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3605.02

June 10, 2002

TO: GENEVIEVE SALMONSON, DIRECTOR
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
DEPARTMENT OF HEALTH

FROM: BRIAN K. MINAAI
DIRECTOR OF TRANSPORTATION

SUBJECT: KAUMALAPAU HARBOR BREAKWATER REPAIR
FINAL ENVIRONMENTAL ASSESSMENT (EA)
TMK 4-9-03-26 2nd DIVISION

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OFC. OF ENVIRONMENTAL QUALITY CONTROL

We are filing the Final Environmental Assessment (EA) for the Kaumalapau Harbor Breakwater Repair in compliance with Chapter 343, Hawaii Revised Statutes, and Chapter 11-200, Hawaii Administrative Rules, State Department of Health. The State of Hawaii Department of Transportation Harbors Division has reviewed the Final EA for the subject project and has made a determination of a Finding of No Significant Impact (FONSI).

Enclosed are five (5) copies of the Final EA/FONSI, a completed OEQC Publication Form and Project Summary, a completed Final EA/FONSI Distribution Cover Letter to participants, and a completed Final EA/FONSI Distribution List.

We respectfully request that notice of this filing be published in the June 23, 2002 issue of *The Environmental Notice*. The Final EA/FONSI is tentatively scheduled for distribution by June 7, 2002.

Should you have any questions, please contact Fred Pascua of the Harbors Division Planning Section at 587-1888. Thank you for your attention to this matter.

Enc.

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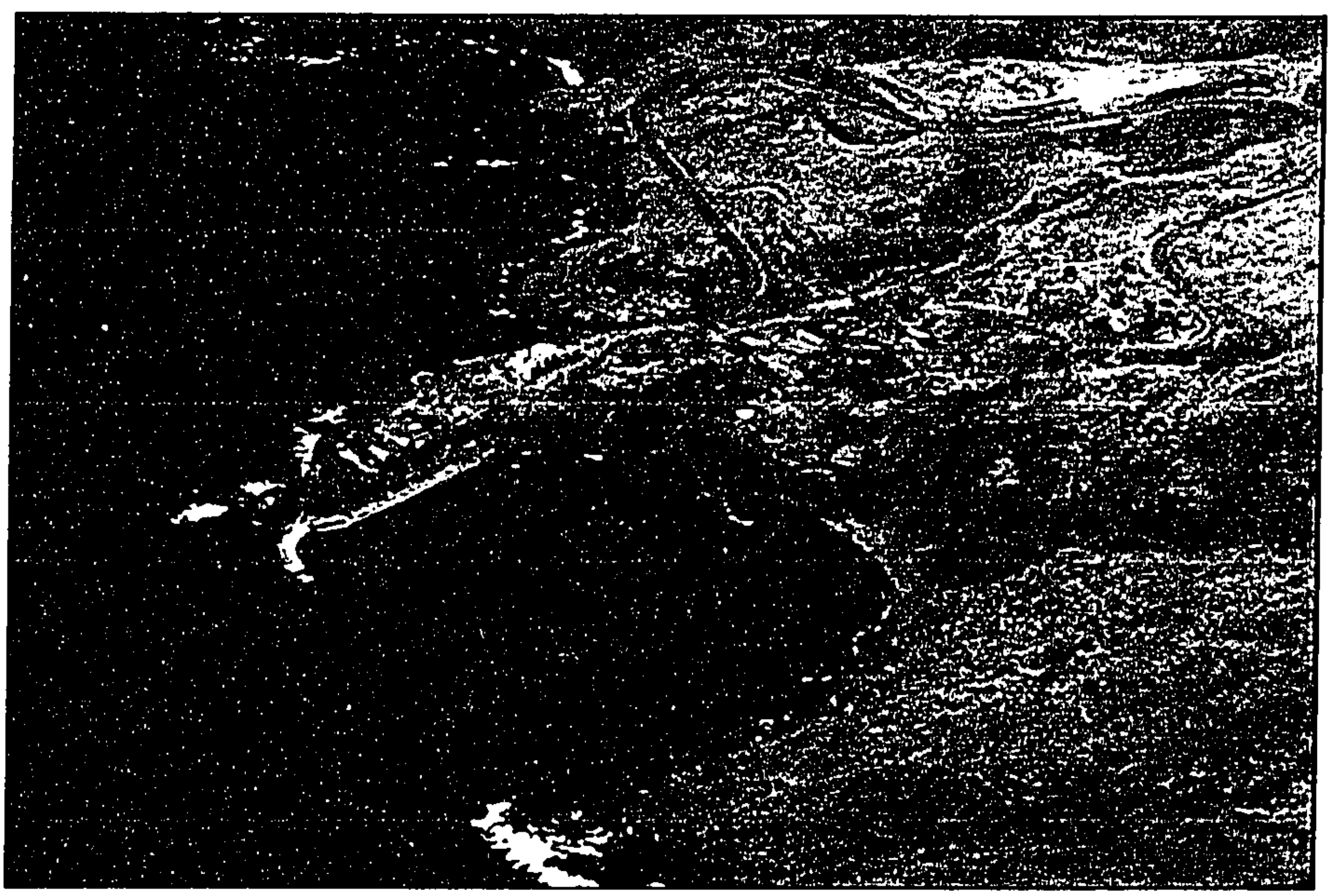
FINAL

ENVIRONMENTAL ASSESSMENT
KAUMĀLAPA‘U HARBOR BREAKWATER REPAIR
Island Of Lāna‘i, Hawai‘i

May 2002



US Army Corps of Engineers

Department of the Army
U.S. Army Engineer District, Honolulu

and

State of Hawai‘i
Department of Transportation

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FINDING OF NO SIGNIFICANT IMPACT (FONSI)
KAUMĀLAPA'U HARBOR BREAKWATER REPAIR
ISLAND 0F LĀNA'I, HAWAI'I

1. Description of the Proposed Action. The proposed plan of improvement consists of repairing the existing breakwater at Kaumālapa'u Harbor, Lāna'i, to reduce wave action in the harbor and increase harbor safety and usability.

   The breakwater will be rebuilt on the footprint of the old rubblemound structure, with the existing structure serving as the core of the new breakwater. The new breakwater will have a crest length of 320 feet, and a crest elevation of +14.5 feet mllw. The existing rubblemound structure will be re-shaped to form the core of the breakwater, over which will be placed an underlayer of 2.5 to 4.5 ton stone and an armor layer of 35-ton Core-Loc concrete armor units. The breakwater crest and top row of Core-Loc units will be stabilized by a concrete crest cap. The new armor units will extend to a depth of 45 to 55 feet on the ocean side and 20 feet on the harbor side, and the toe of the armor layer will be stabilized by a stone buttress.

2. Basis for Finding. The following factors were considered in the Environmental Assessment (EA) in making a determination that an Environmental Impact Statement (EIS) is not required for the proposed project.

2.1 The project consists of the repair of an existing manmade structure, in an area which has previously been disturbed by breakwater construction and maintenance activities. Significant maintenance was required following a severe kona storm in 1980 and hurricane 'Iwa in 1982, and the breakwater was again severely damaged by hurricane 'Iniki in 1992. A well-engineered repair of the breakwater will essentially eliminate the requirement for maintenance in the future.

2.2 Construction of the project would not significantly alter the environmental setting of the area. Natural resources and human use of the surrounding area would not be noticeably affected. Failure to repair the damaged breakwater would result in continued hazardous berthing conditions in the islands only barge harbor. The project would benefit the economic welfare of the residents of Lāna'i by facilitating the timely and consistent delivery of fuel and goods to the island, and would reduce the possibility of accidents.

2.3 The project site is not a wetland, special aquatic site, marine sanctuary or wildlife refuge. Coral cover on the existing breakwater will be destroyed by the project, however the new breakwater will consist of materials similar to the existing breakwater and coral is expected to re-colonize on the new structure. The larger new breakwater with more hard surface area should result in a long-term net increase in coral cover in the area. Care will be taken during construction to avoid damage to the natural reef areas adjacent to the breakwater. The larger breakwater will also increase fish habitat (shelter), with a resultant positive impact on fish abundance. The repairs will also reduce damage to corals caused by rock and concrete rubble movement during storm wave attack.

2.4 Endangered species coordination with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service concluded that the proposed project would not affect endangered or protected species or their critical habitat, nor would the project affect an identified Essential Fish Habitat.

2.5 Construction would utilize large stone and pre-cast concrete units, no fine-grained sediment would be introduced into the water. Care will be exercised to insure that no contamination of the marine environment with petroleum products or other deleterious materials results from construction activity. Best Management Practices and an Environmental Protection Plan for construction operations will be developed to help minimize adverse impacts to coastal water quality and the marine ecosystem. While the new breakwater is designed to reduce surge at the wharf, it would not significantly alter circulation or flushing of the harbor, and no change in water quality at the project site is anticipated following completion of construction.

2.6 Exhaust gases from construction equipment may cause a temporary reduction of air quality at the project site during construction, and some temporary generation of dust in the construction area resulting from the transport and handling of construction materials. There would be temporary localized increases in ambient noise due to operation of heavy equipment during construction. There would not, however, be any long-term impacts to air or noise quality following completion of construction.

2.7 The project will not affect archaeological or cultural resources in the project area. Concurrence with the Corps "no effect" determination has been obtained from the State Historic Preservation Office.

2.8 The project will be undertaken in a manner consistent to the fullest extent practicable with the State Coastal Zone Management Program.

2.9 The project would not affect scenic vistas or viewplanes identified in county or state plans or studies.

2.10 The project would not result in secondary effects, such as population changes or infrastructure demands, or involve a commitment to larger actions.

2.11 The project would not require significant energy consumption, energy will only be required during construction. Repair of the breakwater would reduce future energy requirements associated with maintenance of the structure.

3. Findings. Based on the findings of the environmental assessment, the US Army Corps of Engineers finds that the proposed breakwater repair project does not constitute a major federal action significantly affecting the quality of the environment; therefore an EIS will not be prepared for this project.

Ronald N. Light
Ronald N. Light
Lieutenant Colonel, US Army
District Engineer

May 17, 2002
Date

FINAL
ENVIRONMENTAL ASSESSMENT
FOR
KAUMĀLAPA'U HARBOR BREAKWATER REPAIR
ISLAND OF LĀNA'I, HAWAI'I

This Joint Document is Submitted Pursuant to 42 USC 4321,
40 CFR 1500-1508, 33 CFR 230, ER 1105-2-100, and Chapter 343, HRS

Federal Proponent:
U.S. Army Engineer District, Honolulu

State Proponent:
Department of Transportation, Harbors Division

May 2002

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1. INTRODUCTION AND SUMMARY

1.1 Identification of Authority and Scope of Document

The proposed action involves modifications and repairs to the existing breakwater at Kaumālapa'u Harbor, Island of Lāna'i, Hawai'i. The authority for this study is provided in the Energy and Water Development Appropriations Acts of 1993 and 1994. The 1993 Act stated the following:

> "the Secretary of the Army, acting through the Chief of Engineers is directed to initiate pre-construction engineering and design; and environmental studies for the Kaumālapa'u Harbor, Lāna'i, Hawai'i, project."

A special design report was initiated with this act – Kaumālapa'u Harbor Special Design Report, Island of Lāna'i, Hawai'i prepared, by the US Army Corps of Engineers, Pacific Ocean Division, 1996. The Act of 1994 continued these actions, stating:

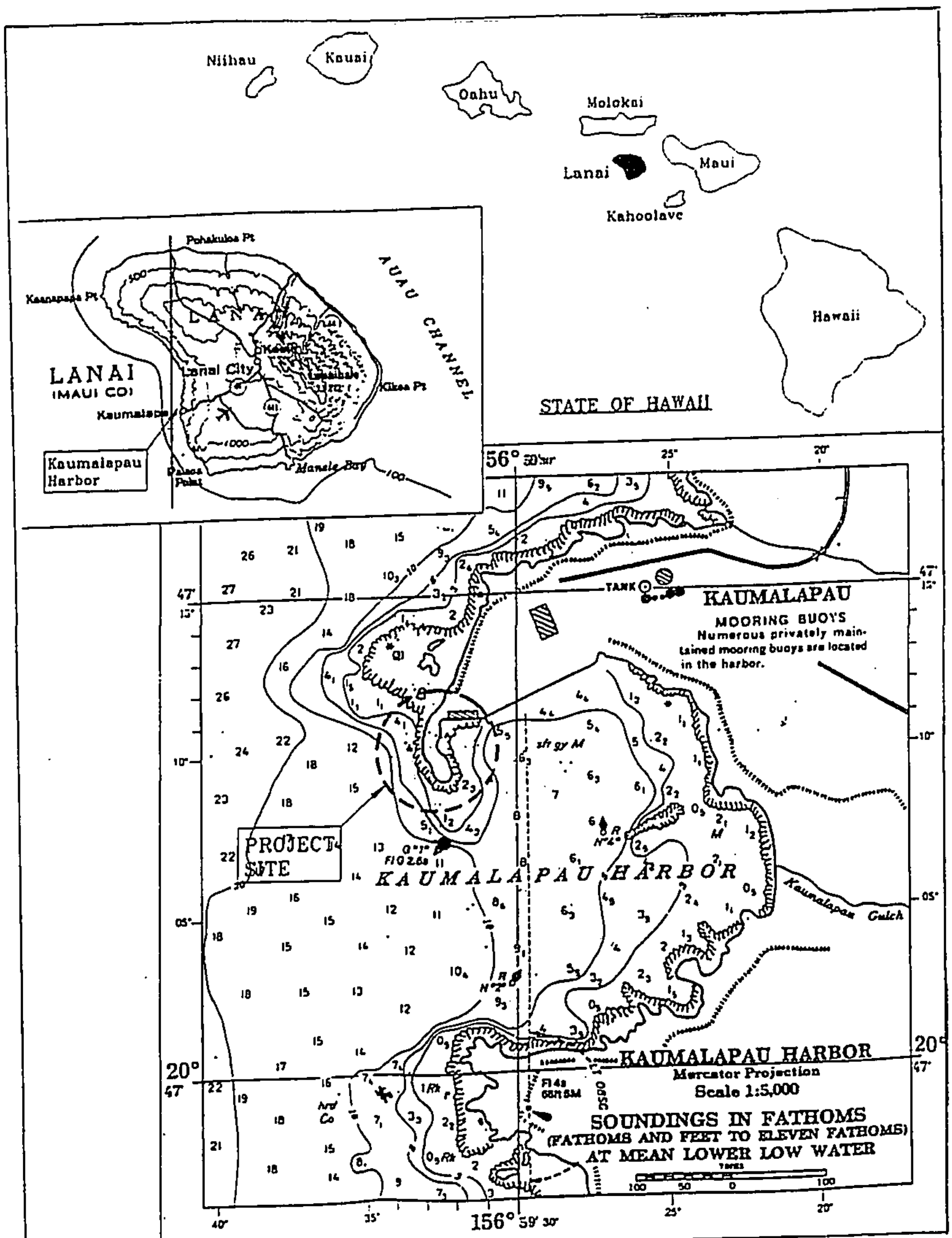
> "to continue pre-construction engineering and design, including preparation of the special design report, initiation of National Environmental Policy Act document preparation and initiation of hydraulic model studies for the Kaumālapa'u Harbor navigation study, Lāna'i, Hawai'i."

This environmental assessment (EA) is prepared to address the effects of the breakwater repair on the environment, and is in accordance with both federal and state requirements. The EA conforms to the National Environmental Policy Act, Council of Environmental Quality (CEQ) regulations, Army Regulations (AR) 200-2-2, and Department of the Interior (DOI) Manual on Environmental Quality, Part 516. It also conforms to State of Hawai'i Revised Statutes, Chapter 343, on the preparation of environmental assessments.

1.2 Summary Description of the Proposed Action

Kaumālapa'u Harbor is a small barge harbor located in a natural embayment on the southwest coast of Lāna'i (Figure 1). The harbor has a 10-acre berthing area, and water depths between 20 and 60 feet. Shoreside facilities along the north side of the embayment consist of a 400-foot long wharf, a cargo shed and barge loading and unloading equipment. The harbor has no distinct entrance channel and has a 600-foot wide opening at the mouth of the bay. A breakwater extending to the south from the northwestern point of the embayment protects the harbor and wharf facilities. The breakwater was reportedly originally 400 feet long, but has been reduced by wave damage to a current length of approximately 200 to 250 feet. The remnants of the breakwater crest elevation are about 10 feet above mean lower low water (mllw).

The badly deteriorated breakwater allows increased wave energy to enter the harbor, thereby hindering safe berthing and cargo handling. The purpose of the proposed action is to repair the existing breakwater at Kaumālapa'u Harbor to reduce wave action in the harbor and increase harbor safety and usability.



Niihau
Kauai
Oahu
Molokai
Lanai
Maui
Kahoolave
Hawaii
STATE OF HAWAII
LANAI
(MAUI CO)
Kaumalapau Harbor
AUAU CHANNEL
Lanai City
Manele Bay
PROJECT SITE
KAUMALAPAU
MOORING BUOYS
Numerous privately maintained mooring buoys are located in the harbor.
KAUMALAPAU HARBOR
KAUMALAPAU HARBOR
Mercator Projection
Scale 1:5,000
SOUNDINGS IN FATHOMS
(FATHOMS AND FEET TO ELEVEN FATHOMS)
AT MEAN LOWER LOW WATER
Kaumalapau Gulch

FIGURE 1

1.3 Summary Description of Alternatives

The alternatives to the proposed action include no action and several structural repairs that were evaluated using numerical and physical modeling techniques. No action entails leaving the harbor breakwater in its present badly deteriorated state. Hazardous berthing and cargo handling conditions would continue in the harbor. Severe storm events can be expected to continue to erode and damage the breakwater, and other harbor facilities. Additional damage to the wharf and vessels would be expected. Delays in shipping operations would continue and perhaps increase as the breakwater further deteriorates. Additional erosion of the existing breakwater material could damage surrounding coral areas. Also, spills of cargo into the water would be more likely due to hazardous wave conditions. Emergency and unauthorized repairs would likely also continue, resulting in more debris being placed on the breakwater.

The structural alternatives evaluated using numerical and physical modeling include the following:

Alternative 1 - a 200-foot long rubble mound breakwater, extending to the northwest from the southern corner of the harbor entrance.

Alternative 2 - wave absorbers along the southern and northeastern portion of the harbor shoreline.

Alternative 3 - rebuilding the existing breakwater and adding a 200-foot long straight extension to the end of the existing breakwater.

Alternative 4 - adding wave absorbers along the northeastern shore to the 200-foot straight extension of Alternative 3.

Alternative 5 - a dogleg extension of the existing breakwater. The first 350 feet of the existing breakwater would be re-built along the current alignment and the next 50 feet would be angled 30 degrees toward the inside of the harbor.

Alternatives 3 and 5 showed promising results in the numerical model studies. For some wave conditions, Alternative 3 showed reductions in wave heights of 29 to 55 percent along the wharf relative to existing conditions, and Alternative 5 resulted in reductions of 26 to 57 percent relative to existing conditions. These alternatives were further evaluated by physical modeling. Based on the physical modeling studies, Alternative 5 (the dogleg breakwater) provided significant improvements over the existing conditions and demonstrated better results than Alternative 3 (the straight breakwater). Alternative 5 was the recommended improvement plan.

The ongoing design study has recommended eliminating the dogleg and shifting the proposed alignment of the breakwater shoreward to center it above the existing rubblemound structure. In the present design, the new breakwater will have a total crest length of 320 feet, and a crest elevation of +14.5 feet above mean lower low water (mllw).

1.4 Summary of Environmental Impacts and Mitigation Measures

The proposed project is to repair and improve the breakwater to reduce wave energy entering the harbor. The new breakwater will be aligned and centered on the existing breakwater structure, thereby minimizing impacts on the surrounding seafloor. It will extend approximately 50 feet further across the mouth of the harbor than the existing structure, and will occupy an additional 8,000 square feet of native sandy seafloor.

The modified breakwater is not expected to noticeably affect current and flushing throughout the harbor. Long-term impacts are not expected to the water quality in the harbor. Construction of the new breakwater will consist of placement of rock and concrete structures, which should be clean of any fine-grained sediment. With Best Management Practices (BMPs) in place to prevent drainage of materials from land into the harbor during construction, there are no apparent agents that could substantially, or permanently, alter water quality within the harbor.

The present deteriorated breakwater structure is characterized by high coral growth. The design of the new breakwater will involve coverage of the existing breakwater structure with new rock and concrete, resulting in loss of much of the existing coral cover on the old breakwater structure. Survey results, however, indicate that coral colonization is rapid in the area. The new breakwater will consist of materials similar to the existing breakwater, and will cover a larger footprint, and consist of a larger surface area of boulders and concrete. Coral colonization of these surfaces is expected, resulting over the long term in a net increase in coral cover in the Kaumālapa'u area.

Survey results also indicate that the fish populations at Kaumālapa'u appear to be substantially depleted by fishing pressure. None of the activities associated with construction of the new breakwater would appear to further impact fish populations. Rather, the increased complexity afforded by the new, larger breakwater should increase favorable fish habitat.

There are expected to be no significant impacts to air quality, noise or terrestrial resources or biology.

Project mitigation measures include:

- Best Management Practices and an Environmental Protection Plan for construction operation will be developed to help minimize adverse impacts to coastal water quality and the marine ecosystem.
- Excess coral encrusted boulders from the construction footprint will be placed on the sand bottom surrounding the breakwater toe. This would maintain in part the coral cover that presently populates the breakwater, and would add substrate complexity to the relatively featureless sand bottom that would increase fish habitat.

2. PURPOSE OF AND NEED FOR THE PROPOSED ACTION

2.1 Purpose of the Proposed Action

The purpose of the proposed action is to repair the existing breakwater at Kaumālapa‘u Harbor, Island of Lāna‘i, Hawai‘i to reduce wave action in the harbor and increase harbor usability. The existing breakwater has been heavily damaged and eroded from an original length of approximately 400 feet to its current length of approximately 200 to 250 feet. The badly deteriorated breakwater allows increased wave energy to enter the harbor, thereby decreasing safe berthing and cargo handling in the harbor.

2.2 Need for the Proposed Action

Kaumālapa‘u harbor was originally constructed in the late 1920's to serve pineapple operations on the island and facilitate shipments to O`ahu. The original breakwater was built and repaired over the years with available material on the island, such as armor stone, concrete jersey barriers, concrete "dolosse" armor units, large shipping containers filled with concrete and other discarded construction material. Storm waves from the south through northwest impact the harbor and the breakwater has been heavily damaged and deteriorated by the storm waves, particularly during Hurricanes ‘Iwa (1982) and ‘Iniki (1992).

Severe wave conditions close the harbor several times each winter season. During the winter of 1995, the breakwater had deteriorated to such an extent that the fuel barge refused to enter the harbor because of unsafe wave conditions at the wharf. The supply and availability of fuel on the island became a serious concern.

The increased wave action in the harbor also causes a constant maintenance problem because the fender system and the pier structure are continuously damaged and repaired. The fenders are replaced three to four times a year; they were replaced only once a year before Hurricane ‘Iwa.

Kaumālapa‘u Harbor is the only commercial harbor on Lāna‘i , and is therefore essential to the welfare of the island's residents and visitors. Most of the consumer goods and food come into Lāna‘i via this harbor. Air transportation is the only alternative, but it is very expensive and has limited cargo capacity. Interruptions in barge service pose hardships to the people on the island and is costly to the carrier serving the island. Without adequate repair to the existing breakwater, the social and economic welfare of the people of Lāna‘i will be negatively impacted.

3. DESCRIPTION OF THE PROPOSED ACTION

3.1 Project Location

Lāna'i, the sixth largest island in the state (Figure 1), is situated approximately 60 miles southeast of the island of O'ahu. It covers 141 square miles and includes about two percent of the state's land area. The 1990 estimated population was 2,426 residents within Lāna'i City, the island's only town.

Kaumālapa'u Harbor (Figure 1) is located on the southwest coast of Lāna'i, approximately 6 miles from Lāna'i City. It is a small barge harbor and the sole commercial harbor on the island.

3.2 Site Description

Lāna'i is made of a single volcanic dome called Lāna'ihae, which rises 3,370 feet above sea level. The major crop producing area is located on a central plateau formed by two partially filled calderas. Most of the area below the 1,000-foot elevation slopes steeply. There is a narrow strip of flat, non-stony, alluvial land along the north to east coast. Steep marine cliffs exist along the west and south coast areas.

Kaumālapa'u Harbor is a small barge harbor located in a natural embayment on the southwest coast of Lāna'i. The harbor has a 10-acre berthing area, and water depths between 20 and 60 feet. Shoreside facilities along the north side of the embayment consist of a 400-foot long wharf, a cargo shed and barge loading and unloading equipment. The harbor has no distinct entrance channel and has a 600-foot wide opening at the mouth of the bay. A breakwater extending to the south from the northwestern point of the embayment protects the harbor and wharf facilities. The breakwater was reportedly originally 400 feet long, but has been reduced by wave damage to a current length of approximately 200-250 feet. The remaining breakwater crest elevation is about 10 feet above mean lower low water (mllw).

The topography of surrounding areas is either sheer cliffs or steep slopes. The area behind the existing pier consists of a narrow strip of land, wide enough to allow a truck or tractor with trailer to make a U-turn. Small offices and warehouses are located along the access road.

3.3 Project Features

The Kaumālapa'u Harbor breakwater repair project will rebuild the badly damaged and deteriorated existing breakwater, in order to provide safe berthing conditions at the existing wharf for cargo and fuel delivery to the island. The breakwater will be rebuilt on the footprint of the old rubblemound structure, and will utilize the existing structure for the core of the new breakwater. The new structure has been designed based on standard coastal engineering criteria and methodology, and the design storm condition wave height and stillwater level rise is based on a hurricane approaching Hawai'i from the south. Core-Loc concrete armor units will be used to provide a stable armor layer capable of withstanding the design storm wave heights of 25 to 30 feet. The Core-Loc armor units are a recent development of the Corps of Engineers Waterways

Experiment Station, and testing has shown them to be extremely stable under wave attack. The project plan is shown on Figure 2, and typical breakwater sections are shown on Figure 3. The new breakwater will have a total length of 320 feet, and a crest elevation of +14.5 feet mllw. The existing rubblemound structure will be re-shaped to form the core of the breakwater, over which will be placed an underlayer of 2.5 to 4.5 ton stone, followed by 35-ton Core-Loc concrete armor units. The breakwater crest and top row of Core-Loc units will be stabilized by a concrete crest cap. The new armor units will extend to a depth of 45 to 55 feet on the ocean side and 20 feet on the harbor side, and the toe of the armor layer will be stabilized by a stone buttress.

Following coordination of the Draft EA minor revisions were made to the design of the breakwater repairs. The design revisions do not alter the basic scale or scope of the project, their primary purpose is to incorporate current Core-Loc concrete armor unit design practice and experience into the design. Design revisions include the following items.

1. The breakwater crest has been re-designed to increase Core-Loc stability during design storm wave conditions, and to improve constructability. Primary changes are: (a) widening the crest width to 40 feet at the top of the underlayer stone (+9.5' elevation), (b) adding a horizontal row of Core-Loc units on the ocean-side crest, and (c) replacement of the rib cap on the crest with a solid mass concrete crest cap.
2. A requirement for tremie concrete to be placed in the toe trench following placement of the Core-Loc units has been added to the design for the nearshore ocean-side where the toe trench will be excavated into hard rock bottom in very shallow water. The concrete will prevent Core-Loc movement and increase stability of the toe in this area.
3. The allowable stone size range for underlayer stone and bedding stone has been increased slightly for more efficient use of available quarry stone.

3.4 Construction Operations

The lack of level and clear space on the shoreline, and the need to maintain usability of the wharf and cargo handling area for fuel and freight service to the island, necessitate careful staging and coordination of the construction activities. An approximate 2-acre contractor work and storage area will be located approximately 2,000 feet inland of the harbor, at a site which has been previously graded. It is anticipated that the underlayer stone would come from existing operating quarries on Lāna'i, O'ahu or Maui, and that the core–loc armor units would be cast on Lāna'i, or O'ahu and barged to Lāna'i. Stone and Core-Loc placement will be accomplished by a crane positioned on the breakwater crest or by a barge-mounted crane. A small concrete batch plant will be located on Lāna'i, near the project site, for construction of the cast-in-place concrete crest cap. The construction sequence would be to re-shape the existing rubblemound to form the trapezoidal core cross section, then the underlayer stone will be placed and the toe buttress formed, followed by placement of the Core-Loc armor layer, and finally construction of the concrete crest cap. Primary construction material quantities are estimated as follows:

Core-Loc Concrete Armor Units:	
Number of Units -	760
Volume of Concrete -	13,590 cy
Concrete Crest Cap:	2,060 cy
2.5 to 4.5-ton Stone:	25,440 cy
500 to 5,000 lb. Stone:	930 cy
50 to 500 lb. Stone:	3,040 cy
Geotextile Filter Fabric:	3,780 sy

3.5 Construction Schedule and Cost

The total construction period is estimated to be 24 months, with actual on-site and in-water work estimated to take approximately 18 months. The total construction cost is estimated to be $15 million, of which 80 percent ($12 million) will be federally funded and 20 percent ($3 million) will be cost shared by the State of Hawai'i.

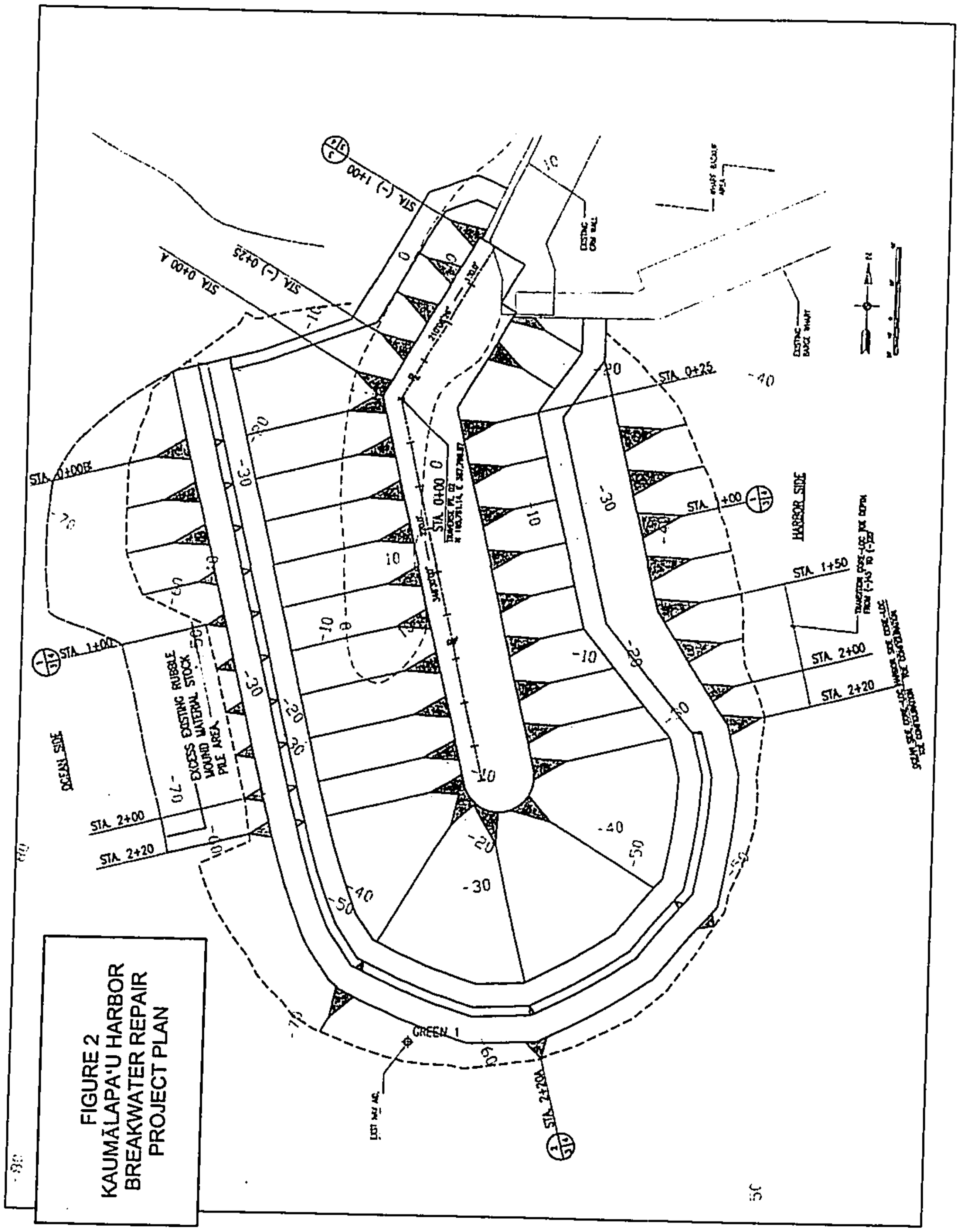


FIGURE 2
KAUMĀLAPA'U HARBOR
BREAKWATER REPAIR
PROJECT PLAN

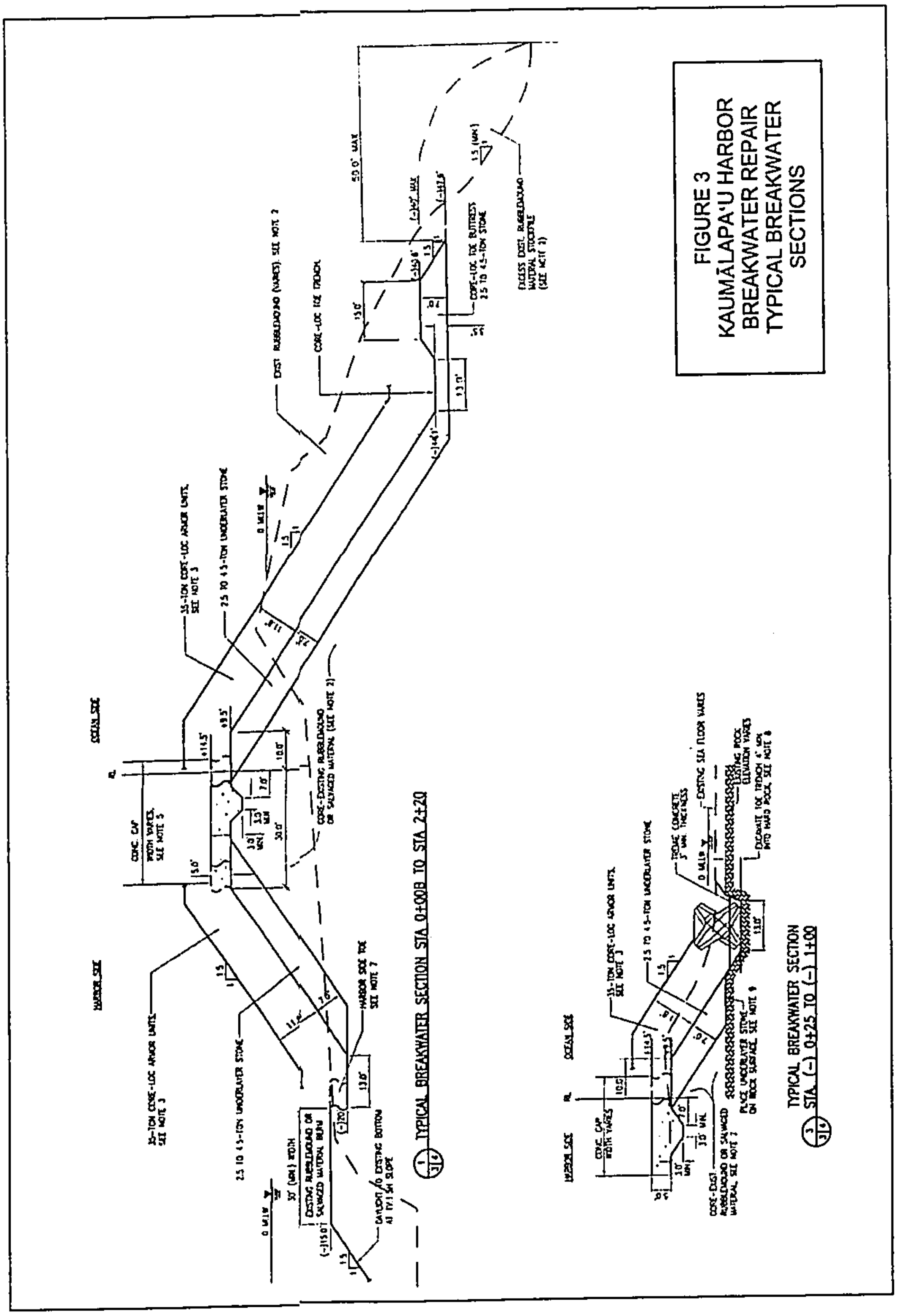


FIGURE 3
KAUMĀLAPA'U HARBOR
BREAKWATER REPAIR
TYPICAL BREAKWATER
SECTIONS

4. ALTERNATIVES INCLUDING THE PROPOSED ACTION

4.1 No Action

The alternative of no action entails leaving the harbor breakwater in its present badly deteriorated state. Hazardous berthing and cargo handling conditions would continue in the harbor. Severe storm events can be expected to continue to erode and damage the breakwater and other harbor facilities. Additional damage to the wharf and vessels would be expected. Delays in shipping operations would continue and perhaps increase as the breakwater further deteriorates.

No repair to the breakwater may also negatively impact the natural environment. Further erosion of the existing breakwater material could damage surrounding coral areas. Also spills of cargo into the water would be more likely during hazardous conditions. Emergency and unauthorized repairs would likely also continue, resulting in more debris being place on the breakwater. These unstable items are anticipated to breakup and to be distributed during severe storm events, possibly damaging development of the coral-reef community surrounding the existing breakwater.

4.2 Other Improvement Alternatives Considered

The US Army Corps of Engineers (1996), using numerical and physical modeling techniques, evaluated five alternatives for the harbor improvements.

Alternative 1 consisted of a 200-foot long rubble mound breakwater, extending to the northwest from the southern corner of the harbor entrance. Numerical model tests showed that the southern breakwater had little effect on wave conditions at the pier.

Alternative 2 consisted of wave absorbers along the southern and northeastern portion of the harbor shoreline. The modeling analysis showed the wave absorbers had little effect on wave heights at the wharf - the average reduction in wave height at the wharf was no more than 10 percent. Wave heights were only reduced in a very localized area immediately adjacent to the absorbing shore.

Alternative 3 consisted of rebuilding the existing breakwater and adding a 200-foot long straight extension to the end of the existing breakwater. For 10-second waves, approaching from the northwest, the addition of the breakwater extension resulted in a reduction in wave heights of 29 to 55 percent relative to existing conditions. Waves approaching from the southwest, however, resulted in wave heights between 61 and 113 percent of those without the extension.

Alternative 4 consisted of adding wave absorbers along the northeastern shore in addition to the 200-foot straight extension of Alternative 3. The average additional wave height reduction at the pier did not exceed 10 percent.

Alternative 5 consisted of a dogleg extension of the existing breakwater. The first 350 feet of the existing breakwater would be re-built along the current alignment and the next 50 feet would be angled 30 degrees toward the inside of the harbor. This alternative significantly reduced wave heights within the harbor. Waves with 10 second periods, approaching from the northwest were particularly affected; wave heights were reduced 26 to 57% relative to those in the existing harbor. Waves approaching from the west and southwest were reduced to a lesser degrees, resulting in wave heights of 60 to 98 percent of those in the existing harbor.

Alternatives 3 and 5 were further evaluated in a physical hydraulic model. Based on the physical modeling studies, Alternative 5 (the dogleg breakwater) provided significant improvements over the existing conditions and demonstrated better results than Alternative 3 (the straight breakwater). Alternative 5 was the recommended improvement plan of the Special Design Report (1996). The ongoing design study has recommended eliminating the dogleg, and instead shifting the proposed alignment of the breakwater shoreward to center it above the existing rubblemound structure.

In the present design, the new breakwater will have a total length of 320 feet, and a crest elevation of +14.5 feet mllw.

5. ENVIRONMENTAL SETTING

5.1 The Natural Environment

5.1.1 Physical Marine Environment

Climate

The climate on Lāna'i is subtropical, dominated by the surrounding ocean and persistent trade winds. Median annual rainfall varies from 35 inches at Lāna'ihale to ten inches along the arid leeward coast. Average temperatures at Kaumālapa'u Harbor are not available. Average temperatures in Lāna'i City, which is approximately six miles northwest of Kaumālapa'u at elevation of 1,600 feet, range from 66 degrees Fahrenheit to 73 Fahrenheit during the year.

Winds

The prevailing winds in the Hawaiian Islands are the northeasterly trade winds. They occur approximately 90 to 95 percent of the time during the summer months of May through October and approximately 55 to 65 percent of the winter months of November through April. Typical wind speeds for the northeasterly trades average 10 to 20 miles per hour. Because of the sheltering effect of the island from the tradewinds, winds at the project site are frequently light and variable land/sea breezes due to the diurnal heating and cooling of the land.

Storms

Storm conditions in the Hawaiian Islands are relatively infrequent. Three classes of storms occur in Hawai'i: cold fronts, low-pressure passages and tropical cyclones (tropical storms or hurricanes). Cold fronts, which occur during the winter months, cause spotty rainfalls and gusty winds. The low-pressure passages bring heavy rains, sometimes with strong winds. The low-pressure storms known as Kona storms usually occur during the winter months. They are associated with strong and persistent southerly winds and intense rainfall on the south and western shores of the islands. In 1980, a severe Kona storm generated waves struck Kaumālapa'u Harbor and damaged the breakwater. The deepwater height of these waves was hindcasted by Sea Engineering, Inc. to be 17 feet, with a 9-second period.

Hurricanes, which are classified as storms with wind speeds in excess of 74 miles per hour, are infrequent in Hawaiian waters. Tropical storms are relatively frequent, passing close to the Hawaiian Islands on an average of once in one or two years. Since 1950 eight hurricanes have either hit or come close enough to the islands to cause property damage, ranging from $100,000 to $1 billion. Hurricanes 'Iwa (1982) and 'Iniki (1992) with deepwater wave heights of 22 and 20 feet, respectively, offshore of the project site, caused major damage to Kaumālapa'u Harbor.

Tides

The tides in Hawaiian waters are semi-diurnal with pronounced diurnal inequalities. Normal tidal fluctuations along the coasts of the main Hawaiian Islands generally do not exceed about 2.5 feet. There is relatively little difference in tidal range between the islands. At Kaumālapa'u Harbor, the mean tidal range and diurnal tidal range are 1.5 feet and 2.2 feet with a mean tide of 0.9 feet above mean lower low water.

Waves

The wave climate of the Hawaiian Islands is characterized by four primary wave types. These are northeast tradewind waves, southern swell, Kona storm waves, and north Pacific swell. Hurricane generated waves, although infrequent, also affect the Hawaiian Islands. All but tradewind waves can affect the study area to some degree.

Southern swell is generated by storms in the Southern Hemisphere and is most prevalent during the summer months. These waves, after traveling long distances, arrive in the Hawaiian waters as low, long waves with typical periods of 12 to 22 seconds and deepwater wave heights of 1.5 to 6.5 feet. Kona storm waves are generated by intense winds associated with locally occurring Kona storms. These waves approach from the south to the west. The typical Kona storm waves have periods ranging from 6 seconds to 10 seconds and heights from 10 to 15 feet.

North Pacific swell is produced by severe winter storms in the Aleutian area of the North Pacific and by mid-latitude low-pressure systems. North swell may arrive in Hawai'i throughout the year, but is largest and most frequent during the winter months of October through March. The waves in North Pacific swell typically have periods of 10 to 20 seconds and heights of 5 to 15 feet or greater.

Kaumālapa'u Harbor is exposed to waves approaching from a directional sector between south-southwest clockwise to north. Annual wave statistics for the site can be estimated using U.S. Army Corps of Engineers, Wave Information Study (WIS) data. The wave statistics for a directional sector from 206 to 310 degrees is shown on Table 1. The table indicates that the waves approach from this sector only about 5 percent of the time, and usually reflect storm conditions, with swell wave heights typically greater than 6 feet with a period longer than 11 seconds. Based on the WIS data, 95 percent of the time wave conditions in the vicinity of Kaumālapa'u Harbor are small, local wind generated seas, less than about 6 feet in height.

TABLE 1. WIS DATA: NUMBER OF WAVE OCCURRENCES FROM THE DIRECTIONAL SECTOR AFFECTING KAUMĀLAPA'U HARBOR
WAVE DIRECTION: 206 – 310 DEGRESS
TOTAL NUMBER OF DATA: 116,880

Wave Period (sec)	Significant Wave Height (feet)							Total
	<3.2	3.2-6.6	6.6-9.8	9.8-13.1	13.1-16.4	16.4-19.7	>19.7	
<7	9	0	24	1	0	0	0	34
7-9	0	6	58	62	30	2	0	158
9-11	0	94	163	39	8	13	3	320
11-13	0	7	948	435	33	1	0	1424
13-15	0	0	663	1902	994	175	8	3742
15-17	0	0	0	0	0	0	0	0
17-19	0	0	0	21	24	26	39	110
>19	0	0	0	0	0	0	0	0
Total	9	107	1856	2460	1089	217	50	5788 (5.0%)

Wave measurements were made at Kaumālapa'u Harbor to calibrate the numerical and physical models of the harbor. Wave gages were placed off the toe of the breakwater head and along the wharf. Data was collected between January 16, 1994 and the end of September 1994. Wave conditions were not very energetic during the measurement period. The mean incident wave height was 1.6 feet, while the largest waves occurred in January, with a height of 4.9 feet and a period of 15 seconds.

Tsunamis

Tsunamis are very long period ocean waves generated by earthquakes, submarine landslides, and volcanic eruptions. Tsunamis are difficult to detect in the deep ocean, but they can significantly increase in height as they approach the shore. Based on methodology described by M & E Pacific, Inc. (1978), the runup elevation of a 100-year tsunami will be about 5 feet above mean lower low water along the Kaumālapa'u shoreline. This indicates that the inundation zone from such a tsunami will be confined to the rocky shoreline near the coast.

Currents

The predominant ocean current flow near Kaumālapa'u Harbor is generally toward the northwest. Under normal tradewind conditions, the speed of the current is typically less than one knot and is not strong enough to cause navigational problems. Tidal currents at Kaumālapa'u Harbor, which do not reverse during ebb and flood tidal periods, are usually too weak to affect navigation (US Department of Interior 1995).

A current drogue study was conducted by Sea Engineering, Inc. in the harbor vicinity on January 14, 1999. Currents were measured during flood, high water slack and the beginning of ebb tide. Winds were west-southwest at 10 to 15 knots. Currents outside the harbor moved to the north during flood tide. In the harbor, surface currents were to the northeast during flood and slack tides, but during ebb tide the currents changed to southeast. Subsurface currents in the harbor consistently moved to the southeast through the tidal phases during the field study. The results of the drogue study also indicate no distinct tidal reversal during the field study. The current speeds were up to 0.1 knots inside the harbor; the speed outside the harbor ranged from 0.1 to 0.3 knots. Figure 4 illustrates the results of the drogue study.

Although the tidal currents are relatively weak, large waves and strong wave-generated currents may develop during Kona and southwesterly storms. The harbor is forced to close during these storm events.

Bottom Characteristics

Figure 1 shows the general bathymetry in the harbor area, while Figure 5 shows the detailed bathymetry around the breakwater. This bathymetry was collected in surveys conducted on October 13 and 14, 1998. The natural shoreline throughout the harbor, and to the north of the breakwater is relatively uniform in structure, consisting of steeply sloping vertical cliffs that also extend underwater. Off the northern end of the existing breakwater a finger reef extends perpendicular to the axis of the breakwater. The finger reef consists of a relatively flat upper surface and nearly vertical sides that extend to the sand floor of the outer harbor. The vertical faces of the natural shoreline are inhabited by high cover (>50%) of a variety of reef corals. The inner shoreline of the harbor also consists of sloping vertical basalt faces that terminate at the sand surface of the harbor floor. Coral cover is uniformly high throughout the margin of the harbor. The breakwater structure extends approximately 400 feet to the south of the finger reef, and is 300 to 350 feet wide. Only a 250-foot length of the breakwater, about 50 feet wide, lies above the water. The breakwater materials consist of large basalt boulders, and construction debris including pilings, concrete debris, conduit, scrap metal and other debris. The breakwater rises from a sand bottom at a depth of 70 feet on the seaward side and 50 feet on the harbor side. The bottom of the bay and harbor consists of gently sloping plain gray sand. The sand is heavily rippled and pocked with numerous burrows likely of either worms or shrimp.

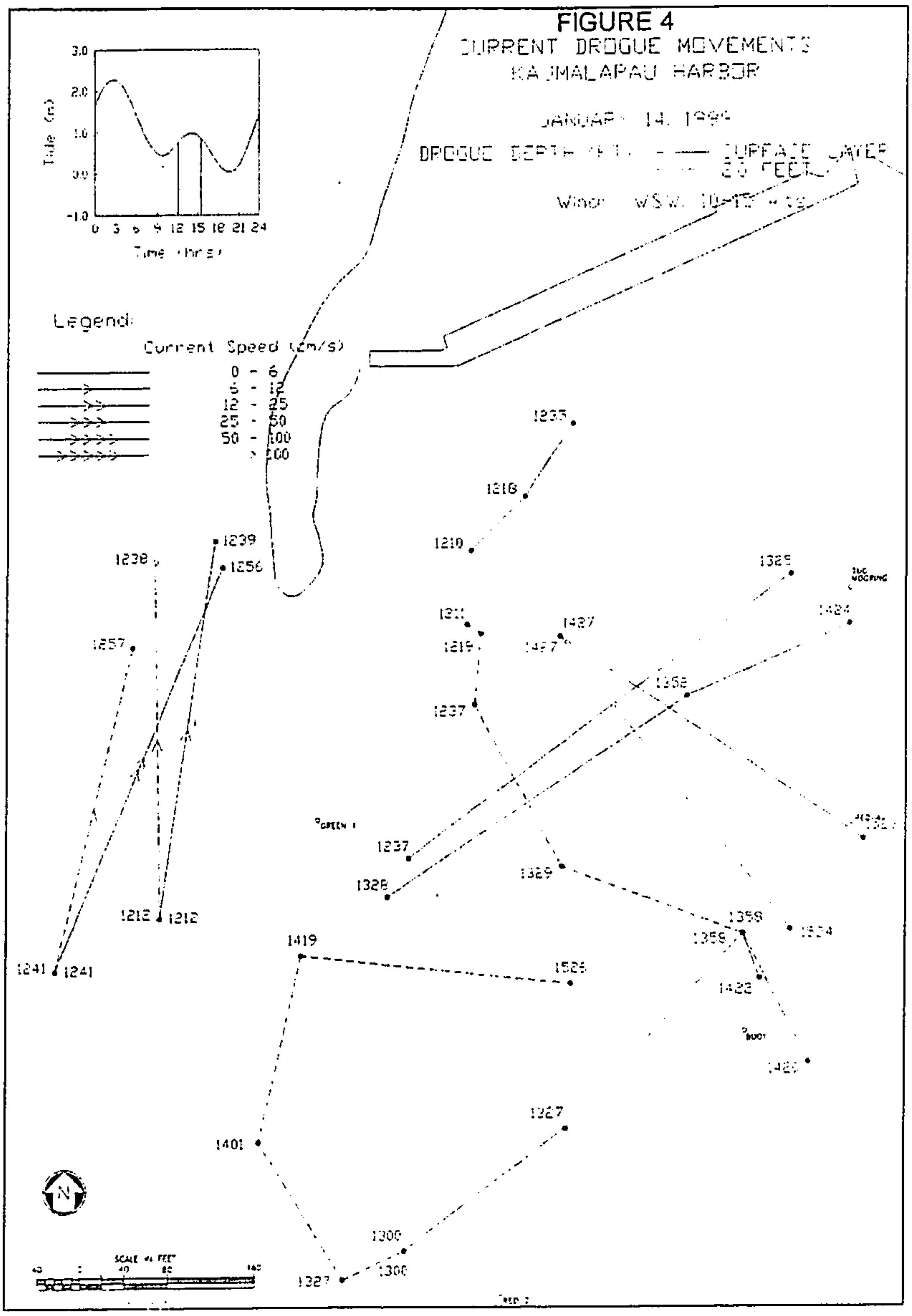
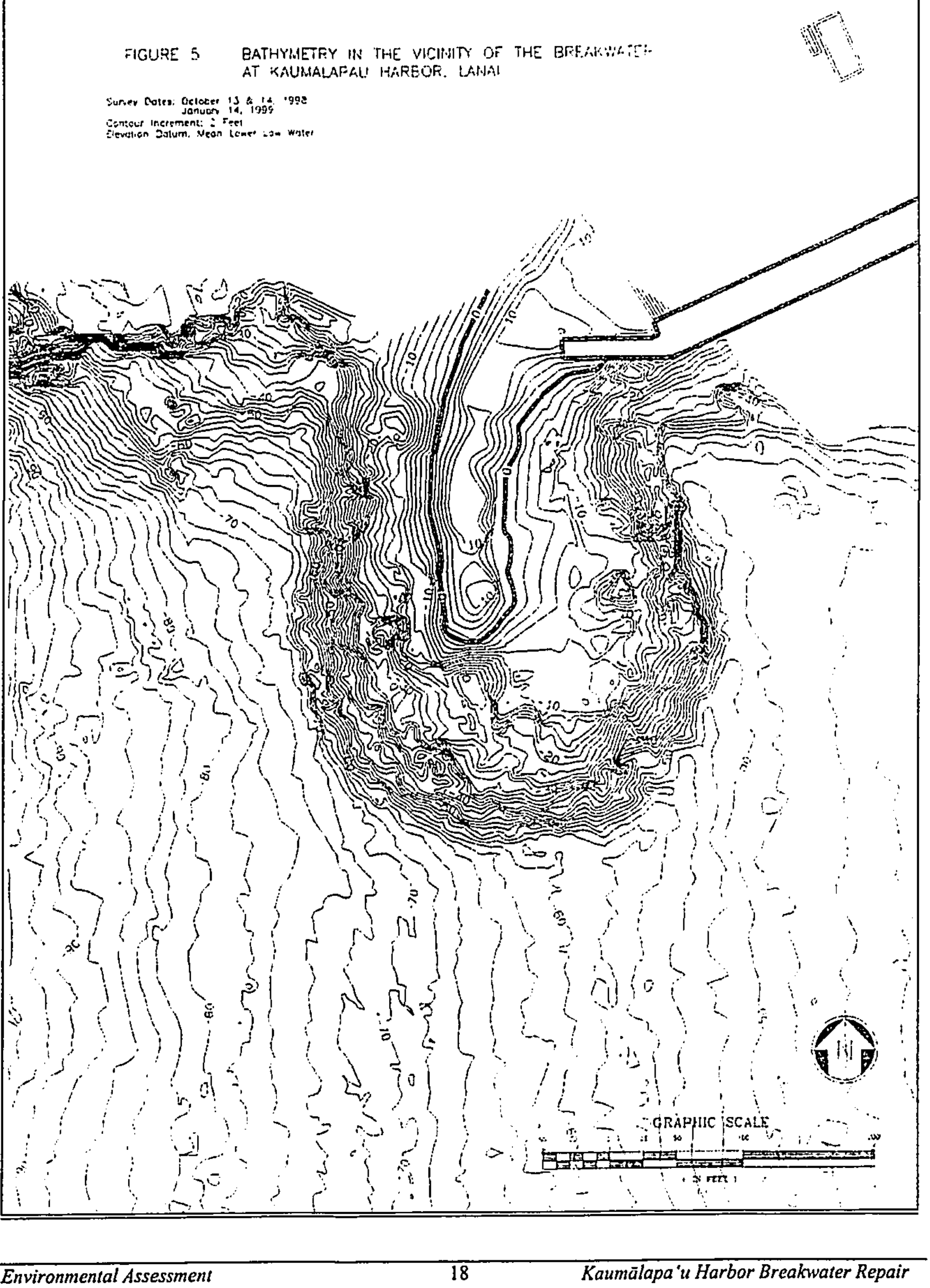


FIGURE 4
Legend:
Current Speed (cm/s)
0 - 6
6 - 12
12 - 25
25 - 50
50 - 100
> 100
Time (hrs)
Tide (m)

FIGURE 5 BATHYMETRY IN THE VICINITY OF THE BREAKWATER AT KAUMALAPAU HARBOR, LANAI

Survey Dates: October 13 & 14, 1998
January 14, 1999
Contour Increment: 2 Feet
Elevation Datum: Mean Lower Low Water



5.1.2 Air Quality

There are no known records or studies of air quality measurements in the Kaumālapa'u vicinity. Air quality, however, can be considered good because of the limited activity occurring in the harbor, and the prevailing tradewinds that disperse any pollutants. Cars, trucks, ships and cargo equipment are the main sources of air pollution. They operate only sporadically in the area, and typically, the tradewinds blow their emissions offshore. Dust from agricultural activities on the island is another possible source of air pollution, although agriculture on the island has greatly diminished in recent years with the cessation of commercial pineapple production.

5.1.3 Noise

Cars, trucks, ships, and cargo equipment are the principal sources of intrusive noise in the Kaumālapa'u area. However, noises from these sources occur only intermittently when cargo is being offloaded or onloaded on ships at the wharf. In addition, airplane traffic of Lāna'i Airport, which located 2.5 miles from Kaumālapa'u Harbor, contributes to noise in the region.

5.1.4 Water Quality

Water quality in Kaumālapa'u Harbor has been assessed with a one-year sampling program. Over the course of the calendar year 1999, water sampling was conducted about once every two months at twelve stations within, and just outside the harbor (Figure 6). Samples were collected at the surface and near the bottom at each station, and analyzed for constituents that could potentially be affected by activities associated with construction and operation of the new breakwater (turbidity, total suspended solids (TSS), salinity, pH). The purpose of the water quality sampling program is to obtain a set of baseline conditions that depict variability of water quality within the harbor on spatial and seasonal scales that can be used to determine changes that could result from construction activities. The pre-construction water quality monitoring program provides a baseline that can be continued during the construction and post-construction periods.

The detailed water quality baseline study results are presented in Appendix A. Overall, the results of the monitoring program indicate that water quality throughout the sampling area in the vicinity of Kaumālapa'u Bay is remarkably clear of suspended material throughout the year. This observation appears to be a result of the arid nature of the western side of the island of Lāna'i, which receives little rainfall, and hence there is little runoff of particulate materials. Table 2 summarizes the data by showing the geometric means, maxima and minima for the six sample periods and four parameters measured, for each of the twelve sampling stations. The generally excellent water clarity is illustrated by the turbidity geometric mean of 0.08 to 0.10 ntu. By comparison, State Department of Health water quality standards list the geometric mean limit for turbidity under dry conditions as 0.20 ntu. Statistical analysis of the data set shows no significant differences in any of the four water quality constituents between means of surface and deep samples, indicating that there is no vertical stratification of the water column. Analysis also shows no significant differences for any of the water quality constituents when all data from each of the twenty-four sampling stations is pooled, indicating that water throughout the sampling regime is essentially homogeneous at any time of the year. Statistical analysis does, however, show small differences between sampling times. In general, the highest means of all constituents occurred in the winter season samplings (January, October, December), while the lowest means occurred during the summer (June, August).

5.1.5 Marine Biology

The marine biology in the area has been studied during a survey conducted for this project by Marine Research Consultants (Appendix B); during a reconnaissance site visit by the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, and the project environmental consultant in December 1999; and by the Fish and Wildlife Service beginning in 1994 and culminating in their Final Fish and Wildlife Coordination Act Report, April 1, 2001 (Appendix C).

The underwater physical environment of the existing breakwater consists of a steeply sloped aggregation of armor stones and various items of debris that extend from the emergent breakwater crest to the sand plain that comprises the natural floor of the harbor (depth of approximately 65 feet). Figure 7 is a typical view of the breakwater, showing boulders, debris and extensive coral coverage. The predominant marine biota inhabiting the present breakwater structure are stony corals, predominantly of the genera *Porites, Pocillopora, and Montipora.* Coral cover is lowest on the shallowest portions of the breakwater compared to the deeper areas, and on the harbor side face of the breakwater as compared to the seaward face. Coral cover peaks on the solid surfaces of debris (pipes, piles, dolos, pineapple boxes) off the end of the existing end of the breakwater and along the seaward face. Coral cover in this area is approximately 50% of bottom cover. As much of the debris was likely placed on site following the two hurricanes in 1982 and 1992, it appears that settlement and growth of corals on the surfaces has been rapid. Other invertebrate communities were restricted to sea urchins (primarily *Echinometra mathaei,* and *Heterocentrotus mammillatus)* observed primarily within the spaces between the boulders and debris.

The natural shoreline throughout the harbor, and to the north of the breakwater is relatively uniform in structure, consisting of steeply sloping vertical cliffs that extend underwater. Off the northern end of the existing breakwater a finger reef extends perpendicular to the axis of the breakwater. The finger reef consists of a relatively flat upper surface and nearly vertical sides that extend to the sand floor of the outer harbor. As with the solid surfaces of the breakwater, the vertical faces of the natural shoreline are inhabited by high cover (greater than 50%) of a variety of reef corals, predominantly of the three genera named above. The inner shoreline of the harbor also consists of sloping vertical basalt faces that terminate at the sand surface of the harbor floor. Coral cover is uniformly high throughout the margin of the harbor. In contrast, the floor of the harbor consists of a flat plain of gray sand. The sand is heavily rippled and pocked with numerous burrows likely of either worms or shrimp. Except for scattered debris that serves as settling surfaces, coral colonies or other macrobenthos do not occur on the sand flat.

Fish assemblages were typical of Hawaiian reef communities, with the exception that there appear to be very limited numbers of large individuals, and species recognized as preferred food fish. The observation of numerous spearfishermen that use the harbor as a point of entry to the ocean along the otherwise inaccessible coastline indicates a high degree of fishing pressure in the area.

Marine macroalgae (*limu*) were essentially absent from all of the areas surveyed within Kaumālapa'u Harbor.

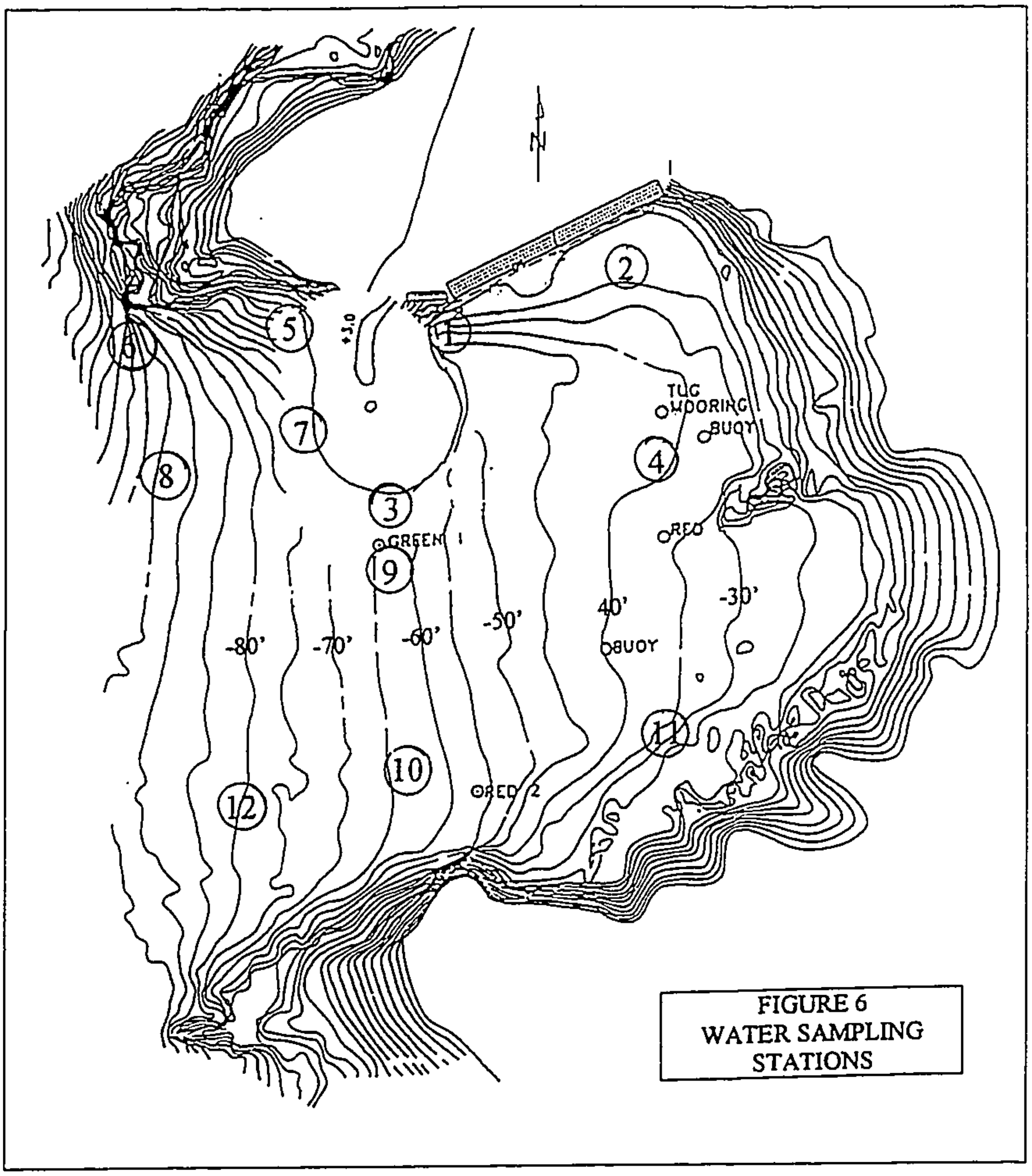


FIGURE 6
WATER SAMPLING
STATIONS

TABLE 2. SUMMARY OF GEOMETRIC MEANS, MAXIMA AND MINIMA FROM SAMPLING STATIONS COMBINED FOR SIX PRE-CONSTRUCTION SURVEYS AT KAUMALAPAU HARBOR. PEAK VALUES OF TSS AND TURBIDITY ARE IN BOLD TYPE FOR EACH PARAMETER.

GEOMETRIC MEANS

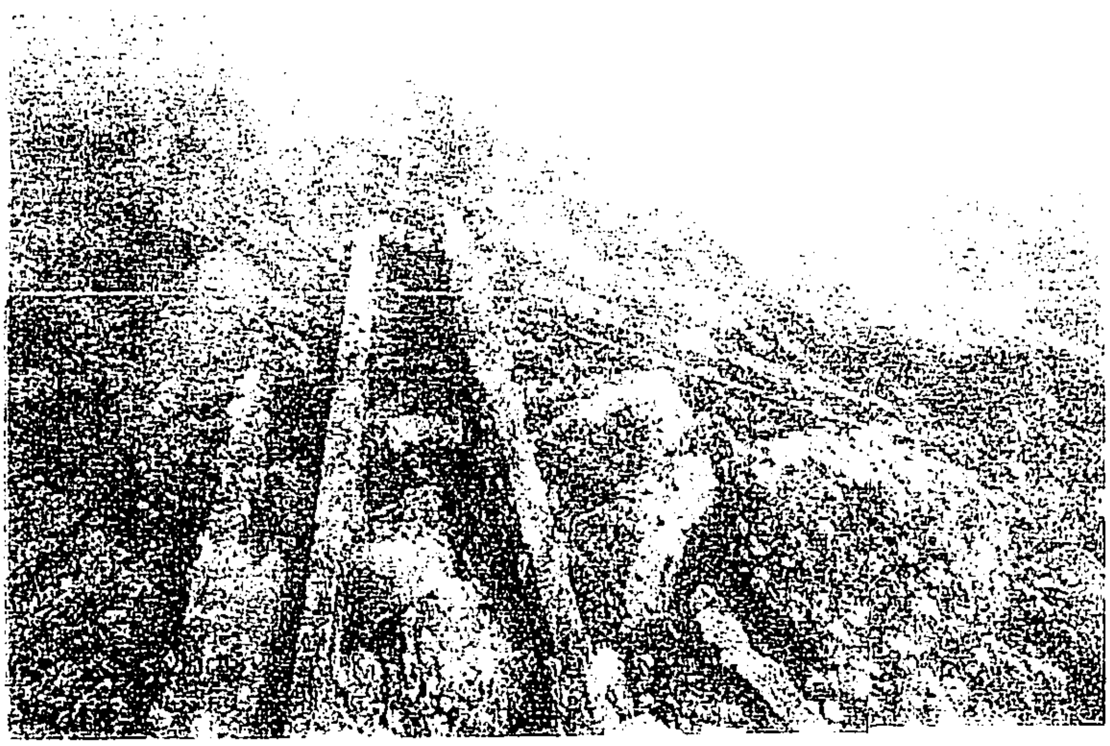
STATION	TSS (mg/l)	Turb (ntu)	SALT (o/oo)	pH (rel)
1-S	2.13	0.09	34.971	8.12
1-B	2.22	0.09	34.962	8.14
2-S	1.14	0.08	34.899	8.15
2-B	1.39	0.09	34.971	8.16
3-S	1.55	0.08	34.931	8.16
3-B	1.74	0.08	34.973	8.16
4-S	1.96	0.09	34.935	8.16
4-B	1.63	0.09	34.974	8.16
5-S	1.52	0.08	34.952	8.17
5-B	1.83	0.09	34.973	8.17
6-S	1.49	0.08	34.930	8.17·
6-B	1.59	0.08	34.973	8.17
7-S	1.27	0.07	34.958	8.17
7-B	1.35	0.08	34.969	8.17
8-S	1.30	0.08	34.924	8.17
8-B	1.19	0.09	34.968	8.17
9-S	1.42	0.07	34.932	8.17
9-B	1.38	0.08	34.987	8.17
1-0-S	1.73	0.08	34.919	8.17
10-B	1.27	0.08	34.980	8.17
11-S	1.43	0.09	34.932	8.16
11-B	1.50	0.10	34.966	8.17
12-S	2.05	0.09	34.908	8.17
12-B	1.35	0.08	34.971	8.17

MAXIMA

STATION	TSS (mg/l)	Turb (ntu)	SALT (o/oo)	pH (rel)
1-S	4.71	0.12	35.057	8.15
1-B	3.40	0.14	35.054	8.17
2-S	3.87	0.12	35.074	8.18
2-B	5.40	0.17	35.071	8.19
3-S	3.80	0.12	35.051	8.19
3-B	3.93	0.13	35.053	8.18
4-S	5.01	0.12	35.080	8.19
4-B	3.47	0.13	35.034	8.19
5-S	4.27	0.13	35.060	8.19
5-B	3.80	0.16	35.059	8.19
6-S	3.87	0.11	35.055	8.20
6-B	2.07	0.09	35.072	8.20
7-S	2.20	0.11	35.088	8.20
7-B	2.80	0.11	35.073	8.19
8-S	4.87	0.15	35.074	8.20
8-B	4.00	0.30	35.064	8.20
9-S	3.20	0.09	35.072	8.20
9-B	2.40	0.13	35.071	8.19
1-0-S	2.80	0.10	35.078	8.20
10-B	3.27	0.10	35.106	8.18
11-S	2.20	0.18	35.069	8.20
11-B	2.93	0.32	35.063	8.18
12-S	5.40	0.12	35.076	8.19
12-B	1.80	0.16	35.080	8.19

MINIMA

STATION	TSS (mg/l)	Turb (ntu)	SALT (o/oo)	pH (rel)
1-S	1.20	0.08	34.844	8.09
1-B	1.40	0.06	34.860	8.10
2-S	0.08	0.07	34.631	8.12
2-B	0.27	0.07	34.878	8.14
3-S	0.80	0.06	34.777	8.13
3-B	1.27	0.05	34.845	8.14
4-S	0.87	0.07	34.737	8.14
4-B	0.87	0.05	34.872	8.14
5-S	0.47	0.06	34.824	8.15
5-B	0.87	0.06	34.849	8.15
6-S	0.80	0.06	34.740	8.15
6-B	1.00	0.06	34.869	8.16
7-S	0.47	0.05	34.815	8.15
7-B	0.67	0.05	34.861	8.15
8-S	0.60	0.06	34.718	8.15
8-B	0.47	0.05	34.864	8.16
9-S	0.87	0.06	34.803	8.15
9-B	0.80	0.05	34.877	8.16
1-0-S	1.03	0.06	34.753	8.16
10-B	0.27	0.06	34.870	8.16
11-S	0.87	0.07	34.770	8.15
11-B	0.80	0.06	34.879	8.16
12-S	1.27	0.06	34.679	8.16
12-B	0.93	0.05	34.875	8.16



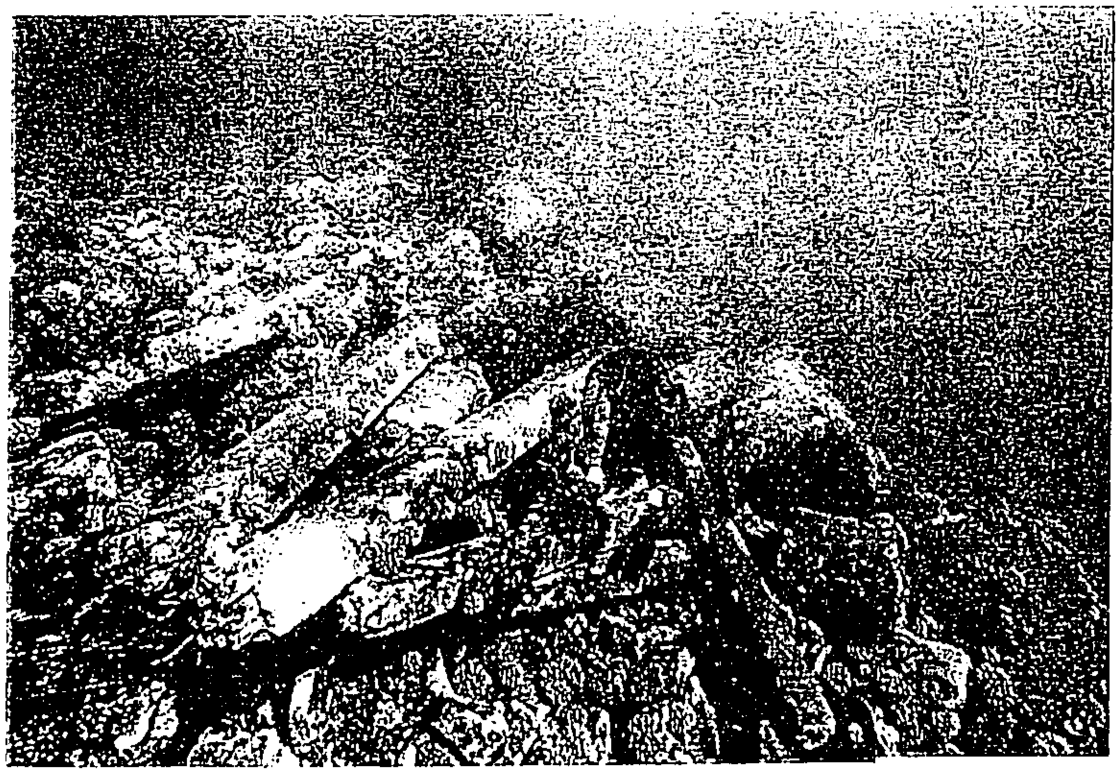


FIGURE 7. Two views of concrete poles and pipes lying near inside end of underwater section of Kaumālapa'u breakwater. Water depth is 8-10 m. Photos courtesy of J. Naughton, NMFS.

5.1.6 Terrestrial Biological Resources

The U.S. Fish and Wildlife Service (Appendix C) has evaluated terrestrial biological resources at the harbor site. They found no wetlands or sensitive upland habitats located within the harbor area. The terrestrial portion of the proposed project site has been altered by construction of the existing breakwater and ancillary harbor buildings, parking lot and wharf. The dominant terrestrial plants at the site include kiawe (Prosopis pallida) and bristly foxtail (Setaria verticillata). Other plants likely to be present in the area include pili grass (Heteropogon contortus), swollen fingergrass (Chloris barbata), false mallow (Malvastrum coromandelianum), hairy merremia (Merremia aegyptia), and partridge pea (Chamaecrista nictitans). All of these species except pili grass are considered exotic introductions to Hawai'i that have become naturalized.

Terrestrial animals at the site are limited to introduced species, including Axis deer (*Cervus axis*), gray francolin (*Francolinus pondicerianus*), and ring neck pheasant (*Phasianus colchicus*), northern cardinals (*Cardinalis cardinalis*), red-crested cardinals (*Paroaria coronata*), barred doves (*Geopilia striata*), spotted doves (*Streptopelia chinensis*), common myna birds (*Acridothetres tristis*), and seabirds are reported to be present within the vicinity of the site (Corps 1993). The domestic cat (*Felis catus)* and dog (*Canis familiaris)*, house mouse (*Mus musculus domesticus*), black roof rat (*Rattus rattus*), brown rat (*R. norvegicus)*, Polynesian rat (*R. exulans hawaiiensis*), and Indian mongoose (*Herpestes auropunctatus*) occur at the site. Introduced skinks (Scincidae) and geckos (Gekkonidae) are also present

5.1.7 Threatened and Endangered Species

Three species of marine animals that occur in Hawaiian waters have been declared threatened or endangered by Federal jurisdiction. The threatened green sea turtle (*Chelonia mydas*) occurs commonly throughout the island chain, and is known to feed on selected species of macroalgae. The endangered hawksbill turtle (*Eretmochelys imbricata*) also occurs, but is considered rare compared to the green turtle. While turtles are known to exist in the waters surrounding Kaumālapa'u Harbor, no turtle-nesting habitat occurs within Kaumālapa'u Bay. The preferred types of resting habitat and food resources for these species were not observed during the survey (e.g. lack of *limu*). No turtles were observed during the fieldwork conducted for preparation of this environmental assessment.

Populations of the endangered humpback whale (*Megaptera novaeangliae*) are known to winter in the Hawaiian Islands from December to April. In November 1992, the Congress passed the Ocean Act of 1992, which established the Hawaiian Island Humpback Whale National Marine Sanctuary. Waters extending seaward from Kaumālapa'u Harbor to the 100-fathom contour are included within the sanctuary's boundaries. Hawaiian monk seals (*Monachus schauinslandi*) also occur occasionally in waters off the high islands. The predominantly cliffed shorelines, and lack of beaches in the area indicate that the area would not be particularly suitable for seals to haul out (beach themselves to rest). No whales or monk seals were observed during the surveys in Kaumālapa'u Harbor.

5.2 Man-Made Environment

5.2.1 Harbor Facilities

The harbor is located in a small natural embayment along the southwest coast of Lāna'i. The entrance to the harbor is formed by a rocky point on the south side and the existing breakwater on the north side. Navigation lights are located on the tip of the breakwater and the point south of the harbor. The breakwater is currently about 250 feet long and is badly deteriorated, with only a portion of its crest still above water. A 400-foot-long wharf is located along the north shore of the harbor, in the lee of the breakwater. The wharf is concrete on top of a rock base. The wharf face is concrete to about the waterline, and is pile supported. Wharf facilities include a cargo shed, cargo loading and unloading equipment, and a derrick for lifting small craft up to 40 feet in length out of the water for repairs. A small office building is located on the slope behind the wharf. There are several privately maintained moorings within the harbor.

5.2.2 Hazardous Waste

Two investigations of environmental conditions in the Kaumālapa'u Harbor vicinity with an emphasis on the potential for hazardous waste materials have been conducted. In August 1997 Brewer Environmental Services, under contract to the Lanai Company, Inc., conducted a site reconnaissance and assessment of environmental conditions at the proposed Kaumālapa'u Land Acquisition parcels (harbor lands to be acquired by the State of Hawai'i, Department of Transportation, Harbors Division). They concluded, "There were no obvious hazardous waste disposal sites or environmental impairments at the Acquisition area." A Phase I Environmental Site Assessment was conducted by Clayton Environmental Consultants in November 1999, also under contract to the Lanai Company, Inc. and performed as part of the harbor land acquisition by the State. This assessment was performed in accord with ASTM E-1527-97, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process. The objective of the assessment was to determine the presence or likely presence of any hazardous substances or petroleum products on the property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property. The assessment included 1) a walkthrough of the property, 2) review of records of present and historical use of the property, 3) interviews with owners and occupants, and 4) review of Federal and State databases for hazardous waste spills or problems. Other than an empty 300-gallon above ground storage tank and some empty 55-gallon drums, and possible PCB containing light fixtures, no evidence of hazardous waste problems in the harbor vicinity were noted by the site assessment.

Investigation of the project site during preparation of this EA to ascertain the likelihood of issues associated with hazardous wastes within the project boundaries or which might be affected by the project included 1) a review of past uses of the harbor, 2) visual observations of the site, and 3) review of the State Department of Health, Office of Hazard Evaluation and Emergency Response, database for known or reported spills or other evidence of possible contaminants or hazardous waste.

The project will consist of work only on the existing breakwater rubblemound structure, which is almost entirely submerged, and is composed of rock and concrete rubble. There is no known reason to suspect hazardous waste material in the existing breakwater structure. The harbor was historically used to ship pineapples grown upland in the center of the island to Oahu, and for the importation of food, fuel, consumer goods, construction materials etc. to the island. With the demise of pineapple production about 10 years ago, the harbor is now used primarily for weekly cargo and fuel barge service. There are no known instances of significant fuel or other contaminant spills from the barge service operations.

Detailed engineering and environmental investigations of the project site have been made, and no visual evidence of contamination was noted (e.g. containers, discolored soil, seeping liquids, films on the water, suspect odors, dead-end pipes etc.). Existing aboveground fuel oil storage tanks owned by the Lanai Oil Company are located about 700 feet inland from the project site, however they are in good condition, show no visual signs of leakage, and are surrounded by containment structures. Lanai Oil Company operations include pumping of oil from a barge at the wharf to the storage tanks. No leaks have been reported either from the tanks or the pipelines. The contractor's work and storage area will be located approximately 2,000 feet inland from the harbor. This area was previously cleared and was the site of a rock quarry. It has been vacant for a number of years, and the surface is composed of grass, earth and rock. It shows no visual evidence of contamination.

The State of Hawai'i, Department of Health, Office of Hazard Evaluation and Emergency Response (HEER) maintains a database of known or reported hazardous waste spills or evidence of possible contamination by hazardous substances. Review of this database showed no reporting of hazardous or toxic waste problems for the Kaumālapa'u Harbor vicinity. The two previous studies discussed above are available for review at the HEER office.

5.3 The Socio-Economic Environment

5.3.1 Ocean Activities

Dominant fishing activities at Kaumālapa'u Bay include hook and line fishing from the harbor breakwater and wharf, and spear fishing on the reefs inside and outside of the bay. The surrounding reefs, especially the fringing coral-reef shelf outside the harbor, are important SCUBA dive sites. Kaumālapa'u Bay is also important to charter dive operators who use the harbor as a loading and unloading site.

5.3.2 Harbor Operations

Kaumālapa'u Harbor is Lāna'i's only commercial harbor, and provides the only deep draft vessel berthing for the island. Young Bros., Inc. inter-island cargo barge which serves Lāna'i once a week, and the weekly fuel barge call, are the primary harbor users. The barge service, particularly the fuel barge, is limited by wave action at the wharf. The barges suspend heavy weights from the bow and stern to dampen vessel motion resulting from wave action and surge, but even with this the barges cannot berth at the wharf when wave heights exceed about 4 feet. In the past, fuel service was provided by Sause Brothers, using a large ocean-going 270-foot long barge and two tugs. Following damage to the breakwater during hurricane 'Iniki, Sause Brothers stopped serving the island, citing the difficult and sometimes dangerous berthing conditions which made it difficult to schedule the barge calls in advance. Fuel is now delivered by a smaller tug and barge operating from Maui.

5.4 Historic and Cultural Resources

No prehistoric archaeological resources have been identified in the areas to be affected by the proposed project, including the inland Contractor's Work and Storage Area. The work and storage area has been previously graded and thoroughly altered. This was verified during a site visit by State Historic Preservation District personnel in March 2001. Kaumālapa'u Harbor, and presumably the breakwater itself, was constructed by the Hawaiian Pineapple Company ca. 1926. The original 425-foot-long (reportedly) breakwater was constructed of rock blasted from nearby cliffs, and hauled to the shore by railroad cars on a 4,000-foot-long track. A 400-foot-long dock was also built, and the harbor was dredged to a minimum depth of 27 feet. The harbor has been recommended for Reserve status on the Hawai'i Register of Historic Places based on its historical association with the pineapple industry on the island of Lāna'i. Unfortunately, storm wave destruction and numerous repair efforts over the years have left virtually none of the original breakwater intact.

A study of Traditional Cultural Places (TCPs) at Kaumālapa'u Harbor has been conducted by Social Resource Pacific, Inc. for this project. Their study report, Oral Historic Studies for the Determination of Traditional Cultural Places at Kaumālapa'u Harbor, Lāna'i Island, Hawai'i, is included in Appendix G. A summary of the study findings taken from Chapter 5 of the report is as follows:

> The oral histories done for this survey come about nearly 75 years after construction began on the harbor area. It is unclear the extent to which this area was used (for traditional purposes) prior to construction-related activities. There has always been some use of Kaumālapa'u Harbor but how much of that has changed since prior to contact and in traditional ways, is difficult to ascertain. It is reasonable to assume that much of the "traditional uses" of the area was discontinued by the time pineapple farming became established on the island. Fishing is a traditional activity, and fishing is a modern activity. It's a practice that continues but has changed in technology as well as in the availability of resources, e.g. types of fish. So traditional uses of the ocean area have continued but all traditional activities are no longer known nor conducted. The area has lost that character. As a result, the Traditional Cultural Properties, those which meet the definition and guidelines of the National Register, and as well the cultural landscapes that hold traditional meaning to native Hawaiians, became nearly non-existent. Physically that is. What remain are the memories of the people who created or inherited the traditions that bring value and significance to these features and places.
>
> Kaumālapa'u Harbor and the breakwater are now important for the more familiar, non-traditional, but historically significant activities. These speak to the importance of having this area as a resource that allows the people to sustain these historically significant activities. The harbor itself has become a place of importance for the current residents of Lāna'i.

6. ENVIRONMENTAL CONSEQUENCES

6.1 The Natural Environment

6.1.1 Physical Marine Environment

The proposed project is to repair and improve the breakwater to reduce wave energy entering the harbor. It will therefore have a direct impact on waves and wave energy along the harbor wharf. The improved breakwater, however, will only extend 50 feet further across the harbor mouth and is therefore not expected to noticeably affect current and flushing throughout the harbor.

6.1.2 Air Quality

There are expected to be no long-term impacts of the proposed project on air quality in the area. Activities during construction of the breakwater will create dust and emit exhaust fumes.

6.1.3 Noise

There are expected to be no long-term impacts of the proposed project on noise in the area. Activities during construction of the breakwater will cause periods of elevated noise levels.

6.1.4 Water Quality

Results to date indicate that even though Kaumālapa'u Harbor is a semi-enclosed basin, water quality throughout the area is essentially oceanic. Such conditions appear to be a result of the lack of drainage into the harbor owing to the arid nature of the terrestrial environment, and substantial exchange between the harbor basin and the open ocean. Construction of the new breakwater will consist of placement of rock and concrete structures, which would be clean of any fine-grained sediment. With Best Management Practices in place to prevent drainage of materials from land into the harbor during construction, there are no apparent agents that could substantially, or permanently, alter water quality within the harbor. While the new breakwater is designed to reduce surge within the inner harbor, it would not significantly alter circulation or flushing of the harbor, and no change in overall water quality at the project site is anticipated following completion of construction.

6.1.5 Marine Biological Resources

Survey results indicate that all of the existing solid surfaces in Kaumālapa'u Harbor, whether natural or manmade, are highly suitable surfaces for reef coral settlement and growth. The apparent lack of sediment input owing to the arid climate of the area, sufficient circulation of seawater, and apparent lack of destructive wave stress during the course of the normal (i.e. non-hurricane) seasonal wave climate appear to provide an ideal habitat for coral growth. Of particular interest is the high coral cover on the armor stone and numerous pieces of debris comprising the submerged sections of the breakwater. Percentage coral cover on the breakwater is presently similar to percentage cover on neighboring natural surfaces. As much of the debris was likely placed on the breakwater following the two hurricanes that impacted Kaumālapa'u (1982, 1992), the coral colonization and growth on these structures appear to be relatively rapid.

The present design of the new breakwater will unquestionably involve coverage of the existing breakwater structure with new rock and concrete, resulting in loss of much of the existing coral cover on the breakwater. Inspection of the breakwater and Kaumālapa'u Harbor basin indicates that the floor of the harbor consists of sand. Thus, expanding the footprint of the breakwater would not substantially impact existing benthic biotic communities beyond the edge of the present breakwater. The new breakwater will consist of materials similar to the existing breakwater, and will cover a larger footprint, and consist of a larger surface area of boulders and concrete. As there is no reason to assume that the new breakwater structures would not colonize in a similar manner as the existing breakwater, it appears that over the long term (10-20 years), there is likely to be coral coverage on the new structure similar to what is present today.

Prolific coral communities also occur on the natural hard bottom adjacent to the breakwater, particularly on the fringing coral reef shelf projecting seaward near the landward terminous of the existing breakwater. While the proposed construction plan does not involve activity in this area, care will be taken to avoid impacts that might accompany construction, such as mooring of barges or stockpiling of materials.

Survey results also indicate that the fish populations at Kaumālapa'u appear to be substantially depleted by fishing pressure. None of the activities associated with construction of the new breakwater would appear to further impact fish populations. The new breakwater with its large concrete armor units will provide increased interstitial space and complexity, which would replace and increase favorable fish habitat that would be lost by covering the existing structure. The National Marine Fisheries Service also concurs that the project will not impact an identified Essential Fish Habitat as delineated by the Magnuson-Stevens Fishery Conservation and Management Act.

6.1.6 Terrestrial Biological Resources

As the existing terrestrial habitat at Kaumālapa'u is already highly affected by the present harbor infrastructure, the proposed work is not expected to impact terrestrial biological resources.

6.1.7 Threatened and Endangered Species

Kaumālapa'u is not a turtle-nesting site, nor does it appear to be a favorable habitat for monk seals. While turtles undoubtedly occur in the area of the proposed construction, it does not appear that the locale is a unique or especially favorable habitat for turtles. A general paucity or lack of food preferred by green sea turtles and hawksbill sea turtles indicates that the area is not likely a feeding habitat for turtles. Nevertheless, it is recommended that a protocol be developed to mitigate disturbances to turtles or seals, should they be present in the area during construction. The construction activity is also restricted to an area not frequented by whales.

Fish and Wildlife Coordination Act and Endangered Species Act (1973), Section 7 coordination has been conducted with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. Both of these agencies concurred that the proposed project is not likely to adversely affect listed endangered species, and that formal consultation under Section 7 of the Endangered Species Act is not required.

6.2 The Man-Made Environment

There are expected to be no adverse impacts of the proposed project on the man-made environment in the harbor vicinity. The proposed project will benefit all harbor operations by reducing wave energy entering the harbor, and minimizing hazardous berthing conditions.

6.3 The Socio-Economic Environment

Kaumālapa'u Harbor was constructed in 1926, and for 75 years it has been a functioning port. Repair of the breakwater will not change the harbor size, wharf space or services provided. Up until about the past decade, when the island's economy was based on agriculture, the harbor chiefly was used for the export of pineapple. As the economic base has changed from agriculture to tourism, the primary function of the harbor is also changing from export to the import of supplies and materials to support the new economic environment. Repair of the harbor breakwater will not of itself result in an increase in tourism and visitor arrivals to the island, the fundamental change in economic base is fueling any expansion in resident population and visitors. Repair of the breakwater will, however, facilitate the safe, timely and consistent delivery of fuel and goods to the island, a benefit to both the social and economic welfare of the residents as well as visitors. The new breakwater will also reduce the possibility of accidents that may introduce pollutants into the water.

Fishing and SCUBA diving at the project site would be restricted during the construction period. After construction, fisheries may be locally enhanced around the breakwater since the concrete armor units would provide new habitat for some algae, benthic invertebrates, and reef fishes.

6.4 Historic and Cultural Resources

The proposed project has been coordinated with the State Historic Preservation Officer (SHPO) under the provisions of Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations 36 CFR Part 800. The SHPO has recommended the implementation of two historic mitigation measures: 1) installing a fence along the edge of the gulch bordering the Contractor Work and Storage Area, and 2) photographically documenting the existing breakwater using Historic American Building Survey standards. With the implementation of the recommended mitigation measures, the SHPO has concurred that there will be no historic properties affected by the proposed project (see coordination letter in Appendix D).

Repair of the breakwater will not affect any existing cultural properties at the site. The harbor itself will remain basically as is following completion of construction, and its use by the current residents of Lāna'i will be unchanged.

7. CONCLUSIONS

7.1 Relationship Between Local Short-term Uses of the Environment and Maintenance and Enhancement of Long-term Productivity

The short-term uses of the environment for this project are associated with the construction of the breakwater. This includes reshaping the existing rubblemound to form a suitable base for the new material, and then placing the new armor material to form the breakwater. The on-site construction work is expected to take approximately 18 months. Short-term uses of the environment will be minimal, and should result in long-term benefits and enhancement of productivity. These include the following: enhanced fish and coral populations in the area by providing increase surface area and habitat; reduction in coral damage caused by dumping debris for emergency protection and by movement of debris during storms; reducing the risk of fuel and cargo spills at the wharf by improving berthing conditions; and more consistent, and regular supply of goods to the island.

7.2 Irreversible and Irretrievable Commitments of Resources

The proposed project entails repairing the existing breakwater. The new breakwater will extend about 50 feet further across the harbor mouth than the existing structure, and therefore, will occupy about 8,000 square feet of new sandy seafloor. The breakwater is designed for stability during hurricanes, and can be considered irreversible and irretrievable. This small sandy area is characterized by very limited macrobiota and will be permanently lost as habitat. However, the few bottom dwelling organisms that might occur in this sand should be a very minor component of the community; sand is extensive within and offshore of the harbor.

The proposed action will not make use of non-renewable resources and will not irreversibly curtail the range of potential uses of the environment. To the contrary, the project will increase the range of potential uses of the area by providing improved vessel berthing opportunities.

Environmental accidents that may occur in this project include the following:

- The unforeseen release of pollutants into the water during construction – best management practices, and a containment plan will be in place to counter the unforeseen release of pollutants into the water.
- Damage to coral during construction – construction activities and stockpiles will be carefully located to avoid natural reef environments, such as the finger reef north of the breakwater.

7.3 Probable Adverse Environmental Effects Which Cannot Be Avoided

Coral growth on the man-made structure that comprises the present breakwater is comparable to natural surfaces. While construction of the new breakwater is expected to cover much, or all, of the existing coral, the new breakwater should be colonized in a similar manner within a relatively short time span. As the new breakwater will result in an increase in settlement surfaces compared to the present, and if some replacement of existing coral encrusted debris is undertaken, the net result of the project could be an increase in coral community abundance. An adverse environmental effect of this project that cannot be avoided is the loss of a small area of sandy seafloor that may serve as habitat for bottom dwelling organisms. This area averages only 40 feet wide and 200 feet long, curving around the head of the breakwater. The few bottom dwelling organisms that may occur in this area represent a very minor portion of the community. Sand bottom is extensive within and offshore of the harbor.

Minor unavoidable impacts may also include the temporary disruption of boating traffic and ocean activities during the construction activities.

7.4 Evaluation of State of Hawai'i Impact Significance Criteria

The "significance criteria" defined in the State of Hawai'i Environmental Impact Statement Rules (Section 11-200-12(a)(11)) are applied during the EA process to support a finding of no significant impact (FONSI) for the project. The following evaluation of the significance criteria indicates that the proposed project is not expected to have significant environmental impact.

(1) Involves an irrevocable commitment to loss or destruction of any natural or cultural resource.

The breakwater repair will result in the loss of much of the existing coral and other benthic organisms presently colonizing the existing deteriorated breakwater structure. The new breakwater will consist of materials similar to the existing breakwater, and will cover a larger footprint and will thus have a larger surface area of boulders and concrete on which coral can colonize. As there is no apparent reason why the new breakwater structure would not colonize in a manner similar to the existing breakwater, it is reasonable to assume that over the long term (10-20 years) there is likely to be coral coverage on the new structure similar to what is present today. The proposed project is not likely to adversely impact listed threatened or endangered species, nor will it impact an identified essential fish habitat.

There will be no historic properties affected by the proposed project, nor will the project affect traditional cultural resources or practices of the community.

(2) Curtails the range of beneficial uses of the environment.

Kaumālapa'u Harbor and the breakwater have been in existence and serving as a commercial port for 75 years. Local residents also use the harbor area for fishing, diving and boating. The proposed breakwater repair will not alter the general harbor configuration or increase the size of the port area, either in the water or on the land. While there will be some curtailment of recreational use of the harbor during the construction period, there would be no permanent reduction of harbor area use by residents as a result of the proposed project.

(3) Conflicts with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS.

The proposed project is consistent with the Environmental Policies established in Chapter 344, HRS, and the National Environmental Policy Act. The project is also consistent with the State's policy to create opportunities for the residents of Hawai'i to improve their quality of life through diverse economic activities that are in balance with the physical and social environment.

(4) Substantially affects the economic or social welfare of the community or state.

The proposed project will provide a significant contribution to Lāna'i's present and future population by providing residents with a safer commercial harbor. Repair of the breakwater is important to the welfare of the residents and economy of Lāna'i because it would facilitate timely and consistent delivery of fuel and goods to the island.

(5) Substantially affects public health.

No impact to public health is anticipated to result from the project.

(6) Involves substantial secondary impacts, such as population changes or effects on public facilities.

Repair of the breakwater is not expected to of itself result in significant impacts on the population of Lāna'i. Up until about the past decade, when the island's economy was based on agriculture, the harbor was primarily used for the export of pineapple. As the economic base has changed from agriculture to tourism, the principal function of the harbor has also changed from export to the import of supplies and materials to support the new economic environment. Repair of the breakwater will not impact the resident population or number of visitor arrivals to the island, the fundamental change in economic base is fueling any population changes. Repair of the breakwater will, however, render the harbor, an essential public facility, safer and more useable.

(7) Involves a substantial degradation of environmental quality.

The project site is not a wetland, special aquatic site, marine sanctuary or wildlife refuge. Coral cover on the existing breakwater will be destroyed by the project, however the new breakwater will consist of materials similar to the existing breakwater and coral is expected to re-colonize on the new structure. Best Management Practices during construction will be used to avoid damage to the natural reef areas adjacent to the project site, and a Water Quality Monitoring Plan will be used to control impacts to coastal water quality. The new breakwater with its large concrete armor units will provide increased interstitial space and complexity, which would replace and increase favorable fish habitat lost by covering the existing structure. Construction of a stable breakwater will also reduce damage to corals caused by rock and concrete rubble movement during storm wave attack.

(8) Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions.

Repair of the breakwater is a stand-alone project, with neither an attachment to additional projects which could have cumulative impacts or any commitment for larger actions.

(9) Substantially affects a rare, threatened, or endangered species, or its habitat

Three species of marine animals that occur in Hawaiian waters have been declared threatened or endangered by Federal jurisdiction: green and hawksbill sea turtles, humpback whales and Hawaiian monk seals. Kaumālapa'u Harbor is not a turtle nesting site, nor is it a favorable habitat for monk seals. While turtles undoubtedly occur in the area of the proposed construction, the locale is not a unique or especially favorable habitat for turtles. The construction activity is also restricted to an area not frequented by whales. Nevertheless, the construction plan will include a protocol to mitigate disturbances to endangered species should they enter the area during construction. Endangered Species Act coordination has been conducted with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, and these agencies have concurred that the proposed project is not likely to adversely affect listed endangered species. The National Marine Fisheries Service also concurs that the project will not impact an identified Essential Fish Habitat.

(10) Detrimentally affects air or water quality of ambient noise levels.

Construction of the new breakwater will consist of placement of rock and concrete armor units. All material would be inert and free of earth or fine sediment, and would not have any significant effect on water chemistry, salinity, temperature, dissolved oxygen, nutrients, nor contain any contaminants. No water quality impacts are expected other that temporary turbidity and suspended solids production from on-site sediment during re- shaping of the existing breakwater and placement of the new breakwater stone. Water quality monitoring in the vicinity of construction activities will be required as part of the construction contract. The monitoring program will be prepared in accordance with State water quality regulations (RDOH, Chapter 11-54) and the General Monitoring Guideline for Section 401 Water Quality Certification Projects (HDOH, 2000). While the new breakwater is designed to reduce surge within the harbor, it would not significantly after circulation or flushing of the harbor, and no change in overall water quality is anticipated following completion of construction.

(11) Affects or is likely to suffer damage by being in an environmentally sensitive area such as a floodplain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal water.

Kaumālapa‘u Harbor breakwater is directly exposed to severe storm wave attack. Both hurricane ‘Iwa (1982) and ‘Iniki (1992) storm waves severely damaged the existing breakwater, and were in large part responsible for the current need for repair. The breakwater repairs have been designed for hurricane wave conditions using standard coastal engineering design criteria and methodology, and the proposed repair has been extensively tested by hydraulic model studies to help insure its ability to perform without significant damage under the design wave conditions. Kaumālapa‘u Harbor is a rocky embayment, and there are no breaches or erosion-prone areas in the vicinity of the project.

(12) Substantially affects scenic vistas and viewplanes identified in county or state plans or studies.

The repaired breakwater crest would be larger than presently exists, and would reduce somewhat the seaward ground level view from the immediate harbor area. However, there are no identified scenic vistas or viewplanes that would be significantly altered by the project.

(13) Requires substantial energy consumption.

Other than energy expended during construction operations, the project involves no energy consumption or long-term commitment to energy use.

7.5 Mitigation Measures

Best Management Practices (BMPs) for construction operations will be developed to help minimize adverse impacts to coastal water quality and the marine ecosystem.

The project specifications will require the Construction Contractor to adhere to environmental protection measures, including, but not limited to, the following.

- The Contractor shall perform the work in a manner that minimizes environmental pollution and damage as a result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of the construction period.
- The Contractor shall submit an environmental protection plan for approval prior to initiation of construction.
- The Contractor shall confine all construction activities to areas defined by the drawings and specifications. No construction materials shall be stockpiled in the marine environment outside of the immediate area of construction.
- The Contractor shall keep construction activities under surveillance, management and control to avoid pollution of surface or marine waters. Construction related turbidity at the project site shall be controlled so as to meet Hawai'i State Water Quality Standards. All water areas affected by construction activities shall be monitored by the Contractor. If monitoring indicates that the turbidity standards are being exceeded due to construction activities, the Contractor shall suspend the operations causing excessive turbidity levels until the condition is corrected. Effective silt containment devices shall be deployed where practicable to isolate the construction activity, and to avoid degradation of marine water quality and impacts to the marine ecosystem. In-water construction shall be curtailed during sea conditions that are sufficiently adverse to render the silt containment devices ineffective.
- All construction materials shall be free of dirt, sediment and possible pollutants.
- Waste materials and waste waters directly derived from construction activities shall not be allowed to leak, leach or otherwise enter marine waters.

Transplanting corals from the existing breakwater structure to another area is not feasible. However, excess coral encrusted boulders and concrete from the construction footprint will be placed on the sand bottom immediately seaward of the breakwater toe. This would maintain in part the coral cover that presently populates the material, and would add substrate complexity to the relatively featureless bottom that would increase fish habitat and the opportunity for additional coral growth.

7.6 Unresolved Issues

There are presently no unresolved issues for this project.

8. LIST OF PREPARERS

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9. PUBLIC AND AGENCY INVOLVEMENT, REVIEW AND CONSULTATION

9.1 Project Scoping Meeting

An environmental scoping meeting was held at the U.S. Army Corps of Engineers, Honolulu Engineer District offices on December 16, 1998, to discuss issues concerning the preparation of an environmental assessment and water quality monitoring plan for the proposed Kaumālapa'u Harbor breakwater modifications. Attendees included the following:

Steve Dollar, Marine Biological Consultants, 734-4009

Michael Molina, U.S. Fish and Wildlife Service, 541-3441

Ed Chen, State DOH, Clean Water Branch, 586-4309

Randal Leong, State DOT-HAR, 587-1883

Stanley Boc, USACOE, 438-9526

Helen Stupplebeen, USACOE, 438-0430

Marc Ericksen, Sea Engineering, Inc., 259-7966

Scott P. Sullivan, Sea Engineering, Inc., 259-7966

9.2 State and Federal Agency Coordination

Environmental coordination has been accomplished with the following agencies:

U.S. Fish and Wildlife Service:	Endangered Species Act, Section 7 Coordination Fish and Wildlife Coordination Act Report
National Marine Fisheries Service:	Endangered Species Act, Section 7 Coordination Marine Mammal Protection Act Fish and Wildlife Coordination Act Magnuson-Stevens Fishery Conservation and Management Act
State Historical Preservation Office:	National Historic Preservation Act, Section 106 Review

9.3 Draft Environmental Assessment Coordination

Notice of the availability of the Draft Environmental Assessment (DEA) was published in The Environmental Notice, State Office of Environmental Quality Control, in the May 23, 2001 issue. The DEA was also sent to concerned Federal, State and County agencies. A public meeting was held on July 9, 2001, on the island of Lāna'i, to present the project plan and solicit public comment. DEA review comment letters have been received from the following agencies and interested public:

Federal Agencies:	U.S. Fish and Wildlife Service
State Agencies:	Office of Environmental Quality Control State Historic Preservation Officer Office of Hawaiian Affairs
Public:	Hawai'i Chapter, Sierra Club

The comment letters and responses to them are contained in Appendix G.

9.4 State and Federal Agency Coordination

The project will require the following permits and approvals.

Section 401 Water Quality Certification, State of Hawai'i, Department of Health, Clean Water Branch (pending).

Hawai'i Coastal Zone Management (CZM) Program Federal Consistency Determination, State of Hawai'i, Department of Business, Economic Development & Tourism, Office of Planning (concurrence received by letter dated July 13, 2001, see Appendix F).

10. REFERENCES

Brewer Environmental Services. Environmental Site Reconnaissance, Kaumālapa'u Land Acquisition. August 1997. Prepared for Lanai Company, Inc.

Clayton Environmental Consultants. Phase I Environmental Site Assessment, 2.3 Acres at Kaumālapa'u Harbor, Lāna'i Hawai'i.

Department of Army Pacific Ocean Division, Corps of Engineers. Manual for Determining Tsunami Runup Profiles on Coastal Areas of Hawai'i 1978

U.S. Army Corps of Engineers, Pacific Ocean Division. Kaumālapa'u Harbor Special Design Report, Island of Lāna'i, Hawai'i. September 1996

U.S. Army Corps of Engineers, Waterways Experimental Station. Wave Response of Kaumālapa'u Harbor Lāna'i, Hawai'i. July 1997. Prepared for U.S. Army Engineer Division, Pacific Ocean.

U. S. Department of the Interior, Fish and Wildlife Service. Final Fish and Wildlife Coordination Act Report, Kaumālapa'u Harbor Navigation Improvements, Lāna'i, Hawai'i. April 2001. Prepared for U.S. Army Corps of Engineers, Honolulu Engineer District, Fort Shafter, Hawai'i.

APPENDIX A: ASSESSMENT OF WATER QUALITY PRE-CONSTRUCTION MONITORING

ASSESSMENT OF WATER QUALITY
PRE-CONSTRUCTION MONITORING

KAUMALAPAU HARBOR BREAKWATER MODIFICATIONS
ISLAND OF LANAI, HAWAII

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April 1, 2000

EXECUTIVE SUMMARY

Planning is underway to improve the existing breakwater at Kaumalapau Harbor on the west coast of the Island of Lanai, Hawaii, in order to provide safe docking conditions for cargo and fuel barges calling at the harbor. One component of the planning process is establishing the existing character of water quality in the area. The purpose of such a characterization is to provide an early indication if there are concerns that need to be specifically addressed in the planning and permitting process to ensure maintenance of water quality, and also to serve as a baseline for future monitoring programs that will be required during and after construction.

To meet these objectives, a water quality monitoring program was carried out in 1999. Six surveys were conducted at approximately bimonthly intervals in which water was sampled from the surface and bottom at twelve stations within and outside of Kaumalapa Harbor. Constituents that were analyzed included turbidity, total suspended solids (TSS), salinity and pH. These constituents were deemed to be the most appropriate suite of parameters that could be affected by the proposed construction activity.

Results of the program indicate that the lack of substantial sediment input, owing to the arid climate of the Kaumalapau area, sufficient circulation of seawater, and lack of destructive wave stress during the normal (i.e., non-hurricane or severe storm) seasonal wave climate result in very clear (low turbidity) waterconditions. Results of the study indicate that water quality throughout Kaumalapau Bay can be considered essentially pristine open coastal waters with little impact from loading of suspended materials from land. Statistical treatment of the data indicate that there is essentially no surface layer of low salinity water that typically occurs in areas where groundwater or surface water enters the ocean from land. In addition, at any particular time, there is no difference in water quality at any of the survey stations which ranged in location from the inner portions of the Bay to the open ocean. The only statistically significant difference in the data occurred as a function of season, indicating a small increase in all constituents during the winter months.

The proposed project to modify and improve the breakwater separating the Bay from the open ocean will consist of placement of rock and concrete armor units over the existing deteriorated breakwater. Such construction activity should have minimal effect on water quality as long as placed material is clean and devoid of dirt, mud, or silt. None of the probable construction activities should affect dissolved nutrient concentrations or organic compounds within the Bay.

The pristine nature of water quality within Kaumalapau Bay is likely a key component in the prolific reef coral growth, and associated biotic communities that inhabit the area. Should Best Management Practices (BMP's) for construction operations employ methods that minimize the addition of suspended sediment to the water column, and avoid disturbance of the naturally occurring reef adjacent to the breakwater, it appears that the proposed project will not have a deleterious effect to water quality or marine community structure.

The present program was designed to serve as an initial phase of construction monitoring, and provides a good representation of the spatial and temporal aspects of water quality in the area of proposed construction. Follow-up surveys using the same methodologies during and after the construction process should provide unambiguous documentation of the effects of the action that should fulfill all regulatory requirements stipulated for the project.

1.0 INTRODUCTION

Kaumalapau Harbor is a small barge harbor located in a natural embayment (Kaumalapau Bay) on the southwest coast of the Island of Lanai, Hawaii. It is the sole harbor serving the island. The harbor has a 10-acre berthing area, 10 to 20 meters (m) deep. A boulder breakwater that extends from the northwestern shoreline southward across the mouth of the bay protects the harbor and wharf facilities (Figure 1).

Kaumalapau Bay is exposed to storm waves from the west and south. The water depth across the mouth of the embayment is about 20 to 25 m deep. The breakwater was originally about 125 m long, but has been reduced by damage from storm waves to a length of approximately 60 m. Damage to the breakwater occurred during both Hurricane Iwa in 1982 and Hurricane Iniki in 1992. The shortened breakwater presently allows for increased wave energy within the harbor during periods of large waves, resulting in hazardous conditions for berthing and cargo handling.

The Kaumalapau Harbor breakwater repair project will rebuild the badly damaged and deteriorated existing breakwater, in order to provide safe berthing conditions at the existing wharf for cargo and fuel delivery to the island. The breakwater will be rebuilt on the footprint of the old rubblemound structure, and will utilize the existing structure for the core of the new breakwater. Construction will consist of shaping the existing rubblemound to provide a core, placing an underlayer of 3 to 4 ton stone, and placing an armor layer of 35 ton Core-Loc concrete armor units. The new breakwater will have a total length of 98 m (320 feet), and a crest elevation of 4.4 m (14.5 feet) above mean lower low water.

An Environmental Assessment (EA) is necessary to address possible impacts of the proposed modification of the harbor. One of the components of the assessment is to evaluate the potential effects to water quality from the construction and operation of the new facility. One requirement of the project will be the issuance of a Section 401 Water Quality Certification; conditions of the certification are the design and implementation of a Best Management Practices (BMP's) and a Water Quality Monitoring Plan. The intents of the Water Quality Monitoring Plan are: 1) to ascertain that the specified BMP's are adequate to comply with State Water Quality Standards (HAR 11-56) and to preserve water quality in State Waters; 2) in the event that the BMP's prove inadequate, to promptly determine such, so that modifications of the BMP's can be implemented in a timely fashion to bring the activity into compliance, so that quality of State waters will be preserved; and 3) to serve as a basis for self-compliance, so that activities associated with the proposed action can proceed within the parameters defined under State water quality standards.

In this vein, it will be necessary that a monitoring program is established to evaluate the extent of changes to water quality during these activities. Typically such monitoring programs involve a three phase approach; 1) an initial pre-construction phase delineates the conditions prior to the commencement of any work. The pre-construction program establishes a set of conditions that can be used as a baseline from which changes can be discerned. Ideally the pre-construction baseline encompasses such factors as seasonal variations and anomalous events (e.g., storms) that are natural phenomena, yet cause extreme excursions in the magnitude of typical natural conditions. As such, the purpose of the pre-construction monitoring program is to define an envelope of natural variability that provides a sound scientific and statistical basis capable of differentiating changes from natural factors and the anthropogenic (construction) activity that is taking place.

It follows that the second phase of monitoring occurs during the period of construction, and is designed to mesh with the pre-construction phase in order to identify changes to the environment that result from the activity in question. It is important that the design of the construction phases is such that potentially harmful conditions can be identified at an early enough point in time that effective mitigation measures can be employed prior to a point where damage to the biotic marine communities that populate the area occur. The third, and final phase of the monitoring program is the post-construction phase. This follow-up monitoring ensures that an effects from the construction activity have completely been completely eliminated, and that no unforseen problems have arisen as a result of the project. The following report presents the methods, results and conclusions of the pre-construction phase of the water quality monitoring for the proposed modifications of Kaumalapau Harbor.

II. SAMPLING AND ANALYTICAL METHODS

A. MONITORING CONSTITUENTS

Chemical constituents that were assessed included turbidity, total suspended solids (TSS), salinity, and pH. Dissolved nutrients, pesticides, heavy metals, etc. were not considered as monitoring constituents as there appears to be little potential for changes in these materials as a result of the proposed construction of the breakwater.

A. SAMPLING STATIONS

A total of twelve sampling stations were established to monitor effects of project activities on water quality (shown in figure 1). Four stations (1, 3, 5, 7) were located in the vicinity of the existing breakwater. Stations 2, 4 and 11 were located in the interior of Kaumalapau Bay; Stations 9 and 10 were located at the mouth of the bay parallel to the existing breakwater, and Stations 6, 8, and 12 were located seaward of the margin of the inner bay.

C. SAMPLING FREQUENCY

During the pre-construction phase, samples were collected on six occasions at approximately 2 month intervals during the calendar year 1999. This sampling schedule was designed to encompass any seasonal variability that may occur in the region. Sampling was conducted randomly with no consideration for any particular sea or weather conditions. During all six of the samplings, conditions were similar with no wind or rain, and small surf of 1-3 feet breaking along the outer shorelines of the Bay. Contingencies were in place to conduct a seventh monitoring during a period of heavy rainfall and surface drainage into Kaumalapau Bay.

D. FIELD SAMPLING METHODS

All water samples were collected using a small boat. At each of the twelve sampling stations, two water samples were collected. Grab samples were collected at the surface (within the upper one meter of the water column), and near the ocean bottom. Samples were collected using 2-liter Niskin oceanographic sampling bottles. These bottles contain spring-loaded end-caps which are cocked in an open position allowing free flow-through as the bottle is lowered to the desired sampling depth. At the desired depth, a weighted messenger is released from the surface which trips the end-caps to close, isolating a volume of water. Following collection, sub-samples were transferred from the Niskin bottles to triple-rinsed 1-liter polyethylene bottles. Samples were immediately analyzed for pH at ambient temperature using a field meter calibrated with 7 and 10 buffers. Following measurement of pH, all samples were stored on ice in insulated coolers from the time of collection until delivery to the analytical laboratory. Appropriate chain of custody transfers were executed between the field sampler and the laboratories.

E. ANALYTICAL METHODOLOGY

Turbidity was determined on 60-ml subsamples using a Turner Designs 90° laboratory nephelometer (EPA method 180.1). TSS was measured gravimetrically using a laboratory grade electrobalance (EPA method 160.2). Salinity was measured using a AGE laboratory grade salinometer calibrated with Copenhagen standards. All laboratory analyses of turbidity, TSS and salinity were performed by Marine Analytical Specialists, located in Honolulu (EPA Lab. No. HI00009).

II. RESULTS

Overall, the results of the monitoring program indicated that water quality throughout the sampling area in the vicinity of Kaumalapau Bay was remarkably clear of suspended material throughout the year. This observation appears to be a result of the arid nature of the western side of the Island of Lanai, which receives little rainfall, and hence little runoff of particulate materials.

Tables 1-6 show the results of each of the six separate samplings for each constituent at each sampling station, along with the geometric means, maxima, minima, and standard deviations for data set. The total range of individual measurements of TSS for all surveys was 0.08 to 5.40 mg/L, while the range in geometric means of TSS from the six samplings was 0.94 to 3.07 mg/L. Similarly, the range of individual measurements of turbidity was 0.05 to 0.32 ntu, while the range of geometric means of turbidity was 0.07 to 0.12 ntu. By comparison, Department of Health (DOH) water quality standards list the geometric mean limit for turbidity under dry conditions as 0.20 ntu. Hence, the highest mean turbidity for any of the sampling dates was approximately one-half of the most stringent DOH limit. Similarly, over the sampling regime salinity shows only slight variation with a range of individual measurements from 34.631 to 35. 051 (Tables 1-6).

Table 7 shows water quality data for each station during each of the sampling periods. Table 8 summarizes this information by showing only the geometric means, maxima and minima from each station at each sampling period. One-way ANOVA performed on the entire data set showed no significant differences ($p = 0.01$) in any of the four water quality constituents between means of surface and deep samples, indicating that there is no vertical stratification of the water column. One-way ANOVA also showed no significant differences ($p =0.01$) for any of the water quality constituents when all data from each of the twenty-four sampling stations was pooled. This result indicates that water throughout the sampling regime is essentially homogeneous at any time of the year.

One-way ANOVA, however, did reveal significant differences ($p= 0.01$) when the data was pooled by sampling period (e.g., data from all 24 stations in march was pooled). Table 9 shows results of these analyses in terms of ranked means and associations (significant differences are shown by different association letters). In general, the highest means of all constituents occurred in the winter samplings (January, October, December), while the lowest means occurred during the summer (June, August). This result may indicate that even though the region as a whole is dry throughout the year, there is a small, but significant effect of rainfall and runoff that affects water quality.

IV. CONCLUSIONS AND RECOMMENDATIONS

Results of the program indicate that the lack of substantial sediment input, owing to the arid climate of the Kaumalapau area, sufficient circulation of seawater, and apparent lack of destructive wave stress during the normal (i.e. non-hurricane) seasonal wave climate result in very clear waterconditions. Results of the study indicate that water quality throughout Kaumalapau Bay can be considered essentially pristine open coastal waters with little impact from loading of suspended materials from land. Statistical treatment of the data indicate that there is essentially no surface layer of low salinity water that typically occurs in areas where groundwater or surface water enters the ocean from land. In addition, at any particular time, there is no difference in water quality at any of the survey stations which ranged in location from the inner portions of the Bay to the open ocean. The only statistically significant difference in the data occurred as a function of season, indicating a small increase in all constituents during the winter months.

The proposed project to modify and improve the breakwater separating the Bay from the open ocean is likely to consist of placement of rock or concrete structures over the existing breakwater. Such construction activity should have minimal effect on water quality as long as placed material is clean and devoid of dirt, mud, or silt. None of the probable construction activities should affect dissolved nutrient concentrations or organic compounds within the Bay.

In summary, the pristine nature of water quality within Kaumalapau Bay is likely a key component in the prolific reef coral growth, and associated biotic communities that inhabit the area. Should Best Management Practices (BMP's) for construction operations employ methods that minimize the addition of suspended sediment to the water column, and avoid disturbance of the naturally occurring reef adjacent to the breakwater, it appears that the proposed project will not have a deleterious effect to marine community structure.

The present program was designed to serve as an initial phase of construction monitoring, and provides a good representation of the spatial and temporal aspects of water quality in the area of proposed construction. Follow-up surveys using the same methodologies during and after the construction process should provide unambiguous documentation of the effects of the action that should fulfill all regulatory requirements stipulated for the project.

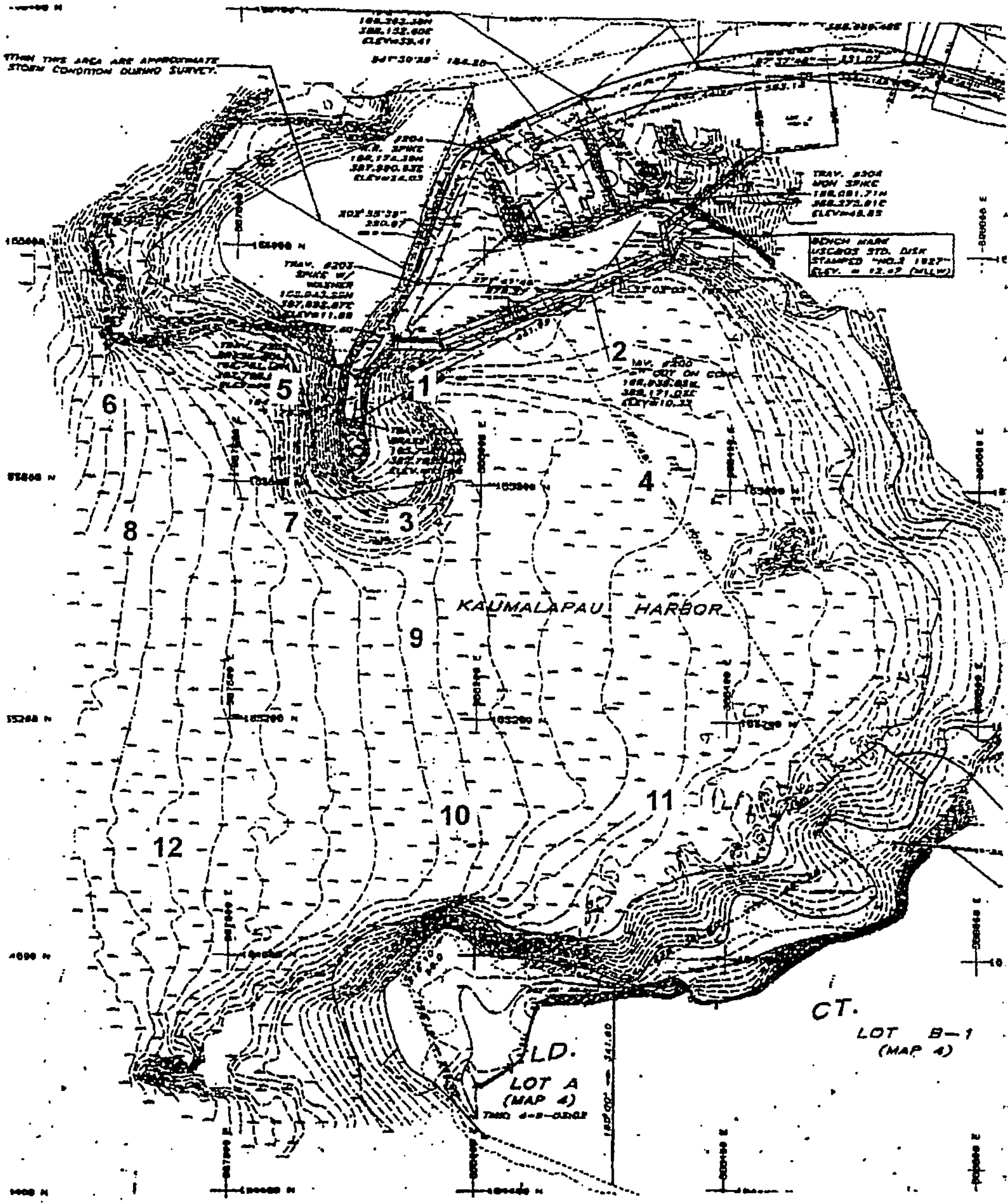

FIGURE 1. Map of Kaumalapau Bay showing locations of twelve water quality sampling stations.

TABLE 1. Water quality monitoring results from stations in Kaumalapau Harbor collected on January 5, 1999. See Figure 1 for locations of sampling stations.

Sample Station	TSS (mg/l)	Turb (ntu)	SALT (o/oo)	pH (rel)
1-S	1.73	0.12	35.040	8.154
1-B	1.67	0.10	35.043	8.174
2-S	0.93	0.08	35.025	8.178
2-B	0.87	0.07	35.046	8.186
3-S	0.80	0.06	35.044	8.193
3-B	1.60	0.08	35.043	8.178
4-S	0.87	0.07	35.034	8.191
4-B	1.03	0.08	35.034	8.185
5-S	1.20	0.08	35.031	8.191
5-B	1.27	0.07	35.013	8.190
6-S	0.93	0.07	35.025	8.197
6-B	1.00	0.06	35.014	8.200
7-S	1.20	0.06	35.020	8.200
7-B	1.47	0.09	34.999	8.185
8-S	1.80	0.06	34.997	8.200
8-B	1.47	0.07	35.016	8.198
9-S	1.40	0.06	35.006	8.195
9-B	1.27	0.08	35.016	8.186
10-S	1.03	0.06	34.999	8.195
10-B	0.87	0.07	35.015	8.183
11-S	1.20	0.07	35.009	8.197
11-B	1.03	0.08	35.008	8.181
12-S	1.27	0.06	35.015	8.193
12-B	1.60	0.07	35.006	8.188
GEO.MEAN	1.19	0.07	35.021	8.188
MAXIMA	1.80	0.12	35.05	8.20
MINIMUM	0.80	0.06	35.00	8.15
STD. DEV.	0.30	0.01	0.02	0.01

TABLE 2. Water quality monitoring results from stations in Kaumalapau Harbor collected on March 4, 1999. See Figure 1 for locations of sampling stations.

Sample Station	TSS (mg/l)	Turb (ntu)	SALT (o/oo)	pH (rel)
1-S	1.47	0.09	34.968	8.126
1-B	1.40	0.09	34.940	8.155
2-S	0.93	0.07	34.631	8.162
2-B	0.27	0.07	34.934	8.159
3-S	0.87	0.09	34.814	8.171
3-B	1.27	0.08	34.993	8.166
4-S	1.00	0.08	34.827	8.160
4-B	0.93	0.08	34.974	8.166
5-S	0.80	0.08	34.824	8.172
5-B	0.87	0.07	35.009	8.171
6-S	0.80	0.08	34.740	8.174
6-B	1.27	0.07	34.966	8.172
7-S	1.20	0.07	34.869	8.171
7-B	1.00	0.08	34.938	8.172
8-S	0.87	0.07	34.718	8.174
8-B	0.47	0.07	34.942	8.172
9-S	1.40	0.09	34.819	8.166
9-B	1.20	0.09	34.955	8.172
10-S	2.27	0.08	34.753	8.176
10-B	0.27	0.08	34.986	8.167
11-S	0.87	0.09	34.834	8.159
11-B	0.93	0.07	34.948	8.171
12-S	1.47	0.09	34.679	8.162
12-B	0.93	0.07	34.933	8.172
GEO.MEAN	0.94	0.08	34.875	8.166
MAXIMA	2.27	0.09	35.01	8.18
MINIMUM	0.27	0.07	34.63	8.13
STD. DEV.	0.42	0.01	0.11	0.01

TABLE 3. Water quality monitoring results from stations in Kaumalapau Harbor collected on June 7, 1999. See Figure 1 for locations of sampling stations.

Sample Station	TSS (mg/l)	Turb (ntu)	SALT (o/oo)	pH (rel)
1-S	1.20	0.08	34.844	8.092
1-B	1.87	0.07	34.860	8.104
2-S	0.08	0.07	34.760	8.123
2-B	0.93	0.07	34.878	8.138
3-S	1.27	0.07	34.777	8.128
3-B	1.40	0.08	34.845	8.142
4-S	1.47	0.09	34.737	8.140
4-B	1.87	0.10	34.872	8.150
5-S	0.47	0.07	34.865	8.159
5-B	2.20	0.10	34.849	8.150
6-S	1.20	0.10	34.854	8.152
6-B	2.07	0.09	34.869	8.161
7-S	0.47	0.07	34.815	8.149
7-B	0.93	0.06	34.861	8.159
8-S	0.87	0.06	34.837	8.152
8-B	0.93	0.05	34.864	8.159
9-S	1.20	0.06	34.803	8.150
9-B	0.80	0.05	35.007	8.169
10-S	1.47	0.08	34.775	8.159
10-B	1.20	0.06	34.870	8.179
11-S	2.07	0.09	34.770	8.159
11-B	0.80	0.07	34.879	8.176
12-S	1.40	0.08	34.803	8.159
12-B	1.27	0.07	34.875	8.176
GEO.MEAN	1.06	0.07	34.840	8.149
MAXIMA	2.20	0.10	35.01	8.18
MINIMUM	0.08	0.05	34.74	8.09
STD. DEV.	0.54	0.01	0.06	0.02

TABLE 4. Water quality monitoring results from stations in Kaumalapau Harbor collected on August 14, 1999. See Figure 1 for locations of sampling stations.

Sample Station	TSS (mg/l)	Turb (ntu)	SALT (o/oo)	pH (rel)
1-S	3.47	0.09	34.909	8.126
1-B	2.40	0.06	34.881	8.129
2-S	3.87	0.07	34.923	8.126
2-B	1.80	0.07	34.907	8.148
3-S	1.40	0.06	34.884	8.146
3-B	1.27	0.05	34.919	8.150
4-S	3.20	0.08	34.893	8.141
4-B	0.87	0.05	34.929	8.158
5-S	2.20	0.06	34.932	8.172
5-B	1.20	0.06	34.907	8.167
6-S	1.93	0.06	34.906	8.168
6-B	1.80	0.07	34.917	8.170
7-S	1.47	0.05	34.953	8.168
7-B	0.67	0.05	34.943	8.172
8-S	0.60	0.06	34.901	8.179
8-B	0.80	0.06	34.912	8.192
9-S	0.87	0.06	34.894	8.174
9-B	1.20	0.05	34.877	8.172
10-S	1.27	0.06	34.903	8.167
10-B	3.27	0.07	34.894	8.165
11-S	0.93	0.07	34.871	8.151
11-B	1.87	0.06	34.893	8.175
12-S	5.40	0.11	34.865	8.177
12-B	1.40	0.05	34.922	8.177
GEO.MEAN	1.59	0.06	34.906	8.161
MAXIMA	5.40	0.11	34.95	8.19
MINIMUM	0.60	0.05	34.87	8.13
STD. DEV.	1.19	0.01	0.02	0.02

TABLE 5. Water quality monitoring results from stations in Kaumalapau Harbor collected on October 16, 1999. See Figure 1 for locations of sampling stations.

Sample Station	TSS (mg/l)	Turb (ntu)	SALT (o/oo)	pH (rel)
1-S	4.71	0.09	35.006	8.111
1-B	3.40	0.09	34.997	8.150
2-S	2.87	0.11	34.984	8.155
2-B	5.40	0.17	34.991	8.164
3-S	3.80	0.12	35.017	8.157
3-B	3.93	0.13	34.983	8.160
4-S	5.01	0.12	35.041	8.152
4-B	3.47	0.10	35.003	8.157
5-S	4.27	0.13	35.002	8.150
5-B	3.80	0.11	34.999	8.154
6-S	3.87	0.11	35.000	8.159
6-B	1.87	0.09	35.002	8.164
7-S	2.20	0.11	35.005	8.159
7-B	2.40	0.11	35.002	8.157
8-S	4.87	0.15	35.018	8.159
8-B	4.00	0.30	35.001	8.160
9-S	3.20	0.09	34.997	8.166
9-B	1.93	0.08	34.999	8.171
10-S	2.80	0.10	35.006	8.166
10-B	2.47	0.10	35.008	8.167
11-S	1.93	0.10	35.041	8.164
11-B	2.71	0.32	35.004	8.157
12-S	2.20	0.12	35.013	8.164
12-B	1.29	0.16	35.012	8.167
GEO.MEAN	3.07	0.12	35.005	8.158
MAXIMA	5.40	0.32	35.04	8.17
MINIMUM	1.29	0.08	34.98	8.11
STD. DEV.	1.12	0.06	0.01	0.01

TABLE 6. Water quality monitoring results from stations in Kaumalapau Harbor collected on December 22, 1999. See Figure 1 for locations of sampling stations.

Sample Station	TSS (mg/l)	Turb (ntu)	SALT (o/oo)	pH (rel)
1-S	1.87	0.10	35.057	8.108
1-B	3.40	0.14	35.054	8.119
2-S	2.80	0.12	35.074	8.143
2-B	3.40	0.10	35.071	8.146
3-S	2.93	0.11	35.051	8.139
3-B	1.93	0.10	35.053	8.143
4-S	2.80	0.10	35.080	8.155
4-B	3.47	0.13	35.033	8.144
5-S	2.87	0.10	35.060	8.158
5-B	3.40	0.16	35.059	8.160
6-S	1.67	0.09	35.055	8.166
6-B	1.80	0.08	35.072	8.170
7-S	1.93	0.08	35.088	8.151
7-B	2.80	0.11	35.073	8.149
8-S	1.20	0.10	35.074	8.165
8-B	1.40	0.11	35.064	8.166
9-S	1.27	0.09	35.072	8.160
9-B	2.40	0.13	35.071	8.156
10-S	2.20	0.09	35.078	8.160
10-B	1.80	0.10	35.106	8.158
11-S	2.20	0.18	35.069	8.156
11-B	2.93	0.10	35.063	8.156
12-S	2.40	0.11	35.076	8.158
12-B	1.80	0.08	35.080	8.158
GEO.MEAN	2.25	0.11	35.068	8.152
MAXIMA	3.47	0.18	35.11	8.17
MINIMUM	1.20	0.08	35.03	8.11
STD. DEV.	0.71	0.02	0.01	0.01

TABLE 7. Water quality monitoring results by station collected in the vicinity of Kamalapau Harbor during six pre-construction bi-monthly monitoring surveys in 1999.

Sample Station	Sample Month	TSS (mg/l)	Turb (ntu)	SALT (o/oo)	pH (rel)
1-S	Jan	1.73	0.12	35.040	8.15
1-S	Mar	1.47	0.09	34.968	8.13
1-S	June	1.20	0.08	34.844	8.09
1-S	Aug	3.47	0.09	34.909	8.13
1-S	Oct	4.71	0.09	35.006	8.11
1-S	Dec	1.87	0.10	35.057	8.11
GEO.MEAN		2.13	0.09	34.971	8.12
MAXIMUM		4.71	0.12	35.057	8.15
MINIMUM		1.20	0.08	34.844	8.09
1-B	Jan	1.67	0.10	35.043	8.17
1-B	Mar	1.40	0.09	34.940	8.16
1-B	June	1.87	0.07	34.860	8.10
1-B	Aug	2.40	0.06	34.881	8.13
1-B	Oct	3.40	0.09	34.997	8.15
1-B	Dec	3.40	0.14	35.054	8.12
GEO.MEAN		2.22	0.09	34.962	8.14
MAXIMUM		3.40	0.14	35.054	8.17
MINIMUM		1.40	0.06	34.860	8.10
2-S	Jan	0.93	0.08	35.025	8.18
2-S	Mar	0.93	0.07	34.631	8.16
2-S	June	0.08	0.07	34.760	8.12
2-S	Aug	3.87	0.07	34.923	8.13
2-S	Oct	2.87	0.11	34.984	8.16
2-S	Dec	2.80	0.12	35.074	8.14
GEO.MEAN		1.14	0.08	34.899	8.15
MAXIMUM		3.87	0.12	35.074	8.18
MINIMUM		0.08	0.07	34.631	8.12
2-B	Jan	0.87	0.07	35.046	8.19
2-B	Mar	0.27	0.07	34.934	8.16
2-B	June	0.93	0.07	34.878	8.14
2-B	Aug	1.80	0.07	34.907	8.15
2-B	Oct	5.40	0.17	34.991	8.16
2-B	Dec	3.40	0.10	35.071	8.15
GEO.MEAN		1.39	0.09	34.971	8.16
MAXIMUM		5.40	0.17	35.071	8.19
MINIMUM		0.27	0.07	34.878	8.14

Sample Station	Sample Month	TSS (mg/l)	Turb (ntu)	SALT (o/oo)	pH (rel)
3-S	Jan	0.80	0.06	35.044	8.19
3-S	Mar	0.87	0.09	34.814	8.17
3-S	June	1.27	0.07	34.777	8.13
3-S	Aug	1.40	0.06	34.884	8.15
3-S	Oct	3.80	0.12	35.017	8.16
3-S	Dec	2.93	0.11	35.051	8.14
GEO.MEAN		1.55	0.08	34.931	8.16
MAXIMUM		3.80	0.12	35.051	8.19
MINIMUM		0.80	0.06	34.777	8.13
3-B	Jan	1.60	0.08	35.043	8.18
3-B	Mar	1.27	0.08	34.993	8.17
3-B	June	1.40	0.08	34.845	8.14
3-B	Aug	1.27	0.05	34.919	8.15
3-B	Oct	3.93	0.13	34.983	8.16
3-B	Dec	1.93	0.10	35.053	8.14
GEO.MEAN		1.74	0.08	34.973	8.16
MAXIMUM		3.93	0.13	35.053	8.18
MINIMUM		1.27	0.05	34.845	8.14
4-S	Jan	0.87	0.07	35.034	8.19
4-S	Mar	1.00	0.08	34.827	8.16
4-S	June	1.47	0.09	34.737	8.14
4-S	Aug	3.20	0.08	34.893	8.14
4-S	Oct	5.01	0.12	35.041	8.15
4-S	Dec	2.80	0.10	35.080	8.16
GEO.MEAN		1.96	0.09	34.935	8.16
MAXIMUM		5.01	0.12	35.080	8.19
MINIMUM		0.87	0.07	34.737	8.14
4-B	Jan	1.03	0.08	35.034	8.19
4-B	Mar	0.93	0.08	34.974	8.17
4-B	June	1.87	0.10	34.872	8.15
4-B	Aug	0.87	0.05	34.929	8.16
4-B	Oct	3.47	0.10	35.003	8.16
4-B	Dec	3.47	0.13	35.033	8.14
GEO.MEAN		1.63	0.09	34.974	8.16
MAXIMUM		3.47	0.13	35.034	8.19
MINIMUM		0.87	0.05	34.872	8.14

TABLE 7. Conitinued.

Sample Station	Sample Month	TSS (mg/l)	Turb (ntu)	SALT (o/oo)	pH (rel)
5-S	Jan	1.20	0.08	35.031	8.19
5-S	Mar	0.80	0.08	34.824	8.17
5-S	June	0.47	0.07	34.865	8.16
5-S	Aug	2.20	0.06	34.932	8.17
5-S	Oct	4.27	0.13	35.002	8.15
5-S	Dec	2.87	0.10	35.060	8.16
GEO.MEAN		1.52	0.08	34.952	8.17
MAXIMUM		4.27	0.13	35.060	8.19
MINIMUM		0.47	0.06	34.824	8.15
5-B	Jan	1.27	0.07	35.013	8.19
5-B	Mar	0.87	0.07	35.009	8.17
5-B	June	2.20	0.10	34.849	8.15
5-B	Aug	1.20	0.06	34.907	8.17
5-B	Oct	3.80	0.11	34.999	8.15
5-B	Dec	3.40	0.16	35.059	8.16
GEO.MEAN		1.83	0.09	34.973	8.17
MAXIMUM		3.80	0.16	35.059	8.19
MINIMUM		0.87	0.06	34.849	8.15
6-S	Jan	0.93	0.07	35.025	8.20
6-S	Mar	0.80	0.08	34.740	8.17
6-S	June	1.20	0.10	34.854	8.15
6-S	Aug	1.93	0.06	34.906	8.17
6-S	Oct	3.87	0.11	35.000	8.16
6-S	Dec	1.67	0.09	35.055	8.17
GEO.MEAN		1.49	0.08	34.930	8.17
MAXIMUM		3.87	0.11	35.055	8.20
MINIMUM		0.80	0.06	34.740	8.15
6-B	Jan	1.00	0.06	35.014	8.20
6-B	Mar	1.27	0.07	34.966	8.17
6-B	June	2.07	0.09	34.869	8.16
6-B	Aug	1.80	0.07	34.917	8.17
6-B	Oct	1.87	0.09	35.002	8.16
6-B	Dec	1.80	0.08	35.072	8.17
GEO.MEAN		1.59	0.08	34.973	8.17
MAXIMUM		2.07	0.09	35.072	8.20
MINIMUM		1.00	0.06	34.869	8.16

Sample Station	Sample Month	TSS (mg/l)	Turb (ntu)	SALT (o/oo)	pH (rel)
7-S	Jan	1.20	0.06	35.020	8.20
7-S	Mar	1.20	0.07	34.869	8.17
7-S	June	0.47	0.07	34.815	8.15
7-S	Aug	1.47	0.05	34.953	8.17
7-S	Oct	2.20	0.11	35.005	8.16
7-S	Dec	1.93	0.08	35.088	8.15
GEO.MEAN		1.27	0.07	34.958	8.17
MAXIMUM		2.20	0.11	35.088	8.20
MINIMUM		0.47	0.05	34.815	8.15
7-B	Jan	1.47	0.09	34.999	8.19
7-B	Mar	1.00	0.08	34.938	8.17
7-B	June	0.93	0.06	34.861	8.16
7-B	Aug	0.67	0.05	34.943	8.17
7-B	Oct	2.40	0.11	35.002	8.16
7-B	Dec	2.80	0.11	35.073	8.15
GEO.MEAN		1.35	0.08	34.969	8.17
MAXIMUM		2.80	0.11	35.073	8.19
MINIMUM		0.67	0.05	34.861	8.15
8-S	Jan	1.80	0.06	34.997	8.20
8-S	Mar	0.87	0.07	34.718	8.17
8-S	June	0.87	0.06	34.837	8.15
8-S	Aug	0.60	0.06	34.901	8.18
8-S	Oct	4.87	0.15	35.018	8.16
8-S	Dec	1.20	0.10	35.074	8.17
GEO.MEAN		1.30	0.08	34.924	8.17
MAXIMUM		4.87	0.15	35.074	8.20
MINIMUM		0.60	0.06	34.718	8.15
8-B	Jan	1.47	0.07	35.016	8.20
8-B	Mar	0.47	0.07	34.942	8.17
8-B	June	0.93	0.05	34.864	8.16
8-B	Aug	0.80	0.06	34.912	8.19
8-B	Oct	4.00	0.30	35.001	8.16
8-B	Dec	1.40	0.11	35.064	8.17
GEO.MEAN		1.19	0.09	34.966	8.17
MAXIMUM		4.00	0.30	35.064	8.20
MINIMUM		0.47	0.05	34.864	8.16

TABLE 7. Conitinued.

Sample Station	Sample Month	TSS (mg/l)	Turb (ntu)	SALT (o/oo)	pH (rel)
9-S	Jan	1.40	0.06	35.006	8.20
9-S	Mar	1.40	0.09	34.819	8.17
9-S	June	1.20	0.06	34.803	8.15
9-S	Aug	0.87	0.06	34.894	8.17
9-S	Oct	3.20	0.09	34.997	8.17
9-S	Dec	1.27	0.09	35.072	8.16
GEO.MEAN		1.42	0.07	34.932	8.17
MAXIMUM		3.20	0.09	35.072	8.20
MINIMUM		0.87	0.06	34.803	8.15
9-B	Jan	1.27	0.08	35.016	8.19
9-B	Mar	1.20	0.09	34.955	8.17
9-B	June	0.80	0.05	35.007	8.17
9-B	Aug	1.20	0.05	34.877	8.17
9-B	Oct	1.93	0.08	34.999	8.17
9-B	Dec	2.40	0.13	35.071	8.16
GEO.MEAN		1.38	0.08	34.987	8.17
MAXIMUM		2.40	0.13	35.071	8.19
MINIMUM		0.80	0.05	34.877	8.16
10-S	Jan	1.03	0.06	34.999	8.20
10-S	Mar	2.27	0.08	34.753	8.18
10-S	June	1.47	0.08	34.775	8.16
10-S	Aug	1.27	0.06	34.903	8.17
10-S	Oct	2.80	0.10	35.006	8.17
10-S	Dec	2.20	0.09	35.078	8.16
GEO.MEAN		1.73	0.08	34.919	8.17
MAXIMUM		2.80	0.10	35.078	8.20
MINIMUM		1.03	0.06	34.753	8.16
10-B	Jan	0.87	0.07	35.015	8.18
10-B	Mar	0.27	0.08	34.986	8.17
10-B	June	1.20	0.06	34.870	8.18
10-B	Aug	3.27	0.07	34.894	8.17
10-B	Oct	2.47	0.10	35.008	8.17
10-B	Dec	1.80	0.10	35.106	8.16
GEO.MEAN		1.27	0.08	34.980	8.17
MAXIMUM		3.27	0.10	35.106	8.18
MINIMUM		0.27	0.06	34.870	8.16

Sample Station	Sample Month	TSS (mg/l)	Turb (ntu)	SALT (o/oo)	pH (rel)
11-S	Jan	1.20	0.07	35.009	8.20
11-S	Mar	0.87	0.09	34.834	8.16
11-S	June	2.07	0.09	34.770	8.16
11-S	Aug	0.93	0.07	34.871	8.15
11-S	Oct	1.93	0.10	35.041	8.16
11-S	Dec	2.20	0.18	35.069	8.16
GEO.MEAN		1.43	0.09	34.932	8.16
MAXIMUM		2.20	0.18	35.069	8.20
MINIMUM		0.87	0.07	34.770	8.15
11-B	Jan	1.03	0.08	35.008	8.18
11-B	Mar	0.93	0.07	34.948	8.17
11-B	June	0.80	0.07	34.879	8.18
11-B	Aug	1.87	0.06	34.893	8.18
11-B	Oct	2.71	0.32	35.004	8.16
11-B	Dec	2.93	0.10	35.063	8.16
GEO.MEAN		1.50	0.10	34.966	8.17
MAXIMUM		2.93	0.32	35.063	8.18
MINIMUM		0.80	0.06	34.879	8.16
12-S	Jan	1.27	0.06	35.015	8.19
12-S	Mar	1.47	0.09	34.679	8.16
12-S	June	1.40	0.08	34.803	8.16
12-S	Aug	5.40	0.11	34.865	8.18
12-S	Oct	2.20	0.12	35.013	8.16
12-S	Dec	2.40	0.11	35.076	8.16
GEO.MEAN		2.05	0.09	34.908	8.17
MAXIMUM		5.40	0.12	35.076	8.19
MINIMUM		1.27	0.06	34.679	8.16
12-B	Jan	1.60	0.07	35.006	8.19
12-B	Mar	0.93	0.07	34.933	8.17
12-B	June	1.27	0.07	34.875	8.18
12-B	Aug	1.40	0.05	34.922	8.18
12-B	Oct	1.29	0.16	35.012	8.17
12-B	Dec	1.80	0.08	35.080	8.16
GEO.MEAN		1.35	0.08	34.971	8.17
MAXIMUM		1.80	0.16	35.080	8.19
MINIMUM		0.93	0.05	34.875	8.16

TABLE 8. Summary of geometric means, maxima and minima from sampling stations combined for six pre-construction surveys at Kaumalapau Harbor. Peak values of TSS and turbidity are in bold type for each parameter.

GEOMETRIC MEANS

STATION	TSS (mg/l)	Turb (ntu)	SALT (o/oo)	pH (rel)
1-S	2.13	0.09	34.971	8.12
1-B	**2.22**	0.09	34.962	8.14
2-S	1.14	0.08	34.899	8.15
2-B	1.39	0.09	34.971	8.16
3-S	1.55	0.08	34.931	8.16
3-B	1.74	0.08	34.973	8.16
4-S	1.96	0.09	34.935	8.16
4-B	1.63	0.09	34.974	8.16
5-S	1.52	0.08	34.952	8.17
5-B	1.83	0.09	34.973	8.17
6-S	1.49	0.08	34.930	8.17
6-B	1.59	0.08	34.973	8.17
7-S	1.27	0.07	34.958	8.17
7-B	1.35	0.08	34.969	8.17
8-S	1.30	0.08	34.924	8.17
8-B	1.19	0.09	34.966	8.17
9-S	1.42	0.07	34.932	8.17
9-B	1.38	0.08	34.987	8.17
1-0-S	1.73	0.08	34.919	8.17
10-B	1.27	0.08	34.980	8.17
11-S	1.43	0.09	34.932	8.16
11-B	1.50	**0.10**	34.966	8.17
12-S	2.05	0.09	34.908	8.17
12-B	1.35	0.08	34.971	8.17

MAXIMA

STATION	TSS (mg/l)	Turb (ntu)	SALT (o/oo)	pH (rel)
1-S	4.71	0.12	35.057	8.15
1-B	3.40	0.14	35.054	8.17
2-S	3.87	0.12	35.074	8.18
2-B	5.40	0.17	35.071	8.19
3-S	3.80	0.12	35.051	8.19
3-B	3.93	0.13	35.053	8.18
4-S	5.01	0.12	35.080	8.19
4-B	3.47	0.13	35.034	8.19
5-S	4.27	0.13	35.060	8.19
5-B	3.80	0.16	35.059	8.19
6-S	3.87	0.11	35.055	8.20
6-B	2.07	0.09	35.072	8.20
7-S	2.20	0.11	35.088	8.20
7-B	2.80	0.11	35.073	8.19
8-S	4.87	0.15	35.074	8.20
8-B	4.00	0.30	35.064	8.20
9-S	3.20	0.09	35.072	8.20
9-B	2.40	0.13	35.071	8.19
1-0-S	2.80	0.10	35.078	8.20
10-B	3.27	0.10	35.106	8.18
11-S	2.20	0.18	35.069	8.20
11-B	2.93	**0.32**	35.063	8.18
12-S	5.40	0.12	35.076	8.19
12-B	1.80	0.16	35.080	8.19

MINIMA

STATION	TSS (mg/l)	Turb (ntu)	SALT (o/oo)	pH (rel)
1-S	1.20	**0.08**	34.844	8.09
1-B	**1.40**	0.06	34.860	8.10
2-S	0.08	0.07	34.631	8.12
2-B	0.27	0.07	34.878	8.14
3-S	0.80	0.06	34.777	8.13
3-B	1.27	0.05	34.845	8.14
4-S	0.87	0.07	34.737	8.14
4-B	0.87	0.05	34.872	8.14
5-S	0.47	0.06	34.824	8.15
5-B	0.87	0.06	34.849	8.15
6-S	0.80	0.06	34.740	8.15
6-B	1.00	0.06	34.869	8.16
7-S	0.47	0.05	34.815	8.15
7-B	0.67	0.05	34.861	8.15
8-S	0.60	0.06	34.718	8.15
8-B	0.47	0.05	34.864	8.16
9-S	0.87	0.06	34.803	8.15
9-B	0.80	0.05	34.877	8.16
1-0-S	1.03	0.06	34.753	8.16
10-B	0.27	0.06	34.870	8.16
11-S	0.87	0.07	34.770	8.15
11-B	0.80	0.06	34.879	8.16
12-S	1.27	0.06	34.679	8.16
12-B	0.93	0.05	34.875	8.16

TABLE 9. Ranked means of combined sampling from six individual dates at Kaumalapau Harbor. Means followed by the same association letter are not significantly different ($p = 0.01$).

TSS Sampling Month	Ranked Mean	Association letter
MAR	1.032	A
AUG	1.226	A
JUN	1.226	A
JAN	1.229	A
DEC	2.361	B
OCT	3.266	C

TURBIDITY Sampling Month	Ranked Mean	Association letter
JAN	0.0737	A
AUG	0.0745	A
JUN	0.0745	A
MAR	0.0792	A
DEC	0.1097	B
OCT	0.1295	B

SALINITY Sampling Month	Ranked Mean	Association letter
AUG	34.8404	A
JUN	34.8404	A
MAR	34.8747	A
OCT	35.0055	B
JAN	35.0208	BC
DEC	35.068	D

pH Sampling Month	Ranked Mean	Association letter
AUG	8.14937	A
JUN	8.14937	A
DEC	8.15183	A
OCT	8.1579	AB
MAR	8.1666	BC
JAN	8.1888	D

APPENDIX B: ASSESSMENT OF MARINE BIOLOGICAL COMMUNITY STRUCTURE

ASSESSMENT OF MARINE BIOLOGICAL COMMUNITY STRUCTURE

KAUMALAPAU HARBOR BREAKWATER MODIFICATIONS
ISLAND OF LANAI, HAWAII

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INTRODUCTION

Kaumalapau Harbor is a small barge harbor located in a natural embayment (Kaumalapau Bay) on the southwest coast of the Island of Lanai, Hawaii. It is the sole harbor serving the island. The harbor has a 10-acre berthing area, 10 to 20 meters (m) deep. A boulder breakwater that extends from the northwestern shoreline southward across the mouth of the bay protects the harbor and wharf facilities (Figure 1).

Kaumalapau Bay is exposed to storm waves from the west and south. The water depth across the mouth of the embayment is about 20 to 25 m deep. Large waves close the harbor several times a year. The breakwater was originally about 125 m long, but has been reduced by damage from storm waves to a length of approximately 60 m. Damage to the breakwater occurred during both Hurricane Iwa in 1982 and Hurricane Iniki in 1993. The shortened breakwater presently allows for increased wave energy within the harbor during periods of large waves, resulting in hazardous conditions for docking vessels.

In order to restore a protected docking environment for barges, a design report, completed by the Corps of Engineers in September 1996 recommends construction of a dog-leg extension of the existing breakwater. The extension includes rebuilding the first 100 m of the breakwater on the existing alignment, with the final 15 m constructed along an alignment shifted slightly toward the inside of the harbor in order to reduce wave heights in the berthing area. Construction would entail placement of a core consisting of stones capped by an armor layer consisting of concrete core-loc units. The proposed structure would cover a footprint area of xxx m^2 on the floor of the bay compared to the present footprint of yyym^2.

An Environmental Assessment (EA) is necessary to address possible impacts of the proposed modification of the harbor. One of the components of the assessment is to evaluate the potential effects to the marine communities that presently populate the area. The following report presents the methods, results and conclusions of the field investigations of the marine community structure at Kaumalapau.

METHODS

Corps of Engineers diving regulations preclude all but commercially certified divers from conducting underwater work. As a result, scientific investigators were restricted from carrying out any underwater surveys to characterized biotic community structure at Kaumalapau. Owing to this restriction, surveys were carried out in total using underwater video equipment. A small video camera (Sub-Sea Video System 100) housed within a protective metal frame attached to a tow sled was lowered by winch from a small boat to a location near the bottom. Real time images of the underwater video were observed on a monitor on the boat. The camera sled was towed slowly along pre-determined transect line throughout the harbor and neighboring areas, recording on video tape. Interfaces between the clock on the camera and shipboard GPS recorded the position of each of the transect tows.

Following the fieldwork, the video tapes were viewed by a marine biologist (S. Dollar) to semi-quantitatively assess the biotic community structure. At periods of 5 seconds, the tape was "paused" and the approximate coverage of identifiable biota (primarily reef corals) was estimated. Following the completion of the transect, average cover on each transect was calculated.

The remote video method employed for this investigation has both advantages and disadvantages over conventional diver-conducted surveys. The advantages are that the method results in a permanent record of the habitat and community structure that can be viewed repeatedly, and can be seen by viewers (e.g., regulators) that cannot conduct site visits. In addition, the video images often provide a more comprehensive picture of the environment than can be conveyed through still photographs.

A disadvantage with the method is that it precludes the accurate quantification of biotic community composition. Differentiation of species, and even genera, is often not possible by the video images. Small benthic organisms, and those that occur within interstitial spaces or on the undersides of exposed surfaces are not visible. Because of avoidance of the camera, estimation of motile species, especially fish, is also extremely limited. In addition, because of the steep topography of the bottom within much of the the study area at Kaumalapau, maintaining a constant field of view (distance from the bottom) is not possible, so scaling of the area of coverage was constantly changing.

With these considerations, however, it appears that the remote video method provided adequate information to address the questions at hand regarding the marine environmental assessment for the Kaumalapau Breakwater Modifications. Because the marine survey was not intended to provide a quantitative assessment of community structure to serve as a pre-construction baseline for follow-up surveys, the lack of collection of such numerical data does not appear deleterious to the overall goals required for the EA. Similarly, while the identification of organisms to genus or species would be preferred, the lack of such ability does not appear to limit or invalidate any of the conclusions. In a sum, while diving surveys would provide more specific detailed data, the method employed appears to be sufficient to address the questions regarding potential environmental impacts from the project.

RESULTS

Figure 1 is a map of Kaumalapau Harbor and adjacent areas. Also shown on the map are the numbered video transect lines. Below is a discussion of the physical structure and biotic composition along each of the transect lines.

Line 1. This transect runs parallel to the inside upper face of the existing breakwater, beginning at the innermost accessible area of the northern corner of the harbor basin and extending to the sand bottom off the seaward end of the breakwater. Bottom composition of the area consists of large boulder armor stones that slope from the emergent rocks of the breakwater to the sand plain that comprises the natural harbor floor. With distance southward (toward the end of the breakwater), bottom composition at depths below approximately 5 m is made up of progressively larger amounts of concrete rip-rap, including poles, pipes and dolos as well as old machinery and even a vehicle. All of this debris material appears to have been intentionally deposited to subsidize and stabilize the breakwater structure.

Biotic composition in the shallower area (upper 3 m) of the breakwater consists of thin veneers of encrusting red algae (*Porolithon spp.*) covering large portions of the boulder armor stones. Corals in this area are rare (<2% of bottom cover) and consist primarily of small (10-20 cm in diameter) hemispherical colonies of the branching coral *Pocillopora meandrina*, and small flat encrustations of what appears to be *Porites lobata* (Figures 2 and 3). Below a depth of approximately 3 m, benthic biotic composition consists primarily of corals that have settled and proliferated on both the armor stones and the deposited debris. The dominant corals visible in the videos are *P. meandrina*, and flat encrustations of *Porites spp.* and *Montipora spp* (Figures 4 and 5). Coral cover increases both with depth and distance southward toward the end of the breakwater, peaking on the hard surfaces at the end of the breakwater (Figures 6 and 7). Average coral coverage along the entire transect was estimated at about 10% of bottom cover for *Pocillopora* and 26% for the encrusting *Porites-Montipora* growth form.

Line 2. This transect runs parallel to and below Line 1 along the inside face of the existing breakwater, beginning at the innermost accessible area of the northern corner of the harbor basin and extending to the sand bottom off the end of the breakwater. As on Line 1, bottom composition consists of a steep slope comprised of boulder armor stones and a variety of deposited rip-rap. This line encompasses the juncture of the inside edge of the breakwater structure and the sand bottom. Along most of the transect, there is a very distinct edge where the boulder and rip-rap intersects the sand; in other words rock and concrete structures do not appear to have moved much laterally from the base of the breakwater over the sand flat. The exception is the presence of several large tires observed on the sand flat that might have slid from the sloping rock face onto the sand flat.

Biotic composition along Line 2 consists primarily of abundant encrustations of flat coral colonies *(Porites-Montipora)* and colonies of *Pocillopora*. As on Line 1, coral cover increased with distance from the inner harbor, peaking on the solid surfaces off the end of the emergent breakwater. Average coral cover along the transect was 15% *Pocillopora* and 32% for encrusting *Porites-Montipora* growth form. Coral occurrence essentially ceased at the juncture of the breakwater slope and the sand bottom, with only occasional corals growing on rubble or debris fragments laying on the sand bed. It was readily apparent from the underwater video transects that the armor stones, concrete rip-rap, and other metal debris that form the breakwater serve as suitable substratum for coral settlement as some surfaces were completely covered with living corals (Figures 6 and 7).

Line 3. This transect begins at the submerged seaward end of the breakwater structure and proceeds northward along the upper portion of the outer face of the breakwater. As on the inner face of the breakwater slope, the outer face is also covered with a variety of concrete structures, predominantly consisting of pipes, poles and dolos. In addition, numerous large metal boxes, which appear to have formerly been used to ship pineapples, are embedded in the outer face of the breakwater. At the northerly end of the outside face of the breakwater, the video transect takes a 90° turn westward and proceeds along the top of a natural finger of reef that extends seaward from the juncture of the breakwater and the wharf for approximately 100 m. The top of the finger lies at a depth of approximately 5 m, with vertical sides that extend to the sand bottom at a depth of approximately 20 m. Within the vertical walls of the finger are numerous undercut ledges and holes providing substantial substratum complexity.

Coral cover appears to reach peak values on the boulder and rip-rap surfaces on the seaward side of the existing breakwater, near the origin of line 3 (Figures 8 and 9). In particular, the cover of *Pocillopora meandrina* off the seaward end and the outer side of the breakwater is substantially greater than observed on the inside edge (Lines 1 and 2). Colonies of *P. meandrina* are extremely abundant on all concrete surfaces, particularly on the flat upper surfaces of the pineapple boxes (Figures 10 and 11). Overall estimates of coral cover revealed approximately 35% *P. meandrina* and 24% encrusting corals on the outer face of the breakwater. The predominance of living coral colonies on the outer seaward face of the breakwater indicates that prevailing oceanographic conditions are extremely suitable for coral settlement and growth.

Biotic composition on the natural finger reef extending perpendicular from the breakwater consists of similar assemblages as observed on the breakwater. The upper flat surface of the finger is populated primarily with hemispherical colonies of *P. meandrina* (estimated at 40% coral cover). The vertical undercut sides of the finger are primarily covered with both *P. meandrina* and flat encrusting species that appeared to be predominantly *Porites lobata* and several species of *Montipora* (cover estimated at 30%) (Figure 12).

Line 4. This transect runs parallel to line 3 at the juncture of the breakwater structure and the sand bottom, and also takes a 90° turn at the juncture of the breakwater and the finger reef. Physical structure and coral community structure on the breakwater and cliff face of line 4 were similar to that described above for line 3. At the base of the cliff, bottom topography slopes gently toward the sand plain that extends seaward and toward the harbor mouth. Corals occurring on the natural bottom at the base of the cliff include the branching species *Pocillopora meandrina* and *Porites compressa*, as well as the encrusting species *Porites lobata* and *Montipora spp.* (Figure 13). Coral cover at the base of the cliff was estimated at 60%.

Line 5. This transect runs along the outer, seaward facing reef edge beginning at the outer terminus of the finger reef and extending in a northeasterly direction. The physical structure of the area is similar to the finger reef, with a narrow reef top extending to the rocky shoreline that drops in a near vertical face to a sand plain. Examination of the shoreline north of the harbor indicates that such structure is the typical shoreline topography for at least several kilometers. Coral cover along the entire shoreline ridge consists primarily of large colonies of *P. lobata* and heads of *P. meandrina*, with an overall cover of 50-60%.

Line 6. This line bisects Kaumalapau Bay, originating at the berthing wharf and terminating at the southern edge of the harbor. Overall, the harbor floor consists of coarse-grained grey sand. Numerous burrows, likely from burrowing shrimp or worms occur throughout the sand plain. Abundant debris, including tires, cables and machinery occurs on the sand bed. Occasional small outcrops of limestone also occur throughout the sand plain. Living coral colonies occupy the outcrops which extend above the level of the sand plain. In total, however, coral cover within the harbor basin is less than 1%.

Line 7. This line traced the boundary of the shoreline around the circumference of the harbor basin originating at the inner corner of the wharf, and terminating at the southern point of the harbor mouth opposite from the breakwater. Throughout the transect, bottom topography consisted of a rocky nearshore ledge that slopes to the sand plain of the harbor floor. Numerous sand-filled grooves and spurs characterize the nearshore ledge. In the approximate center of the harbor, a rocky outcrop protrudes approximately 50 m outward from the shoreline. Near the southern edge of the harbor mouth, the shoreline ridge becomes a nearly vertical face approximately 3 m in height that terminates on a boulder-strewn sand plain. The entire shoreline ledge was populated by a high percentage (70%)of living corals of the species *Pocillopora meandrina, Porites compressa* and *P. lobata,* and *Montipora spp.* One conspicuous difference in the coral assemblages between the inner harbor ridge, and the outer harbor reef described above is the greater abundance of *Porites compressa* in the inner areas. *P. compressa,* known commonly as "finger coral" consists of mats of relatively delicate branches that are susceptible to breakage from wave energy. The presence of high levels of cover of this species within the inner harbor suggests that while water circulation within the harbor is sufficient to result in ideal conditions of coral growth, wave energy is minimal. On the contrary, on the outer reefs and on the breakwater, the lack of P. compressa suggests the occurrence of periodic episodes of high wave energy.

Other Observations of Marine Biota at Kaumalapau

Because of the limitations of the video methods in terms of identifying organisms, it is fortunate to have other resources to consider. In August 1995, the U.S. Fish and Wildlife Service (FWS) prepared a Draft Report entitled "Fish and Wildlife Coordination Act Report; Kaumalapau Harbor Navigation Improvements, Lanai, Hawaii." The report contains an assessment of the terrestrial and marine biota of the area based on field surveys conducted by Service personnel.

In general, the descriptions of the coral community structure in the vicinity of the existing breakwater and harbor presented in the FWS report is similar to the results of the present report. However, the FWS report also describes the presence of other common reef invertebrates not visible in the videos, including the sea urchins *Heterocentrotus mammillatus, Echinometra matheai, Colobocentrotus atra,* and the sea cucumber *Holothuria atra.*

The FWS report also describes the fish communities of the area. On the seaward facing area of the breakwater, the fish community was described as being fairly diverse with 56 species in 26 families identified. On the inner side of the breakwater, fish communities were less diverse with 40 species from 15 families observed. Throughout the entire region, however, overall fish abundance appeared to be relatively low, and fish species were generally represented by individuals belonging to small size classes. The near absence of larger individuals of common food fishes was noticeable. During the surveys conducted for the present report, several groups of spearfishermen were observed working in the harbor. Such observations, as well as the documentation of lack of larger fish, indicate that this area sustains a high level of fishing pressure.

The FWS report also states that the only marine plant observed was an unidentified filamentous turf algae on the finger reef west of the breakwater. The lack of algae in the video transects appears to be consistent with this observation.

The FWS report states that although federally protected green sea turtles (*Chelonia mydas*), and endangered hawksbill turtles (*Eretmochelys imbricata*) are known to exist in the waters surrounding the harbor, no turtle nesting habitat occurs within Kaumalapau Bay. The FWS report also states that the preferred types of resting habitat and food resources for these species were not observed during the survey. No turtles were observed during the field periods when the video transecting was conducted.

CONCLUSIONS AND RECOMMENDATIONS

Results of the present study as well as the draft report prepared by the FWS indicate that all of the existing solid surfaces, whether natural or manmade, are highly suitable surfaces for reef coral settlement and growth. The apparent lack of sediment input owing to the arid climate of the area, sufficient circulation of seawater, and apparent lack of destructive wave stress during the course of the normal (i.e. non-hurricane) seasonal wave climate appear to provide an ideal habitat for coral growth. Of particular interest is the high coral cover on the armor stone and numerous pieces of debris comprising the submerged sections of the breakwater. Percentage coral cover on the breakwater is presently similar to percentage cover on neighboring natural surfaces. As much of the debris was likely placed on the breakwater following the two hurricanes that impacted Kaumalapau (1982, 1993), the coral colonization and growth on these structures appears to be relatively rapid.

The present design of the new breakwater will unquestionably involve coverage of the existing breakwater structure with new rock and concrete, resulting in loss of much of the existing coral cover. Inspection of the breakwater and Kaumalapau Harbor basin indicates that the floor of the harbor consists of sand. Thus, expanding the footprint of the breakwater should not substantially impact existing benthic biotic communities beyond the edge of the present breakwater. The new breakwater will consist of materials similar to the existing breakwater, and will cover a larger footprint, and consist of a larger surface area of boulders and concrete. As there is no reason to assume that the new breakwater structures would not colonize in a similar manner as the existing breakwater, it appears that over the long term (10-20 years), there is likely to be a net increase in coral cover in the Kaumalapau area.

While transplanting existing corals that presently occur on the armor stone and breakwater debris appears unfeasible, a partial method of mitigating loss of existing coral resources might involve moving some of the rip-rapdebris (poles, pipes and boxes) from the breakwater to the sand plain of the harbor floor. Moving these structures out of the footprint of the new breakwater may be required for stable placement of the new construction materials. Movement of debris to the harbor floor would maintain in part the coral cover that presently populates the debris, and would also add substrate complexity to the relatively featureless harbor floor that could promote fish habitat in the manner of an artificial reef. The depth of the harbor floor appears substantial enough that movement of materials from the breakwater to the harbor floor would not result in hazards to navigation. In addition, the design purpose of the new breakwater is to reduce wave action within the harbor; hence, material within the harbor should not be subject to forces sufficient to move them from the areas of placement. Such a measure could result in an overall net increase in coral abundance when considering both colonization of newly placed materials and maintenance of a portion of corals that presently occur on existing structures.

Survey results also reveal prolific coral communities on the naturally occurring bottom adjacent to the breakwater, particularly on the finger reef that projects westward from the wharf. While the proposed construction plan does not involve activity in this area, care should be taken to avoid impacts that might accompany construction, such as mooring of barges or stockpiling of materials.

Survey results also indicate that the fish populations at Kaumalapau appear to substantially depleted by fishing pressure. None of the activities associated with construction of the new breakwater would appear to further impact fish populations. Rather, the increased complexity afforded by the new, larger breakwater should increase favorable fish habitat.

The FWS report also states that Kaumalapau is not a turtle nesting site. While turtles undoubtedly occur in the area of the proposed construction, it does not appear that the locale is a unique or especially favorable habitat for turtles. The lack of filamentous algae also indicates that the area is not likely a preferred feeding habitat for turtles. Nevertheless, it is recommended that a protocol be developed to mitigate disturbances to turtles, should they be present in the area during construction.

In summary, the marine resources in the vicinity of Kaumalapau Harbor consist of prolific reef coral growth, and associated communities. Coral growth on the man-made structures that comprise the present breakwater is comparable to natural surfaces. While construction of the new breakwater is expected to cover much of the existing coral, there is no reason to believe that the new breakwater will not be colonized in a similar manner within a relatively short time span. As the new breakwater will result in an increase in settlement surfaces compared to the present, and if some replacement of existing coral encrusted debris is undertaken, the net result of the project could be an increase in coral community abundance. Should Best Management Practices (BMP's) for construction operations employ methods that minimize the addition of suspended sediment to the water column, and avoid disturbance of the naturally occurring reef adjacent to the breakwater, it appears that the proposed project will not have a deleterious effect to marine community structure.

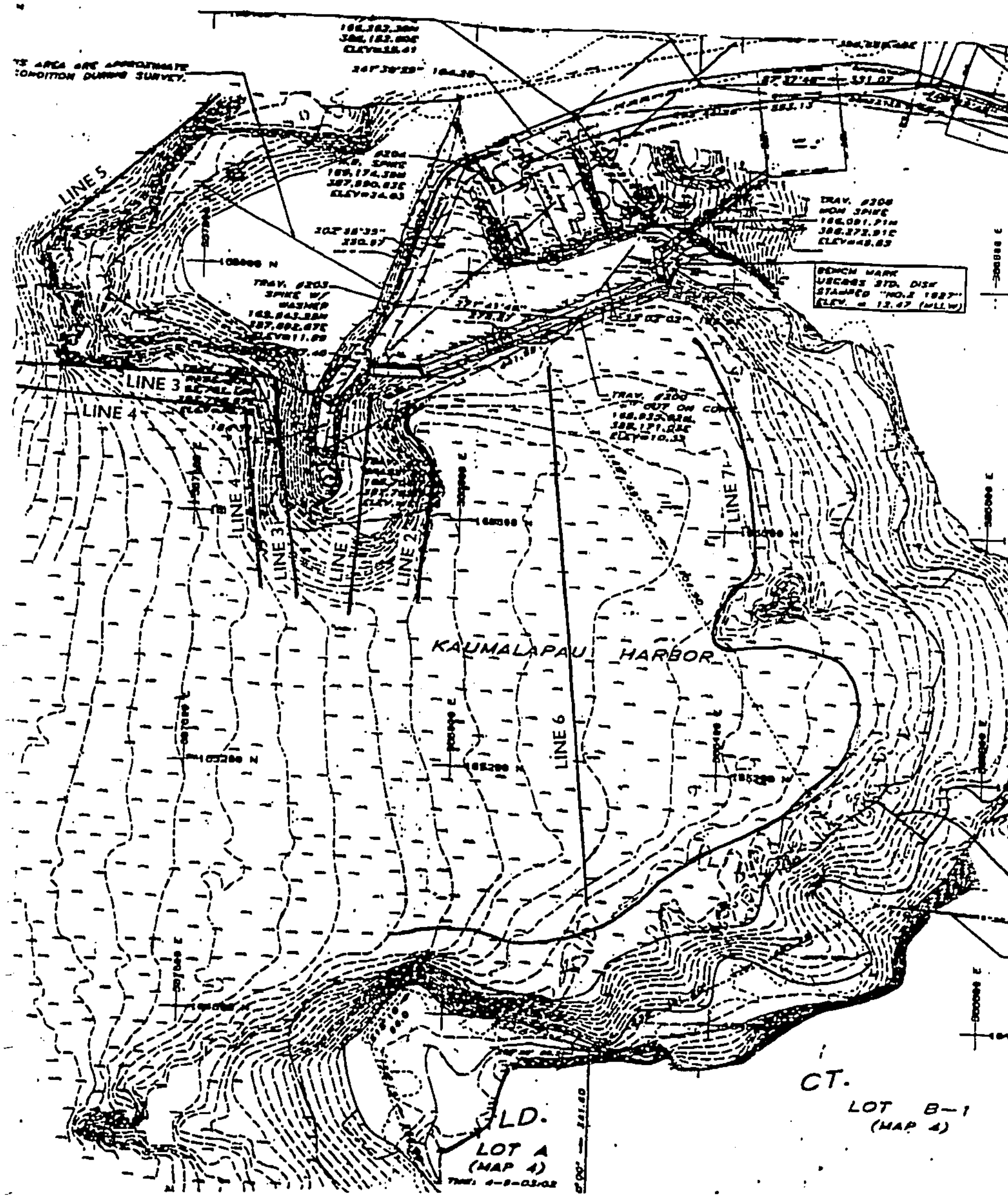
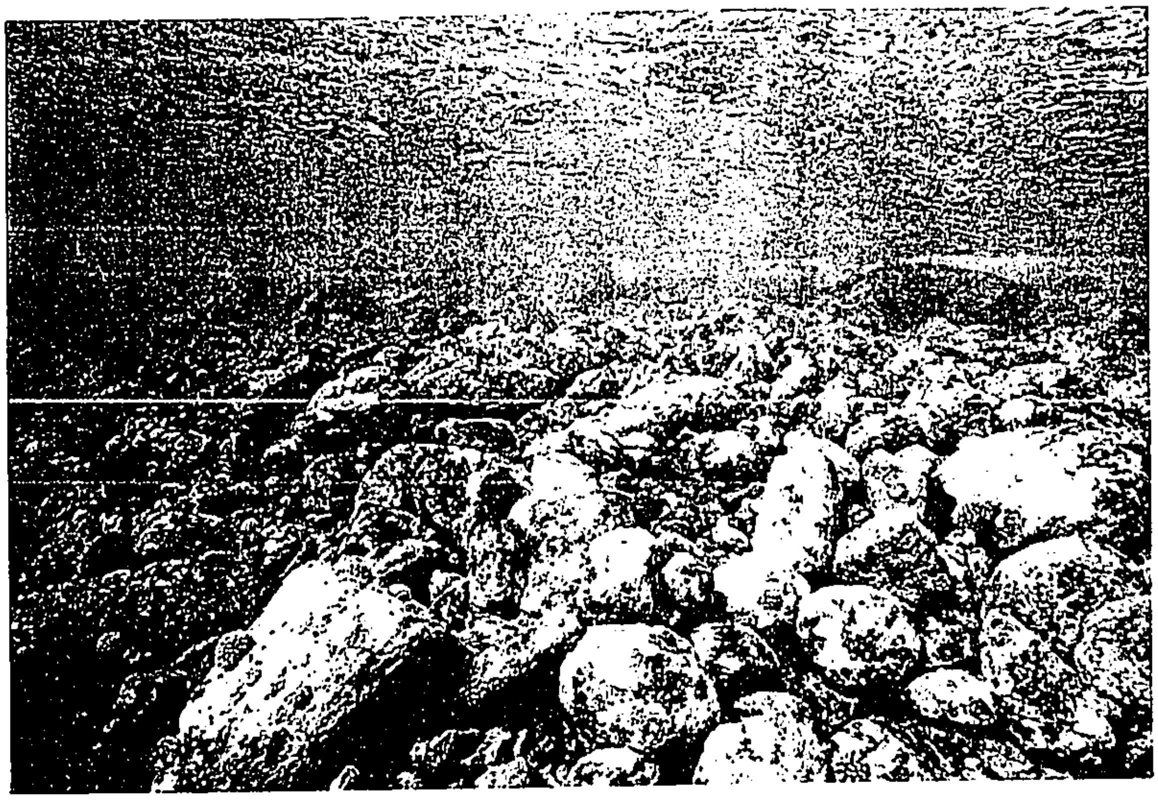
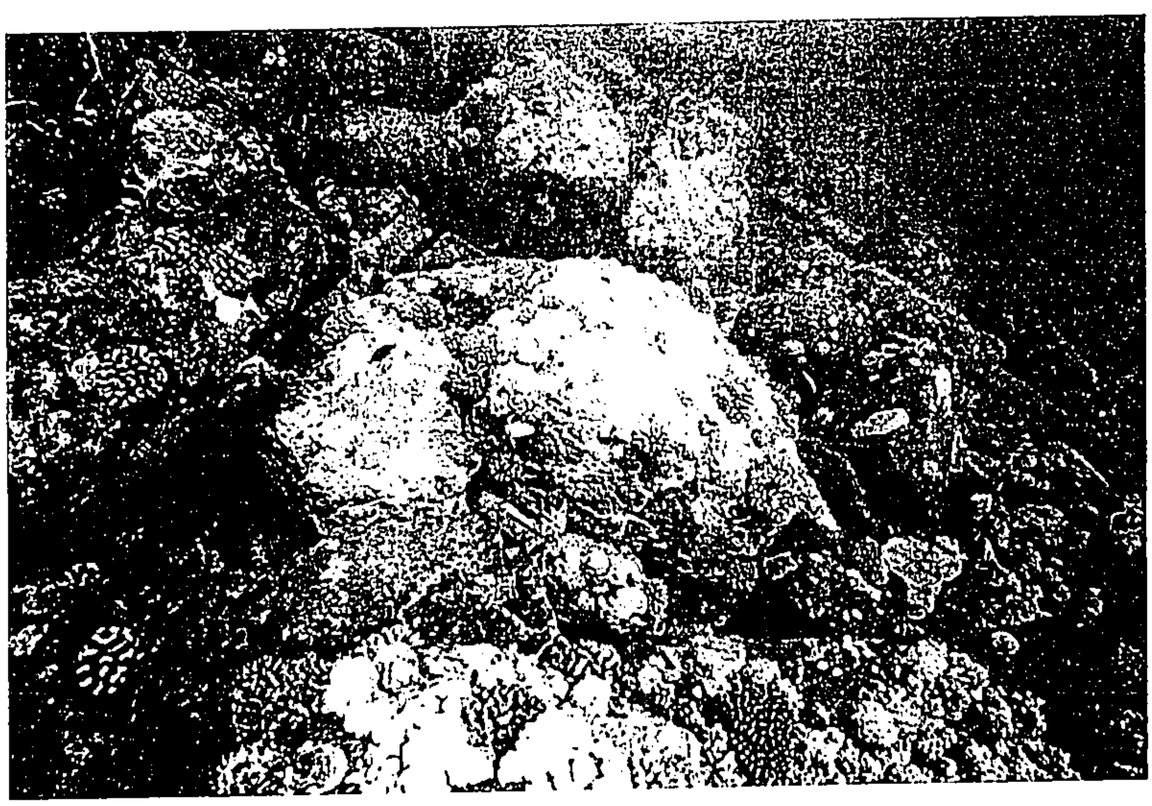


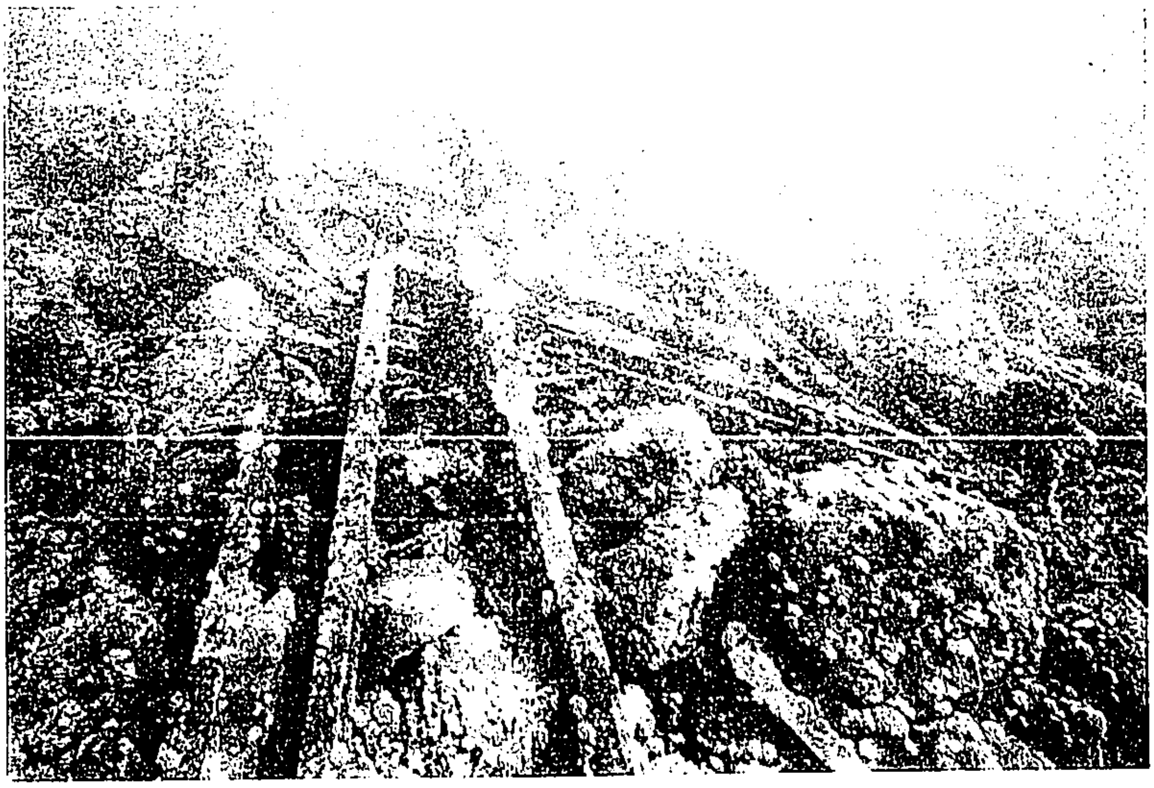
Figure 1. Map of Kaumalapau Harbor showing location of existing breakwater and numbered tracks of video transects used to assess marine community structure.



Figures 2 and 3. Two views of boulders located on inside edge of existing breakwater at Kaumalapau Harbor. Water depth is 1-2 meters. Photos courtesy of J. Naughton, NMFS.

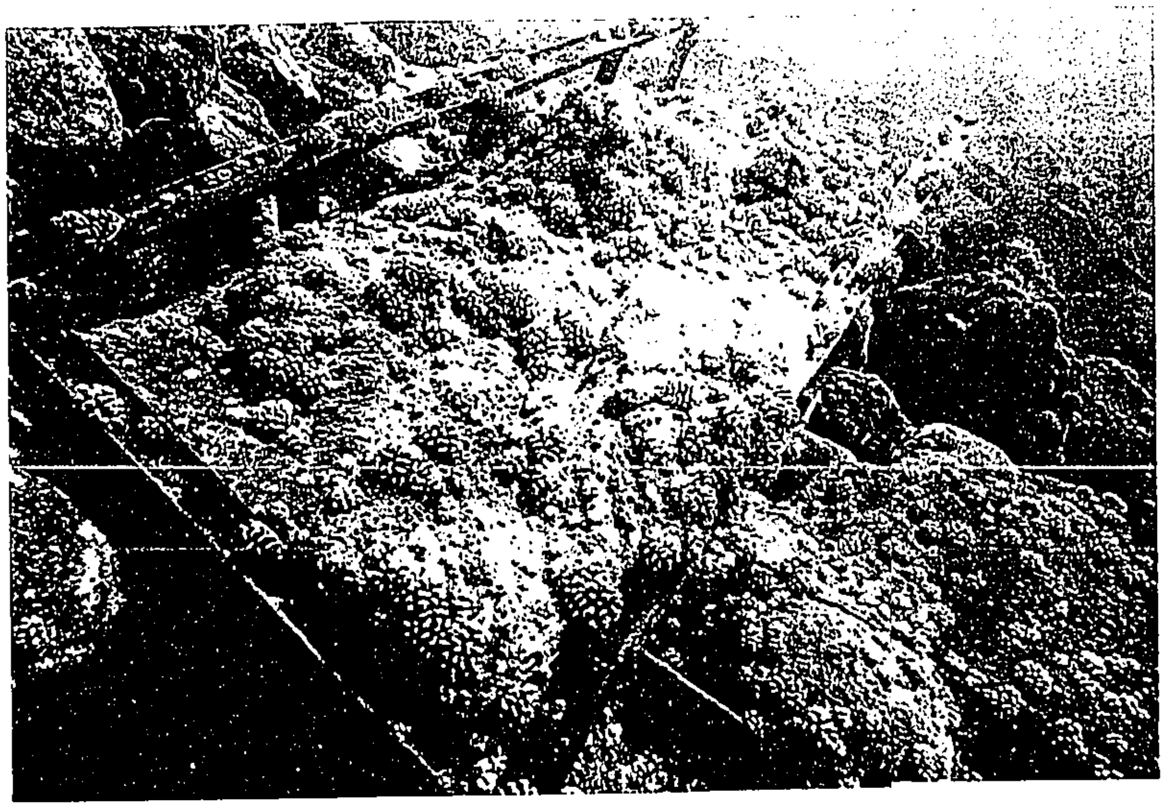


Figures 4 and 5. Two views of boulders on inside sloping side of breakwater at Kaumalapau Harbor, Lanai. Hemispherical branched corals are *Pocillopora meandrina*; flat encrusting species are predominantly *Porites lobata* and *Montipora spp.* Water depth is approximately 8-10 m. Photos courtesy of J. Naughton, NMFS.



Figures 6 and 7. Two views of concrete poles and pipes lying near inside end of underwater section of Kaumalapau breakwater. Water depth is 8-10 m. Photos courtesy of J. Naughton, NMFS.

Figures 8 and 9. Two views of concrete dolos off seaward facing edge of submerged Kaumalapau breakwater. Note high percentage of coral cover on all exposed surfaces. Water depth is 5 to 8 m. Photos courtesy of J. Naughton, NMFS.



Figures 10 and 11. Two views of metal boxes lying off the seaward end of the submerged Kaumalapau breakwater. Note high coverage of Pocillopora meandrina on tops of boxes. Water depth is 5 to 8 m. Photos courtesy of J. Naughton, NMFS.

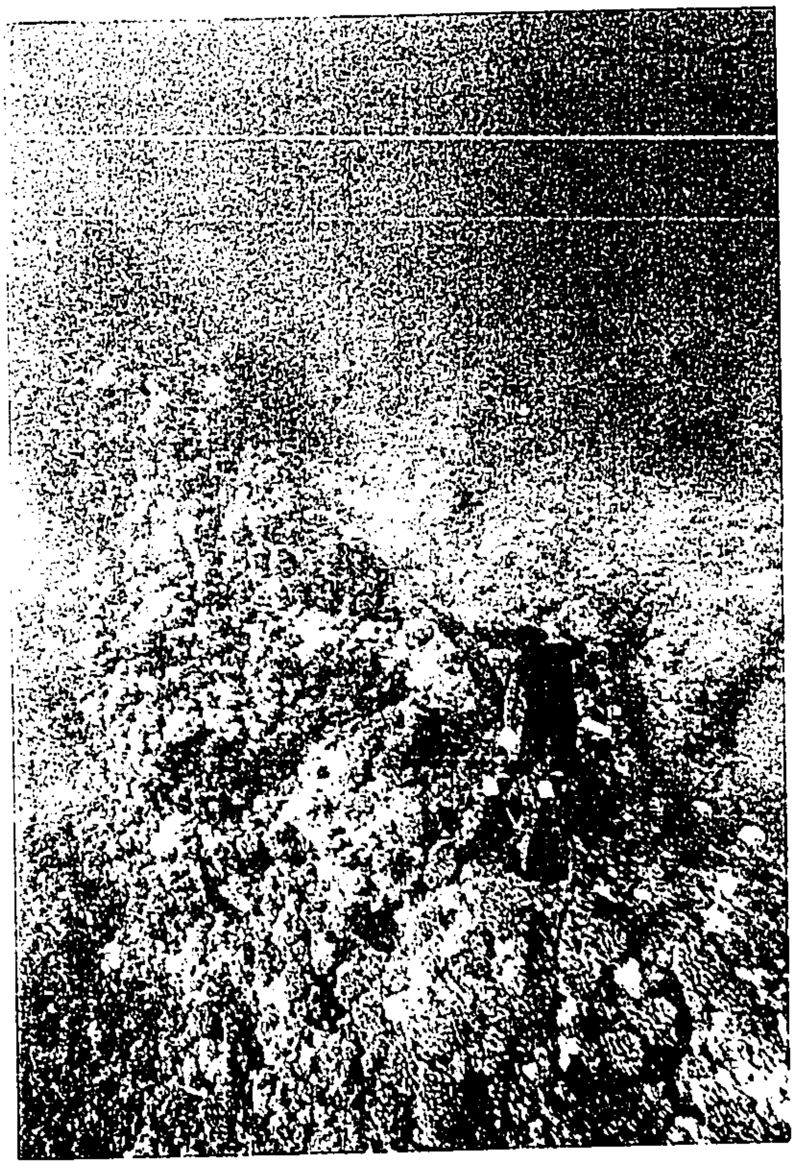


Figure 12. View of natural finger reef that extends seaward from juncture of Kaumalapau breakwater and wharf. Photo shows flat top of reef and nearly vertical face on left. Photos courtesy of J. Naughton, NMFS.

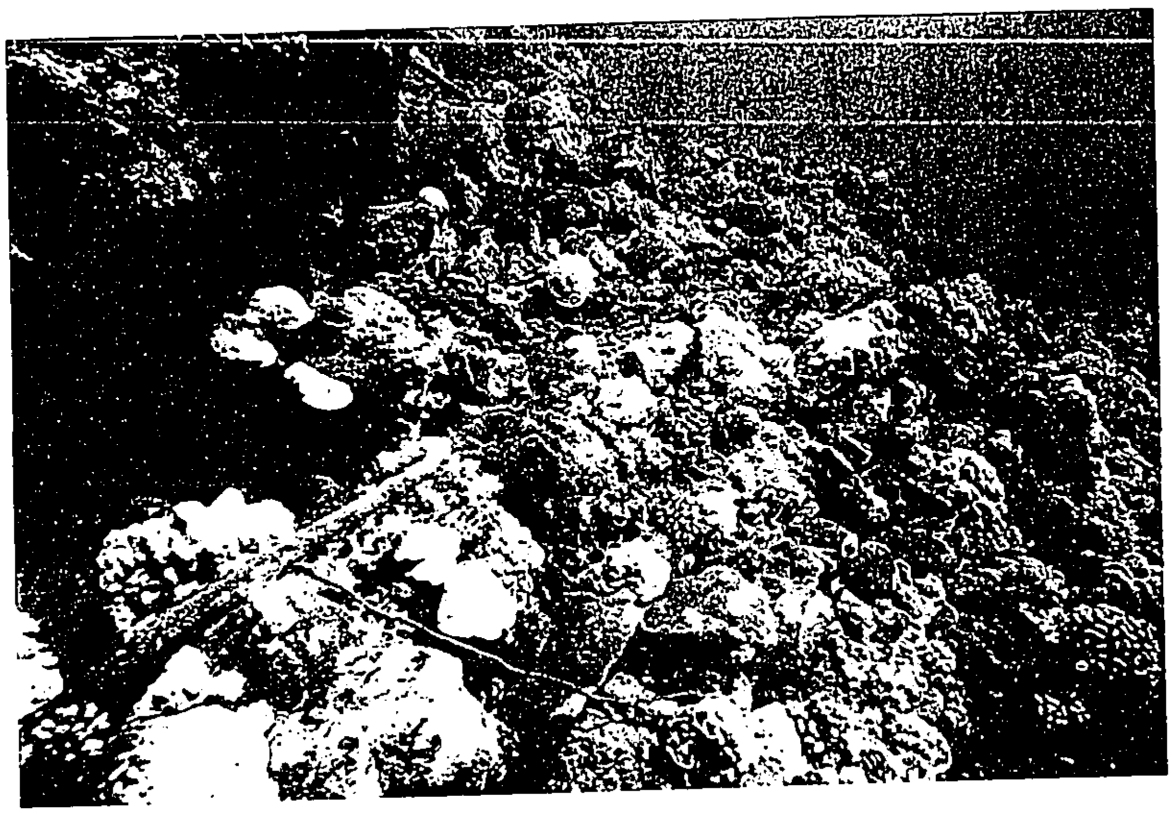


Figure 13. View of gently sloping reef edge at base of cliff shown in Figure 12. Water depth is approximately 12 m. Photos courtesy of J. Naughton, NMFS.

APPENDIX C: FINAL FISH AND WILDLIFE COORDINATION ACT REPORT

FINAL
FISH AND WILDLIFE COORDINATION ACT REPORT
KAUMALAPAU HARBOR NAVIGATION IMPROVEMENTS
LANAI, HAWAII

prepared by

U.S. Department of the Interior
Fish and Wildlife Service
Pacific Islands Ecoregion
Honolulu, Hawaii

prepared for

U.S. Army Corps of Engineers
Pacific Ocean Division
Honolulu Engineer District
Fort Shafter, Hawaii

April 2001

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INTRODUCTION

Authority, Purpose and Scope

This is the U.S. Fish and Wildlife Service's (Service) final report on plans developed by the U.S. Army Corps of Engineers (Corps) for navigation improvements at Kaumalapau Harbor on the island of Lanai in the State of Hawaii. This report has been prepared under the authority of the Fish and Wildlife Coordination Act of 1934 [16 U.S.C. 661 et seq.; 48 Stat. 401], as amended (FWCA), and other authorities mandating Department of the Interior (DOI) concern for environmental values. This report is also consistent with the National Environmental Policy Act of 1969 [42 U.S.C. 4321 et seq.; 83 Stat. 852], as amended (NEPA). The purpose of this report is to document the existing fish and wildlife resources at the proposed project site and to insure that fish and wildlife conservation receives equal consideration with other proposed project objectives as required under the FWCA. The report includes an assessment of the significant fish and wildlife resources at the proposed project site, an evaluation of potential impacts associated with the proposed project design alternatives, and recommendations for fish and wildlife mitigation measures.

The proposed Kaumalapau Harbor project was originally authorized under the Energy and Water Development Appropriations Act of 1993 (PL 102-337). In this act, Congress directed the Corps to initiate preconstruction engineering and design work to repair the breakwater that protects the harbor basin. Congress released funds for the Corps to initiate a *reconnaissance study* of the harbor and compile a Special Report with technical appendices. Additional funding was provided through the Energy and Water Development Appropriations Act of 1994 for the Corps to continue the pre-engineering and design work.

Kaumalapau Harbor is forced closed several times each winter by wave assault associated with storms approaching from the west and south. In 1980, 1982, 1985, 1992, and 1993, storm waves severely damaged the harbor's breakwater. Concrete dolosse, pilings and conduit and scrap metal and other debris were placed on the breakwater to reinforce it after many of these events. Much of this material was displaced after the 1992 and 1993 storms, which also scattered the breakwater's crest stones, broke a hole through the middle of the breakwater, and left most of the seaward 23 m (75 ft) of the breakwater reduced to a submerged, low rubble mound. The breakwater, which has not been repaired since the 1993 event, has continued to deteriorate. In 1995, the captain of the fuel barge servicing Lanai refused to enter the harbor because of unsafe wave conditions near the existing wharf, and the supply and availability of fuel on the island became a serious concern.

Kaumalapau Harbor is important to the public welfare in Lanai because it serves as the only commercial harbor and the receiving site for most of the consumer goods, food, and mail that come into the island. The purpose of the proposed project is to repair and lengthen the existing, damaged breakwater. The existing rubble mound would be slightly reshaped to form the core of the new breakwater. A new underlayer of stones would be placed over the core, and a layer of core-loc concrete armor units would be placed over the stone underlayer. Finally, a cast-in-place concrete rib cap would be constructed to stabilize the crest of the breakwater.

Coordination with Federal and State Resource Agencies

Service biologists have discussed the proposed project with staff of the National Marine Fisheries Service (NMFS) of the U.S. Department of Commerce (DOC), the Division of Aquatic Resources (DAR) of the Hawaii Department of Land and Natural Resources, and the Coastal

Zone Management Program (CZMP) of the Hawaii Office of State Planning. Concerns relative to the protection and conservation of important fish and wildlife resources at Kaumalapau Harbor expressed by the Hawaii DAR and CZMP were incorporated into this draft FWCA report. Copies of this report are being provided to the U.S. Environmental Protection Agency (EPA), the Clean Water Branch (CWB) of the Hawaii Department of Health, the NMFS, the DAR, and the CZMP.

Prior Fish and Wildlife Studies and Reports

In October 1994, the Service conducted a field investigation of the proposed project site, which was documented in a draft FWCA report to the Corps that was released in August 1995. The report included brief descriptions of the major habitats existing within the project site and data on the composition of conspicuous species observed in each habitat. In the report, the Service identified the coral reefs within Kaumalapau Bay and immediately outside the existing breakwater as the habitats of major concern. Several conservation measures to minimize the degradation of coastal water quality and impacts to marine fish and wildlife resources and habitats were recommended for incorporation into the project design. From a resource conservation perspective, the Service supported either of the two project breakwater design alternatives under consideration at that time.

In December 1998, the Service attended a scoping meeting on issues concerning the proposed project. The meeting participants also included representatives of the Corps, the CWB, the Harbors Division of the Hawaii Department of Transportation, and two project environmental consulting companies. The meeting focused primarily on a potential modification of the original design for the repaired breakwater, avoidance of the coral reef shelf immediately seaward and north of the existing breakwater, and proposed project mitigation measures. Based on this meeting, a site visit was scheduled to assess the potential impacts anticipated to result from the modified breakwater design.

In January 1999, the Service participated in the site visit with representatives of the NMFS and two project environmental consulting companies. Observations indicated that the status of the coral reef habitat at the proposed project site had changed very little since the 1994 FWCA investigation. The major change was that many of the small, newly recruited coral colonies seen on the breakwater stones in 1994 had grown in size. Based on the site visit, it was determined that additional FWCA resource surveys and a revised draft FWCA report for the proposed project would not be required.

DESCRIPTION OF THE PROJECT AREA

The proposed project area is the island of Lanai (20° 50' N and 156° 55' W) in the State of Hawaii (Figure 1). With approximately 84 kilometers (km) [52 miles (mi)] of shoreline encompassing approximately 361 square km (km^2) [139.5 square mi (mi^2)] of land, Lanai is the sixth largest island in the Hawaiian archipelago. The island was created by the eruptions of a single shield volcano. Lanai's highest point of land, Lanaihale, reaches an elevation of 914 m (3000 ft) roughly in the center of the island. Almost the entire island is privately owned by Castle & Cook, Incorporated. Until recently, the Dole Company, a subsidiary of Castle & Cook, used the island primarily for the production of pineapple (University of Hawaii, 1983).

Kaumalapau Harbor is located in Kaumalapau Bay on the arid, high-cliffed, volcanic southwestern coast of Lanai (Figure 1). Kaumalapau Harbor was completed in 1926 by the Hawaiian Pineapple Company (later the Dole Company) to provide small barge facilities for exporting locally grown pineapples and importing various goods from Oahu. The harbor has since become the principal seaport for the island. Aside from its commercial port facilities, the harbor contains numerous privately maintained mooring buoys. Although the harbor lacks a boat launching ramp, a derrick is present for lifting small craft up to 12 m (40 ft) in length out of the water and onto a concrete wharf for repairs. The nearest small boat launching ramp exists at Manele Bay, which is approximately eight nautical miles away (Balder, 1992).

Existing features at Kaumalapau Harbor include a west rubble-mound breakwater that is approximately 76 m (250 ft) long with an existing crest elevation of approximately 3 m (10 ft). A concrete wharf approximately 122 m (400 ft) in length lies along the harbor's north side adjacent to cargo sheds, the derrick, and other barge loading and unloading equipment. Gasoline, diesel fuel, and water are available at the wharf. Although there is no distinct harbor entrance channel, an opening approximately 182 m (600 ft) wide leads into a turning and mooring basin that is four hectares (ha) [10 acres (ac)] in size and from 9 m (30 ft) to 15 m (50 ft) in depth. Navigational markers are located on both sides of the harbor opening and on a shallow reef that extends along the eastern and southern sides of the harbor.

Although the average daytime high temperature at Kaumalapau Harbor is not available, this temperature calculated for Lanai City, which is approximately 10 km (6 mi) northwest of Kaumalapau at an elevation of 494 m (1620 ft), is 24° C (75° F). Rainfall on Lanai is relatively low due to the shielding effects of rain-producing tradewinds by the islands of Molokai and Maui. Average annual precipitation recorded in the vicinity of Kaumalapau is approximately 25 cm (10 in), although Lanaihale near the center of the island receives over 89 cm (35 in) of rainfall per year. The majority of the rainfall at Kaumalapau occurs between October and April, but intermittent rainfall may be expected in any month of the year, including the summer months, which are generally drier (University of Hawaii, 1983).

Northeast tradewinds with an average velocity of 10-20 knots (kts) [11-23 miles per hour (mph)] blow fairly consistently across Lanai from May through September. Average wind velocities at Kaumalapau on the leeward coast are approximately 8-10 kts (9-11 mph). Between October and April, winds may decrease in velocity and shift direction in response to the northerly winds that follow or the southwesterly winds that precede cold fronts and southerly winds of "Kona" storms. Thus, winter is the season of more frequent cloudiness and rain (University of Hawaii, 1983).

The predominant ocean current flow near Kaumalapau Harbor is generally toward the northwest. Under normal tradewind conditions, the speed of this current is typically less than 1 kt (1.2 mph) and is not strong enough to cause navigational problems. However, during Kona and southwesterly storms, large waves may close the harbor, and strong wave-generated currents may develop. Tidal currents at Kaumalapau Harbor are usually too weak to affect navigation and do not reverse during ebb and flow periods.

The Hawaii DAR has indicated that the dominant fishing activities occurring at Kaumalapau Bay include hook & line fishing from the harbor breakwater and wharf and spear fishing on the reefs inside and outside of the bay (S. Hau and B. Puleloa, Pers. Comm.). Targeted organisms include reef fishes, octopuses, lobsters, crabs, molluscs, and algae. Fishing effort at the harbor is currently unquantified. Also, Kaumalapau Bay is important to charter dive operators who use the harbor as a loading and unloading site and the surrounding reefs, especially the fringing coral-reef shelf outside the harbor, as a scuba dive site.

In November 1992, the U.S. Congress passed the Oceans Act of 1992 (P.L. 102-587), which established the Hawaiian Islands Humpback Whale National Marine Sanctuary. Waters extending seaward from Kaumalapau Harbor to the 100-fathom isobath are included within the sanctuary's boundaries.

FISH AND WILDLIFE RESOURCE CONCERNS AND PLANNING OBJECTIVES

The Service's primary concerns with the proposed project include potential impacts to endangered species and other fish and wildlife resources and their habitats from dredging and filling in the marine environment. Specific Service planning objectives are to maintain and enhance the existing significant habitat values at the proposed project site by (1) obtaining basic biological data for the proposed project site, (2) evaluating and analyzing the impacts of proposed-project alternatives on fish and wildlife resources and their habitats, (3) identifying the proposed-project alternative least damaging to fish and wildlife resources, and (4) recommending mitigation for unavoidable project-related habitat losses consistent with the FWCA and the Service's Mitigation Policy.

Under the authority of the ESA, the DOI and the DOC share responsibility for the conservation, protection and recovery of federally-listed endangered and threatened species. Authority to conduct consultations has been delegated by the Secretary of the Interior to the Director of the Service and by the Secretary of Commerce to the Assistant Administrator for Fisheries of the NOAA. Section 7(a)(2) of the ESA requires federal agencies, in consultation with and with the assistance of the Service or NMFS, to insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitats. The Biological Opinion is the document that states the opinion of the Service or the NMFS as to whether the Federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

The Service's Mitigation Policy (Service, 1981) outlines internal guidance for evaluating project impacts affecting fish and wildlife resources. The Mitigation Policy complements the Service's participation under the NEPA and the FWCA. The Service's Mitigation Policy was formulated with the intent of protecting and conserving the most important fish and wildlife resources while facilitating balanced development of this nation's natural resources. The policy focuses primarily on habitat values and identifies four resource categories and mitigation guidelines. The resource categories are the following:

a. Resource Category 1: Habitat to be impacted is of high value for the evaluation species and is unique and irreplaceable on a national basis or in the ecoregion section.

b. Resource Category 2: Habitat to be impacted is of high value for the evaluation species and is relatively scarce or becoming scarce on a national basis or in the ecoregion section.

c. Resource Category 3: Habitat to be impacted is of high to medium value for the evaluation species and is relatively abundant on a national basis.

d. Resource Category 4: Habitat to be impacted is of medium to low value for the evaluation species.

The coral reefs fronting Kaumalapau Harbor and within Kaumalapau Bay comprise the habitat of major concern. Although corals are very small and sensitive organisms, healthy coral colonies are fundamentally important in providing the basic foundation for habitat that supports diverse communities of other highly-specialized aquatic organisms. Corals contribute the bulk of the calcareous raw material that forms and maintains the basic structural framework of the reef. Coral colonies add significantly to the submarine topographic relief in which a large number of fish and invertebrate species find shelter and food. Coral polyps themselves are an important food source for some fishes and other marine life. The institutional significance of U.S. coral reefs has been established through their formal designation as Special Aquatic Sites [40 CFR Part 230 §230.44 / FR v.45 n.249] and as a Federal Trust Resource [Executive Order (E.O.) 13089 on Coral Reef Protection]. Such sites possess special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values and contribute to the general overall environmental health or vitality of an entire ecosystem of a region.

Coral reefs are relatively scarce on a national basis and are currently in a world-wide state of decline (Crosby *et al.* 1995; U.S. Coral Reef Task Force 2000). In the main Hawaiian Islands, coral reefs are subjected to relatively frequent adverse impacts, and the extent of healthy and productive coral reefs may be declining on a local basis. The Service considers coral reef habitats to be Resource Category 2 habitats. The Service's resource goal for Category 2 habitat is no net loss of in-kind habitat values. Under this designation, the Service will recommend ways to avoid or minimize the losses. If losses are unavoidable, mitigation measures to immediately rectify, reduce, or eliminate these losses over time will be recommended. As necessary, compensation by replacement of the in-kind habitat values may be incorporated as integral project features.

Corals and reef fishes have been selected as the evaluation species for the reef habitats that may be affected by the proposed project. Reef fishes were selected because of their potential importance as sources of food and recreation for humans. The harbor area supports subsistence and sport fisheries for reef fishes, lobsters, crabs, octopi, and algae. Hook and line fishing from the existing breakwater and spear fishing on the reef slope are commonly practiced. Also, reef fishes are among the marine resources most important to resident and visiting recreational skin and SCUBA divers.

EVALUATION METHODOLOGY

In 1994, the Service conducted a reconnaissance survey at Kaumalapau Bay to evaluate potential impacts on fish and wildlife resources based on the proposed project design criteria in effect at the time. A brief reconnaissance of the terrestrial flora and fauna around the harbor was also conducted. Observations on the distribution and relative abundances of marine fishes, corals, other macroinvertebrates, and algae were compiled during random swims over substrates both inside and outside of the bay.

Within the bay, marine surveys were conducted adjacent to the harbor side of the existing breakwater and commercial dock, adjacent to the shore of the bay between the commercial dock and the point at the south end of the bay, and over the turning basin and middle portion of the bay. Outside the bay, marine surveys were conducted adjacent to the seaward side of the existing breakwater, over the fringing reef shelf west of the breakwater, and on the submarine terrace between the shelf and the harbor opening to a maximum depth of 25 m (82 ft). Substrate coverage data collected every 0.6 m (2 ft) along 46-m (150-ft) transects were used to assess the potential value of the existing reef habitat.

A brief site visit was made in 1999 to assess whether a potential modified breakwater design (*i.e.*, dogleg extension off the existing breakwater) would result in greater potential coral reef impacts than those anticipated to result from the original two alternative designs. Potential mitigation measures for the proposed project were also discussed. The complete results of these surveys are contained in this final report.

DESCRIPTION OF FISH AND WILDLIFE RESOURCES

Existing Conditions:

Terrestrial:

The arid, terrestrial portion of the proposed project site has been altered by construction of the existing breakwater and ancillary harbor buildings, parking lot, and wharf. There are no wetlands or sensitive upland habitats located within the harbor area.

A type of mesquite known locally as kiawe (*Prosopis pallida*) and bristly foxtail (*Setaria verticillata*) are among the dominant terrestrial plants present at the harbor site. Pili grass (*Heteropogon contortus*), swollen fingergrass (*Chloris barbata*), false mallow (*Malvastrum coromandelianum*), hairy merremia (*Merremia aegyptia*), and partridge pea (*Chamaecrista nictitans*) are also likely to be present (Corps, 1993). All of these species except *H. contortus*, which is considered indigenous, are exotic introductions to Hawaii that have become naturalized (Wagner *et al.*, 1990).

Terrestrial animals at the site are limited to introduced species, including Axis deer (*Cervus axis*), gray francolin (*Francolinus pondicerianus*), and ring neck pheasant (*Phasianus colchicus*), which were originally introduced as game species. House sparrows (*Passer domesticus*), northern cardinals (*Cardinalis cardinalis*), red-crested cardinals (*Paroaria coronata*), barred doves (*Geopilia striata*), spotted doves (*Streptopelia chinensis*), common myna birds (*Acridothetres tristis*), and seabirds are reported to be present within the vicinity of the site (Corps, 1993). The domestic cat (*Felis catus*) and dog (*Canis familiaris*), house mouse (*Mus musculus domesticus*), roof or black rat (*Rattus rattus*), brown rat (*R. norvegicus*), Polynesian rat (*R. exulans hawaiiensis*), and Indian mongoose (*Herpestes auropunctatus*) occur at the site. Introduced skinks (Scincidae) and gekkos (Gekkonidae) are also present.

Marine:

A fringing, coral-reef shelf extends approximately 200 m westward from the point at which the existing breakwater at Kaumalapau Harbor is connected to shore (Figure 2). The end of this shelf descends to approximately 35 m (115 ft) where it meets a submarine terrace that extends seaward from the existing breakwater and across the mouth of Kaumalapau Bay. The top of the shelf is relatively shallow with high spots that are exposed at low tide. The southwest side of the shelf is a nearly vertical wall that contains ledges and small caves to an approximate depth of 24 m (80 ft). A narrow zone of calcareous rubble lies adjacent to the base of the wall on the southern side of the shelf.

Over the top central portion of the shelf, coral coverage is approximately 90%. Between the central portion and southwest edge of the shelf above the wall, coral coverage is 100%. *Pocillopora meandrina* is the dominant coral species on the shelf, followed by *Porites lobata*. Black coral (*Cirrhipathes anguina*) was recorded on the wall near its western end below 21 m (70 ft). A school of approximately 75 spotted unicornfishes (*Naso brevirostris*) was seen swimming northward past the end of the shelf between depths of 6 and 8 m (20 and 26 ft). An aggregation of approximately 100 pyramid butterflyfishes (*Hemitaurichthys polylepis*) was seen feeding on plankton off the end of the shelf between depths of 8 and 12 m (25 and 40 ft).

In the area adjacent to the southwest side of the shelf and the landward third of the breakwater, the submarine terrace is covered with patches of coral (47%), basalt boulders (25%), calcareous rubble (15%), reef pavement (10%), and unconsolidated calcareous sand (3%). *P. meandrina* is the most abundant coral occurring on the terrace within this area. As the terrace deepens toward the seaward end of the breakwater, the coral *P. lobata* appears to be more abundant. The corals *Montipora verrucosa* and *Pocillopora eudouxi* are common on the terrace, and the coral *Montipora flabellata* is present but relatively rare. Near the mouth of the bay, the terrace becomes progressively covered by greater amounts of unconsolidated, calcareous sand and eventually grades into a sand flat fronting the harbor entrance.

The fish community between the shelf and the seaward end of the breakwater is fairly diverse, with 56 species in 26 families having been observed during the survey. Common food-fishes eaten by humans include 16 (29%) of these species. Overall fish abundance, however, appears to be relatively low, and fish species are generally represented by individuals belonging to small size classes. The absence of larger individuals of common food-fish species is notable. The most abundant fishes observed include round herrings (*Sprateloides delicatulus*), halfbeaks (*Hyporhamphus acutus pacificus*), jacks (*Caranx melampygus*), fusiliers (*Caesio caerulaurea*), goatfishes (*Mulloides vanicolensis*), damselfishes (*Chromis agilis* and *C. vanderbilti*), surgeonfishes (*Acanthurus guttatus, A. triostegus, Ctenochaetus strigosus*, and *Zebrasoma flavescens*), and Moorish idols (*Zanclus cornutus*).

A large number of basalt boulders lie near the base of the existing breakwater, apparently having tumbled down during periods of severe storm-wave assault. In addition, numerous pieces of concrete (*eg*., dolosse, pilings, and conduit), scrap metal, and other debris are scattered among and on top of these boulders, especially over the submerged, low rubble mound adjacent to the seaward half of the breakwater. Off the seaward end of the breakwater, this material is present to a depth of at least 27 m (90 ft). Along the western side of the breakwater, corals have colonized the boulders and concrete material between depths of 6 and 12 m (20 and 40 ft). This coral zone widens to a depth of approximately 20 m (65 ft) near the seaward end of the breakwater. Coral coverage within this zone is approximately 80%, with *P. lobata* and *M. verrucosa* being the most abundant species.

Other conspicuous macroinvertebrates present on the western side of the breakwater include cowrie snails (*Cypraea caputserpentis*), cone snails (*Conus flavidus*), slate-pencil sea urchins (*Heterocentrotus mammillatus*), boring sea urchins (*Echinometra mathaei*), and sea cucumbers (*Holothuria atra*). In shallower water, helmet sea urchins (*Colobocentrotus atratus*) are present on the breakwater just below the intertidal zone. Rock crabs (*Grapsus grapsus tenuicrustatus*), moon snails (*Polinices melanostomus*), and nerites (*Nerita picea*) are common within the intertidal and splash zones on the breakwater.

Within the harbor, a very large rubble mound of basalt boulders, concrete material, and other debris lies adjacent to the eastern side of the breakwater. Along the seaward half of the breakwater, this mound extends approximately 46 m (140 ft) into the harbor turning basin and is relatively level within the first 30 m (100 ft) before descending to the basin floor. Corals have colonized this material within a zone that is approximately 15 m (50 ft) wide between depths of 5 m (15 ft) and 11 m (35 ft). *P. meandrina* and *P. lobata* are the dominant corals present within this zone. Beyond the submerged rubble mound, the turning basin floor is covered by a layer of unconsolidated, calcareous sand and terrigenous silt, in which a wide variety of metal, plastic, and rubber debris items are embedded.

Adjacent to the landward half of the breakwater, the boulder/debris mound inside the harbor is less extensive. Scattered, small colonies of *P. lobata* are present on the basalt boulders and cement pilings comprising the mound. Within the portion of the harbor immediately bounded by the breakwater and the wharf, coral cover is greatest in the corner where the breakwater meets the wharf. Along an oblique line extending approximately 46 m (150 ft) into the turning basin from this corner, the harbor floor is covered with corals (24%), basalt boulders (25%), and sand/silt (51%). *P. lobata* is the dominant coral on the lower portion of the wharf face and on natural rock outcrops near the wharf on the turning basin floor. *P. meandrina*, *M. verrucosa*, and *Porites compressa* are also present, especially on the wharf face. Away from the breakwater and wharf the relatively flat harbor basin substrate is widely covered by deposits of sand and silt.

The dominant feature in the eastern portion of the bay is Kaumalapau Gulch. Between the wharf and the gulch, the substrate immediately seaward of the shoreline changes from predominantly sand/silt near the wharf to basalt with outcrops colonized by corals. Immediately north of the gulch, a shallow basalt ridge extends across the basalt substrate and into the sand/silt area toward the center of the bay. The predominant coral species present on the ridge include *P. compressa*, *P. lobata*, *P. meandrina*, and *M. verrucosa*. The top of the ridge is 90-100% covered by corals, although overall coral coverage on the ridge is approximately 50%. A field of basalt rocks lines the shore immediately in front of the gulch. Directly offshore, many larger basalt boulders are spread over the substrate. Seaward of these boulders, scattered, low-relief outcrops colonized by corals are present. *P. compressa* and *P. lobata* are dominant on the boulders and the outcrops. Seaward of these outcrops, the substrate within the center of the bay is predominantly covered by sand and silt.

South of the gulch and the submerged tract of larger boulders, 90-100% of the hard basalt substrate between the shoreline and the sand/silt bay floor is covered by corals. Reef outcrops in this area are more abundant and of higher relief than they are north of the gulch. Between the gulch and the southern point of the bay near the harbor entrance, several basalt ridges, which are separated by sand/silt-covered channels, extend from shore toward the center of the bay. The tops of these ridges are 100% covered by corals, however, overall coral coverage on the ridges is approximately 50%. *P. meandrina* is the dominant coral on the ridges, which slope downward and grade into lower relief coral beds as they approach the sand/silt substrate in the center of the bay. *P. lobata, P. compressa, and M. verrucosa* are also present, with *P. compressa* being more abundant toward the south point of the bay. Immediately inside of the south point, the reef is a nearly vertical wall along the shoreline. Basalt boulders lie scattered on the substrate near the base of the wall. Coral coverage is 90-100% on the wall, boulders, and basalt substrate between the shoreline and the sand/silt harbor floor.

The fish community within Kaumalapau Bay is less diverse than it is outside of the bay. A total of 40 species representing 15 families were observed inside the bay during the survey. Despite the excellent, high-relief coral habitat present within the shoreward portions of much of the bay, reef fishes are not very abundant. Common food-fishes eaten by humans include nine (23%) of these species. As is the case outside of the bay, the absence of larger individuals of common food-fish species is notable. The most abundant fishes observed in the bay include round herrings (*S. delicatulus*) in the corner of the harbor where the breakwater meets the wharf, goatfishes (*M. vanicolensis*) over the sand/silt harbor substrate, and damselfishes (*C. agilis* and *C. vanderbilti*) and surgeonfishes (*C. strigosus* and *Z. flavescens*) over the coral reef areas.

Excluding corals, conspicuous macroinvertebrates present within the bay include collector sea urchins (*Pseudoboletia indiana*), slate-pencil sea urchins (*H. mammillatus*), and cowrie snails (*C. caputserpentis*) within coral reef areas; and rock crabs (*Grapsus grapsus tenuicrustatus*), moon snails (*P. melanostomus*), and nerites (*Nerita picea*) within intertidal and splash zones on the breakwater and along rocky shorelines. Spiny lobsters (*Panulirus pennicilatus*) are also present in reef areas in the south and southwestern parts of the bay.

Lists of the marine organisms observed during the 1994 surveys are presented in Tables 1-4. A total of 68 species of marine fishes (Table 1), nine species of reef corals (Table 2), 25 species of marine molluscs (Table 3), and 13 species of other macroinvertebrates, including nine species of echinoderms, (Table 4) were recorded. The only algae observed during the surveys was an unidentified filamentous turf, primarily on the shelf west of the breakwater. Although federally threatened Green sea turtles (*Chelonia mydas*) and endangered Hawksbill sea turtles (*Eretmochelys imbricata*) are known to exist in the waters surrounding the harbor, no turtle nesting habitat occurs within Kaumalapau Bay. Furthermore, preferred types of resting habitat and food resources for these species were not observed during the survey.

Future Without the Project:

Kaumalapau Harbor is important to the public welfare in Lanai because it serves as the only commercial harbor and the receiving site for most of the consumer goods, food, and mail that come into the island. A majority of the items leaving Lanai also go through the harbor. Due to its location, however, the existing breakwater and wharf at Kaumalapau Harbor are susceptible to being damaged by storm-generated waves. As a result of periodic damage, loading and unloading operations at the harbor have been adversely affected. Without repairs to the breakwater, rough sea conditions in the harbor are expected to continue. Accordingly, additional damage to the wharf and vessels in the harbor and delays in ship operations are anticipated. These rough sea conditions also increase the risk of catastrophic releases of petroleum products and other chemicals from vessels and vessel groundings.

Without the project, emergency strengthening of the breakwater after major storm events will continue to be necessary. It is likely that such temporary repair measures will continue to involve the piling of boulders, concrete, and debris items on the damaged areas of the breakwater. It is obvious that development of the coral-reef community surrounding the existing breakwater has been hampered by the recurring storm-related breakup and distribution of these items. Although the degree of this impact cannot be quantified by available data, it is anticipated that future storm events will continue to redistribute these unstable items and adversely affect the development of the existing coral-reef community.

DESCRIPTION OF ALTERNATIVES EVALUATED

Only two alternatives were under consideration at the time of the draft FWCA report (Service 1995). In 2000, the Corps released revised and expanded information on alternatives for the proposed project. This revision was based on model test analyses and additional field investigations. Six alternative actions are currently being considered by the Corps (Corps 2000). One of the proposed actions is a No Action Alternative that would leave the existing harbor as it is with no action taken to install any of the proposed federal improvements. The other five alternatives would result in the construction of a new breakwater to replace the old deteriorated structure. Details of the five alternative breakwater designs under consideration are summarized below.

Alternative 1:

This alternative includes construction of a new 200-foot rubble mound breakwater, extending to the northwest from the southern corner of the harbor entrance. Numerical model tests showed that the southern breakwater had little effect on wave conditions at the pier.

Alternative 2:

This alternative includes installation of new wave absorbers along the southern and northeastern portions of the harbor shoreline. Model analysis showed that wave heights were reduced in localized areas immediately adjacent to the wave absorbers but resulted in no more than a 10% average wave height reduction at the wharf where the reduction is most needed.

Alternative 3:

This alternative includes rebuilding the existing breakwater and adding a 200-foot straight extension to the end of the existing breakwater. Test results showed 29-55% wave height reductions for northwest swells but 61-113% wave height changes for southwest swells.

Alternative 4:

This alternative includes the same design as in Alternative 3 with the addition of wave absorbers along the northeastern portion of the harbor shoreline. Analysis showed that this design resulted in an average additional wave height reduction at the wharf of less than 10%.

Alternative 5:

This alternative includes addition of a dog-leg extension to the existing breakwater. The first 350 feet of the existing breakwater would be rebuilt along its current alignment and the next 50 feet would be angled 30 degrees toward the inside of the harbor. Model tests showed wave height reductions of 26-57% for northwest swells and reductions of 60-98% for southwest swells.

After further evaluation, it was determined that Alternative 5 provided significant improvements over the existing conditions and demonstrated better results than Alternative 3. In the Corps' 1996 Special Design Report, Alternative 5 was the Recommended Plan of Improvement. Subsequent study has led to the recommendation that the dog-leg be eliminated and that the proposed breakwater alignment be repositioned shoreward to center it above the existing rubble mound. This final design for the Recommended Plan of Improvement would result in a new breakwater with a total length of 320 feet and a crest elevation of +14.5 feet above mean low low water (Figures 3 and 4).

PROJECT IMPACTS

Terrestrial Resources:

Construction activities associated with the proposed project are not expected to adversely impact terrestrial biological resources at the harbor. Stone for the breakwater's underlayer would come from existing quarries on Lanai, Oahu, or Maui, and the core-loc concrete armor units would be cast on Lanai or Oahu and barged to Lanai. A small concrete batch plant would be located in a currently disturbed area near the project site for construction of the cast-in-place concrete rib cap. An approximate two-acre contractor work and storage area would be located approximately 2,000 feet inland of the harbor, at the site of an old stone quarry operation. Any upland disposal of debris removed from the existing harbor bottom would be at an approved landfill site.

Marine Resources:

Excluding the No Action Alternative, all other actions currently under consideration would each result in direct and secondary adverse impacts to marine fish and wildlife resources. Alternative 1 is anticipated to result in the direct and permanent elimination of approximately 1.1 acre of undisturbed, marine benthic habitat from filling for the new breakwater. This structure would cover natural wall, boulder, and basalt substrate near shore that is 90-100% covered with corals. The seaward end of the breakwater would partially extend across the existing harbor entrance floor where the existing infauna residing in substrate sediments would be lost.

Alternative 2 is anticipated to result in the loss of an unestimated amount of undisturbed, reef substrate adjacent to the northeastern and southern shorelines of the bay from filling for the wave absorbers. Coral cover on the substrate in these areas is 50-100%, with coral cover as high as 100% on reef outcrops and ridge tops.

Alternative 3 is anticipated to result in the loss of approximately 2.5 acres of disturbed, benthic habitat comprised mostly of basalt boulders, concrete dolosse units, and other debris on the existing rubble mound at the site. The substantial amount of corals that have become established on these features would be lost. The seaward end of the breakwater would bury an estimated 0.3 acre of the harbor entrance floor where the existing infauna residing in substrate sediments would be lost.

Alternative 4 is anticipated to result in the same losses of marine benthic habitat and corals and soft-bottom infauna as alternatives 2 and 3 combined.

Alternative 5 (Recommended Plan) is anticipated to result in the loss of approximately 1.75 acres of disturbed, benthic habitat, comprised primarily of the basalt boulders, concrete dolosse units, and other debris on the existing rubble mound. The seaward end of the breakwater would bury an estimated 0.3 acre of the harbor entrance floor where the existing infauna residing in substrate sediments would be lost.

All alternatives would secondarily impact nearby corals and other filter-feeding organisms and algae by temporarily degrading nearshore water quality as a result of increased levels of suspended sediments and turbidity generated by project-related debris movement, boulder redistribution, and core-loc unit placement. Secondary impacts may include smothering of reef corals and other filter-feeders from excessive sediment deposition, abrasion of coral polyps by current-driven suspended sediments, and reduced primary productivity of benthic algae, zooxanthellae, and phytoplankton from decreased light levels.

The coral reefs that are present outside the harbor and along the eastern through southwestern shoreline within the bay are the habitats of major concern for the proposed project, and the degraded, marine benthic habitats within the harbor basin are considered to be important but of lesser value. During construction, it will be important to minimize adverse project-related impacts to these coral reefs. After construction, the new breakwater extension is not expected to cause the deflection of longshore currents or the creation of eddies, which could disperse suspended sediments over areas of productive reef and spread adverse impacts to a greater amount of corals and other sediment-sensitive marine organisms.

Project-related boulder and debris redistribution at the harbor may attract fish to the site to feed on benthic organisms exposed by these actions. However, high turbidity caused by these actions may limit or preclude this from happening. The harvest of marine resources from the site would have to be restricted for safety reasons during any implemented construction period, but overall fishing effort is expected to return to existing levels following project completion. After construction, fisheries may be locally enhanced near the concrete core-loc units, which would provide new habitat for some algae, benthic invertebrates, and reef fishes. Based on this and other studies at the proposed project site, it is expected that coral recruitment to the new breakwater surfaces will be relatively high and that new coral colonies will ultimately establish and grow on the new structure at densities similar to current levels. The repaired breakwater, however, is not expected to duplicate the physical heterogeneity, interstitial complexity, and vertical relief of the existing coral-reef habitat within the bay or on the terrace and shelf outside of the bay.

FISH AND WILDLIFE SERVICE RECOMMENDATIONS

The Service shares jurisdiction with the NMFS over federally listed threatened green sea turtles and endangered hawksbill sea turtles. The Service has sole jurisdiction over these species when they are on shore, and the NMFS has sole jurisdiction over the species when they are in the water. Although these sea turtles do not nest at Kaumalapau Bay, they are known to occur in waters surrounding the site. The Service is concerned that measures to protect these species be included within the scope of the proposed project. Therefore, the Service recommends that any NMFS recommendations for the protection and conservation of sea turtles at Kaumalapau be made part of the project.

The natural, fringing coral-reef shelf projecting seaward of the base of the existing breakwater should be protected as much as possible from project-related impacts. No construction-related materials should be placed on this reef. Coral colonies currently living on this reef should also be protected from runoff contaminated by project-related activities.

Coral colonies currently living on the boulders, concrete, and debris on the existing rubble mound would be lost by breakwater construction. Transplantation of these existing corals out of the footprint of the proposed breakwater is not feasible. However, relocation of some of the coral-covered debris from the rubble mound prior to filling is possible, especially since removal of this debris would be required for stable placement of new construction materials. The harbor basin is deep enough to accept these items without causing navigation problems, and coral growth on these items should be promoted by the protection afforded by the new breakwater and the overall relatively light use of the harbor by vessels.

Finally, the Service recommends that the following measures to minimize the degradation of coastal water quality and impacts to fish and wildlife resources and habitats be incorporated into the project:

a. No construction materials (other than basalt boulders currently displaced from the existing breakwater) should be stockpiled in the marine environment;

b. Underlayer fills for the repaired breakwater should be protected from erosion with core-loc units as soon after placement as practicable;

c. All construction-related materials should be placed on upland and properly contained to avoid or minimize disturbance to the natural reef;

d. All construction-related materials should be free of pollutants;

e. No contamination (trash or debris disposal etc) of the marine environment should result from construction activities;

f. A contingency plan to control accidental spills of petroleum products at the construction site should be developed. Absorbent pads and containment booms should be stored on-site to facilitate the clean-up of petroleum spills;

g. Turbidity and siltation from boulder/debris removal/redistribution and placement of fills should be minimized and confined to the immediate vicinity of the activity through the use of effective silt containment devices and the curtailment of these activities during adverse sea conditions;

h. No debris extracted from harbor sediments should be stockpiled in the marine environment; and

i. All debris removed from the harbor should be disposed of at an approved upland disposal site.

SUMMARY AND FISH AND WILDLIFE SERVICE POSITION

The coral colonies within Kaumalapau Bay and on the natural, fringing coral-reef shelf projecting seaward of the base of the existing breakwater have been identified as the habitats of major concern for the proposed project because of their value to reef-fish resources. Coral-reef habitats are relatively scarce on a national basis, and because they are currently subjected to relatively frequent adverse impacts in the main Hawaiian Islands, the extent of healthy and productive coral reefs on a local basis may be declining. Coral reefs have been designated as Special Aquatic Sites [40 CFR Part 230 §230.44 / FR v.45 n.249] and given special status as a Federal Trust Resource [E.O. 13089]. Such sites possess special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values and contribute to the general overall environmental health or vitality of an entire ecosystem of a region. The Service has recommended that limited relocation of coral-covered debris from the footprint of the proposed breakwater be conducted to the extent practicable. The disturbed marine benthic habitat within the harbor basin is considered to be important but of lesser value, and anticipated project-related losses of this habitat are minimal.

Although federally listed, threatened and endangered sea turtles are known to exist in waters surrounding Lanai, the Service does not expect losses of sea turtle nesting habitat to occur as a result of the proposed project. The maintenance of good water quality within the harbor is of great importance since cumulative adverse impacts to water quality could lead to the degradation of coral-reef biota and habitats at Kaumalapau Bay. Implementation of measures to control sedimentation from boulder/debris removal/redistribution and from stone and core-loc unit placement would minimize water quality degradation and subsequent adverse effects on coral-reef habitats. The Service has recommended that several conservation measures to minimize the degradation of coastal water quality and impacts to fish and wildlife resources and habitats be incorporated into the project design.

The Service believes that the proposed project cannot be avoided because of the need for the island of Lanai to have an adequately protected commercial harbor upon which all of the island's residents and visitors depend either directly or indirectly. Implementation of the proposed project at an alternative site is not possible since the project is meant to solve a specific problem at Kaumalapau Harbor. From a resource conservation perspective, the selection of Alternative 5 (*i.e.*, the final design for the Recommended Plan of Improvement) would result in the least amount of anticipated adverse impacts to fish and wildlife. The Service supports implementation of this plan provided the recommendations included in this report are incorporated into and made part of the project.

REFERENCES CITED

Balder, A. 1992. *Marine Atlas of the Hawaiian Islands.* University of Hawaii Press Honolulu. 120 pp.

Coleman, N. 1991. *Encyclopedia of Marine Animals.* Harper Collins Publishers, New York. 324 pp.

Crosby, M., S. Drake, C. Eakin, N. Fanning, A. Patterson, P. Taylor, and J. Wilson. 1995. *The United States Coral Reef Initiative: an overview of the first steps.* Coral Reefs (1995) 14: 1-3.

University of Hawaii. 1983. *Atlas of Hawaii (2nd ed.).* University of Hawaii Press, Honolulu. 238 pp.

U.S. Army Corps of Engineers. 2000. *Draft Environmental Assessment for Kaumalapau Harbor Breakwater Repair, Island of Lanai, Hawaii.* Pacific Ocean Division, Fort Shafter, Hawaii. 36 pp + Appendices.

U.S. Army Corps of Engineers. 1993. *Kaumalapau Harbor Navigation Improvements, Island of Lanai, Hawaii: Reconnaissance Report.* Pacific Ocean Division, Fort Shafter, Hawaii. 29 pp + Appendices.

U.S. Coral Reef Task Force. 2000. *The National Action Plan to Conserve Coral Reefs.* U.S. Coral Reef Task Force, Washington DC. 34 pp + Appendices.

U.S. Fish and Wildlife Service. 1981. *U.S. Fish and Wildlife Service Mitigation Policy.* Federal Register (46) 15: 7644-7663.

U.S. Fish and Wildlife Service. 1995. *Draft Fish and Wildlife Coordination Act Report, Kaumalapau Harbor Navigation Improvements, Lanai, Hawaii.* U.S. Fish and Wildlife Service, Pacific Islands Ecoregion, Honolulu, Hawaii. 33 pp.

Wagner, W., D. Herbst, and S. Sohmer. 1990. *Manual of the Flowering Plants of Hawaii.* University of Hawaii Press and Bishop Museum Press, Honolulu. 1853 pp.

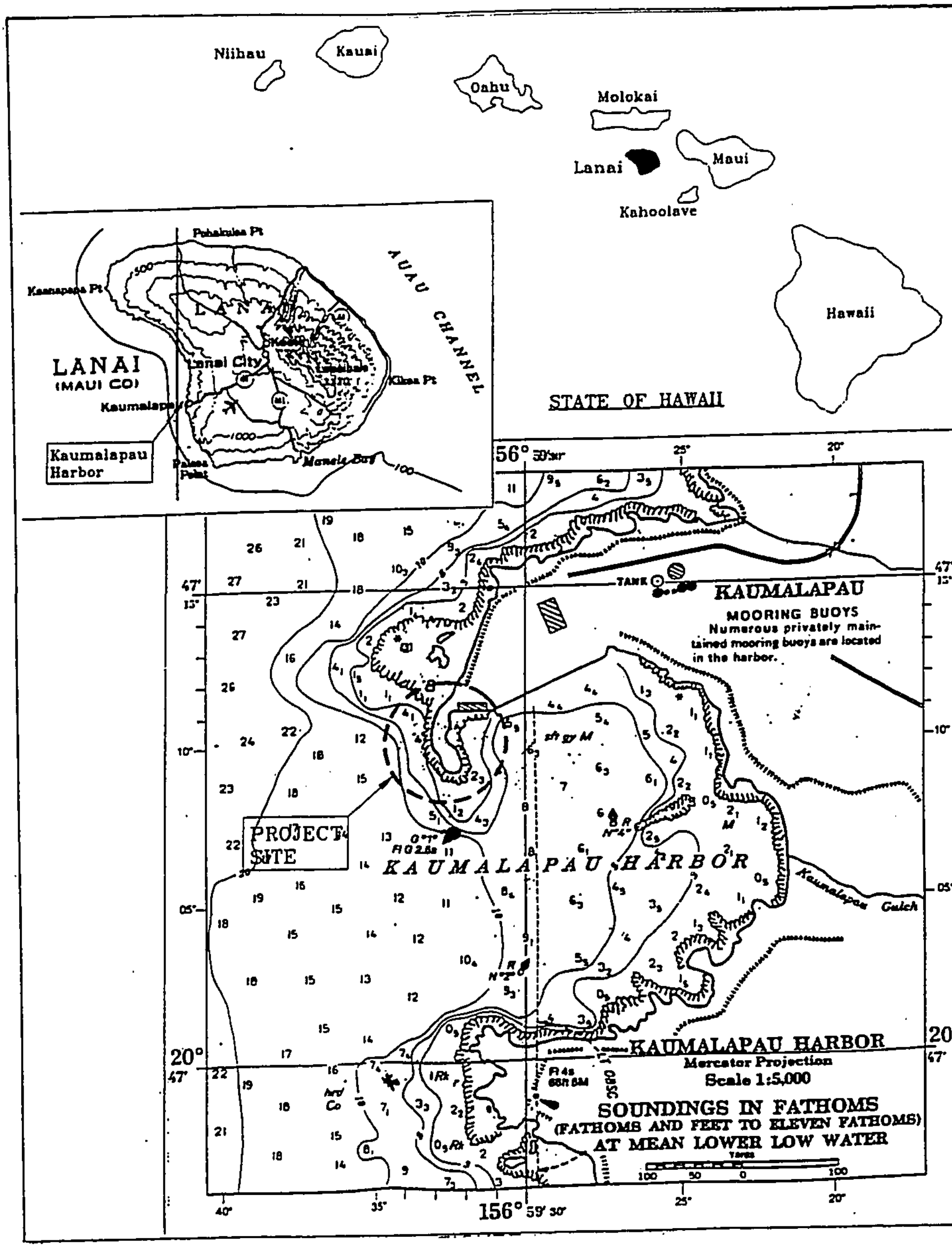

Figure 1. The proposed project site at Kaumalapau Harbor on the island of Lanai, Hawaii. (Source: Corps 2000)

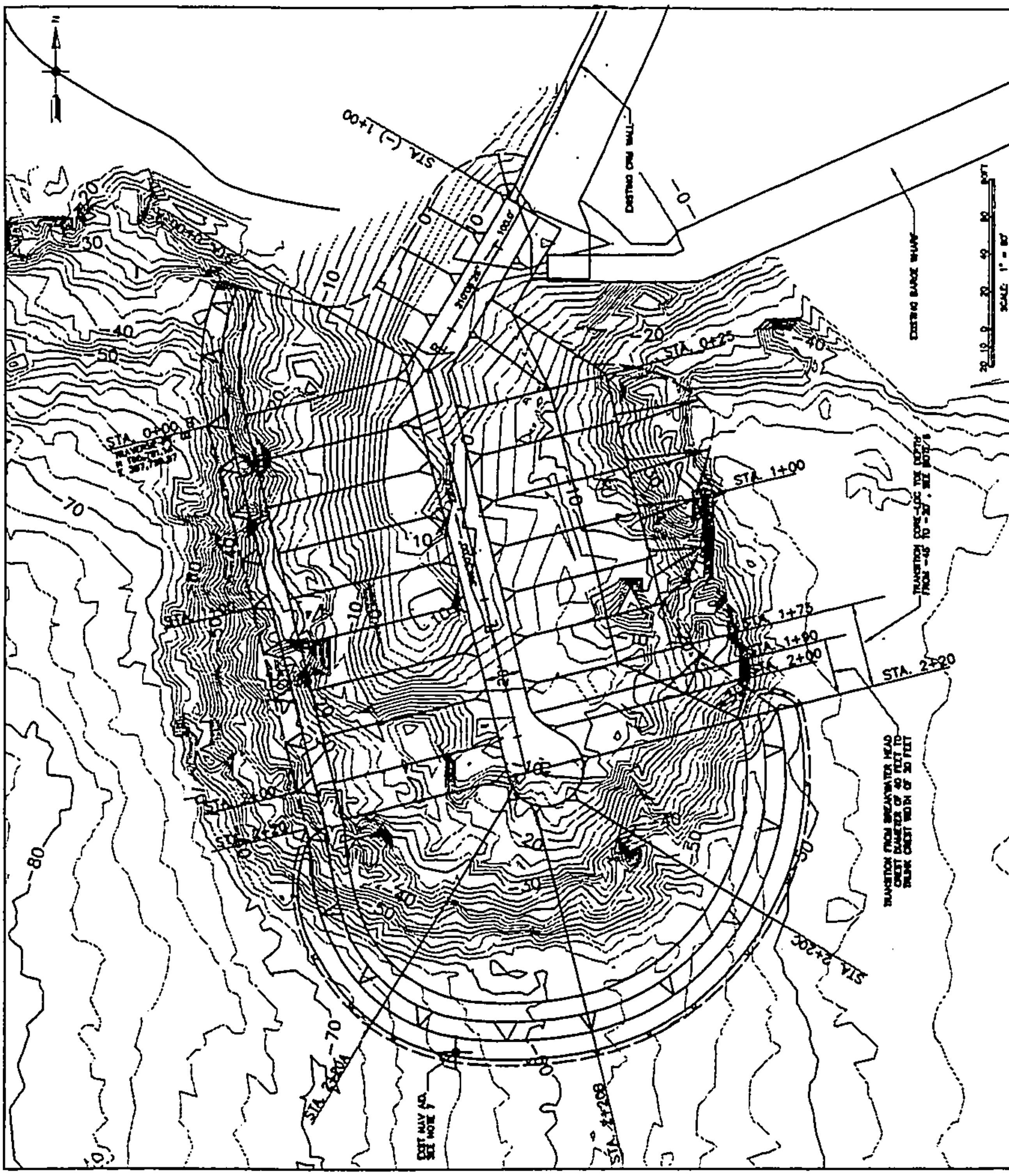

Figure 2. Recommended Plan of Improvement (final Alternative 5) for breakwater repair at Kaumalapau Harbor, Lanai, Hawaii (Source: Corps 2000)

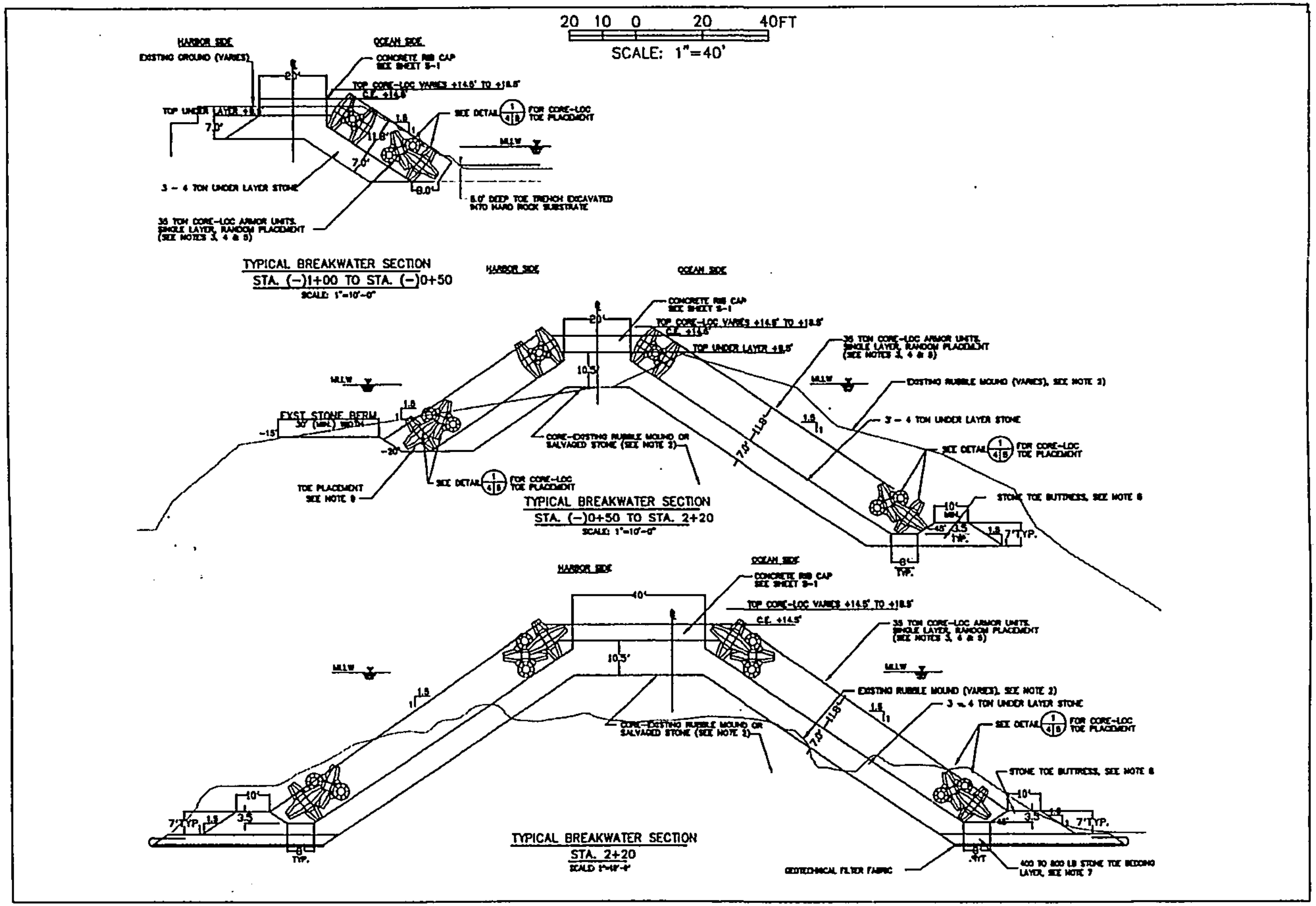

Figure 3. Typical breakwater cross sections for the Recommended Plan of Improvement at Kaumalapau Harbor, Lanai, Hawaii (Source: Corps 2000)

Table 1. Coral-reef fishes observed at Kaumalapau Harbor, Lanai, Hawaii, during October 24-25, 1994.

FAMILY *Species*
MURAENIDAE (Moray Eels)
Gymnothorax meleagris
CLUPEIDAE (Herrings, Sardines)
Spratelloides delicatulus
SYNODONTIDAE (Lizardfishes)
Synodus variegatus
HEMIRAMPHIDAE (Halfbeaks)
Hyporhamphus acutus pacificus
AULOSTOMIDAE (Trumpetfishes)
Aulostomus chinensis
CARANGIDAE (Jacks, Trevallies)
Caranx melampygus
LUTJANIDAE (Snappers)
Aphareus furca
Lutjanus fulvus
L. kasmira
Monotaxis grandoculis
CAESIONIDAE (Fusiliers)
Caesio caerulaurea
MULLIDAE (Goatfishes)
Mulloides vanicolensis
Parupenus bifasciatus
P. multifasciatus
KYPHOSIDAE (Rudderfishes)
Kyphosus bigibbus

Table 1. (Continued)

FAMILY *Species*
CHAETODONTIDAE (Butterflyfishes)
Chaetodon auriga
C. fremblii
C. kleinii
C. lunula
C. miliaris
C. multicinctus
C. ornatissimus
C. quadrimaculatus
C. reticulatus
C. trifasciatus
C. unimaculatus
Forcipiger favissimus
F. longirostris
POMACANTHIDAE (Angelfishes)
Centropyge loriculus
POMACENTRIDAE (Damselfishes)
Chromis agilis
C. margaritifer
C. vanderbilti
P. johnstonianus
Pomacentrus vaiuli
Stegastes fasciolatus
CIRRHITIDAE (Hawkfishes)
Paracirrhites arcatus
LABRIDAE (Wrasses)
Bodianus bilunulatus
Coris gaimard
Gomphosus varius
Halichoeres marginatus
Pseudojuloides cerasinus
Thalassoma duperrey
SCARIDAE (Parrotfishes)
Scarus dubius
S. psittacus
S. sordidus

Table 1. (Continued)

FAMILY *Species*
BLENNIIDAE (Blennies)
Plagiotremus ewaensis
ACANTHURIDAE (Surgeonfishes)
Acanthurus achilles
A. blochii
A. guttatus
A. nigrofuscus
A. olivaceus
A. triostegus
Ctenochaetus hawaiiensis
C. strigosus
Hemitaurichthys polylepis
Naso brevirostris
N. lituratus
N. unicornis
Zebrasoma flavescens
ZANCLIDAE (Moorish Idols)
Zanclus cornutus
BALISTIDAE (Triggerfishes)
Rhinecanthus rectangulus
Sufflamen bursa
MONACANTHIDAE (Filefishes)
Cantherhines sandwichiensis
Melichthys niger
OSTRACIONTIDAE (Boxfishes)
Ostracion meleagris
TETRAODONTIDAE (Smooth Puffers)
Arothron meleagris
Canthigaster amboinensis
C. jactator

TOTAL NUMBER OF SPECIES OBSERVED: 59

Table 2. Reef corals observed at Kaumalapau Harbor, Lanai, Hawaii, during October 24-25, 1994.

FAMILY *Species*
ANTIPATHIDAE
Cirrhipathes anguina
PORITIDAE
Porites compressa
P. lobata
P. rus
POCILLOPORIDAE
Pocillopora damicornis
P. eudouxi
P. meandrina
ACROPORIDAE
Montipora flabellata
M. verrucosa

TOTAL NUMBER OF SPECIES OBSERVED: 9

Table 3. Marine molluscs observed at Kaumalapau Harbor, Lanai, Hawaii, during October 24-25, 1994.

FAMILY *Species*
PATELLIDAE (Limpets)
Cellana sandwicensis
TROCHIDAE (Top shells)
Trochus intextus
TURBINIDAE (Turbans)
Turbo sandwicensis
NERITIDAE (Nerites)
Nerita picea
VERMETIDAE (Vermetids)
Dendropoma gregaria
Vermetus alii
PLANAXIDAE (Cluster winks)
Planaxis labiosa
HIPPONICIDAE (Hipponicids)
Hipponix imbrcatus
CYPRAEIDAE (Cowries)
Cypraea caputserpentis
C. isabella
C. maculifera
C. moneta
NATICIDAE (Moon snails)
Polinices melanostomus
CYMATIIDAE (Trumpets)
Cymatium intermedius
THAIDIDAE (Thaidids)
Drupa ricina
Morula granulata
MITRIDAE (Miters)
Mitra fastigium
COSTELLARIIDAE (Costellarids)
Vexillum lautum

Table 3. (Continued)

FAMILY *Species*
CONIDAE (Cones)
Conus flavidus
C. lividus
C. pennaceus
PTERIIDAE (Pearl Oysters)
Pinctada margaritifera
ISOGNOMONIDAE (Toothed Pearl Shells)
Isognomon incisum
OSTREIDAE (True Oysters)
Ostrea sandvicensis
TELLINIDAE (Tellens)
Macoma dispar

TOTAL NUMBER OF SPECIES OBSERVED: 25

Table 4. Marine coelenterates, crustaceans, and echinoderms observed at Kaumalapau Harbor, Lanai, Hawaii, during October 24-25, 1994.

PHYLUM
FAMILY
Species

COELENTERATA

CARYBDEIDAE (Cuboid Medusae)
Carybdea alata

ZOANTHIDAE (Zoanthids)
Zoanthus pacificus

CRUSTACEA

PALINURIDAE (Spiny Lobsters)
Panulirus pennicilatus

GRAPSIDAE (Rock Crabs)
Grapsus grapsus tenuicrustatus

ECHINODERMATA

OPHIDIASTERIDAE (Sea Stars)
Linckia multifora

DIADEMATIDAE (Sea Urchins)
Diadema paucispinum
Echinothrix calamaris
E. diadema

TOXOPNEUSTIDAE (Collector Urchins)
Pseudoboletia indiana

ECHINOMETRIDAE (Sea Urchins)
Colobocentrotus atrata
Echinometra mathaei
Heterocentrotus mammillatus

HOLOTHURIDAE (Sea Cucumbers)
Holothuria atra

TOTAL NUMBER OF SPECIES OBSERVED: 13

APPENDIX D. COORDINATION LETTERS

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

REPLY TO ATTENTION OF

October 18, 2000

Civil and Public Works Branch

Mr. Robert P. Smith
Pacific Islands Manager
U.S. Fish and Wildlife Service
300 Ala Moana Boulevard, Room 3-122
Box 50088
Honolulu, Hawaii 96850

Subject: Fish and Wildlife Coordination Act Report for Kaumalapau Harbor Breakwater Repair, Island of Lanai, Hawaii

Dear Mr. Smith:

The environmental assessment (EA) for the repair of breakwater at Kaumalapau Harbor is currently being finalized. This work was authorized by the Energy and Water Development Appropriations Acts of 1993 and 1994.

Kaumalapau Harbor is a small barge harbor located in a natural embayment on the southwest coast of Lana'i. The harbor has no distinct entrance channel and has a 600-foot wide opening at the mouth of the bay. A breakwater extending to the south from the northwestern point of the embayment protects the harbor and wharf facilities. The breakwater was originally constructed to a length of 400 feet, but has been reduced by wave damage to a current length of approximately 200 to 250 feet. The remnants of the breakwater crest elevation are about 10 feet above mean lower low water. The badly deteriorated breakwater allows increased wave energy to enter the harbor, thereby hindering safe berthing and cargo handling operations.

The purpose of the proposed action is to repair the existing breakwater at Kaumalapau Harbor to reduce wave actions in the harbor and increase harbor safety and usability. Repair alternatives were evaluated using numerical and physical modeling techniques. Initial plans called for a dogleg

extension of the existing breakwater: the first 350 feet of the existing breakwater would be re-built along the current alignment and the next 50 feet would be angled 30 degrees toward the inside of the harbor. The ongoing design study has recommended eliminating the dogleg and shifting the proposed alignment of the breakwater shoreward to center it above the existing rubblemound structure, thereby minimizing impacts on the surrounding seafloor. In the present design, the new breakwater will extend approximately 50 feet further across the mouth of the harbor than the existing structure (total crest length of 320 feet), and will occupy an additional 15,000 square feet of native sandy seafloor.

In 1995, the Fish and Wildlife Service prepared the Draft Fish and Wildlife Coordination Act Report, Kaumalapau Harbor Navigation Improvements, Lanai, Hawaii. This report concluded that losses of sea turtle nesting habitat are not expected to occur as a result of the project, and further, supported the repair plan being considered. Since that time, as discussed above, the design has been slightly modified to further reduce impacts to the seafloor. The U.S. Fish and Wildlife Service (Mr. Michael Molina) and National Marine Fisheries Service (Mr. John Naughton) conducted an additional site survey in January 1999. We would like to request that the Fish and Wildlife Coordination Act Report for this project be finalized, with any revisions you deem necessary based on the slightly revised project plan and your recent site survey.

If you have any questions, please contact Mr. James Hatashima of my Civil and Public Works Branch staff at 438-2264. Your timely action on this request will be greatly appreciated.

Sincerely,

Ray H. Jyo, P.E.
Deputy District Engineer for
Programs and Project Management

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

REPLY TO ATTENTION OF

October 18, 2000

Civil and Public Works Branch

Mr. Paul Henson
Field Supervisor
U.S. Fish and Wildlife Service
300 Ala Moana Boulevard, Room 3-122
Box 50088
Honolulu, Hawaii 96850

Subject: Endangered Species Act, Section 7 Coordination for Kaumalapau Harbor Breakwater Repair, Island of Lanai, Hawaii

Dear Mr. Henson:

The environmental assessment (EA) for the repair of breakwater at Kaumalapau Harbor is currently being finalized. This work was authorized by the Energy and Water Development Appropriations Acts of 1993 and 1994.

Kaumalapau Harbor is a small barge harbor located in a natural embayment on the southwest coast of Lana'i. The harbor has no distinct entrance channel and has a 600-foot wide opening at the mouth of the bay. A breakwater extending to the south from the northwestern point of the embayment protects the harbor and wharf facilities. The breakwater was originally constructed to a length of 400 feet, but has been reduced by wave damage to a current length of approximately 200 to 250 feet. The remnants of the breakwater crest elevation are about 10 feet above mean lower low water. The badly deteriorated breakwater allows increased wave energy to enter the harbor, thereby hindering safe berthing and cargo handling operations.

The purpose of the proposed action is to repair the existing breakwater at Kaumalapau Harbor to reduce wave actions in the harbor and increase harbor safety and usability. Repair alternatives were evaluated using numerical and physical modeling techniques. Initial plans called for a dogleg extension of the existing breakwater: the first 350 feet of the existing breakwater would be re-built along the current alignment and the next 50 feet would be angled 30 degrees toward the inside of the harbor. The ongoing design study has recommended eliminating the dogleg and shifting the proposed alignment of the breakwater shoreward to center it above the existing rubblemound structure, thereby minimizing impacts on the surrounding seafloor. In the present design, the new breakwater will extend approximately 50 feet further across the mouth of the harbor than the existing structure (total crest length of 320 feet), and will occupy an additional 15,000 square feet of native sandy seafloor.

Our consultant, Dr. Steven Dollar, has conducted the water quality and marine flora and fauna investigations for preparation of the Environmental Assessment (EA) for this project. Four species of marine animals that occur in Hawaiian waters have been declared threatened or endangered by Federal jurisdiction. The threatened green sea turtle (*Chelonia mydas*) occurs commonly throughout the island chain, and is known to feed on selected species of macroalgae. The endangered hawksbill turtle (*Eretmochelys imbricata*) also occurs, but is considered rare in comparison to the green turtle. While turtles are known to exist in the waters surrounding Kaumalapau Harbor, no turtle nesting habitat occurs within Kaumalapau Bay. The preferred types of resting habitat and food resources for these species were not observed during the site investigations (e.g. lack of filamentous algae). No turtles themselves were observed during the fieldwork conducted for preparation of the EA.

Populations of the endangered humpback whale (*Megaptera novaeangliae*) are known to winter in the Hawaiian Islands, however the nearshore location and shallow water of the project site effectively precludes whales frequenting the site. Hawaiian monk seals (*Monachus schauinslandi*) also occur occasionally in waters off the high islands. The predominantly sea cliff shoreline, and lack of sand beaches in the area, indicates that the project site would not be suitable for seals to beach themselves to rest. No whales or monk seals were observed during the field investigations.

In 1995, the Fish and Wildlife Service prepared the Draft Fish and Wildlife Coordination Act Report, Kaumalapau Harbor Navigation Improvements, Lanai, Hawaii. This report concluded that losses of sea turtle nesting habitat are not expected to occur as a result of the project, and further, supported the repair plan being considered. Since that time, as discussed above, the design has been slightly modified to further reduce impacts to the seafloor. The revised project was discussed at an EA scoping meeting in December 1998, attended by Mr. Michael Molina of your office. The U.S. Fish and Wildlife Service (Mr. Michael Molina) and the National Marine Fisheries Service (Mr. John Naughton) also conducted additional project site investigations in January 1999.

Based on these findings, we believe that the proposed project will not impact endangered species, and that formal consultation with your office, under Section 7 of the Endangered Species Act, is not required. We request your timely review and concurrence with our determination.

Should you have any questions regarding this matter, please contact Mr. James Hatashima of my staff at 438-2264. Thank you for your assistance with this project.

Sincerely,

Ray H. Jyo, P.E.
Deputy District Engineer for
Programs and Project Management

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

REPLY TO ATTENTION OF

October 18, 2000

Civil and Public Works Branch

Dr. Charles Karnella
Administrator, Pacific Islands Area Office
National Marine Fisheries Service
1601 Kapiolani Boulevard, Suite 1110
Honolulu, Hawaii 96814-0047

Subject: Endangered Species Act Section 7 Coordination and Magnuson-Stevens Fishery Conservation and Management Act Consultation for Kaumalapau Harbor Breakwater Repair, Lanai, Hawaii

Dear Dr. Karnella:

The environmental assessment (EA) for the repair of breakwater at Kaumalapau Harbor is currently being finalized. This work was authorized by the Energy and Water Development Appropriations Acts of 1993 and 1994.

Kaumalapau Harbor is a small barge harbor located in a natural embayment on the southwest coast of Lana`i. The harbor has no distinct entrance channel and has a 600-foot wide opening at the mouth of the bay. A breakwater extending to the south from the northwestern point of the embayment protects the harbor and wharf facilities. The breakwater was originally constructed to a length of 400 feet, but has been reduced by wave damage to a current length of approximately 200 to 250 feet. The remnants of the breakwater crest elevation are about 10 feet above mean lower low water. The badly deteriorated breakwater allows increased wave energy to enter the harbor, thereby hindering safe berthing and cargo handling operations.

The purpose of the proposed action is to repair the existing breakwater at Kaumalapau Harbor to reduce wave actions in the harbor and increase harbor safety and usability. Repair alternatives were evaluated using numerical and physical modeling techniques. Initial plans called for a dogleg extension of the existing breakwater: the first 350 feet of the

existing breakwater would be re-built along the current alignment and the next 50 feet would be angled 30 degrees toward the inside of the harbor. The ongoing design study has recommended eliminating the dogleg and shifting the proposed alignment of the breakwater shoreward to center it above the existing rubblemound structure, thereby minimizing impacts on the surrounding seafloor. In the present design, the new breakwater will extend approximately 50 feet further across the mouth of the harbor than the existing structure (total crest length of 320 feet), and will occupy an additional 15,000 square feet of native sandy seafloor.

Our consultant, Dr. Steven Dollar, has conducted water quality and marine flora and fauna investigations for preparation of the Environmental Assessment (EA) for this project. Four species of marine animals that occur in Hawaiian waters have been declared threatened or endangered by Federal jurisdiction. The threatened green sea turtle (*Chelonia mydas*) occurs commonly throughout the island chain, and is known to feed on selected species of macroalgae. The endangered hawksbill turtle (*Eretmochelys imbricata*) also occurs, but is considered rare in comparison to the green turtle. While turtles are known to exist in the waters surrounding Kaumalapau Harbor, no turtle nesting habitat occurs within Kaumalapau Bay. The preferred types of resting habitat and food resources for these species were not observed during the site investigations (e.g. lack of filamentous algae). No turtles themselves were observed during the fieldwork conducted for preparation of the EA.

Populations of the endangered humpback whale (*Megaptera novaeangliae*) are known to winter in the Hawaiian Islands, however the nearshore location and shallow water of the project site effectively precludes whales frequenting the site. Hawaiian monk seals (*Monachus schauinslandi*) also occur occasionally in waters off the high islands. The predominantly sea cliff shoreline, and lack of sand beaches in the area, indicate that the project site is not suitable for seals to beach themselves to rest. No whales or monk seals were observed during the field investigations.

In 1995, the Fish and Wildlife Service prepared the Draft Fish and Wildlife Coordination Act Report, Kaumalapau Harbor Navigation Improvements, Lanai, Hawaii. This report concluded that losses of sea turtle nesting habitat are not expected to occur as a result of the project, and further, supported the repair plan being considered. Since that time, as discussed above, the design has been slightly modified to further reduce impacts to the seafloor. Mr. John Naughton of the National Marine Fisheries Service, along with Mr. Michael Molina of the U.S. Fish and Wildlife Service, conducted a project site investigation in January 1999.

Based on these findings, we believe that the proposed project will not impact endangered species, and that formal consultation with your office, under Section 7 of the Endangered Species Act, is not required. It is also our belief that the proposed project does not affect an identified Essential Fish Habitat, and therefore formal consultation under the Magnuson-Stevens Fishery Conservation and Management Act is also not required. We request your timely review and concurrence with our determination.

Should you have any questions regarding this matter, please contact Mr. James Hatashima of my staff at 438-2264. Thank you for your assistance with this project.

Sincerely,

Ray H. Jyo, P.E.
Deputy District Engineer for
Programs and Project Management

April 25, 2000

Civil Works and Support for Others Branch

CEPOH-PP-C

Mr. Timothy Johns
State Historical Preservation Officer
Department of Land and Natural Resources
601 Kamokila Boulevard, Room 555
Kapolei, Hawaii 96707

Dear Mr. Johns:

The U.S. Army Corps of Engineers, Honolulu Engineer District, is assessing the potential impacts of proposed navigation improvements at the existing Kaumalapau Harbor on the island of Lanai. The proposed improvements consist of reshaping and rebuilding the existing breakwater from 250 to 300 feet in length (Enclosure). A draft Environmental Assessment (dEA) and draft Finding of No Significant Impact (dFONSI) are being prepared by the Corps consultant and will be submitted for your review under separate cover. The two existing surface historic properties which are likely to be eligible for listing in the National Register of Historic Places have been identified. The Kalulu Shrine (Site No. 50-xx-xx-xxxx) and Kalamanui Complex (Site No. 50-xx-xx-xxxx) are located adjacent to and southwest of the proposed improvements and will not be impacted by the proposed project.

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We request your comments and concurrence in determining that pursuant to 36 CFR Sections 800.4 and 800.5 of the regulations of the President's Advisory Council on Historic Preservation, this proposed undertaking for navigation improvements at Kaumalapau Harbor will have no effect on any identified or potential historic properties.

Thank you for your timely response on this matter. If you have any further questions or comments, please contact Mr. James Hatashima at 438-2264 or Ms. Helen Stupplebeen at 438-8526.

Sincerely,

Ray H. Jyo, P.E.
Deputy District Engineer for
Programs and Project Management

Enclosure

APR 27 2000

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Ecoregion
300 Ala Moana Boulevard, Room 3122
Box 50088
Honolulu, Hawaii 96850

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In Reply Refer To: ER-01-111

Lt. Colonel Ronald N. Light
Honolulu District Engineer
U.S. Army Corps of Engineers
Building 230
Fort Shafter, HI 96858-5440

Re: Final Fish and Wildlife Coordination Act Report on Navigation Improvements at Kaumalapau Harbor, Lanai, Hawaii

Dear Lieutenant Colonel Light:

The U.S. Fish and Wildlife Service (Service) has prepared a Final Fish and Wildlife Coordination Act (FWCA) Report on Navigation Improvements at Kaumalapau Harbor, Lanai, Hawaii. This report is provided in accordance with the requirements of section 2(b) of the FWCA of 1934 [16 USC 661 *et seq*; 48 Stat. 401], as amended. The purpose of the report is to document the existing fish and wildlife resources at the proposed project site and to insure that fish and wildlife conservation receives equal consideration with other proposed project objectives as required under the FWCA. The report includes an assessment of the significant fish and wildlife resources at the proposed project site, an evaluation of potential impacts associated with the proposed project design alternatives, and recommendations for fish and wildlife mitigation measures.

The Service appreciates the opportunity to coordinate with the U.S. Army Corps of Engineers on the proposed project. If you have any questions regarding the report, please contact my Environmental Review Coordinator, Michael Molina, by telephone at (808) 541-3441.

Sincerely,

Paul Henson
Field Supervisor
Ecological Services

cc: NMFS-PIAO, Honolulu
USEPA-Region IX, Honolulu
DAR, Honolulu, Wailuku, Kualapuu
CZMP, Honolulu
CWB, Honolulu

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Ecoregion
300 Ala Moana Boulevard, Room 3-122
Box 50088
Honolulu, Hawaii 96850

04 DEC 2000
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DHED
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In reply refer to: KBF

DEC 1 2000

Lt. Colonel Ronald N. Light
Honolulu District Engineer
U.S. Army Corps of Engineers
Building 230
Fort Shafter, Hawaii 96858

Re: Informal Section 7 Concurrence Request for Kaumalapau Harbor Breakwater Repair, Island of Lanai, Hawaii

Dear Lieutenant Colonel Light:

The U.S. Fish and Wildlife Service (Service) has received your letter dated October 18, 2000 requesting informal consultation under section 7 of the U.S. Endangered Species Act (Act) with regards to the above referenced action. The proposed project involves repairing the existing breakwater to reduce wave energy in the harbor. Also, the project would extend the existing breakwater by about 50 feet, and displace about 15,000 square feet of benthic habitat, primarily sand.

We have reviewed the maps prepared by the Service's Wetland Inventory Program and other relevant material. Federally listed threatened and endangered species that occur at this location include two sea turtles, the green sea turtle (*Chelonia mydas*) and the hawksbill turtle (*Eretmochelys imbricata*). Although these sea turtles are known to occur in the marine environment, there is no evidence that they haul out or nest in the vicinity of the proposed project. We recommend that the NMFS be consulted regarding listed sea turtles, which is under their jurisdiction when they occur in the marine environment.

The Service concurs that the proposed action is not likely to adversely affect nesting or basking sea turtles. The requirements of section 7 have been satisfied. However, obligations under section 7 of the Act must be reconsidered, if (1) new information reveals impacts of this defined action that affect listed species or critical habitat in a manner that was not previously considered in this assessment; (2) this action is subsequently modified in a manner not previously considered in this assessment; or (3) a new species is listed or critical habitat determined that may be affected by this identified action.

The Service appreciates your concern for endangered and threatened species. If you have any questions regarding these comments, please contact Fish and Wildlife Biologist Kevin Foster by telephone at (808) 541-3441 or by facsimile transmission at (808) 541-3470.

Sincerely,

for Paul Henson
Field Supervisor

cc: NMFS-PAO, Honolulu
EPA-Region IX, Honolulu
DLNR, Hawaii
DAR, Hawaii
CZMP, Hawaii
CWB, Hawaii

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
Pacific Islands Area Office
1601 Kapiolani Boulevard, Suite 1110
Honolulu, Hawaii 96814-0047

James Hatashima
Department of the Army
US Army Engineer District, Honolulu
Ft. Shafter, HI 96856-5440

November 26, 2000

Re: Kaumalapau Harbor Breakwater Repair, Lanai, Hawaii

Please refer to Consultation No: I-PI-00-32:MMD

Dear Mr. Hatashima:

This responds to your request of October 18, 2000, for comment on the project to repair the Kaumalapau Harbor Breakwater on Lanai, Hawaii. We provide the following comments and information under our statutory authorities under the Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 *et seq.*, and the Marine Mammal Protection Act of 1972, as amended 16 U.S.C. 1361 *et seq.* (MMPA). For your information and consideration we are also providing you with a list of protected species that may be found in the waters of Lanai.

Threatened green turtles (*Chelonia mydas*), and endangered hawksbill turtles (*Eretmochelys imbricata*) occur in the nearshore waters around Lanai. Endangered humpback whales (*Megaptera novaeangliae*) may be found offshore during the winter season. Endangered Hawaiian monk seals (*Monachus schauinslandi*) are also found in the nearshore waters and beaches of Lanai.

Marine mammals protected under the Marine Mammal Protection Act of 1972, as amended, 16 U.S.C. 1361 *et seq.*(MMPA) (not endangered or threatened under the Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 *et seq.*), that are found in the waters off Lanai include:

Bryde's whale (*Balaenoptera edeni*)
Cuvier's beaked whale (*Ziphius cavirostris*)
Pygmy sperm whale (*Kogia breviceps*)
Melon-headed whale (*Peponocephala electra*)
Pygmy killer whale (*Feresa attenuata*)
False killer whale (*Pseudorca crassidens*)
Killer whale (*Orcinus orca*)
Short finned pilot whale (*Globicephala macrorhynchus*)
Spinner dolphins (*Stenella longirostris*)
Striped dolphin (*Stenella coeruleoalba*)
Pantropical spotted dolphin (*Stenella attenuata*)
Common dolphin (*Delphinus delphis*)
Risso's dolphin (*Grampus griseus*)

Based on the studies referenced in the EA, performed by NMFS (John Naughton) and the draft Fish and Wildlife Coordination Act Report on the Kaumalapau Harbor navigation improvements, there is no sea turtle nesting or resting habitat in Kaumalapau Bay. Green turtles (threatened) and hawksbill turtles (endangered) are known to be present in Kaumalapau Harbor. Therefore, Best Management Practices are advised to minimize turbidity, avoid disturbance of the reefs, and to avoid the release of pollutants into the water. Silt curtains, booms, and a contaminant plan should be utilized when appropriate. If during construction activities, a listed or protected species enters the project area, construction should cease until the animal leaves the area. Therefore, the NMFS concurs with the determination that the breakwater repair is unlikely to adversely affect endangered or protected species.

Should the project plans change or additional information become available, this determination may be reconsidered.

Should you have further questions regarding our comments for the proposed project and/or the section 7 process, please contact Margaret Dupree at (808) 973-2937 or fax (808) 973-2941

Sincerely,

Rebecca Lent, Ph.D.
Regional Administrator

cc: Leona Stevenson

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
Pacific Islands Area Office
1601 Kapiolani Boulevard, Suite 1110
Honolulu, Hawaii 96814-0047

December 8, 2000

Mr. Ray H. Jyo, P.E.
U.S. Army Corps of Engineers, Honolulu
Building 230
Fort Shafter, Hawaii 96858-5440

Dear Mr. Jyo:

The National Marine Fisheries Service (NMFS) has reviewed the draft Environmental Assessment for the *Kaumalapau Harbor Breakwater Repair* project on the Island of Lanai, Hawaii. The work is part of a U.S. Army Corps of Engineers (Corps) Civil Works project. The purpose of the project is to repair the existing breakwater to reduce wave actions in the harbor and increase harbor safety and usability. Initial plans were redesigned to avoid impacts to the surrounding seafloor and coral resources. The present design will extend the breakwater approximately 50 feet further across the mouth of the harbor than the existing structure (total crest length of 320 feet), and will occupy an additional 15,000 square feet of sandy seafloor. This letter is provided in accordance with the Fish and Wildlife Coordination Act (FWCA), and the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA). We offer the following comments on this project.

Results of a survey conducted in January 1999 in which NMFS participated indicated that coral coverage is high throughout the margin of the harbor, particularly on the outer shelf. The project was redesigned by shifting the proposed alignment of the breakwater shoreward (Alternative 5, preferred alternative) to reduce adverse impacts to the coral habitat on the outer shelf. To further reduce potential effects, we recommend that appropriate and effective silt containment devices be used to prevent turbidity and potential contaminants from impacting coral and other marine resources located both within the harbor and outside the harbor entrance. If silt containment devices are determined to be ineffective for a particular situation, then the plan should state what alternative best management practices (BMPs) are being considered. We also request a copy of the final BMP/monitoring plan when it becomes available. If resuspension is minimized, then it appears unlikely that the reconstruction of the breakwater will adversely impact NMFS trust resources.

The EA states that coral growing on the existing breakwater will be lost due to coverage with new rock and concrete. This loss should be offset by the additional surface area for future coral colonization provided by the new breakwater. However, the destruction of adjacent areas of live coral should be avoided during construction. If additional coral resources will be significantly impacted, a coral mitigation plan may be required.

Should you have any questions regarding these comments, please contact John Naughton at 973-2935, extension 211, or Alan Everson at 973-2935, extension 212.

Sincerely,

C. Kaunee

Rebecca Lent, Ph.D.
Regional Administrator

Copies Furnished:
Mr. James Slawson, Southwest Region, NMFS, 501 West Ocean Blvd., Suite 4200, Long Beach, CA 90802-4213
Western Pacific Fishery Management Council, 1164 Bishop Street, Suite 1400, Honolulu, HI 96813
U.S. Environmental Protection Agency, P.O. Box 5003, Honolulu, Hawaii 96850
U.S. Fish and Wildlife Service, Environmental Services, P.O. Box 50088, Honolulu, HI 96850
Clean Water Branch, Environmental Management Division, Hawaii State Department of Health, P.O. Box 3378, Honolulu, HI 96801-3386
Hawaii State Department of Business, Economic Development and Tourism, Office of Planning, Coastal Zone Management Program, P.O. Box 2359, Honolulu, HI 96804
State of Hawaii, Department of Land and Natural Resources, Division of Aquatic Resources, P.O. Box 621, Honolulu, HI 96809

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
HISTORIC PRESERVATION DIVISION
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, Hawaii 96707

GILBERT S. COLOMA-AGARAN, CHAIRPERSON
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HISTORIC PRESERVATION
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STATE PARKS

April 2, 2001

Mr. James Hatashima, P.E.
Department of the Army
U.S. Army Engineer District, Honolulu
Fort Shafter, Hawaii 96858-5440

LOG NO: 27195 ✓
DOC NO: 0103CD43

Dear Mr. Hatashima,

SUBJECT: **National Historic Preservation Act Section 106 Revised Review Pertaining to the Proposed Navigation Improvements at the Existing Kaumalapau Harbor**
Kalulu Ahupua'a, Lahaina District, Island of Lana'i
TMK: 4-9-02

These are our revised comments pertaining to the proposed Navigation Improvements at the existing Kaumalapau Harbor. Our review is based on reports, maps, and aerial photographs maintained at the State Historic Preservation Division. On February 9, 2001, Dr. Melissa Kirkendall, SHPD Maui/Lana'i Island Archaeologist, and SHPD student intern Catherine Cur conducted a field inspection of areas to be impacted by the proposed project. (These areas were indicated by crosshatching on an aerial photograph provided by Mr. James Hatashima, Army Corps of Engineers).

On March 28, 2001, a meeting was held at the State Historic Preservation Office to discuss the proposed undertaking. In attendance were Kanalei Shun, Archaeologist Army Corps of Engineering; James Hatashima, Army Corps of Engineers; Scott Sullivan, Sea Engineering; Carol Ogata, SHPD Historic Architect; and Cathleen Dagher, SHPD staff archaeologist.

As a result of the field inspection, it was determined that the mauka area, marked Lana'i Rock Quarry, was not in the immediate vicinity of the proposed undertaking and would not be impacted by the proposed undertaking. However, if construction activities or ground-altering activities are planned for this area in the future, we request the opportunity to review the plans, as portions of this area appear to be unaltered and may contain historic sites. The more makai area, labeled storage, has been thoroughly graded and previously utilized for storage (Janna Kahaleanu, local resident, personal communication to Dr. Kirkendall). However, this area is bordered by a gulch on the north side, which may contain historic sites, although debris has been pushed into the gulch during previous land-altering episodes.

Given the above information, we recommend that construction fencing be temporarily placed along the edge of the gulch, as a mitigation measure. As per the March 28, 2001 meeting, the Army Corps of Engineers will be responsible for the placement of ths temporary fencing and will verify in writing to this office that the fencing is in place prior to the commencement of t he proposed undertaking.

The Kaumalapau Harbor was built in 1926 and breakwater originally 425 feet long. The current breakwater is approximately 200 feet long. We believe that prior to the proposed reconstruction that the existing breakwater be photographically documented to Historic American Building Survey standards (4x5 Negatives and 8x10 prints archivally processed).

With the implementation the recommended mitigation measures, we believe there will be "no historic properties affected" by the proposed undertaking.

Thank you for the opportunity to comment. Should you have any questions please call Cathleen Dagher (archaeologist) at 692-8023 or Carol Ogata (architect) at 692-8032.

Aloha,

Gilbert Coloma-Agaran
State Historic Preservation Officer

CD:jen

APPENDIX E: SECTION 404 (b) (1) EVALUATION

Kaumālapa'u Harbor Breakwater Repair
Island of Lana'i, Hawai'i

Evaluation of the Effects of the
Discharge of Dredged or Fill Material into
Waters of the U.S.
Using the U.S. Environmental Protection Agency (EPA)
Section 404(b)(1) Guidelines

1. PROJECT DESCRIPTION

a. Location. The project site is located in a natural embayment on the southwest coast of the island of Lana'i, Hawai'i. The project location is shown on Figure 1 in the Draft Environmental Assessment (DEA).

b. General Description. Kaumālapa'u Harbor is a small barge harbor, with a wharf protected by a breakwater extending partially across the mouth of the embayment. The breakwater was reportedly about 400 feet long, but has been reduced by repeated wave damage to a current length of approximately 200 to 250 feet. The remnants of the breakwater crest extend about 10 feet above mean lower low water (mllw). The badly deteriorated breakwater allows increased wave energy to enter the harbor, thereby hindering safe berthing and cargo handling.

The proposed project will repair the existing Kaumālapa'u Harbor breakwater. The project plan consists of rebuilding the breakwater on top of the old structure, with an underlayer of 2.5 to 4.5 ton stone and an armor layer of 35-ton concrete Core-Loc armor units. The new breakwater will have a total crest length of 320 feet, and will extend approximately 50 feet further across the mouth of the embayment and cover an additional 15,000 square feet of native sand seafloor than the existing structure. The new breakwater will have a crest elevation and width of +14.5 feet mllw and 20 feet, respectively, and side slopes of 1V:1.5H. The project plan and typical sections are shown on Figures 2 and 3 in the DEA.

c. Authority and Purpose. The authority for engineering design and environmental assessment for the project is provided in the Energy and Water Development Appropriations Acts of 1993 and 1994. The purpose of the proposed action is to repair the existing breakwater to reduce wave action in the harbor and increase harbor safety and usability.

This evaluation is prepared under the authority of Section 404 and Section 401 of the Clean Water Act (33 U.S.C. 1341; 33 U.S.C. 1344); Sections 324D-4 and 342D-53, Hawai'i Revised Statutes (HRS).

d. General Description of Fill Material.

(1) General Material Characteristics:

Basalt stone ranging in size from 50 to 500 pounds (bedding stone) to 2.5 to 4.5 ton (core and underlayer stone), and 35-ton concrete Core-Loc armor units.

(2) Quantity of Material:

	Total Volume	Above MHHW	Below MHHW
Shaping of Existing Breakwater	34,810 cy	4,180 cy	30,630 cy
Concrete Armor Units (35-ton)	13,590 cy	4,480 cy	9,110 cy
2.5 to 4.5-ton Stone	25,440 cy	3,050 cy	22,390 cy
500 to-5,000-lb. Stone	930 cy	0	930 cy
50 to 500-lb. Stone	3,040 cy	0	3,040 cy
Concrete Crest Cap	2,060 cy	2,060 cy	0
Tremie Concrete	100 cy	0	100 cy
Geotextile Filter Fabric	3,780 sy	0	3,780 sy

(3) Source of Material

Stone would come from existing quarries or stockpiles on O'ahu, Maui or Lāna'i. Concrete armor units would be fabricated on O'ahu, Maui or Lāna'i.

e. Description of the Proposed Discharge Site

(1) Location: Southwest coast of the island of Lāna'i, see Figure 1 in the DEA.

(2) Size: 3.5 acres

(3) Type of Site: Unconfined coastal water

(4) Type of Habitat: Rocks, boulders, and concrete rubble comprising the existing rubblemound structure, and native sand bottom at the toe of the structure.

(5) Timing and Duration of Discharge: In-water work 18 months

f. Description of Discharge Method

Material will be moved and placed by floating crane barge and a breakwater mounted crane. Bedding stone will be placed by clamshell bucket, larger underlayer stone and the concrete armor units will be individually placed. There will be no random dumping of material.

2. FACTUAL DETERMINATION

a. Physical Substrate Determination

(1) Substrate Elevation and Slope: The existing rubblemound breakwater extends from the water surface to the native bottom at an elevation of –40 feet to –70 feet. The existing slope is highly irregular, but averages about 1V on 2H.

(2) Sediment Type: The existing rubblemound breakwater is composed of rock, boulders, concrete rubble, and other materials (e.g. concrete filled vehicles). The native bottom is coral sand and gravel.

(3) Dredged/Fill Material Movement: The existing breakwater material will be moved and shaped to form the core of the new structure. All existing material will remain in the water in the immediate vicinity of the breakwater.

(4) Physical Effects on Benthos: The existing rubblemound breakwater has significant coral coverage (up to 50% of the surface area in some locations), primarily of the genera *Porites, Pocillopora and Montipora*. The native sand bottom at the toe of the structure exhibits burrows of worms and/or shrimp. The proposed project will involve coverage of the existing structure with new rock and concrete, resulting in the loss of much of the existing coral cover. However, the new breakwater will be constructed of materials similar to the existing structure, and corals are expected to rapidly colonize the new structure in a manner similar to the existing conditions. The new breakwater will extend about 50 feet further than the existing structure, and will occupy approximately 15,000 square feet of sandy seafloor, with the commensurate loss of habitat for bottom dwelling organisms. The loss of sandy seafloor habitat will be mitigated by the creation of additional hard substrate for coral colonization.

(5) Other Effects: None

(6) Actions Taken to Minimize Impacts: Best Management Practices (BMPs) for construction operations will include methods that minimize the addition of suspended sediment to the water column, and avoid disturbance of the natural reefs adjacent to the project site. Silt curtains and containment booms will be utilized where appropriate. No fine material will be placed into the water.

b. Water Circulation, Fluctuation and Salinity Determination

(1) Effects on Water:

(a) Salinity	No Effect
(b) Chemistry	No Effect
(c) Clarity	Temporary turbidity during construction, no long term impact
(d) Color	No Effect

(e) Odor — No Effect
(f) Taste — No Effect
(g) Dissolved Gas Levels — No Effect
(h) Nutrients — No Effect

(2) Current Patterns and Circulation:

(a) Current Patterns and Flow: The proposed project will not significantly alter the existing circulation and flushing of the harbor and embayment.
(b) Velocity — No effect
(c) Stratification — No Effect
(d) Hydrologic Regime — No Effect

(3) Normal Water Level Fluctuations — No Effect

(4) Salinity Gradients — No Effect

(5) Action That Will Be Taken to Minimize Impacts: Water quality will be monitored during construction.

<u>c. Suspended Particulate/Turbidity Determinations</u>

(1) Expected Changes in Suspended Particulate and Turbidity Levels in the Vicinity of the Fill Site:

Temporary and localized increases in turbidity will likely occur during construction. The good water circulation, currents and flushing characteristic of the project site will be maintained during construction, and will rapidly mix and disperse turbid water.

(2) Effects on Chemical and Physical Properties of the Water Column:

(a) Light Penetration – Temporary localized reduction due to increased turbidity during construction.
(b) Dissolved Oxygen — No Effect
(c) Toxic Metals and Organics — No Effect
(d) Pathogens — No Effect
(e) Aesthetics – Temporary degradation during construction.

(3) Effects on Biota

(a) Primary Production/Photosynthesis — No Effect
(b) Suspension/Filter Feeders — No Effect
(c) Sight Feeders — No Effect

(4) Actions Taken to Minimize Impacts

So far as practicable, breakwater material will be free of fine sediments that would result in turbidity. BMPs and a containment plan will be in place to prevent the introduction and dispersion of suspended sediment into the water. Silt curtains and containment booms/dikes shall be used where appropriate.

d. Contaminant Determination

Contaminants are not expected to occur as a result of the proposed filling activities. The stone used for construction would come from the site itself or operating quarries, and the stone and concrete armor units would be clean and free of contaminants.

e. Aquatic Ecosystem and Organism Determinations

(1) Effect on Plankton — No Effect

(2) Effect on Benthos

Coral growth on the existing man-made rubblemound structure is comparable to natural surfaces in the project area. Construction of the new breakwater will cover essentially all of the existing coral within the footprint of the new structure, however the new breakwater is expected to be colonized by new coral within a relatively short time. The increased surface area afforded by the new structure should result in an increase in coral colonies over time. An unavoidable adverse environmental effect of the project will be the loss of a small area of sand seafloor at the toe of the structure which serves as habitat for bottom dwelling (burrowing) organisms. This area averages 50 feet wide and 300 feet long, curving around the head of the breakwater. However, sand bottom is extensive in the project vicinity, and the loss of this habitat will be mitigated by the creation of new hard substrate for coral colonization.

(3) Effects on Nekton — No Effect

(4) Effects on Aquatic Food Web

Fish egg development and hatching within the construction area would be impacted, however juvenile forms of fish are not expected to be permanently of lethally affected. In general, free swimming fish will be expected to vacate the site during construction, returning shortly after the disturbance ceases. There will be a small loss of sand bottom available for bottom feeders, generalized feeders would not be significantly affected.

(5) Effects on Special Aquatic Sites

(a) Sanctuaries and Refuges: The offshore waters are within the boundaries of the Hawaiian Islands Humpback Whale National Marine Sanctuary. However the project, located immediately adjacent to the shoreline in shallow water, is not expected to affect the whales. In addition, harbor improvements will not significantly increase the numbers of vessels trafficking the area.

(b) Coral Reefs: Destruction of coral will occur where the seaward breakwater face ties into the existing hard rock bottom substrate at the shoreline. BMPs for the breakwater construction will include methods that minimize the disturbance of coral encrusted hard bottom substrate outside of the immediate area of construction.

(c) Wetlands, Mud Flats, Vegetated Shallows: No Effect

(6) Threatened and Endangered Species

Four species of marine animals that occur in Hawaiian waters have been declared threatened or endangered by Federal jurisdiction. The threatened green sea turtle occurs commonly throughout the island chain, and is known to feed on selected species of macroalgae. The endangered hawksbill turtle also is present, but is considered rare in comparison to the green turtle. While turtles are known to exist in the waters surrounding Kaumālapa'u Harbor, no turtle nesting habitat occurs within Kaumālapa'u Bay. Typical types of resting habitat and food resources for turtles were not observed during the site investigations for this project. The draft Fish and Wildlife Coordination Act Report for this project concluded that loss of sea turtle nesting habitat are not expected to occur as a result of the project. Populations of the endangered humpback whale are known to winter in the Hawaiian Islands, however the nearshore location and shallow water of the project site effectively precludes whales frequenting the site. Hawaiian monk seals also occur occasionally in waters off the high islands. The predominantly sea cliff shoreline and lack of sand beaches in the area indicate that the project site is not suitable for seals to beach themselves to rest.

(7) Other Wildlife No Effect

f. Proposed Discharge Site Determination

(1) Mixing Zone Determination N/A

(2) Determination of Compliance with Water Quality Standards: Section 401 Water Quality Certification will be obtained from the State of Hawai'i, Department of Health.

(3) Potential Effects on Human Use Characteristics

(a) Municipal and Private Water Supply No Effect

(b) Recreational and Commercial Fisheries: Recreational fishing from shore in the project area will be reduced during construction. No long-term impact to recreational fishing will occur. No impact to commercial fishing.

(c) Water-Related Recreation: The harbor and wharf is used by small recreational fishing and dive boats. Temporary disruption of small boat traffic in the project area will occur during construction. The completed project will improve small boat operational safety at the wharf.

(d) Aesthetics: The project will replace the existing deteriorated rock and concrete rubble structure with a new, larger breakwater. The man-made appearance of the breakwater will remain unchanged.

(e) Parks, Historical Sites, Preserves: No effect

g. Determination of Cumulative Effects on the Aquatic Ecosystem

Coral growth on the man-made structure that comprises the present breakwater is comparable to natural surfaces in the project area. Construction of the new breakwater will cover much, or all, of the existing coral, however the new breakwater should be colonized in a similar manner within a relatively short time span. As the new breakwater will result in an increase in settlement surfaces compared to the present, the long-term effect of the project would be an increase in coral community abundance. There are no anticipated cumulative impacts to threatened or endangered species as a result of the project.

h. Determination of Secondary Effects on the Aquatic Ecosystem

There are no anticipated secondary effects on the aquatic ecosystem.

FINDING OF COMPLIANCE
FOR
KAUMĀLAPA‘U HARBOR BREAKWATER REPAIR
ISLAND OF LĀNA‘I, HAWAI‘I

a. No significant adaptations of the Section 404(b)(1) guidelines were made relative to this evaluation.

b. The placement of rock and concrete armor units in the water is necessary to construct the breakwater repairs. The discharge is project specific; there are no practicable alternatives to the proposed discharge that would achieve the desired project purpose. Other improvement alternatives considered are discussed in Section 4 of the Draft Environmental Assessment (DEA), however they are all located at the same site and involve basically the same type of in-water work and impacts. The proposed project discharge will not result in significant adverse impact to the marine ecosystem.

c. The discharge of rock and concrete armor units at the project site will not violate State of Hawai‘i water quality rules and regulations. A Section 401 Water Quality Certification will be obtained from the State Department of Health for the project.

d. The proposed project will not violate the Toxic Effluent Standard or Prohibition under Section 307 of the Clean Water Act.

e. The proposed project will not impact threatened or endangered species or their critical habitat, or specifically designated marine sanctuaries.

f. The proposed discharge will not result in significant adverse effect on (1) human health and welfare, including water supplies, recreational and commercial fisheries, marine life or other wildlife, special aquatic sites; (2) aquatic ecosystem diversity, productivity and stability; and (3) recreational, aesthetic and economic values.

g. Best Management Practices for construction operations will be used minimize potential adverse impacts to the marine ecosystem.

h. On the basis of the guidelines, the proposed discharge site for fill material is specified as complying with the requirements of these guidelines.

May 17, 2002
Date

Ronald N. Light
Ronald N. Light
Lieutenant Colonel, US Army
District Engineer

APPENDIX F: COASTAL ZONE MANAGEMENT (CZM) CONSISTENCY CERTIFICATION

Kaumalapau Harbor Breakwater Repair
Island of Lanai, Hawaii

Coastal Zone Management (CZM) Consistency Certification

Prepared For
Hawaii CZM Program, Office of Planning
Department of Business, Economic Development & Tourism
State of Hawaii

PROJECT DESCRIPTION

The project site is located in a natural embayment on the southwest coast of the island of Lanai, Hawaii (see Figure 1). Kaumalapau Harbor is a small barge harbor, with a wharf protected by a breakwater extending partially across the mouth of the embayment. The harbor provides the island's only access for inter-island transport of goods and fuel by tug and barge. The breakwater was reportedly about 400 feet long, but has been reduced by repeated storm wave damage to a current length of approximately 200 to 250 feet. The remnants of the breakwater crest extend about 10 feet above the water surface.The badly deteriorated breakwater allows increased wave energy to enter the harbor, thereby hindering safe berthing and cargo handling.

The proposed project will repair the existing harbor breakwater. The project plan consists of rebuilding the breakwater on top of the old structure, with an underlayer of 3 to 4 ton stone and an armor layer of 35-ton concrete core-loc armor units. The new breakwater will have a total crest length of 320 feet, and will extend approximately 50 feet further across the mouth of the embayment and cove an additional 15,000 square feet of native sand seafloor than the existing structure. The new breakwater will have a crest elevation of +14.5 feet above mean lower low water, a crest width of 20 feet, and side slopes of 1V:1.5H. The project plan and typical sections are shown on Figures 2 and 3.

The purpose of the proposed project is to repair the existing breakwater in order to reduce wave action at the wharf, and increase harbor safety and usability.

HAWAII CZM PROGRAM
ASSESSMENT FORM

RECREATIONAL RESOURCES

Objective: Provide coastal recreational opportunities accessible to the public.

Policies

1) Improve coordination and funding of coastal recreation planning and management.

2) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:

   a) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;

   b) Requiring replacement of coastal resources having significant recreational value, including but not limited to surfing sites and sandy beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;

   c) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;

   d) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;

   e) Encouraging expanded public recreational use of County, State, and Federally owned or controlled shoreline lands and waters having recreational value;

   f) Adopting water quality standards and regulating point and non-point sources of pollution to protect and where feasible, restore the recreational value of coastal waters;

   g) Developing new shoreline recreational opportunities, where appropriate, such as artificial reefs for surfing and fishing; and

   h) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, County planning commissions; and crediting such dedication against the requirements of section 46-6.

Check either "Yes" or "No" for each of the following questions.

	Yes	No
1. Will the proposed action involve or be near a dedicated public right-of-way?		X
2. Does the project site abut the shoreline?	X	
3. Is the project site near a State or County park?		X
4. Is the project site near a perennial stream?		X
5. Will the proposed action occur in or affect a surf site?		X
6. Will the proposed action occur in or affect a popular fishing area?	X	
7. Will the proposed action occur in or affect a recreational or boating area?	X	
8. Is the project site near a sandy beach?		X
9. Are there swimming or other recreational uses in the area?	X	

Discussion

The project site is located in a natural embayment on the southwest coast of the island of Lanai, Hawaii (see Figure 1). Kaumalapau Harbor is a small barge harbor, with a wharf protected by a breakwater extending partially across the mouth of the embayment. The harbor provides the island's only access for inter-island transport of goods and fuel by tug and barge. The breakwater was reportedly about 400 feet long, but has been reduced by repeated storm wave damage to a current length of approximately 200 to 250 feet. The remnants of the breakwater crest extend about 10 feet above the water surface.The badly deteriorated breakwater allows increased wave energy to enter the harbor, thereby hindering safe berthing and cargo handling.

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The purpose of the proposed project is to repair the existing breakwater in order to reduce wave action at the wharf, and increase harbor safety and usability.

HISTORIC RESOURCES

Objective: Protect, preserve, and where desirable, restore those natural and man-made historic and pre-historic resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Policies

1) Identify and analyze significant archaeological resources;

2) Maximize information retention through preservation of remains and artifacts or salvage operations; and

3) Support State goals for protection, restoration, interpretation, and display of historic resources.

Check either "Yes" or "No" for each of the following questions.

	Yes	No
1. Is the project site within a historic/cultural district?	___	X
2. Is the project site listed on or nominated to the Hawaii or National register of historic places?	___	X
3. Does the project site include undeveloped land which has not been surveyed by an archaeologist?	___	X
4. Has a site survey revealed any information on historic or archaeological resources?	___	X
5. Is the project site within or near a Hawaiian fishpond or historic settlement area?	___	X

Discussion

The project site has been extensively modified by modern usage for handling waterborne cargo. No historic resources have been identified in or near the project site.

SCENIC AND OPEN SPACE RESOURCES

Objective: Protect, preserve and, where desirable, restore or improve the quality of coastal scenic and open space resources.

Policies

1) Identify valued scenic resources in the coastal zone management area;

2) Insure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;

3) Preserve, maintain and, where desirable, improve and restore shoreline open space and scenic resources; and

4) Encourage those developments which are not coastal dependent to locate in inland areas.

Check either "Yes" or "No" for each of the following questions.

	Yes	No
1. Does the project site abut a scenic landmark?	___	X
2. Does the proposed action involve the construction of a multi-story structure or structures?	___	X
3. Is the project site adjacent to undeveloped parcels?	X	___
4. Does the proposed action involve the construction of structures visible between the nearest coastal roadway and the shoreline?	___	X
5. Will the proposed action involve construction in or on waters seaward of the shoreline? On or near a beach?	X	___

Discussion

The coastline in the project vicinity is rugged, sea cliff shoreline, and virtually inaccessible except for the immediate harbor area. There are no beaches in the area, and no development in the area except for the harbor facilities.

The proposed project will be built entirely in the water immediately adjacent to the shoreline. The repaired breakwater will consist of large, manmade concrete armor units, and thus will have a manmade appearance. However, the project is completely coastal dependant, and will not be visible except from the shoreline except in the immediate area of the harbor, which already has numerous elements of manmade appearance. There will be no significant impact to existing valued scenic resources.

COASTAL ECOSYSTEMS

Objective: Protect valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal ecosystems.

Policies

1) Improve the technical basis for natural resource management;

2) Preserve valuable coastal ecosystems of significant biological or economic importance;

3) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land water uses, recognizing competing water needs; and

4) Promote water quantity and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate State water quality standards.

Check either "Yes" or "No" for each of the following questions.

		Yes	No
1.	Does the proposed action involve dredge or fill activities?	X	
2.	Is the project site within the Shoreline Setback Area (20 to 40 feet inland of the shoreline)?	X	
3.	Will the proposed action require some form of effluent discharge into a body of water?		X
4.	Will the proposed action require earthwork beyond clearing and grubbing?		X
5.	Will the proposed action include the construction of special waste treatment facilities, such as injection wells, discharge pipes, or cesspools?		X
6.	Is an intermittent or perennial stream located on or near the project site?		X
7.	Does the project site provide habitat for endangered species of plants, birds, or mammals?		X
8.	Is any such habitat located nearby?		X
9.	Is there a wetland on the project site?		X
10.	Is the project site situated in or abutting a Natural Area Reserve?		X

11. Is the project site situated in or abutting a Marine Life Conservation District? ___ X

12. Is the project site situated in or abutting an estuary? ___ X

Discussion

The project will involve reshaping the existing breakwater, and placing stone and concrete armor units into the water to repair the breakwater. The following types and volumes of material will be utilized in the construction.

	Total Volume	Above MHW	Below MHW
Shaping of Existing Breakwater	31,800cy	3,800cy	28,000cy
Core Stone (3-4 ton)	1,200cy	0	1,200cy
Bedding Stone (400 –800 lb)	90cy	0	90cy
Underlayer Stone (3-4 ton)	15,000cy	2,250cy	12,750cy
Concrete Armor Units (35 ton)	6,885cy	1,585cy	5,300cy
Concrete Rib Cap	900cy	900cy	0
Geotextile Filter Fabric	9,300sf	0	9,300sf

Material will be moved and placed by floating crane barge and breakwater mounted crane. Bedding stone will be placed by clamshell bucket, larger undrlayer stone and the concrete armor units will be individually placed. There will be no random dumping of material.

The project will abut, but not actually intrude into, the Shoreline Setback Area. Construction activities will occur within the Shoreline Setback Area.

There will be no impact to threatened or endangered species. While the threatened green sea turtle is known to exist in the waters surrounding Kaumalapau Harbor, no turtle nesting habitat occurs within Kaumalapau Bay. Typical types of resting habitat and food resources for turtles was not observed during the site investigations for the project. Populations of the endangered humpback whale are known to winter in the Hawaiian Islands, however the nearshore location and shallow water of the project site effectively precludes whales frequenting the site. The project site also provides no suitable habitat for the endangered Hawaiian monk seal.

The existing rubblemound breakwater has significant coral coverage, and the native sand bottom at the toe of the structure exhibits burrows of worms and/or shrimp. The proposed project will involve coverage of the existing structure with rock and concrete, resulting in the loss of much of the existing coral cover. However, the new breakwater will be constructed of materials similar to the existing structure, and corals are expected to rapidly colonize the new structure in a manner similar to the existing conditions.

The discharge of rock and concrete armor units at the project site will not violate State of Hawaii water quality rules and regulations. A Section 401 Water Quality Certification will be obtained from the State Department of Health for the project. There will be some temporary water turbidity increase during construction, however Best Management Practices for construction operations will include methods that minimize the addition of suspended sediment to the water column.

ECONOMIC USES

Objective: Provide public or private facilities and improvements important to the State's economy in suitable locations.

Policies

1) Concentrate in appropriate areas the location of coastal dependent development necessary to the State's economy;

2) Insure that coastal dependent development such as harbors and ports, visitor industry facilities, and energy generating facilities are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and

3) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such development and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

   a) Utilization of presently designated locations is not feasible;

   b) Adverse environmental effects are minimized; and

   c) Important to the State's economy.

Check either "Yes" or "No" for each of the following questions.

	Yes	No
1. Does the project involve a harbor or port?	X	
2. Is the project site within a designated tourist destination area?		X
3. Does the project site include agricultural lands or lands designated for such use?		X
4. Does the proposed activity relate to commercial fishing or seafood production?		X
5. Does the proposed activity relate to energy production?		X
6. Does the proposed activity relate to seabed mining?		X

Discussion

Kaumalapau Harbor is an existing State operated port, and provides the only port facility for the island of Lanai. All waterborne cargo and fuel for the island must land here, and the continued operation of the port is vital to the island's economy. The deteriorated existing breakwater limits the use of the harbor wharf. The proposed project to repair the harbor's protective breakwater will improve the safety and usability of the harbor.

COASTAL HAZARDS

Objective: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, and subsidence.

Policies

1) Develop and communicate adequate information on storm wave, tsunami, flood erosion, and subsidence hazard;

2) Control development in areas subject to storm wave, tsunami, flood, erosion, and subsidence hazard;

3) Ensure that developments comply with requirements of the Federal Flood Insurance Program; and

4) Prevent coastal flooding from inland projects.

Check either "Yes" or "No" for each of the following questions.

		Yes	No
1.	Is the project site on or abutting a sandy beach?		X
2.	Is the project site within a potential tsunami inundation area as depicted on the National Flood Insurance Program flood hazard map?		X
3.	Is the project site within a potential flood inundation area according to a flood hazard map?		X
4.	Is the project site within a potential subsidence hazard area according to a subsidence hazard map?		X
5.	Has the project site or nearby shoreline areas experienced shoreline erosion?		X

Discussion

The project site is in no known coastal hazard area, with the exception of storm wave hazards. Hurricanes Iwa (1982) and Iniki (1992), as well as other storms prior to them, generated waves which significantly damaged the existing breakwater. The proposed repair project has been designed for severe storm wave conditions.

Marine Resources

Objective: Implement the State's ocean resources management plan.

Policies:

1) Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;

2) Assure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;

3) Coordinate the management of marine and coastal resources and activities management to improve effectiveness and efficiency;

4) Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;

5) Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and

6) Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

Discussion: *Please provide information about the proposal relevant to the Objective and Policies above.*

Repair of the Kaumalapau Harbor breakwater is a joint federal/state project being undertaken by the U.S. Army Corps of Engineers and the State Department of Transportation, Harbors Division.

A detailed marine biological assessment of the project site has been conducted during preparation of the Environmental Assessment for the project. In addition, the U.S. Fish & Wildlife Service has conducted site investigations and prepared a Fish and Wildlife Coordination Act Report for the project. The proposed project has been coordinated with the U.S. fish & Wildlife Service and the National Marine Fisheries Service in accord with Section 7 of the Endangered Species Act, and both agencies concur that the project will not impact endangered species.

Best Management Practices (BMP'S) for construction operations will include methods that minimize the addition of suspended sediment to the water column, and avoid disturbance of marine life and reef resources outside of the immediate construction area.

BEACH PROTECTION

Objective: Protect beaches for public use and recreation.

Policies:

1) Locate new structures inland from the shoreline setback to conserve open space and to minimize loss of improvements due to erosion;

2) Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and

3) Minimize the construction of public erosion-protection structures seaward of the shoreline.

Discussion: *Please provide information about the proposal relevant to the Objective and Policies above.*

The project will have no impact on sandy shorelines or public beaches.

PUBLIC PARTICIPATION

Objective: Stimulate public awareness, education, and participation in coastal management.

Policies:

1) Maintain a public advisory body to identify coastal management problems and to provide policy advice and assistance to the coastal zone management program;

2) Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal-related issues, developments, and government activities; and

3) Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.

Discussion: *Please provide information about the proposal relevant to the Objective and Policies No. 2 and No. 3 above.*

A Draft environmental Assessment will be circulated for public review and comment. A public meeting will be held on Lanai to present the project to the public and solicit public input.

MANAGING DEVELOPMENT

Objective: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Policies

1) Effectively utilize and implement existing law to the maximum extent possible in managing present and future coastal zone development;

2) Facilitate timely processing of application for development permits and resolve overlapping or conflicting permit requirements; and

3) Communicate the potential short- and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the general public to facilitate public participation in the planning and review process.

Check either "Yes" or "No" for each of the following questions.

	Yes	No
1. Will the proposed activity require more than two (2) permits or approvals?	X	
2. Does the proposed activity conform with the State and County land use designations for the site?	X	
3. Has or will the public be notified of the proposed activity?	X	
4. Has a draft or final environmental impact statement or an environmental assessment been prepared?	X	

Discussion

The project will undergo both Federal and local regulatory agency review and approval processes, and all necessary permits and approvals will be obtained prior to project implementation. A Draft Environmental Assessment has been prepared and coordinated for agency and public review and comment. A public meeting will be held on Lanai to present the project to the public.

FEDERAL CONSISTENCY
SUPPLEMENTAL INFORMATION FORM

Project/Activity Title or Description: Kaumalapau Harbor Breakwater Repair

Island Lāna'i **Tax Map Key No.** N/A **Est. Start Date:** ________

APPLICANT OR AGENT

Name & Title Ronald N. Light, Lt. Col., U.S. Army, District Engineer

Agency/Organization U.S. Army Corps of Engineers Honolulu Engineer District **Telephone** ________

Address Fort Shafter, HI **Zip** 96858

TYPE OF APPLICATION (check one only)

[X] I. Federal Activity (statement "a")

"The proposed activity is consistent with and will be conducted in a manner consistent to the maximum extent practicable with the Hawaii Coastal Zone Management Program."

Signature *Ronald N. Light* Date 29 April 2001

[ ] II. Permit or License (statement "b")

"The proposed activity complies with Hawaii's Coastal Zone Management Program and will be conducted in a manner consistent with such a program."

Signature ____________________ Date ____________

[ ] III. OCS Plan/Permit

[ ] IV. Grants & Assistance

DEPARTMENT OF BUSINESS,
ECONOMIC DEVELOPMENT & TOURISM

OFFICE OF PLANNING
235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

BENJAMIN J. CAYETANO
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DIRECTOR, OFFICE OF PLANNING

Telephone: (808) 587-2846
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18 JUL 2001
HED
DHED
SECY
PP

Ref. No. P-9145

July 13, 2001

Lt. Colonel Ronald N. Light
Honolulu District Engineer
U.S. Army Corps of Engineers
Building 230
Fort Shafter, Hawaii 96858-5440

Dear Lt. Colonel Light:

Subject: *Hawaii Coastal Zone Management (CZM) Program Federal Consistency Review for the Proposed Kaumalapau Harbor Breakwater Repair, Lanai*

We have reviewed the proposal for the Kaumalapau Harbor breakwater repair and improvements to the existing damaged and deteriorated breakwater in Kaumalapau Harbor. We concur with your CZM consistency determination based on the following:

1) Where necessary, silt containment devices shall be installed prior to construction and properly maintained throughout the duration of construction. Removal of these devices shall not cause turbidity which violates State water quality standards.

2) Water quality from construction and maintenance activities shall be appropriately mitigated and comply with applicable State of Hawaii water quality standards as specified in the HAR, Chapter 11-54 and water pollution control requirements as specified in Chapter 11-55. These administrative rules are administered by the Department of Health (DOH) and are federally approved enforceable policies of the Hawaii CZM Program.

3) The project shall be in compliance with regulations for the Shoreline Setback Area and Special Management Area, if applicable, which are administered by the County of Maui Planning Department.

4) Installation of a temporary construction fence along the edge of the gulch bordering the contractor work and storage area, and photographically documenting the existing breakwater using Historic American Building Survey standards as described in the draft environmental assessment (p. 29). If artifacts or human remains are uncovered during any activity, work in the area would stop and the State Historic

Preservation Division is immediately notified and all applicable requirements of the Department of Land and Natural Resources are followed.

5) Changes to the project are subject to CZM federal consistency. Should there be changes to the project, we require that you submit the amendments for our review.

CZM consistency concurrence is not an endorsement of the project nor does it convey approval with any other regulations administered by any State or County agency. Thank you for your compliance with Hawaii's CZM Program. Should you have any questions, please call Debra Tom of our CZM Program at 587-2840.

Sincerely,

David W. Blane, AICP
Director
Office of Planning

c: U.S. Army Corps of Engineers, Regulatory Branch
U.S. Environmental Protection Agency
U.S. Fish and Wild life Service, Pacific Islands Ecoregion
U.S. National Marine Fisheries Service, Pacific Area Office
Department of Health, Clean Water Branch
Department of Land & Natural Resources,
Planning & Technical Services Branch
State Historic Preservation Division
Department of Transportation
County of Maui, Planning Department

APPENDIX G: ORAL HISTORIC STUDIES FOR THE DETERMINATION OF TRADITIONAL CULTURAL PLACES AT KAUMĀLAPA‘U HARBOR, LĀNA‘I ISLAND, HAWAI‘I

Draft Report

ORAL HISTORIC STUDIES FOR THE DETERMINATION OF TRADITIONAL CULTURAL PLACES AT KAUMÄLAPA‘U HARBOR, LÄNA‘I SLAND, HAWAI‘I

Contract No. DACW83-01-P-0008

Prepared for
United States Army Engineering District, Honolulu
Directorate of Engineering
Environmental Branch
Fort Shafter, Hawaii 96858-5440

Prepared by

Social Research Pacific, Inc.
328B Keaniani Street
Kailua, HI 96734

September 20, 2001

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1.0 Introduction

At the request of the U.S. Army Corps of Engineers, Honolulu Engineer District, under Contract No. DACW83-01-P-0008, Social Research Pacific, Inc., conducted Oral Historic Studies for the Determination of Traditional Cultural Places at Kaumälapa'u Harbor Project, Läna'i Island, Hawaii. The work was completed by SRP, Inc. (SRP) and its subcontractors, Kumu Pono Associates and Franzen Photography, between July 22 and July 30, 2001.

The project has completed the following tasks: 1) preparation of a Work Plan (WP); 2) completion of background and archival research; 3) completion of oral histories; 4) identification/determination of Traditional Cultural Places at Kaumälapa'u Harbor; and 5) preparation of this draft report. Along with a report of general findings, this report includes photographic documentation of remnants of the breakwater fronting Kaumälapa'u Harbor. Photographic documentation was conducted in accordance with Historic American Building Survey/Historic American Engineering Record (HABS/HAER) standards.

1.1 Background and Goal

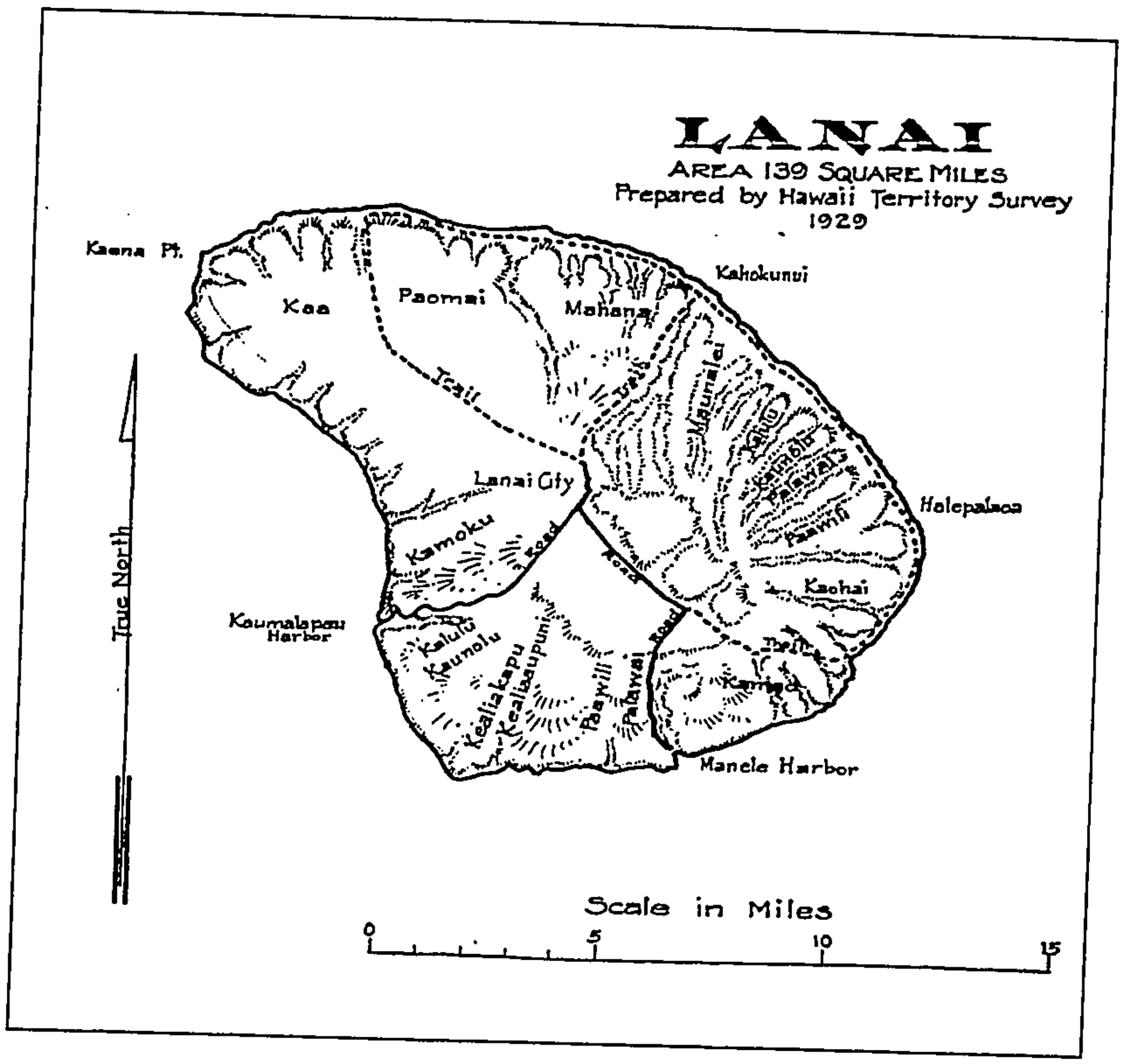
The primary goal of this project was to conduct archival and record searches, and oral historic studies to locate potential Traditional Cultural Places (TCPs) at Kaumälapa'u Harbor, Läna'i. While previous archaeological work and oral histories have been completed on traditional and historic sites and features on Läna'i Island, it was not known whether TCPs exist within the vicinity of Kaumälapa'u Harbor.

The purpose of this study was to identify these potential TCPs through oral interviews. A series of oral interviews were completed with knowledgeable native Hawaiians and other long-term residents of Läna'i; these included interviews with individuals who had once been residents of Kaumälapa'u Camp. Information from the interviews identified the traditional uses (land and sea) of the area, while adding to existing information on the cultural history of Kaumälapa'u Harbor. Along with oral interviews and historical research, HABS/HAER photographing was completed of the remnants of the breakwater at the harbor. The purpose of these photographs is to preserve an accurate pictographic record of the breakwater as a historic property.

1.2 Project Area

Kaumälapa'u Harbor is located in the southwestern portion of Läna'i Island (Figure 1). Kaumälapa'u Bay is one of the few 'boat accessible' harbors on the island. The harbor was constructed in 1925 by the Hawaiian Pineapple Company (Wentworth 1925:5). Prior to this time, Manele Bay was the main port of entry for Läna'i; its primary purpose was to ship pineapple off the island. Remnants of Halepalaoa Landing, primarily used to ship cattle, remain on the eastern shores of Läna'i. Its also reported that in the late 1800s, a steamer landing was located on the western shore of Läna'i Island and served as a docking grounds (*The Friend* 1892:96).

Figure 1. Map of the General Location of the Project Area



1.2.1 A Brief Introduction to the Prehistory and History of Traditional Hawaiian Historic era Land Use in the Project Area

The island of Läna'i is divided into thirteen traditional land districts or *ahupua'a.* Kaumälapa'u Bay and Kaumälapa'u Harbor are located in the southernmost portion of Kamoku *ahupua'a.* The southern edge of Kaumälapa'u Bay forms the ocean boundary between the *ahupua'a* of Kamoku and Kalulu (Fig. 2). According to the *Gazetteer of Läna'i* (in Emory1969):

> "Kaumala-pa'u Bay. The Kekoewa family say this name should be Kamuela-pa'u; but Mrs. Awili Shaw says that her parents and grandparents called the place Kau-molo-pa'u. None of these names can be translated with any meaning" (Emory 1969:32).

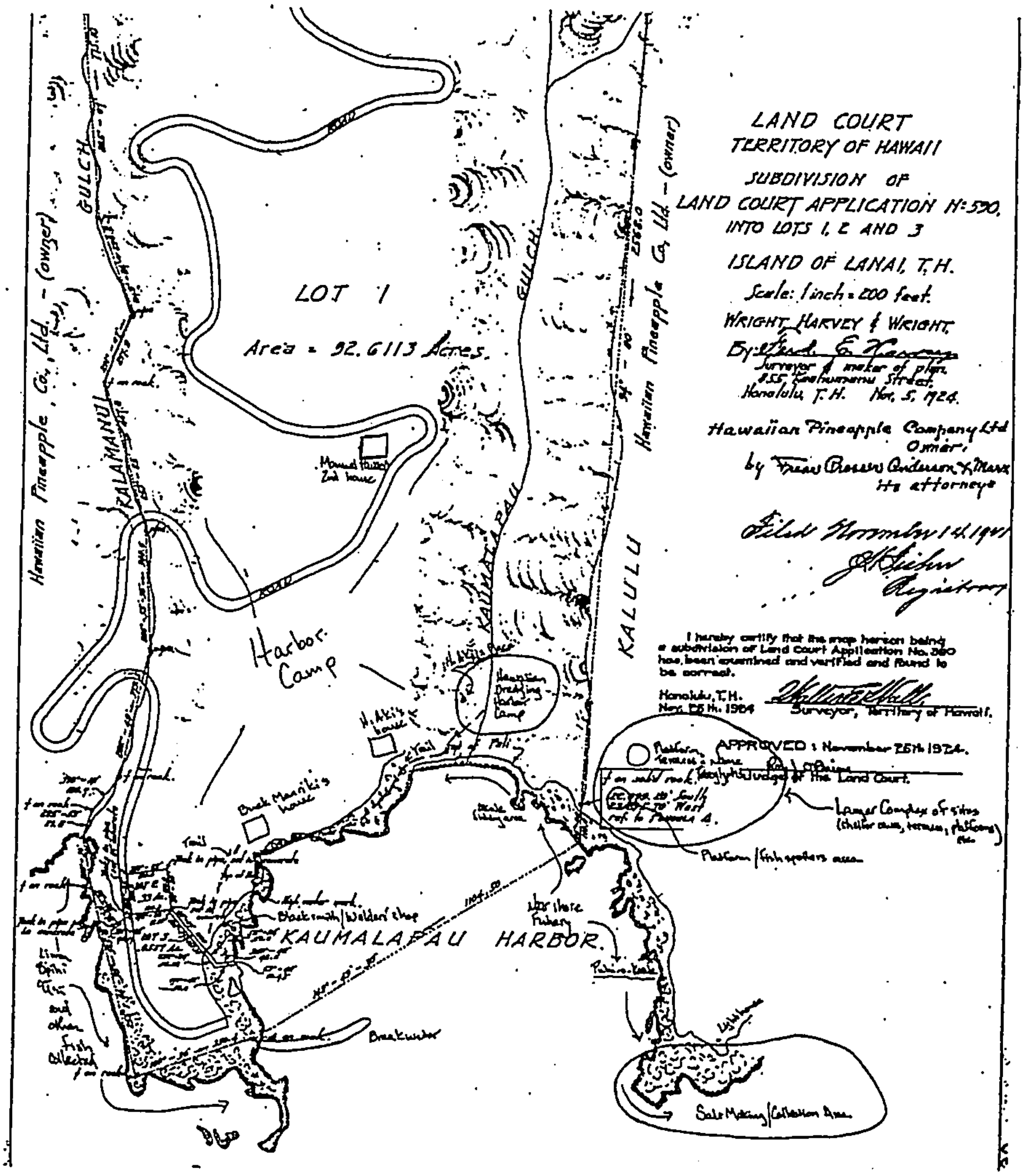
Emory did ethnographic and archaeological investigations on Läna'i between July 1921 and January 1922. He describes finding three types of native habitation sites on Läna'i:1) terraces in natural caves or under overhanging bluffs; 2) stone shelters; and 3) house sites marked by either cleared ground, leveled ground, an enclosure, terrace or platform (Emory 1969:38). At the edge of a sea cliff south of Kaumälapa'u, he found "a house site consisting of a cleared, naturally level space and including a fireplace (Emory 1969:39). He goes on to describe that the "deep gulches of Kaumälapa'u, Kalamanui, and Honopu, on the central west coast, have the finest house terraces. The front walls are 2 to 8 feet high...the length of the terrace from 10 to 35 feet, the width from 10 to 15 feet. Some large terraces support smaller terraces a few inches high, and most of them against the back...the neatest work observed was that in the facing of a house terrace at Kaumälapa'u" (Emory 1969:40).

In a survey to identify archaeological sites in the Hulopoe and Manele Bays in south Läna'i, Kaschko and Athens (1987), found thirty-three archaeological sites. Most of these sites are classified as being traditional Hawaiian, presumably prehistoric in origin (1987:18). The majority of these sites are walled structures, rectangular terraces, C-shaped structures and cairns. It is interesting to note that over half of these sites were located along the coast.

Along with known archaeological features around Kaumälapa'u Bay, there is a brackish water well that was used in the earlier part of the 20th century. According to the "old native Keliihananui...about one hundred horses which grazed on the plateau lands nearer to the wells of Kaunolu and Kaumälapa'u than to the mountain springs, watered at those wells" (in Emory 1969:47). The same well was known to be used by the people of Kaunolu (east of Kaumälapa'u) in the middle part of the 19th century.

In addition to the traditional history told by archaeological features, written stories and events also tell of an earlier time. Traditional history as told through documents and previously recorded myths and legends, are discussed in sections 3.3. and 3.3.1.

Figure 2. Map showing the *ahupua'a* of Kamoku and Kalulu



1.2.2 Land Tenure and Land Use in the *Ahupua'a* of Kamoku

Emory estimated that Läna'i probably had a population of 3,000 at the time of Captain Cook's arrival (in *Honolulu Star Bulletin* April 6, 1970, p.D-20); this would have been a fairly large number considering that the island population is currently around 2,000. By 1921, approximately one hundred and two Hawaiians remained on the island (ibid). According to Emory, an individual by the name of Ohua, was the only resident of Kaonolu Village at the turn of this century; he died around 1900 (*Honolulu Star Bulletin* April 6, 1970, p.D-20). The village of Kaonolu has perhaps the most extensive archaeological sites and features on the island of Läna'i (c.f. Emory 1922).

Records of land claims indicate that the project area had either a small Hawaiian community/settlement or few claimants to the land. Previous research on land tenure and land use by Maly (Appendix A), shows very little transactions in land claims in the project area following the *Mähele*; the remainder of this section summarizes Maly's findings:

> In the *Mahele 'Äina* (Land Division) of 1848, the *ahupua'a* of Kamoku and Kalulu were retained by the King (Kamehameha II), though the *'ili* of Kaumälapa'u 1 & 2 were given by the King to the Government (*Buke Mahele*, 1848:105, 209; and Boundary Commission Certificate No.'s 36 & 37). As *Konohiki* (Overseer) of the land of Kamoku on behalf of the King, Noa Pali reported that the *i'a kapu* (restricted fish) of Kamoku was the *uhu* (parrot fish), and the *lä'au kapu* (restricted wood) of Kamoku was the *koko* (*Euphorbia* spp.) (Interior Department Land Files – August 26, 1852). *Uhu* are still noted as an important fish of the Kaumälapa'u fishery to the present day (pers. comm., Henry Aki and Sam Kaopuiki). Four claims and awards were identified which include land in:
>
> 1. Kaauwaeaina (LCA 8556) – in the *ahupuaa* of Kamoku and Kalulu. Situated near Keahialoa and Puu Nanaihawaii; and along the *mauka-makai* trail from upland Kamoku to Kaumälapa'u (two parcels on north of present-day airport parcel).
> 2. Pali (LCA 10630) – in the *ahupuaa* of Kamoku. Situated in the Kihamaniania-Nininiwai vicinity, in the uplands of Kamoku (behind present-day Läna'i City, south of Koele).
> 3. Kaaiai (LCA 6833) – in the *ahupuaa* of Kalulu and Kamoku. Situated in the uplands, between Keaaku and Lalakoa (three parcels situated on Palawai side of Läna'i City).
> 4. Kalaihoa (LCA 3719 B) – in the *ahupuaa* of Kalulu and Kamoku. Situated in the uplands, between Pulehuloa and Kapano Gulch (situated on Palawai side of Läna'i City).
>
> Apparently no native tenants applied for *pä hale* or other properties in the *'ili* of Kaumälapa'u during the Mahele. In 1866, a Royal Patent Grant (No. 3029) was issued to Nahuina and Keliihue for two parcels of land, one entirely in Kamoku, and the other crossed by the boundary between Kalulu and Kamoku. These parcels are

generally on the north and south sides of Pu'u Nänäihawai'i (above the present-day airport parcel). Parcel No. 1 of the Grant is crossed by the *mauka-makai* trail that runs to Kaumälapa'u (the same trail that crosses Kaauwaeaina's *kuleana* parcel). In 1876, Keliihue (*wahine*), recipient of the Grant, was one of the informants before the Boundary Commission.

In 1862, a Commission of Boundaries (the Boundary Commission) was established to legally set the boundaries of all the *ahupua'a* that had been awarded as a part of the *Mähele*. Subsequently, in 1874, the Commissioners of Boundaries were authorized to certify the boundaries for lands brought before them (W.D. Alexander in Thrum 1891:117-118). W.D. Alexander, Surveyor General of the Kingdom of Hawai'i worked on Läna'i, and recorded the testimonies for the *ahupua'a* of Kamoku. Among the important features described was the *heiau*, Ili o Lono (situated above Kaumälapa'u Gulch, on the Boundary between Kamoku and Kalulu), and the old trail rising from Kaumälapa'u to the uplands.

2.0 Traditional Cultural Places/Properties

The definition of a TCP is found in the *Guidelines for Evaluating and Documenting Traditional Cultural Properties* (National Register Bulletin No.38), which offers the following:

> "...[a traditional cultural property is generally] one that is eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community" (Parker and King 1995:2).

While the primary goal of this project was to identify TCPs at Kaumälapa'u Harbor that met the criteria established in the National Register, oral histories indicate that the context within which historical events and practices are remembered may not correspond with a specific site or area. Rather it is the broader "cultural landscape" in which events or situations are recalled. The significance of the landscape as the context for identifying traditional properties, is discussed below.

2.1 Cultural Landscapes: Areas as Sites of Significance

The concept of cultural landscape has been part of American human geography since the 1920s when Carl Sauer, sometimes referred to as the father of American geography, promoted it as a method to undercut environmental determinism (Rowntree 1978:146). As such, cultural geographers place emphasis on the social perception and response to environments, the cognition, feelings, and behavior associated with places. Earle et al. define cultural landscape as "that segment of earth space which lies between the viewer's eye and his or her horizon" (1978:71).

> "As normally experienced, sense of place quite simple *is*, as natural and straightforward as our fondness for certain colors and culinary tastes, and the thought that it might be complicated, or even very interesting, seldom crosses our minds. Until, as sometimes

> happens, we are deprived of these attachments and find ourselves adrift, literally *dislocated*, in unfamiliar surroundings we do not comprehend and care for even less" (Basso 1996: xiii).

Within the context of the landscape, the value attached to the locality's identification is also highly representative of the people who use it. Kaumālapa'u Harbor and Kaumālapa'u Valley hold special meanings to those who experienced the area through the generations. As will be suggested in the conclusions of this text, based on its meaningfulness as a cultural landscape, it may be appropriate to address the project area in its entirety as a TCP.

3.0 The Study Approach

Data gathered from the oral histories, unless otherwise permitted by the informants, is treated confidentially, respecting the rights and sensitivities of the Native Hawaiian community. The information in this report, including direct citations, is rarely presented with the name of the interviewee; where names are cited, it has been done so with the consent of the informant. Appendix B provides a list of the individuals who were interviewed for this survey. It also includes some of the names of individuals who provided informal interviews.

3.1 Process of Obtaining Oral Histories

Each interview involved several steps, from initiation to its completion. The following six steps were taken:

1. identification of a preliminary list of potential sources to interview;
   - the list was presented to the ACM (Mr. Kanalei Shun);
2. scheduling the interview;
3. audio, visual and written recordation of interview (if consented to);
4. identification of important features/sites in the project area (this was often done with the help of visual aides such as maps and photographs);
5. translation and transcriptions of the interview; and
6. presentation of the results of the interview.

3.1.1 Formal Interviews: Written, Audio/Visual Recordation

All of the oral interviews were completed using audiotapes and cassettes, and/or in written format. Some interviewees requested that only written notes by taken; their wish to not be recorded was granted. Audiotaping was done using a minidisk CD player. Written notes were taken during all of the interviews. Where applicable, a formal written questionnaire was completed by the interviewer (Appendix C). A request to remove all recordation of an interview, after the fact, was also granted. Interviews were also completed via telephone (from Honolulu to Lāna'i City).

3.1.2. Consent/Release Form

Prior to the interview process, each interviewee was asked of their willingness and consent to the interview. A consent/release form (Appendix D) was used whenever possible. In several instances, the interviewee felt uncomfortable with signing the document even though they were very willing to participate in the interview. Out of respect for the interviewee, the consent form was waived, and as appropriate, is noted in this report. In several instances, a consent form was not signed but the agreement to do the interview was recorded on tape. The interviewees were also given the option of receiving a copy of their contribution prior to finalization of this report. In all interviews completed for this survey, the judgment of the oral historian, being in the position of doing the interview and most sensitive to the given situation, determined what constituted the best course of action.

3.1.3 Informal Interviews

Informal discussions, particularly those arising from attempting to locate interviewees and/or sites and areas mentioned, also led to gathering of information pertinent to this survey. These took place on a frequent basis during visits to the harbor area and the nearby residences. These are noted and incorporated into the project, with appropriate acknowledgements given to the discussant.

3.2 Identifying Traditional Cultural Properties

The process by which Traditional Cultural Properties were identified was done in accordance to the National Register guidelines. This entailed the following:

1. a comprehensive effort to identify properties already known in the area; and
2. consulting with and conducting oral histories with individuals who practiced and/or had traditional Hawaiian knowledge and information; and
3. description of the TCP identified and/or located.

While the goal of this project was to identify Traditional Cultural Places at Kaumālapa‘u Harbor that met the criteria established in the National Register, the oral histories identified historic properties and historic land uses of the area that hold local cultural significance but do not qualify under the established guidelines.

3.2.1 Evaluation and Interpretation of the TCP guidelines

It is important to briefly discuss the criteria for defining a TCP. The reader should bear in mind that the definition is used in conjunction with nominating properties to the National Register…a TCP is not a "stand alone" identification in this sense. A broad interpretation of this definition would identify nearly all-archaeological properties as TCPs. First, archaeological features and sites that are of ceremonial significance to a living community are a TCP. Second, the identification of a community with its historic roots via a feature or site, would also qualify as a TCP. Third, although continuation of a practice or belief is an important aspect of the criteria defining a TCP, communities can claim the lack of physical access as a deterrent against being able to continue such practices.

Previously identified sites of cultural significance, in nearly every instance, meet the criteria of a TCP, by their "....association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community." All religious and ceremonial structures, and some housing and agricultural features and sites, qualify under the definitions established for a TCP. Features and sites that do not qualify are those that hold no cultural value, traditionally or currently. These "non TCP" types of properties are by definition, out of the realm of historic cultural properties identified through previous archaeological and oral history work.

3.3 Documentary Research

Documentary research, primarily entailing the search of background literature, photographs of the project area and oral histories of the area was done throughout the duration of the survey. A review was made of all known archaeological documents prepared for the Kaumälapa'u area at the Corps of Engineers Office, Hawaii State Library and Archives, the Hawaii Historical Society, the Bishop Museum, and the Public Library on Läna'i Island. Information was also gathered from Dole Food Company and Hawaiian Dredging Construction Company.

One of the earliest documents is a letter from Walter Murray Gibson with the heading, "Island of Läna'i, Hawaiian Islands, July 16th 1862, letter to The Honourable Secretary of the House of Nobles, Honolulu, from Walter Murray Gibson." As president of the Church of Latter Day-Saints, Gibson requested about 15000 acres in "a valley or extinct crater, for permanent settlement. No running water there. No road, just dangerous 'bridle path'. We would make a good wagon-road" (p.3). In describing the inhabitants of Läna'i, Gibson claimed that "previous to my organization of their labour, these people obtained a precarious subsistence by fishing, or by tending a few goats" (p.3).

Prior to and during the construction of Kaumälapa'u Harbor in 1924, newspaper articles appeared quite frequently in the *Honolulu Star Bulletin* and the *Honolulu Advertiser.* Some of the earliest photographs of the harbor can be seen in articles such as "Scenes on the Coast of the Island of Läna'i Where Hawaii's Biggest New Development Work Is in Progress" (*Honolulu Star Bulletin* Monday, January 28, 1924) (Figure 3). Figures 3 through 7 show the general sequence in the development and changing face of the harbor and breakwater, between the years 1924 and 2001:

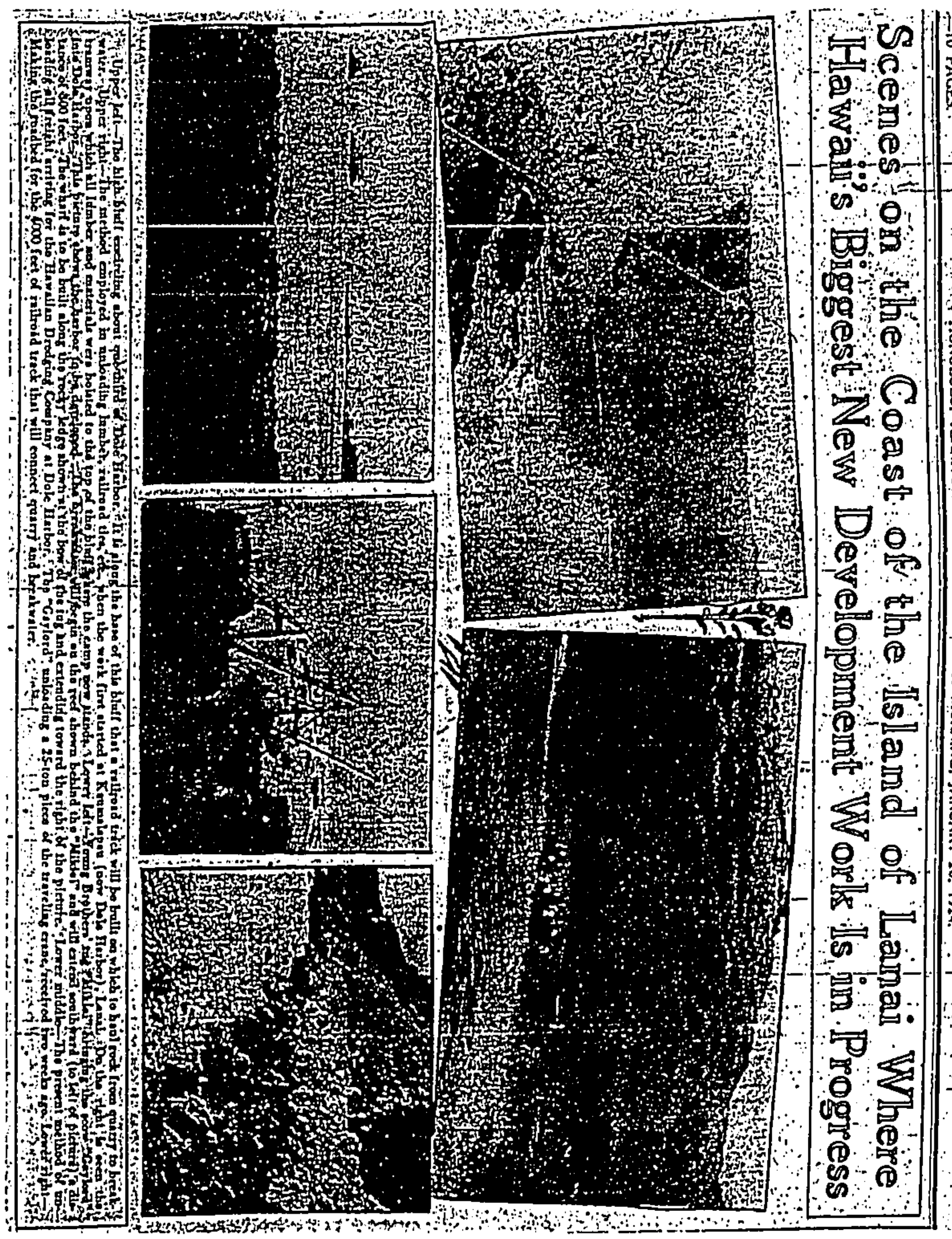
Table 1. A Pictorial History of Kaumälapa'u Harbor

Figure	Year of Photograph	Description
3	1924	Initial work on the Dole Harbor.
4a	1946	View from the breakwater, looking north
4b	1946	Wall enclosing the harbor
5	1960	Semi-circular view of the breakwater, harbor and Kaumälapa'u Gulch.
6a	1983	Aerial view of Kaumälapa'u Harbor and Kaumälapa'u Gulch/Valley
6b	1983	Aerial view of Kaumälapa'u Harbor, looking north
7a	2001	View of the breakwater from atop Kaumälapa'u Ridge
7b	2001	Entrance to Kaumälapa'u Gulch/Valley
7c	2001	Shoreline of the previous rail track leading to Kaumälapa'u Gulch
8a	1924	Dredging of Kaumälapa'u Harbor
8b	1931	Wagon carts, Model T Fords and Pineapple being transported to the harbor

As described in Fig. 3, during its initial construction, the harbor was known as "Dole Harbor". Figures 4a and 4b show the harbor as it was in 1946; Fig 4a shows perhaps what was the longest extension of the breakwater. Figure 5 shows a semicircular view of the entire harbor area, and sweeps around to Kaumälapa'u Gulch/Valley. Figures 6a and 6b are aerial photographs that show a much shorter extension of the breakwater. Figure 6a is a view of the harbor looking north, and Fig. 6b is a view of the harbor looking south and shows a portion of Kaumälapa'u Gulch. Figures 7a through 7c were taken during this study, showing the current views around the harbor area. 7a shows a view of the breakwater and harbor from atop Kaumälapa'u Ridge; Fig. 7b shows the entrance to Kaumälapa'u Gulch/Valley; and Fig. 7c shows the rocky shoreline atop which ran the rail tracks from the harbor to the gulch.

As told repeatedly by informants, the breakwater had at least four facelifts during its existence. The majority of these followed post-hurricane and tidal damage to the breakwater. At present, at least four separate layers of cement and gravel are evident in the initial portion of the breakwater. Albert Reinicke (see Interview) recalls Hurricane Dot in 1960, doing severe damage to the breakwater. He also recalls that the repairs to the breakwater required square boulders. These boulders were brought in on the tugs "Ahi" and "Ono", from Kawai'hae Harbor on Hawaii.

Years on Läna'i, a publication of the Dole Plantation Company, served as the island newspaper for many years. *Years on Läna'i* was a bimonthly publication, prepared by the Läna'i Plantation Division out of Läna'i City. Its articles covered the general events of living on Läna'i, and as well was/is a good source of early photographs of Kaumälapa'u Harbor. Among these photographs is one that shows wagon carts on a track running past Kaumälapa'u Camp on top, and Model T Fords carrying the pineapple on the road below (Fig. 8a). Figure 8b shows the dredging of Kaumälapa'u Bay, after the harbor and



10 PAGES. HONOLULU, TERRITORY OF HAWAII, MONDAY MORNING, JANUARY 28, 1924.

Scenes on the Coast of the Island of Lanai Where Hawaii's Biggest New Development Work Is in Progress

Figure 3. Initial work on Dole Harbor (source: Honolulu Star Bulletin. January 28. 1924).

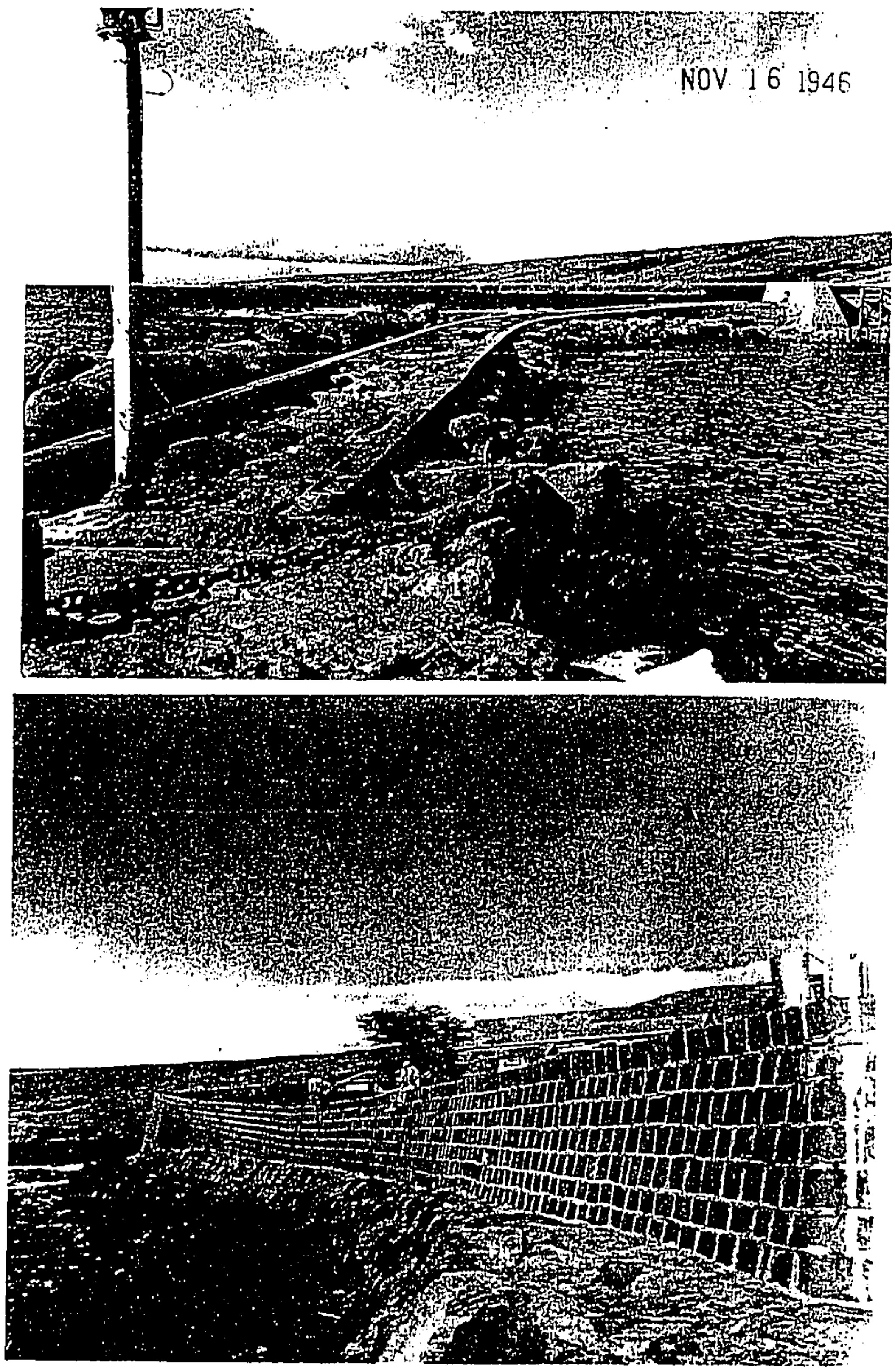


Figure 4. (a-b) Breakwater and Stone Wall surrounding Kaumālapa'u Harbor
(Source: Hawaii State Archives. Photos by Hawaii State Department of Transportation)

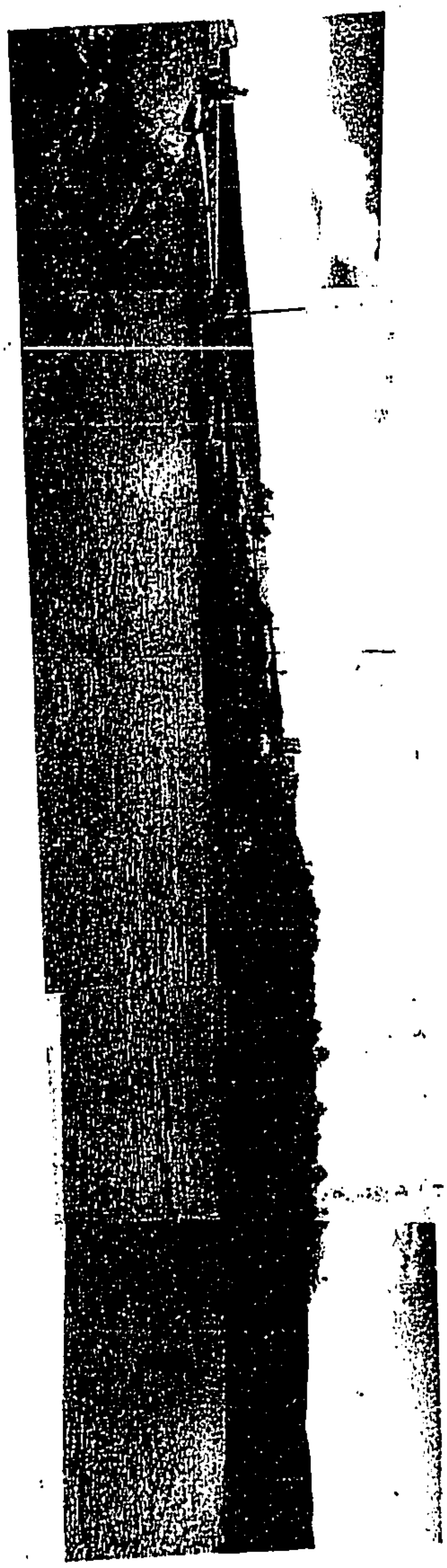


Figure 5. View from the breakwater, circling around to Kaumälapa'u Gulch/Valley.
(Source: Hawaii State Archives. Photos by Department of Transportation)

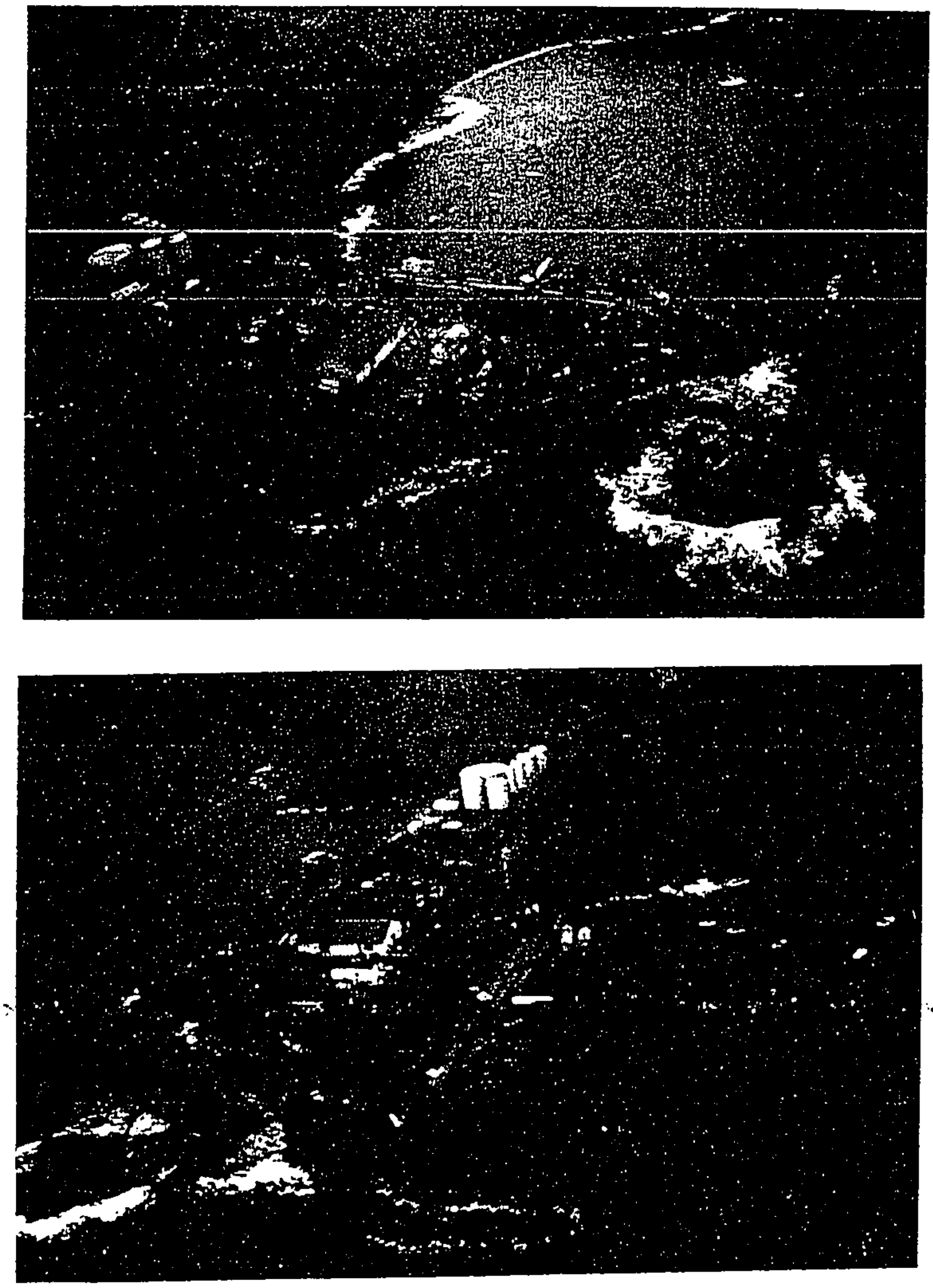


Figure 6. (a - b)Aerial views of Kaumälapa'u Harbor and Kaumälapa'u Gulch/Valley. (Source: Hawaii State Archives, Photos by Department of Transportation)

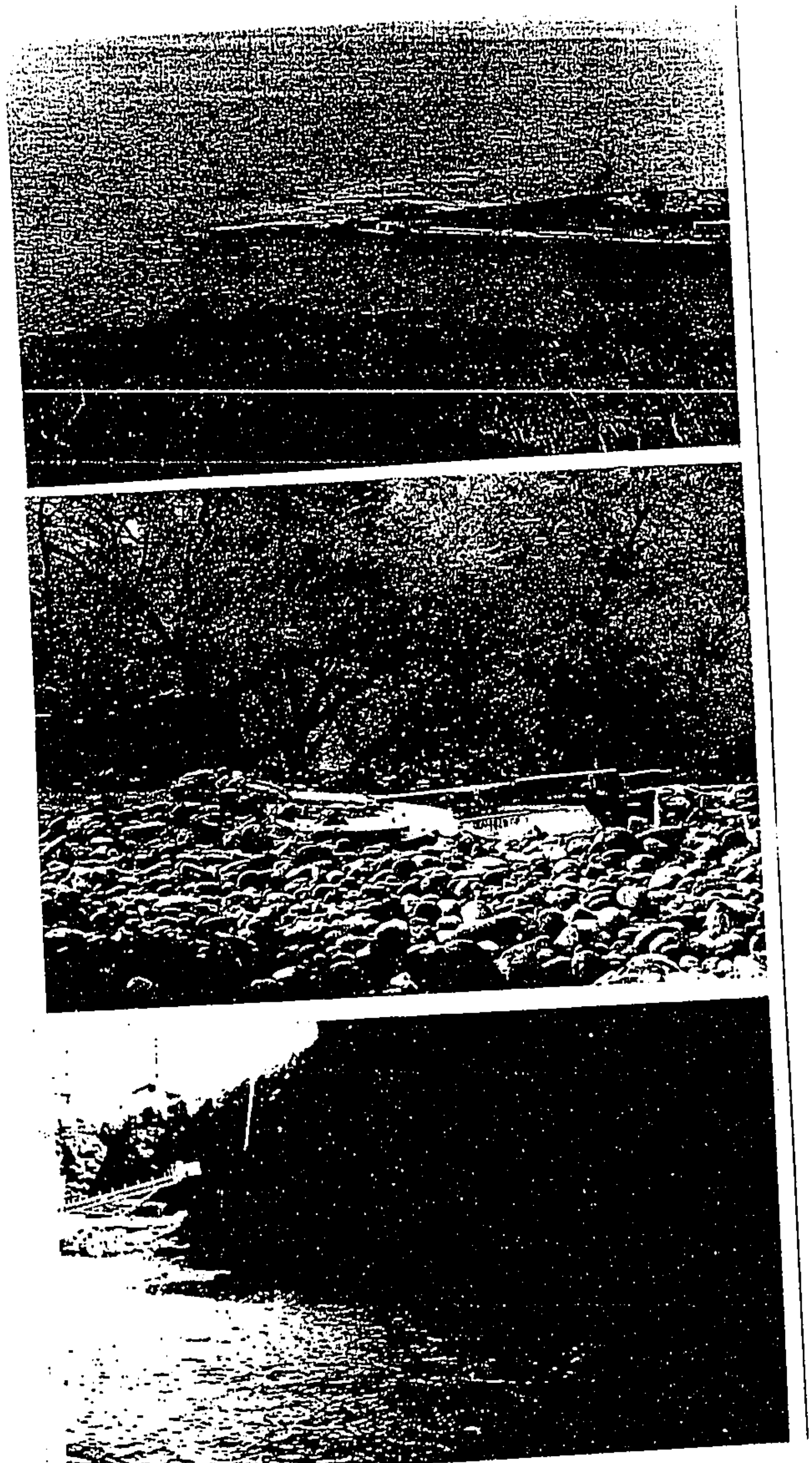
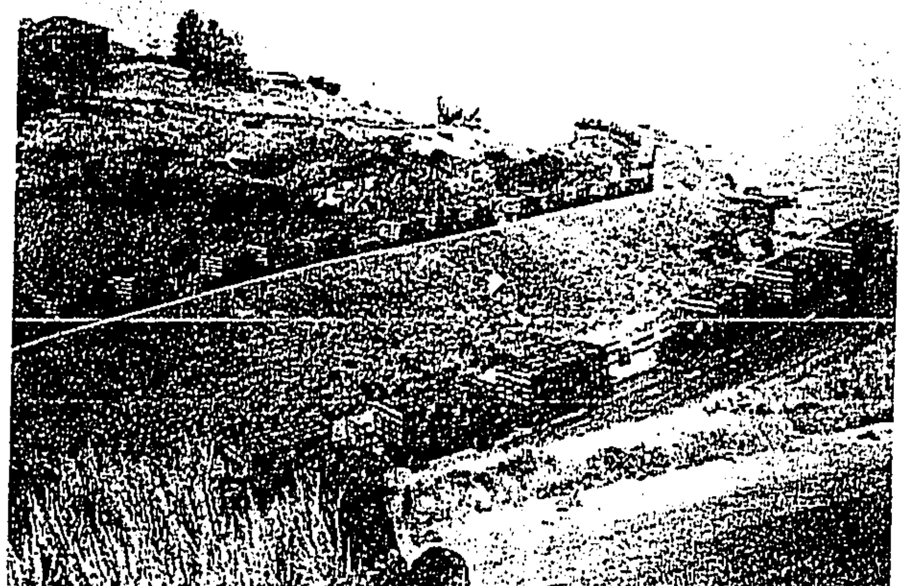
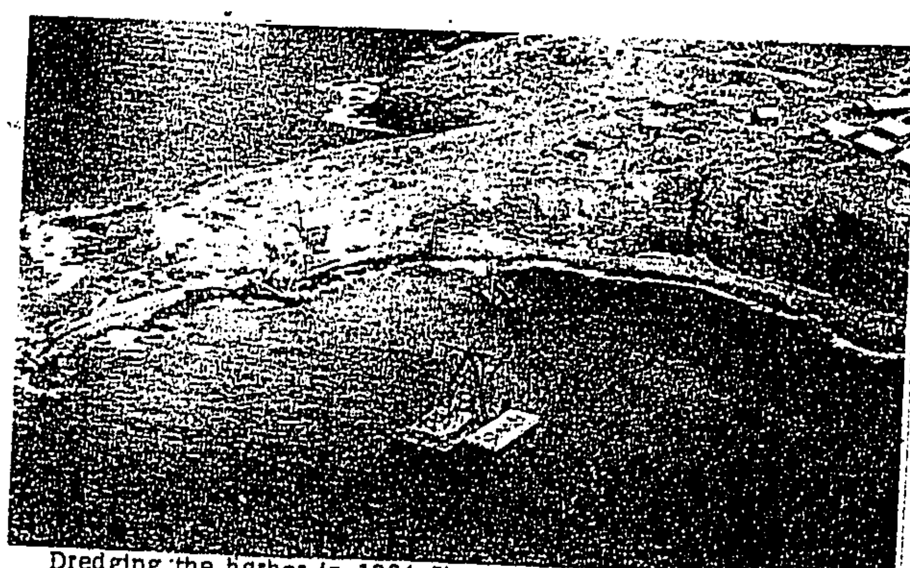


Figure 7. (a) H[illegible] [illegible] Kaumalapa'u Ridge, (b) Entrance to Kaumälapa'u Gulch/Valley, (c) Shoreline of old rail track leading into the gulch/valley.



Hauling fruit to Kaumalapau Harbor around 1931. Pineapples were packed in small lug boxes which had to be dumped by hand at the cannery.



Dredging the harbor in 1924 Jim Dole hired a well known engineer named "Drydock" Smith to design the port facility. More than 116,000 tons of rock were hauled in to make the breakwater.

Figure 8. (a) Wagon Carts and Model T Ford heading to the harbor, (b) dredging of the harbor with Kaumälapa'u /Harbor Camp houses on the ridge. (Source: The Pine Islander. June 30. 1967).

breakwater had been built, and Kaumälapa'u or Harbor Camp on the slopes above the harbor. According to the article in the *Pine Islander* (Vol. 9:6, June 30, 1967) Jim Dole hired an Engineer named "Drydock" Smith to design the port facility. Mr. Reinicke also recalls the mule wagon used on the tracks to go into Kaumälapa'u Gulch/Valley; he used to ride the wagon as a kid.

3.3.1 Previously Recorded Myths and Legends

Perhaps because of Läna'i's "social distance" from Oahu, Maui and Hawaii, some of the myths and legends associated with the "hard to reach" island create a sense of mystery or fear about the land and its people. The following exemplifies some of the written accounts. In the retelling of *The Bad Boy of Lahaina, the Goblin Killer of Läna'i,* Emerson states that the "goblins [*akuas*] of Läna'i were a dangerous lot" (Annual Report of the Hawaiian Historical Society 1920:16-19). Emerson was told this story by an old native while crossing on a whaleboat from Lahaina to Läna'i in 1920. An earlier incident echoes similar sentiments. "The Läna'i Horror" (*The Friend* 1892, Vol.50(7):49) documents an earlier incident involving a *kahuna anaana*, or sorceress, named Pulolo. Pulolo killed several family members on February 11, 1892, in Awalua, Läna'i; she was sentenced in Lahaina, Maui according to U.S. laws (ibid). According to Emory (in *Honolulu Star Bulletin* April 6, 1970, p.D-20), Läna'i was once known as the "evil island...because it was first thought to be inhabited by evil spirits...[that] were killed off by Kaululaau, son of the Maui chief, Kakaalaneo, who lived about 1400 A.D.

The importance of these accounts, specifically with reference to identifying TCPs, is that they reflect aspects of a native Hawaiian community on Läna'i at the turn of this century. All of these stories, regardless of the their main subject, indicate that traditional roles still existed. For instance, its rare that a *kahuna anaana* is mentioned in written documents; the fact that this role existed and was acknowledged as such by the people of Läna'i (and the courts) indicates that traditional roles were still observed.

3.4. HABS/HAER Documentation of Historic Properties

Historic structures such as breakwater at Kaumälapa'u Harbor, are properties that meet the criteria established by the National Register. The *Secretary of the Interior's Standards and Guidelines for Architectural and Engineering Documentation* (1983) outlines the documentation standards and guidelines for architecture. Standard 1 of these guidelines, reads as follows:

> Standard 1: Documentation shall adequately explicate and illustrate what is significant or valuable about the historic building, site, structure or object being documented. The historic significance of the building, site, structure or object identified in the evaluation process should be conveyed by the drawings, photographs and other materials that comprise documentation. The historical, architectural, engineering or cultural purpose of the documentation activity determine the level and methods of documentation. Documentation prepared for submission to the Library of

Congress must meet the Historic American Building Survey/Historic American Engineering Record (HABS/HAER) Guidelines.

4.0 Results of Oral Historic Studies of Kaumälapa'u Harbor

Information obtained through oral accounts about a historic property can significantly add to its value. It can also tell of a category of significance that is not embodied in the physical remains of a structure or site. Indeed, oral histories can create value when there seemingly does not appear to be any. Whether it be a story recalled or an experience shared, the information found through oral histories allows the listener to become a "participant" by creating an image or visual picture of what used to be. Appendix B is a list of individuals and groups contacted for the formal interviews; Appendix E (to be inserted later) is the written transcription of the oral interviews completed for this study. The information relating to TCPs has been gleaned from the interviews and presented throughout the remainder of this report.

Studies done by archaeologists who have looked at the historic sites at and in the vicinity of Kaumälapa'u Harbor (c.f. Emory, Kaschko and Athens, et al.) indicate the traditional and historical significance of this part of Läna'i Island. Oral histories show that the broader area upon which Kaumälapa'u Harbor borders also holds historical significance. These recollections do not necessarily point to site-specific events or locations, but rather tell of the general character of the physical environment within which historic events and activities occurred.

Recollections are stories and memories being recalled through first-hand experiences. These are from individuals who have either been residents or visitors of Kaumälapa'u Harbor and surrounding areas. Many of these do not indicate places or features that can be directly associated with traditional practices. Rather they tell of life or visitations to the ocean's shore. For instance, several individuals went to Kaumälapa'u to fish and/or swim. Others spent time visiting the area when the tugboats and containers arrived; these too were done for social-recreational purposes. A few former residents of Kaumälapa'u Camp recall spending their childhood years growing up at the seashore.

There are also traditions or re-telling of observances/practices, and perhaps stories, that are both first-hand experiences, as well as those that have been passed on from another generation or individual. These however, are uncommon since continued use of Kaumälapa'u, and indirectly the history associated with this continued use, does not exist. It is known however, that residential settlement at Kaumälapa'u coincides with the establishment of Camp Kaumälapa'u. The generations of elders or *kupuna*, who often are the bearers of historical lore, do not seem to have had a shared physical presence with the camp's residents. For instance, the archaeological features up on the ridge that borders the eastern boundary of Kaumälapa'u Valley, are not familiar to most former residents of Camp Kaumälapa'u. Although some of these features are clearly visible to the naked eye and people are aware of their existence, there isn't a known history of the use and meaning of these sites for the Hawaiians who built them.

Based on the information gathered from the interviews, it is clear that TCPs, as defined by the *Guidelines for Evaluating and Documenting Traditional Cultural Properties* (National Register Bulletin No.38) exist around Kaumälapa'u Harbor. It is equally clear that a second category that includes historic properties that hold local cultural significance but do not qualify under the established guidelines, also exists. These fall within the broader, cultural landscape of the area. The applicability of the term cultural landscape is not unique to Kaumälapa'u (c.f. Prasad 2001); it may more appropriately describe the traditional values associated with a place by Hawaiians and long-term residents of a place. After briefly discussing the applicability of TCP guidelines, the remainder of this section looks at existing and newly identified TCPs, and as well, at the applicability of cultural landscape

4.1. Application of TCP Guidelines to Kaumälapa'u Harbor

What constitutes a TCP at Kaumälapa'u needs to be established here. For the purposes of this report, it is important to note that there are no traditional/historic structural features or remnants of features within or adjacent to the harbor and the breakwater. Also, there are two very significant issues to consider with regards to the project area. First, the harbor and the breakwater are "not" traditional cultural properties. Both were constructed during the historic period. Second, use of the area...by the residents and community of Läna'i, has been continuous. Whether this use qualifies as "traditional" or "historic," is perhaps a matter of interpretation. While its historical existence and use will be briefly discussed below, it should be noted that interpretation of the guidelines define Kaumälapa'u Harbor as a "historic property" but not one that is "associated with cultural practices or beliefs of a living community that are rooted in that community's history, and are important in maintaining the continuing cultural identity of the community" (Parker and King 1995).

Kaumälapa'u Harbor is a historic property. The HABS/HAER photographs (Appendix F) that accompany this report are to accompany documents nominating the site to the National Register of Historic Places. The harbor was built in 1924 and is seventy-seven years old. The breakwater was built one year later. Changes to the original structure, primarily as a result of wind and ocean damage, have occurred several times over its lifespan. Use of the harbor and surrounding area by residents, both Hawaiians and non-Hawaiians, continues for fishing/recreational purposes. In that regards, traditional use for traditional purposes of the area has continued.

The area's continued use by residents of the community for purposes such as fishing, presumably from traditional times to the present, attests to its historic significance. Whether or not there is "continuation" of a practice or belief that is traditional is perhaps a matter of interpretation. It is proposed here that a separate category, which consists of properties bearing traditional cultural significance that fall "outside" the guidelines, be created.

In its discussion of TCPs and tangible cultural resources or historic properties, Bulletin 38 reads: "attributes that give such properties significance, such as their association with historical events, often are intangible in nature...properties and their intangible attributes of significance must be considered together" (National Register Bulletin 38:3). This consideration cannot be overlooked when referencing TCPs associated with Kaumalapau Harbor.

Following a brief discussion of the types of TCPs (newly [re]labeled and newly identified), the importance of the cultural landscape is discussed. As will be seen, known traditional and historic use of the area lend to the entire project area being classified as a TCP.

4.2 Previously Identified Properties of Cultural Significance

Previous archaeological work around Kaumälapa'u Harbor, and its surrounding vicinities has identified several traditional Hawaiian sites such as *heiau* and house sites (c.f. Emory 1969) in the general vicinity of the project area. Emory also located house terraces in Kaumälapa'u Gulch, and believes there were several smaller terraces in the area. Based on Emory's earlier work, it was assumed that archaeological and historic sites may be encountered in the project area. Also, based on the geographical make-up of the harbor area, it was assumed that Kaumälapa'u Bay is still a good fishing grounds as it was in historic times.

4.3 Identification and Delineation of New TCPs

No new Traditional Cultural Places that met the *Guidelines for Evaluating and Documenting Traditional Cultural Properties* (Parker and King 1995), were identified. Identification of new TCPs was a specific objective of this study. Oral histories, along with a review of historical documents, did not identify features or sites that qualify under this criteria within the immediate vicinity of the project area.

It should be noted that attempts to visit and identify potential TCPs was done with the help of several interviewees. Various historical maps of the project area and its vicinities were used to help identify historic features and sites.

A review and critical analyses of the interviews and integration of data from previous studies and other written sources were done. No TCPs were located within the immediate vicinity of the project area. However, based on interview results, several possible features/sites were investigated. In addition, one extensive archaeological complex above Kaumälapa'u Valley was identified, visited and reported to the CRM.

4.3.1 Historic Sites Associated with Fishing

Since the harbor was constructed in 1924, and a few residents of Kaumälapa'u Camp were available for the interviews, information about traditional uses of the area, including fishing, was gathered for this study. Fishing was and is a major activity at Kaumälapa'u Bay. The resources, their availability and accessibility have changed but the area's value as a special fishing grounds for Läna'i residents, has not changed. Maly's research (Appendix A) on land claims found:

> In the *Mähele 'Äina* (Land Division) of 1848, the *ahupua'a* of Kamoku and Kalulu were retained by the King (Kamehameha II), though the *'ili* of Kaumälapa'u 1 & 2 were given by the King to the Government (*Buke Mahele*, 1848:105, 209; and Boundary Commission Certificate No.'s 36 & 37). As *Konohiki* (Overseer) of the land of Kamoku on behalf of the King, Noa Pali reported that the *i'a kapu* (restricted fish) of Kamoku was the *uhu* (parrot fish), and the *lä'au kapu* (restricted wood) of Kamoku was the *koko* (*Euphorbia* spp.) (Interior Department Land Files – August 26, 1852). *Uhu* are still noted as an important fish of the Kaumälapa'u fishery to the present day (pers. comm., Henry Aki and Sam Kaopuiki).

Conversations with Hazel Maioho Tanegawa (see complete interview in Appendix E), a former resident of Kaumälapa'u Camp, describes fishing at her former home as:

> "almost all of us kids fished. Mr. Aikala, Martin, every so often he would gather the kids, he would go diving with the bigger boys, and we'd just tag along. With his wife Grace...we'd catch crabs and *opihi*. It was beautiful growing up down there...we all looked out after one another. I still go fishing at the harbor but only at nighttime. Now we catch *enenue*, *mempache*, *papio*... But there's a Big change – not like how we used to catch. Back in our days, we only caught enough to eat. We had three bags we'd take down there. One bag was for *aama* crab, one bag for *ahukihuki*, the round purple things with hats [urchin], and one bag for *opihi*. When I was young, we used to fish during the day. It was faster to fish...now you stay overnight, you might walk away with two [fish]. Still have crab [referring to *aama*] but not as galore. *Aama* crab was hundred of them [back then].

Fish such as *uhu* were still important during Hazel's earlier time at Kaumälapa'u Camp. She refers to change not just in the numbers and availability of fish but also the ocean environment. She went to add that "it is more rough, bigger waves nowadays".

Access to fishing whether by boat or off the shoreline, is easily attained at Kaumälapa'u. One of the sites immediately *mauka* of the harbor is called "Fisherman's Trail". In the 1862 letter requesting settlement and use of Läna'i, even Gibson indicates the importance of fishing as the primary source of subsistence for the island's inhabitants. The village of Kaunolu, just to the south of Kaumälapa'u was known as a "fishing village". Given its proximity to Kaumälapa'u, it is highly likely that neighboring Kaumälapa'u also offered good fishing grounds to Hawaiians. The Kaumälapa'u Trail (Fig. 2), extending close to Läna'i City, also adds to the significance of the use of the area. The trail ends at the former Kaumälapa'u Camp, just above the above current harbor.

Mr. Henry Aki, a former Harbor Supervisor, was one of the last occupants/users of Kaumälapa'u Valley. He told Maly (Appendix E) that one building, the 'Scout House,' from the old Hawaiian Dredging camp in Kaumälapa'u Valley was still extant in the 1940s, and he secured a lease of the valley from the company which he retained until the late 1980s. The old Scout House had deteriorated, so Mr. Aki took it down, and used the foundation to build another small house. His primary interest in Kaumälapa'u Valley was as a base camp for fishing. A trail down the side of the *pali*, from the Harbor Camp, was his main route of access.

While Mr. Aki, had seen, and traveled past the platforms and other features on the Kalulu Bluff of Kaumälapa'u, he did not recall anyone ever speaking of the sites, or giving them names. Though in his time, elder Hawaiian residents did still go to certain areas on the bluff to *kilo i'a* (spot fish) and direct the fishermen to the schools. Daniel Kaopuiki Sr. had told Mr. Aki that Hawaiians once lived at Kaumälapa'u and that it was an important fishing area. He was also told that water for the old residents was found a little ways up the valley, in a well. In the old days, *akule* were caught near the shore fronting Kaumälapa'u Valley. The schools would still come in occasionally throughout the years that Mr. Aki worked at the harbor.

Mr. Aki's mother, Ella Kekai Haia-Aki, and other old Hawaiian residents of Kaumälapa'u regularly gathered *limu* (seaweed) such as the *kohu* and *līpoa* from along the shoreline. They also gathered various near shore fish and crabs, and the elder Mrs. Aki, regularly gathered *pa'akai* (salt) from *käheka* (natural salt basins) at the front of the cliff near the Kalulu-Kamoku boundary (in area of the lighthouse). The *pa'akai* was used for all home needs and salting fish caught in the surrounding fishery. Among the fish regularly caught around Kaumälapa'u were the — *uhu, kole, akule, 'ü'ü, nenue, päpa'i,* and *'öpihi.* Families also regularly fished from the breakwater, and around the point towards Kalamanui Valley. Sharks were known to come into the bay, but Mr. Aki's mother instructed him not to bother them; they were considered family, and would not bother him.

Samuel Kaopuiki, who was born in 1925 at Keömoku, Läna'i, has been a fisherman all of his life, and regularly fished at Kaumälapa'u. His elder brother Daniel Kaopuiki Sr. lived and worked at Kaumälapa'u as well, and his own job with the plantation had him regularly at the harbor. Kaumälapa'u is an important fishery. There were all kinds of fish that he would catch at Kaumälapa'u. Among them were the — *'äholehole, uouoa, moi, uhu, akule*, and many others. The *akule* used to school in Kaumälapa'u. But now, because people take everything, and don't think about tomorrow, there are very few fish (it's not like it was before). Mr. Kaopuiki's primary methods of fishing included *kamäkoi* (pole fishing) and *ku'u 'upena* (net fishing). He noted that before days, in his father's and kupuna's time, the families used to travel across the island on trails, fishing seasonally at Keömoku and vicinity, and at other times, fishing at Kaumälapa'u. He did not know of any *ko'a* (fishing station markers or triangulation points) at Kaumälapa'u. He is certain that in earlier times, various points, hills, and perhaps in later times, even the lights at the harbor were used to mark various fishing spots.

4.3.2 Kaumälapa'u Camp (also called Camp Kaumälapa'u or Harbor Camp)

According to Henry Aki, among the residents of Harbor Camp (see Fig. 8b) were: Buck Manriki (his house was the first house on the bluff, overlooking the area of the fuel storage tanks); Alfred Kimokea; Manuel Pavao (two houses – his last residence being the brick house which has been remodeled and is now the first house seen when driving into the camp); Junior AhLeong Aki; Shigeru Yagi; Nakama; Hashiba; Captain Kealahao; Lono Pokipala; John Kaiaokamalie; Daniel Kaopuiki Jr.; John Kauwenaole; Asing Ahyo; Alex Maioho; Joe Kaehuaea; Martin Kaaikala; Sonny Fernandez; Minoru Oda; Matsuda; and Henry Aki (his house was the last one on the bluff overlooking Kaumälapa'u Valley; near the trail head that went into the valley). There were also at least two long garages; a pool hall; a rooming house (in which six single men lived); a bath house (prior to inside plumbing being installed in the houses); a duplex house; and baseball field.

One of the former residents of Kaumälapa'u Camp is Hazel M. Tanegawa. Born in 1940, she lived at the camp until December of 1958, when she left for college. The camp had about nineteen homes, all which were built plantation style. Of these, only three remain today. She recalls there being a park (the site of the current homes), "they had three swings. We used to play on them all the time. The foundation for these swings is still there.. There was a duplex for the captain of the tugboat, and a complex, like an apartment for all single men. Tom Knott was the tugboat captain at that time."

Hazel recalls that during the war (1942), "we had to move up to the city...so no lights on the roadway. Couldn't travel on road with light so dad had to move us up. We had to move back [to Kaumälapa'u Camp] in two years". When growing up in Kaumälapa'u Camp, there was a shack in Kaumälapa'u Gulch. There weren't any houses in there. "A Filipino man, [she forgot his name] used to raise pigs in the gulch. He also had chickens and dogs. He used to bring slop in nearly every day to feed the pigs. We used to wonder how he got all the slop into the gulch...it was a tough walk along the beach side. There were trails that went into the gulch but these were too steep to walk, and too steep to carry the heavy slop. After the Filipino man left, Mr. Aki went down in there."

Hazel also remembers the breakwater. This was a special place for her and her family. The breakwater "used to be so long...every week was clean-up, come Friday, they'd run the water and wash down the docks. They run the water, had one big hose. We had three tanks, four way above the highway. Two in the camp, one down the harbor side. The tank [at the harbor] was used only to wash down the harbor area. The washing was done by the guys who worked at the harbor. They used to keep is so clean. Every year we had luau, for Christmas, down there. Manual Pavao, the company foreman, used to have the harbor all washed down for the luau."

Albert Reinicke, whose father was John Kaonaole, grew up around Kaumälapa'u. He recalls Harbor Camp, and the kids that used to play there. Mr. Reinicke currently works at the Läna'i landfill/dump; he drives one of the trucks bringing in waste to the dumpsite. The dumpsite is approximately half a mile from Kaumälapa'u Harbor.

4.3.3 Archaeological complex on Kaumälapa'u Ridge

Standing on the breakwater and looking east, a wall structure is clearly visible. Several other possible structures or their remnants are also visible. A visit to the structure, approached using goat trails up the southern slope of Kaumälapa'u Gulch, shows a very large prehistoric complex with a series of structure covering the entire hill slope. These features are of various sizes and dimensions, e.g. C-shaped structures, terraces, a rectangular walled enclosure with an upright slab, etc. In Emory's earlier work (1967), he found "a house site" at the edge of a sea cliff south of Kaumälapa'u. It is very likely however, that Emory did not visit the site located during the current study since he would have seen and noted the large number of features. The extensive complex is also not featured on his survey map of the area.

Information gathered from the interviews indicate that there are one and possibly two *heiau* on the slope. According to Lee Tavares, her husband Ernest who purchases heavy equipment for the Läna'i Company, has visited the sites and knows of their 20th century use as a fishing shrine (*koa*). Ernest also knows of older fisherman who still visited the *heiau* until approximately twenty years ago.

Mr. Solomon Kaopuiki, born at Keömoku in 1919, is a descendant of several generations of Läna'i families (Appendix E). Mr. Kaopuiki is well known for his knowledge of Läna'i's cultural and natural landscapes. While he did not hear specific name references for the features on the Kalulu Bluff over looking Kaumälapa'u Bay, it is Mr. Kaopuiki's understanding (from elders) that in the old days, people lived at Kaumälapa'u and vicinity. The land was different, and families could grow sweet potatoes and similar crops there. There was also some water available in the valley. Kaumälapa'u was an important canoe landing and fishery in the old days.

Strewn throughout the complex are empty bullet casings, in what appear to be hunting activities (Axis deer were observed in the area during the field study). However, according to Hazel Tanegawa, a former resident of Kaumälapa'u Camp, the ridge across from their houses was used as a target practice range by the men of the camp. She remembers watching, "from across the camp, they would shoot…guys from the camp would use for target range…that's why there's shell casings up there". Whether hunting took place alongside with target practice is not known; the area however, has had some historic disturbance.

4.2 The Cultural Landscape: Sites without Physical Markers

> "…geographical landscapes is more than a valuable resource for exploring local conceptions of the surrounding material universe. It may, in addition, be useful for interpreting forms of social action that regularly occur within that universe. For landscapes are always available to their seasoned inhabitants in more than material terms. Landscapes are available in symbolic terms as well, and so, chiefly through the manifold agencies of speech, they can be 'detached' from their fixed spatial moorings and transformed into instruments of thought and vehicles of purposive behavior" (Basso 1996:75).

Oral traditions and oral histories have been a significant component of Hawaiian culture since before written records of these were available. Chants, myths and legends make up the bulk of what is known about the Hawaii of yesteryear. Rarely is an archaeological report completed without reference to writers such as Fornander, John Ii, S. Kamakau, Handy and Pukui, et al., who have written these histories in various forms. These oral traditions and histories are significant cultural properties of Hawaiians, and serve as an example of property that has no physical markers.

First, it is important to discuss how names of places signify meaning to a group or people. The translation of Kaumälapa'u or why the area was given this name, was not directly found in historical sources (c.f. Emory 1969) or known to those interviewed. (It was also not found in *Place Names of Maui*.) According to Keone Nunes (pers. comm.), at least two possible interpretations can be made of Kaumälapa'u. These are as follows:

Kau = yours
Mala = ache or pain
Pau = finish

Using the above, Kaumälapa'u could mean "cessation of pain". As Keone explains, it could indicate a safe harbor if currents lead directly into the bay. This would be appropriate given that the bay opens up directly to the ocean but also provides shelter. Keone suggested that it is also possible that *umala* is the name of the wind in the area. In some interviews, recollections were made of the heavy winds (as well as the calm periods) that came into the bay.

The naming of Kaumälapa'u, as with place names throughout the islands, show the meaning Hawaiians associated with physical spaces. The original intent of the meaning may no longer be known, however, the fact that landscapes can be are symbolic lends to the possibility of defining the landscape as a traditional cultural property. The value arises not from the "spatial moorings" as Basso so adequately describes, but rather from the symbolic value the landscape represents.

One of the written legends that tells of the cultural and traditional significance of the Kaumälapa'u area, and is widely supported by oral history, is presented here by Maly (Appendix A).

Kaumälapa'u (Kamoku Ahupua'a) in Native Traditions

A significant native tradition of Läna'i, which is in part centered at Kaumälapa'u, is associated with a waterspout and cave known as Puhi-o-Ka'ala (literally: Waterspout of Ka'ala). Puhi-o-Ka'ala is situated on the shore, along the southern (Kamoku-Kalulu) boundary of Kaumälapa'u Bay (*Figure 3*). Emory (1924) reported that the tradition "*Puhi o Kaala*" was first publicly told in 1868, at the request of Lot Kamehameha (Emory 1924:23). Walter Murray Gibson (one time resident and owner of large tracts of land on Läna'i), reportedly learned the account from M. Kekuanaoa (who accompanied Kamehameha I on Läna'i), and from Pi'ianai'a who had also resided on the island. Gibson first published the account in the Hawaiian Newspaper "*Nu Hou*" in 1873; King Kaläkaua, retold the story in his book "*Legends and Myths of Hawaii*" (1888).

The waterspout and a cave associated with it (which according to tradition, also contains the remains of Ka'ala and Ka'aiali'i), is one of the famous storied places (*wahi pana*) on the island of Läna'i. As a youth growing up on Läna'i, Maly learned the *mo'olelo* (tradition) from elders of the Kaopuiki family, and the account was spoken of by individuals who participated in the limited oral history-consultation program conducted as a part of the present study.

Emory (1924) provided readers with the following summary of the account:

> *After Kamehameha had conquered all the islands he visited the village of Kaunolu to fish and sport. His residence was on the bluff which forms the east side of the bay, overlooking the village, the temple and the bay. Natives came from all over the island to view the sports which would be held for Kamehameha's entertainment.*
>
> *One of the events was a wrestling match between Kaaialii, warrior of Kamehameha, and Mailu, for the beautiful girl Kaala. Kaaialii was victorious, but the father of Kaala, Opunui, was not willing that he should have the girl, because Kaaialii had driven a friend of his over the cliff at Hookio in the battle of Kamokuhi.*
>
> *Opunui succeeded in getting Kaala away by telling her that her mother was dying at Mahana. But instead of taking her to Mahana, he led her away to Kaumalapa'u and hid her in the sea cave with an under-water entrance, on the south side of the bay. This cave is called Puhi o Kaala, The Spouting Cave of Kaala.*
>
> *Ua, a lover of Kaaialii, told him that Kaala would be hidden by Opunui. He immediately set out to find the father. When Opunui saw Kaaialii he fled for his life and was saved by being able to reach the heiau of refuge at Kaunolu a few moments before Kaaialii.*
>
> *Kaaialii wandered over the island till at the spring Waiakeakua he met a priest from whom he forced the secret of Kaala's hiding place at Kaumalapa'u bay.*
>
> *Kaala had tried to escape by swimming under water, but her strength was not enough. Kaaialii found her half drowned and so badly bitten by eels that she expired soon after. (Emory 1924:23).*

Names of places show the meaning Hawaiians associated with these physical spaces. The fact that landscapes can be symbolic lends to the possibility of defining the landscape as a traditional cultural property. The value arises not from the "spatial moorings" as Basso so adequately describes, but rather from the symbolic value the landscape represents.

Except for the account of Puhi-o-Ka'ala, Mr. Henry Aki had not heard of there being known *ilina* (burials) around the harbor. Mr. Aki also noted that it was the practice of the old residents to leave Puhi-o-Ka'ala alone (not to *maha'oi*, and see if one could dive into it and find the cave etc.). It was the general practice of his mother and other old Hawaiians who lived at Kaumälapa'u, to respect and leave the old places alone. Puhi-o-Ka'ala was known to all of the old Hawaiian families, and pointed out as a storied place at Kaumälapa'u.

Surmising from the vast archaeological features on the cliffs above Kaumälapa'u Gulch, Kaumälapa'u Harbor was probably a very important settlement (seasonal and/or permanent) for native Hawaiians. It is also likely that terraces existed in the Kaumälapa'u Gulch/Valley, as assumed by Emory; no visible evidence of these are present largely due to the continuous historical disturbance in the area. The archaeological features are no longer in use.

5.0 Summary: Cultural and Historic Significance of Kaumälapa'u Harbor

There are features, sites and areas of significance associated with Kaumälapa'u Harbor. These continue to hold meaning for those born to the land or those whose paths have crossed the lands. Some of the traditional meaning and/or value of the area have been lost. This perhaps is due more to disruptions and changes brought on by historical developments such as building of the harbor and breakwater, than to a decline of the native inhabitants of the area. As to be expected, the interviews reveal that overall memories and experiences of the people who have past or present association with Kaumälapa'u vary. Memories are very personal...one person's history and experience invariably differs from another's. Added to this is the factor of time – as it passes, so does the ability to re-associate all events and places.

Most people had some knowledge about historical sites, such as the heiau complex atop Kaumälapa'u Ridge. The designation of TCP to a specific feature or site however, in general, seems to become less informative as time passes and these sites or features are no longer used. Cultural landscapes, however, seem to maintain their traditional and historical meaning.

The oral histories done for this survey come about nearly 75 years after construction began on the harbor area. It is unclear the extent to which this area was used (for traditional purposes) prior to construction-related activities. There has always been some use of Kaumälapa'u Harbor but how much of that has changed since prior to contact and in traditional ways, is difficult to ascertain. It is reasonable to assume that much of the "traditional uses" of the area was discontinued by the time pineapple farming became established on the island. Fishing is a traditional activity, and fishing is a modern activity. It's a practice that continues but has changed in technology as well as in the availability of resources, e.g. types of fish. So traditional uses of the ocean area have continued but all traditional activities are no longer known nor conducted. The area has lost that character. As a result, the Traditional Cultural Properties, those which meet the definition and guidelines of the National Register, and as well the cultural landscapes that hold traditional meaning to native Hawaiians, became nearly non-existent. Physically that is. What remain are the memories of the people who created or inherited the traditions that bring value and significance to these features and places.

Kaumälapa'u Harbor and the breakwater are now important for the more familiar, non-traditional, but historically significant activities. These speak to the importance of having this area as a resource that allows the people to sustain these historically significant activities. The harbor itself has become a place of importance for the current residents of Läna'i.

REFERENCES CITED

Basso, Keith H.

1996 *Wisdom Sits in Places.* Keith H. Basso, University of New Mexico Press, Albuquerque.

Emerson, O. P.

1920 *The Bad Boy of Lahaina, The Goblin-Killer of Lāna'i.* In Annual Report of the Hawaiian Historical Society 1920:16-19.

Emory, Kenneth P.

1969 *The Island of Lāna'i: A Survey of Native Culture.* Bernice P. Bishop Museum Bulletin No. 12, Honolulu.

Gibson, Walter Murray

1862 Letter to the Honourable Secretary of the House of Nobles, Honolulu.

Honolulu Star Bulletin

1970 Lāna'i: Its Sacred Hawaiian Lands Are Undisturbed. Honolulu Star Bulletin, Thursday, April 16, 1970, p.D-20.

Kaschko, Michael W. and J. Stephen Athens

1987 Archaeological Inventory Survey of the Hulopoe Bay and Manele Bay Areas, Island of Lāna'i. International Archaeological Research Institute, Inc., Honolulu.

Dole Company

1931 *Years on Lāna'i.* Publication of the Lāna'i Plantation Division, Dole Company.

Maly, Kepa

2001 "Kaumālapa'u (Ahupuaa of Kamoku, Island of Lāna'i." Ms. Prepared by Kumu Pono Associates for Social Research Pacific, Inc. (Appendix ? in this report).

Parker, P.L. and King, T.E.

1995 Guidelines for Evaluating and Documenting Traditional Cultural Properties. National Register Bulletin 38, National Park Service.

Prasad, Usha K.

2001 Planning Level Oral history Survey, Makua and Kahanahaiki Valleys for Traditional cultural properties at the u.s. Army Makua Military Reservation, Waianae, Oahu island, Hawaii. Report prepared by Social Research Pacific, Inc., for U.S. Army Engineering District, Honolulu.

Rowntree, Lester B.
1996 *Concepts in Human Geography.* Carville Earle, Kent Mathewson and Martin S. Kenzer, Eds. Rowman & Littlefield Publishers, Inc., Lanham, Maryland.

The Friend
1892 The Läna'i Horror, *The Friend*, Vol. 50(7):49.
1892 The Plateau Island of Läna'i, *The Friend*, Vol. 50(12): 95-96.

U.S. Department of Interior
1983 "Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation" (48 CFR 44716). September 29, 1983.

Wentworth, Chester K.
1925 *The Geology of Läna'i.* B. P. Bishop Museum Bulletin 24, Honolulu.

APPENDIX A

Summary Report: Kaumälapa'u (Ahupua'a of Kamoku, Island of Läna'i) Traditional Cultural Places Study – Kaumälapa'u Harbor Project.

Prepared by Kumu Pono Associates.

To be Inserted

APPENDIX B

List of Individuals Interviewed/Consulted for Oral Historic Studies for the Determination of Traditional Cultural Places at Kaumälapa'u Harbor, Läna'i

1. Solomon Kaopuiki
2. Edean Desha (and daughters)
3. Henry Aki
4. Samuel Shin
5. Hoss Richardson
6. Lee Tavares
7. Chelsea and Rick Trevino
8. Samuel Kaopuiki
9. Alfred Kimokeo
10. Solomon Kahoohalahala
11. Albert Reinicke
12. Joanna Vawara
13. Roland Lee
14. Hazel Maioho-Tanegawa

The following individuals resided or worked at Kaumälapa'u:

1. Josephine Kauwenaole
2. Grace Kaaikala
3. Harriet Maioho
4. Shigero Yagi
5. Clarence Lincoln
6. Mamo Aiona-Fernandes
7. Ben and Cissy (Kauwenaole) Kaaikala
8. Hazel Maioho-Tanegawa
9. Mr. Minoru Oda

APPENDIX C

Questions on Traditional Cultural Places at Kaumälapa'u Harbor, Läna'i

The following questions are meant to provide a basic format for the oral history interviews. The historian's personal knowledge and experiences will provide direction for the formulation of other detailed questions, determine the need for site visits, and/or other forms of documentation that may be necessary.

Oral Historian-Family Background:

Name: ______________________________ Phone: ______________

Address: ____

Interview date: ___________ Location: ________________________

Where were you born: ____________________
When were you born: ____________________

Parents (father): ____________________
(mother): ____________________

Where did you grow up: ______________________________________

How much of your life has been spent on Läna'i: ______________

a) Did you spend much time around Kaumälapa'u Harbor: ______________

b) If yes, then what length of time: ______________________________

- Additional family background pertinent to the project area, e.g. generations of family residency in the area and approximate time period:

What activities (types of traditional land use practices such as fishing, boating, etc.) took place there? How long did these continue during your lifetime?

Did you use other areas adjacent to the harbor?

How did you learn about these areas, and their significance (was it passed on from your parents/elders?, did you use the area for such practices, etc.)

Do you remember who else used the area (family names), such as your neighbors? Do you remember names of any other people who may have historical knowledge about the area?

Do you have any early photographs, maps or written account of the area?

Do you remember when the harbor was built? Who built it and what was it used for?

What meaning does the harbor, and the area, hold for you today?

Note: Family names (claimants of *kuleana* lands) who can be inquired about

APPENDIX D
Personal Release of Interview Records

Title of Project: **Oral Historic Studies, Kaumālapa'u Harbor, Lāna'i**

Study Purpose:

1) You will be asked for your personal insights and remembrances concerning your knowledge about Traditional Cultural Places at Kaumālapa'u Harbor. The focus lies on recording your recollections and knowledge in an effort to identify these sites/features within the valley.
2) The information you provide will be recorded, transcribed, and presented to the U.S. Army Corps of Engineers, and may be made available to the Department of Land and Natural Resource – State Historic Preservation Division. You will be sent a copy of your transcription upon request. Any information you would like to add or delete will be noted at this time.

Benefits: This information will help determine the types of traditional (Native Hawaiian) land uses at Kaumālapa'u Harbor. It is knowledge that is not readily available or known to others.

Confidentiality: The information sought is based on your personal knowledge and insights about this period of history. Use of names for quotations, paraphrasing, and support of other participant information will greatly benefit this study.

Liability: Your signature and consent to participate in this study assures you will not hold the interviewers liable.

Participation: Your participation in this study is voluntary (If you wish to withdraw consent and stop participating, you can). Your signature acknowledges that you have read the information stated and willingly sign this consent form. Your signature also acknowledges that you have received on this date signed, a copy of this document containing 1 page.

Participant name (printed)____

Participant signature______________________________ Date____________

Interviewer's signature____

Contact Name and phone number for Questions: Kepa Maly, 668-1295/384-6656
Or Usha K. Prasad @: 808-263-3114).

If consent given for taped interview, transcript made from recording: Yes ____ No ____
Transcript made from expanded notes of unrecorded interview (if consent given only for written interview):
Yes ____ No ____

Note: a copy of this consent release form will be given to you, the U.S. Army Garrison, and the Army Corps of Engineers, Ft. Shafter.

APPENDIX E

Transcripts of Oral Interviews completed for Oral Historic Studies, Kaumälapa'u Harbor, Läna'i

Hazel Tanegawa
(Interiewed via telephone 8/30/01 and 8/31/01)

Hazel Maioho Tanegawa was born and raised on the island of Lanai. She is part-owner of Tanegawa's Restaurant in Lanai City, which she operates with her second husband who is a former Oahu resident (Phone: 565-6537). Hazel was born in 1940, at Lanai Hospital, and grew up at Kaumalapau Camp. She has two brothers and a sister. She lived there until December 1958.

She lived in one of the plantation homes at Kaumalapau. There were about 19 homes; only three of these remain today (one is the man Kepa and I went to see but who is no longer well enough to talk). Up at the park (the site of the current homes), "they had three swings. We used to play on them all the time. The foundation for these swings is still there". There was a duplex for the captain of the tugboat, and a complex (like an apartment) for all single men. At that time, Tom Knott was the tugboat captain.

In 1960, her mom had an accident and lost both arms. Because of her mother's disability, the company (Dole I assume) had to put her in a "flat ground home". After her father died, her mother no longer wanted to return to Kaumalapau. She left Lanai when she graduated from High School, so she could go to college. She recalls that during the war (1942), "we had to move up to the city...so no lights on the roadway. Couldn't travel on road with light so dad had to move us up. We had to move back in two years".

When growing up in Kaumalapau Camp, there was a shack in Kaumalapau Gulch. There weren't any houses in there. A Filipino man, [she forgot his name] used to raise pigs in the gulch. He also had chickens and dogs. He used to bring slop in nearly every day to feed the pigs. We used to wonder how he got all the slop into the gulch...it was a tough walk along the beach side. [this means that the road was no longer there...from the rail]. There were trails that went into the gulch but these were too steep to walk, and too steep to carry the heavy slop. After the Filipino man left, Mr. Aki went down in there.

The Breakwater "used to be so long". Every week was clean-up, come Friday, they'd run the water and wash down the docks. "they run the water, had one big hose. We had three tanks, four way above the highway. Two in the camp, one down the harbor side. The tank [at the harbor] was used only to wash down the harbor area. The washing was done by the guys who worked at the harbor. They used to keep is so clean. " every year we had luau, for Christmas, down there. Manual Pavao, the company foreman, used to have the harbor all washed down for the luau.

Fishing – "almost all of us kids fished". Mr. Aikala, Martin, every so often he would gather the kids, he would go diving with the bigger boys, and we'd just tag along. Along with his wife Grace, we'd catch crabs and opihi. "it was beautiful growing up down there...we all looked out after one another". Hazel still goes fishing off the harbor but only at nighttime. She catches Enneui, mempache (and one other fish that I couldn't understand).

But there's a "Big change – not like how we used to catch. Back in our days, we only caught enough to eat. We had three bags we'd take down there. One bag was for Aama crab, one bag for Ahukihuki (round purple things with hats...urchin), and one bag for opihi. When I was young, we used to fish during the day. It was faster to fish...now you stay overnight, you might walk away with two [fish]. Still have crab [referring to Aama] but not as galore. Aama crab was hundred of them [back then].

On the heiau's and traditional sites up above Kaumalapau Gulch. Hazel remembers seeing them (the stone wall foundations) from down below and across the way. They never went to touch the rocks but respected them. We also respected the Filipino man and never went into the gulch to see what was there. We never did those things. There was mango [in the gulch], we used to go for that. Men used to use that area [slope with heiaus and foundations] for target practice. From across the camp, they would shoot. "guys from camp would use for target range. Target range for Kaumalapau men...that why there are empty shell casings up there. (Doesn't know about the cement hooks with cables running through).

Hazel's looking forward to having the breakwater rebuilt. She says the waves coming in now are very high. Its dangerous for the boats coming in. "The whole bay we swam in, from one end to the other end. Now its so scary, the waves are so strong. More waves now then ever before". People my age, their children still go and swim there.

Q: was the rail or a road still there along side the shoreline, leading into Kaumalapau Gulch?

Henry K. Aki, July 26, 2001
Former Kaumālapa'u Resident and Retired Harbor Supervisor
Henry Aki was born in 1924 at Lāhainā. He shares familial relations with noted fishing families of the Lāhainā Region (Maui), and Lāna'i. As a youth, he was brought to Lāna'i by Daniel Kaopuiki Sr., and spent summers on Lāna'i. In 1941, he moved to Lāna'i, first living with *kupuna* of the Makahanaloa line at Pālawai. In 1942, he and his mother (Ella Kekai Haia-Aki) moved to Kaumālapa'u, and Henry began a life-long career, working at the harbor. Henry Aki retired from his position as Harbor Supervisor in 1986.

The following expanded notes are a summary of key historical points regarding Kaumālapa'u—including: traditional practices; residency; and harbor matters—which Mr. Aki recalled. The notes include both his personal experiences and references to earlier events of which he learned from others who were connected with harbor and breakwater development.

Harbor and Breakwater Development 1924-1926
(from conversations with Manuel Pavao, Construction Site Supervisor and first Harbor Supervisor; and others who worked in the early period of harbor use):

- When work on the harbor, wharf, and breakwater was begun, Hawaiian Dredging set up its' base camp in Kaumālapa'u valley. Temporary houses for laborers (including island residents and others from neighbor islands) were set up in the valley, from about 100 feet behind the shore.
- A road from the valley along the shoreward lava flats, out to the area of the present-day wharf was made. It was on this road, that access from the valley to the job site was gained.
- Boulders from the Kaumālapa'u valley were taken off the cliffs, and transported via a track (hauled by mules), along the near-shore road for fill behind the wharf and on part of the breakwater.
- Caves in the Kaumālapa'u valley cliffs were used by laborers to store tools and supplies. Through the 1940s, tools such as chisels and mallets were still occasionally found in caves in the valley.
- Large boulders for the breakwater were also harvested from the Waiakeakua flats, below the Pu'u Manu vicinity.
- Sections of the cliffs on the wharf side of the harbor were leveled and dropped in the water to make fill for the wharf.
- The area from the water-edge of the wharf to around 20 feet inland is supported on pilings, with the fill extending inland from the pilings. Mr. Aki noted that the pilings are cement with heavy rebar inside, and when he was still working at the harbor, he had made recommendations that the pilings be repaired (no work was done on them). His recommendation was based on diving inspections he'd made under the wharf, where over the years, he'd noted that in some areas, the cement was cracking and the iron expanding, thus weakening the pilings.
- Houses developed on the bluff overlooking Kaumālapa'u Bay (Harbor Camp) were built only for harbor employees. A trail along the front (*makai*) side of the bluff gave residents access to the wharf area.

Harbor and Breakwater Operations 1926-1986
(from conversations with elder harbor employees and personal experiences at Kaumālapa'u):

- The breakwater extended out from the wharf a little more than 300 feet. It was generally straight with only a slight curve inland, towards the outer end (*Figure 5*).
- Cement was laid across the top of the breakwater, and a light was situated near the end of the breakwater as one of the markers for harbor access.
- Each year, during summer, the harbor crew would conduct harbor and breakwater maintenance. Regular maintenance included — collection of new boulders from the inland flats; laying a temporary

track across the cement on the breakwater; moving one of the 35-ton cranes onto the breakwater, which was used to set stones in place; and placement of the new boulders. Upon completion of the repair work, the crane would be backed up, and the temporary tracks picked up, and crane returned to operation on the wharf.

- John Kauwena'ole and John Kaiaokamalie were among the crane operators. From around 1942, Henry Aki was a diver who directed stone placement from in the water.

- In the uplands, holes were drilled into the boulders, and pins were set in them. Cranes would lift the boulders onto the trucks, and they would in turn be hauled to the harbor.

- During peak season, the harbor and wharf was used every day of the week. During the slack season there would generally be two barges a week. Fuel barges also ran weekly, and the pipe line (L.C. App. 590-Lot 3) ran from the wharf to the tanks (Lot 2, L.C. App. 590).

- Regular maintenance was continued to around the 1960s; by the 1980s, maintenance was funded only on an "as-needed basis."

- Mr. Aki noted that the ocean and weather has changed since he was young. The storms like those in ca. 1980, and subsequent hurricanes, *Iwa* and *Iniki* (1982 and 1992 respectively), were unknown by the early crew of Kaumālapa'u, and were a new experience in his lifetime. He also observed that while extensive damage was done to the breakwater and harbor in 1980, 1982 and 1992, only minimal repairs were done on the harbor complex. Indeed, the condition of the breakwater is such now, that when there is a westerly swell, the barges cannot enter the harbor.

Harbor Camp and Wharf Facilities (ca. 1940s-1990s)

Mr. Aki recalled that there were about 30 residences and facility buildings associated with the Harbor Camp and Wharf.

Wharf and Outlying Facilities:

- The early office was below the fuel storage tanks, and above the present-day Quonset hut and office facility. Also in the vicinity of the original office was a house (residence of supervisor, Tom Knot).
- The cut stone used on walls fronting the Kaumālapa'u Harbor Road was made by Japanese and Korean stone masons. The stones are generally 12"x12" and set in place with mortar. Key stones are set in various locations. When the storms of 1980 and 1982 hit the stone walls, the mortar was washed out and section of the stone walls were pushed in, causing the Harbor Road (facing the ocean) to buckle.
- One building, the "Scout House," from the old Hawaiian Dredging camp in Kaumālapa'u Valley was still extant in the 1940s, and Mr. Aki, secured a lease of the valley from the company, which he retained until the late 1980s. The old "Scout House" had deteriorated, so Mr. Aki took it down, and used the foundation to build another small house. His primary interest in Kaumālapa'u Valley was as a base camp for fishing. A trail down the side of the *pali*, from the Harbor Camp, was his main route of access. Mr. Aki also raised roosters in the valley.

Harbor Camp:

- Camp residents included (but were not limited to) — Buck Manriki (his house was the first house on the bluff, overlooking the area of the fuel storage tanks); Alfred Kimokea; Manuel Pavao (two houses – his last residence being the brick house which has been remodeled and is now the first house seen when driving into the camp); Junior AhLeong Aki; Shigeru Yagi; Nakama; Hashiba; Captain Kealahao; Lono Pokipala; John Kaiaokamalie; Daniel Kaopuiki Jr.; John Kauwenaole; Asing Ahyo; Alex Maioho; Joe Kaehuaea; Martin Kaaikala; Sonny Fernandez; Minoru Oda; Matsuda; and Henry Aki (his house was the last one on the bluff overlooking Kaumālapa'u Valley; near the trail head that went into the valley).
- There were also at least two long garages; a pool hall; a rooming house (in which six single men lived); a bath house (prior to inside plumbing being installed in the houses); a duplex house; and baseball field.

Hawaiian Practices and Sites:

- While the presence of caves was noted in the Kaumālapa'u vicinity, Mr. Aki does not recall hearing anyone talk about much more than tools (from the harbor construction period) being found in the caves.
- Except for the account of Puhi-o-Ka'ala, Mr. Aki had not heard of there being known *ilina* (burials) around the harbor. Mr. Aki also noted that it was the practice of the old residents to leave Puhi-o-Ka'ala alone (not to *maha'oi*, and see if one could dive into it and find the cave etc.). It was the general practice of his mother and other old Hawaiians who lived at Kaumālapa'u, to respect and leave the old places alone.
- Puhi-o-Ka'ala was known to all of the old Hawaiian families, and pointed out as a storied place at Kaumālapa'u.
- While Mr. Aki, had seen, and traveled past the platforms and other features on the Kalulu Bluff of Kaumālapa'u, he did not recall anyone ever speaking of the sites, or giving them names. Though in his time, elder Hawaiian residents did still go to certain areas on the bluff to *kilo i'a* (spot fish) and direct the fishermen to the schools.
- Daniel Kaopuiki Sr. had told Mr. Aki that Hawaiians once lived at Kaumālapa'u and that it was an important fishing area. He was also told that water for the old residents was found a little ways up the valley, in a well.
- In the old days, *akule* were caught near the shore fronting Kaumālapa'u Valley. The schools would still come in occasionally throughout the years that Mr. Aki worked at the harbor.
- Mr. Aki's mother (Ella Kekai Haia-Aki) and other old Hawaiian residents of Kaumālapa'u regularly gathered *limu* (seaweeds) such as the *kohu* and *līpoa* from along the shoreline. They also gathered various near shore fish and crabs, and the elder Mrs. Aki, regularly gathered *pa'akai* (salt) from *kāheka* (natural salt basins) at the front of the cliff near the Kalulu-Kamoku boundary (in area of the lighthouse). The *pa'akai* was used for all home needs and salting fish caught in the surrounding fishery.
- Among the fish regularly caught around Kaumālapa'u were the — *uhu, kole, akule, 'ū'ū, nenue, pāpa'i*, and *'ōpihi*. Families also regularly fished from the breakwater, and around the point towards Kalamanui Valley.
- Sharks were known to come into the bay, but Mr. Aki's mother instructed him not to bother them; they were considered family, and would not bother him.

Edean Puahau'oli Desha, July 26, 2001

Edean Puahau'oli Desha was born on O'ahu, and moved to Lāna'i with her husband (Swede Desha) in 1946. Since moving to Lāna'i, Mrs. Desha has collected articles and historical writings about Lāna'i, and traveled around the island with various individuals knowledgeable about Lāna'i's cultural and natural resources (both native Hawaiian residents and others who have made studies on the island).

Mrs. Desha's recollections of Harbor development at Kaumālapa'u are similar to those of Henry Aki. The tradition of Puhi-o-Ka'ala is one that stands out in her mind as being told by a few native elders and being retold in historical manuscripts. One additional historical observation shared by Mrs. Desha, which she heard from Manuel Pavao (former Hawaiian Dredging employee and Kaumālapa'u Harbor Supervisor), described continued travel via the old Kaumālapa'u Trail (see *Figure 2*) in the 1920s. Manuel Pavao told Edean:

- When we were living in Kaumālapa'u Valley, working on the harbor and breakwater, we would sometimes be invited to lū'aus up at Kō'ele. The only way for us to go, was to walk the old Kaumālapa'u trail out of the valley, across the flats and up to Kō'ele. It was nothing for us to walk up for a party one night, and walk back down (pers. comm., M. Pavao to E. Desha).

Albert Reinicke, July 27, 2001

Albert Reinicke was born in 1942, and lived at Kaumālapa'u while he was growing up. His mother, is

Josephine Kauwenaole, and his *hānai* father was the late John Kauwenaole (a harbor employee). Mr. Reinicke's recollections about Kaumālapa'u Harbor management and residences are similar to those shared by Mr. Aki. Mr. Reinicke did add that he believed around 1960, following Hurricane Dot (1959), some stone for breakwater repair came from Kawaihae (Island of Hawai'i) as well. The timing of the repair may have coincided with work on the Kawaihae Harbor.

Solomon "Kolomona" Kaho'ohalahala, July 27, 2001

Kolomona Kaho'ohalahala is a Lāna'i native; a historian; and cultural practitioner-resource specialist. Mr. Kaho'ohalahala shared the following thoughts regarding traditional cultural places, and care of the cultural-natural resources in the Kaumālapa'u vicinity:

- Puhi-o-Ka'ala is a significant feature on the cultural landscape of Kaumālapa'u. It is a place that needs to be protected.
- In traditional times, the area was an important canoe landing and fishing village. There are native sites and features around Kaumālapa'u, known to some families that should not be disturbed, or made known to the larger public. For the most part, it is not anticipated that the breakwater repairs will affect those sites. But replacement boulders should not be harvested from the Kaumālapa'u cliffs.
- A larger resource issue (that impacts Kaumālapa'u) is the degradation of the *kula* (plateau lands) and remnant native plant community. As a result of the ranching and pineapple business interests, the land has been left almost barren. Kaumālapa'u valley is a catch-all for run off that occurs when heavy rains fall. Siltation in the bay is going to be an on-going problem, and also impacts the fishery resources.
- One of the important trails on Lāna'i, connects Kaumālapa'u to the uplands and other areas on the island. *This is the trail referenced in the mo'olelo* of Puhi-o-Ka'ala, and is also the route traveled by native families seasonally, when fishing between the Keōmoku and Kaumālapa'u fisheries.
- The place names which occur at, and above Kaumālapa'u, are an indicator of the knowledge and familiarity that the *kūpuna* had with the landscape. The alignments of hills were long distance markers used by those people who traveled across Lāna'i. Care should be taken to perpetuate those place names, and to not further impact these resources.

Samuel Kaopuiki, July 27 & August 6, 2001

Samuel Kaopuiki was born in 1925 at Keōmoku, Lāna'i. He is a native of Lāna'i, descended from several families with generations of residency on the island, and known for his knowledge of the island. Mr. Kaopuiki has been a fisherman all of his life, and regularly fished at Kaumālapa'u. His elder brother Daniel Kaopuiki Sr. lived and worked at Kaumālapa'u as well, and his own job with the plantation had him regularly at the harbor. Mr. Kaopuiki's recollections of the harbor residences and operations are similar to those of Mr. Henry Aki above. Discussing the Kaumālapa'u vicinity, and fishing customs and practices, Mr. Kaopuiki observed:

- Puhi-o-Ka'ala is one of the important, traditional places of Kaumālapa'u.
- Asked about the Hawaiian sites and petroglyph names — *Pulaa* and *Kuaiwa* — seen during a site visit on one of the platform features (*Figures 8 & 9*) on the Kalulu bluff, overlooking Kaumālapa'u, Mr. Kaopuiki did not recognize the names. And while he was familiar with the platforms and features (he had traveled the area while hunting), he noted that he had never heard anything about the sites.

Mr. Kaopuiki did note that it was a practice of his elders to put their names at various places where they lived or visited. For example, his *kupuna* Ka'enaokalani's name is still seen near Kaunolū.

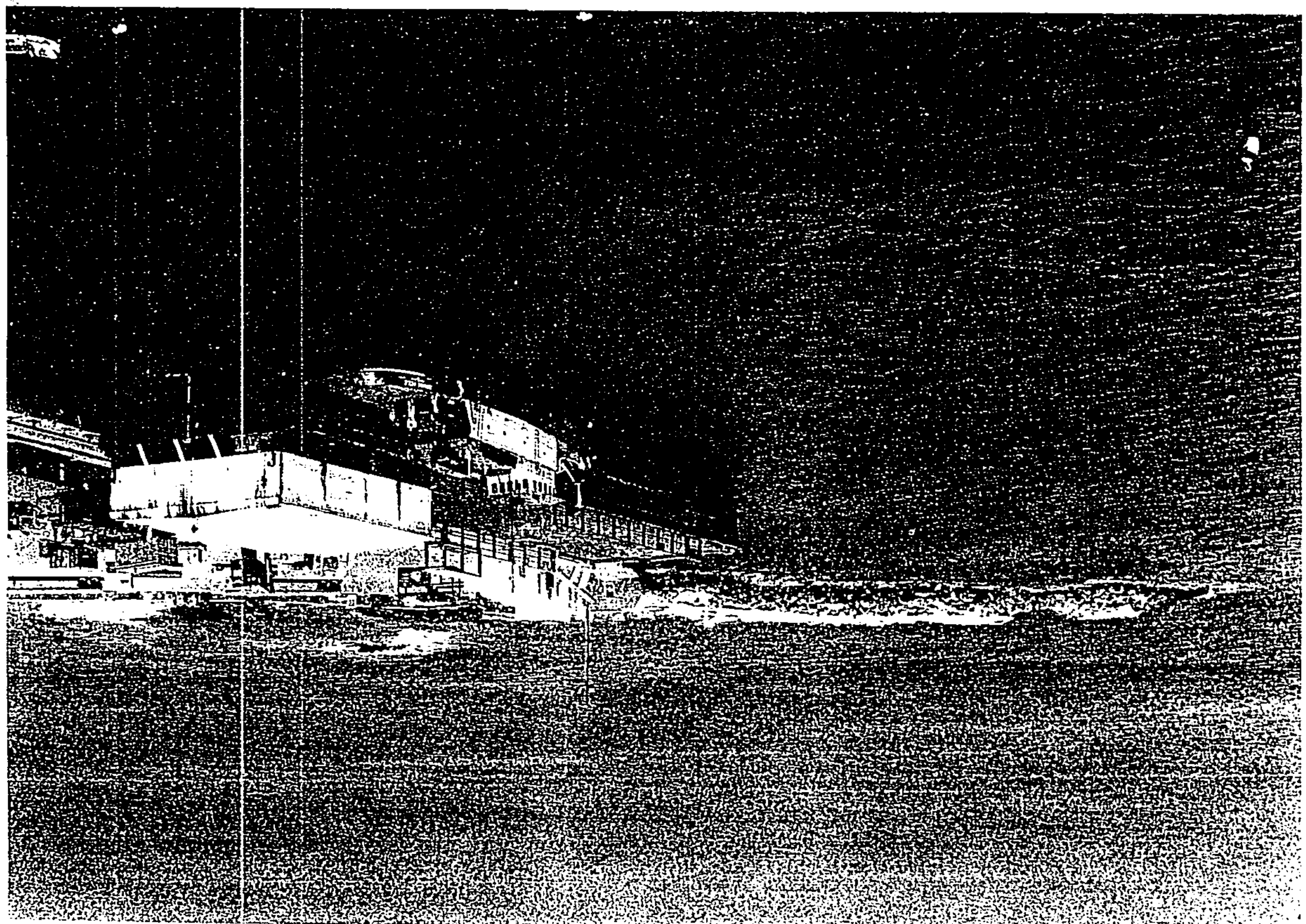
Kaumālapa'u is an important fishery. There were all kinds of fish which he would catch at Kaumālapa'u. Among them were the — *'āholehole, uouoa, moi, uhu, akule*, and many others. The *akule* used to school in Kaumālapa'u. But now, because people take everything, and don't think about tomorrow, there are very few fish (it's not like it was before).

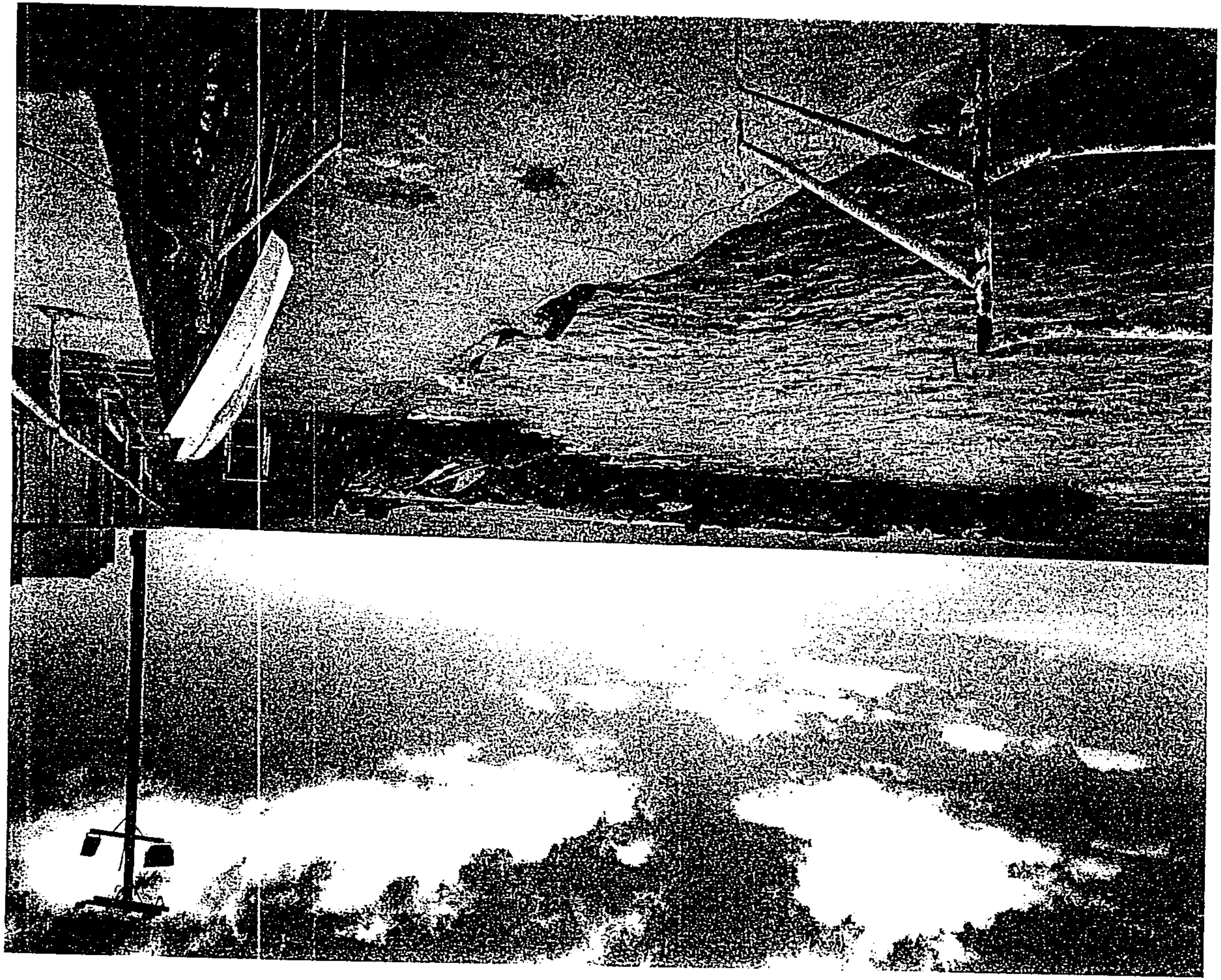
APPENDIX F

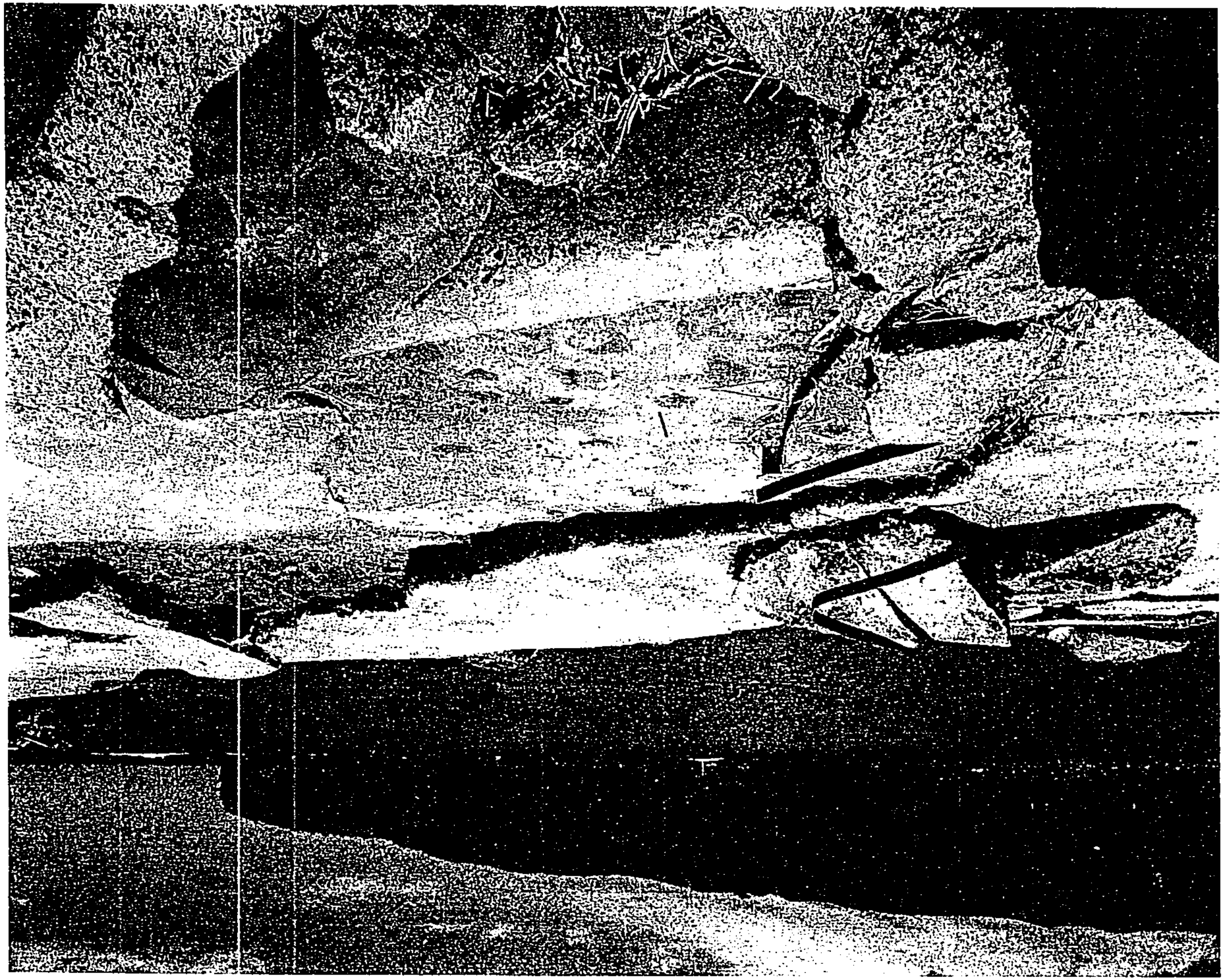
HABS/HAER Photographs of the Breakwater at Kaumälapa'u Harbor, Läna'i

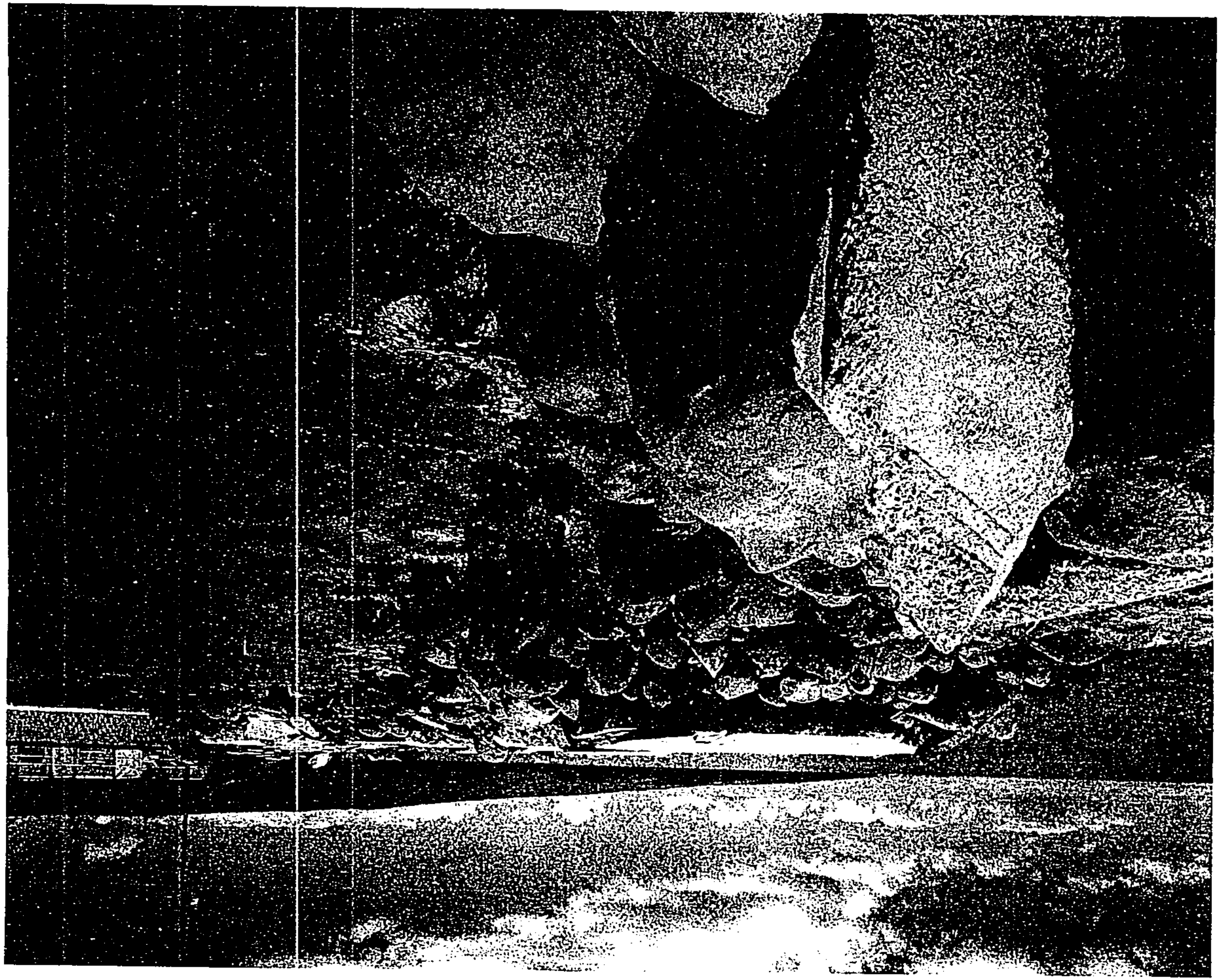
[illegible]
LANA'I, HI

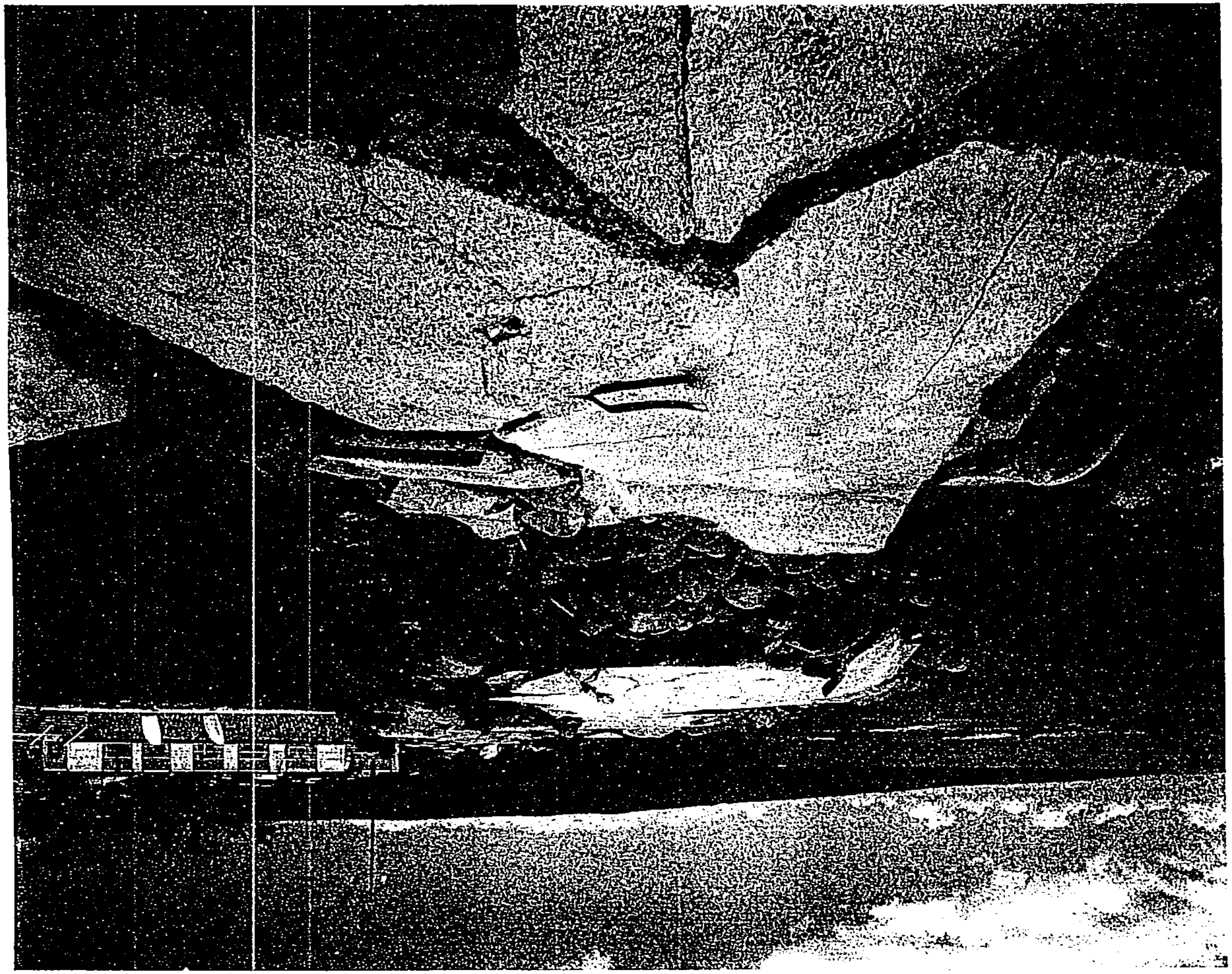
Project	Job#	Photo	Bldg#	Description	Area	Shot	Orienta	Date	ClientID
Kaumalapa' u Breakwater	F45JJ	1	Breakwater	Overview from pali	Kaumalapa' u	1	275	7/26/01	USHA
Kaumalapa' u Breakwater	F45JJ	2	Breakwater	Breakwater from wharf	Kaumalapa' u	2	245	7/26/01	USHA
Kaumalapa' u Breakwater	F45JJ	3	Breakwater	View from seawall toward breakwater. Red bouy and light on pali to far left	Kaumalapa' u	3	205	7/26/01	USHA
Kaumalapa' u Breakwater	F45JJ	4	Breakwater	View across breakwater showing old road bed. Spouting horn on shore at right center.	Kaumalapa' u	4	140	7/26/01	USHA
Kaumalapa' u Breakwater	F45JJ	5	Breakwater	View from channel end of breakwater toward wharf. Compare to old photo to see difference in length/curve.	Kaumalapa' u	5	335	7/26/01	USHA
Kaumalapa' u Breakwater	F45JJ	6	Breakwater	View from channel end straight along tow mountains. Eroded section in foreground. Wharf on right.	Kaumalapa' u	6	345	7/26/01	USHA
Kaumalapa' u Breakwater	F45JJ	7	Breakwater	Shore end of breakwater showing damage and joining of wharf and breakwater.	Kaumalapa' u	7	10	7/26/01	USHA
Kaumalapa' u Breakwater	F45JJ	8	Breakwater	View over end of breakwater toward spouting horn (rt ctr) and valley on left.	Kaumalapa' u	8	130	7/26/01	USHA

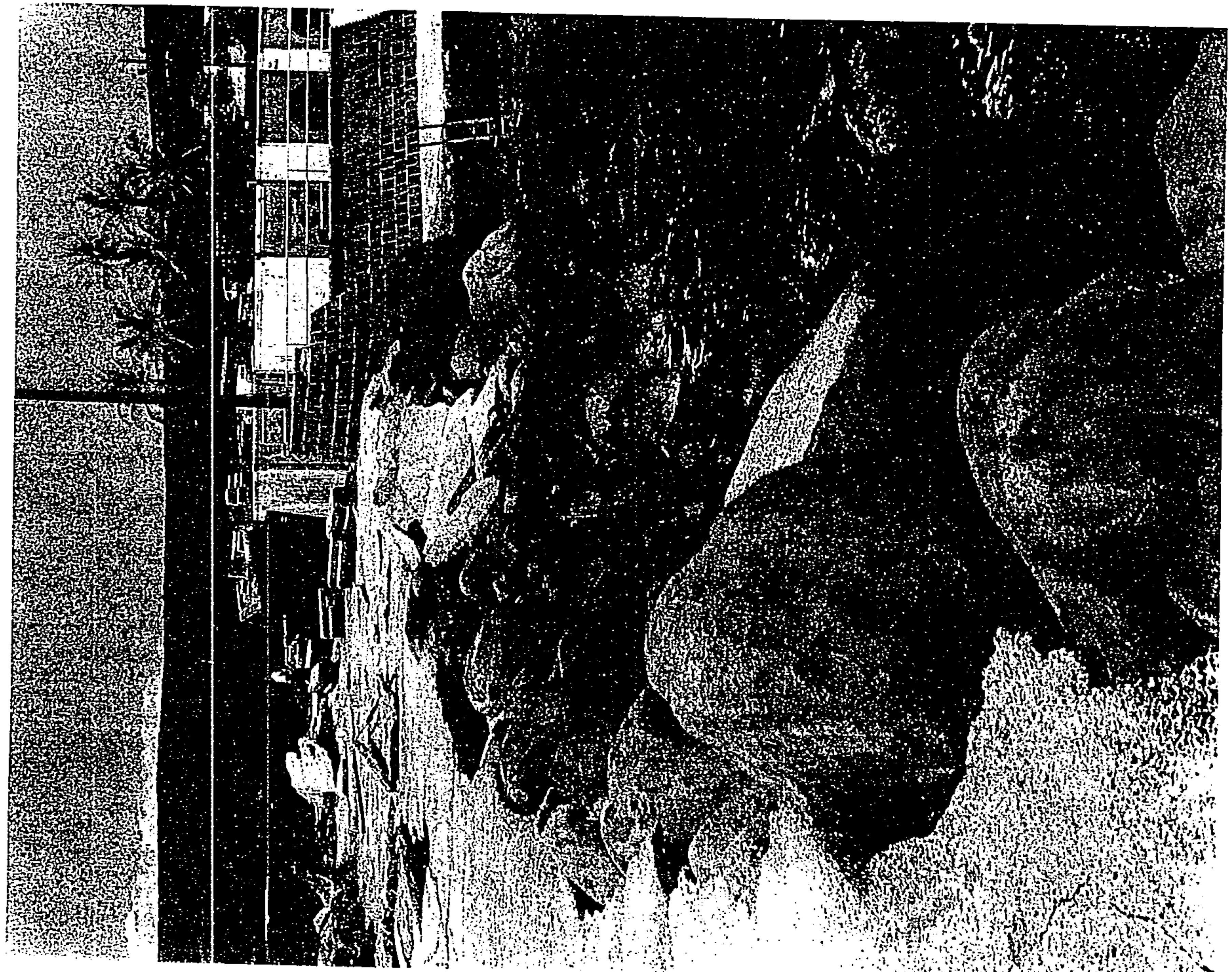












APPENDIX H: DEA REVIEW COMMENT AND RESPONSE LETTERS

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Ecoregion
300 Ala Moana Boulevard, Room 3122
Box 50088
Honolulu, Hawaii 96850

In Reply Refer To: PI-01-145

JUN 27 2001

28 JUN 2001
HED 6/26
CHIEF
SECY
PP

Lt. Colonel Ronald N. Light
District Engineer
Honolulu Engineer District
U.S. Army Corps of Engineers
Building 230
Fort Shafter, HI 96858-5440

Re: Draft Environmental Assessment for Kaumalapau Harbor Breakwater Repair, Lanai, Hawaii.

Dear Lieutenant Colonel Light:

The U.S. Fish and Wildlife Service (Service) has reviewed the Draft Environmental Assessment for Kaumalapau Harbor Breakwater Repair, Lanai, Hawaii (DEA). The proposed project proponents are the U.S. Army Corps of Engineers (Corps), Honolulu District and the Hawaii State Department of Transportation, Harbors Division. The following comments have been prepared pursuant to the National Environmental Policy Act of 1969 [42 U.S.C. 4321 *et seq.*; 83 Stat. 852], as amended, the Fish and Wildlife Coordination Act of 1934 [16 U.S.C. 661 *et seq.*; 48 Stat. 401], as amended, the Endangered Species Act of 1973 [16 U.S.C. 1531 *et seq.*; 87 Stat. 884], as amended (Act), and other authorities mandating Service concern for environmental values. Based on these authorities, the Service offers the following comments for your consideration.

GENERAL COMMENTS

The proposed project involves the repair of an existing breakwater in order to reduce wave action and increase safety and usability inside Kaumalapau Harbor. The existing breakwater is in need of repair due to damage caused by multiple severe storms and subsequent inadequate attempts to repair the structure. The materials comprising the existing breakwater and rubble mound would be redistributed shoreward to form the base of a new breakwater that would be 320 feet long with a crest elevation of +14.5 feet at Mean Low Low Water.

The Service released a final Fish and Wildlife Coordination Act (FWCA) report on the proposed project in April 2001. In that report, which is appended to the DEA, the Service supported the implementation of the proposed plan of improvement provided that the recommendations contained in the report are incorporated into and made part of the project.

We believe the DEA adequately identifies the existing species and habitats at the proposed project site and adequately assesses the potential project-related impacts to these resources. A project Environmental Protection Plan (EPP) will be prepared for approval prior to initiation of construction, and we recommend that the EPP contain the recommendations made by the Service in the final FWCA report as well as the mitigation measures contained in the DEA. We further recommend that the EPP require that the contractor comply with Hawaii State Water Quality Standards and that the contractor's compliance with these standards be monitored by either the Corps or the Hawaii Department of Health. The EPP should be reviewed by the Service and the other Federal and State natural resource agencies prior to approval.

Based on the incorporation of the above recommendations, significant adverse impacts to fish and wildlife resources are not anticipated and the Service would support a Finding of No Significant Impact (FONSI) for the proposed project. Nevertheless, the DEA does contain some factual inaccuracies and these are addressed in our specific comments below.

SPECIFIC COMMENTS

Pg. 19, Section 5.1.5 Marine Biology.
The first sentence in the first paragraph refers to a reconnaissance site visit by the National Marine Fisheries Service (NMFS) in December 1998. This site visit actually occurred in December 1999 and the participants also included the Service and the project environmental consultants.

In the last sentence of the second paragraph, the name of sea urchin *Echinometra mathaei* is misspelled.

Pg. 28, Section 6.1.5 Marine Biological Resources.
The fourth sentence in the second paragraph states that the new breakwater will consist of a larger surface area of boulders and concrete than the existing breakwater and suggests that this will lead to a net increase in coral cover in the Kaumalapau area. No data comparing the surface areas of either the existing or proposed breakwater are presented to support this statement. Furthermore, many other variable factors are expected to contribute to the rate and extent future coral colonization in the area. In addition, coral cover on the existing rubble mound that will be lost is not considered. Therefore, the statement and suggestion that the new breakwater will lead to a net increase in coral cover are unsupported and misleading and should be deleted.

Similarly, the last sentence in the last paragraph states that increased complexity (shelter) afforded by the new, larger breakwater should increase favorable fish habitat is unsupported and misleading. Again the shelter afforded by the existing rubble mound that will be lost is not considered. Therefore, this statement should be deleted.

Pg. 28, Section 6.1.7 Threatened and Endangered Species.
The third sentence in the first paragraph refers to filamentous algae as being preferred food for sea turtles. Green sea turtles (*Chelonia mydas*) prefer certain species of fleshy macroalgae, and certain sponges and other macroinvertebrates and fishes are known to be preferred by hawksbill sea turtles (*Eretmochelys imbricata*). This information should be clarified in this paragraph.

The second sentence in the second paragraph states that both the Service and the NMFS concurred that the proposed project will not impact endangered species. However, both the Service and the NMFS concurred with a determination the proposed project is not likely to adversely affect listed species and this should be clarified in this paragraph.

The last paragraph also addresses FWCA comments submitted by the Service and Essential Fish Habitat comments submitted by the NMFS. It would be more appropriate to include this information in Section 6.1.5.

SUMMARY

The DEA contains some factual inaccuracies but adequately identifies the existing species and habitats at the proposed project site and adequately assesses the potential project-related impacts to these resources. We recommend that the EPP, which should be reviewed by the Service and the other Federal and State natural resource agencies prior to approval, contain the recommendations made by the Service in the final FWCA report as well as the mitigation measures contained in the DEA and require that the contractor's compliance with Hawaii Water Quality Standards be monitored by either the Corps or the Hawaii Department of Health. Based on the incorporation of the above recommendations, the Service would support a FONSI for the proposed project.

The Service appreciates the opportunity to comment on the proposed project. If you have questions regarding these comments, please contact my Environmental Review Coordinator, Michael Molina, at (808) 541-3441.

Sincerely,

Gina Shultz

Paul Henson
Acting Field Supervisor
Ecological Services

cc: NMFS-PIAO, Honolulu
USEPA-Region IX, Honolulu
ACOE, Honolulu
DAR, Hawaii
CZMP, Hawaii
CWB, Hawaii

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

REPLY TO ATTENTION OF

May 20, 2002

Subject: Kaumalapau Harbor Breakwater Repair, Lana'i, Hawai'i

Civil and Public Works Branch

Mr. Paul Henson
Field Supervisor, Ecological Services
U.S. Fish and Wildlife Service
Pacific Islands Ecoregion
P.O. Box 50088
Honolulu, Hawaii 96850

Dear Mr. Henson:

Thank you for your letter dated June 27, 2001, commenting on the Draft Environmental Assessment (EA) for the Kaumalapau Harbor Breakwater Repair project.

Currently, we are in the process of finalizing the EA and a copy of this response letter will be included in the final document. Following the completion of the Draft EA, minor revisions were made to the design of the breakwater repair work. Revisions do not alter the basic scale or scope of the project. The primary purpose was to incorporate the current design practices and experiences gained in using the Core-Loc concrete armor unit. Revisions include the following items.

a. The breakwater crest has been re-designed to increase Core-Loc stability during design storm wave conditions, and to improve constructability. Primary changes are:

(1) Widening the crest width to 40 feet at the top of the underlayer stone (+9.5' elevation),

(2) adding a horizontal row of Core-Loc units on the ocean-side crest, and

(3) replacement of the rib cap on the crest with a solid mass concrete crest cap.

b. A requirement for tremie concrete to be placed in the toe trench following placement of the Core-Loc units has been added to the design for the near shore ocean-side where the toe trench will be excavated into hard rock bottom in very shallow water. The concrete will prevent the movement of Core-Loc units and will increase the stability in the toe area.

c. The range of allowable stone size for under layer and bedding stones has been increased slightly for more efficient use of available quarry stones.

Revisions to the design are included in the Final EA for the project.

The recommendations made by the Fish and Wildlife Service in your final FWCA report will be considered in the Environmental Protection Plan to be prepared prior to initiation of construction. In addition, the Section 401 Water Quality Certification for the project by the State Department of Health will require compliance with the Hawaii State Water Quality Standards and implementation of a Water Quality Monitoring Plan during construction.

Your specific comments on the DEA have been addressed as follows:

a. Page 19, Section 5.1.5: Final EA revised in accord with review comment.

b. Page 28, Section 6.1.5: The larger footprint of the repaired breakwater will result in a longer breakwater than presently exists, and thus a larger surface area of hard substrate on which corals can colonize. We state that the repair will involve the loss of much of the existing coral cover. However we believe that there is reasonable likelihood that coral will colonize the new breakwater concrete and rock in a manner similar to the existing breakwater material, and thus it is valid to assume that in time coral cover will be similar to that existing now. We concur that there are many variables contributing to the rate and extent of future coral colonization, and have therefore revised the Final EA to state "...over the long term (10-20 years), there is likely to be coral coverage on the new structure similar to what is present today."

c. The last sentence has been replaced by "The new breakwater with its large concrete armor units will provide increased interstitial space and complexity, which would replace and increase favorable fish habitat which would be lost by covering the existing structure."

d. Page 28, Section 6.1.7: Third sentence in first paragraph has been changed to "A general paucity or lack of food preferred by green sea turtles and hawksbill sea turtles indicates that the area is not likely a feeding habitat for turtles." The second sentence in the second paragraph and the last paragraph has been revised in accordance with the respective review comments.

If you have any questions or need additional information regarding this project, please do not hesitate to contact Mr. James Hatashima, Project Manager of my Civil and Public Works Branch staff at (808) 438-2264.

Sincerely,

Ray H. Jyo, P.E.
Deputy District Engineer for Program
Project Management

BENJAMIN J. CAYETANO
GOVERNOR

GENEVIEVE SALMONSON
DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
235 SOUTH BERETANIA STREET
SUITE 702
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186

June 12, 2001

Mr. Brian Minaai, Director
State Department of Transportation
869 Punchbowl Street
Honolulu, Hawai'i 96813

Dear Mr. Minaai:

Subject: Draft Environmental Assessment for the Kaumalapau Harbor Breakwater Repair, Lāna'i

Thank you for the opportunity to review the subject document. We have the following comments.

1 Please describe why the SHPO is requiring the installation of a fence along the edge of the gulch bordering the Contractor Work and Storage Area. What archaeological or historical resource is expected to be protected by the fence?

2. The justification for supporting the finding of no significant impact must include full evaluation of section 11-200-12(a)(11) of the Hawai'i EIS rules. Please see the enclosed example.

3. The environmental assessment must include a list of all permits and approvals required from federal, state and local agencies.

Should you have any questions, please call Jeyan Thirugnanam at 586-4185.

Sincerely,

Genevieve Salmonson
Director

Enclosure

c: Jim Hatashima, OE
Sea Engineering, inc.

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

REPLY TO ATTENTION OF

May 20, 2002

Subject: Kaumalapau Harbor Breakwater Repair, Lana'i, Hawai'i

Civil and Public Works Branch

Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control
State of Hawaii
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Ms. Salmonson:

Thank you for your letter dated June 12, 2001, to Mr. Brian Minaai, Director, State Department of Transportation, commenting on the Draft Environmental Assessment (EA) for the Kaumalapau Harbor Breakwater Repair project. The Draft EA was prepared by the Honolulu Engineer District, and thus we are responding to your comments on behalf of Mr. Minaai and the Department of Transportation, Harbors Division.

Currently, we are in the process of finalizing the EA and a copy of this response letter will be included in the final document. Following the completion of the Draft EA, minor revisions were made to the design of the breakwater repair work. Revisions do not alter the basic scale or scope of the project. The primary purpose was to incorporate the current design practices and experiences gained in using the Core-Loc concrete armor unit. Revisions include the following items.

a. The breakwater crest has been re-designed to increase Core-Loc stability during design storm wave conditions, and to improve constructability. Primary changes are:

(1) Widening the crest width to 40 feet at the top of the under layer stone (+9.5' elevation),

(2) adding a horizontal row of Core-Loc units on the ocean-side crest, and

(3) replacement of the rib cap on the crest with a solid mass concrete crest cap.

b. A requirement for tremie concrete to be placed in the toe trench following placement of the Core-Loc units has been added to the design for the near shore ocean-side where the toe trench will be excavated into hard rock bottom in very shallow water. The concrete will prevent the movement of Core-Loc units and will increase the stability in the toe area.

c. The range of allowable stone size for underlayer and bedding stones has been increased slightly for more efficient use of available quarry stones.

Revisions to the design are included in the Final EA for the project.

The following responses are provided to address your review comments on the Draft EA:

a. No archaeological or historical resource is known to exist in the gulch bordering the Contractor Work and Storage Area. We have contracted with the consulting firm of Social Research Pacific, Inc. to conduct a study of "Oral Historic Studies for the Determination of Traditional Cultural Places, Kaumalapau Harbor Project, Lana'i, Hawai'i." This study includes oral interviews with local residents who have expertise and knowledge of the area, historical and background research, and identification of Traditional Cultural Practices in and around Kaumalapau Harbor. Our consultant reports that according to oral histories and historic documentation, the gulch (also known as Kaumalapau Valley) adjacent to the Contractor Work and Storage Area was occupied by the construction crew during construction of the breakwater in the 1920's. The settlement was known as Kaumalapau Camp. Following the camp, a farm (including pigs and chickens) was located in the gulch until about 1997. A walk through of the gulch showed considerable disturbance resulting from the activity there over the past 75 years, thus it is considered unlikely that any historic features relating to traditional Hawaiian settlement can still be found. Nevertheless, in order to help insure that no construction equipment or materials are stored outside of the designated area on land that has not been thoroughly investigated for possible historic resources, SHPO has recommended that a fence be constructed as a precautionary measure.

b. An evaluation of the "Significance Criteria" in accord with section 11-200-12(a)(11) of the Hawai'i EIS rules has been added to section 7 of the Final EA.

c. A list of required permits and approvals has been added to section 9 of the Final EA.

Should you have any questions or need additional information regarding this project please call Mr. James Hatashima of my staff at 438-2264.

Sincerely,

Ray H. Jyo, P.E.
Deputy District Engineer for Program
Project Management

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, Hawaii 96707

REF: HP-JEN

JUN 25 2001

Mr. James Hatashima, P.E.
Department of the Army
U.S. Army Engineer District, Honolulu
Fort Shafter, Hawaii 96858-5440

LOG NO: 27666
DOC NO: 0106CD13

Dear Mr. Hatashima,

SUBJECT: **National Historic Preservation Act Section 106 Review Pertaining to the Draft Environmental Assessment for the Proposed Kaumalapau Harbor Breakwater Repair Kalulu Ahupua'a, Lahaina District, Island of Lana'i**
TMK: 4-9-02

Thank you for the opportunity to comment on the Draft Environmental Assessment (DEA) for the proposed Kaumalapau Harbor Breakwater Repair. Our review is based on reports, maps, and aerial photographs maintained at the Historic Preservation Division. On February 9, 2001, Dr. Melissa Kirkendall, SHPD Maui/Lana'i Island Archaeologist, and SHPD student intern Catherine Cur conducted a field inspection of areas to be impacted by the proposed project. (These areas were indicated by crosshatching on an aerial photograph provided by Mr. James Hatashima, Army Corps of Engineers).

On March 28, 2001, a meeting was held at the State Historic Preservation Office to discuss the proposed undertaking. In attendance were Kanalei Shun, Archaeologist Army Corps of Engineering; James Hatashima, Army Corps of Engineers; Scott Sullivan, Sea Engineering; Carol Ogata, SHPD Historic Architect; and Cathleen Dagher, SHPD staff archaeologist.

Based on the submitted DEA, we understand the proposed undertaking consists of repairs to the existing breakwater. The breakwater was constructed in 1926 and originally was 425 feet long. As a result of wave damage the breakwater has been reduced to approximately 200 to 250 feet. The new breakwater will be aligned and centered on the existing breakwater structure and will extend an additional approximately 50 feet across the mouth of the harbor than the existing breakwater.

As a result of the field inspection, it was determined that the mauka area, marked Lana'i Rock Quarry, was not in the immediate vicinity of the proposed undertaking and would not be impacted by the proposed undertaking. However, if construction activities or ground-altering activities are planned for this area in the future, we request the opportunity to review the plans prior to the commencement of the ground-alterations, as portions of this area appear to be unaltered and may contain historic sites. The more makai area, labeled storage, has been thoroughly graded and previously utilized for storage (Janna Kahaleanu, local resident, personal communication to Dr. Kirkendall). However, this area is bordered by a gulch on the north side, which may contain historic sites, although debris has been pushed into the gulch during previous land-altering episodes.

Given the above information, we recommend that prior to the proposed reconstruction that the existing breakwater be photographically documented to the Historic American Building Standards (4x5 Negatives and prints archivally processed. In addition, we recommend that construction fencing be temporarily placed along the edge of the gulch, as a mitigation measure. As per the March 28, 2001 meeting, the Army Corps of Engineers will be responsible for the placement of the temporary fencing and will verify in writing to this office that the fencing is in place prior to the commencement of t he proposed undertaking.

With the implementation the recommended mitigation measures, we believe that there will be "no historic properties affected" by the proposed undertaking.

Please call Cathleen Dagher at 692-8023, if you have any questions.

Aloha,

Gilbert Coloma-Agaran, ~~Chairperson and~~
State Historic Preservation Officer

CD:jen

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

REPLY TO ATTENTION OF

May 20, 2002

Subject: Kaumalapau Harbor Breakwater Repair, Lana'i, Hawai'i

Civil and Public Works Branch

Mr. Gilbert Coloma-Agaran
State Historic Preservation Officer
Department of Land and Natural Resources
Historic Preservation Division
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, Hawai'i 96707

Dear Mr. Coloma-Agaran:

Thank you for your letter dated June 25, 2001 commenting on the Draft Environmental Assessment (EA) for the Kaumalapau Harbor Breakwater Repair project.

Currently, we are in the process of finalizing the EA and a copy of this response letter will be included in the final document. Following the completion of the Draft EA, minor revisions were made to the design of the breakwater repair work. Revisions do not alter the basic scale or scope of the project. The primary purpose was to incorporate the current design practices and experiences gained in using the Core-Loc concrete armor unit. Revisions include the following items.

a. The breakwater crest has been re-designed to increase Core-Loc stability during design storm wave conditions, and to improve constructability. Primary changes are:

(1) Widening the crest width to 40 feet at the top of the underlayer stone (+9.5' elevation),

(2) adding a horizontal row of Core-Loc units on the ocean-side crest, and

(3) replacement of the rib cap on the crest with a solid mass concrete crest cap.

b. A requirement for tremie concrete to be placed in the toe trench following placement of the Core-Loc units has been added to the design for the near shore ocean-side where the toe trench will be excavated into hard rock bottom in very shallow water. The concrete will prevent the movement of Core-Loc units and will increase the stability in the toe area.

c. The range of allowable stone size for underlayer and bedding stones has been increased slightly for more efficient use of available quarry stones.

Revisions to the design are included in the Final EA for the project.

In accordance with your recommendation, we will photographically document the condition of the existing breakwater based on the Historic American Building Survey standards prior to the start of construction. A copy of these photographs will be provided to the State Historic Preservation Division. We will also include in the construction plans and specifications a requirement that the construction contractor build a fence around the designated Contractor's Work and Storage Area to help insure that no construction material or equipment is placed outside of the designated area.

For your information, we have contracted with the consulting firm of Social Research Pacific, Inc. to conduct a study of "Oral Historic Studies for the Determination of Traditional Cultural Places, Kaumalapau Harbor Project, Lana'i, Hawai'i." This study includes oral interviews with local residents who have expertise and knowledge of the area, HABS/HAER photography of the breakwater, historical and background research, and identification of Traditional Cultural Practices in and around Kaumalapau Harbor.

Our consultant reports that according to oral histories and historic documentation, the gulch (also known as Kaumalapau Valley) adjacent to the Contractor Work and Storage Area was occupied by the construction crew during construction of the breakwater in the 1920's. The settlement was known as Kaumalapau Camp. Following the camp, a farm (including pigs and chickens) was located in the gulch until about 1997. A walk through of the gulch showed considerable disturbance resulting from the activity there over the past 75 years, thus it is considered unlikely that any historic features relating to traditional Hawaiian settlement can still be found. Nevertheless, the gulch will be fenced off during construction to avoid any further disturbance of the area by construction activities.

Should you have any questions or desire additional information regarding this project, please contact Mr. James Hatashima of my staff at 438-2264.

Sincerely,

Ray H. Jyo, P.E.
Deputy District Engineer for Program
Project Management

PHONE (808) 594-1888

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

FAX (808) 594-1865

26 JUN 2001
HED
DHED
SEC:

June 19, 2001

LTC Ronald N. Light, USA
District Engineer
U.S. Army Corps of Engineers
Building 230
Fort Shafter, HI 96858-5440

Subject: DRAFT EA – Kaumalapau Harbor Breakwater Repair – Island of Lana'i, Hawai'i

Dear Colonel Light:

Thank you for the opportunity to comment on the above referenced project. According to the DEA, the project consists of repairing the existing breakwater at Kaumalapau Harbor, which will reduce wave action in the harbor and increase harbor safety and usability. The Office of Hawaiian Affairs offers the following comments:

In Section 6.4 – Historic and Cultural Resources, the DEA states that there are no historic properties affected by the proposed project, but there is no indication that there has been consultation with individuals and/or organizations with expertise and knowledge of the area.

Act 50, Session Laws of Hawai'i (SLH) – Regular Session 2000

The purpose of Act 50, SLH 2000, is to:

1) "Require that environmental impact statements include the disclosure of the effects of a proposed action on the cultural practices of the community and State;

2) Amend the definition of 'significant effect' to include adverse effects on cultural practices."

OHA requests that the U.S. Army Corps of Engineers amend the DEA to identify and address the effects on Native Hawaiian culture and traditional and customary rights pursuant to Section 343-2, Hawaii Revised Statutes, as amended.

The cultural assessment should include consultation with individuals and/or organizations with expertise and knowledge of the Lana'i areas. These consultations should encompass the types of cultural resources, practices and beliefs found within the district or ahupua'a of the proposed project areas. It should be noted that in their letter of April 2, 2001, (Appendix D) the State Historic Preservation Division identified a gulch which bordered the north side of the project and suggested that it may contain historic sites.

If you have any questions, please contact Jerry B. Norris at 594-1847, or email him at jnorris@oha.org.

Sincerely,

Colin C. Kippen, Jr.
Deputy Administrator

cc: OHA Board of Trustees
Randall K. Ogata, OHA Administrator
Irene Kaahanui, Molokai CAC

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

REPLY TO
ATTENTION OF

May 20, 2002

Subject: Kaumalapau Harbor Breakwater Repair, Lana'i, Hawai'i

Civil and Public Works Branch

Mr. Colin C. Kippen, Jr.
Deputy Administrator
Office of Hawaiian Affairs
State of Hawaii
711 Kapi'olani Boulevard, Suite 500
Honolulu, Hawai'i 96813

Dear Mr. Kippen:

Thank you for your letter dated June 19, 2002, commenting on the Draft Environmental Assessment (EA) for the Kaumalapau Harbor Breakwater Repair project.

Currently, we are in the process of finalizing the EA and a copy of this response letter will be included in the final document. Following the completion of the Draft EA, minor revisions were made to the design of the breakwater repair work. Revisions do not alter the basic scale or scope of the project. The primary purpose was to incorporate the current design practices and experiences gained in using the Core-Loc concrete armor unit. Revisions include the following items.

a. The breakwater crest has been re-designed to increase Core-Loc stability during design storm wave conditions, and to improve constructability. Primary changes are:

(1) Widening the crest width to 40 feet at the top of the under layer stone (+9.5' elevation),

(2) adding a horizontal row of Core-Loc units on the ocean-side crest. and

(3) replacement of the rib cap on the crest with a solid mass concrete crest cap.

b. A requirement for tremie concrete to be placed in the toe trench following placement of the Core-Loc units has been added to the design for the near shore ocean-side where the toe trench will be excavated into hard rock bottom in very shallow water. The concrete will prevent the movement of Core-Loc units and will increase the stability in the toe area.

c. The range of allowable stone size for under layer and bedding stones has been increased slightly for more efficient use of available quarry stones.

Revisions to the design are included in the Final EA for the project.

With regard to consultation with individuals or organizations regarding the cultural practices in the project area, we have contracted with the consulting firm of Social Research Pacific, Inc. to conduct a study of "Oral Historic Studies for the Determination of Traditional Cultural Places, Kaumalapau Harbor Project, Lana'i Island, Hawai'i." This study includes oral interviews with local residents who have expertise and knowledge of the area, photography of the existing breakwater in accord with Historic American Building Survey standards, historical and background research, and identification of Traditional Cultural Properties in and around Kaumalapau Harbor. The results of the study will be included in the Final EA.

We have also conducted several public information meetings during the planning phase of this project to solicit input from the community regarding their needs and concerns. In addition, a public meeting was held on July 9, 2001, to discuss the Draft EA and any new or additional community concerns not addressed by the project plan. These meetings were attended by a broad cross section of Lana'i residents.

As you noted, the State Historic Preservation Division in their letter dated April 2, 2001, recommended that a fence be constructed between the area identified as a Contractor's Work and Storage Area (an abandoned quarry site which has been extensively disturbed) and the adjacent gulch (Kaumalapau Valley). According to oral histories and historic documentation, the gulch was occupied by the construction crew during construction of the breakwater in the 1920's. The settlement was known as Kaumalapau Camp. Following the camp, a farm (including pigs and chickens) was located in the gulch until about 1997. A walk through of the gulch showed considerable disturbance resulting from the activity there over the last 75 years, thus it is considered unlikely that any historic features relating to traditional Hawaiian settlement can still be found. Nevertheless, the gulch will be fenced off during construction in accord with the SHPO recommendation to avoid any further disturbance of the area by construction activities.

Should you have any questions or desire additional information regarding this matter, please contact Mr. James Hatashima of my staff at 438-2264.

Sincerely,

Ray H. Jyo, P.E.
Deputy District Engineer for Program
Project Management

JAMES "KIMO" APANA
Mayor

DAVID C. GOODE
Director

MILTON M. ARAKAWA, A.I.C.P.
Deputy Director

Telephone: (808) 270-7845
Fax: (808) 270-7955

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS AND WASTE MANAGEMENT
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

RALPH NAGAMINE, L.S., P.E.
Land Use and Codes Administration

RON R. RISKA, P.E.
Wastewater Reclamation Division

LLOYD P.C.W. LEE, P.E.
Engineering Division

BRIAN HASHIRO, P.E.
Highways Division

Solid Waste Division

July 23, 2001

Mr. Ray H. Jyo, P.E.
Department of the Army
U. S. Army Engineer District, Honolulu
Fort Shafter, Hawaii 96858-5440

Dear Mr. Jyo:

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT
KAUMALAPAU HARBOR BREAKWATER REPAIR

We reviewed the subject draft environmental assessment and have no comments to offer at this time.

If you have any questions, please call Milton Arakawa at (808) 270-7845.

Sincerely,

for DAVID GOODE
Director of Public Works
and Waste Management

MA:jso
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DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF

May 20, 2002

Subject: Kaumalapau Harbor Breakwater Repair, Lana'i, Hawai'i

Civil and Public Works Branch

Mr. David Goode, Director
Department of Public Works and Waste Management
County of Maui
200 South High Street
Wailuku, Maui, Hawaii 96793

Dear Mr. Goode:

Thank you for your letter dated July 23, 2001, regarding review of the Draft Environmental Assessment (EA) for the Kaumalapau Harbor Breakwater Repair project. We understand that you have no comments to offer at this time.

Currently, we are in the process of finalizing the EA and a copy of this response letter will be included in the final document. Following the completion of the Draft EA, minor revisions were made to the design of the breakwater repair work. Revisions do not alter the basic scale or scope of the project. The primary purpose was to incorporate the current design practices and experiences gained in using the Core-Loc concrete armor unit. Revisions include the following items.

a. The breakwater crest has been re-designed to increase Core-Loc stability during design storm wave conditions, and to improve constructability. Primary changes are:

(1) Widening the crest width to 40 feet at the top of the underlayer stone (+9.5' elevation),

(2) adding a horizontal row of Core-Loc units on the ocean-side crest, and

(3) replacement of the rib cap on the crest with a solid mass concrete crest cap.

b. A requirement for tremie concrete to be placed in the toe trench following placement of the Core-Loc units has been added to the design for the near shore ocean-side where the toe trench will be excavated into hard rock bottom in very shallow water. The concrete will prevent the movement of Core-Loc units and will increase the stability in the toe area.

c. The range of allowable stone size for underlayer and bedding stones has been increased slightly for more efficient use of available quarry stones.

Revisions to the design are included in the Final EA for the project.

If you have any questions or need additional information regarding this project, please do not hesitate to contact Mr. James Hatashima, Project Manager of my Civil and Public Works Branch staff at (808) 438-2264.

Sincerely,

Ray H()yo, P.E.
Deputy District Engineer for Program
Project Management

SIERRA CLUB
HAWAI'I CHAPTER
P.O. Box 2577, Honolulu, HI 96803
tel: 808.538.6616 fax: 808.537.9019

20 June 2001

Jim Hatashima
U.S. Army Corps of Engineers
Honolulu Engineer District
Building 230
Fort Shafter, Hawaii 96858-5440

Fred Pascua
State Department of Transportation
Harbors Division
79 S. Nimitz Highway
Honolulu, HI 96813

RE: Kaumalapau Harbor Breakwater Repair

The Sierra Club, Hawai'i Chapter requests that the following issues be addressed more thoroughly in the Environmental Assessment (EA):

1. Humpback Whale Sanctuary. The EA needs to more thoroughly examine the impact of this project on the Humpback Whale National Marine Sanctuary. This analysis should include construction activities, potential accidents, and increased boat traffic resulting from this project.

2. Corals. The EA should more fully discuss the impact to corals and timelines for recovery of the various species. Any loss of corals—which the DEA reveals will occur—are an irretrievable loss of a natural resource. Not only is this loss unmitigated, it is also in and of itself a significant effect. The EA should fully disclose how much coral will be lost, what kind of coral will be destroyed, and how the impact will be mitigated.

3. Secondary effects. The EA should disclose the impact of increased tourism arrivals due to the improvements proposed to the breakwater. Considering the expansion plans that Lanai Company is undergoing, it is clear that more fuel, cargo, supplies, and other goods will need to be imported to Lanai—facilitated by the seawall improvements.

4. Funding. The EA should fully disclose the source of funding for this project and discuss what other projects could have been funded with this federal or state money.

We appreciate the opportunity to offer these comments and look forward to your response.

Sincerely,

Jeff Mikulina
Director, Sierra Club, Hawai'i Chapter
cc: Office of Environmental Quality Control
Scott Sullivan, Ocean Engineering

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

REPLY TO
ATTENTION OF

May 20, 2002

Subject: Kaumalapau Harbor Breakwater Repair, Lana'i, Hawai'i

Civil and Public Works Branch

Mr. Jeff Mikulina
Director, Hawai'i Chapter
Sierra Club
P.O. Box 2577
Honolulu, Hawaii 96803

Dear Mr. Mikulina:

Thank you for your letter dated June 20, 2001, commenting on the Draft Environmental Assessment (EA) for the Kaumalapau Harbor Breakwater Repair project.

Currently, we are in the process of finalizing the EA and a copy of this response letter will be included in the final document. Following the completion of the Draft EA, minor revisions were made to the design of the breakwater repair work. Revisions do not alter the basic scale or scope of the project. The primary purpose was to incorporate the current design practices and experiences gained in using the Core-Loc concrete armor unit. Revisions include the following items.

a. The breakwater crest has been re-designed to increase Core-Loc stability during design storm wave conditions, and to improve constructability. Primary changes are:

(1) Widening the crest width to 40 feet at the top of the underlayer stone (+9.5' elevation),

(2) adding a horizontal row of Core-Loc units on the ocean-side crest, and

(3) replacement of the rib cap on the crest with a solid mass concrete crest cap.

b. A requirement for tremie concrete to be placed in the toe trench following placement of the Core-Loc units has been added to the design for the near shore ocean-side where the toe trench will be excavated into hard rock bottom in very shallow water. The concrete will prevent the movement of Core-Loc units and will increase the stability in the toe area.

c. The range of allowable stone size for under layer and bedding stones has been increased slightly for more efficient use of available quarry stones.

Revisions to the design are included in the Final EA for the project.

The following responses are provided to the issues raised in your letter:

a. Humpback Whale Sanctuary: As discussed in section 5.1.7 of the Draft EA, coastal waters seaward of Kaumalapau Harbor to the 100-fathom contours are included in the Hawaiian Island Humpback Whale National Marine Sanctuary. The 100-fathom contour is located approximately one mile offshore of the harbor. Construction activities will simply involve reshaping the existing breakwater material and placing new stone and concrete armor units. No blasting will be required or permitted. Large vessels utilizing the harbor are deepwater tug and barges traveling seaward of the 100-fathom contour, and which would only enter the sanctuary waters in transit from deep water directly to or from the harbor. At present one cargo barge call per week is made by Young Brothers, and typically one fuel barge call per week is made. No increase in scheduled tug and barge calls at the harbor are anticipated in the foreseeable future. There will be a temporary increase in tug and barge calls during the construction period transporting equipment and materials to the site. These vessels also travel outside of the sanctuary waters except to enter or depart the harbor. Smaller commercial fishing and tourist activity boats, as well as small recreational fishing and dive boats also occasionally utilize the harbor and wharf. These vessels may spend more time within the 100-fathom contour, however the breakwater repairs are not anticipated to increase the small boat traffic. The proposed project has been coordinated with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service as required by the Endangered Species Act, and both agencies have concurred that the breakwater repair is unlikely to adversely affect listed endangered or protected species, including whales.

b. Corals: The predominant marine biota inhabiting the present breakwater structure are stont corals, primarily of the genera *Porites, Pocillopora* and *Montipora*. As discussed in section 6.1.5 of the Draft EA, the proposed breakwater repair will involve coverage of the existing breakwater structure with new rock and concrete, resulting in the loss of much of the existing coral cover on the breakwater. Unfortunately, the loss of the coral on the existing structure is an unavoidable cost of repairing the breakwater. However, as the new breakwater will consist of materials similar to those on the existing structure, and the repairs will not otherwise alter conditions for coral growth at the project site, it is reasonable to assume that coral will colonize the new breakwater and that over a 10 to 20 year period coral cover on the new structure will be similar to what is present today. Excess stone removed during the reshaping of the breakwater to form the core of the new structure will be placed on the sand bottom at the toe of the breakwater, which will create additional hard bottom substrate for coral growth. In addition, construction of a stable breakwater structure will reduce the potential for damage to corals by movement of the breakwater material during storm wave attack.

c. Secondary Effects: Kaumalapau Harbor was constructed in 1926, and for 75 years it has been a functioning port. Repair of the breakwater will not change the harbor size, wharf space or services provided. Up until about the past decade, when the island's economy was based on agriculture, the harbor chiefly was used for the export of pineapple. As the economic base has changed from agriculture to tourism, the primary function of the harbor is also changing from export to the import of supplies and materials to support the new economic environment. Repair of the harbor breakwater will not of itself result in an increase in tourism and visitor arrivals to the island, the fundamental change in economic base is fueling the expansion plans of Lanai Company. Repair of the breakwater will, however, facilitate the safe, timely and consistent delivery of fuel and goods to the island, a benefit to both the social and economic welfare of the residents as well as the Lana'i Company. This discussion has been added to section 6.3 of the Final EA.

d. Funding: The total construction cost of the proposed repair is estimated to be $15 million, of which 80 percent ($12 million) will be federally funded and 20 percent ($3 million) provided by the State of Hawai'i. This is stated in section 3.5 of the final EA.

Should you have any questions or desire additional information regarding this project, please contact Mr. James Hatashima of my Civil and Public Works Branch staff at 438-2264.

Sincerely,

Ray H. Jyo, P.E.
Deputy District Engineer for Program
Project Management