger a NPDES permit requirement for the discharge, a point which will be added in the Final EA. That such a possibility exists, however, is discussed in Section IV.D.4 of the draft EA.

We will provide additional specifications on the treatment system in the final EA. The applicant is aware of the requirements under NPDES and we are presently in the process of preparing the application package for this permit, which will describe the water treatment proposed. Because this discharge will be regulated and monitored, a mechanism will be in place to insure that the degree of treatment is effective and achieves practical goals related to the quality of the discharge.

Potential Significance Requires an EIS

The need for an effluent management permit (NPDES) underscores the involvement of the Department of Health in setting requirements to guarantee minimal or no adverse impacts on the environment from this discharge. In fact, the EA demonstrates that the untreated discharge of sea water from the described facility into Maalaea Harbor would have no significant adverse impact on the water quality or biota of the harbor or Maalaea Bay; the applicant's proposal to provide treatment is to comply with HAR §11-54-03.

Drainage Impacts

The net increase of 29.9 cfs refers to the calculated difference in peak flow runoff between the surfaces which now exist on-site (fallow cane field) and those which would exist after completion of the Maalaea Triangle project, for a 10-year (2 inch in 1 hour) recurrence interval storm. An increase in peak flow does not necessarily mean an increase in total volume of water flowing into Ma'alaea Harbor, only that the water would get there faster. The total amount of water flowing into the harbor from the project site (as runoff and ground water infiltration) with or without the project is the amount precipitated minus the evapotranspiration loss plus any irrigation subsidy. With the project, the irrigation subsidy (from former sugar cane cultivation) is substantially

reduced, while evapotranspiration is also reduced. The completed project includes a drainage system designed to retard runoff generated on site, reducing the peak flow and enhancing percolation (i.e., the net increase of 29.9 cfs does not take into account mitigation from the system design). Assuming that the former sugar cultivation was very efficient and losses to ground water were slight, the change in the volume of water moving into Ma'alaea Harbor from the developed Maalaea Triangle parcel would be an increase about equal to the amount previously evapotranspired on site from rainfall or runoff. Ma'alaea is a very dry area (median annual rainfall under 15 inches) and the parcel is only 3.5 % of the drainage basins opening into the harbor area.

The salinity of Maalaea Harbor is determined by the climate (balance between precipitation and evaporation), ground water input, and residence time of water in the harbor. Runoff from most rainfall events is insignificant in this process, having mostly a temporary impact on the surface layer only. This is not to deny that certain uncommon events (50 or 100-year storms) might not have a profound impact on the resident biota. However, biological populations recover after such events and develop in response to the salinity regime determined by the factors listed above. Only very slow growing species (certain corals perhaps) would have their distribution determined by the infrequent storm events (such as the 10-year design flood used in the engineering calculations).

Alternatives Considered

We are under the distinct impression from having worked with the Waikiki Aquarium in obtaining permits for the sea water intake and discharge that the quality of the ground water can not meet discharge limitations (NPDES permit limits) and the aquarium is in the process of converting at least partially to an offshore intake. Given that the intake is located close to shore off Waikiki, it is not surprising that with respect to some parameters the well water is of better quality.

If well water were used for some of the source water at the MOC, the well would have to penetrate to a depth of perhaps 250 to 300 feet in order to provide good sea water (not brackish water). We agree, this water would not likely contain contaminants from the surface agricultural operations with the possible exception of highly soluble nitrates.

Unfortunately, in the Ma'alaea area, intake pipes would have to extend more than 500 meters (1640 feet) offshore of Kapoli to reach a depth of 30 feet. Although water quality 500 meters offshore would improve as compared with that typically found at the proposed intake location, the improvement (mostly reduction of particulates) would not justify the added construction and maintenance costs of the much longer pipes. The EA includes as alternative designs, extensions of the pipes and intakes out about 1400 feet from shore where water depth is around 18 feet (i.e., vicinity of Station 1 in the baseline water quality study).

Analysis of Marine Species in the Water Column

We presume that interest in the composition of the plankton follows from concerns that the proposed sea water system will have an adverse impact on the plankton community. Studies of impacts on plankton have been required for much larger sea water systems such as the Kahe Generating Station on Oahu. Studies undertaken in the late 1970's considered the mortality of plankters passing through the cooling system for the Kahe plant and concluded that mortality due to heating was negligible and mortality to zooplankton due to mechanical effects was on the order of 5 to 30%.

Because of internal recirculation and filtration loops, plankton "mortality" through the MOC system would probably be higher than measured at Kahe: a low percentage of the plankters entrained would actually pass all the way through. The important consideration is the volume of water taken in relative to the volume available. At Kahe in the 1970's, when the cooling system was drawing 500,000 gpm (2.72×10^6 m^3/day), it was estimated that this represented only 0.4 to 2.4 % of the resident coastal water. Resident volume off Kahe was estimated at between 113×10^6 m^3/day and 692×10^6 m^3/day where there is some upwelling and a longshore current averaging 0.125 m/sec (0.25 kt). The MOC proposes to pump 800 gpm (4,320 m^3/day) - about 0.16% of the 1977 Kahe volume. The resident water volume of upper Ma'alaea Bay has been estimated by Westinghouse (1972) to be on the order of 204×10^6 m^3/day based upon an average longshore current of 0.06 m/sec (0.12 kts). The MOC would be taking in about 0.002% of the resident volume.

Community Response to Project

Maui Ocean Center and Maalaea Triangle Partners have maintained an

active dialogue with the Maalaea Community Association and the Maalaea Boat and Fishing Club since early 1994. Presentations have been made to both of these groups at their regularly scheduled meetings. The letter from the Maalaea Community Association was generated in response to the announcement that an environmental assessment was being prepared. The Association and the Maalaea Fishing Club were provided the information requested in the form of the draft EA which was sent directly to the individuals mentioned. Although neither group responded to the draft with any additional concerns or comments, these were sought verbally. The assertion in your concluding paragraph that the applicants have not actively corresponded with Ma'alaea residents as to their feelings about this project is unfounded.

We are uncertain of the basis of your statement that "..the Draft EA ....only addresses economic benefits and aesthetic enhancement of the area" and presume that you meant to say that within Section IV Impacts and Mitigations under IV.A Social, Cultural, and Economic Impacts no specific mention is made of impacts on cultural uses of the area. The specific proposals will have no impacts on cultural uses of the area beyond construction disruption of the nearshore area off Kapoli Beach which is discussed extensively in Section IV.C.1. Some temporary disruption to limu gathering (a cultural use of the area) would attend the construction process, but would not be permanent. This will be reiterated in Section IV.A.1 in the final EA.

Fishermen who frequent Ma'alaea Harbor use the facilities there to dock and/or launch boats for fishing and diving in offshore waters. The proposed MOC sea water system and MTP site drainage improvements involve no irrevocable loss or destruction of cultural resources, no adverse impacts on boating facilities, and no impacts on offshore fisheries. Anticipated improvements in water quality within a part of the harbor may improve fishing in this area.

Conclusion

We believe, and have explained above, that the Environmental Center has misinterpreted a number of impacts that were clearly addressed in the draft EA. However, we will expand on the material provided in the final EA in those areas where the Environmental Center has indicated that further clarification would be beneficial to understanding the nature

of the impacts of this project. We do not agree that this project will have significant impacts on the marine environment or fishing activities in the Ma'alaea Bay area.

Sincerely,

Eric B. Guinther

LINDA CROCKETT LINGLE
Mayor
GEORGE N. KAYA
Director
CHARLES JENCKS
Deputy Director
AARON SHINMOTO, P.E.
Chief Staff Engineer

RALPH NAGAMINE, L.S., P.E.
Land Use and Codes Administration
EASSIE MILLER, P.E.
Wastewater Reclamation Division
LLOYD P.G.W. LEE, P.E.
Engineering Division
DAVID WISSMAR, P.E.
Solid Waste Division
BRIAN HASHIRO, P.E.
Highways Division

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
AND WASTE MANAGEMENT
LAND USE AND CODES ADMINISTRATION
250 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

RECEIVED
94 OCT 28 PM 4:38
DCEA

October 24, 1994

RECEIVED
91 OCT 26 A9:42
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

Mr. Keith Ahue
State of Hawaii
Dept. of Land & Natural Resources
P.O. Box 621
Honolulu, HI 96809

SUBJECT: Conservation District Use Application
MAALAEA SMALL BOAT HARBOR - SEAWATER INTAKE SYSTEM AND DRAINAGE IMPROVEMENTS
TMK: 3-6-001:002
File No.: MA-2741

Dear Mr. Ahue:

We reviewed the subject application and have the following comments:

1. *Comments from the Engineering Division:*

   a. *That a final detailed drainage and erosion control plan including, but not limited to, hydrologic and hydraulic calculations, scheme for controlling erosion and disposal of runoff water, and an analysis of the soil loss using the HESL erosion formula, be submitted to the Department of Public Works, Engineering Division for our review and approval. The plan shall provide verification that the grading and runoff water generated by the project will not have an adverse effect on the adjacent and downstream properties.*

   b. *That a copy of the approved water quality report including project mitigation measures (acceptable to the State Department of Health) which evaluates the quality of the storm water discharging into the ocean receiving waters be provided to the County of Maui, Department of Public Works and Waste Management. The report should include a discussion on sediment and nutrient loadings at all drainage outlets.*

   c. *That all existing features, such as, structures, driveways, drainageways, edge of pavement, etc. shall be shown on the project site plan.*

   d *That the 100-year flood inundation limits, if applicable, be shown on the project site plans.*

   e. *That the applicant obtain easements from the County of Maui for private underground waterlines within the County road right-of-ways from the County Council.*

The applicant is requested to contact the Engineering Division at 243-7745 for additional information.

2. *Comments from the Wastewater Reclamation Division:*

This division has reviewed this submittal and has no comments at this time.

3. *Comments from the Solid Waste Division:*

   a. *The owners and their contractors shall implement solid waste reduction, re-use and recycling programs to reduce the amount of solid waste to be disposed of at the County landfills.*

   b. *Alternative means of disposal of grubbed material and rock shall be utilized other than disposed of at the County landfills.*

The applicant is requested to contact the Solid Waste Division at 243-7875 for additional information.

4. *Comments from the Land Use and Codes Administration:*

This division has reviewed this submittal and has no comments at this time.

Very truly yours,

GEORGE N. KAYA
Public Works & Waste Management Director

RMN:ey
g:\ucatall\czm\maalboat.ahu

AECOS
970 N. Kalaheo Avenue, Suite C300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

November 17, 1994

County of Maui
Department of Public Works
and Wastewater Management
Land Use Codes Administration
250 South High Street
Wailuku, Maui, Hawaii 96793

RE: Maalaea Triangle and Maui Ocean Center Draft EA for a Sea Water System and Drainage Improvements.

Dear Mr. Kaya,

Thank you for responding to the circulated draft EA. The Maui Triangle Partners will provide the detailed erosion control and drainage plans as requested in due course and will comply with the other requests made by the Engineering Division. The owners will cooperate with efforts by the County of Maui to reduce solid waste disposal at County landfills.

Sincerely,

Eric B. Guinther

RECEIVED
'94 OCT 12 PM 12:53
DLNR
OCEA

BOARD OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-7109

September 28, 1994

RECEIVED
94 OCT 11 AM :10
DIV. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

Mr. Keith W. Ahue, Chairperson
Department of Land and Natural Resources
Office of Conservation and Environmental Affairs
P.O. Box 621
Honolulu, Hawaii 96809

Dear Chairperson Ahue:

Re: Proposed development of seawater intakes and drainage systems at TMK: 3-6-1:2, Haalaea Harbor, Maui; Application for Conservation District Use Permit No. MA-2741 submitted by Maui Ocean Center, Inc.

The Board of Water Supply's resource priorities are fresh water, brackish water, then lastly ocean waters. However, nothing should happen in the design, use or effects of this project to shut the door now on the long-term contingency of seawater desalination from the subject, adjacent or dependent areas.

We also note two potential risks to aquatic resources in the area: 1) any illness to captive populations could be transported to surrounding aquatic communities; and 2) the potential for introduction of captive population into the surrounding aquatic communities. Therefore, we recommend that the applicant be required to protect the associated aquatic resources from chemical or biological contamination.

Further, please find attached a copy of our comments which were dated February 8, 1994 and submitted regarding the subject project's base, Maui Ocean Center. Also, attached is a copy of the fire protection and water distribution map which relates tc the subject area for your information.

Sincerely,

David R. Craddick, Director

ELK
attachments

"By Water All Things Find Life."

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-7109

February 8, 1994

Mr. Brian Miskae, Director
County of Maui Planning Department
250 South High Street
Wailuku, Hawaii 96793

Dear Mr. Miskae:

Re: Proposed marine park which revises the previously planned commercial center at TMK:3-6-01:01, Maalaea; Request for a one-year time extension and approval of revised plans on Special Management Area Use Permit No. 89/SM1-003 submitted by Mr. Chris Hart on behalf of Maui Ocean Center and Maalaea Triangle Partnership

In keeping with an ecologically-sensitive approach, the applicants and their mechanical engineering consultant are advised to eliminate single-pass systems and provide recirculating ones where cooling and refrigeration are intended in the proposed project. Recirculating systems should be designed to run adequately with a higher accumulation of dissolved solids and a minimized rate of water loss due to functions such as bleeding.

In addition, the applicants are advised to use water-saving decorative features, soil preparation and plantings. Saving water through the use of point-source irrigation systems such as drip and bubblers is advised, because existing spray systems near the subject site yield wasted water in Haalaea's especially-constant high winds.

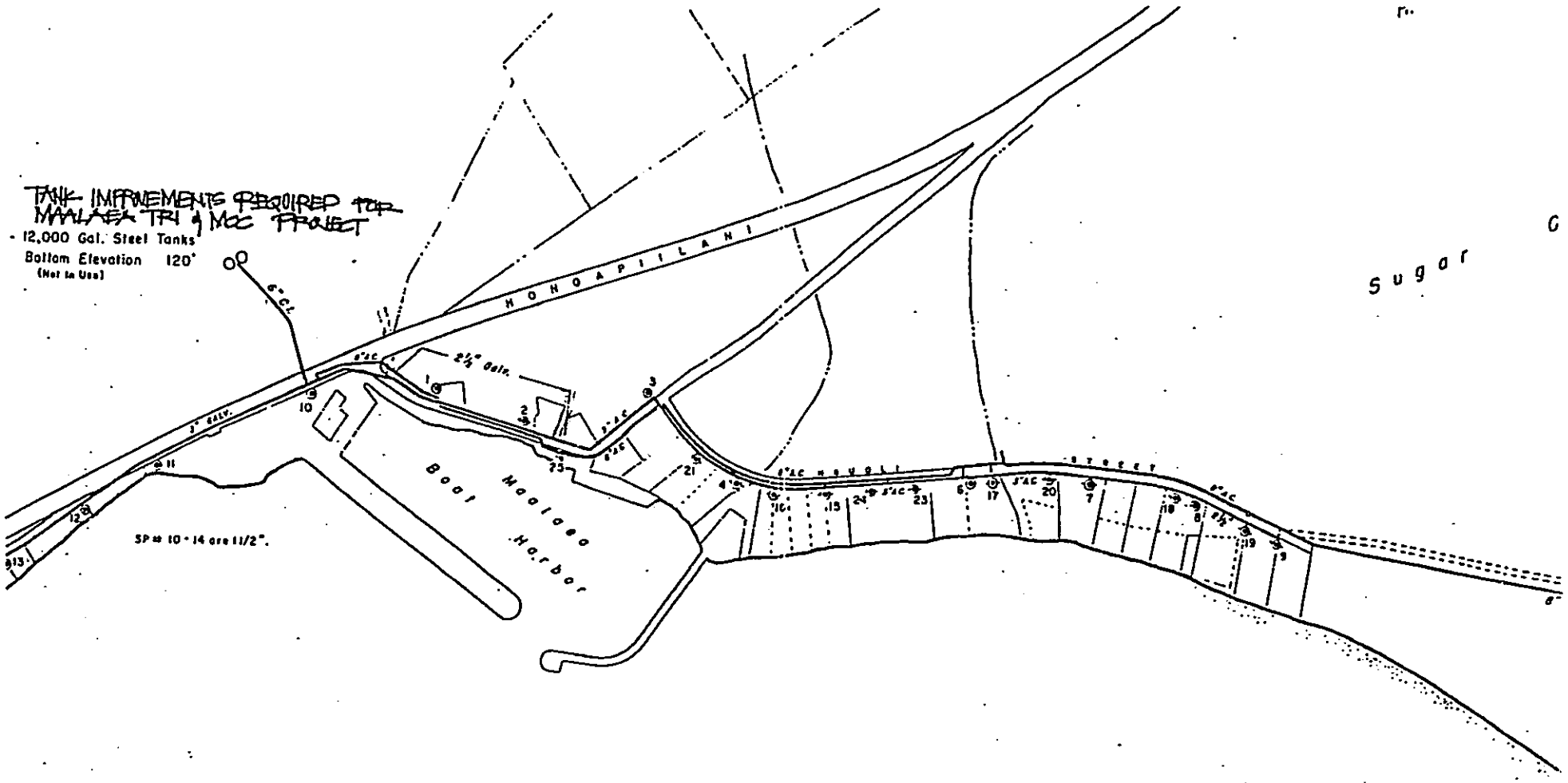
However, no guarantee of water is granted or implied as a result of these comments or the approval or amendment of the subject discretionary permit. The Department of Water Supply determines if water is available at such time as an application for water service at the parcel is approved and the subject fee is paid. If approved and paid, the water commitment to the proposed construction and domestic water uses is for a period of two years.

Sincerely,

David R. Craddick, Director

DDS

"By Water All Things Find Life."



Sugar C

COUNTY OF MAUI
BOARD OF WATER SUPPLY

1991 WATER DISTRIBUTION AND FIRE PROTECTION MAP. FOR OF II
SCALE: 1"=400'

F A

AECOS
970 N. Kalaheo Avenue, Suite C300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

November 17, 1994

Board of Water Supply
County of Maui
P.O. Box 1109
Wailuku, Maui, Hawaii 96793-7109
Attn: David Craddick, Director

Re: Maalaea Triangle and Maui Ocean Center Draft Environmental Assessment for a Sea Water System and Drainage Improvements.

Dear Mr. Craddick,

Thank you for your response to the subject EA. We do not believe the proposed project would in any way limit the County's options with respect to future desalination plans given the size of the Pacific Ocean.

1) Outbreaks of disease among captive populations usually results from poor health either because some nutritional need is not being met by the limited habitat or crowding promotes transfer of infectious agents. Since any illnesses suffered by the captive populations must come from the surrounding aquatic communities, the impact of such illnesses within the MOC on these communities would be negligible. The captive populations would be subject to treatment in some cases, and efforts would always be made to keep the populations healthy.

2) Captive populations will be of native species and any escapes would not be of any consequence. Displays of species not native to Hawaii (possible, but not presently contemplated) would have to be in aquaria isolated from the flow through sea water system such as is presently done at the Waikiki aquarium.

Sincerely,

Eric B. Guinther

RECEIVED
'94 OCT 11 PM 2:13
OEQC

250 Hau'oli Street
Ma'alaea, Maui HI 96793
October 7, 1994

To: Department of Land and Natural Resources
1115 Punchbowl Street
Honolulu, Hawai'i 96813
Attention: Sam Lemmo (587-0377)

From: Lesley Ann Bruce

Re: OEQC Bulletin Vol. XI, Sept. 8, 1994 No. 17, p.6
MAUI OCEAN CENTER AND MA'ALAEA TRIANGLE SEA WATER SYSTEM AND DRAINAGE IMPROVEMENTS
Response to Draft Environmental Assessment

The June 1994 Draft Environmental Assessment (AECOS No. 780) needs to be expanded to a full Environmental Statement because the following issues need careful study and mitigation plans.

(1) Filtered Water/Filtrates

The water of Ma'alaea Bay, at present, is notoriously dirty.

After bay water is filtered by Maui Ocean Center, where will the filtrates be put?

The Hawai'i State Department of Health does not permit filtrates to be slowly released into the aquarium discharge into Ma'alaea Small Boat Harbor.

Will the filtrates be carted away? If so, how?
Will they be dumped? If so, where?
What kind of containers will filtrates be dumped in?
Who will bear the cost of land-dumped filtrates?

What is the content of the filtrates? How is the content expected to change over time?

What effect will salty filtrates have on the land fill and its underground aquifer?

Will filtrates be leached and/or pumped underground? What effect will the salts, nitrates, nitrites, ammonia, silicates have on the land and its aquifer?

What is the significance on filtrate handling of indications "of a strong ground water influence within the harbor as well as along the shore to the east" (Draft EA 1994:57)?

How does strong ground water influence relate to filtrate handling?

How will filtrates fluctuate seasonally? during storms? during hurricanes? during tsunami?

(2) What is the environmental impact of taking water from the ocean and making it cleaner?

(3) Protection of water in Ma'alaea Bay

What laws consider the importance of protecting Ma'alaea Bay's waters for recreation and natural wild life?

(4) How will fish and other Maui Ocean Center creatures be treated for diseases?

(5) How will everything be cleaned at Maui Ocean Center?

What chemicals will be used to clean fish tanks and other equipment?

(6) Will any exotic animals, plants, or life forms be kept at Maui Ocean Center?

Have permits to import exotics been applied for?

(7) Where will accidental releases, overflow and unexpected floods from the Maui Ocean Center drain?

(8) Does the entertainment of tourists justify exposing Ma'alaea Bay to possible environmental hazards?

(9) What is the environmental justification for the choice of Ma'alaea Bay for the Maui Ocean Center?

Please advise me of how these issues will be addressed. Thank you for your concern.

Yours very truly,

Lesley Ann Bruce

Lesley Ann Bruce

cc: Maui Ocean Center
Ma'alaea Triangle
Chris Hart and Partners, Att. Rory Frampton
OEQC
DOH

AECOS
970 N. Kalaheo Avenue, Suite C300 • Kailua, Hawaii 96734
Telephone: (808) 254-3884

November 15, 1994

Lesley Ann Bruce
250 Hau'oli Street
Ma'alaea, Maui 96793

Dear Ms. Bruce,

Thank you for your interest and concern in responding with questions to the draft EA for the Maui Ocean Center. Allow me to respond by letter specifically to the points you raise. Your letter will be included in the final EA and that document will be modified as required to address your concerns.

(1) Filtered Water/Filtrates

As described in the draft EA, some portion of the sea water drawn into the MOC from Ma'alaea Bay will be filtered and these particulates will need to be disposed of. Depending upon the type of treatment of the backflush water some of the particulates will be removed and disposed of on land at a suitable landfill site or put to some other use (e.g., added to compost). Some of the particulates will enter the discharge stream. Disposal by underground injection is not contemplated, although this method is used in other locations around Maui. Some of the filter systems are biofilters which do not require regular backflushing. The concentration of particulates allowed in the discharge will be regulated by permit from the Department of Health and will be regularly monitored.

Particulates removed from the system will be partly dried and hauled away by MOC to a County landfill. The cost would be borne by MOC, paying whatever the County charges for commercial accounts. The salt content of the filtrates disposed of would be too small to impact on the landfill or any underground aquifers on Maui. Other components (nitrates, nitrites, ammonia, silicates) would also be small compared

with concentrations found in household garbage. I can not give you an exact volume of the material that would be disposed of, but can give you a rough idea of how much solid material might be generated. Assuming that the sea water contains about 10 mg/l of suspended solids that can be settled out, an 800 gpm (same as 50 liters/sec) pump will push a total of 43,200 grams of particulate solids through each day. If all of this is removed, and assuming a density of around 1.2, the daily volume of solids to be disposed of would be 1 and 1/3 cubic feet or 9.5 gallons; about a shopping bag full. The actual amount will be somewhere between half this much and twice this volume.

The particulates will consist of organic matter generated as waste from the animals kept at the MOC, and inorganic and organic particulates present in the sea water as it is drawn in from the Bay. Presumably the soil content will rise at times of excessive runoff into Ma'alaea Bay as this is the primary source of turbid water observed along shore. Runoff could increase during the wet season and during storms. Turbidity usually increases under high wave conditions.

The statement "Nitrates and silicates ....values ....indicate a strong ground water influence within the harbor as well as along the shore to the east" has no bearing on filtrate handling at MOC because ground water injection is not being proposed as a method of disposal. The statement refers to our ability to detect brackish water entering the ocean along the shore in the Ma'alaea area.

(2) There would be no impact of taking the volume of water contemplated from the ocean and "making it cleaner". The MOC will draw in about 0.002 % of the daily resident water volume in upper Ma'alaea Bay. If this were a significant number (that is, 10% or 25% or more) the impact would certainly be negative because removal of that much living plankton from the water would interfere with the ecology of the marine environment in numerous ways.

(3) Ma'alaea Bay has long been considered special from a biological perspective, but has never received protective status. The laws which protect Ma'alaea Bay are more general: these waters are classified "A" by DOH, offshore benthic areas are within State and Federal jurisdictions, and Maalaea Bay is within the National Humpback Whale Sanctuary.

(4) Because many of the tanks will be connected to the flow-through sea water system, water-based treatments can not be used. Animals can be given medicines via food or injections (larger fishes), or placed in isolated tanks (quarantined) for water-based treatments.

(5) Hand cleaning methods are appropriate for these systems. No chemicals that would be harmful to the aquatic biota would be used in the sea water system. Tanks are seldom drained for any purpose, so that cleaning (siphoning bottom silt, cleaning of the glass) must be accomplished by means that are not harmful to the tank's inhabitants.

(6) No animals that are not native to (or already naturalized in) the Hawaiian Islands will be kept in tanks or aquaria connected directly to the sea water system. No permits to import exotics have been applied for. In the event that exotic animals are displayed, this would be accomplished as it presently is at the Waikiki Aquarium, within special isolated tanks, and only after proper permits and review by Department of Agriculture and DLNR have been completed.

(7) Some overflows or spillage from the display tanks will drain directly to the site drainage system (storm drains). In cases where spillage from a tank is normal, the drainage may be collected and diverted into the back-flush reservoir.

(8) The MOC is for the benefit of the citizens of Maui as well as tourists, and will expose no one and no place to environmental hazards.

(9) The MOC is intended to provide marine education and appreciation to those who visit the displays and activities. Protection of Maalaea Bay and other marine resources in Hawaii requires an informed and educated public. It is a strong public interest in the marine environment that makes commercial aquaria economically feasible to develop. Without this public interest, any attempts to protect Maalaea Bay from the economic forces that would despoil it would be futile.

In addition to this letter, we will be addressing the points raised by your letter in modifying the draft EA. Thank you again for your efforts.

Sincerely,

Eric B. Guinther

Island Property Management
A Division of Village West Realty, Inc.

RECEIVED
OCT 0 6 1994
CHRIS HART & PARTNERS
Landscape Architecture & Planning

October 3, 1994

Chris Hart
1955 Main Street, Suite 200
Wailuku, HI 96793
Attn: Rory Frampton

Re: Sea water system at proposed aquarium in Ma'alaea

Dear Mr. Hart:

I am writing to question the environmental assessment for the filtration system for the proposed aquarium at Ma'alaea. It is my understanding that the aquarium will have a system that will filter sea water to be taken in and out of the ocean to be used in the aquarium. I am concerned that there is a system available to dispose of the land/dirt that is filtered out of the sea water. I don't believe it is legal to put it back in the ocean, so I am wondering how it will be disposed of, and whether you perceive this to be a potential problem.

I would appreciate receiving the latest copy of your environmental assessment.

Aloha,

Craig Edwards
Recording Secretary
Ma'alaea Community Association

P.O. Box 10399 • 727 Wainee • Suite 104 • Lahaina, HI 96761
Office 808-661-6773 • Fax 808-667-9588

AECOS
970 N. Kalaheo Avenue, Suite C300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

November 17, 1994

Craig Edwards
P.O. Box 10399
Lahaina, Maui 96761

Dear Mr. Edwards,

Your letter requesting additional information about the Maui Ocean Center filtration system was forwarded to me to provide a response. I hope you were provided a copy of the draft EA for the project. If not, please call me at (808) 254-5884. We are in the process of preparing a final EA.

The MOC sea water system will have filtration loops on some of the aquaria. These will filter the water recirculating within the aquarium. In addition, some portion of the water will be constantly replaced by new sea water drawn in from offshore as described in the EA. Some of the filters will need to be backflushed periodically. This process washes out particulate matter trapped on the filter. The backflush water will be directed into a large settling tank, and the overflow from this tank fed into the sea water return line (the sea water effluent discharged into the harbor). In this process, some particulates removed from the sea water by the filtration process will be entrained in the discharge. This is not illegal, but does require a permit with limitations on the amount of particulates that can be present in the discharge water.

I do not think that this system will cause any problems. The particulates will be mostly generated from the marine displays and will not be concentrated enough to produce a visible plume. Relative to the harbor water, the sea water discharge will appear clear. The volume of particulates generated for disposal (removed by settlement) will probably be on the order of 1 or 2 cubic feet per day (the size of a shopping bag). If you have any further questions, please call.

Sincerely,

Eric B. Guinther

APPENDIX B

DRAINAGE AND EROSION REPORT

PRELIMINARY DRAINAGE AND SOIL EROSION CONTROL REPORT

FOR

THE PROPOSED MAALAEA TRIANGLE

Maalaea, Maui, Hawaii

TMK: 3-6-01:01

OWNER

MAALAEA TRIANGLE PARTNERSHIP
Wailuku, Maui, Hawaii

Prepared By:

Warren S. Unemori Engineering, Inc.
Civil and Structural Engineers - Land Surveyors
Wells Street Professional Center, Suite 403
2145 Wells Street
Wailuku, Maui, Hawaii 96793

July, 1987
Revised November, 1988
Revised January, 1994

TABLE OF CONTENTS

Preliminary Drainage and Soil Erosion Control Report
for
The Proposed Maalaea Triangle

I. INTRODUCTION:

This report has been prepared to evaluate both the existing site drainage conditions and the proposed drainage plan for the subject development.

This report has also been prepared to determine the potential movement of soil due to rainfall and surface runoff off the project site in accordance with Chapter 24, Permanent Ordinances of the County of Maui, 1971, as amended by Ordinance 816 (1975).

II. PROPOSED PROJECT:

A. Site Location:

The project site is located in Maalaea, on the Island of Maui and in the State of Hawaii. The subject project site is a triangular shaped parcel situated approximately 100 feet north and mauka of the Maalaea Boat Harbor. Maalaea Road borders its makai and eastern boundaries with Honoapiilani Highway bordering its mauka and westerly boundary.

The project site encompasses an area of approximately 18.2 Acres. (See Exhibit 1).

B. Project Description:

The proposed Maalaea Triangle Development project will be a multi-purpose commercial and business project. The proposed site improvements will include, but not be limited to, asphalt paved parking lots and landscaping planting and irrigation of open areas.

III. EXISTING CONDITIONS:

A. Topography and Soil Conditions:

Presently, the majority of the project site is not being used for any particular purpose and was previously used for the cultivation of sugar cane. Natural vegetation consists of kiawe trees and various weeds and shrubbery native to the area. Situated on the remaining portion of the project site are a few single family residential homes and commercial buildings along the eastern corner of the project site.

The existing ground slopes from an elevation of approximately 40 feet ± along the mauka boundary to approximately 10 feet ± at makai boundary. The general direction of the slope follows a northeasterly to southeasterly direction, with an average slope of approximately 5.0%.

According to the "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii, (August 1972)", there are two soil types present on the project site. The Ewa silty clay (ESB, 3 to 7 percent slopes) covers the majority of the project site, while the Ewa cobbly silty clay (EHB, 3 to 7 percent slopes) covers a small portion of the northeastern corner of the project site. Both the Ewa silty clay and Ewa cobbly silty clay are

characterized as having moderate permeability, slow runoff, and a slight erosion hazard. (See Exhibit 2).

B. Drainage:

Presently, the total onsite surface runoff volume is calculated to be approximately 14.5 cfs. The majority of this onsite surface runoff sheet flows into an existing natural drainageway located mauka and west of the existing Maalaea Store. This onsite runoff then discharges into the Maalaea Boat Harbor through an existing 5x10 foot drainage structure on Maalaea Road and two 36 inch pipes located between buildings within the Coast Guard facilities.

Onsite surface runoff generated from the northern portion of the project site generally sheet flows in a west to east direction across the project site onto Maalaea Road. This onsite runoff then flows in a southwesterly direction along the Maalaea, eventually discharging into Maalaea Boat Harbor in the general vicinity of the existing U.S. Coast Guard Station.

Surface runoff generated from the southern portion of the project site sheet flows in a southeasterly direction across the project site to an existing 54-inch culvert on Maalaea Road located approximately 300 feet east of the southern intersection of Maalaea Road and Honoapiilani Highway. The existing 54-inch culvert then conveys this flow across Maalaea Road to a culvert which discharges into Maalaea Harbor.

Three (3) existing box culverts convey offsite runoff from lands mauka of the project site across Honoapiilani Highway. The first culvert is a 4x6 foot

concrete box culvert. It is located approximately 900 ft. southwest of the northern intersection of Maalaea Road and Honoapiilani Highway. It conveys approximately 254 cfs of offsite flow from Drainage Area No. 1 across Honoapiilani Highway onto the project site. This offsite runoff then flows across the project site in an easterly direction onto Maalaea Road. The runoff then flows along Maalaea Road and discharges into Maalaea Harbor in the vicinity of the existing U.S. Coast Guard Station (See Exhibit 4).

An existing 4x6 foot concrete box culvert, located approximately 1,000 feet northeast of the southern intersection of Maalaea Road and Honoapiilani Highway, conveys approximately 428 cfs of offsite runoff from Drainage Area No. 2, across Honoapiilani Highway into an existing well-defined natural drainageway located within the project site. This drainageway then conveys the offsite flow through the project site to Maalaea Road where an existing 5x10 foot concrete box culvert and two (3) 36-inch culverts located in the vicinity of the existing U.S. Coast Guard Station discharge the offsite runoff into Maalaea Boat Harbor. (See Exhibit 4).

An existing 4x5 foot box culvert located approximately 30 feet northeast of the south intersection of Maalaea Road and Honoapiilani Highway, conveys approximately 280 cfs of offsite surface runoff from Drainage Area No. 3, to an existing box culvert located within Maalaea Road and then is conveyed to a 36-inch culvert which outlets into Maalaea Boat Harbor.

C. Flood and Tsunami Zone:

According to the Flood Insurance Rate Map, effective June 1, 1981, prepared by the U.S. Federal Emergency Management Agency, Federal Insurance Administration, the majority of the project site is situated in an area designated as Zone C, which is prone to minimal flooding. A portion of the project site surrounding the existing natural drainageway previously mentioned, lies within an area designated as Zone B, which is an area between the limits of the 100-year and 500-year flood. In accordance with the provisions of Chapter 19.62 of the Maui County Code all habitable structures within the project site will be built above the designated flood plain elevation. (See Exhibit 3).

IV. DRAINAGE PLAN:

A. General:

According to our calculations, the onsite surface runoff volume generated by the project site after development will be approximately 44.4 cfs, for a net increase of approximately 29.9 cfs (see Appendix "A").

In conjunction with the development, onsite runoff will be intercepted by grated-inlet type catch basins which will be located at appropriate intervals throughout the parking lots. The onsite runoff will first be conveyed into new subsurface detention/sedimentation facilities, consisting of large diameter perforated pipes installed within the parking lots before being conveyed and discharged into Maalaea Boat Harbor through an existing 5x10 foot box culvert and two (3) existing 36-inch culverts located in the vicinity of the

existing U.S. Coast Guard Station. The subsurface detention/sedimentation facilities will serve as a means of temporarily storing and slowly releasing the peak surface runoff volume at a controlled discharge rate, and allow potential pollutants to settle prior to discharging into Maalaea Boat Harbor. A new underground storm drain system, consisting of curb-inlet type catch basins, will be installed on Maalaea Road to intercept and convey a portion of the onsite surface runoff into the existing drainage outlet in the vicinity of the U.S. Coast Guard Station previously mentioned.

Offsite surface runoff from Drainage Area No. 1 will continue to be conveyed across Honoapiilani Highway through an existing 4x6 culvert. A new 72" diameter drainline will be installed to intercept and convey the offsite runoff to a new 7x10 foot box culvert drainline, where it will be conveyed to a new outlet located in Maalaea Boat Harbor. This new drainage outlet will be constructed approximately 140 feet east of the existing drainage outlet in the vicinity of the U.S. Coast Guard Station previously mentioned.

The offsite runoff from Drainage Area No. 2 will continue to be conveyed across Honoapiilani Highway through an existing 4x6 box culvert. This offsite surface runoff will then be intercepted and conveyed through the project site by a 90" diameter drainline which will be connected to the new 7x10 foot box culvert drainline mentioned previously and allowed to discharge into Maalaea Boat Harbor at the new drainage outlet previously mentioned.

Offsite surface runoff from Drainage Area No. 3 will continue to be conveyed across Honoapiilani Highway by means of an existing 4x5 foot box culvert into an existing box culvert and 36-inch culvert where it will be

allowed to discharge into Maalaea Boat Harbor as it is presently doing. No onsite surface runoff generated from the proposed development will be directed into this drainage system.

B. Hydrology Calculations:

The hydrologic calculations are based on the "Drainage Master Plan for the County of Maui", and the "Rainfall Frequency Atlas of the Hawaiian Islands", Technical Paper No. 43, U.S. Department of Commerce, Weather Bureau.

Rational Formula Used: $Q = CIA$

Where Q = rate of flow (cfs)

A = area (acres)

I = rainfall intensity for a duration equal to the time of concentration (in./hr.)

C = runoff coefficient

The hydrologic calculations for drainage areas greater than 100 acres are based on procedures developed by the U.S. Department of Agriculture, Soil Conservation Service (SCS). This procedure is described in detail in the SCS National Engineering Handbook, Section 4, Hydrology (NEH-4). Hydrologic calculations were computed by utilizing computer software simulating "SCS Computer Program for Project Formulation, Hydrology (TR-20)", which is based on the procedures outlined in NEH-4. See Appendix "A" for hydrologic calculations.

C. Conclusion:

According to our calculations, approximately 29.9 cfs of additional onsite surface runoff volume will be generated as part of the proposed development (see Appendix A). However, the onsite surface runoff volume generated by the proposed development will be intercepted by new curb-inlet and grated-inlet type catch basins which will be installed as part of the proposed improvements. The majority of the onsite surface runoff will be conveyed to new subsurface detention/sedimentation facilities which will temporarily store and slowly release the intercepted surface runoff. This surface runoff will then be conveyed to an existing 5x10 foot box culvert and two (2) existing 36-inch culverts where it will be discharged into Maalaea Boat Harbor in the vicinity of the existing U.S. Coast Guard Station.

The offsite surface runoff presently flowing through the project site from the contributory drainage areas mauka of the project site will be either intercepted by new underground drainage systems, which will be installed as part of the proposed development and conveyed to a new drainage outlet in Maalaea Boat Harbor, or allowed to flow through the project site as it is presently doing.

Since the additional surface runoff generated by the proposed development and the offsite surface runoff presently flowing through the project site will be conveyed to adequate drainage outlets, it is our professional opinion that the proposed project will not adversely affect the adjoining properties.

V. SOIL EROSION CONTROL PLAN:

A. General:

The following measures will be taken to control erosion during the site development period.

1. Minimize time of construction.
2. Retain existing ground cover until latest date to complete construction.
3. Early construction of drainage control features.
4. Use temporary area sprinklers in non-active construction areas when ground cover is removed.
5. Station water truck on site during construction period to provide for immediate sprinkling, as needed, in active construction zones (weekends and holidays included).
6. Use temporary berms and cut-off ditches, where needed, for control of erosion.
7. Thoroughly water graded areas after construction activity has ceased for the day and on weekends.
8. Sod or plant all cut and fill slopes immediately after grading work has been completed.

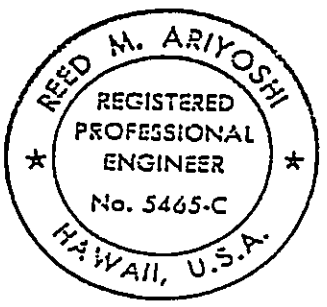
The development project is provided with adequate facilities for drainage control and storm water disposal. This, together with ultimate ground cover, shall preclude any appreciable onsite erosion.

B. Conclusion:

Based on our calculations, (see Appendix "B"), sedimentation hazard to coastal waters and downstream properties is minimal. Erosion rate computed for this project site is well within the tolerable limits and additional control measures are not required.

Report By: Eric M. Matsuda

Checked by: Reed M. Ariyoshi



x:\wp50data\sfowp\87036001.rpt (5.2)

VI. REFERENCES

1. *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii.* August 1972. United States Department of Agriculture, Soil Conservation Service.

2. *Flood Insurance Rate Map, Maui County, Hawaii.* Community-Panel Number 150003 0255B. June 1, 1981. Federal Emergency Management Agency, Federal Insurance Administration.

3. *Drainage Master Plan for the County of Maui, State of Hawaii.* October 1971. R.M. Towill Corporation.

4. *SCS National Engineering Handbook, Section 4 - Hydrology.* 1969. Soil Conservation Service, U.S. Department of Agriculture.

5. *Rainfall Frequency Atlas of the Hawaiian Islands, Technical Paper No. 43.* 1962. U.S. Department of Commerce, Weather Bureau.

6. *Storm Drainage Standards.* March 1986. Department of Public Works, City and County of Honolulu.

7. *Drainage of Highway Pavements, Hydraulic Engineering Circular No. 12.* March 1969. U.S. Department of Transportation, Federal Highway Administration.

8. *Hydraulic Design of Highway Culverts, Hydraulic Design Series No. 5.* September, 1985. U.S. Department of Transportation, Federal Highway Administration.

EXHIBITS

1 Location Map
2 Soil Survey Map
3 Flood Insurance Rate Map
4 Drainage Area Map

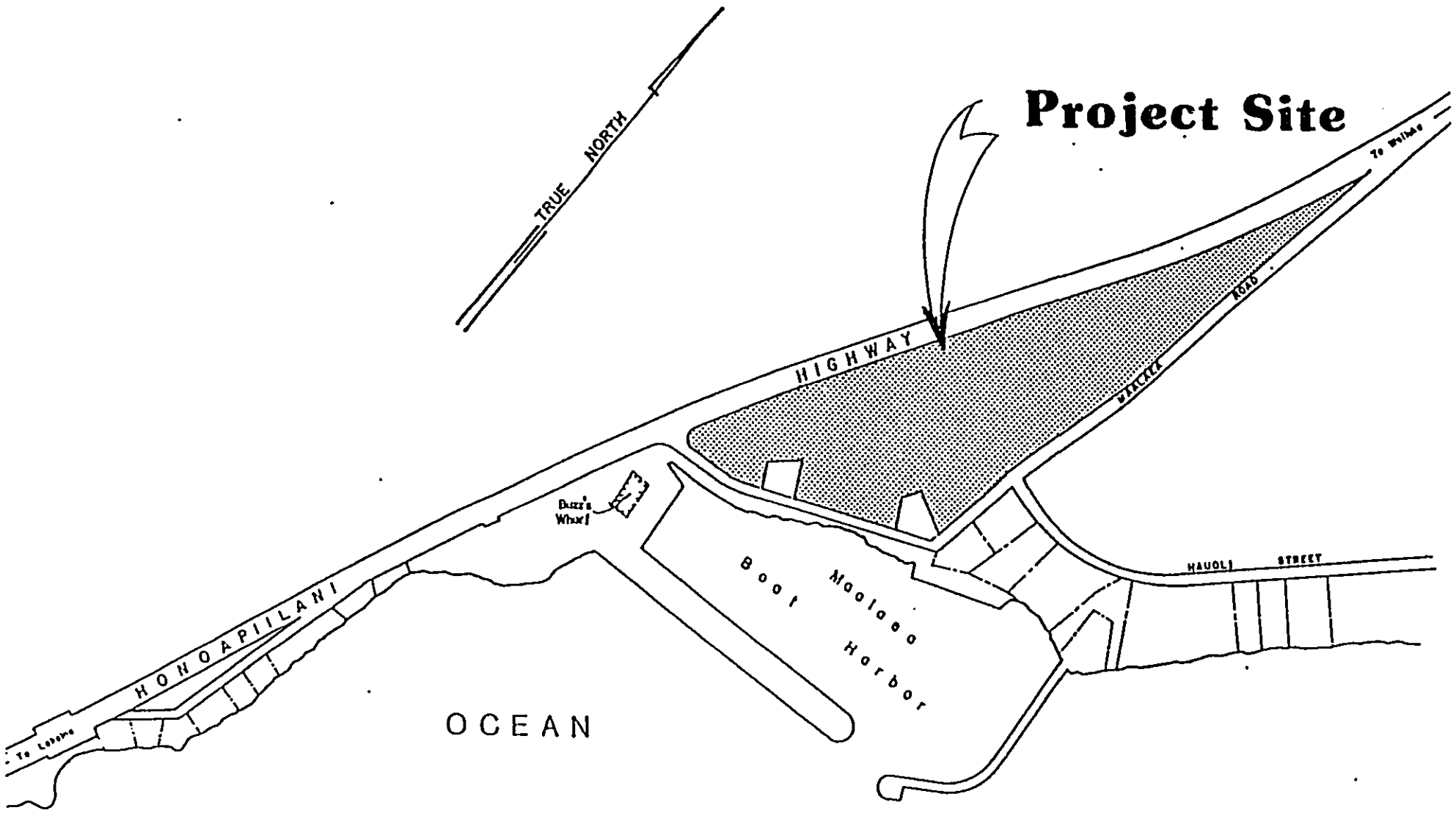


Exhibit 1
Location Map
Scale: 1"=500'

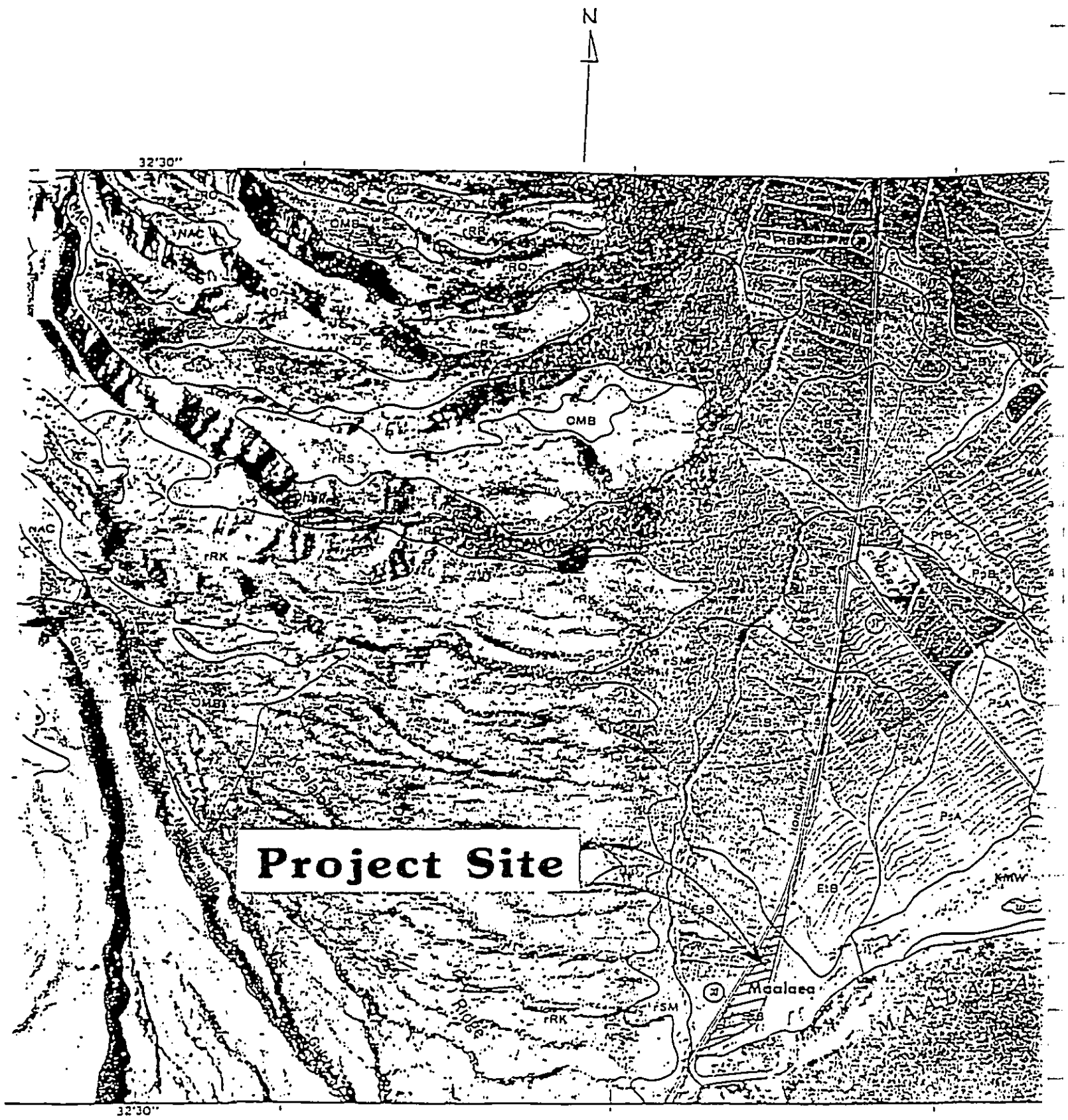


Exhibit 2
Soil Survey Ma
Scale: 1"=2000'

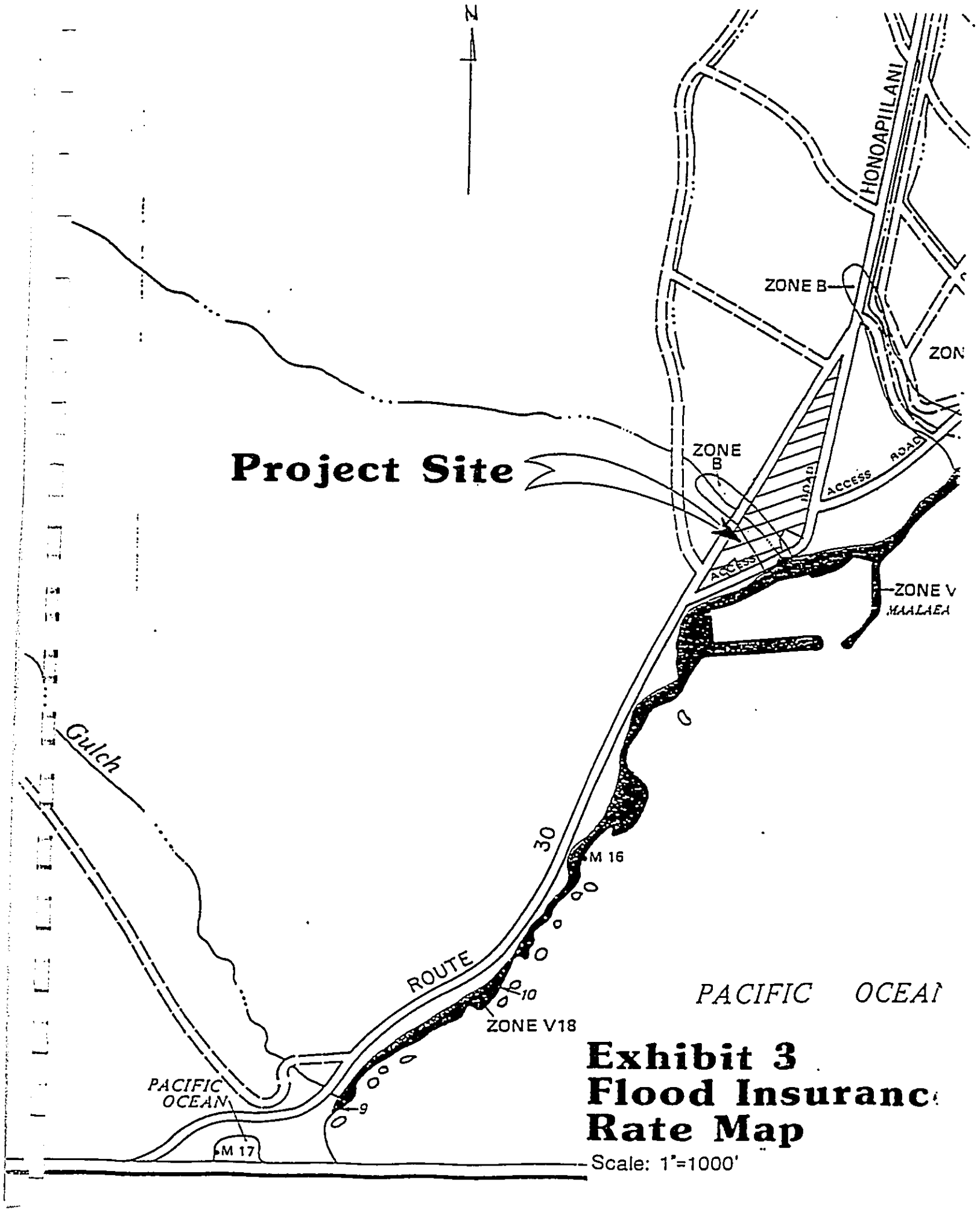


Exhibit 3
Flood Insurance Rate Map

Scale: 1"=1000'

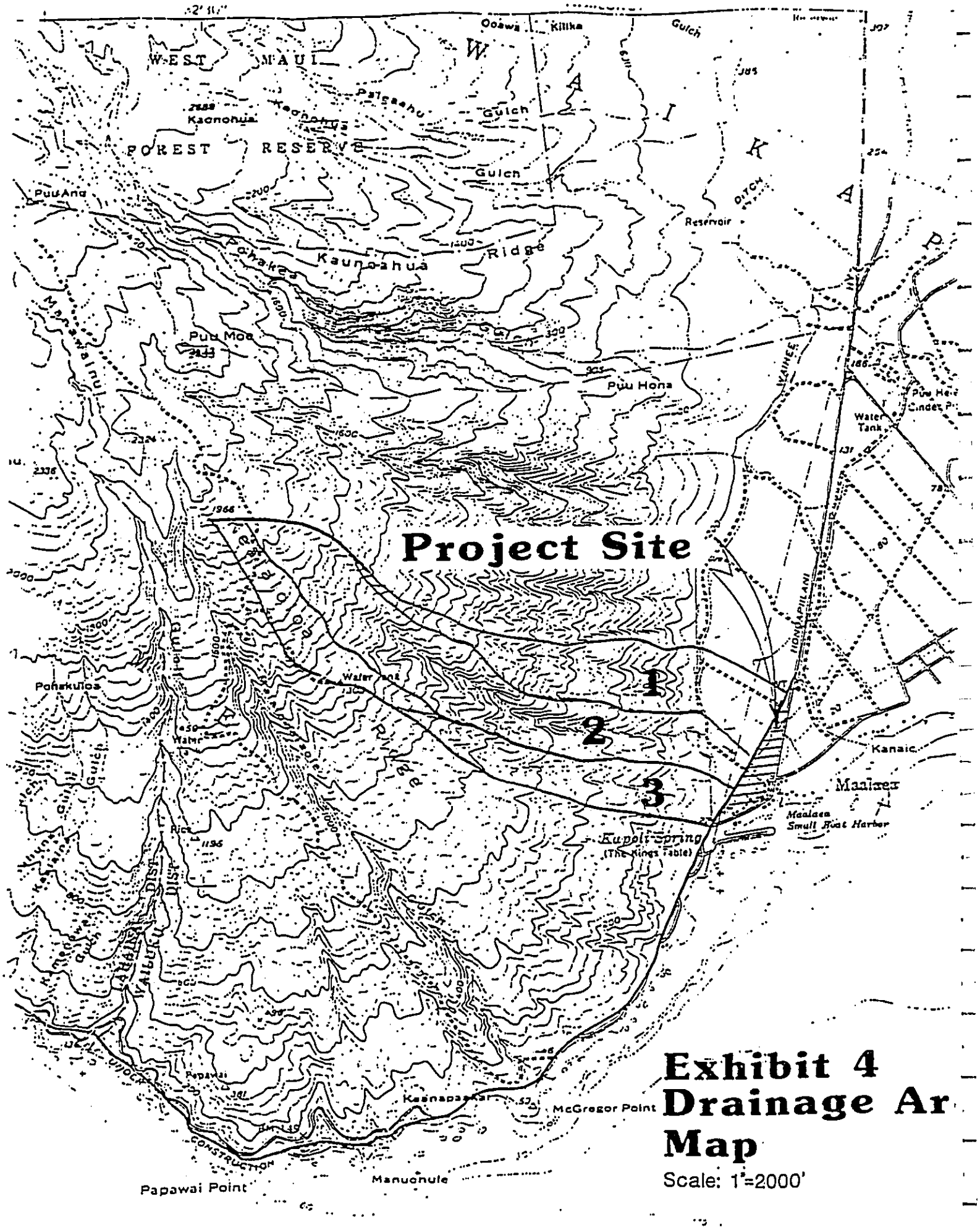


Exhibit 4
Drainage Ar
Map
Scale: 1"=2000'

APPENDICES

A Hydrologic Calculations
   1. Onsite Surface Runoff
   2. Offsite Surface Runoff

B Universal Soil Loss Equation Calculations

C References for Universal Soil Loss Equation

Page 1 of 2
M.D. UNDERWOOD ENGINEERING, INC.
2145 Wells Street Suite 403
Wailuku, Maui, Hawaii 96793

BY. CMM
DATE. January 10, 1991

HYDROLOGIC STUDY
FOR
MAALAEA TRIANGLE

MAALAEA, MAUI, HAWAII

ONSITE SURFACE RUNOFF BEFORE DEVELOPMENT

RECURRENCE INTERVAL.	10 years	HYDRAULIC LENGTH.	600.0 ft.
ONE-HOUR RAINFALL.	2.00 inches	ELEV'N. DIFFERENTIAL.	30.00 ft.
		HYDRAULIC SLOPE.	0.050 ft./ft
WEIGHTED RUNOFF COEFFICIENT, C:	0.25	TIME OF CONCENTRATION.	20.0 min.
INTENSITY, I.	2.85 inches		
AREA, A.	20.40 acres	SUB BASINS CONSIDERED.	1

Q = CIAm = 14.53 cfs

COMMENTS.

W.O. UNEMORI ENGINEERING, INC
2145 Wells Street Suite 4C
Wailuku, Maui, Hawaii 9679

BY: GMM
DATE: January 10, 1994

MAALAEA TRIANGLE
(continued)

TABULATION OF RUNOFF COEFFICIENTS & AREAS:

SUB-BASIN 1 OF 1 : AGRICULTURAL AREA

INFILTRATION:	Medium	0.07	
RELIEF:	Rolling (5-10%)	0.05	COMPOSITE C = 0.3
VEGETAL COVER	High (50-75%)	0.00	AREA = 20.400 acr
DEVELOPMENT:	Agricultural	0.15	

M.C. UNEMORI ENGINEERING, INC
2145 Wells Street Suite 40
Wailuku, Maui, Hawaii 96793

Ck. ____
DATE. January 10, 1994

HYDROLOGIC STUDY
FOR
MAALAEA TRIANGLE

MAALAEA, MAUI, HAWAII

ONSITE SURFACE RUNOFF AFTER DEVELOPMENT

RECURRENCE INTERVAL.	10 years	HYDRAULIC LENGTH.	600.0 ft.
ONE-HOUR RAINFALL.	2.00 inches	ELEV'N. DIFFERENTIAL.	30.00 ft.
		HYDRAULIC SLOPE.	0.050 ft./ft
WEIGHTED RUNOFF COEFFICIENT, C:	0.68	TIME OF CONCENTRATION.	21.0 min.
INTENSITY, I.	3.20 inches		
AREA, A:	20.40 acres	SUB BASINS CONSIDERED.	1

Q = CIfA = 44.37 cfs

COMMENTS.

W.O. UNEMORI ENGINEERING, INC
2145 Wells Street Suite 40
Wailuku, Maui, Hawaii 9679

BY: CMM
DATE. January 10, 1994

MALAEA TRIANGLE
[continued]

TABULATION OF RUNOFF COEFFICIENTS & AREAS:

SUB-BASIN 1 OF 1 : INDUSTRIAL/BUSINESS AREA

INFILTRATION:	Medium	0.07	
RELIEF.	Rolling (5 15%)	0.05	COMPOSITE C = 0.82
VEGETAL COVER:	Good (10-50%)	0.05	AREA = 20.100 acres
DEVELOPMENT.	Industrial / Business	0.65	

PURPOSE: Determine the weighted curve numbers and lag times for the three offsite drainage areas.

Calculations:

For Drainage Area 1: A_1 = 140.43 Acres = 0.22 sq.mi.

Soil Type & Curve Number:

Map Class	Soil Type	Hydrologic Classification	Curve Number
rRK	Rock land	D	83
rSM	Stony alluvial land	A	45
EsB	Ewa silty clay	B	59
EtB	Ewa cobbly silty clay	B	59

Weighted Curve = 94 Ac./140 Ac.(83) + 4 Ac./140 Ac.(45) + 40 Ac./140 Ac.(59) + 2 Ac./140 Ac.(59)

= 75

Lag Time:

Hydrograph Method: Tc = 1.67L Where $L = \frac{\ell^{0.8}(S+1)^{0.7}}{1900Y^{0.5}}$

Length of watershed (ℓ) = 7400 ft.

Difference in elevation = 1410 ft.

Slope (Y) = 1410/7400 = 19.1%

S = 1000/CN - 10 = 1000/75 - 10 = 3.3

$$L = \frac{(7400)^{0.8}(3.3+1)^{0.7}}{1900(19.1)^{0.5}}$$

= 0.42 hr.

Calculations:

For Drainage Area 2: A_2 = 217 Acres = 0.339 sq.mi.

Soil Type & Curve Number:

Map Class	Soil Type	Hydrologic Classification	Curve Number
OMB	Oli silt loam	B	66
rRK	Rock land	D	83
rSM	Stony alluvial land	A	45
EsB	Ewa silty clay	B	59

Weighted Curve = 16 Ac./217 Ac.(66) + 170 Ac./217 Ac.(83) + 10 Ac./217 Ac.(45) + 21 Ac./217 Ac.(59)

= 78

Lag Time:

Hydrograph Method: Tc = 1.67L Where $L = \frac{\ell^{0.8}(S+1)^{0.7}}{1900Y^{0.5}}$

Length of watershed (ℓ) = 9400 ft.

Difference in elevation = 1800 ft.

Slope (Y) = 1800/9400 = 19.1%

S = 1000/CN - 10 = 1000/78 - 10 = 2.8

$L = \frac{(9400)^{0.8}(2.8+1)^{0.7}}{1900(19.1)^{0.5}}$

= 0.46 hr.

Calculations:

For Drainage Area 3: A_3 = 158 Acres = 0.247 sq.mi.

Soil Type & Curve Number:

Map Class	Soil Type	Hydrologic Classification	Curve Number
OMB	Oli silt loam	B	66
rRK	Rock land	D	83
rSM	Stony alluvial land	A	45
EsB	Ewa silty clay	B	59

Weighted Curve = 21 Ac./158 Ac.(66) + 117 Ac./158 Ac.(83) + 14 Ac./158 Ac.(45) + 6 Ac./158 Ac.(59)

= 76

Lag Time:

Hydrograph Method: $Tc = 1.67L$ Where $L = \frac{\ell^{0.8}(S+1)^{0.7}}{1900Y^{0.5}}$

Length of watershed (ℓ) = 9800 ft.

Difference in elevation = 1926 ft.

Slope (Y) = 1926/9800 = 19.7%

$S = 1000/CN - 10 = 1000/76 - 10 = 3.2$

$$L = \frac{(9800)^{0.8}(3.2+1)^{0.7}}{1900(19.7)^{0.5}}$$

= 0.41 hr.

PAGE
W.C. UNEMORI ENGINEERING, INC.
Wailuku, Maui, Hawaii
JANUARY 10, 1994

HYDROLOGIC REPORT FOR

MAALAEA TRIANGLE

6 HOUR S. C. S. HYDROGRAPH

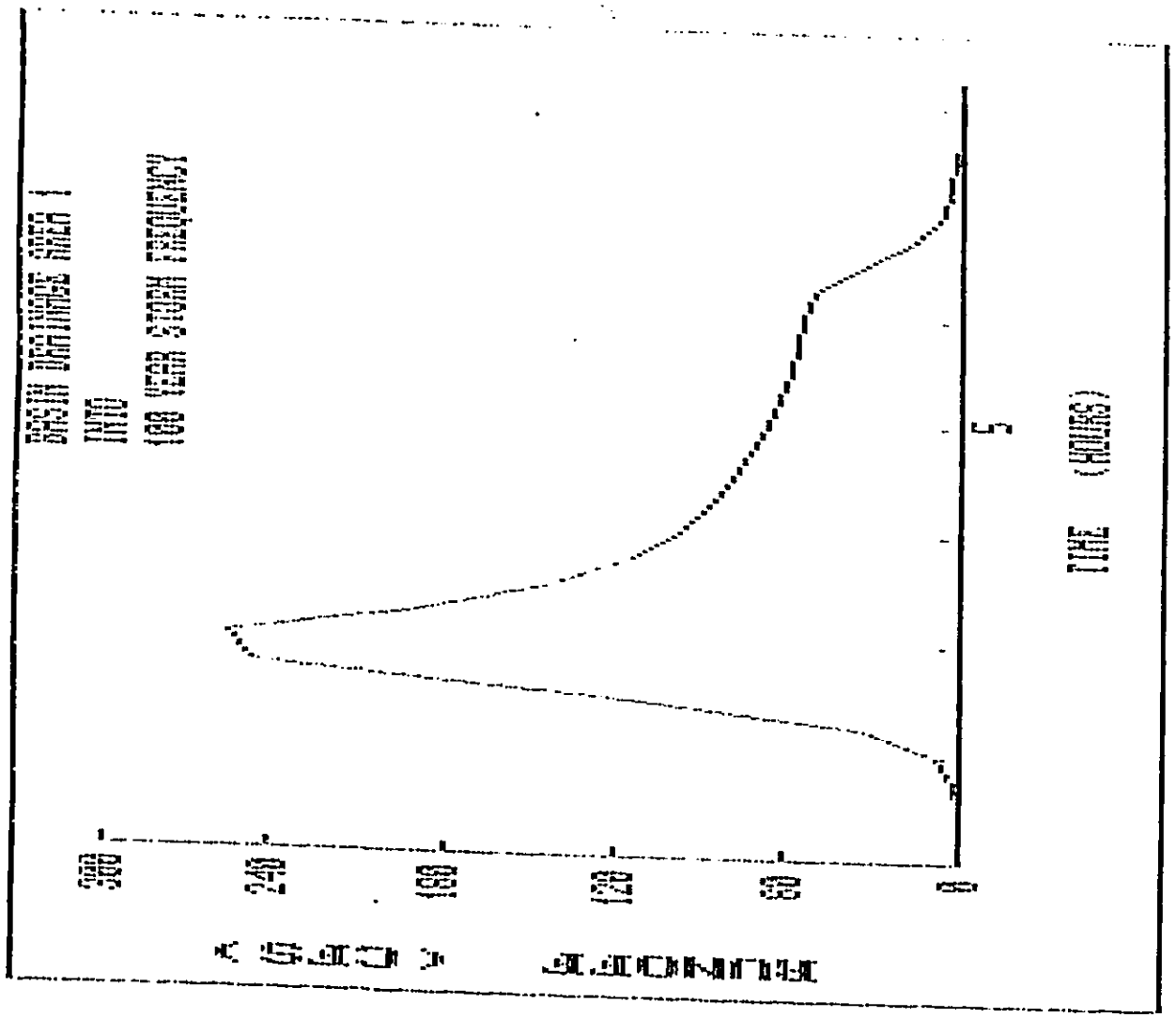
BASIN IDENTIFICATION: DRAINAGE AREA 1
BASIN DISCHARGES INTO

BASIN AREA	=	140.43	ACRES
BASIN CURVE NUMBER	=	75.00	
6-HOUR PRECIPITATION	=	6.00	INCHES
6-HOUR RUNOFF	=	3.28	INCHES
AVERAGE BASIN SLOPE	=	12.10	%
HYDRAULIC LENGTH	=	7,400.00	FEET
BASIN LAG ,(TC)	=	0.42	HOURS , 0.70 HOURS
UNITPEAK COEFFICIENT	=	484.00	
RAINFALL DISTRIBUTION	=	SCS TYPE II	

HYDROGRAPH RUNOFF VALUES
100 YEAR STORM FREQUENCY

TIME HOUR	RUNOFF C.F.S.	TIME HOUR	RUNOFF C.F.S.	TIME HOUR	RUNOFF C.F.S.	TIME HOUR	RUNOFF C.F.S.
0.00	0.0	0.25	0.0	0.50	0.0	0.75	0.0
1.00	0.0	1.25	0.0	1.50	0.0	1.75	1.4
2.00	7.9	2.25	38.1	2.50	150.6	2.75	245.2
3.00	253.8	3.25	183.7	3.50	140.8	3.75	113.4
4.00	98.2	4.25	86.8	4.50	78.6	4.75	71.9
5.00	66.5	5.25	62.1	5.50	58.0	5.75	54.1
6.00	50.3	6.25	47.4	6.50	33.3	6.75	12.4
7.00	6.5	7.25	1.5	7.50	1.1	7.75	0.4
8.00	0.1	8.25	0.0	8.50	0.0	8.75	0.0
9.00	0.0	9.25	0.0	9.50	0.0	9.75	0.0

TIME TO PEAK = 3.00 HOURS
PEAK RUNOFF = 253.79 C.F.S.



PREPARED BY
M.S. UNEMORI ENGINEERING, INC.
Wailuku, Maui, Hawaii
JANUARY 10, 1994

HYDROLOGIC REPORT FOR

MAALAEA TRIANGLE

6 HOUR S. C. S. HYDROGRAPH

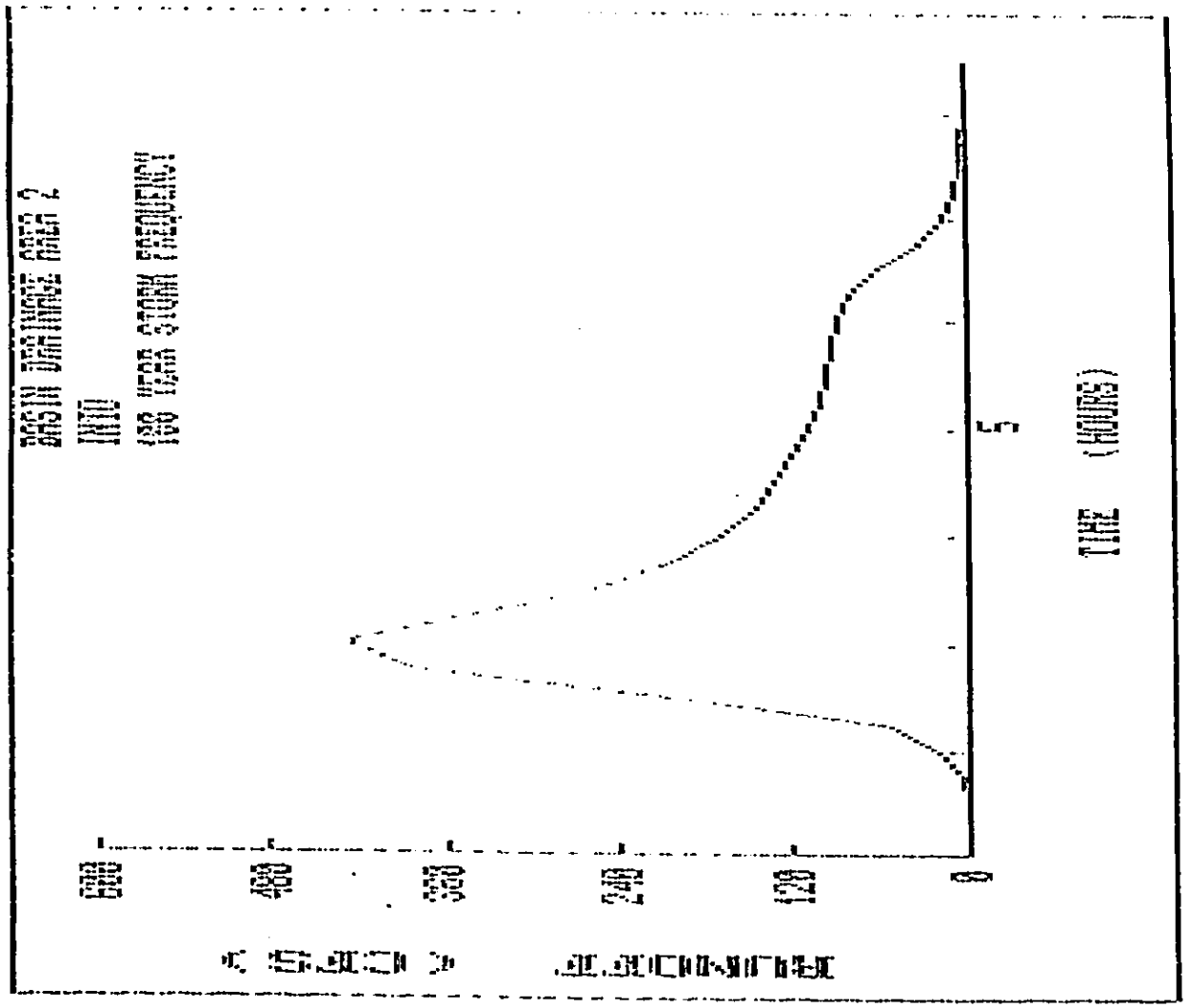
BASIN IDENTIFICATION DRAINAGE AREA 2
BASIN DISCHARGES INTO

BASIN AREA		21.00	ACRES
BASIN CURVE NUMBER	:	78.00	
6-HOUR PRECIPITATION		2.00	INCHES
6-HOUR RUNOFF	:	0.58	INCHES
AVERAGE BASIN SLOPE	:	10.10	%
HYDRAULIC LENGTH	:	2,400.00	FEET
BASIN LAG .(TL)	:	0.46	HOURS . 0.77 HOURS
UNITPEAK COEFFICIENT	:	484.00	
RAINFALL DISTRIBUTION	:	6 HR SCS	

HYDROGRAPH RUNOFF VALUES
100 YEAR STORM FREQUENCY

TIME HOUR	RUNOFF C.F.S.	TIME HOUR	RUNOFF C.F.S.	TIME HOUR	RUNOFF C.F.S.	TIME HOUR	RUNOFF C.F.S.
0.00	0.0	0.25	0.0	0.50	0.0	0.75	0.0
1.00	0.0	1.25	0.0	1.50	0.0	1.75	0.0
2.00	17.7	2.25	50.0	2.50	191.3	2.75	330.1
3.00	420.3	3.25	541.1	3.50	557.0	3.75	532.2
4.00	169.5	4.25	147.3	4.50	121.4	4.75	120.1
5.00	110.1	5.25	101.3	5.50	90.1	5.75	71.3
6.00	87.5	6.25	81.2	6.50	69.1	6.75	61.7
7.00	14.0	7.25	9.4	7.50	7.2	7.75	5.2
8.00	6.3	8.25	6.0	8.50	5.6	8.75	5.0
9.00	0.0	9.25	0.0	9.50	0.0	9.75	0.0

TIME TO PEAK - 5.00 HOURS
PEAK RUNOFF - 420.04 C.F.S.



W.O. UNEMORI ENGINEERING, INC.
Wailuku, Maui, Hawaii
JANUARY 10, 1994

HYDROLOGIC REPORT FOR

MAALAEA TRIANGLE

6 HOUR S. C. C. HYDROGRAPH

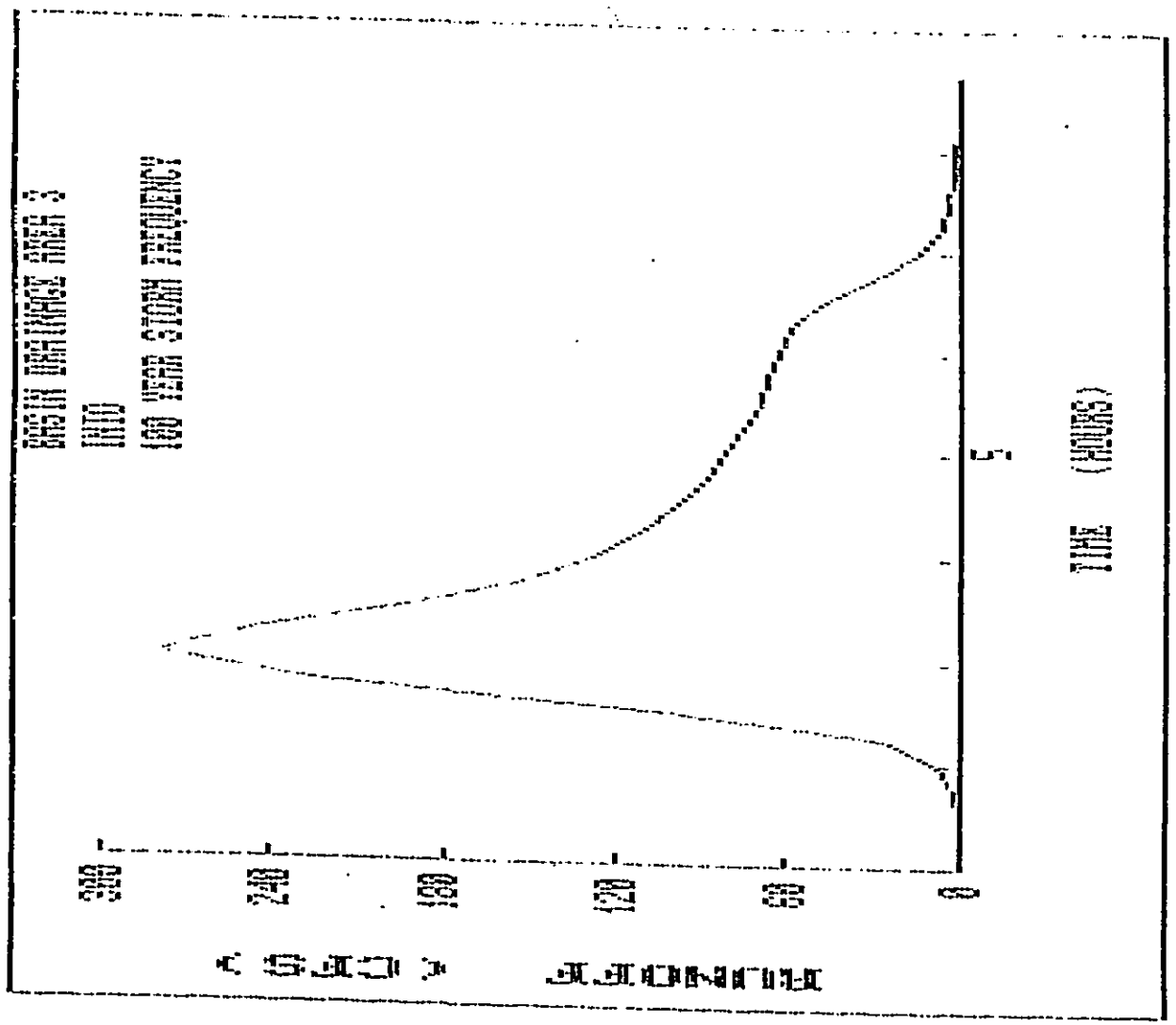
BASIN IDENTIFICATION DRAINAGE AREA 3
BASIN DISCHARGES INTO

BASIN AREA	:	153.00	ACRES
BASIN CURVE NUMBER	:	76.00	
6-HOUR PRECIPITATION	:	6.00	INCHES
6-HOUR RUNOFF	:	3.38	INCHES
AVERAGE BASIN SLOPE	:	14.70	%
HYDRAULIC LENGTH	:	3,000.00	FEET
BASIN LAG .(Tc)	:	3.31	HOURS . 3.00 HOURS
UNITPEAK COEFFICIENT	:	484.00	
RAINFALL DISTRIBUTION		NRCS	

HYDROGRAPH RUNOFF VALUES
100 YEAR STORM FREQUENCY

TIME HOUR	RUNOFF C.F.S.	TIME HOUR	RUNOFF C.F.S.	TIME HOUR	RUNOFF C.F.S.	TIME HOUR	RUNOFF C.F.S.
0.00	0.0	0.25	0.0	0.50	0.0	0.75	0.0
1.00	0.0	1.25	0.0	1.50	0.1	1.75	1.4
2.00	7.0	2.25	26.4	2.50	100.1	2.75	222.3
3.00	279.7	3.25	244.4	3.50	188.0	3.75	150.7
4.00	125.7	4.25	108.0	4.50	92.8	4.75	87.0
5.00	80.3	5.25	74.1	5.50	69.0	5.75	64.3
6.00	63.0	6.25	59.1	6.50	46.5	6.75	27.5
7.00	13.3	7.25	6.2	7.50	7.1	7.75	1.3
8.00	0.7	8.25	0.3	8.50	0.1	8.75	0.0
9.00	0.0	9.25	0.0	9.50	0.0	9.75	0.0
10.00	0.0	10.25	0.0	10.50	0.0	10.75	0.0

TIME TO PEAK = 3.00 HOURS
PEAK RUNOFF = 279.71 C.F.S.



APPENDIX "B"

Universal Soil Loss Equation Calculations

EROSION PROGRAM

HESL ANALYSIS
(UNIVERSAL SOIL LOSS EQUATION)

THESE EQUATIONS COMPUTE THEORETICAL SOIL MOVEMENT UNDER WATER EROSION CONDITIONS. THIS MOVEMENT DOES NOT NECESSARILY CONCLUDE THAT THE SOIL IS LOST TO THE SITE, ONLY THAT IT IS TRANSPORTED AN INCREMENTAL DISTANCE BY THE EROSIVE FORCES.

HESL EQN: E = RKLSCP (REF. (6), SEC. 24-1.2(K))

WHERE
E = SOIL LOSS IN TONS/ACRE/YR.
R = RAINFALL FOR EROSION IN TONS/AC./YR.
K = SOIL ERODIBILITY FACTOR, NO. DIMENSION.
L = SLOPE LENGTH IN FEET.
S = SLOPE IN PERCENT.
LS= SLOPE FACTOR FOR EQN., NO DIMENSION.
C = CROP MANAGEMENT FACTOR, NO DIMENSION.
P = EROSION CONTROL PRACTICE FACTOR, NO DIMENSION.

FACTORS FOR EQUATION ARE DEVELOPED FROM REF (1).

R: (PLATE M7-L-22937-4,SHT 2 OF 2), ESTIMATED = 150

K: SOIL SERIES FROM REF. (3), PL. (EWA SERIES)
FACTORS FROM REF (1), TABLE 3
COMPOSITE K = .17

L: SLOPE LENGTH IN PREDOMINANT DIRECTION OF OVERLAND RUNOFF.
L FACTOR = 600

OVERALL ELEVATION CHANGE ACROSS SITE.
V FACTOR = 30
S FACTOR = ((30 / 600) * 100) = 5 %

LS: REF (1); FIG. 2 = 1.31

C: REF (1), P. 7 FOR BARE GROUND
C FACTOR = 1

P: REF (1) P. 7 FOR CONSTRUCTION SITES
P FACTOR = 1

E: = RKLSCP
= (150)(.17)(1.31)(1)(1) = 33.405 TONS/ACRE/YR.

DETERMINE SEVERITY RATING NUMBER

H = (2FT + 3D)AE

F = 4.00 DOWNSLOPE - DOWNSTREAM DETRIMENT - SEVERE
D = 1.00 COSTAL WATER RATING FACTOR - CLASS B
A = 20.40 AREA OF DISTURBED LAND
E = 33.40 FROM PREVIOUS EQUATION
T = 1.00 YEARS - DURATION OF LAND DISTURBANCE

H = 7496.082

STANDARD SEVERITY RATING (ALLOWABLE) 50,000 > 7496.082

50,000 = (2FT + 3D)A*E

E = 50,000 / 224.4 = 222.8 TONS PER ACRE > 33.4

COSTAL HAZARD: CLASS 'B' WATERS ARE APPROX. 100 FT.
FROM THE SITE.

CONCLUSION: SEDIMENTATION HAZARD TO COASTAL WATERS AND DOWNSTREAM PROPERTIES IS MINIMAL. EROSION RATE COMPUTED FOR THIS PROJECT SITE IS WELL WITHIN THE TOLERABLE LIMITS AND ADDITIONAL CONTROL MEASURES ARE NOT REQUIRED.

EROSION CONTROL PLAN

THE FOLLOWING MEASURES WILL BE TAKEN TO CONTROL EROSION DURING THE SITE DEVELOPMENT PERIOD (ESTIMATED 12 MONTHS).

(1) MINIMIZE TIME OF CONSTRUCTION.
(2) RETAIN EXISTING GROUND COVER UNTIL LATEST DATE TO COMPLETE CONSTRUCTION.
(3) EARLY CONSTRUCTION OF DRAINAGE CONTROL FEATURES.
(4) USE OF TEMPORARY CUTOFF DITCHES AND BERMS.
(5) INSTALL TEMPORARY AREA SPRINKLERS IN NON-ACTIVE CONSTRUCTION AREAS WHEN GROUND COVER IS REMOVED. WATER TO BE OBTAINED FROM COUNTY WATER MAIN ADJACENT TO SITE.
(6) STATION WATER TRUCK ON SITE DURING CONSTRUCTION PERIOD TO PROVIDE FOR CONTINUOUS SPRINKLING IN ACTIVE CONSTRUCTION ZONES.

THE DEVELOPMENT PROJECT IS PROVIDED WITH ADEQUATE FACILITIES FOR DRAINAGE CONTROL AND STORM WATER DISPOSAL. THIS TOGETHER WITH ULTIMATE GROUND COVER WILL PRECLUDE ANY APPRECIABLE ON-SITE EROSION.

APPENDIX "C"

References for Universal Soil Loss Equation

REFERENCES

(1) SOIL CONSERVATION SERVICE (USDA); 'GUIDELINES FOR USE OF THE UNIVERSAL SOIL LOSS EQUATION IN HAWAII.' TECHNICAL NOTES, MARCH 1975. (REVISED DRAFT)

(2) COUNTY OF MAUI; (ORD NO. 816), 'CHAPTER 24,SOIL EROSION AND SEDIMENTATION CONTROL.' JUNE 13, 1975.

(3) SOIL CONSERVATION SERVICE (USDA); 'SOIL SURVEY OF ISLANDS OF KAUAI, OAHU, MAUI, MOLOKAI, AND LANAI, STATE OF HAWAII AUG. 1972.

(4) HAWAII ENVIRONMENTAL SIMULATION LABORATORY; 'GUIDELINES FOR DATA PREPARATION, PART 1; UNIVERSAL SOIL LOSS EQUATION UNDATED (DRAFT).

APPENDIX C

MISCELLANEOUS OCEANOGRAPHY AND WATER QUALITY DATA SHEETS AND TABLES

TABLE C•1. CHECKLIST OF PLANTS FOUND IN THE MA'ALAEA HARBOR VICINITY.

Species	Common name	Status	Abundance
	FERNS		
POLYPODIACEAE			
Microsorium scolopendria (Burm.) Copel.	*laua'e*	ind.?.	Uncommon
	MONOCOTYLEDONES		
AGAVACEAE			
Cordyline fruticosa (L.) A. Chev.	ornamental ti	orn.	Uncommon
ARECACEAE			
Cocos nucifera L.	coconut palm, *niu*	pol.	Occasional
HELICONIACEAE			
Heliconia rostrata Ruiz & Pavon.	parrot's beak heliconia	orn.	Occasional
MUSACEAE			
Musa x *paradisiaca* L.	banana	pol.	Uncommon
POACEAE (GRAMINEAE)			
Cenchrus ciliaris L.	buffelgrass	nat.	Abundant
Chloris radiata (L.) Sw.	plush grass	nat.	Uncommon
** *Coix lachryma-jobi* L.	Job's tears, *pu'ohe'ohe*	nat.	Occasional
Panicum maximum Jacq.	Guinea grass	nat.	Common
	DICOTYLEDONES		
ACANTHACEAE			
Asystasia gangetica (L.) T. Anders	Chinese violet	nat.	Common
AIZOACEAE			
Sesuvium portulacastrum (L.) L.	*'akulikuli*	ind.	Uncommon
AMARANTHACEAE			
Amaranthus spinosus L.	spiny amaranth	nat.	Occasional
APOCYNACEAE			
Cascabela thevetia (L.) Lippold	be-still tree	nat.	Common
Plumeria acuminata Ait.	plumeria, frangipani	orn.	Uncommon
Plumeria obtusa L.	Singapore plumeria	orn.	Occasional
ASTERACEAE (COMPOSITAE)			
Emilia fosbergii Nicolson	*pualele*	nat.	Uncommon
BIGNONIACEAE			
Spathodea campanulata P. Beauv.	African tulip tree	nat.	Uncommon
BORAGINACEAE			
Heliotropium curassavicum L.	seaside heliotrope, *kipukai*	ind.	Occasional
CASUARINACEAE			
Casuarina equisetifolia L.	common ironwood	nat.	Occasional

TABLE C•1. MA'ALAEA HARBOR PLANT SPECIES CHECKLIST (continued)

Species	Common name	Status	Abundance
CHENOPODIACEA			
Atriplex semibaccata R. Br.	Australian saltbush	nat.	Occasional
Chenopodium murale L.	*'aheahea*	nat.	Occasional
CONVOLVULACEAE			
Ipomoea ?littoralis Blume		ind.?	Uncommon
Jacquemontia ovalifolia H. Hallier	*pa'uohi'iaka*	ind.	note 1
CUCURBITACEAE			
Momordica charantia L.	balsam apple	nat.	*Common*
GOODENIACEAE			
Scaevola sericea Vahl	beach *naupaka*	ind.	Uncommon
EUPHORBIACEAE			
Ricinus communis L.	castor bean, *pa'aila*	nat.	Occasional
FABACEAE			
Leucaena leucocephala (Lam.) deWit	*koa haole*	nat.	Occasional
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	*kiawe*	nat.	Abundant
LAMIACEAE			
Leonotis nepetifolia (L.) R. Br.	lion's ear	nat.	Uncommon
MALVACEAE			
Abutilon grandifolium (Willd.) Sweet	hairy abutilon, *ma'o*	nat.	Uncommon
Thespesia populnea (L.) Sol. ex Corrêa	*milo*	ind.?	Planted
NYCTAGINACEAE			
Boerhavia coccinea Mill.		nat.	Uncommon
STERCULIACEAE			
Waltheria indica L.	*'uhaloa*	ind.?	Occasional

Note 1: Species reported in R.M. Towill Corp. (1982) not reported by USFWS (1980) or recorded in the 1994 site survey, but which may be present.

KEY: * - Faculative wetland species - may be found outside of wetlands.
** - Obligate wetland species - found only in wetlands.

Status = distributional status
end. = endemic; native to Hawaii and found naturally no where else.
ind. = indigenous; native to Hawaii, but not unique to the Hawaiian Islands.
nat. = naturalized, exotic, plant introduced to the Hawaiian Islands since the arrival of Cook Expedition, and well-established outside of cultivation.
orn. = exotic, ornamental; plant not naturalized (not well-established outside of cultivation)..
pol. = polynesian introduction.

Abundance = abundance ratings are for this site only.
Uncommon - a plant found less than five times;
Occasional - a plant that was found between five and ten times;
Common - a plant considered an important part of the vegetation
Abundant - plants found in large numbers, dominant or locally dominant.

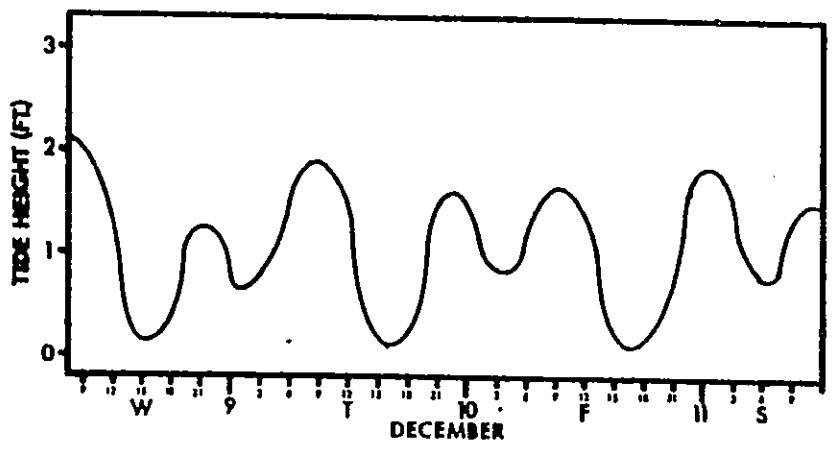
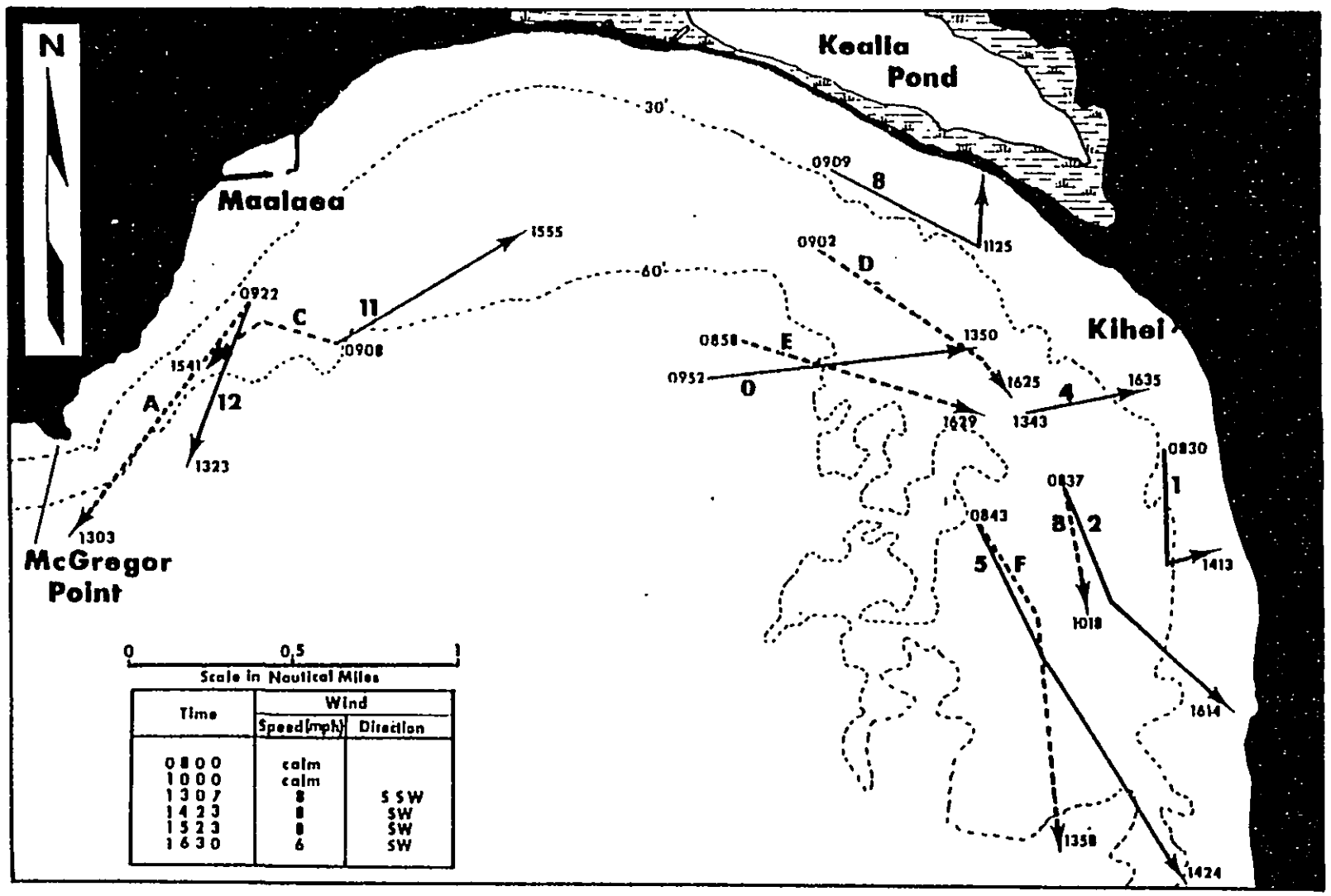


Diagram A. Predicted tides at Kihei, Maui during study period.

FIGURE C-1
PROGRESSIVE VECTOR DIAGRAM OF CURRENT METER DATA
(Dots Indicate One Hour Intervals)



Time	Wind	
	Speed (mph)	Direction
0800	calm	
1000	calm	
1307	8	SSW
1423	8	SW
1523	8	SW
1630	6	SW

FIGURE C-2
CURRENT DROGUE SURVEY FOR DECEMBER 3, 1971

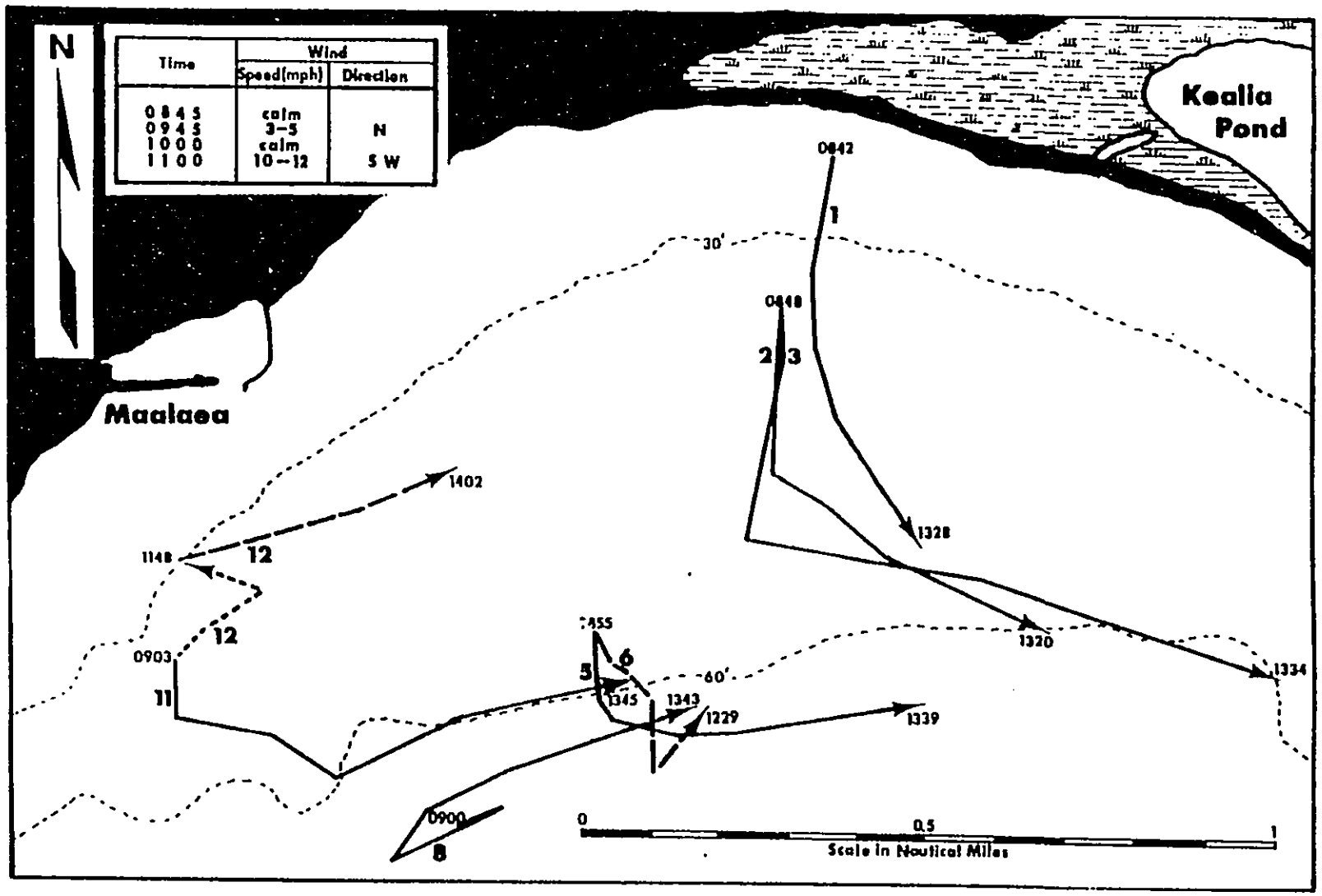
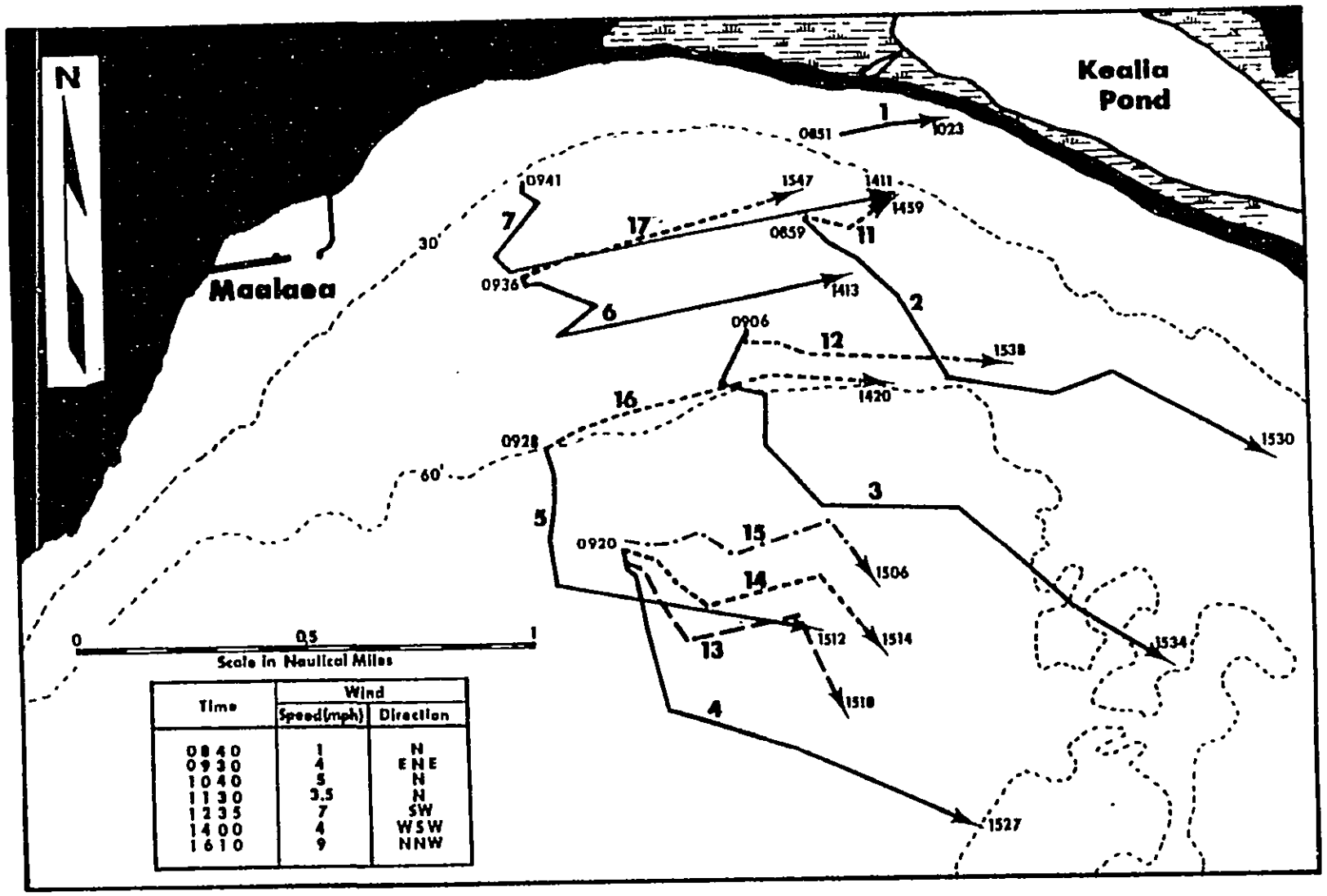
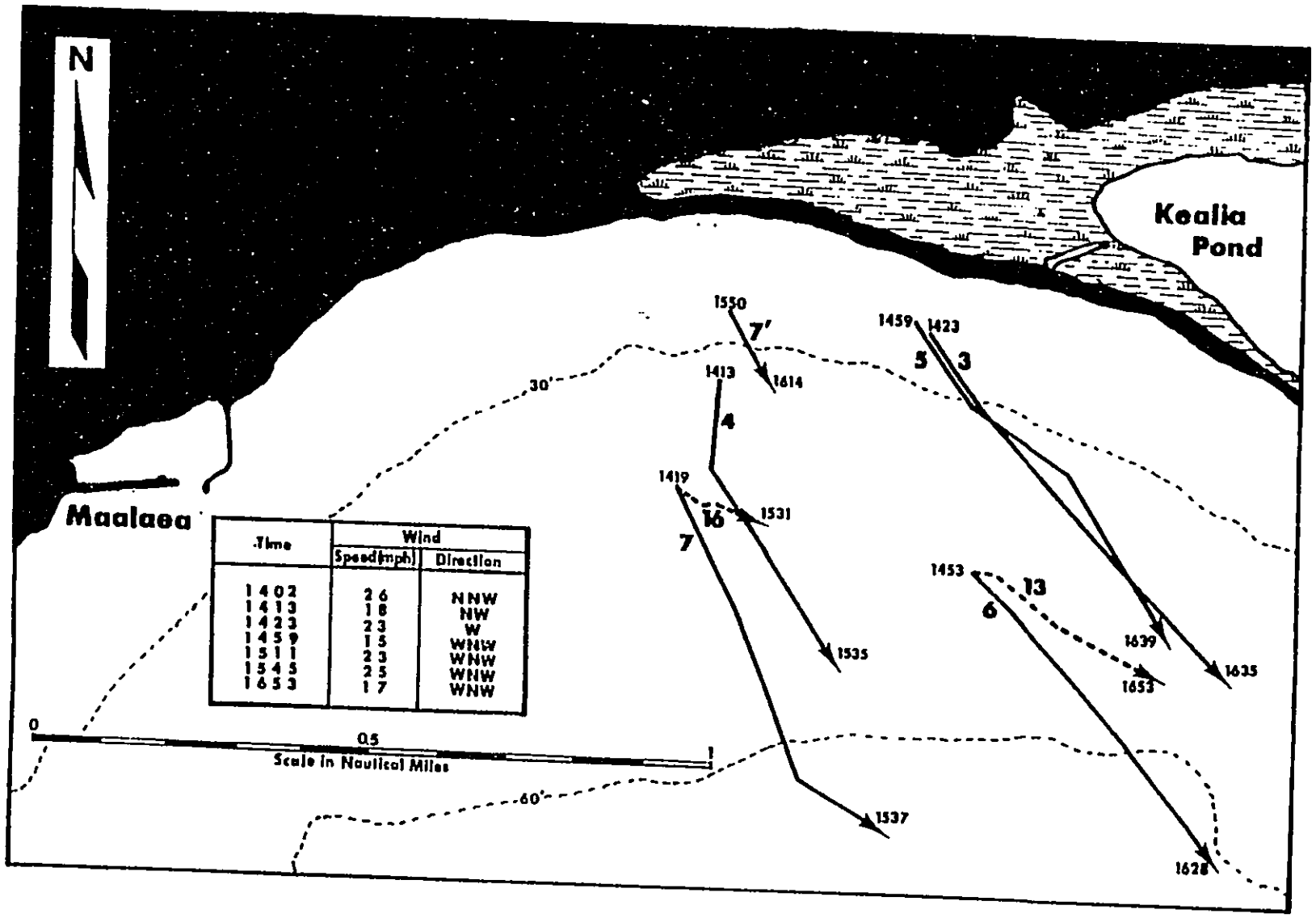


FIGURE C-3
CURRENT DROGUE SURVEY FOR DECEMBER 6, 1971



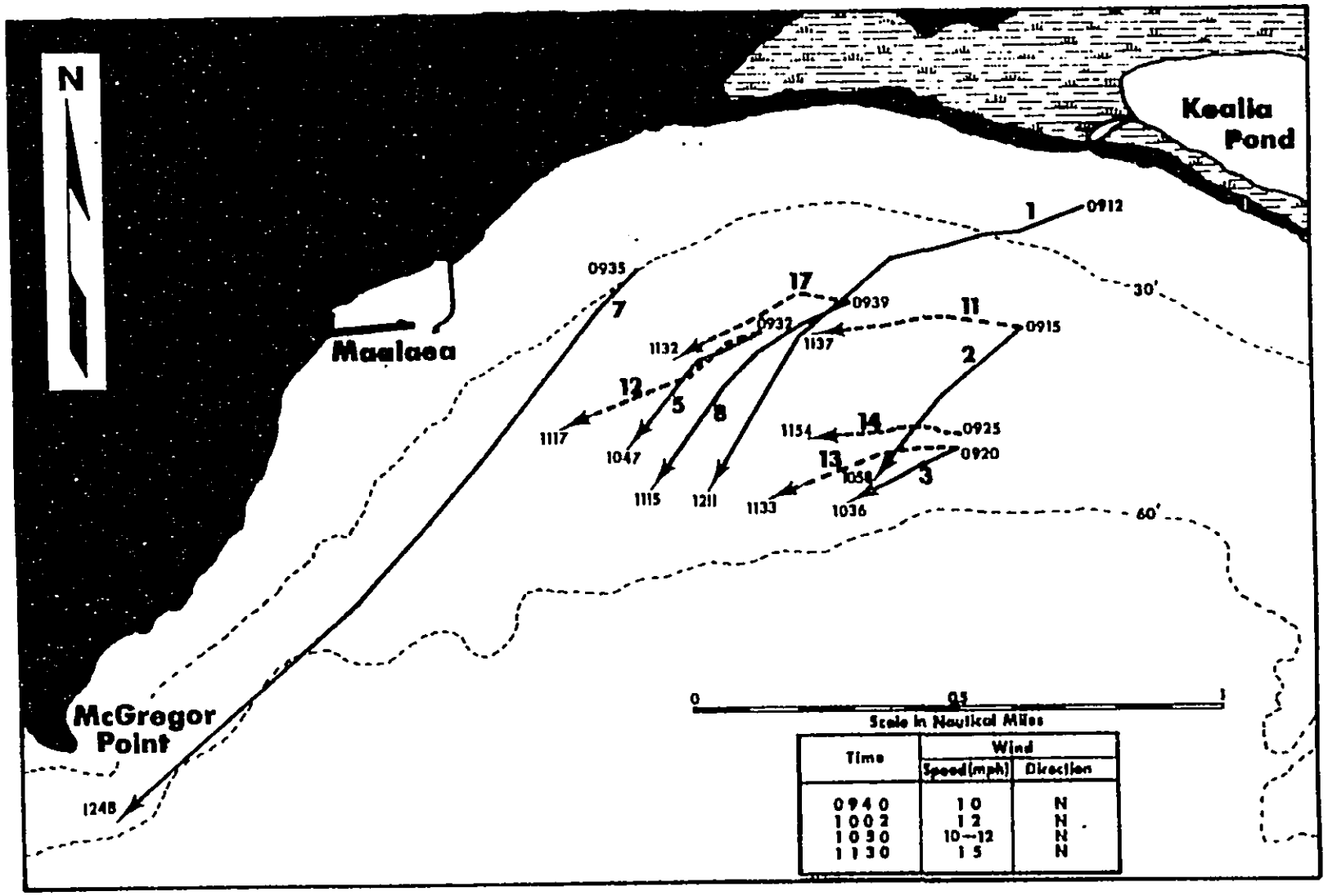
Time	Wind	
	Speed(mph)	Direction
0840	1	N
0930	4	ENE
1040	5	N
1130	3.5	N
1235	7	SW
1400	4	WSW
1610	9	NNW

FIGURE C-4
CURRENT DROGUE SURVEY FOR DECEMBER 8, 1971



Time	Wind	
	Speed(mph)	Direction
1402	26	NNW
1413	18	NW
1423	23	W
1459	15	WNW
1511	23	WNW
1545	25	WNW
1653	17	WNW

FIGURE C-5
CURRENT DROGUE SURVEY FOR DECEMBER 9, 1971



Time	Wind	
	Speed(mph)	Direction
0940	10	N
1002	12	NN
1050	10—12	NN
1130	15	N

FIGURE C-6
CURRENT DROGUE SURVEY FOR DECEMBER 10, 1971

TABLE C•2 MA'ALAEA BAY WATER QUALITY DATA
(after Cattell & Miller, 1972)

STA. I - ~1 km south of Ma'alaea Harbor

EVENT NO.	DATE	TIME	NO_3+NO_2 (µg N/l)	NH_3 (µg N/l)	PHOS-PHATE (µg P/l)	POC (µg /l)	CHL α (µg/l)	PRIMARY PROD. (µgC/l/hr)
001	01/09/72		4.5	8.3	4.0	150	0.23	1.97
002	01/15/72		11.1	3.8	7.4	140	0.13	1.54
003	01/22/72		nd	4.1	3.7	154	0.40	3.45
004	01/29/72		nd	8.3	4.0	99	0.34	2.78
005	02/12/72		4.9	4.5	4.6	109	0.08	1.05
006	02/19/72		–	–	–	–	–	–
wet season means			2.3	5.4	4.6	128	0.20	1.98

STA. II - off Kanaio ~ 0.5 km west of Ma'alaea Harbor

EVENT NO.	DATE	TIME	NO_3+NO_2 (µg N/l)	NH_3 (µg N/l)	PHOS-PHATE (µg P/l)	POC (µg /l)	CHL α (µg/l)	PRIMARY PROD. (µgC/l/hr)
001	01/09/72		1.7	7.0	3.7	194	0.17	1.84
002	01/15/72		1.8	8.4	4.3	187	0.25	2.30
003	01/22/72		nd	5.3	2.8	214	0.48	5.21
004	01/29/72		1.8	3.3	3.4	119	0.55	9.01
005	02/12/72		2.1	1.3	1.5	89	0.38	4.10
006	02/19/72		6.7	nd	1.5	125	0.27	0.98
wet season means			1.8	3.0	2.6	147	0.32	3.04

STA. III - "Kihei Shoals"

EVENT NO.	DATE	TIME	NO_3+NO_2 (µg N/l)	NH_3 (µg N/l)	PHOS-PHATE (µg P/l)	POC (µg /l)	CHL α (µg/l)	PRIMARY PROD. (µgC/l/hr)
001	01/09/72		nd	6.1	5.0	140	0.10	0.96
002	01/15/72		2.1	7.8	7.1	102	0.12	1.13
003	01/22/72		10.1	7.9	6.5	–	0.22	1.08
004	01/29/72		–	–	–	–	–	–
005	02/12/72		2.8	3.6	4.0	46	0.14	1.23
006	02/19/72		–	–	–	–	–	–
wet season means			2.3	6.1	5.5	87	0.14	1.10

TABLE C-2 MA'ALAEA BAY WATER QUALITY DATA (Continued)

STA. IV - ~500 m off Kihei Pier

EVENT NO.	DATE	TIME	NO_3+NO_2 (µg N/l)	NH_3 (µg N/l)	PHOS-PHATE (µg P/l)	POC (µg /l)	CHL α (µg/l)	PRIMARY PROD. (µgC/l/hr)
001	01/09/72		69.9	3.6	5.0	134	0.44	3.80
002	01/15/72		13.4	4.8	5.9	147	0.24	2.22
003	01/22/72		9.1	5.7	3.7	–	0.38	4.13
004	01/29/72		10.1	3.8	4.0	119	0.45	4.37
005	02/12/72		11.3	4.9	4.6	108	0.42	3.90
006	02/19/72		75.5	6.7	5.3	167	0.28	3.87
wet season means			20.5	4.8	4.7	133	0.36	3.63

STA. V - ~2.5 km southeast of McGregor Point

EVENT NO.	DATE	TIME	NO_3+NO_2 (µg N/l)	NH_3 (µg N/l)	PHOS-PHATE (µg P/l)	POC (µg /l)	CHL α (µg/l)	PRIMARY PROD. (µgC/l/hr)
001	01/09/72		–	–	–	–	–	–
002	01/15/72		–	–	–	–	–	–
003	01/22/72		7.6	9.4	3.4	100	0.09	–
004	01/29/72		nd	7.0	3.4	78	0.14	0.95
005	02/12/72		–	–	–	–	–	–
006	02/19/72		–	–	–	–	–	–
wet season means			–	–	–	–	–	–

NOTE: In these tables means are geometric means calculated by substituting the value 0.5 for "nd".

FILE: 780

Table C-3
MA'ALAEA, MAUI

STATION 1 ~100 m OFFSHORE, WEST OF HARBOR

EVENT No.	DATE	TIME	DEPTH (m)	TEMP. (°C)	SALINITY (ppt)	SALINITY (ppt)	D.O. (mg/L)	pH	TURB. (NTU)	TSS (mg/L)	NO_3+NO_2 (µg N/L)	NH_3 (µg N/L)	TOT. N (µg N/L)	TOT. P (µg P/L)	SILICATE (µg Si/L)	Chl. α (µg/L)
001	04/28/94	*1150*	0.1	*25.3*	35	34.38	6.4	8.26	1.01	1.6	16	2	132	10	164	0.24
001	04/28/94	*1150*	3.5	--	--	34.45	--	--	0.77	1.7	--	--	--	--	--	--
002	05/09/94	1040	0.1	--	--	34.42	--	8.20	0.68	1.5	26	3	153	15	275	0.46
002	05/09/94	1040	3.5	--	--	--	--	--	0.73	--	--	--	--	--	--	--
003	06/07/94	1130	0.2	--	--	34.27	--	8.41	0.80	2.5	24	2	128	21	221	0.52
003	06/07/94	1130	4.0	--	--	34.57	--	--	0.70	3.4	--	--	--	--	--	--
means				--	--	**34.42**	--	**8.29**	**0.77**	**2.0**	**22**	**2**	**137**	**15**	**212**	**0.39**

STATION 2 SHORE AT KAPOLI BEACH PARK

EVENT No.	DATE	TIME	DEPTH (m)	TEMP. (°C)	SALINITY (ppt)	SALINITY (ppt)	D.O. (mg/L)	pH	TURB. (NTU)	TSS (mg/L)	NO_3+NO_2 (µg N/L)	NH_3 (µg N/L)	TOT. N (µg N/L)	TOT. P (µg P/L)	SILICATE (µg Si/L)	Chl. α (µg/L)
001	04/28/94	1140	0.1	24.2	33.5	33.34	7.1	8.42	3.21	7.4	51	9	201	11	733	1.12
002	05/09/94	1100	0.1	26.5	34	33.67	--	8.44	2.89	4.2	24	7	174	18	520	1.06
003	06/07/94	1055	0.1	25.9	--	33.88	8.15	8.42	1.65	4.4	12	5	137	15	440	0.84
means				**25.5**	--	**33.63**	**7.6**	**8.43**	**2.48**	**5.2**	**24**	**7**	**168**	**14**	**551**	**1.00**

STATION 3 MOUTH OF MA'ALAEA HARBOR OFF SOUTH MOLE

EVENT No.	DATE		DEPTH (m)	TEMP. (°C)	SALINITY (ppt)	SALINITY (ppt)	D.O. (mg/L)	pH	TURB. (NTU)	TSS (mg/L)	NO_3+NO_2 (µg N/L)	NH_3 (µg N/L)	TOT. N (µg N/L)	TOT. P (µg P/L)	SILICATE (µg Si/L)	Chl. α (µg/L)
001	04/28/94	1220	0.1	25.8	--	33.77	6.6	8.28	1.24	2.6	81	10	205	20	564	0.70
002	05/09/94	1150	0.1	26.0	34	33.43	--	8.30	1.53	2.8	69	13	226	21	642	1.35
003	06/07/94	1045	0.1	25.6	--	33.41	6.15	8.26	1.64	3.3	98	12	226	21	684	0.61
means				**25.8**	--	**33.54**	**6.4**	**8.28**	**1.46**	**2.9**	**82**	**12**	**219**	**21**	**628**	**0.83**

FILE: 780

Table C-3 (Continued)

STATION 4 INNER MA'ALAEA HARBOR, NEAR BOAT RAMP

EVENT No.	DATE	TIME	DEPTH (m)	TEMP. (°C)	SALINITY (ppt)	SALINITY (ppt)	D.O. (mg/L)	pH	TURB. (NTU)	TSS (mg/L)	NO_3+NO_2 (µg N/L)	NH_3 (µg N/L)	TOT. N (µg N/L)	TOT. P (µg P/L)	SILICATE (µg Si/L)	Chl. α (µg/L)
001	04/28/94	1235	0.1	26.2	32	30.53	6.3	8.20	9.26	21.6	327	31	579	60	2670	7.5
002	05/09/94	1200	0.1	26.3	32	33.76	--	8.26	21.0	32.1	176	34	479	94	1520	17.7
003	06/07/94	1035	0.1	25.4	--	31.24	5.78	8.20	13.3	33.9	274	27	470	62	2324	7.3
means				26.0	--	31.84	6.0	8.22	13.7	28.6	251	30	507	70	2113	9.9

STATION 5 MA'ALAEA HARBOR, WEST SIDE OF SAMPAN WHARF

EVENT No.	DATE	TIME	DEPTH (m)	TEMP. (°C)	SALINITY (ppt)	SALINITY (ppt)	D.O. (mg/L)	pH	TURB. (NTU)	TSS (mg/L)	NO_3+NO_2 (µg N/L)	NH_3 (µg N/L)	TOT. N (µg N/L)	TOT. P (µg P/L)	SILICATE (µg Si/L)	Chl. α (µg/L)
001	04/28/94	1240	0.1	25.3	33	32.50	6.1	8.22	3.06	5.5	192	15	315	39	1050	1.04
002	05/09/94	1215	0.1	25.8	32	32.15	--	8.24	2.02	5.6	264	21	399	44	1440	1.35
003	06/07/94	1025	0.1	25.4	--	32.63	5.64	8.20	4.85	6.0	202	22	318	34	1728	0.91
means				25.5	--	32.43	5.87	8.22	3.11	5.7	217	19	342	39	1377	1.08

STATION 6 MA'ALAEA SHORE, BASE OF EAST BREAKWATER

EVENT No.	DATE	TIME	DEPTH (m)	TEMP. (°C)	SALINITY (ppt)	SALINITY (ppt)	D.O. (mg/L)	pH	TURB. (NTU)	TSS (mg/L)	NO_3+NO_2 (µg N/L)	NH_3 (µg N/L)	TOT. N (µg N/L)	TOT. P (µg P/L)	SILICATE (µg Si/L)	Chl. α (µg/L)
001	04/28/94	1250	0.1	27.0	28	27.54	11.8	8.70	1.40	4.1	320	16	511	28	2640	2.04
002	05/09/94	1228	0.1	26.5	34	33.79	--	8.50	5.08	10.1	61	24	361	33	577	2.94
003	06/07/94	1015	0.1	26.7	--	27.45	14.0	8.56	--	--	256	<1	481	48	3065	--
means				26.7	--	29.59	12.9	8.59	2.67	6.4	171	6	446	35	1671	2.45

FILE: 780

Table C-3 (Continued)

STATION 7 MA'ALAEA PARK, KANAIO

EVENT No.	DATE	TIME	DEPTH (m)	TEMP. (°C)	SALINITY (ppt)	SALINITY (ppt)	D.O. (mg/L)	pH	TURB. (NTU)	TSS (mg/L)	NO_3+NO_2 (µg N/L)	NH_3 (µg N/L)	TOT. N (µg N/L)	TOT. P (µg P/L)	SILICATE (µg Si/L)	Chl. α (µg/L)
001	04/28/94	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
002	05/09/94	1240	0.1	--	--	--	--	--	--	--	--	--	--	--	--	--
003	06/07/94	1000	0.1	25.7	--	33.50	7.08	8.33	3.58	12.1	111	9	275	48	1070	--
											70	6	196	21	635	3.7

means

APPENDIX D

MAUI PLANNING COMMISSION
SMA PERMIT CONDITIONS

LINDA CROCKETT LINGLE
Mayor

COUNTY OF MAUI
PLANNING DEPARTMENT
250 S. HIGH STREET
WAILUKU, MAUI, HAWAII 96793

BRIAN W. MISKAE
Director

GWEN Y. OHASHI
Deputy Director

April 14, 1994

Mr. Christopher L. Hart
Chris Hart & Partners
1955 Main Street, Suite 200
Wailuku, Maui, HI 96793-1706

Dear Mr. Hart:

Subject: Maalaea Triangle Partnership Requesting Amendments to the Special Management Area Permit for the Maalaea Triangle Project in Order to: 1) Transfer the Permit Holder from the Maalaea Triangle Partnership to the Maalaea Triangle Partnership and the Maui Ocean Center, Inc.; 2) Extend the Period to Initiate Project Construction for One Year or Until June 19, 1995; and 3) Incorporate the Maui Ocean Center into the Project Plans at TMK: 3-6-001:1 and 19, Maalaea, Maui. (89/SM1-003)

At its regular meeting on April 12, 1994, the Maui Planning Commission reviewed the above requests. The applicant amended their request for time-extension to initiate project construction from 12 months to 18 months because of the anticipated time it would take to secure necessary government permits for the ocean intake and discharge structures. After due deliberation, the Maui Planning Commission voted to approve of the above mentioned requests, subject to the following conditions:

1. That construction of the project shall be initiated before December 20, 1995. Further initiation of construction shall be determined as construction of off-site improvements, issuance of a foundation permit and initiation of construction of the foundation, or issuance of a building permit and initiation of building construction, whichever occurs first. Failure to comply within the time limit will terminate the SMA Use Permit.

2. That final construction shall be in accordance with preliminary architectural plans dated December 1988 and revised plans dated January 1994.

3. That the construction of the project shall be completed within five (5) years after date of its initiation. Failure to complete construction within this period will automatically terminate the SMA Use Permit.

4. That the applicant shall contribute his pro-rata share to traffic improvements to be determined by the County and traffic master plans. An agreement to the above shall be prepared for filing with the State's Bureau of Conveyances by the developer.

5. That Honoapiilani Highway at its intersection with the main access road to this project be signalized as approved by the State Department of Transportation, Highways Division and by the Department of Public Works and Waste Management, Engineering Division.

6. That the developer shall revise the traffic impact study to reflect the following:

   a. Intersection improvements at the northerly connection of Honoapiilani Highway and Old Maalaea Road would be required. It is recommended that the southbound movement from Honoapiilani Highway to Old Maalaea Road be eliminated.

   b. The intersection improvements at Honoapiilani Highway and the proposed project access road should be modified to reflect the diverted traffic.

   c. It is recommended that the intersection at the southerly connection of Honoapiilani Highway and Old Maalaea Road allow for only right turns in and out. The intersection improvements should be modified accordingly.

   d. Honoapiilani Highway, between the northerly and southerly connections to Old Maalaea Road, should be a divided highway. Recommendations for roadway improvements along this segment should be modified accordingly.

7. That a 30 ft. radii shall be provided at all intersections and at corners of this large lot.

8. That the developer shall add the following measures to the Soil Erosion Control Plan to minimize on-site runoff, erosion, and sedimentation:

a. Conduct grubbing and grading activities during the low rainfall months (April-October).

b. Clear areas sequentially so that only a small portion of the total site is bare at any one time.

c. For all planted areas, include the application of soil amendments, high planting densities or seeding rates, fertilizer, and temporary irrigation to ensure rapid stand establishment.

d. Use vegetation, mulch, gravel and porous pavement wherever feasible to minimize impervious areas.

9. That the applicant shall consider installing sediment/stormwater retention basin (s) and report the results of its decision to the Department of Health and to the Planning Department.

10. That the applicant shall discuss with Wailuku Agribusiness about the possibility of constructing and maintaining a sediment basin on Wailuku Agribusiness's land within drainage basin two (2) before it crosses Honoapiilani Highway and into the drainage lines. The developer shall report the results of their discussions with Wailuku Agribusiness to the Soil Conservation Service and the Maui Planning Department.

11. That the following mitigative measures shall be undertaken by the developer to protect cultural resources:

a. A subsurface archaeological inventory survey shall be conducted of the project area, with particular attention given to the portion fronting Maalaea Bay and including Parcel 19.

b. A report which presents survey results, background information, and recommendations shall be submitted to the Historic Preservation Division and approved, prior to any land alteration commencing.

c. If necessary, a mitigation/preservation plan shall be prepared and approved by the Division, and executed prior to any land alteration commencing.

d. The Ebisuko Jinsha Shrine be relocated to the proposed site and be rehabilitated in accordance with the Secretary of the Interior's standards for rehabilitation. Rehabilitation plans must be submitted to DLNR-State Historic Preservation Division for review and concurrence. Alternatively, the applicant may seek permission to tear down and rebuild the structure from the appropriate State or Federal agencies.

12. That the applicants shall use water-saving decorative features, soil preparation, and plantings.

13. That the applicants shall consider eliminating single-pass systems and provide recirculating ones where cooling and refrigeration are intended in the proposed project. The applicants shall report the results of their decision to the Department of Water Supply and the Maui Planning Department.

14. That full compliance with all other conditions of the SMA permit 89/SM1-003 as stated in the approval letter dated June 22, 1989 shall be rendered.

15. That all roadway and intersection improvements shall be provided by the developers concurrently with the development at no cost to the State or County.

16. That all construction employee parking shall be accommodated on the project site and not within the County right-of-way during the construction of this project.

17. That a solid waste management plan shall be submitted to the Department of Public Works and Waste Management for their review and approval.

18. That the Petitioner shall submit to the Planning Department a detailed report and addressing its compliance with the conditions established with the subject Special Management Area Use Permit. Further, this report shall be reviewed and approved by the Planning Department prior to the issuance of the building permit.

Attached for your record are copies of the following:

1.) Maui Planning Department's Report dated April 12, 1994.

2.) Written testimony of the Maalaea Community Association dated April 8, 1994.

3.) Written testimony of Mr. Ron M. Gammie.

Should you have any questions, please contact Mr. Clayton Yoshida, AICP, of this office at 243-7735.

Very truly yours,

BRIAN W. MISKAE
Planning Director

BWM:CY:osy
enclosure
cc: CZM File
LUCA (5)
Water Dept.
Fire Dept.
Police Dept.
Soil Conservation Service-Maui
Army Corps of Engineers
Maui Electric Co.
Dept. of Health
Dept. of Transportation
DLNR, Historic Preservation
DLNR
Clayton Yoshida, AICP
Project File a:maalaea.tri.ltr