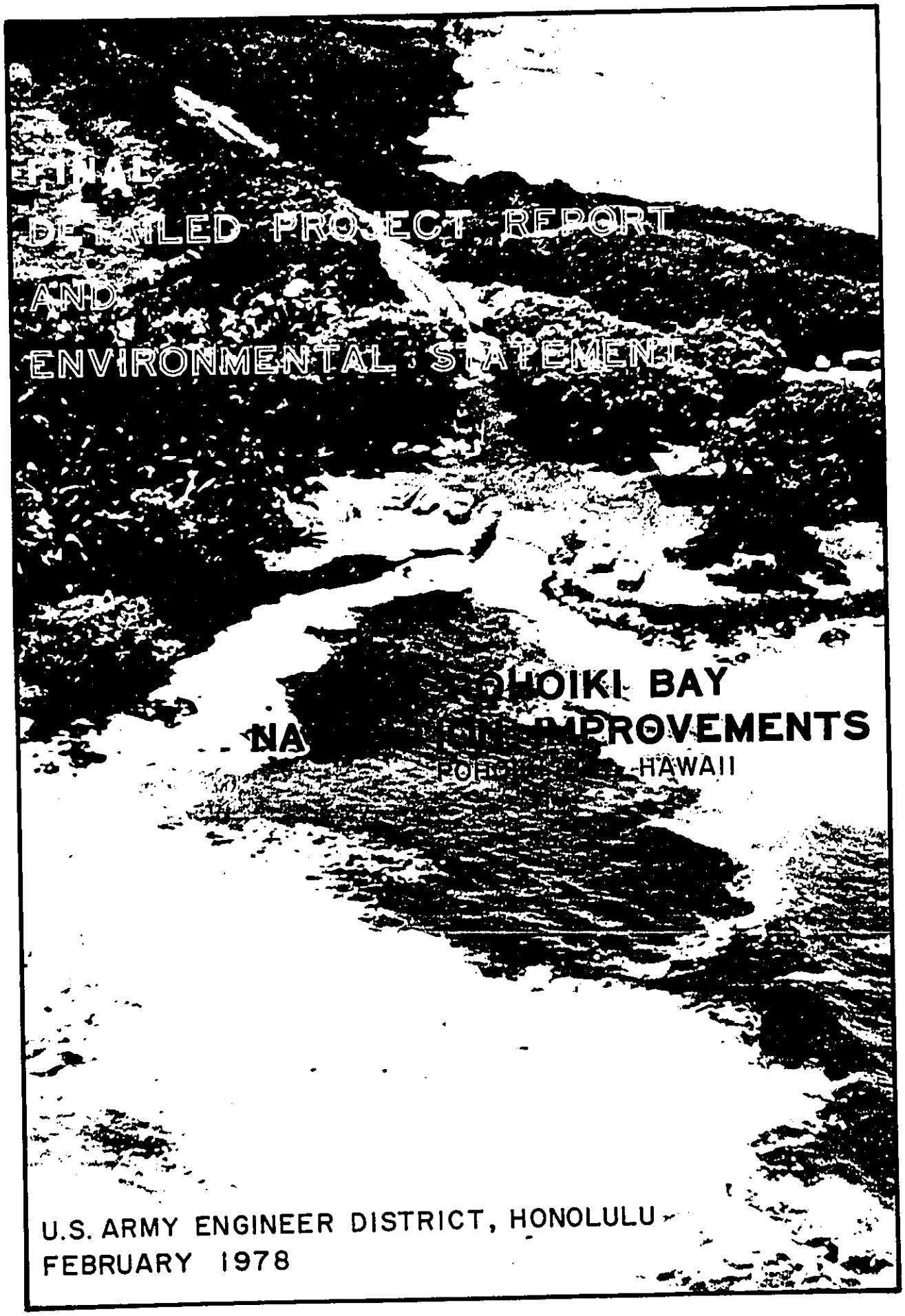
FINAL
DETAILED PROJECT REPORT
AND
ENVIRONMENTAL STATEMENT
OHOIKI BAY
IMPROVEMENTS
HAWAII
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FEBRUARY 1978

DETAILED PROJECT REPORT
NAVIGATION IMPROVEMENTS
POHOIKI BAY, HAWAII

PERTINENT DATA

PROJECT FEATURES

1. BREAKWATER	
a. Length	90 Feet
b. Crest Elevation	+10 Feet MLLW
c. Crest Width	16 Feet
d. Side Slope	1V to 2H
e. Armor Layer	
Size	7 to 12 Ton Stone
Thickness	11 Feet
f. Underlayer Stone Size	700 to 1,200 Lb. Stone
g. Core Stone Size	30 to 60 Lb. Stone
2. REMOVE LARGE BOULDER IN APPROACH TO LAUNCH RAMP	

PROJECT BENEFITS

Total Average Annual Benefits Based on a 6-5/8% Interest Rate and a 50-Year Project Life	$76,500

PROJECT COSTS

Federal Project First Cost	$316,000
Non-Federal Project First Cost	0

ANNUAL CHARGES

Total Annual Charges Based on a 6-5/8% Interest Rate and a 50-Year Project Life	$26,400

BENEFIT-COST RATIO	2.9

DETAILED PROJECT REPORT
NAVIGATION IMPROVEMENTS
POHOIKI BAY, HAWAII

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THE STUDY AND REPORT

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SECTION A

THE STUDY AND REPORT

PURPOSE AND AUTHORITY

1. The purposes of this study were to determine the need for and feasibility of navigation improvements at Pohoiki Bay on the Island of Hawaii, and to determine the extent to which the Federal Government can participate in the recommended solution.

2. This study results from a request by the State of Hawaii, Department of Transportation, to investigate the navigation problems at Pohoiki Bay and possible solutions. A reconnaissance report indicating the feasibility of constructing navigation improvements and recommending detailed studies was completed in November 1975. Preparation of a Detailed Project Report for Pohoiki Bay navigation improvements was approved in December 1976, and funds to initiate detailed studies were received in January 1977.

3. The study focused on the identification and evaluation of the problems attending navigation in Pohoiki Bay on the island of Hawaii, and the need for navigation improvements. The problems and needs were summarized in planning objectives to guide the study. Alternative improvement plans were developed to meet the planning objectives. The costs, benefits, and environmental impacts associated with implementing the alternative plans were determined, and the plans evaluated to determine which plan would best meet the planning objectives as well as being compatible with the overall needs and resources of the study area.

4. The study area was limited to Pohoiki Bay on the southeast (Puna) coast of the island of Hawaii. Fishermen from the Puna area of the Island of Hawaii state that Pohoiki Bay is historically the best site on the southeast coast of the island for launching small boats, and it is the site of a launch ramp now used by local commercial fishermen.

5. Studies conducted during the preparation of this report include detailed site investigations, topographic and bathymetric surveys, oceanographic analysis to determine the design criteria, and detailed engineering design, economic evaluations, and environmental assessment. A detailed marine environmental survey and an archaeological reconnaissance study were accomplished to aid in the impact assessment and evaluation and the preparation of an environmental statement.

6. The study was conducted in sufficient depth and detail to define the navigation need and the planning objectives, and to develop and assess alternative plans for public review and comment. Additional detailed studies and evaluations have resulted in a final recommended plan of action.

STUDY PARTICIPANTS AND COORDINATION

7. The U.S. Army Corps of Engineers, Honolulu Engineer District, is responsible for conducting and coordinating the study and preparing the study report. Close coordination has been maintained with the State of Hawaii, Department of Transportation, Water Transportation Facilities Division, which requested the study and serves as local sponsor of the project.

8. The study has been coordinated with the following agencies and comments received from them have been considered in the identification of study concerns:

US Fish and Wildlife Service
National Marine Fisheries Service
US Soil Conservation Service
Department of Land and Natural Resources, State of Hawaii
Department of Planning and Economic Development, State of Hawaii
Office of Environmental Quality Control, State of Hawaii
Planning Department, County of Hawaii
Department of Recreation, County of Hawaii
Big Island Resource Conservation and Development Council

9. A public workshop was held on 6 July 1977. Persons attending included representatives from the State Department of Transportation, the County Planning Department, the Soil Conservation Service, the Puna Council, fishermen, and residents. The workshop focused on the navigation needs as well as associated needs for the Pohoiki area, possible alternatives, and impacts associated with construction of improvements in Pohoiki Bay. A formal public meeting to present the study results and the alternative plans of improvement was held on 16 November 1977. The fishermen and residents attending the public meeting strongly supported the recommended navigation improvements.

PRIOR STUDIES AND REPORTS

10. A reconnaissance report on navigation improvements for Pohoiki Bay was completed by the Honolulu Engineer District in November 1975. In conjunction with the detailed studies a reconnaissance survey of the marine environment was completed in September 1977. A draft report titled Isaac Hale Beach Park, Public Water-Based Recreation Measure Plan, dated September 1977, was made available by the U.S. Soil Conservation Service.

SECTION B

RESOURCES AND ECONOMY OF THE STUDY AREA

SECTION B

RESOURCES AND ECONOMY OF THE STUDY AREA

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SECTION B

RESOURCES AND ECONOMY OF THE STUDY AREA

GENERAL DESCRIPTION

STATE OF HAWAII

1. The Hawaiian Islands are centrally located in the Pacific Ocean, extending northwest to southeast from about 155° to 179° W. longitude and 19° to 28°N latitude. Eight major islands constitute more than 99 percent of the total land area of the state, or about 6,446 square miles. Honolulu, the State Capital, is located on the island of Oahu which is situated approximately 2,100 miles southwest of San Francisco. The State of Hawaii is noted for its unique blend of multi-ethnic cultures, its natural beauty, and its equable subtropical climate, as well as its strategic location in the Pacific.

STUDY AREA

2. The island of Hawaii is the largest of the Hawaiian islands, consisting of about 4,038 square miles of land area and 266 miles of coastline (Figure B-1). The town of Hilo, on the eastern side of Hawaii, is the economic and political center of the island and the main port.

3. Pohoiki Bay is located in the Puna District, the most easterly point in the Hawaiian islands, about 25 road miles south of Hilo. The Puna District has a population of about 7,800. The Puna landscape is characterized by historic lava flows, slopes with little or no established surface drainage, and a cliffed volcanic coast. The soil is primarily a thin layer of organic material accumulated on lava rock. The groundwater supply is principally a basal water lens floating on salt water. The prevailing winds are the northeasterly tradewinds, and the rainfall ranges between 50 and 200 inches per year.

4. Pohoiki Bay (Figure B-2) is about 1,100 feet wide at its seaward mouth, and extends inland about 450 feet. The County of Hawaii's Isaac Hale Beach Park borders the eastern shoreline of the bay. The beach park encompasses 2.07 acres and contains a group shelter, restrooms, picnic tables, and showers. The County, with the assistance of the Soil Conservation Service, is planning park improvements to meet the growing need for public recreation facilities. A one-lane State-maintained launching ramp is located adjacent to the County park. This ramp is heavily used by commercial fishermen who live in the nearby area. Pohoiki Bay is also used by swimmers, pole fishermen, divers, and surfers.

5. The shoreline of the bay is generally rocky, with shallow lava ledges at both ends of the bay and in the center. The bottom consists of rock and cobbles with scattered small coral heads. The bay is exposed to ocean waves from the northeast clockwise to the southwest.

NATURAL FORCES

WINDS

6. No wind gages exist in the immediate vicinity of Pohoiki Bay. Information on wind conditions at this location is extrapolated from statistical data on offshore winds contained in the U.S. Naval Weather Service Command publication, "Summary of Synoptic Meteorological Observation," June 1971. The wind information is for the position 20.9° north latitude and 156.0° west longitude. This information is representative of conditions at the project site. Figure B-3 is a diagram which shows wind direction, speed, and frequency.

WAVES

7. Waves arriving at Pohoiki Bay originate from various areas in the Pacific and Indian Oceans. These waves have a variety of periods and heights depending on their origin and other factors related to wave building and decay. At Pohoiki, several distinct wave types may be acting simultaneously. This produces a very complex wave climate.

8. Pohoiki Bay faces roughly southeast and generally is subject to a wave spectrum from the northeast clockwise to the southwest. In a simplified description, the waves at Pohoiki can be classifed into a few predominant wave types, where each is typified by a range of heights, periods, and directions of approach. The three primary wave types are: (1) the northeast trade waves, (2) the southern swell, and (3) the "Kona" storm waves.

9. Northeast trade waves are present throughout most of the year, but are most frequent between April and November when they usually dominate the local wave spectrum. They result from the strong tradewinds blowing out of the northeast quadrant over long fetches of open ocean. Typical periods range from 6 to 12 seconds with heights of 4 to 12 feet. Generally northeast trade waves are present from 90 to 95 percent of the time between April and November and from 55 to 65 percent of the time during the remainder of the year.

10. Southern swell is generated during the Antarctic winter months by strong winds blowing over long fetches of the southern Pacific and Indian Oceans. After traveling over thousands of miles of open ocean, these waves arrive at the southern shores of the Hawaiian Islands as long period swell. Periods typically range between 14 and 22 seconds with heights generally 1 to 4 feet. In an average year, southern swell arrives at Pohoiki Bay about 53 percent of the time; usually during the summer months from April to October.

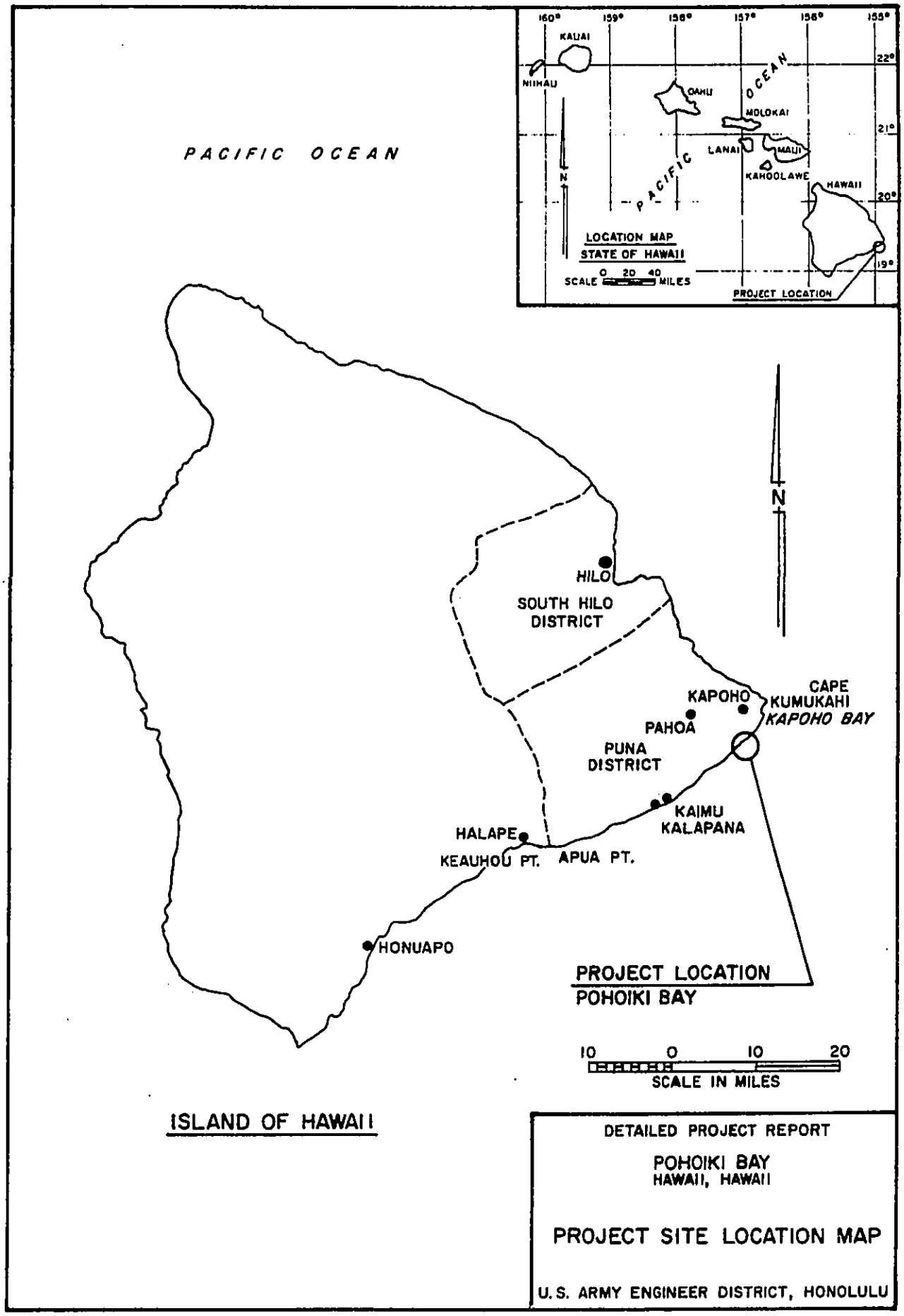

PACIFIC OCEAN
160°
159°
158°
157°
156°
155°
22°
21°
20°
19°
KAUAI
NIIHAU
OAHU
OCEAN
MOLOKAI
LANAI
MAUI
KAHOOLAWE
HAWAII
PACIFIC
N
LOCATION MAP
STATE OF HAWAII
SCALE 0 20 40 MILES
PROJECT LOCATION
N
HILO
SOUTH HILO
DISTRICT
KAPOHO
CAPE
KUMUKAHI
KAPOHO BAY
PAHOA
PUNA
DISTRICT
KAIMU
KALAPANA
HALAPE
KEAUHOU PT.
APUA PT.
HONUAPO
PROJECT LOCATION
POHOIKI BAY
10 0 10 20
SCALE IN MILES
ISLAND OF HAWAII
DETAILED PROJECT REPORT
POHOIKI BAY
HAWAII, HAWAII
PROJECT SITE LOCATION MAP
U.S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE B-1

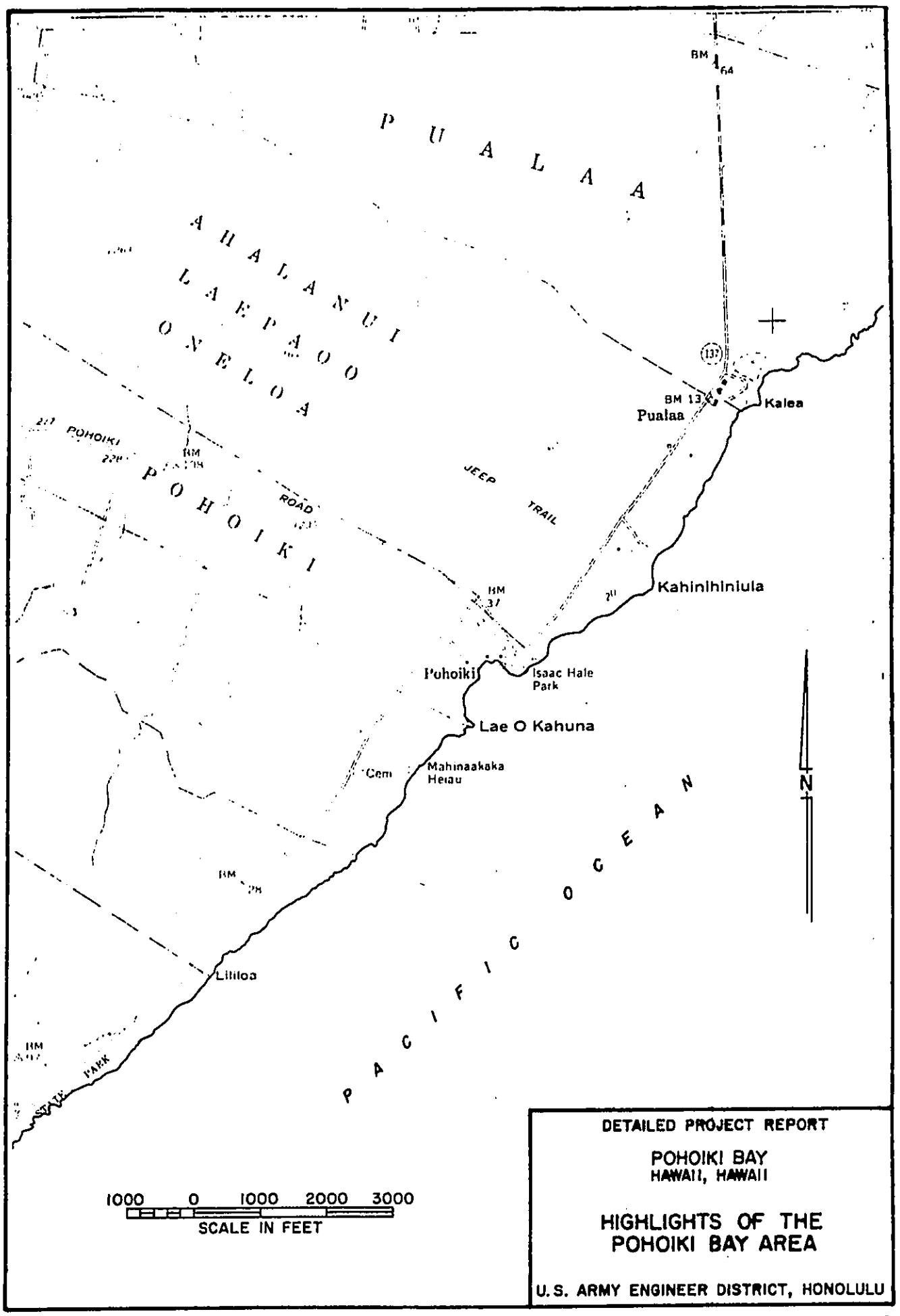
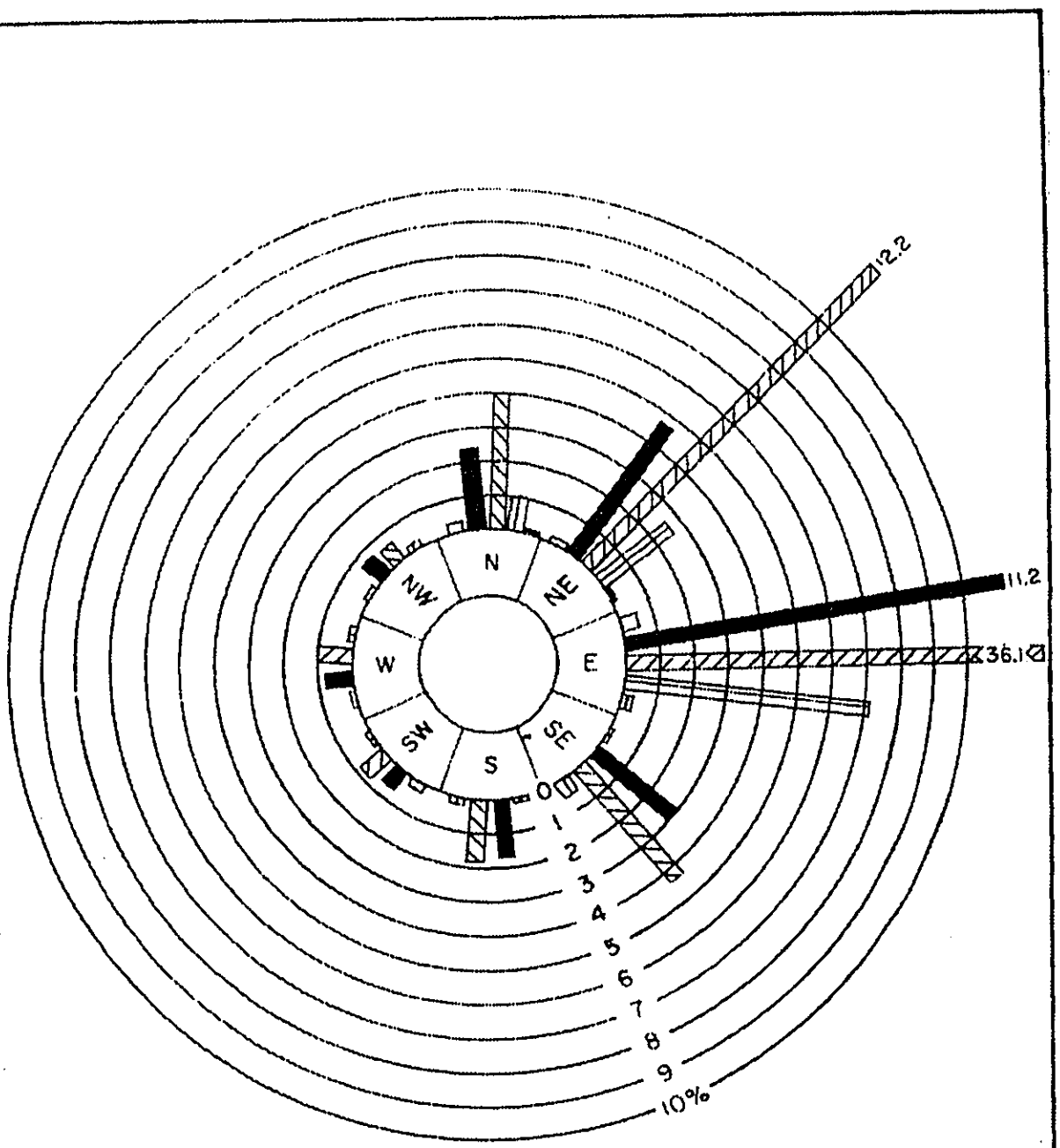

PUALAA
AHALANUI
LAEPAOO
ONELOA
POHOIKI
POHOIKI
ROAD
JEEP
TRAIL
BM 64
BM 13
Pualaa
Kalea
Kahinihiniula
Pohoiki
Isaac Hale
Park
Lae O Kahuna
Cem
Mahinaakaka
Heiau
Lilliloa
PARK
PACIFIC OCEAN
N
1000 0 1000 2000 3000
SCALE IN FEET
DETAILED PROJECT REPORT
POHOIKI BAY
HAWAII, HAWAII
HIGHLIGHTS OF THE
POHOIKI BAY AREA
U.S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE B-2



LEGEND

1-3 KTS

4-10 KTS

11-21 KTS

22-33 KTS

34-37 KTS

10% = TOTAL % OF THE YEAR

PERIOD OF RECORD

1963 TO 1970

STATION LOCATION

20.9 NORTH LATITUDE
156 WEST LONGITUDE

SOURCE

U. S. NAVAL WEATHER SERVICE COMMAND

OFFSHORE WIND DIAGRAM

FIGURE B-3

11. "Kona" storm waves are generated by local storms and fronts which generally cause winds and waves from the south through the west. These storms are neither frequent nor consistent, however, they may generate large destructive waves which can directly affect Pohoiki Bay. Commonly, periods range from 8 to 10 seconds, with heights of 10 to 15 feet. In any year, Kona storms may occur several times or not at all. They occur most often in the winter months.

12. In addition to the primary wave types just discussed, there are others which are less frequent, but which are significant. One of these is the large swell generated by tropical storms in the equatorial regions. Wave heights may be 8 to 15 feet with periods of 10 to 15 seconds. These waves generally approach the Hawaiian islands from the southeast through the southwest and are most likely to occur in August and September.

13. Another infrequent source of large destructive waves is hurricanes. The most recent hurricanes passed through the Hawaiian chain in December 1957 and again in August 1959. Theoretical calculations by Dr. C. L. Bretschneider indicate that a significant deepwater wave height of 27 feet can be expected for a typical 50-year hurricane having the following parameters: a) central pressure reduction of 1 inch of mercury, b) radius of maximum winds of 20 nautical miles, c) forward speed of 12 knots. This results in a maximum sustained wind speed of 62 knots and a corresponding maximum deepwater wave height of 46 feet.

14. Wave refraction was studied to aid in locating zones of high energy concentration in the vicinity of the boat launch area, and to determine the probable approach alignment of the primary wave types affecting the site.

15. The refraction analysis was simplified because of the uniform nature of the shoreline along the southeast coast of the island between Cape Kumukahi and Keauhou Point, and because of a lack of available bathymetry for depths between 5 and 100 fathoms. Initial wave direction change in depths greater than 5 fathoms was approximated. The configuration of the bay and adjacent coastline is such that waves from these directions are refracted and approach the bay from the south to southeast directions. A detailed refraction analysis was then performed from the 5 fathom contour to the shoreline for 10 second east-northeast trade wind waves and the 15 second southern swell, which are the prevailing waves at the project site.

TIDES

16. The nearest tidal benchmark to Pohoiki Bay is at Honuapo on the south coast of the island, approximately 53 miles from Pohoiki. Tidal measurements taken at this location by the U.S. Coast and Geodetic Survey in 1929 are as follows:

	Feet
Highest tide (estimated)	4.00
Mean higher high water	2.50
Mean high water	2.00
Half tide level	1.15
Mean Low water	0.30
Mean lower low water	0.00
Lowest tide (estimated)	-1.50

CURRENTS

17. Extensive statistical data about currents at Pohoiki Bay does not exist. However, it has been reported that the net permanent drift from Cape Kumukahi to Keauhou Point is southwest, but that tidal currents may flow northeast during low tides or at any time in the presence of current eddies.

18. Current meter observations at Apua Point, 28 miles from Pohoiki, show that the net drift during a 16-day observation period was southwest at 0.1 knot. Tidal currents are superimposed on this net drift, but appear to be heavily influenced by local topography.

19. Wave generated rip currents within Pohoiki Bay have been reported by local commercial fishermen and observed by Corps personnel. These currents appear to be a dominant force in the oceanographic character of the bay. During heavy wave attack, the rip currents are probably severe. A moderate rip current was observed near the project site running in a west-southwesterly direction from the northeast point (Isaac Hale Park).

TSUNAMI AND EARTHQUAKES

20. During the past 31 years, eight tsunami have affected the island of Hawaii. Four of the eight caused major damage throughout the State. These occurred on 1 April 1946, 4 November 1952, 9 March 1957, and 23 May 1960. The most recent tsunami, which occurred on 29 November 1975, was unique because it was generated locally by a large scale land subsidence which occurred during an earthquake centered off the southeast coast of the island of Hawaii. The earthquake was the largest in over a century--magnitude 7.2 on the Richter Scale. The tsunami caused runups of about 25 feet along much of the southeastern coast of Hawaii. At Halape,

about 32 miles southwest of Pohoiki, the runup was about 40 feet, but at Pohoiki Bay it was only 7.5 feet. Ground subsidence, which occurred simultaneously with the earthquake, fell 10 feet in some areas. The Pohoiki area subsided about 1.3 feet. Earthquakes and tsunamis are characteristic of the island of Hawaii.

NATURAL RESOURCES

CLIMATE

21. The island of Hawaii has a warm, semi-tropical climate generally characterized by two seasons a year. In Puna District, the climate varies considerably from the rocky shoreline to the rainforest areas in the upper elevations. Along the coastal regions, temperatures average in the seventies. Rainfall at Pohoiki varies between 80 and 100 inches annually.

GEOLOGY

22. The island of Hawaii is of volcanic origin, and was formed during the past 800,000 years by the gradual emergence and subsequent coalescence of five volcanoes, two of which, Mauna Loa and Kilauea, are still active. The Puna coastline from Cape Kumukahi to Kalapana consists of low sea cliffs and the constructional surface of recent lava flows. Pohoiki is located about 4 miles from the active east rift zone of Kilauea and is within an active fault zone. The last eruption and lava flow affecting the Puna District was in September 1977. During the past 15 years, the island of Hawaii has experienced 11 earthquakes with Richter magnitude ratings of 6 or more. The most recent occurred on 29 November 1975. Earthquakes and volcanic activity can be expected to continue in the Puna District.

Because of the recent eruptions in Puna, there is a lack of "true" soils. Tropofolist soils, predominating at Pohoiki, are well-drained, very shallow organic soils, mostly underlain by a'a or clinker type lava.

TERRESTRIAL ENVIRONMENTAL SETTING

23. The natural vegetation in the Pohoiki region of Puna consists of Ohia-Koa forests toward Pahoa and a zone of open guava forest with shrubs surrounding the Pohoiki Bay. Common species found near the bay include kukui, ohia, koa, koa haole, guava, lantana, and coconut. Coffee and sugar cane were once the region's principal agricultural products, but now papayas and commercial flowers, especially orchids, are cultivated in scattered fields. Milo trees have been planted in Isaac Hale Park. The local people have indicated a strong desire to preserve these trees.

24. Wild pigs inhabit the forests inland of Pohoiki and are hunted on a semi-subsistence basis. The nearby Malama-ki Forest Reserve, 1.5 miles west of Pohoiki, is a public hunting area and has been proposed as a Natural Area Reserve.

24. The forested zones around Pohoiki Bay probably provide habitat for spotted doves, barred doves, cardinals, Japan white eyes, and house finches. Along the rocky coastline wandering tattlers, Pacific golden plovers, sanderlings, and ruddy turnstones can be found.

MARINE ENVIRONMENTAL SETTING

26. The substrate in the proposed breakwater and dredge area in Pohoiki Bay is mainly mixed, rounded basalt rubble and sand over a basalt pavement. In nearshore areas, the sand and small rock material is constantly in motion or suspension, especially between the launching ramp and the lava shelf extending out near the center of the bay. Towards the outer portions of the proposed breakwater and dredge area, large basaltic boulders appear more often and some are within 2 or 3 feet of the surface at low tide.

27. Biological profiles of Pohoiki Bay detected no rare or endangered species within or adjacent to the project area, although the locally-protected green turtle has been observed outside the bay just beyond the breaker lines.

Water Quality

28. The waters on the southeastern coast of Hawaii are classified "Class AA waters" in Chapter 37-A, State of Hawaii Department of Health, Water Quality Standards. These waters are to be protected for oceanographic research, support and propagation of shellfish and other marine life, conservation of coral reef and wilderness areas, compatible recreation, and aesthetic enjoyment. The established parameters for Class AA waters may not be met in their entirety at Pohoiki Bay because in part of unique natural conditions prevailing there as the result of the natural discharge of heated brackish water within the bay. Construction of navigation improvements at Pohoiki Bay should not affect water quality except temporarily during construction.

HUMAN RESOURCES

POPULATION CHARACTERISTICS

29. The population of Hawaii County declined from 1930 to 1960. Population growth for the County experienced a continued acceleration from 1960 to 1975, with some slowing in the rate from 1975 to 1976, as shown

in Table B-1. The 1960-1970 decade witnessed a 3-1/2 percent increase, the first hint of growth since 1930, and largely due to the rapid growth of the tourist industry. By 1975, the County's population had increased by another 19 percent to 75,300, and to 76,600 by 1976. Population for the district of Puna shared in this growth, increasing by 2.4 percent from 1960 to 1970, and by 51 percent from 1970 to 1975.

Table B-1. Population of Puna District and Hawaii County

	Puna District		Hawaii County	
Year	Population	Average Annual Growth Rate	Population	Average Annual Growth Rate
1910			55,382	
1920			64,895	1.6%
1930			73,325	1.2%
1940			73,276	-.1%
1950			68,350	-.7%
1960	5,030		61,332	-1.1%
1970	5,154	0.2%	63,468	.3%
1975	7,200	6.9%	75,300	3.5%
1976	7,800	8.3%	76,600	1.7%

Source: Through 1970 from U.S. Census of Population; 1975-1976 estimates by Hawaii Department of Planning & Economic Development (DPED).

30. Despite the rapid population growth in recent years, the County remains relatively uncrowded with a density of 18 persons per square mile, as compared with Oahu's over 1,000 persons per square mile. Growth in the visitor industry will probably continue to influence population increases on the island.

31. Puna District is the second most populous district in Hawaii County, and is the most rapid growing district in the State of Hawaii. Approximately 70 percent of the population in 1970 was concentrated along the Mountain View-Keaau corridor near Hilo at 16.5 persons per square mile. In rural Pahoa-Kalapana region, including Pohoiki, only 1,352 people resided in 1970 (6.7 persons per square mile). No figures are available for this micro-region since 1970, but it is probable that the population of the Pahoa-Kalapana region has risen.

MAJOR SKILLS AND OCCUPATIONS

32. The civilian labor force within the County increased from 23,740 in 1960 to 30,120 in 1970 and to 32,200 in 1976. The greatest increase was hotel employment, followed by retail trade. The largest decrease was in the sugar industry where labor needs in harvesting and processing were reduced by mechanization. These trends have continued sinee 1970, but

the recent depression of the tourist trade in conjunction with the rising population has caused unemployment to rise to its highest levels in two decades. The median family income among Puna residents was $8,122 in 1970 compared with $9,750 for the County as a whole and $11,554 for the State. In the Pahoa-Kalapana region, the median family income was only $7,603. More recent figures are not available.

PUBLIC FACILITIES AND SERVICES

33. Basic improvements and amenities are not available at Pohoiki Bay. Potable water is supplied to the few consumers in the Pohoiki region by roof catchment systems. According to officials with the County Department of Water Supply, there are no plans to extend the Pahoa water distribution system to Pohoiki. Most Puna residences are served by individual sewerage systems. Private residences and the restrooms at Isaac Hale Park are served by cesspools, although there are plans to upgrade the park facilities. No electricity or telephone service is available at Pohoiki Bay, and no immediate plans exist to extend service to the region. The nearest telephones are available at Kapoho.

34. Primary access to Pohoiki Bay is from Pahoa by the Pahoa-Pohoiki Road. During 1976 and 1977, this route was widened and paved, noticeably increasing the volume of traffic according to local inhabitants at Pohoiki Bay. (Alternative access along Route 137 from either Kalapana or Kapoho is proposed to be upgraded and then renamed the Puna Coast Scenic Highway. This highway will connect Hilo to Kalapana via Kapoho.) This highway will provide access to potential recreation areas, as well as to the shoreline. The improved access may invite new development.

35. Rescue services for endangered boats at sea is provided by the U.S. Coast Guard, either from its base at Hilo Harbor or by rescue boat launched at Pohoiki Boat Ramp when sea conditions permit. The County of Hawaii Fire Department also provides rescue services from its station at Pahoa. Health service in Puna district is provided by a privately operated clinic in Keaau which treats plantation employees and has an ambulance service.

RECREATION RESOURCES

36. Puna District has only four beach parks. Swimming is limited at all of the parks because of unfavorable shoreline conditions. The only park offering boat-launching facilities is at Isaac Hale Beach Park on Pohoiki Bay. Isaac Hale Beach Park comprises 2.07 acres of which 1.25 acres are in active service, including ten camp sites with picnic tables, a pavilion, restrooms, and a drinking fountain. Recent counts of visitors, based on pavilion reservations, amounted to 1,920 in 1973-1974, 1,037 in 1974-1975, and 1,835 in 1975-1976. These figures are estimated to be about 20 percent of the actual use. The County in conjunction with the U.S. Soil and Conservation Service Rural Conservation and Development

Council, plan major improvements to Isaac Hale Park including a larger pavilion, a new comfort station with new water and sewage treatment systems, additional picnic tables and a graded parking lot.

37. The boat ramp adjacent to the County park is the responsibility of the State of Hawaii Department of Transportation. Maintenance to the boat ramp is provided, on an actual day-to-day basis, by the local fishermen who rely upon the ramp for their livelihood. At present the boat ramp is used almost exclusively by commercial fishermen.

38. Swimming and surfing are also quite popular in Pohoiki Bay, particularly among the local island residents. A mid-afternoon visual count on a Wednesday in July 1977 found about 15 swimmers, including one scuba diver, using the boat ramp to enter the water. Most of the swimming is near the boat ramp, possibly because of warm spring water which enters into the bay along the shoreline near the boat ramp. Most surfing occurs in the middle and southwest half of the bay but also, occasionally, off the northeast point near the park. Another recreation and historical resource at the bay is the Pohoiki Warm Springs which swimmers use for bathing in lieu of showering facilities at the park.

39. In addition to the commercial fishing, there is also recreational fishing from boats and from the shoreline. According to local residents at Pohoiki, the shoreline is often crowded and the number of fishermen seems to have increased as road access has improved. It is anticipated that there will be an increase in the number of fishermen when improved parking facilities are provided at Isaac Hale Beach Park.

CULTURAL AND HISTORICAL RESOURCES

40. Puna was probably settled very early in Hawaiian prehistory, but the region was one of minor importance. A cultural reconnaissance conducted by the State Historical Preservation Officer in 1975 and an earlier reconnaissance conducted by Bishop Museum in 1972 revealed many archeological structures in the Pohoiki region. It appears that most of these are historical and may be scattered remains of a coastal settlement. A walk-through reconnaissance conducted in 1977 within the immediate project area revealed no archeological sites, although local informants suggested that several residences once were located there.

41. The first historic reference to Pohoiki dates from 1846, when there may have been as many as 200 people living in the area. A search of historic documents shows that the local legend that Pohoiki served as a whaling port probably derives its origin from the boat landing there in the 1890's, which was used to transport coffee from the Rycroft coffee mill to waiting ships.

42. No sites on the National Register of Historic Places are in the general vicinity of the project. There are, however, two sites on the Hawaii State Register of Historic Places, both in Reserve Status. Site 10-46-2510, Pohoiki Warm Springs, and Site 10-46-2515, Hale Park Complex are located, respectively, about 400 and 800 feet northwest of the boat ramp.

DEVELOPMENT AND ECONOMY

43. Hawaii is a prosperous state with a growing population and economy. Between 1950 and 1975, the total resident population increased over 73 percent from 498,000 to 865,000. During the same period, the gross State product more than quadrupled, from $900 million to $6.49 billion. The three largest contributors to the State economy are tourism, defense expenditures, and agriculture, the bulk of the last activity being in the production of sugar and pineapple. The most rapid growth during the last several years has been in the tourist industry. Tourist arrivals totaled 687,000 in 1965 and 2,830,000 in 1975. Tourist expenditures were $225 million in 1965 and $1,405 million in 1975, an increase of 524 percent. This is compared to an increase of 125 percent for defense spending. It is expected that the trend in growth of the tourist industry will continue although at a slower pace, together with the State economy in general.

44. The economy of the island of Hawaii (the Big Island) is centered around the sugar industry, although tourism is increasing significantly in importance. There are 509 sugar cane farms on Hawaii. They produced 388,000 tons of raw sugar in 1976. The United Cane Planters Cooperative (UCPC), a non-profit organization of 389 independent farmers, produces about 125,000 tons of sugar annually, which is the second largest tonnage in the State of Hawaii. (Maui's Hawaiian Commercial & Sugar Company produces the most tonnage). Currently the State of Hawaii supplies about 10 percent of the nation's 11-1/2 million tons of annual sugar consumption. No pineapple is grown on the Big Island.

45. The visitor industry has exhibited rapid growth in the past 10 to 15 years. Hotel construction on the Big Island grew so fast during this period that capacity has exceeded the need for rooms in recent years. In 1970 there were 3,534 hotel rooms, increasing to 4,292 in 1971 and to 5,641 by the end of 1976.

46. Coffee farms have existed for about a half century and more recently diversified farming such as macadamia nut and papaya farms have been increasing. Most of the commercially caught fish are sold in the local markets except for those in the eastern coast around Hilo and Pohoiki; much of this catch is eventually shipped to Honolulu.

47. The economy of the Puna District is based primarily on the sugar industry. The cultivation and processing of macadamia nuts is also a significant industry. Rapid growth since the 1970's has been demonstrated in diversified agriculture in the form of truck farms in the volcano region; papaya groves in the Kapoho region, and more recently in the Pohoiki region; and flower fields, principally anthuriums and vanda orchids, in the Mountain View, Pahoa, and Kapoho regions. Except for visitor attractions like the Kaimu Black Sand Beach, Lava Tree State Park, and the flower fields, the visitor industry has very little impact on the district. Currently no hotels or resort facilities are in Puna and local opposition to resort development in the Kaimu Beach region suggests that Puna would remain undeveloped for at least the near future. In conjunction with geothermal exploration currently underway, there has been some thought among private interests given to establishing a health spa which would in effect function as a resort destination. Commercial fishing became popular in the Pohoiki area in the 1960's and has more than tripled in tonnage to date. In 1976 at least 300,000 pounds were caught. This tonnage is expected to grow since Pohoiki is adjacent to one of the best fishing grounds in the Islands.

SECTION C

PROBLEMS AND NEEDS

SECTION C

PROBLEMS, NEEDS, AND OBJECTIVES

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SECTION C

PROBLEMS, NEEDS, AND OBJECTIVES

THE NAVIGATION PROBLEM

1. Direct ocean wave attack on Pohoiki Bay and the existing boat launching area results in considerable danger and difficulty during launch and retrieval of the commercial fishing boats which utilize the ramp. Commercial fishermen and others who use the ramp sustain damages to their craft and delays in their operations as well as personal injury.

2. Commercial fishermen have stated that the usually rough sea conditions in the Puna area and the lack of protective structures makes navigation in Pohoiki Bay a hazardous task even for skilled boatmen, particularly in the vicinity of the launch ramp. Once in the open sea they experience no problems under normal conditions. The fishermen reported that with the existing conditions at Pohoiki Bay, it takes at least four persons to launch and to retrieve a boat during average sea conditions. Numerous human injuries and damages to boats and trailer damages occur because of the unsafe navigation conditions in the bay. In addition to fishermen, the U.S. Coast Guard and the county's fire department rescue team use the Pohoiki ramp for emergency purposes, both have also experienced difficulty in launching their boats. In spite of the navigational difficulties and hazards, fishermen and emergency crews continue to use the Pohoiki launch ramp, primarily because it is the only one in the Puna District and because of its proximity to excellent fishing grounds off Pohoiki. The nearest launching ramp to Pohoiki is at Hilo which is 32 miles northwest by sea. Another launching ramp which is privately owned is located at Punaluu, approximately 40 miles southwest by water.

3. To determine the frequency of occurrence of sea conditions which would prohibit launching and retrieval, it was first necessary to define those conditions. Then, using the results of the wave refraction analysis and considering shoaling effects, the corresponding deep water waves were calculated. Deep-water wave frequency statistics, developed by Marine Advisors, Inc., in their report "Characteristics of Deep-Water Waves in the Oahu Area for a Typical Year" (1964), were used to determine how often the identified deepwater waves are likely to occur.

a. An analysis of wave characteristics at the launch ramp shows that a 4-foot breaking wave can occur. This wave would definitely prohibit launching and retrieval operations. The largest wave that can be tolerated during launching and retrieval is estimated at 2 feet.

b. The refraction and shoaling analysis indicates that a 2-foot wave at the ramp would result from a 7-foot, 10-second deepwater wave from the east, or from a 3-foot, 15-second deepwater wave from the south. The frequency of occurrence of the 7-foot or greater wave from the east for periods greater than 9 seconds was calculated to be about 18 percent for an average year. The 3-foot or greater wave from the south can be expected to occur about 23 percent of the time. Considering that waves from both directions can occur simultaneously, and that the southern swell generally occurs during the strong tradewind season, it was estimated that the existing launching facility is not usable about 25 percent of the time in an average year.

4. In addition to the launch and recovery problems, the absence of any navigational aids makes it extremely difficult and hazardous for fishermen returning during hours of darkness. During the public workshop the boaters stated the need for a lighted navigation aid.

RELATED PROBLEMS AND NEEDS

ENVIRONMENTAL RESOURCES

5. Pohoiki Bay, characteristic of the Puna coast with a rugged, rocky shoreline, is poorly protected from the almost constant wave attack. Heated water discharging along the shore is a unique feature of the bay, and serves as a reminder that the Puna District is geologically very active. The Pohoiki warm water springs are a natural resource protected by registration as a State Historic Place. No rare or endangered species are found in Pohoiki Bay. Marine life is diverse and abundant within Pohoiki Bay. The natural resources attract many island residents as well as visitors to the Puna coast. Any navigation improvements should be designed to complement the existing uses of the area's natural resources and should have as little adverse effect on the coastal and marine environment as possible.

HUMAN RESOURCES

6. Pohoiki Bay provides recreational opportunities for East Hawaii residents, and is actively utilized by swimmers, fishermen, and surfers as well as persons attracted simply for its scenic beauty. The effect of navigation improvements on these activities, and the possible secondary effects on the use of Isaac Hale Park must be assessed and evaluated.

7. The Puna coast is rich in Hawaiian historical and cultural resources. The local residents have indicated an awareness and concern for protecting these resources and the need to coordinate improvements in the Puna area so as to not adversely impact on important cultural and historic resources as well as local lifestyles.

DESIRED IMPROVEMENTS

8. The Director of the State Department of Transportation, by letter dated 29 April 1977, requested that the Corps of Engineers investigate the navigation problems at Pohoiki Bay and the feasibility of providing improvements. A reconnaissance report was completed and preparation of a Detailed Project Report was approved on 9 December 1976.

9. Commercial fishermen utilizing the existing facilities at Pohoiki Bay have stated the need to protect the launch ramp from wave action and to improve the general navigation conditions in the bay. At a public workshop meeting held on 6 July 1977, the boaters expressed the need for surge reduction and the elimination of breaking waves at the launch ramp. The ramp is currently unusable approximately 20 to 25 percent of the time. They stated that under present conditions a minimum of 4 persons is required to launch and recover their boats. When returning at the end of the day or early in the morning they must have previously arranged for help to meet them at the ramp and must wait offshore until help arrives. In addition, the boaters indicated the need to remove a large boulder located in the ramp approach area. Because of the generally rough sea conditions, boaters exiting or approaching the ramp area are restricted to a relatively narrow navigation area and the large boulder is difficult to avoid at low tide. The boaters also expressed the need for a lighted navigation aid.

10. The persons attending the workshop generally felt that the improvements should be as simple as possible, nothing fancy, and that the planning should be realistic both in terms of size and cost.

PLANNING OBJECTIVES

11. The planning objectives for the Pohoiki Bay navigation improvements were developed based on an analysis of the social, economic, and environmental aspects of the project area, and the identification of problems and needs attending navigation as well as environmental and human resources. The following planning objectives were adopted to guide the formulation and evaluation of alternative project plans:

a. Provide protection for trailer boat launching and recovery during all but storm conditions.

b. Improve commercial fishing opportunities.

c. Limit the protected water area to launch and recovery operations, allowing for sufficient maneuvering room.

d. Minimize conflicts with existing and planned uses of the Pohoiki Bay area, including Isaac Hale Park, surfing, swimming, shoreline fishing, and diving.

e. Protect historic Pohoiki Warm Springs.

SECTION D

FORMULATING A PLAN

SECTION D

FORMULATING A PLAN

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SECTION D

FORMULATING A PLAN

FORMULATION AND EVALUATION CONCEPTS

1. The formulation and analysis of alternative solutions to achieve the planning objectives were based on the Water Resources Council's Principles and Standards for Planning Water and Related Land Resources (P&S). The evaluation and assessment of economic, social, and environmental effects also followed the guidelines of Section 122 of the River and Harbor Act of 1970 (Public Law 91-611) and the National Environmental Policy Act of 1969 (NEPA). The formulation of alternative plans of improvement was guided by the following technical, economic, and environmental criteria.

2. TECHNICAL CRITERIA

a. The improvement should provide safe navigation and protection for the launching and recovery of vessels during all periods when small boats can reasonably be expected to utilize the Pohoiki Bay facilities.

b. Protective structures should be designed for overtopping during severe wave attack.

c. The improvements should be designed to accommodate vessels now operating out of Pohoiki Bay, i.e., 25-foot length, 7-foot beam, 3-foot draft.

d. The protective structures should provide a safe maneuvering area for the design vessel.

3. ECONOMIC CRITERIA

a. The plan should be economically sound, the benefit-to-cost ratio should be at least unity, and the net benefits, as far as practicable, should be maximized.

b. The cost for alternative plans of improvement are based on preliminary layouts and estimates of quantities, and August 1977 unit prices. The benefits and costs are expressed in comparable quantitative economic terms to the fullest extent possible. Annual costs are based on a 50-year amortization period and a 6-5/8 percent interest rate. The annual charges include the annual maintenance cost.

4. ENVIRONMENTAL CRITERIA

a. Minimize the physical destruction of marine resources in Pohoiki Bay.

b. Minimize long-term disturbances to the physical environment (e.g., water circulation, water quality, and sediment transport) which may have secondary impacts on the living organisms that inhabit Pohoiki Bay.

5. The following general concepts were also used to guide the formulation, assessment, and evaluation of alternative harbor plans:

a. Both adverse and beneficial impacts of alternative plans should be identified and measured, and the beneficial or adverse contributions of each plan evaluated;

b. The plans should be developed to minimize conflicts, maximize compatibility, and insure completeness;

c. The desires of local interests should be given full consideration; and

d. The plans should be evaluated with respect to their acceptability, certainty, completeness, effectiveness, efficiency, equity, benefit-cost ratio, and reversibility.

IDENTIFICATION OF ALTERNATIVE PLANS

6. Possible navigation improvements in Pohoiki Bay were investigated based on the evaluation of problems and needs and the expressed desire for improving navigation conditions. A solution of no action was not considered because it would not meet the expressed desire for improvement, which is the basic objective of this study.

7. Although not intended to provide all-weather navigation protection, improving the navigation conditions for fair through marginal weather would greatly increase the commercial fishing opportunity by increasing the percentage of time that vessels can use the launch facility.

ALTERNATIVE SITES

8. The use of other existing facilities by the Pohoiki boaters, or the construction of a new ramp at a naturally protected area, were considered.

9. The closest existing protected launching to Pohoiki Bay is in Hilo, 25 road miles from Pohoiki and 30 nautical miles from the fishing grounds. Pohoiki fishermen operating out of Hilo with the existing fleet would sustain a loss of fish quality and price, a reduction in fish catch volume because of reduced fishing time, and an increase in fuel consumption per pound of fish caught.

10. The size of the boats precludes refrigeration or provision for carrying sufficient ice for long hauls. Without adequate refrigeration or icing, fish quality deteriorates rapidly and market value drops. When large fish or a large quantity of smaller fish are caught, it is common practice for the fishermen to return to Pohoiki, unload the fish, and go back out to sea.

11. Boats operating a few miles offshore at the fishing grounds can return and be retrieved before sea conditions build up from approaching storms. The long haul to Hilo requires about 4 to 5 hours and presents a serious danger of swamping in high seas for these small craft.

12. Based on the foregoing reasons, it is not considered safe or practical for Pohoiki fishermen to use the existing navigation facilities at Hilo.

13. The Puna coast is rugged, with steep cliffs dropping to the sea along much of the shoreline. There are few naturally protected bays or inlets. The only bay within a reasonable distance of Pohoiki and the fishing grounds that offers any natural protection at all is Kapoho Bay, located approximately 3.5 miles north of Pohoiki Bay. The bay is exposed to easterly and northeasterly swells and has no facilities for boat launching or mooring. Portions of the bay have had extensive use for pond culture of various marine and brackish water fish species.

14. Kapoho Bay is a considerably larger embayment than Pohoiki Bay. A shallow lava ledge at the mouth of the bay restricts wave energy entering the bay. The old fishponds are no longer used, and the inner ponds and shoreline areas are overgrown with mangroves. Coral coverage is low, possibly as a result of extremely high (100°F) water temperature during a 1960 lava flow. Kapoho Bay has a depauperate fauna when compared with Pohoiki and other shallow water sites on the Puna Coast. Much of the land around the bay is developed, and there is no public access.

15. During the public workshops the boaters stated that Pohoiki is historically the best place to launch boats in this area. They also stated that navigation was dangerous in Kapoho Bay because of the many shoal areas and large boulders. Because of the high cost of relocating the launch facilities and public access, and the fact that Kapoho Bay did not offer any greater natural protection than Pohoiki Bay, it was not considered an acceptable alternate site.

ALTERNATIVE PLANS

16. Various navigation improvements for Pohoiki Bay, including the ability of a breakwater to effectively protect the launching area and increase the useability of the ramp, were investigated to develop a plan which would best satisfy the established engineering, economic, and environmental criteria.

DESCRIPTION OF ALTERNATIVE PLANS

17. Three alternative plans were developed to meet the study objectives. Plan 1 (Figure D-1) provides a 90-foot long breakwater adjacent to the existing ramp. Plan 2 (Figure D-2) provides a 90-foot long breakwater and a relocated ramp to be excavated 50 feet inland of the existing ramp. Plans 1 and 2 utilize the existing approach to the ramp. Plan 3 (Figure D-3) provides a 160-foot long curved breakwater and a relocated, dredged approach channel. All plans include removal of the large boulder in the approach channel. Detailed design features and costs are presented in Table D-1.

DESIGN

18. A breakwater design was formulated to best meet all of the developed and established requirements. The major requirements are that: (1) the structure must effectively reduce wave heights at the launch and retrieval area; (2) the structure must be stable under all anticipated sea conditions; (3) overtopping of the structure should only occur during those periods when the approach channel is not navigable; (4) major overtopping should only occur during severe storm conditions; (5) crest elevation should conform aesthetically with adjacent topography; and (6) construction must be possible under adverse sea conditions.

19. The effectiveness of the structure in reducing wave heights was evaluated by wave diffraction analysis. The analysis was performed for various breakwater configurations, alignments, and positions. Wave periods of 5 seconds, 10 seconds, and 15 seconds were investigated. Directions of wave approach were selected after examining results of the refraction analysis and after observing waves at the project site. Three wave crest alignments were chosen for each of two breakwater positions. The alignments correspond to probable refracted wave orientation for various deepwater wave directions and periods.

20. Positioning of the breakwaters was constrained by several factors, including: (1) the location of the existing natural approach channel; (2) the desire to minimize dredging impact; (3) water depth; (4) the desire for a low profile structure; and (5) the desire for a minimal impact on surfing.

21. It is anticipated that the approach channel will not be navigable when waves are breaking in the channel at the breakwater head. Calculations based on water depth, bottom slope and wave steepness show that a 6.5-foot breaker can be expected in the approach channel at the breakwater head. This breaker would cause a wave at the ramp of about 1.9 feet for Plan 1 and about 1.5 feet for Plans 2 and 3. Waves of these heights should not prohibit launching, although some difficulty may be encountered when heights at the ramp are over 1.5 feet. Thus, launching and retrieval and channel navigation become marginal at about the same time.

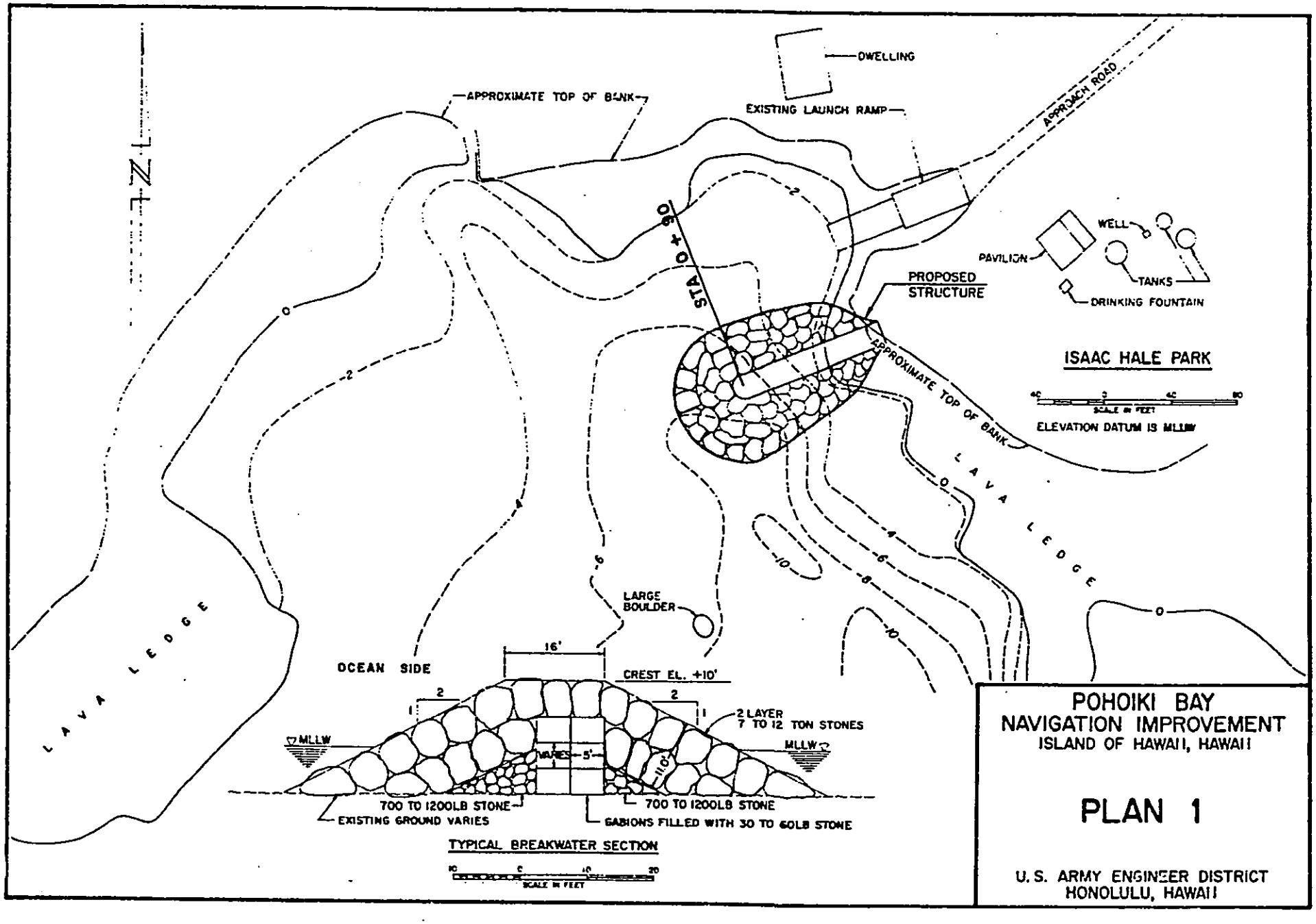
DWELLING
APPROACH ROAD
APPROXIMATE TOP OF BANK
EXISTING LAUNCH RAMP
STA 0+00
PROPOSED STRUCTURE
WELL
PAVILION
TANKS
DRINKING FOUNTAIN
ISAAC HALE PARK
SCALE IN FEET
ELEVATION DATUM IS MLLW
APPROXIMATE TOP OF BANK
LAVA LEDGE
LARGE BOULDER
OCEAN SIDE
16'
CREST EL. +10'
2 LAYER 7 TO 12 TON STONES
MLLW
5'
700 TO 1200LB STONE
EXISTING GROUND VARIES
700 TO 1200LB STONE
GABIONS FILLED WITH 30 TO 60LB STONE
TYPICAL BREAKWATER SECTION
SCALE IN FEET
POHOIKI BAY
NAVIGATION IMPROVEMENT
ISLAND OF HAWAII, HAWAII
PLAN 1
U.S. ARMY ENGINEER DISTRICT
HONOLULU, HAWAII

FIGURE D-1

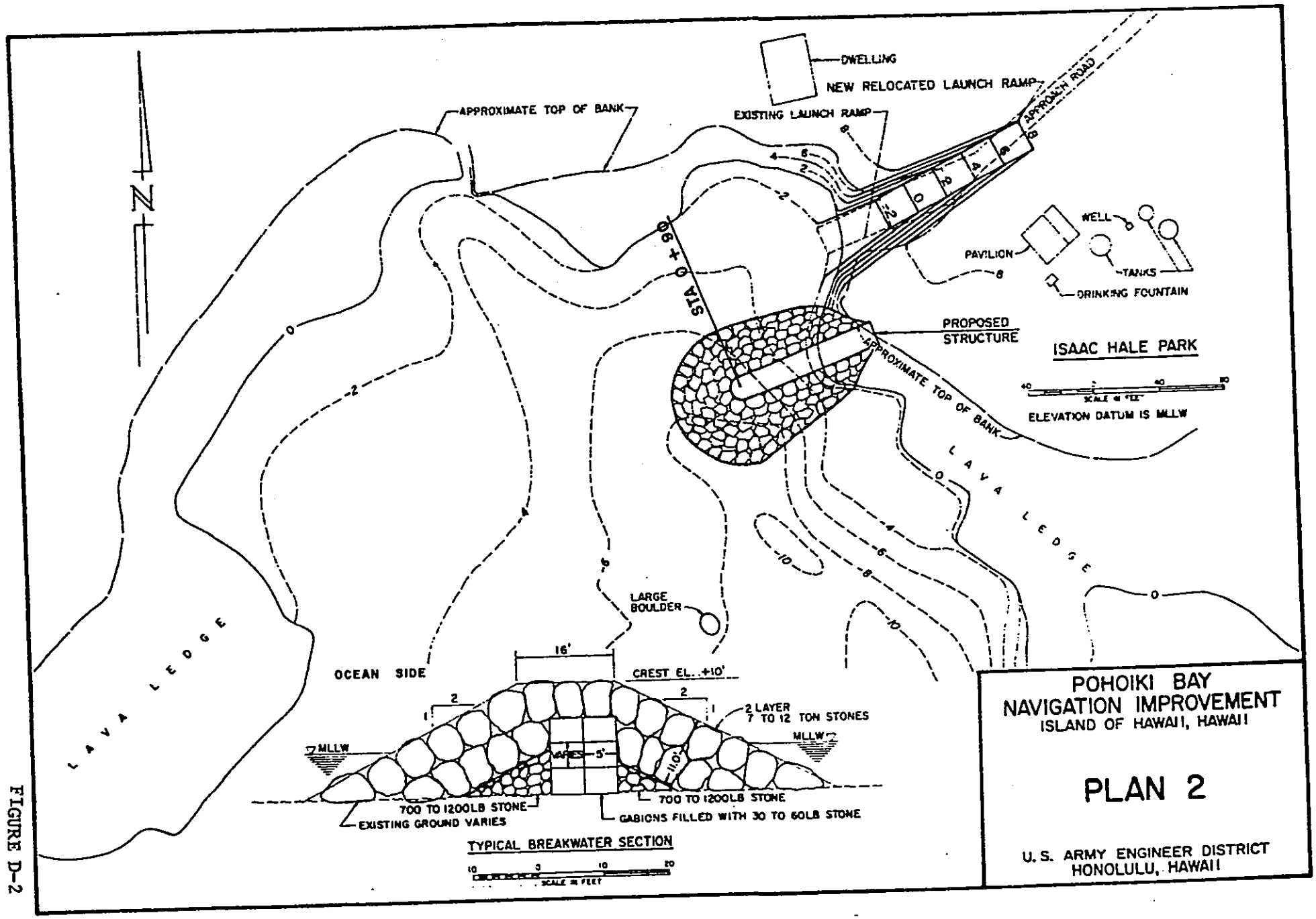
DWELLING
NEW RELOCATED LAUNCH RAMP
APPROACH ROAD
APPROXIMATE TOP OF BANK
EXISTING LAUNCH RAMP
STA 0+00
WELL
PAVILION
TANKS
DRINKING FOUNTAIN
PROPOSED STRUCTURE
ISAAC HALE PARK
APPROXIMATE TOP OF BANK
ELEVATION DATUM IS MLLW
LAVA LEDGE
LARGE BOULDER
OCEAN SIDE
16'
CREST EL. +10'
2 LAYER 7 TO 12 TON STONES
MLLW
MLLW
VARIES
5'
11.0'
700 TO 1200LB STONE
EXISTING GROUND VARIES
700 TO 1200LB STONE
GABIONS FILLED WITH 30 TO 60LB STONE
TYPICAL BREAKWATER SECTION
SCALE IN FEET
LAVA LEDGE
POHOIKI BAY
NAVIGATION IMPROVEMENT
ISLAND OF HAWAII, HAWAII
PLAN 2
U.S. ARMY ENGINEER DISTRICT
HONOLULU, HAWAII

FIGURE D-2

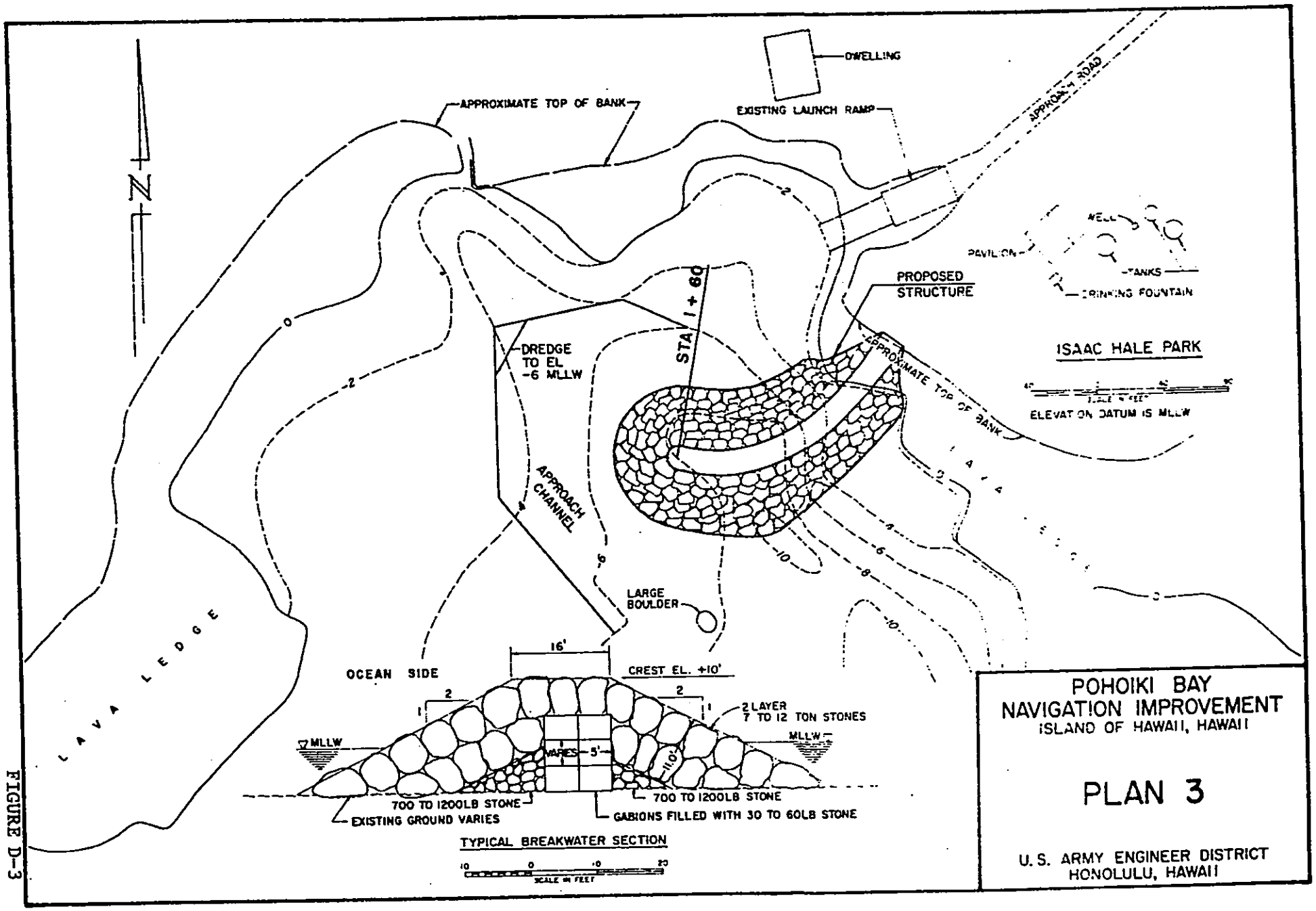
N
APPROXIMATE TOP OF BANK
DWELLING
EXISTING LAUNCH RAMP
APPROACH ROAD
WELL
PAVILION
TANKS
DRINKING FOUNTAIN
PROPOSED STRUCTURE
ISAAC HALE PARK
APPROXIMATE TOP OF BANK
ELEVATION DATUM IS MLLW
DREDGE TO EL -6 MLLW
STA 1 + 60
APPROACH CHANNEL
LARGE BOULDER
LAVA LEDGE
OCEAN SIDE
CREST EL. +10'
16'
2 LAYER 7 TO 12 TON STONES
MLLW
VARIES 5'
700 TO 1200LB STONE
EXISTING GROUND VARIES
GABIONS FILLED WITH 30 TO 60LB STONE
TYPICAL BREAKWATER SECTION
SCALE IN FEET
POHOIKI BAY
NAVIGATION IMPROVEMENT
ISLAND OF HAWAII, HAWAII
PLAN 3
U.S. ARMY ENGINEER DISTRICT
HONOLULU, HAWAII

FIGURE D-3

22. In addition to wave height reduction, the diffraction effect changes the approach of the wave crest to a more favorable direction. Diffracted wave approach will be longitudinal to the ramp rather than perpendicular to it.

23. Determination of breakwater crest elevation was based on desired overtopping characteristics as well as aesthetic considerations. Aesthetically, the structure should not be too much higher than the predominant ground elevation which is about 8 feet above Mean Lower Low Water (MLLW). Minimum crest elevation must be high enough to prevent overtopping when sea conditions permit navigation of the approach channel. Overtopping may be permitted when wave heights at the breakwater head exceed 6.5 feet, since launch and recovery operations will be unlikely. Major overtopping will not occur when wave heights are less than 6.5 feet.

24. Because of the site's severe wave exposure, the breakwater design analysis assumes that the worst breaking wave condition will occur. Controlling depth criteria was used to determine the maximum breaking wave condition which can be expected at the proposed structure site. Analysis parameters are water depth at the proposed structure toe, nearshore bottom slope, and wave steepness.

25. Water depth at the proposed structure toe was determined by tentatively positioning a trial breakwater plan on the hydrographic survey. Depth at the toe was calculated to be the MLLW depth (8 feet) plus estimated water level rise due to astronomical tides, wave set-up, and atmospheric conditions (4 feet) for a total depth of 12 feet.

26. The results of the analysis show that a 20 second wave approaching from a southerly direction will produce the worst condition, which is a 12-foot wave that breaks directly on the proposed structure. Longer period waves do not significantly affect breaker height due to the nearshore bottom slope. Larger waves will break seaward of the structure.

27. A crest elevation of 10 feet would prevent overtopping during operational sea conditions, and should not be aesthetically displeasing. Overtopping is expected under adverse sea conditions.

28. The structure slope of 1 vertical to 2 horizontal was chosen for both the exterior and interior faces to provide increased stability during overtopping situations. A crest width of 3 armor stones (16 feet) is provided.

29. The breakwater armor was designed using the stability formula developed by the Waterways Experiment Station. Using a unit weight for armor stone of 165 pounds per cubic foot with a stability coefficient of 2.5 and a structure slope of 1 vertical to 2 horizontal, the 12-foot design wave requires 5 to 9 ton quarrystone. Because major overtopping may occur, stone size was increased by 30 percent to 7 to 12 ton quarrystone.

30. Two layers of 7 to 12 ton stone are utilized as the armor layer. Armor stones above MLLW will be keyed and fitted to add further stability and to prevent leaching of the underlayer and core. The underlayer is of 700 to 1,200 pound stone. Gabions filled with 30- to 60-pound stone are a construction technique designed to raise the elevation of the core stone and thereby reduce wave energy transmission through the breakwater. This technique will also permit construction of the core without excessive loss of core stone due to wave action during construction. Above MLLW where armor stones are in direct contact with the gabions, the gabions will be grouted to reduce the probability of losing core stone through the armor layer in the event of failure of the wire mesh.

EFFECTIVENESS OF ALTERNATIVE PLANS

31. During periods of high seas and high stillwater levels, waves greater than 6.5 feet in height would cause major overtopping of the breakwater and boats would not be launched. At lower stillwater levels a 6.5-foot wave would break in the channel near the breakwater head. During such sea conditions the fishermen would also not be expected to launch their boats.

32. Based on refraction and shoaling analysis, a 6.5-foot breaking wave near the breakwater head would result from a 19-foot, 10-second deepwater wave approaching from the east, and from an 8-foot, 15-second deepwater wave from the south. The frequency of occurrence of a wave from the east with a height of 19 feet or greater and a period of 9 seconds or greater is about .05 percent. Waves from the south with heights of 8 feet or greater and periods of 11 seconds or greater, occur about 0.2 percent of the time in an average year. Thus, with a breakwater in place, boats could navigate the bay nearly 99 percent of the time, whereas without the breakwater the bay can be navigated only about 75 percent of the time.

33. Based on diffraction analysis, Plan 1 reduces wave height at the ramp by about 71 percent. Plans 2 and 3 each reduce wave height at the ramp by about 77 percent. All three plans permit launching and retrieval of boats during times when the existing natural approach channel is navigable.

ASSESSMENT AND EVALUATION

34. The economic, social, and environmental effects of the three alternative plans have been assessed and evaluated, and a summarization of these evaluations is presented in Table D-2, Summary Comparison of Alternative Plans and System of Accounts. This table displays the significant contributions, beneficial and adverse effects, and the extent to which the planning objectives and evaluation criteria are met by each plan.

35. The assessment and evaluation shows that all three plans fulfill the basic study objective of providing protection for trailer boat launching and recovery during all but storm conditions. All three plans are economically justified. Plan 1 has the highest net annual benefits, while reducing wave heights at the ramp by about 71 percent.

36. The persons attending the public meeting held on 16 November 1977 favored the implementation of Plan 1, stating that it would meet their needs for the least cost and have the least impact to the other uses of the area. The boaters expressed concern that if the breakwater was too long, it would be difficult to navigate past the shoal area in the central part of Pohoiki Bay. The Plan 1 breakwater will permit the boaters to approach the ramp essentially the same way that they do now. The boaters also requested removal of the large boulder in the approach to the ramp.

37. The State Department of Transportation, Water Transportation Facilities Division, the local sponsors for the project, endorse Plan 1, stating that it has the highest benefit to cost ratio while providing significant improvement for the launch ramp. The U.S. Soil Conservation Service, in conjunction with Hawaii County, have planned major improvements to the park adjacent to the launch ramp, and have stated that the proposed improvement meets the needs of the area and complements their park improvement plans.

Plan Selection

38. The selection of the most desirable plan which meets the planning objectives involved the comparison of the various features of the alternative plans and the tradeoffs among the features. The tradeoff analysis involved objective comparison of the engineering, environmental, and economic features and impacts of the three alternative plans, and evaluation of public opinion and input. Plan 1 was selected for implementation because it would provide for the navigation needs while minimizing the environmental impacts and maximizing the net benefits. The recommended plan is discussed in the following section.

TABLE D-1. ENGINEERING AND ECONOMIC FEATURES OF ALTERNATE PLANS

	Plan 1	Plan 2	Plan 3
A. Engineering Features			
Approach Channel	None	None	
Length, Feet			200
Width, Feet			60
Depth, Feet			6
Protected Area (Square Feet)	8,000	9,000	16,000
Breakwater			
Length, Feet	90	90	160
Crest Elevation Above MLLW, Feet	10	10	10
B. Economic Features			
Project First Cost 1/			
Federal	$330,000	$330,000	$660,000
Non-Federal	0	35,000	0
Annual Charges at 6-5/8%			
Interest & Amortization	$22,800	$25,200	$45,600
Maintenance	5,200	5,200	9,200
TOTAL	$28,000	$30,400	$54,800
Average Annual Benefits at 6-5/8%			
Reduction of Damages	$ 5,800	$ 5,800	$ 5,800
Increased Fish Catch	70,700	70,700	70,700
TOTAL	$76,500	$76,500	$76,500
Benefit-Cost Ratio	2.7	2.5	1.4
Net Annual Benefits	$48,500	$46,100	$21,700

1/ Excludes preauthorization study costs of $47,000.

TABLE D-2. SUMMARY COMPARISON OF ALTERNATIVE PLANS AND SYSTEM OF ACCOUNTS

	PLAN 1	PLAN 2	PLAN 3
A. PLAN DESCRIPTION	Construction of a 90-foot long rubble-mound breakwater with crest elevation 10 feet above mean lower low water.	Construction of a 90-foot long rubble-mound breakwater with crest elevation 10 feet above mean lower low water, and a relocated boat ramp.	Construction of a 160-foot long curved rubble-mound breakwater with crest elevation 10 feet above mean lower low water, and a 60-foot wide, 6-foot deep, 200-foot long approach channel.
B. SIGNIFICANT IMPACTS			
1. Economic Impacts			
a. Damages to boats and launching equipment.	Measurable decrease in damages during launch and recovery operations.	Same as in Plan 1.	Same as in Plan 1.
b. Commercial fish catch.	Increase of 76,000 pounds per year.	Same as in Plan 1.	Same as in Plan 1.
2. Environmental Impacts			
a. Changes in marine environment.	8,000 Sq. Ft. of nearshore marine habitat will be covered by the breakwater. New rocky vertical habitat will be created.	Same as in Plan 1.	14,500 Sq. Ft. of nearshore marine habitat will be covered by the breakwater. New rocky vertical habitat will be created.
	Temporary adverse effect during construction of the breakwater.	Same as in Plan 1.	Temporary adverse effect during construction of the breakwater, and dredging of approach channel.

TABLE D-2 (Cont)

	PLAN 1	PLAN 2	PLAN 3
2. Environmental Impacts (Cont)			
b. Water quality.	Temporary increase in turbidity during construction of the breakwater.	Same as in Plan 1.	Temporary increase in turbidity during construction of the breakwater, and during dredging of the approach channel. Possible change in rate of flow or location of thermal springs due to dredging.
c. Terrestrial habitat	Creates new feeding and resting habitat for water birds.	Same as in Plan 1.	Same as in Plan 1.
d. Natural resources	Commitment of 2,500 cubic yards of rock for construction of the breakwater.	Same as in Plan 1.	Commitment of 4,500 cubic yards of rock for construction of the breakwater.
e. Scenic resources	Visual intrusion of the breakwater on the natural setting of Pohoiki Bay.	Same as in Plan 1.	Same as in Plan 1.
f. Cultural resources	No effects.	Same as in Plan 1.	Same as in Plan 1.
3. Social Impacts			
a. Health, safety, community well-being	Increases personnel safety during launch and recovery operations.	Same as in Plan 1.	Same as in Plan 1.
	Increases commercial fishing opportunities.	Same as in Plan 1.	Same as in Plan 1.

TABLE D-2 (Cont)

	PLAN 1	PLAN 2	PLAN 3
3. Social Impacts (Cont)			
b. Recreational opportunities	Increases recreational boating opportunity.	Same as in Plan 1.	Same as in Plan 1.
	Potential increase in fish catch by shoreside pole fishermen.	Same as in Plan 1.	Same as in Plan 1.
	Breakwater may infringe on surfboard recovery area during particular surf conditions.	Same as in Plan 1.	Same as in Plan 1.
		Requires 1,500 square feet of park land.	
c. Community cohesion	Potential increase in conflicts between Isaac Hale Park users and boaters over limited shoreside facilities.	Same as in Plan 1.	Same as in Plan 1.
	Potential increase in conflicts between boaters and swimmers in the protected water area.	Same as in Plan 1.	Same as in Plan 1.
d. Transportation	Increased traffic and parking congestion due to proposed improvements at both Isaac Hale Park and the launch ramp.	Same as in Plan 1.	Same as in Plan 1.

TABLE D-2 (Cont)

	PLAN 1	PLAN 2	PLAN 3
C. PLAN EVALUATION			
1. Contribution to Planning Objectives			
a. To provide navigation improvements	Reduces wave heights at the ramp by about 71 percent.	Same as in Plan 1.	Reduces wave heights at the ramp by about 77 percent.
	Changes the approach of waves at the ramp to a more favorable direction.	Same as in Plan 1.	Same as in Plan 1.
b. To improve commercial fishing opportunities.	Increase the number of potential fishing days per year by about 33 percent.	Same as in Plan 1.	Same as in Plan 1.
c. Improve only the launch and recovery conditions.	Provides improvement of launch and recovery operations but does not provide for berthing of boats.	Same as in Plan 1.	Provides improvement of launch and recovery operations and allows for possible future construction of one or two temporary moorings.
d. Minimize conflict between potentially conflicting activities.	Minimizes conflict by preserving existing usage patterns. Some increase in usage probably will occur.	Same as in Plan 1.	Same as in Plan 1.
e. Protect Pohoiki warm springs bath.	No effects.	Inland excavation should not affect warm springs.	Offshore dredging should not affect warm springs.

TABLE D-2 (Cont)

	PLAN 1	PLAN 2	PLAN 3
2. Relationship to National Accounts			
a. National Economic Development			
Average Annual Benefits	$76,500	$76,500	$76,500
Average Annual Costs	$28,000	$30,400	$54,800
Net Annual Benefits	$48,500	$46,100	$21,700
B/C Ratio	2.7	2.5	1.4
b. Environmental quality	See Item B.2. in this Table for impacts.	Same as in Plan 1.	Same as in Plan 1.
c. Social well being	See Item B.3. in this Table for impacts.	Same as in Plan 1.	Same as in Plan 1.
d. Regional development	The Pahoa-Kapalana region should experience increased per capita income due to additional fish catch.	Same as in Plan 1.	Same as in Plan 1.
3. Response to Evaluation Criteria			
a. Acceptability	Acceptable	Same as in Plan 1.	Same as in Plan 1.
b. Certainty	High	High	High
c. Completeness	Complete	Complete	Complete
d. Effectiveness	Effective 99 percent of the time.	Same as in Plan 1.	Same as in Plan 1.
e. Efficiency	High	High	High
f. Reversibility	Reversible	Reversible	Reversible

SECTION E

THE SELECTED PLAN

SECTION E

THE SELECTED PLAN

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SECTION E

THE SELECTED PLAN

1. This section describes the selected plan of improvement and presents other structural and design information of the project. The probable environmental effects of the plan are discussed in the environmental impact statement attached to this report. Economic information is presented in Section F.

PLAN DESCRIPTION

2. The selected plan of improvement provides for a 90-foot long breakwater adjacent to the existing ramp, and removal of the large boulder in the approach to the ramp, as shown in Plate E-1. The breakwater extends in a southwesterly direction and is located on a gently sloping bottom that drops off abruptly into deepwater about 300 feet seaward from the breakwater.

DESIGN

3. Design Still Water Level. The water depth at mean lower low water is about 8 feet at the head of the proposed structure. Increase in water level due to tides, atmospheric pressure drop, and setup due to winds and waves is estimated at +4 feet MLLW. The total design water depth is the sum of these depths which is equal to 12 feet.

4. Design Wave Height. A design breaking wave based on depth controlled criteria was developed utilizing wave height - water depth relationships from the CERC Shore Protection Manual. An analysis of the worst conditions results in a 12-foot, 20-second wave that breaks directly on the structure.

5. Armor Layer Stability. The stability formula developed by the Waterways Experiment Station was used to determine the required armor stone size:

$$W = \frac{W_r H^3}{K_D (S_r - 1)^3 \cot \theta}$$

Where W = weight of stone in pounds

w_r = unit weight of stone

w_w = unit weight of water

H = design breaker height

θ = the angle of the breakwater face with the bottom

K_D = emperically determined stability coefficient

When w_r=165 pcf and the breakwater slope is 1 vertical to 2 horizontal, and K_D equal to 2.5, the required stone weight is 14,500 pounds or 7.25 ton for a non-overtopping structure. Since an overtopping structure will be designed, this stone size is increased by 30% to 9.5 tons.

7. The allowable range of stone size for the armor layer is 7 to 12 tons. Two layers of 7 to 12 ton stone will be utilized in the design. Crest width will be 3 armor stone diameter equal to a total of 16 feet.

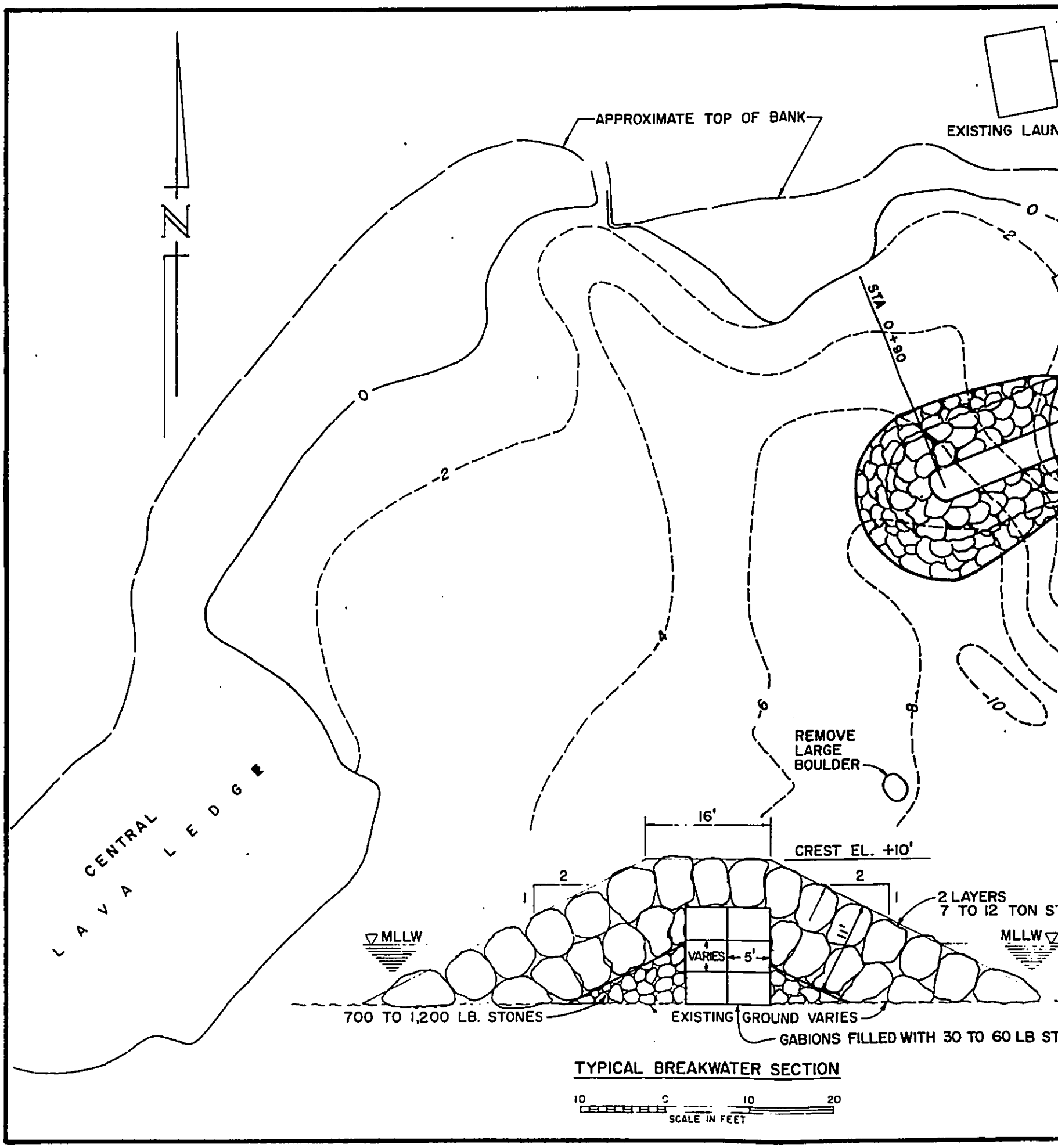
8. Crest Elevation. To determine the crest elevation for an overtopping structure, criteria was developed to select the desired overtopping conditions. It was determined that when a 6.5 foot wave breaks at the head of the proposed structure, the bay would probably not be navigable. Thus, the breakwater should only be overtopped by waves larger than 6.5 feet. For aesthetic reasons, the crest elevation is kept at a minimum.

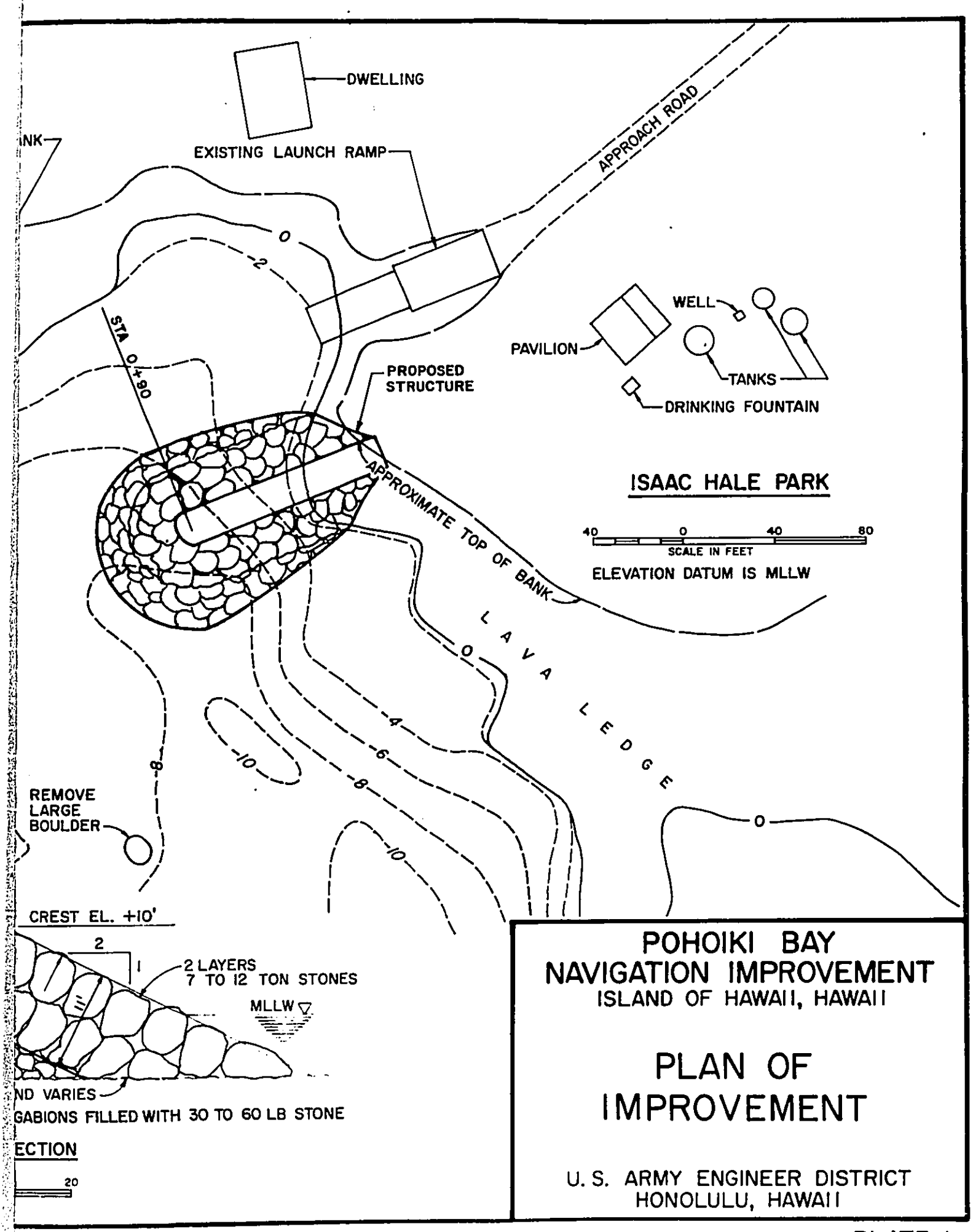
9. Using a stillwater level of +1 foot, a runup factor of 1.4, and a wave height of 6.5 feet, a breakwater crest elevation of 10.1 feet would sustain only minor overtopping. The crest width of 16 feet would also reduce overtopping. Based on these considerations, a +10-foot breakwater crest elevation was selected.

10. Wave Transmission. Due to the thickness of the armor layer and the relatively low crest elevation, only a limited cross section was available for the core of the breakwater. If core stone size is too large, wave transmission would be unacceptable. For this reason, a core was developed utilizing wire mesh gabions filled with 30 to 60 pound stones. The gabion core should reduce transmitted wave energy,

11. Refraction and Diffraction. Wave refraction and diffraction were analyzed to aid in the positioning of the breakwater and in the estimation of wave height reductions in the vicinity of the launch ramp. Refraction diagram for a 10 second wave from the east and a 15 second wave from the south are shown on Plate E-2. Considering both refraction and shoaling, the easterly trade wave with a 10 second period is reduced from its deep water height by about 66 percent before reaching the proposed breakwater. A wave from the south with a period of 15 seconds will be reduced by about 20 percent from its deep water height.

12. Diffraction was investigated for wave periods of 5, 10 and 15 seconds. Two wave crest orientations were selected after examination of refraction diagrams and photographs of the bay. The results are shown on Plates E-3, E-4, and E-5. The values shown indicate the ratio of the wave height at that point to the incident wave height at the head of the proposed structure. Based on the diffraction analysis, the estimated wave heights in the launching area will be about 30% of the incident wave heights at the breakwater head.


N
APPROXIMATE TOP OF BANK
EXISTING LAUN
STA 0+90
0
-2
-4
-6
-8
-10
CENTRAL
LAVA
LEDGE
REMOVE
LARGE
BOULDER
16'
CREST EL. +10'
2
1
2
1
2 LAYERS
7 TO 12 TON ST
MLLW
MLLW
VARIES
5'
700 TO 1,200 LB. STONES
EXISTING GROUND VARIES
GABIONS FILLED WITH 30 TO 60 LB ST
TYPICAL BREAKWATER SECTION
10
0
10
20
SCALE IN FEET



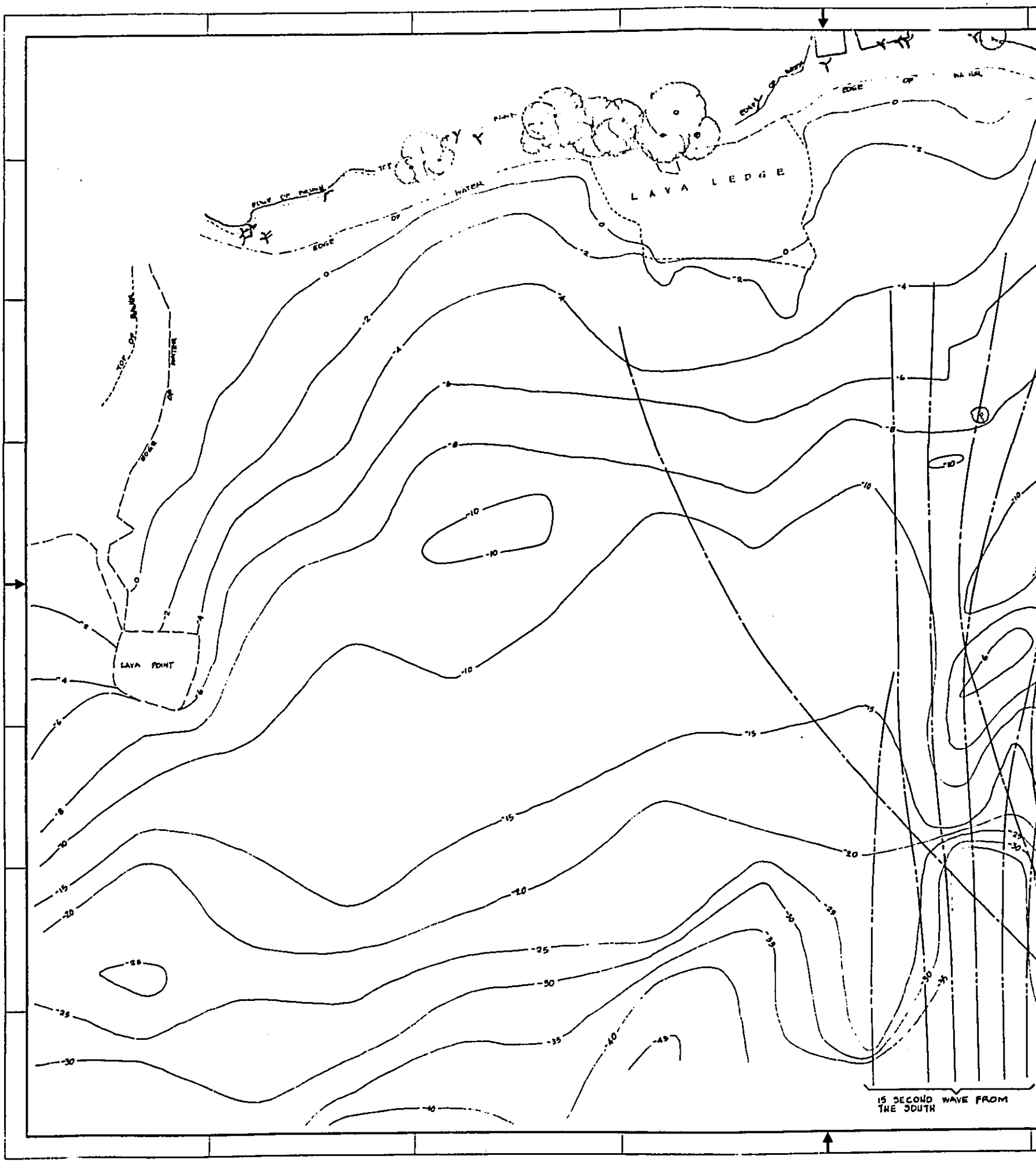
POHOIKI BAY NAVIGATION IMPROVEMENT

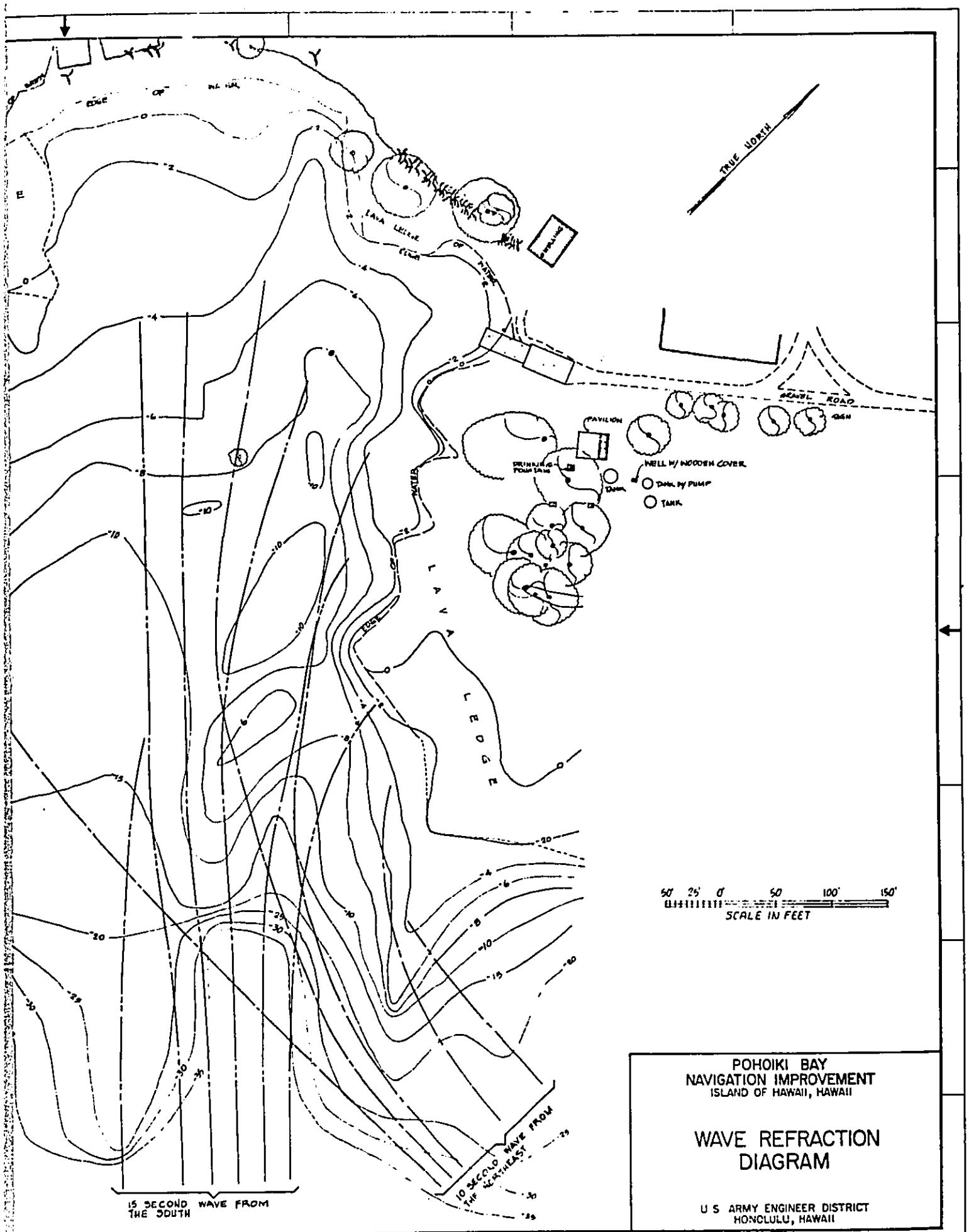
ISLAND OF HAWAII, HAWAII

PLAN OF IMPROVEMENT

U. S. ARMY ENGINEER DISTRICT
HONOLULU, HAWAII

PLATE 1


LAVA LEDGE
LAVA POINT
TOP OF BANK
EDGE OF WATER
EDGE OF WATER
EDGE OF WATER
EDGE OF WATER
15 SECOND WAVE FROM THE SOUTH

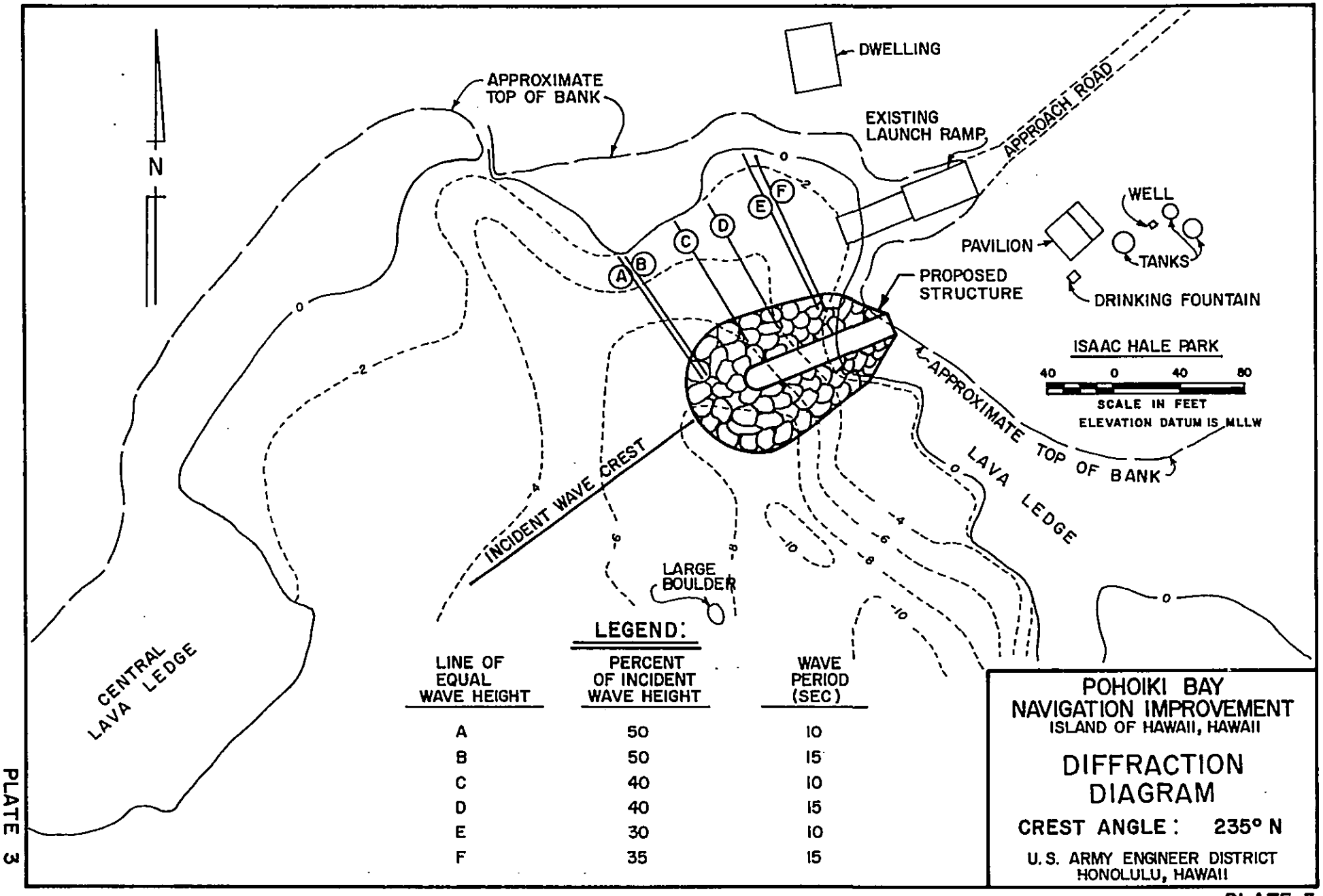


POHOIKI BAY
NAVIGATION IMPROVEMENT
ISLAND OF HAWAII, HAWAII

WAVE REFRACTION DIAGRAM

U S ARMY ENGINEER DISTRICT
HONOLULU, HAWAII

PLATE 2



LEGEND:

LINE OF EQUAL WAVE HEIGHT	PERCENT OF INCIDENT WAVE HEIGHT	WAVE PERIOD (SEC)
A	50	10
B	50	15
C	40	10
D	40	15
E	30	10
F	35	15

POHOIKI BAY
NAVIGATION IMPROVEMENT
ISLAND OF HAWAII, HAWAII

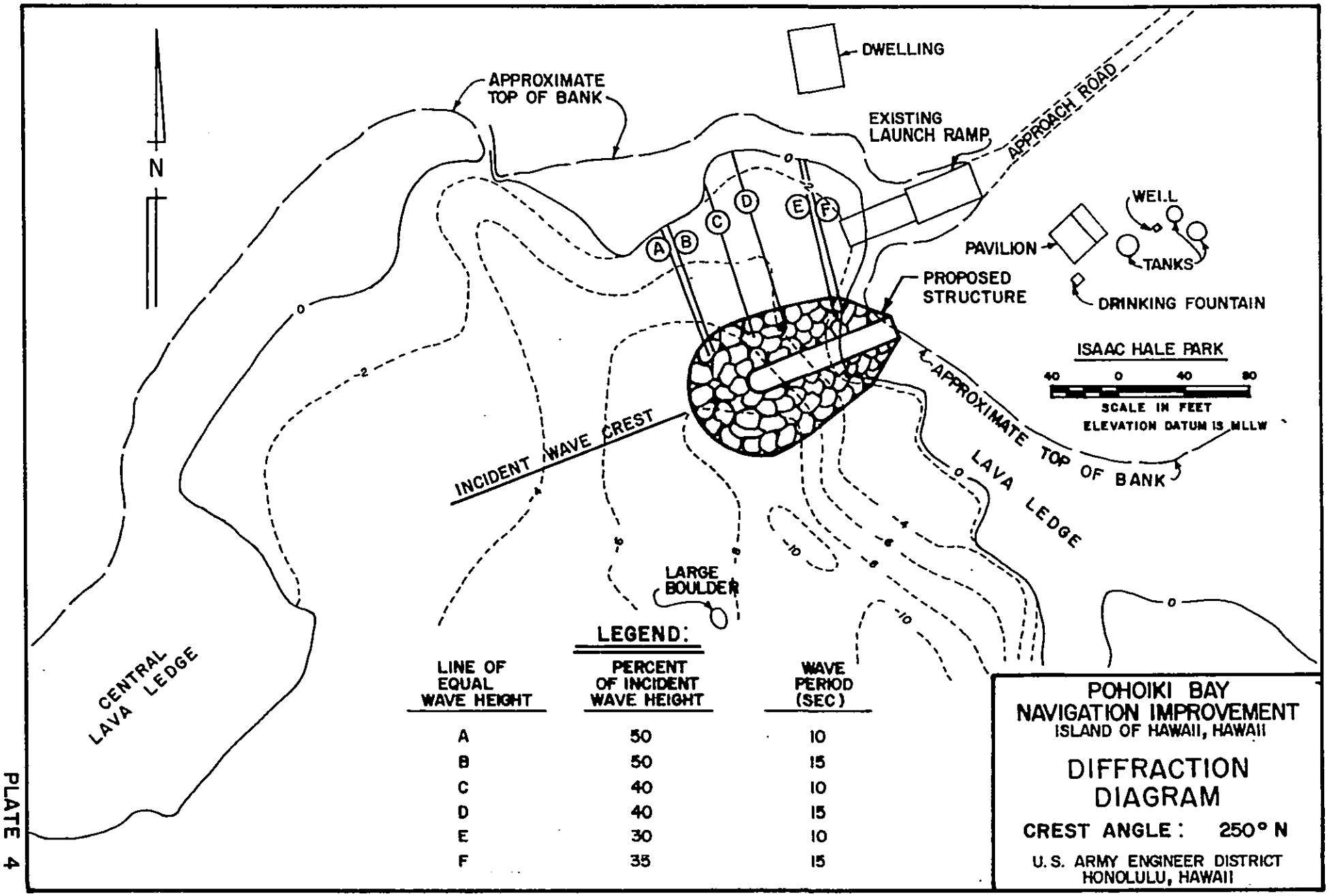
DIFFRACTION DIAGRAM

CREST ANGLE : 235° N

U.S. ARMY ENGINEER DISTRICT
HONOLULU, HAWAII

PLATE 3

PLATE 3



LEGEND:

LINE OF EQUAL WAVE HEIGHT	PERCENT OF INCIDENT WAVE HEIGHT	WAVE PERIOD (SEC)
A	50	10
B	50	15
C	40	10
D	40	15
E	30	10
F	35	15

POHOIKI BAY
NAVIGATION IMPROVEMENT
ISLAND OF HAWAII, HAWAII

DIFFRACTION DIAGRAM

CREST ANGLE: 250° N

U.S. ARMY ENGINEER DISTRICT
HONOLULU, HAWAII

PLATE 4

PLATE 4

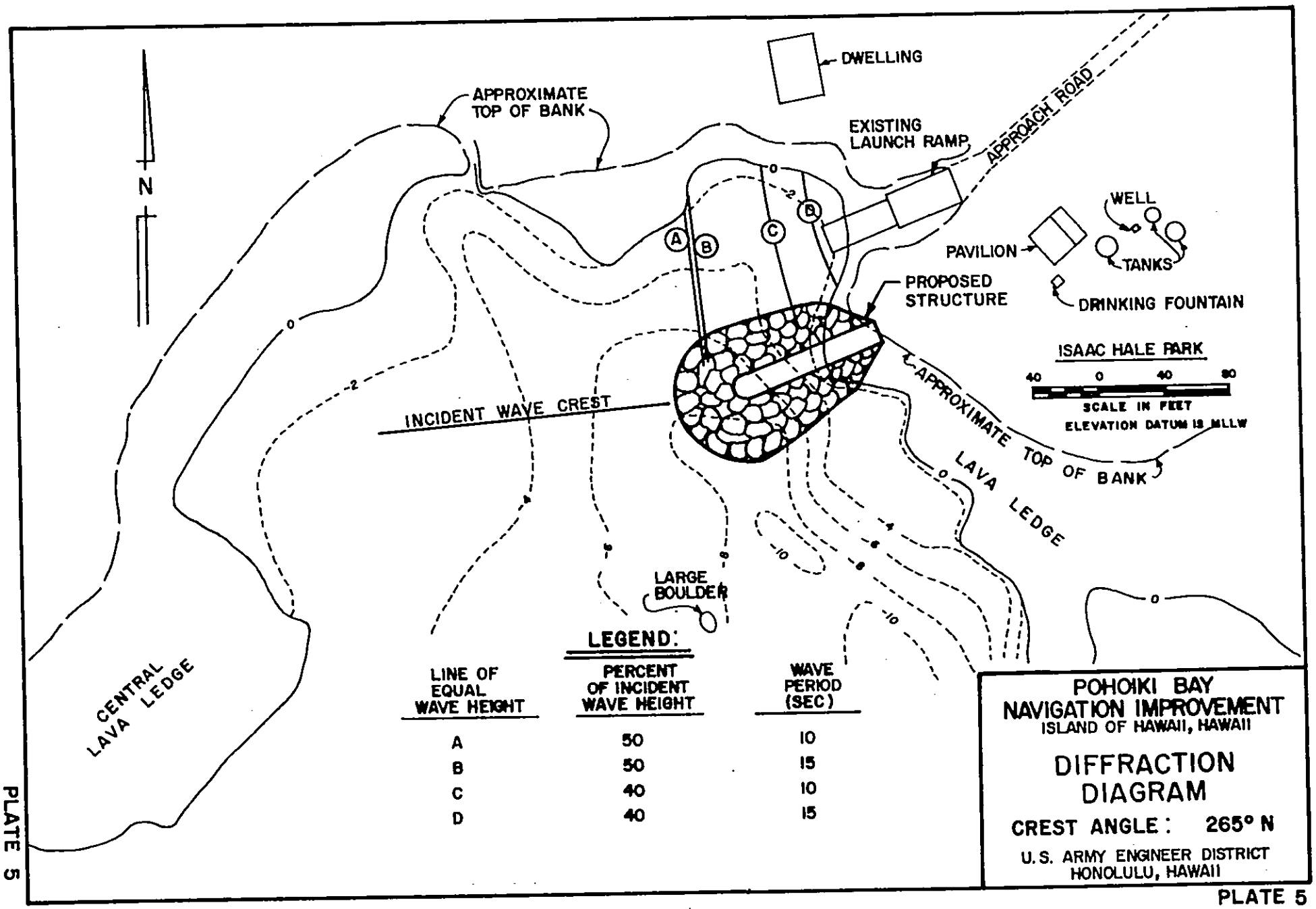

N
APPROXIMATE TOP OF BANK
DWELLING
EXISTING LAUNCH RAMP
APPROACH ROAD
WELL
PAVILION
TANKS
PROPOSED STRUCTURE
DRINKING FOUNTAIN
ISAAC HALE PARK
40 0 40 80
SCALE IN FEET
ELEVATION DATUM IS MLLW
APPROXIMATE TOP OF BANK
LAVA LEDGE
INCIDENT WAVE CREST
LARGE BOULDER
CENTRAL LAVA LEDGE
A
B
C
D
0
-2
-4
-6
-10
LEGEND:
LINE OF EQUAL WAVE HEIGHT
PERCENT OF INCIDENT WAVE HEIGHT
WAVE PERIOD (SEC)
A 50 10
B 50 15
C 40 10
D 40 15
POHOIKI BAY
NAVIGATION IMPROVEMENT
ISLAND OF HAWAII, HAWAII
DIFFRACTION DIAGRAM
CREST ANGLE: 265° N
U.S. ARMY ENGINEER DISTRICT
HONOLULU, HAWAII
PLATE 5

PLATE 5

SECTION F

ECONOMICS OF THE SELECTED PLAN

SECTION F

ECONOMICS OF THE SELECTED PLAN

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SECTION F

ECONOMICS OF THE SELECTED PLAN

COSTS

FIRST COSTS

1. The estimated first cost for the Pohoiki Bay improvement is shown in Table F-1. Locally available field stones will be used in the construction of the breakwater. The cost for the Aid to Navigation was developed by the Coast Guard.

TABLE F-1. ESTIMATE OF PROJECT FIRST COST

Item	Unit	Quantity	Unit Cost	Item Cost	Total Cost
FEDERAL					
Mobilization & Demobilization	L.S.	-	-	$ 9,600	$ 9,600
BREAKWATER					
7-12 Ton Stone	Ton	3520	$50	174,600	
700-1200 lb Stone	Ton	250	37	9,200	
30-60 lb. Gabion Core	Ton	360	110	39,600	223,400
Contingency (± 15%)					37,000
Total Direct Cost					$270,000
Engineering & Design[1/]					23,000
Supervision and Administration					17,000
Total Corps of Engineers First Cost					$310,000
U.S. Coast Guards Aid to Navigation					6,000
Total Federal Project First Cost					$316,000

1/ Excludes pre-authorization study costs of $47,000.

APPORTIONMENT OF PROJECT FIRST COSTS

2. Based on the apportionment of benefits developed later in this section, the first costs of the project will be borne entirely by Federal interests.

ANNUAL COSTS

3. Estimates of annual costs are based on an economic life of 50 years. Interest and amortization charges are based on an interest rate of 6-5/8 percent. Table F-2 summarizes the average annual costs.

TABLE F-2. ESTIMATE OF AVERAGE ANNUAL COSTS

	Item Cost	Total Cost
FEDERAL		
Interest at 6-5/8%	$ 21,800	
Maintenance	4,600	
Total Federal Annual Charges		$26,400
NON-FEDERAL	0	0
Total Annual Charges		$26,400

4. Maintenance of the breakwater and aid to navigation will be performed by the Federal Government at Federal expense. Based on an annual maintenance cost of 2 percent of the cost of the breakwater armor stone and a $600 annual maintenance cost for the aid to navigation, the estimated Federal annual maintenance cost is $4,200.

BENEFITS

5. Benefits are estimated to accrue to the commercial fishing fleet using Pohoiki launch ramp. These benefits basically result from the measured difference between conditions with and without the proposed plan of improvement. All of the proposed plans accomplish essentially the same physical results, and benefits attributable to the alternative plans do not differ measurably from each other.

6. The existing fleet of 15 boats will experience benefits due to decreased damage, greater fish catch, and enhanced safety. Recreational boating is minimal in this area due to rough sea conditions. Recreational opportunities may be somewhat enhanced with an improved launching area.

However, rough seas in the area require expert boatmanship, and any increase in recreational use will not be economically significant.

7. Reduction of Damages. Present use of the launch ramp results in an annual damage to boats and launching equipment of about $6,040 as detailed in Table F-3. It is difficult to accurately estimate the reduction in sustained damages with improved conditions. Damage reduction benefits are based on the assumption that damage incurred is proportional to the percent of time that conditions prohibit launching. Based on an engineering analysis of navigation at Pohoiki, existing conditions preclude launching 25 percent of the time. With the proposed improvement, this is reduced to 1 percent of the time, resulting in a reduction in damages of $\frac{24}{25}$ x $6040 = $5800/year.

TABLE F-3. DAMAGES AT POHOIKI RAMP
(January 1974 to July 1975)

Description	Damage Estimate
Damages to outboard motor propellers (25 to 30 each)	$1,220
Bent or broken engine legs (3 each)	$1,380
Bent trailer spindal (axle & housing) from bouncing with waves (7 each)	$ 840
Bent trailer hub from bouncing with waves (3 sets)	$ 90
Damaged boat (bottom) from bouncing on ramp with waves (3 each)	$5,530
Total damages for 18 month period	$9,060
Equivalent damages for 1 year period	$6,040
($9060 ÷ 18 x 12 = $6040)	

INCREASED FISH CATCH

8. The commercial fishing fleet operating from Pohoiki currently averages 871 fishing trips per year with an average net income per trip of $318 as shown in Table F-4. With the proposed project, an increase in the fish catch and hence increase in net income can be expected as a result of:

a. An increase in the average number of boats able to operate due to the decrease in damages resulting in less "down time".

b. An increase in the number of trips due to improved conditions which would permit launching a greater percent of the time.

TABLE F-4. AVERAGE NET INCOME PER TRIP, POHOIKI FISHING FLEET

Average Catch Per Trip	=	344 Lbs.
Average Value Per Pound	=	$.99
Average Revenue Per Trip	=	344 Lb. x $.99/16 = $341
Average Cost Per Trip	=	$23
Average Net Income Per Trip	=	$341 - $23 = $318

9. Although the fleet is comprised of 15 boats, the average number of boats operational at any time is less than 15, since damaged boats are inoperative during repair. Commercial fishermen using the ramp have reported that over a recent 18 month period, 8 boats were damaged. It took an average of 1/2 month for the repair of each damaged boat. With the proposed plan this down-time will be reduced so that the effective size of the operational fleet will be greater, resulting in an increase in trips, fish catch, and net income.

10. The down-time experience for the Pohoiki fishing fleet is equivalent to one out of 15 boats being inoperative for 4 months out of every 18 month period. Expressed in terms of frequency or probability, this is equivalent to (1/15 x 4/18) of the fleet being out of service due to repairs. With the project, this down-time factor will decrease by an estimated 24/25 (based on the assumption discussed in connection with damage reduction benefits). The effect on the equivalent size of the operational fleet is as follows:

a. Boats operating per year without project

$$15 - 15\ (1/15 \times 4/18) = 14.78$$

b. Boats operating per year with project

$$15 - 15\ (1/15 \times 4/18 \times 1/25) = 14.99$$

11. An engineering analysis of Pohoiki navigation conditions has shown that launching is now possible about 75 percent of the time, and that project protection would result in an increase to 99 percent. If the number of trips made per year per boat were proportional to this factor, the indicated increase in trips per year would be about 32 percent (99%/75% = 1.32). Interviews with fishermen using the launch ramp have indicated that conditions prohibit launching about 5 times (5 days) per

month. This is about 17 percent of the time based on a 7 day fishing week, and 23 percent based on a 5 day fishing week. An average of 20 percent is probably representative of all the users. With the project, the ramp would be usable about 99 percent of the time, indicating an increase in trips per year of about 24 percent (99%/80% = 1.24).

12. The analysis of physical conditions suggests an increase in boat-trips per year of 32 percent (from 75% to 99%). However, the lower estimate of 24 percent (80% to 99%) reflecting the actual experience and judgment of the users themselves, is used in the benefit computation.

13. The benefits resulting from an increase in the number of trips per year due to improved navigability and launching conditions, and to the increase in the number of boats in operating condition is calculated below. This benefit is the increase in net income based on an increased fish catch.

a. Net income without project:

(871 trips/year) x ($318/trip) = $276, 978/year

b. Net income with project:

(871 trips/year) x (99%/80%) x (14.99/14.78) x $318/trip

= $347,630/year

c. Average annual benefit:

$347,630 - $276,978 = $70,652

ENHANCED SAFETY

14. In addition to the economic returns resulting from improved conditions as described above, unquantifiable benefits would result from a greater degree of safety. Numerous injuries have been incurred with use of the launching facility, as indicated in Table F-5 (information obtained from personal interviews).

TABLE F-5. INJURIES AT POHOIKI RAMP
(January 1974 to July 1975)

1. Gash on head from fall due to rough seas during landing.
2. Cut feet and bruises from trailer lifted by waves during launch.
3. Smashed finger and hand from boat bouncing on trailer during retrieval of boat
4. Smashed toe from trailer bouncing on ramp from wave action.

As a direct result of incidents like these, expenses are incurred in the form of medical costs and potential income foregone because of a missed trip. Improved launching conditions would largely eliminate such occurrences, and could possibly prevent a fatal accident.

15. Summary of Benefits. The estimated overage annual benefits which would result from the proposed plan are summarized in Table F-6.

TABLE F-6. SUMMARY OF AVERAGE ANNUAL BENEFITS

Reduction of Damages	$5,800
Increased Fish Catch	70,700
Enhanced Safety	1/
Total	$76,500

1/ Not quantified

JUSTIFICATION

16. The average annual benefit for the selected plan of improvement is $76,500. Based on an interest rate of 6-5/8 percent and an economic life of 50 years, the average annual cost is $26,400. The resulting benefit-cost ratio is 2.9.

S E C T I O N G

PLAN IMPLEMENTATION, SUMMARY, AND RECOMMENDATIONS

SECTION G

PLAN IMPLEMENTATION, SUMMARY, AND RECOMMENDATIONS

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SECTION G

PLAN IMPLEMENTATION, SUMMARY AND RECOMMENDATIONS

PLAN IMPLEMENTATION

LOCAL COOPERATION

1. Federal participation in the proposed navigation improvement is subject to the condition that local interests will:

a. Provide without cost to the United States all lands, easements, and rights-of-way required for construction of the project and for aids to navigation upon the request of the Chief of Engineers.

b. Provide and maintain without cost to the United States necessary launching facilities and utilities, including a public landing with suitable supply facilities open to all on equal terms;

c. Accomplish without cost to the United States such utility or other relocations or alterations necessary for project purposes;

d. Provide and maintain without cost to the United States all appropriate onshore structures, access roadways, parking areas, public restrooms, and launching facilities as necessary to insure a complete and adequate project;

e. Hold and save the United States free from damages that may result from construction and subsequent maintenance of the project;

f. Establish regulations prohibiting the discharge of pollutants into the waters of the channel and harbor by users thereof, which regulations shall be in accordance with applicable laws or regulations of Federal and local authorities responsible for pollution prevention and control; likewise prohibit construction of any structure within these limits.

g. Assume the responsibility for all project costs (excluding costs for aids to navigation) in excess of the $2 million Federal cost limitation under the Section 107 authority. The cash contribution is currently estimated to be $0 (December 1977).

2. By letter, a copy of which is included in Appendix A, the State of Hawaii Department of Transportation, as local sponsoring agency, has agreed to comply with the local cooperation requirements for the project. Formal assurances in accordance with Section 221, River and Harbor Act of 1970, will be obtained prior to commencement of construction of the project.

WORK SCHEDULE

3. The work schedule for preparation of plans and specifications and for construction of the Pohoiki Bay navigation improvements is shown on figure G-1. Construction would be accomplished by contract and would require approximately 3 months for completion. An appropriation of $330,000 (excluding aids to navigation) would be required for project construction. Preauthorization study funds totaling $42,000 have been received for the preparation of the reconnaissance and detailed project reports.

DISCUSSION

4. The selected plan of improvement is considered the most efficient and economical method of improving the navigation conditions in Pohoiki Bay. The improvements would enable commercial fishermen to use the existing launching facilities during all times when small craft can reasonably be expected to navigate the adjacent coastal waters and will contribute significantly to the economic welfare of the local commercial fishermen. The improvements are desired by the State of Hawaii and the persons residing in the project area.

RECOMMENDATIONS

5. The District Engineer recommends that the plan of improvement presented in this detailed project report be approved, subject to the condition that local interests comply with the local cooperation requirements outlined in paragraph 1. The plan of improvement consists of constructing a 90-foot-long breakwater with crest elevation of +10 feet, and removal of a large boulder in the water. Installation of the required navigation aid will also be included in the Federal project.

F. R. Schlapak, LTC., Deputy
for F. M. PENDER
Colonel, Corps of Engineers
District Engineer

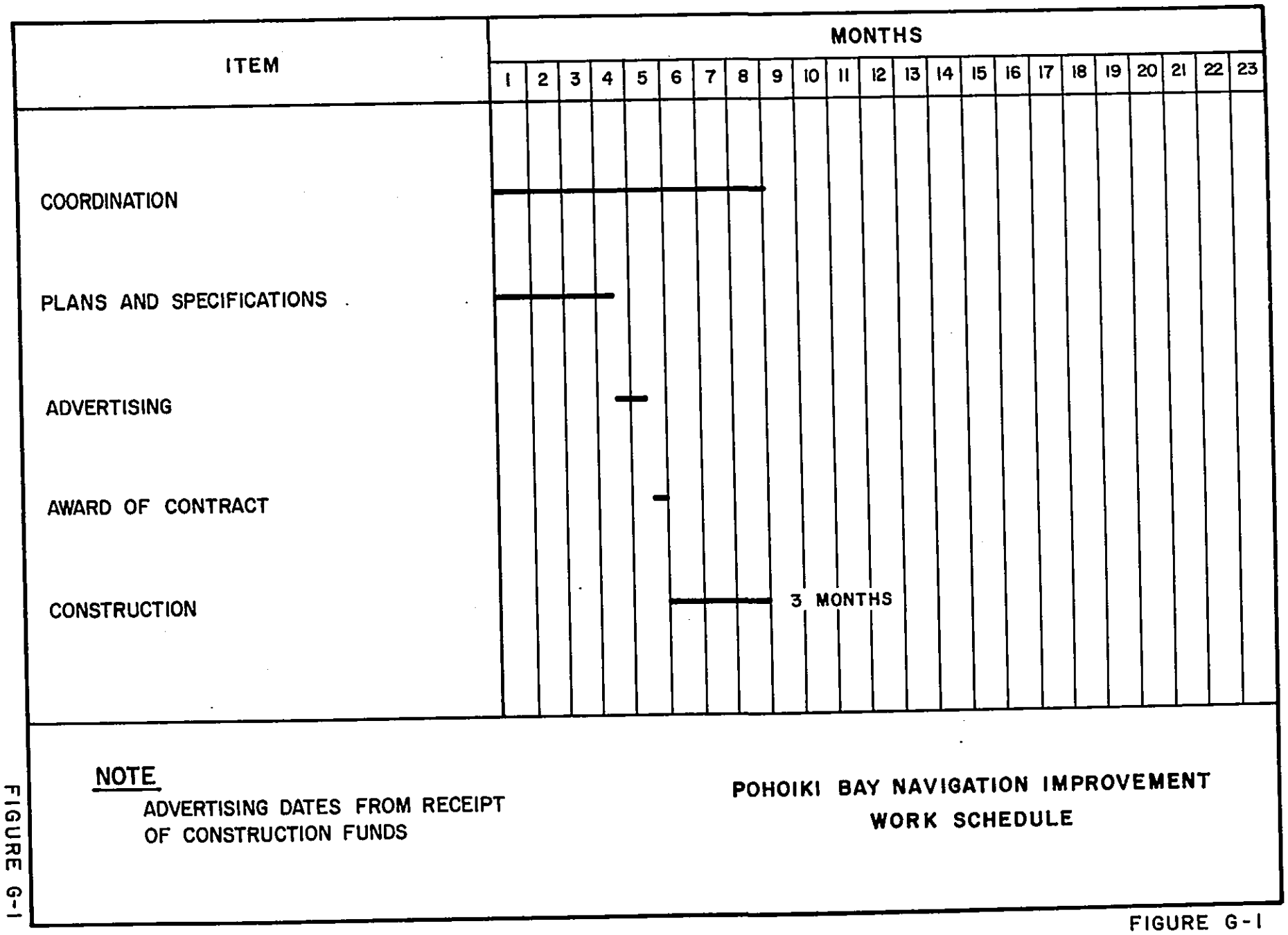
ITEM
MONTHS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
COORDINATION
PLANS AND SPECIFICATIONS
ADVERTISING
AWARD OF CONTRACT
CONSTRUCTION
3 MONTHS
NOTE
ADVERTISING DATES FROM RECEIPT OF CONSTRUCTION FUNDS
POHOIKI BAY NAVIGATION IMPROVEMENT
WORK SCHEDULE
FIGURE G-1

FIGURE G-1

APPENDIX

PERTINENT CORRESPONDENCE

PERTINENT CORRESPONDENCE

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GEORGE R. ARIYOSHI
GOVERNOR

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

DEPUTY DIRECTORS
WALLACE ARA
RICHARD H. HIGASHIONNA
DOUGLAS S. SAKAMOTO
CHARLES J. SAWYER

IN REPLY REFER TO:

January 24, 1978

WT-EP 2965

Colonel F. H. Pender, District Engineer
U. S. Army Engineer District, Honolulu
Building 230
Fort Shafter, Hawaii 96858

Dear Colonel Pender:

Subject: Pohoiki Bay Navigation Improvements, Hawaii

Pursuant to the local cooperation requirements specified in Section 107 of the River and Harbor Act of 1960, as amended, the following assurances are provided in connection with the Pohoiki Bay Navigation Improvements project. The Department of Transportation, as local sponsoring agency, hereby gives assurance that it will:

a. Provide without cost to the United States all lands, easements, and rights-of-way required for construction of the project and for aids to navigation upon the request of the Chief of Engineers;

b. Provide and maintain without cost to the United States necessary launching facilities and utilities, including a public landing with suitable supply facilities open to all on equal terms;

c. Accomplish without cost to the United States such utility or other relocations or alterations necessary for project purposes;

d. Provide and maintain without cost to the United States all appropriate onshore structures, access roadways, parking areas, public restrooms, and launching facilities as necessary to insure a complete and adequate project;

e. Hold and save the United States free from damages that may result from construction and subsequent maintenance of the project;

f. Establish regulations prohibiting the discharge of pollutants into the waters of the channel and harbor by users thereof, which regulations shall be in accordance with applicable laws or regulations of Federal and local authorities responsible for pollution prevention and control; likewise prohibit construction of any structure within these limits.

g. Assume the responsibility for all project costs (excluding costs for aids to navigation) in excess of the $2 million Federal cost limitation under the Section 107 authority. The cash contribution is currently estimated to be $0 (December, 1977).

It is understood that this agreement must be formally executed in accordance with Section 221, River and Harbor Act of 1970, prior to commencement of construction of the project.

Very truly yours,

R. HIGASHIONNA, Ph.D.
Acting Director

cc: Department of Land and Natural Resources
Hawaii County Department of Parks and Recreation

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

PEP ER-77/1031

JAN 20 1978

Colonel F. M. Pender
District Engineer
Corps of Engineers
Department of the Army
Building 230
Ft. Shafter, Hawaii 96858

Dear Colonel Pender:

This is in reply to your letter of November 2, 1977, requesting our views and comments on a navigation study report and draft environmental impact statement for Pohoiki Bay, Island of Hawaii.

We note that the report has not set forth a recommended plan of development for Pohoiki Bay. However, three reasonable alternatives have been described for possible implementation and there is a reasonable basis for evaluating the engineering, economic, and environmental effects of these proposals. We do have some comments which we feel will improve the quality of the environmental statement.

General

With minor exceptions, this document appears to describe adequately the proposed project alternatives, the biological resources affected, and the anticipated ecological impacts associated with their construction. It does not provide for mitigation of marine habitat disruption or the secondary adverse impacts of project construction within and adjacent to the proposed project area. We are primarily concerned with the potential decrease in water quality resulting from the discharge of fish offal during onshore cleaning activities.

Due to proximity of Pohoiki Warm Springs and Hale Park Complex to the proposed project area, the potential exists for disturbance to these sites through increased visitor access. In order to provide maximum protection for these historic resources, they should be evaluated for inclusion in the National Register

of Historic Places in consultation with the State Historic Preservation Officer. The final statement should also contain documentation that the State Historic Preservation Officer concurs with the determination that the project will not have an adverse effect upon these resources.

In addition, the State Historic Preservation Officer should be contacted to determine if there are any properties eligible for, or pending nomination to the National Register of Historic Places.

Although a walk-through reconnaissance of the proposed project area revealed no archeological sites, local informants have suggested that several residences were once located there. Thus, if in the course of construction cultural remains are discovered, construction activity should be halted until a qualified archeologist can evaluate the remains.

Specific

On page 3-3 the fishery resources of the project area are briefly mentioned. We see no discussion of the opihi fishery which is present in this area, and we believe that the document should address this resource.

On page 3-5 the Pohoiki Warm Springs are noted as being 300 feet northwest of the boat ramp. However, on page B-10 of the project report this distance is given as 400 feet. This discrepancy should be clarified.

On page 5-2, shorebird resting and feeding habitat creation benefits are claimed for the proposed breakwater. While the breakwater might be utilized as an occasional resting site, it is doubtful that its relatively steepsided slope could be used as feeding habitat by the species anticipated to be found within the project area.

On page 6-1, the adverse water quality effects of fish cleaning activities carried out behind the breakwater are presented as unavoidable. We disagree with this conclusion. If facilities are provided on the seaward side of the project, this impact can be reduced if not eliminated. If necessary this misuse of the project area can be eliminated although it admittedly would be difficult to provide constant surveillance.

Recommendation

We do not object to the improvement of boat launching facilities at Pohoiki Bay, Hawaii. However, we recommend against selection of Alternative 3. Dredging and jetty construction would result in more marine habitat disturbance than anticipated by implementation of Alternatives 1 and 2. It is also possible that dredging will alter the underground hot spring flow, resulting in the increased release of heated effluent into the marine environment.

The detailed project report indicates that the local support for this project would be satisfied with a project that will do the job but have limited frills. Alternative 1 appears to be the least ecologically damaging of the proposed plans, and as shown in the detailed project report, this alternative would be acceptable to local interests.

Marine habitat losses should be mitigated. An appropriate mitigation measure would be the installation of fish cleaning facilities on the seaward side of the jetty.

Sincerely,

Larry E. Meierotto
Deputy Assistant SECRETARY

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Science and Technology
Washington, D.C. 20230
(202) 377-4335

January 6, 1978

Colonel F. M. Pender
District Engineer
U.S. Department of the Army
Corps of Engineers
Ft. Shafter, Hawaii 96858

Dear Colonel Pender:

This is in reference to your draft environmental impact statement "Pohoiki Bay Navigation Improvements Pohoiki Bay, Hawaii." The enclosed comments from the National Oceanic and Atmospheric Administration are forwarded for your consideration.

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving eight (8) copies of the final environmental statement.

Sincerely,

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

Enclosures: Memo from Lester Q. Spielvogel
Environmental Research Laboratories/NOAA

Letter from Gerald V. Howard
National Marine Fisheries Service/NOAA

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Environmental Research Laboratories
Joint Institute for Marine and
Atmospheric Research
U. Of Hawaii/2525 Correa Road
Honolulu, Hawaii 96822

December 16, 1977

To: John Apel

From: Lester J. Spielvogel LJS

Subj: DEIS 7711.32 - Pohoiki Bay Navigation Improvements
Pohoiki Bay, Hawaii

This is in response to the Draft Environmental Impact Statement, Pohoiki Bay Navigation Improvements Project, Pohoiki Bay, Island of Hawaii, Hawaii, which I received December 9, 19[illegible]. My comments follow.

The DEIS for the Pohoiki Bay Navigational Improvements does not include considerations of the tsunami hazard problem. Because of the potential risks to life and property, any proposed alteration of the shoreline (especially the building of structures and the increased use of this region) must be designed with the tsunami hazard in mind. The point is not a moot one when one realizes that tsunami wave heights of 9 feet have been reported at Pohoiki in recent history. Reference 23 (US Army Engineer District, Honolulu Draft Detailed Project Report, Pohoiki Bay Navigation Improvements Project, Pohoiki Bay, Island of Hawaii, Hawaii, November 1977) and others are not available to me at present so I cannot testify as to the inclusion of tsunami data in the design of this facility.

Points that ought to be included in the DEIS are:

1. Effects of tsunamis on the structure
2. Effects of tsunamis adjacent to the structure but influenced by its presence
3. Increased risk to life and property because of ancillary structures - location and use of parking/camping facilities
4. Increase risk because of the placement of legal or illegal moorings, both temporary and permanent

Comments on DEIS, Pohoiki Bay Navigation Improvements, Island of Hawaii

General Comments

Resources for which the National Marine Fisheries Service (NMFS) bears a responsibility, and alternatives to reduce adverse impacts on these resources, have for the most part been addressed to our satisfaction in the DEIS. Specific areas needing further clarification are detailed below.

The description of the three alternative plans strongly indicates that Plan 1 will have the least adverse impact on the marine environment and biota of Pohoiki Bay. The NMFS recommends implementation of Plan 1. We strongly recommend against Plan 3 which will require blasting, dredging and modification of nearly twice the amount of marine habitat as would occur if either of the other two plans were implemented.

Specific Comments

Section 3. ENVIRONMENTAL SETTING WITHOUT THE WATER RESOURCES PROJECT

3.5 Marine Environmental Setting

Page 3-3, Paragraph 3.5.5. This paragraph indicates that the corals Pocillopora meandrina, Porites lobata, and Palythoa sp. are found in the area that would be dredged in Plan 3. The statement should be expanded to include the percentage of substrate covered by these corals in the proposed dredge area. The same data should be provided for that portion of the inner bay which would be inclosed by the proposed breakwater. Although these data may be present in the referenced reconnaissance survey report (reference 4), they are essential to properly evaluate potential imports of the proposed project and therefore should also be included in the DEIS.

3.10 Recreation Resources.

Page 3-8, paragraph 3.10.2. In addition to surf-casting this paragraph should detail other forms of recreational and semi-subsistence fishing which are presently carried out in Pohoiki Bay and adjacent waters. These should include hand harvesting of limpets (opihi) and algae (limu), diving and spearfishing, throw-net and gill-net fishing, and pole fishing for reef fish.

We hope these comments will be of assistance to you in the preparation of the final statement. Please send us a copy of the final as soon as it becomes available.

Advisory Council on
Historic Preservation
1522 K Street N.W.
Washington, D.C. 20005

November 14, 1977

Colonel F. M. Pender
District Engineer
Corps of Engineers
U. S. Army Engineer District, Honolulu
Building 230
Ft. Shafter, Hawaii 96858

Dear Colonel Pender:

Thank you for your request of November 2, 1977, for comments on the draft environmental statement (DES) for the Pohoiki Bay Navigation Improvements, Island of Hawaii, Hawaii. Pursuant to Section 102(2)(C) of the National Environmental Policy Act of 1969 and the Council's "Procedures for the Protection of Historic and Cultural Properties" (36 C.F.R. Part 800), we have determined that your DES mentions properties of cultural and/or historical significance; however, we need more information in order to evaluate the effects of the undertaking on these resources. Please furnish additional data indicating:

Compliance with Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470f, as amended, 90 Stat. 1320).

The environmental statement must demonstrate that either of the following conditions exists:

1. No properties included in or that may be eligible for inclusion in or which have been determined on the authority of the Secretary of the Interior to be eligible for inclusion in the National Register of Historic Places are located within the area of environmental impact, and the undertaking will not affect any such property. In making this determination, the Council requires evidence of an effort to ensure the identification of properties eligible for inclusion in the National Register, including evidence of contact with the State Historic Preservation Officer, whose comments should be included in the final environmental statement. The State Historic Preservation Officer for Hawaii is Ms. Jane L. Silverman, Department of Land and Natural Resources, P. O. Box 621, Honolulu, Hawaii 96809.

2. Properties included in or that may be eligible for inclusion in or which have been determined on the authority of the Secretary of the Interior to be eligible for inclusion in the National Register of Historic Places are located within the area of environmental impact, and the undertaking will or will not affect any such property. In cases where there will be an effect, the final environmental impact statement should contain evidence of compliance with Section 106 of the National Historic Preservation Act through the Council's "Procedures for the Protection of Historic and Cultural Properties" (36 C.F.R. Part 800).

Should you have any questions, please call Michael H. Bureman at (303) 234-4946, an FTS number.

Sincerely yours,

Louis S. Wall
Assistant Director, Office of
Review and Compliance, Denver

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

COMMANDER(mep)
Fourteenth Coast Guard District
Prince Kalanianaole Federal Bldg.
300 Ala Moana Blvd.
Honolulu, Hawaii 96850
Phone:808-546-7510

16452

From: Commander, Fourteenth Coast Guard District
To: District Engineer, U. S. Army Engineer District, Honolulu

Subj: Pohoiki Bay Navigation Improvements; Draft Project and Environmental Statement

1. Staff review of the subject draft has been completed and the Coast Guard has the following comments concerning the project.

2. Depending upon which plan is finally accepted, a single fixed aid to navigation may be appropriate to mark the proposed breakwater. If the project is federally funded, the Coast Guard would assume responsibility for marking the breakwater. If the project is not federally funded, the installation of any aids to navigation would be at the State's discretion. An evaluation of the proposed plans indicate that a breakwater light would be adequate for plans 1 and 2 and that a sectored light would be appropriate for plan 3.

3. The diagrams illustrating the plans show a large boulder near the tip of the proposed breakwater. Before the Coast Guard will install any aids to navigation, the navigational hazards presented by this boulder will have to be evaluated. If the boulder does present a hazard to navigation, it will have to be removed before the Coast Guard will install any aids.

4. Thank you for the opportunity to review and comment on this proposed project.

Copy to:
COMDT(G-WEP/7)
OEQC Hawaii
Water Transportation Facilities Div., DOT, State of Hawaii

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca. 94105

Project #D-COE-K32015-HI

Scott Sullivan
U.S. Army Engineer District, Honolulu
Building 230
Ft. Shafter HI 96858

Dear Mr. Sullivan: JAN 6 1978

The Environmental Protection Agency has received and reviewed the draft environmental statement for the Pohoiki Bay Navigation Improvements.

EPA's comments on the draft environmental statement have been classified as Category LO-1. Definitions of the categories are provided on the enclosure. The classification and the date of EPA's comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions under Section 309 of the Clean Air Act. Our procedure is to categorize our comments on both the environmental consequences of the proposed action and the adequacy of the environmental statement.

EPA appreciates the opportunity to comment on this draft environmental statement and requests one copy of the final environmental statement when available.

Sincerely,
Paul De Falco, Jr.

Paul De Falco, Jr.
Regional Administrator

Enclosure

cc: Council on Environmental Quality

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
P. O. 50004, Honolulu, HI 96850

December 14, 1977

Colonel F. M. Pender
District Engineer
U.S. Army Engineer District,
Honolulu
Building 230
Fort Shafter, Hawaii 96858

Dear Colonel Pender:

Subject: Pohoiki Bay Navigation Improvements, Island of Hawaii

We have reviewed the draft EIS and project report and find that your proposed project and ours at Issac Hale Beach Park complement each other extremely well.

Our only concern is that Plan II, as described in your document, could possibly reduce the amount of parking available in the Issac Hale Beach Park. However, we feel that your project is a needed one and meets the needs of the area.

Thank you for the opportunity to review and comment on the draft EIS and project report.

Sincerely,

Donald A Mucr, acting

Jack P. Kanalz
State Conservationist

13

REGION IX
450 Golden Gate Avenue
P.O. Box 36003
San Francisco, California 94102

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
AREA OFFICE
300 ALA MOANA BLVD., RM. 3318, ~~BOX BOX~~ 50007
HONOLULU, HAWAII ~~96813~~ 96850
January 9, 1978

Colonel F. M. Pender
Corps of Engineers
District Engineer
U.S. Army Engineer District, Honolulu
Building 230
Fort Shafter, Hawaii 96858

Dear Colonel Pender:

Subject: Pohoiki Bay Navigation Improvements, Pohoiki Bay, Hawaii; Draft Detailed Project Report and Environmental Statement

The subject document that covers the proposed action to construct a breakwater and launching facilities for improved trailer-boat launching and recovery at Pohoiki Bay, Hawaii was reviewed by our office.

This action does not adversely impact on HUD concerns but should provide for increased safety and convenience for boat operators at Pohoiki Bay.

We appreciate the opportunity to comment on the Draft Statement and look forward to receiving the final EIS.

Sincerely,

Alvin K. H. Pang
Director

14

GEORGE R. ARIYOSHI
GOVERNOR

RICHARD E. MARLAND, PH.D.
DIRECTOR

TELEPHONE NO
548-6915

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
OFFICE OF THE GOVERNOR
550 HALEKAUWILA ST
ROOM 301
HONOLULU, HAWAII 96813

December 19, 1977

Mr. Kisuk Cheung, Chief
Engineering Division
Department of the Army
Corps of Engineers
Building 230
Fort Shafter, Hawaii 96858

SUBJECT: Draft Detailed Project Report and Environmental Statement for Pohoiki Bay Navigation Improvements, Hawaii

Dear Mr. Cheung:

We have completed our review of the subject project report and environmental statement. As of this date we have received nine (9) comments on this subject, as shown on the attached list. We wish to offer the following comments for your consideration:

1) The term "heavily used" (page B-1) is somewhat misleading. No relationship is expressed as to what is meant by heavily used. Is this ten, twenty, or whatever number of launches a day? Both present and estimated future usage of the boat launching ramp should be presented in the report.

2) The Surf Parameters studies conducted by the J.K.K. Look Laboratory of Oceanographic Engineering presents more recent wave climate data than that used for the proposed project. We mention this because there is no citation of these reports in the subject document's list of references.

3) The potential environmental impact of an increasing fish catch due to the increased accessibility to the Pohoiki fishing grounds should be shown under environmental impacts page D-9.

4) Within the section of "Relationship of the Alternatives to Land Use Plans," these should be a discussion on how this project relates to the State's Coastal Zone Management Act and Hawaii County's requirements under their Special Management Area ordinance. How does this proposed project compare with the guidelines set forth in the CZM Act, Chapter 205A, Hawaii Revised Statutes?

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5) The direct effects of constructing the breakwater are discussed in the Draft EIS. The potential effects on the nearby coastline are not discussed. Will placement of the breakwater in the proposed location cause a change in the beach by either accelerating erosion or accretion of the beach materials? Will sand and gravel accrete in the boat launching ramp, thus increasing the maintenance costs? This topic appears to warrant further study and discussion in the EIS.

6) Will waves reflect off the breakwater, or will they be totally absorbed by the structure? What would be the various directions of the reflected waves and what might they affect? In other words would the surfing sites be affected or might an increased wave attack occur on the exposed beach area? A discussion of this topic is recommended for inclusion in the EIS.

For brevity and fairness, this Office did not attempt to summarize comments made by other reviewers. Instead, we strongly recommend that careful consideration be given to each comment made by the receivers. We also recommend that a copy of the revised EIS be provided to those persons and agencies that have provided substantive comments on the EIS.

We trust that our comments will be helpful to you in the preparation of the Final Statement. Thank you for the opportunity to review this EIS.

Sincerely,

Richard E. Marland
Director

Attachment

16

University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

Office of the Director

December 27, 1977

MEMORANDUM

TO: Chairman
Office of Environmental Quality Control

FROM: Doak C. Cox, Director

SUBJECT: Review of EIS for the Proposed Pohoiki Bay Navigation Improvements
Pohoiki Bay, Hawaii

The Environmental Center review of the above cited EIS has been prepared with the assistance of Ray Tabata, Sea Grant; Darro Thuet and Jacquelin Miller, Environmental Center. The following concerns have been raised by our reviewers:

"The purposes of this study were to determine the need for and feasibility of navigation improvements at Pohoiki Bay." Why is there no actual count of ramp usage? (3.10.2) It is stated on page A-1 paragraph 6 that "The study has been conducted in sufficient depth and detail to define the navigation need and the planned objectives." Without data on ramp usage, how can the navigational need be defined?

The economic features and cost-benefit ratio appears to be misleading. Are the costs for increasing the parking area, installation of a lighted navigation aid, removing the large boulder and constructing a wash down facility included in the projects first cost? If not, what will they be? How was the increased fish catch used to determine the benefit? (Page D-8) Can the nineteen fisherman travel 25 miles to Hilo to launch their boats if high surf conditions limit access at Pohoiki Bay? If so perhaps the benefit could be calculated by the time saved from this improvement.

$$(19\ \text{fishermen})\left(\frac{2\ \text{hours}}{\text{Roundtrip-Fisherman}}\right)\left(\frac{52\ \text{weeks}}{\text{year}}\right)\left(\frac{1\ \text{Trip}}{\text{Week}}\right)\left(\frac{\$10}{\text{hr}}\right) = \$19{,}760/\text{year}.$$

We note that the annual costs of the project will be $28,000. If the benefits were calculated as above the cost-benefit ratio would be $\frac{\$19{,}760}{28{,}000} = .7$ rather than 1.7 as indicated in the EIS.

Do the fishermen travel to Hilo to sell their daily catch? If they do, even the above benefit may be too high.

It is stated in paragraph 3.5.2 that "total coliform levels of the bay waters next to the ramp were just within acceptable water quality standards." Will these limits be exceeded and swimming in the bay restricted due to the reduced circulation caused by the breakwater? Are there other breakwater designs that allow more circulation? Is it possible to design for less breakwater and 95% ramp usage?

Page B-4 paragraph 17 states "it has been reported that the net permanent drift from Cape Kumukahi to Keauhou Point is southwest." Why are there no statistical data about currents in and around Pohoiki Bay? Current information is necessary to design the breakwater and to determine the environmental impacts on Pohoiki Bay.

In connection with tsunami hazards you may be interested in recent evidence uncovered that tsunamis not evaluated in previous tsunami literature had runups in the Opihikao, Pohoiki vicinity of about 20 feet in October 1868, and 27 feet in July 1869. (Cox, D.C., and Morgan, J.; "LOCAL TSUNAMIS IN HAWAII" [in press])

We appreciate your considerations of our comments.

cc: Ray Tabata
Darro Thuet
Jacquelin Miller

HEADQUARTERS
FOURTEENTH NAVAL DISTRICT
BOX 110
PEARL HARBOR, HAWAII 96860

GEORGE R. ARIYOSHI
GOVERNOR

IN REPLY REFER TO:
002A:FWD:amn
Ser 2301
18 NOV 1977

Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Gentlemen:

Draft Detailed Project Report and
Environmental Statement, Pohoiki Bay
Navigation Improvements, Pohoiki Bay, Hawaii

The Draft Detailed Project Report and Environmental Statement for Pohoiki Bay Navigation Improvements forwarded by your transmittal letter of 9 November 1977 has been reviewed, and the Navy has no comments.

Thank you for the opportunity to review the subject report.

Sincerely,

FRED W. DEW
Lt, CEC, USN
Deputy District Civil Engineer
By direction of the Commandant

19

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

E. ALVEY WRIGHT
DIRECTOR

DEPUTY DIRECTOR
WALLACE ARAI
MICHIKO HIGASHIONNA
DOUGLAS S. SAKAMOTO
CHARLES C. HARRISON

December 12, 1977

IN REPLY REFER TO
STP 8.4601

Office of Environmental Quality
Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Gentlemen:

Subject: Draft Detailed Project Report and
Environmental Statement
Re: Pohoiki Bay Navigation Improvements
Pohoiki Bay, Hawaii

Thank you very much for giving us this opportunity to review the above-captioned document. We are in complete accord with the Corps' evaluation and we support their recommended solutions to improve the hazardous conditions presently being experienced by boaters utilizing the Pohoiki boat launching ramp. We find the EIS to adequately address the environmental concerns as they relate to the three alternative plans of action. For the record, we endorse Plan I which simply calls for a 90-foot long breakwater perpendicular to the shoreline and adjacent to the launching ramp. This plan has the highest benefit/cost ratio while providing significant improvements to the surge conditions at the ramp--in the order of 70% reduction of wave energy.

Sincerely,

E. ALVEY WRIGHT
Director

20

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

December 28, 1977

GEORGE A. L. YUEN
DIRECTOR OF HEALTH
Audrey W. Mertz, M.D., M.P.H.
Deputy Director of Health
Henry N. Thompson, M.A.
Deputy Director of Health
James S. Kumagai, Ph.D., P.E.
Deputy Director of Health

In reply, please refer to
File EPHS – 88

MEMORANDUM

To: Office of Environmental Quality Control

From: Deputy Director for Environmental Health

Subject: Environmental Impact Statement (EIS) for Pohoiki Bay Navigation Improvements, Pohoiki Bay, Hawaii

Thank you for allowing us to review and comment on the subject EIS. On the basis that the project will comply with all applicable Public Health Regulations, please be informed that we have no objections to this project.

We realize that the statements are general in nature due to preliminary plans being the sole source of discussion. We, therefore, reserve the right to impose future environmental restrictions on the project at the time final plans are submitted to this office for review.

JAMES S. KUMAGAI, Ph.D.

cc: Environmental Quality Commission

21

UNIVERSITY OF HAWAII

Water Resources Research Center

Office of the Director

December 7, 1977

Office of Environmental Quality Control
Office of the Governor
550 Halekauwila Street, Rm. 301
Honolulu, Hawaii 96813

Dear Sirs:

Subject: Environmental Impact Statement: Detailed Project Report Navigation Improvements Pohoiki Bay, Hawaii

We have reviewed the above EIS and have no critical comments. We appreciate the opportunity to participate in this EIS review.

Sincerely,

Reginald H. F. Young
Asst. Director, WRRC

RHFY:jm

22

2540 Dole Street · Honolulu, Hawaii 96822

GEORGE R. ARIYOSHI
GOVERNOR

ANDREW I. T. CHANG
DIRECTOR OF SOCIAL SERVICES & HOUSING

STATE OF HAWAII
DEPARTMENT OF SOCIAL SERVICES AND HOUSING
P. O. Box 339
Honolulu, Hawaii 96809

November 22, 1977

MEMORANDUM

TO: Office of Environmental Quality Control
550 Halekauwila St., Room 301
Honolulu, Hawaii 96813

FROM: Andrew I. T. Chang, Director
Department of Social Services and Housing

SUBJECT: Draft Environmental Impact Statement - Pohoiki Bay Navigation Improvements

Subject EIS has been reviewed for its impact on departmental programs.

We have no comment to make.

Thank you for the opportunity to review and comment.

DIRECTOR

23

GEORGE R. ARIYOSHI
Governor

HIDETO KONO
Director

FRANK SKRIVANEK
Deputy Director

DEPARTMENT OF PLANNING
AND ECONOMIC DEVELOPMENT

Kamamalu Building, 250 South King St., Honolulu, Hawaii • Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Ref. No. 5044

November 23, 1977

MEMORANDUM

TO: Dr. Richard E. Marland, Director
Office of Environmental Quality Control

FROM: Hideto Kono, Director

SUBJECT: Draft Detailed Project Report and Environmental Statement,
Pohoiki Navigation Improvements, Pohoiki Bay, Hawaii

We have reviewed the subject project report and environmental statement and wish to offer the following comments.

We have determined that the project report has fully evaluated the navigation problems at Pohoiki and the feasibility of providing improvements. We also find that, in general, the draft environmental statement has adequately identified and assessed the economic, social and environmental effects that can be anticipated from the proposed improvements.

Thank you for the opportunity to review this draft report and environmental statement.

24

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

W. Y. THOMPSON, Chairman
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

December 8, 1977

Governor of Hawaii
550 Halekauwila St.
Honolulu, Hawaii 96813

Dear Sir:

We have reviewed the project and EIS for the Pohoiki boat ramp improvements.

Of the three alternative plans presented, we find plans 1 and 2 will be less environmentally disruptive. As indicated on pages D-8 and D-13, the benefits gained from each plan is the same. We suspect, however, that plan 2 may afford greater benefit than plan 1 (p. D-6).

The environmental impact of the project appears to be adequately covered.

Very truly yours,

W. Y. Thompson

W. Y. THOMPSON
Chairman of the Board

cc: Dept. of Transportation
Fish and Game
State Parks
DOWALD

LEND A HAND TO CLEAN OUR LAND STATE OF HAWAII

GEORGE R ARIYOSHI
GOVERNOR

VALENTINE A. SIEFERMAN
MAJOR GENERAL
ADJUTANT GENERAL

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
FORT RUGER, HONOLULU, HAWAII 96816

HIENG

16 NOV 1977

Dr. Richard E. Marland, Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Dr. Marland:

Pohoiki Bay Navigation Improvements
Pohoiki Bay, Hawaii

Thank you for sending us a Draft copy of the "Pohoiki Bay Navigation Improvements" Detailed Project Report and Environmental Statement. We have received the publication and have no comments to offer. As requested, the attached document is returned for your use.

Yours truly,

Frederick W. Klemm

WAYNE R. TOMOYASU
for Captain, CE, HARNG
Contr & Engr Officer

CPT, CE, HARNG

Enclosure

GEORGE R. ARIYOSHI
GOVERNOR

JOHN FARIAS, JR.
CHAIRMAN, BOARD OF AGRICULTURE

YUKIO KITAGAWA
DEPUTY TO THE CHAIRMAN

BOARD MEMBERS:

ERNEST F. MORGADO
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HAWAII MEMBER

STEPHEN L. AU
KAUAI MEMBER

FRED M. OGASAWARA
MAUI MEMBER

STATE OF HAWAII
DEPARTMENT OF AGRICULTURE
1428 SO. KING STREET
HONOLULU, HAWAII 96814

November 16, 1977

MEMORANDUM

To: Environmental Quality Control
Office of the Governor

Subject: EIS - Pohoiki Bay Navigation Improvements
Puna, Hawaii

The Department of Agriculture has reviewed the subject EIS. Although we have no comments to offer, we appreciate having been given the opportunity to do so.

The document is herewith returned for the use of others.

JOHN FARIAS, JR.
Chairman, Board of Agriculture

Encl.

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAII

P. O. BOX 1820 • HILO, HAWAII 96720 • 25 AUPUNI STREET

November 16, 1977

Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, HI 96813

POHOIKI BAY NAVIGATION IMPROVEMENTS
DRAFT PROJECT REPORT AND EIS

We have no comments to offer to the subject project.

Akira Fujimoto
Manager

QA

DEPARTMENT OF PARKS & RECREATION

COUNTY OF HAWAII

Herbert Matayoshi, Mayor

Milton Hakoda, Director

December 12, 1977

Colonel F. M. Pender
Corps of Engineers, Dept. of the Army
Building 230
Fort Shafter, Hawaii 96858

Subject: Pohoiki Bay Navigation Improvements
Draft Environmental Statement

Thank you for the opportunity to review the draft statement.

Our only comment concerns several references (pages 3-8 and 5-4) to providing of thirteen parking stalls for boat trailers and campers. A commitment to provide these stalls has not been made by the County, therefore, we would recommend that the specific number and type of stalls not be mentioned.

If any questions should arise relative to the above, please do not hesitate to contact this office.

Thank you.

Milton T. Hakoda
Director

cc: RC&D Committee
Dan Matsumoto

• 25 AUPUNI STREET • HILO, HAWAII 96720 • TELEPHONE 961-8311

ATTACHMENT 1

FINAL ENVIRONMENTAL STATEMENT

FINAL ENVIRONMENTAL IMPACT STATEMENT
POHOIKI BAY NAVIGATION IMPROVEMENTS
POHOIKI BAY, ISLAND OF HAWAII, HAWAII

SUMMARY

( ) Draft (X) Final Statement

Responsible Office: US Army Engineer District, Honolulu
Building 230
Fort Shafter, Hawaii 96858
Telephone: (808) 438-1091

1. Name of the Action: (X) Administrative ( ) Legislative

2. Description of Project. The Pohoiki Bay Navigation Improvements Project is a Federal and State planned and funded project to provide navigational protection for the launching and recovery of commercial fishing boats at the Pohoiki Launch Ramp. The plan provides for the construction of a 90-foot breakwater using 2,500 cubic yards of rock material.

3. Environmental Effects. The project will allow and improve year-round usage of the launch ramp by commercial fishermen and other users contributing to continued growth of the local fishing industry and possibly enhancing water-based recreational opportunities. Breakwater construction will cover 8,000 square feet of marine habitat. The breakwater will provide 10,000 square feet of new habitat which would be colonized by benthic marine organisms and coastal reef fish possibly resulting in a localized increase in species diversity at the site of the breakwater. Construction activities will cause temporary water turbidity and temporary traffic and noise nuisances. Increased launch ramp usage may create use conflicts relating to recreational fishing, swimming and boating, and availability of parking space and potable water. Possible increased use of the launching ramp for cleaning fish and equipment may temporarily degrade inner bay waters. The project does not conflict with land use plans for the area.

4. Adverse Environmental Effects. Breakwater construction will destroy 8,000 square feet of marine habitat and will temporarily increase water turbidity and traffic and noise inconveniences. Increased ramp usage may generate competition for natural and facility resources and could degrade inner bay waters.

5. Alternatives. Alternatives considered included no-action and a Kapoho Bay alternative site, relocating the boat ramp, improving the entrance channel, and alternative designs.

6. Comments received from:

US Advisory Council on Historic Preservation
US Department of Agriculture
US Department of Commerce
US Department of Housing and Urban Development
US Department of the Interior
US 14th Coast Guard District
US Environmental Protection Agency

State of Hawaii:
Department of Agriculture
Department of Defense
Department of Health
Department of Land & Natural Resources
Department of Planning & Economic Development
Department of Social Services & Housing
Department of Transportation
Office of Environmental Quality Control
University of Hawaii, Environmental Center & Water Resources Center

County of Hawaii:
Department of Parks & Recreation
Department of Water Supply

7. Draft Statement Filed with CEQ: November 1977.

Final Statement Filed with EPA: _____.

27. US Army Engineer District, Honolulu. Memo for Record, dated 31 May 1977, Subject: Pohoiki.

28. US Fish and Wildlife Service, Office of Endangered Species, Dr. Derral Herbst. Personal Communication, 19 August 1977.

29. US Fish and Wildlife Service, Division of Ecological Services, Mr. Maury Taylor, Chief. Personal Communication, 19 August 1977.

30. US Soil Conservation Service. Isaac Hale Beach Park, Public Water-Based Recreation Measure Plan, Honolulu, September 1977.

31. Bishop Museum, Archeological Reconnaissance of the Proposed Kapoho Kalapana Highway, District of Puna, Island of Hawaii, Department of Anthropology, Report 71-1, 1972, by Bevacque and Dye.

FINAL
ENVIRONMENTAL IMPACT STATEMENT
POHOIKI BAY NAVIGATION IMPROVEMENTS
POHOIKI BAY, ISLAND OF HAWAII, HAWAII

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SECTION 1

DESCRIPTION OF THE PROJECT

1. Description of the Project.

1.1 The project involves the construction of a breakwater (see Plate 1, Plan of Improvement, Detailed Project Report) having a length of 90 feet, a crest elevation of 10 feet above mean lower low water, and a slope of 1 vertical to 2 horizontal. Approximately 2,500 cubic yards of 7- to 12-ton rock obtained from a commercial quarry source on Hawaii will be used for construction. An existing rock at the head of the breakwater will be removed and probably placed within the breakwater. A lighted navigational aid will be provided. The breakwater will reduce the wave energy at the boat ramp and will improve trailer boat launching and retrieval operations, improving commercial fishing activities at Pohoiki.

SECTION 2

ENVIRONMENTAL SETTING WITHOUT THE WATER RESOURCES PROJECT

2. ENVIRONMENTAL SETTING WITOUT THE WATER RESOURCES PROJECT

Physical Setting.

2.1 Pohoiki Bay is located on the southeast coast of Hawaii Island in the agricultural Puna District. The county seat at Hilo is 25 road miles to the northwest, and the nearest town of Pahoa is 8 miles away. The Puna landscape is characterized by fields of sugarcane, commercial flower nurseries, and papaya groves, interrupted by dense forests, unimproved residential tracts, and barren flows of recent lava. Pohoiki Bay is located along a sparsely inhabited, rocky coastline, separated from the inland town of Pahoa by a large papaya plantation, a geothermal exploration site, and partially developed residential subdivisions. A private residential development lies about 3 miles to the north at Kapoho Bay (see Figures B-1 and B-2 in Section B, Detailed Project Report).

2.2 Pohoiki Bay is about 1,100 feet long at its seaward mouth enclosing an area of 11.5 acres between Isaac Hale Beach Park at the Northeastern corner of the bay and a low headland called Lae O Kahuna ("point of the secret place") to the southwest. There are only two permanent residences located within 1,500 feet of the bay, one of which is immediately adjacent to the one-lane, State-maintained, launching ramp. Pohoiki Bay is the only small boat launching site in the Puna District and is an important commercial and sports fishing resource for the people of Hawaii.

Weather and Coastal Hazards.

2.3 The climate on the island of Hawaii is characterized by a two-season year (summer and winter). Along the coastal area of Pohoiki, temperatures average in the seventies with rainfall ranging between 80 and 100 inches annually. No empirical measurements of winds, currents, or tidal range are available for Pohoiki Bay. For detailed description and an analysis of climate and oceanographic parameters of the Pohoiki Bay area, see Section B of the Detailed Project Report. In general, sea conditions within Pohoiki Bay preclude the use of the launching ramp about 25 percent of an average year. Isaac Hale Park is located within a 100-year tsunami inundation hazard zone which extends 200 to 800 feet inland from the shoreline. Tsunami runup of 20 to 27 feet has been reported by the Environmental Center, University of Hawaii (see Appendix A). The area is also subject to geologic subsidence and earthquakes having Richter scale magnitudes greater than 6.

2.4 Detailed description of the geology of the project area may be found in Section B of the accompanying Detailed Project Report. In general, Pohoiki is in a geologically young and active zone with a long history of volcanic eruptions, lava flows, and earthquakes in Puna

District. Evidence of the continuing subsurface activity is found in a geothermal test well located 4 miles northwest of Pohoiki which has yielded temperatures and pressures capable of generating up to 4 megawatts of electric power (reference 18). The Pohoiki Warm Springs and a thermal spring discharge within the bay are further examples of the geological infancy of Puna. The Pohoiki Warm Springs discharge has a temperature of 35°C. and salinity of 7 parts per thousand (reference 9). The coastline at Pohoiki Bay is characterized by low, basalt sea cliffs, rocky beaches, and a substrate of basalt (pahoehoe) pavement. Well-drained, very shallow organic soils predominate the land surface at Pohoiki.

Terrestrial Environmental Setting.

2.5 A zone of open guava forest and shrubs surrounds Pohoiki Bay. Common species probably include coconut, guava, kukui, ohia, koa, koa haole, and lantana. Milo trees have been planted in Isaac Hale Park. According to the US Fish and Wildlife Service, no endangered species of plants are known to exist in the immediate project area (reference 28).

2.6 Based on bird counts by Dr. Robert Shallenberger at Kapoho Bay which has a similar, but less forested than Pohoiki Bay, vegetative cover, the forests around Pohoiki are likely to provide habitat for species of spotted dove, barred dove, cardinal, Japanese white-eye, and house finch (reference 2). Along the rocky coastline, according to sources, including the US Fish and Wildlife Service, there are resting and feeding habitats for wandering tattler, Pacific golden plover, sanderling, and ruddy turnstone (reference 29).

Marine Environmental Setting.

2.7 Reconnaissance surveys of the marine environment in the study area and at Kapoho Bay were performed by Dr. Daniel P. Cheney, consultant in marine sciences, during August 1977 (reference 4). Random swimming transects were conducted at Pohoiki and Kapoho Bays to provide a comparative, qualitative description of biota and substrate. A series of four 50-meter transects were set in Pohoiki Bay within the project area and one 60-meter transect was set at the entrance to the bay to provide quantitative inventories of fish, coral, algae, and macro-invertebrates and to quantify substrate types. Water chemistry measurements were also taken at various locations in both bays and along the transects in Pohoiki Bay.

2.8 The waters off the southeastern coast of Hawaii Island are designated "Class AA waters" in Chapter 37-A, State of Hawaii Department of Health Water Quality Standards, to be protected for oceanographic research, support, and propagation of shellfish and other marine life, conservation of coral reefs, wilderness areas, compatible recreation, and aesthetic

enjoyment. In general, coastal waters meet or exceed the Class AA standards (reference 11). At Pohoiki Bay, the natural discharge of heated brackish water into the bay has created ambient conditions which exceed the State water quality standards for temperature and total phosphorus. No point sources of discharge were located during surveys, but subsurface groundwater seepage was observed. Salinity/temperature data indicated the presence of a mixed layer of warm water, 3 to 6 inches thick, located in the intertidal area of the shoreline between the launching ramp and a lava ledge at the center of the bay. Temperatures measured near the shoreline opposite the Pohoiki Warm Springs were about 2°C. higher than ambient conditions (approximately 26°C.). Isolated pockets of warm water were measured as far out as the mouth of the bay; however, resampling during heavy seas found much lower water temperatures probably due to more extensive water mixing. Salinities were less than oceanic conditions throughout the bay and tended to increase with distance from shore. Mean orthophosphate levels measured at three locations in the proposed project area were high with total phosphates exceeding State water quality standards. The cause of the phosphate elevation is not known. Nitrate-nitrite levels, ranging from 0.006 to 0.22 mg/1, showed a trend of relatively high levels in the area adjacent to the launching ramp during both ebb and floodtide cycles. These high levels of nutrients may be the result of higher than ambient orthophosphate and nitrate-nitrite levels in Pohoiki Warm Springs discharge, runoff from intensively-cultivated papaya fields above the bay, and to a lesser extent, activities of fishermen, such as, gutting fish and/or cleaning boats, bait buckets and fish boxes near the launching ramp.

2.9 Based on measurements taken in the field and data obtained from the State of Hawaii Department of Health, total coliform levels of bay waters next to the ramp were just within acceptable water quality standards. No turbidity measurements were taken, but visibility was reported to be 3 to 10 feet in nearshore waters, probably influenced by the freshwater discharge and wave agitation of fine material and bubble entrainment.

2.10 Water quality studies at Kapoho Bay revealed a large recent influx of fresh water into the bay as determined by salinity measurements which ranged from 19.0 to 25.2 parts per thousand as compared to 32.2 to 23.9 parts per thousand measured in the same locations in 1972 (reference 10). One effect of the rise in freshwater influx has been the development of mangrove forests along the shores of inner Kapoho Bay. The waters in Kapoho Bay were extremely turbid which may be caused by normally heavy wave action eroding the adjacent, recent lava flow (reference 4).

2.11 The substrate of the breakwater site consists mainly of basalt rubble and black sand overlying a basalt pavement. The proportion of sand and rock material increases nearshore and is characteristic of the shoreline and the area adjacent to the launching ramp. Outer sections

of the breakwater site are characterized by a higher proportion of bare basalt pavement and a few large basalt boulders or pinnacles which come to within 2 to 3 feet of the surface of MLLW. Boulder size along the shore increases toward the southwest headland adjacent to Isaac Hale Park. Large boulders become more common across the mouth of the bay. The outer edge of the bay is well defined by a 15-foot cliff which drops to a sand and boulder covered terrace.

2.12 Diversity and/or standing crops of algae, fish, corals and sea urchins are generally high, except in the immediate wave-wash zones. A rich area for algae, fish and invertebrates, the intertidal regions of Pohoiki Bay are an important and accessible fishery resource, particularly along the shoreline of Isaac Hale Park. A total of 23 species of algae were identified at Pohoiki Bay. Species of the fleshy red algae, Amansia glomerata and Pterocladia capillacea are most obvious in the nearshore area within 100 feet of the launching ramp. These species give way to the pink coralline algae Porolithon toward the center of the bay. A total of 12 species of coral were identified in Pohoiki Bay. Corals found within the inner bay that would be covered by the proposed breakwaters are represented mainly by the tree coral Pocillopora damicornia and the soft coral Anthelia edmondsoni. These corals blend into small colonies of the rose coral Pocillopora meandrina and incrustations of Porites lobata and Palythoa further out from shore. Toward the center of the bay are scattered large masses of the blue encrusting coral Montipora flabellata and white patches of Palythoa colonies. Coral coverage is low varying between 0.9 and 3.8 percent in the project site and between 0.4 to 2.1 percent further inshore. Despite low coral abundance, diversity was high suggesting that the bay provides significant habitat and protection for the benthic biota. However, coral development is much less than the flourishing and variable coral communities found along the entire Kona or leeward coast of the island. The project site is also characterized by relatively high concentrations of echinoderms, especially sea urchins near the Isaac Hale Park shoreline.

2.13 A total of 65 species of reef fish were observed at Pohoiki. Fish diversity and abundance were high considering the low coral abundance and general lack of bathymetric relief. Large schools of surgeon fish were also encountered. The abundance and diversity of fish was noted to be similar to other Puna areas, and diversity was similar to West Hawaii reefs along the leeward side of Hawaii. A scarcity of coral dependent fish was noted and attributed to the low coral abundance. Fifteen species of juvenile fish were counted in intertidal pools suggesting that the pools also serve as nursery grounds for juvenile species, such as mullet and blennies. Green sea turtles have been observed outside the bay beyond the breaker line (reference 4).

2.14 Kapoho Bay was observed to be depauperate in marine fauna in comparison to Pohoiki Bay and other shallow water sites on the Puna coast. Living coral coverage was extremely low in shoreline areas and only scattered colonies of Pocillopora and other species could be found in the center of the bay, 300 to 600 feet offshore. Few sea cucumber and sea urchin species were found and the 32 species of reef fishes observed were composed mainly of surgeon fishes and wrasses. In contrast, the algal cover was rich with the highest diversity of species occurring along the shore and the highest coverage occurring near the center of the bay (reference 4).

Cultural Heritage.

2.15 According to legend, Pele, the volcano goddess, is said to have dug a "small depression" at Pohoiki, which is the literal meaning of the place name (reference 13). The first historic reference to Pohoiki dates from 1846, when as many as 200 people are reported to have lived in the ahupua'a (which is the customary Hawaiian land unit running inland from the sea). Archaeological reconnaissances conducted by Bishop Museum in 1972 (reference 31) seems to confirm these population figures by the number of structures found in the general area. The Hawaii State Register of Historic Places lists two sites around Isaac Hale Park. These sites include the Hale Park Complex, and Pohoiki Warm Springs. A third site, Rycroft's Coffee Mill, is also present in the area, but not listed on the State Register. The Hale Park Complex and Pohoiki Warm Springs are listed in reserve status, the lowest of three evaluation categories. Rycroft's Coffee Mill is considered for preservation and restoration in the County of Hawaii General Plan (reference 7). The Hale Park Complex, warm springs and coffee mill are located on private land outside the park approximately 800, 400 and 700 feet, respectively, from the launch ramp. The sites are hidden from view by a dense growth of vegetation; however, the warm springs are used by local bathers. A cultural reconnaissance survey of the project area in 1976-1977 (Inclosure 1), did not reveal any surface archaeological remains in the project site, except for two metal poles located just below the intertidal zone about 140 feet east of the launch ramp. Historic documents suggest that the poles mark the previous location of an old landing from which coffee was shipped from Rycroft's mill in the 1890's and were part of an old wharf which was used as a landing for interisland vessels until 1940. The metal poles were judged to be of recent origin as the original wharf was constructed 80 years ago; metal poles would not have survived constant immersion in saltwater and erosion by wave action for that period of time. Furthermore, major earthquakes (Richter magnitude ratings of 6 or greater) have occurred in the Pohoiki vicinity since 1940 when tax maps last showed the boat hoist anchor base of the landing facility as a recognizable feature. The latest of the earthquakes in 1975 resulted in a subsidence of 1.3 feet. Subsidence would have eliminated visible traces of the original landing facility. The metal

poles were considered to have no historic value. Rycroft's Coffee Mill was considered to be the most significant historic resource in the project area. No sites listed on or eligible for inclusion on the National Register of Historic Places are located at the project site.

Social Characteristics.

2.16 Detailed information on State and county-wide social statistics may be found in Section B of the accompanying Detailed Project Report. The 1970 Census reported a population of 63,468 for the County of Hawaii, up 3.5 percent from 1960. This was the first increase since 1930 and was primarily due to the rapid growth of the tourist industry. By 1 July 1976, the County population was estimated to have grown to 76,600 for an average annual growth rate of 3.2 percent compared with 2.5 percent for the State as a whole (references 14 and 21). Puna is the second most populous and most rapidly growing district in Hawaii County with an estimated 7,800 people residing there in 1976, up 2,646 from a 1970 population of 5,154, an average annual growth rate of about 7.1 percent (reference 14). Although most of the district's population is concentrated in the Mountain View-Keaau area near Hilo, the rural Pahoa region, including Pohoiki, has also experienced a recent influx of residents. No head count for the area has been made since 1,352 people were recorded in the 1970 census, but it is known that over 500 homes have been built between Pahoa and Nanawale Bay area to the northeast since 1970. In addition, elementary/secondary school enrolement at Pahoa has increased from 400 in 1971 to 989 in 1977 (references 5 and 15). The population of Puna District is expected to grow at or near present rates. No other relevant district population projections are now available. With this recent growth, it is presumed that the stable mobility patterns that prevailed in 1970 are not to be expected to be maintained. Changes in ethnic proportion cannot necessarily be presumed for this area and it is likely that persons of Japanese ancestry will still predominate as they did in 1970 when they comprised 41 percent of Puna District's population. Ethnic Caucasians and Filipinos numbered 24 percent and 22 percent, respectively, for the whole district, but persons of Hawaiian ancestry significantly increased from 9 percent to 18 percent within the more remote coastal areas of Pahoa and Kalapana. The most recent income figures also date from 1970 when the median family income among Puna residents was $8,122 per year compared with $9,750 for the whole county. In the Pahoa-Kapanana region, the same statistic was only $7,603 (reference 17).

Land Use and Economy.

2.17 Pohoiki Bay and the land area seaward of the coastal road are located within the State of Hawaii Conservation District which was established in part to preserve scenic areas to provide park land, wilderness and beach reserve, and to conserve endemic plants, fish and

wildlife (reference 19). Most of the area inland is designated Agriculture except for the Malama-Iki Forest Reserve located 1.5 miles to the southwest which is classified Conservation. Kapoho is the nearest urban district. The General Plan of the County of Hawaii designated Pohoiki Bay as an Open Area, but also proposed Pohoiki as a minor Resort Area where isolated developments could be allowed when the area is serviced with adequate basic facilities (reference 7). The area inland from Pohoiki Bay is designated to be used for agriculture, principally orchard production. While the Comprehensive Zoning Ordinance for the County of Hawaii implements the General Plan, zoning guide maps for Puna have not been prepared, but a Puna Comprehensive Development Plan is being developed.

2.18 Most of the land adjacent to the Pohoiki Bay shoreline is privately owned. The Isaac Hale Beach Park is owned by the County and the boat ramp and nearshore sea bottom is owned by the State. Puna Papaya Company, a subsidiary of American Factors, owns much of the land inland from Pohoiki Bay located between Route 137. An uninhabited, residential subdivision is controlled by Tokyu Land Development Corporation. Tokyu is considering selling its holdings in bulk for one-acre agricultural plots or for commercial development in association with the nearby geothermal well site. Other private developers have been considering establishment of a health spa in the area (reference 1). Contingent upon Federal funding, the State of Hawaii is planning to install a wellhead generator at the geothermal site to create up to 4 megawatts of electicity, most of which will be sold to the Hawaii Electric Light Company. The project will also accommodate research and development in the use of geothermal energy, such as the direct application of the hot water to agricultural and industrial processes (reference 8).

2.19 The economy of the island is based primarily on sugar and tourism. Although the 1972 County General Plan designated Puna as a resort destination area, present public sentiment appears to run against resort development in Puna (reference 6). Except for visitor attractions such as Kaimu Black Sand Beach, the Lava Tree State Park, and the flower plantations, the tourist industry has very little impact on the district. Sugar dominates the economy of Puna along with macadamia nut cultivation and processing. Since 1970, there has also been rapid growth in diversified agriculture such as truck farming near Volcano, flowers in the Mountain View, Paho, and Kapoho regions, and papaya plantations near Kapoho and Pohoiki. Accompanying county-wide expansion of the tourist industry and retail trade, the civilian labor force reached 32,200 in 1976. In the agricultural district of Puna, job losses due to mechanization of sugar harvesting and processing were partially offset by development of the export trade in macadamia nuts, flowers and papayas. Many workers also commute to the resort-service center of Hilo. The percent of unemployed nonagricultural workers for the county as a whole was down to 9.5 percent in August 1977 from 11.4 percent the year before

(reference 16). No district figures for unemployment are available, but in 1976 there were 812 Puna residents seeking new or other employment, 13.2 percent of the total 5,374 "employables" in the county (reference 8).

2.20 The commercial fishing industry is presently worth about $12 million and about 500 jobs statewide. Although its impact is relatively small within the State's total economy, it has the potential of developing into a $40 million industry creating another 400-500 jobs (reference 12). On the island of Hawaii, much of the commercial fish caught in the waters off Hilo and the Puna coast are shipped to Honolulu, the State's population center. Since 1960 to the present, commercial fishing out of Pohoiki Bay has tripled in tonnage, generating about 300,000 pounds in 1976 (reference 28). Most of this fishing is conducted by a small number of full-time fishermen numbering less than twenty and residing in the Pahoa-Pohoiki area.

Public Facilities and Services

2.21 There are no basic utilities at Pohoiki. Potable water is supplied only by roof catchment systems. County Department of Water Supply officials state there are no plans to extend the County water distribution system from Pahoa to Pohoiki (reference 26). Planned improvements to Isaac Hale Park will provide a water tank of at least 12,000 gallons. Private residences along Pohoiki Bay and the public restrooms in Isaac Hale Beach Park are served by cesspools, although the park facilities will soon be upgraded to a non-water, recoverable oil flush treatment system (reference 31). Electric service and telephones are not available at Pohoiki and there are no plans for bringing service to the area. The nearest telephones are at Kapoho Bay. Generation of electric power at the geothermal site offers the potential of bringing electric power to Pohoiki.

2.22 Direct access by improved roads to Pohoiki from Hilo is provided by Volcano Road (Hawaii Route 11) to Keaau, Pahoa Road (Hawaii Route 13) from Keaau to Pahoa, and the Pahoa-Pohoiki Road, the latter being an improved cinder road until 1976. Average daily traffic in 1976 on the latter route was an estimated 200-300 vehicles (reference 22). During 1976 and 1977, the Pahoa-Pohoiki Road was widened and paved, noticeably increasing the volume of traffic according to local inhabitants (reference 26). Alternative access via route 137 from Kalapana running along the Puna coastline has been proposed for eventual upgrading and realignment to become the Puna Coast Scenic Highway connecting with Hilo. This action could open new recreational areas, provide access to the shorelines, lead to extensive urban development along the route alignment, and increase property values (reference 3).

2.23 Rescue services for distressed vessels is provided by the US Coast Guard directly from Hilo Harbor or by rescue boats launched at Pohoiki Bay. The County Fire Department also provides rescue services from Pahoa and a private ambulance service is available from Keeau.

Recreation Resources.

2.24 Puna District has four beach parks: Mackenzie State Park (13.1 acres), Harry K. Brown County Park, (22.8 acres), Kaimu Beach County Park (less than 2.6 acres), and Isaac Hale Beach Park (2.07 acres). Only Isaac Hale Beach Park offers boat-launching facilities. In late 1977, the Hawaiian Paradise Corporation tentatively offered coastal acreage at Kings Landing, northeast of Keaau, to the State of Hawaii for possible development as a marina facility. Isaac Hale Beach Park presently offers ten campsites with picnic tables, a pavilion, restrooms, and a drinking fountain. Annual visitor counts range between 1,000 to 2,000 which the County estimates to be 20 percent of actual usage (reference 31). Construction funds are expected to be available for park improvement in fiscal year 1978 which will include additional picnic tables, a larger pavilion, and a new comfort station with new water and sewage treatment systems. In the past, there has been inadequate parking space for campers, picnickers and launch ramp users, resulting in competition for spaces and traffic intrusion into the park recreational area and into private property.

2.25 The launching ramp is owned and maintained by the State of Hawaii and is used almost exclusively by commercial fishermen. No actual count of ramp usage is available. The launching ramp is also reported to be used by some recreational, weekend fishermen. Surf-casting is very popular along the park shoreline among local residents and members of the Hilo Casting Club. Baited hooks are sometimes slung from a wire which extends across the bay (reference 4). According to the National Marine Fisheries Service (see Appendix A) other forms of recreational and semi-subsistence fishing traditionally carried out in Pohoiki Bay and adjacent waters include hand-harvesting of limpets (opihi) and algae (limu), diving and spearfishing, throw-net and gill-net fishing, and pole fishing for reef fish. The number of shoreline fishermen are reported to have increased since road access was recently improved (reference 26).

2.26 Swimming and surfing have long been popular pastimes at Pohoiki, but seem to have increased since the earthquake in 1975 (reference 4). A midweek count of swimmers in July 1977 found about 15 swimmers in the bay, especially nearshore where thermal stratification in the water occurs as a result of the discharge of warm waters into the bay. Swimmers often bath in the nearby Pohoiki Warm Springs after emerging from the ocean. The 1971 Statewide Surfing Site Survey and visual observations indicate that most surfing occurs in the middle and southwest portion of the bay, but it will occasionally take place adjacent to the park as well when waves are high (reference 24 and 26).

SECTION 3

RELATIONSHIPS OF THE ALTERNATIVES TO LAND USE PLANS

3. RELATIONSHIP OF THE PROJECT TO LAND USE PLANS

3.1 The project does not conflict with either the 1961 County of Hawaii General Plan (reference 7), the 1972 State of Hawaii Statewide Boat Launching Facilities Master Plan (reference 23), nor the 1975 State of Hawaii Statewide Comprehensive Outdoor Recreation Plan (SCORP) (reference 20). The project is compatible with the planned improvements to Isaac Hale County Park as sponsored by the County of Hawaii Department of Parks and Recreation and the US Soil Conservation Service's Big Island Rural Conservation and Development Council (reference 30). The project does not conflict with long-range County intentions to construct a Puna Coast Scenic Highway, State of Hawaii plans for research and development at the geothermal site, and private plans to cultivate papayas inland of Pohoiki Bay. There is no anticipated conflict with the Puna District Development Plan now under preparation by the County of Hawaii Planning Department. Although part of the project would occur within the shoreline set-back and special management areas, Planning Commission shoreline set-back procedures allow construction of special structures for safety reasons and for protecting property from wave damage, provided approval from the County Planning Director and concurrence of the Chief Engineer of the Department of Public Works, County of Hawaii are obtained.

SECTION 4

THE PROBABLE EFFECT OF THE PROJECT ON THE ENVIRONMENT

4. THE PROBABLE EFFECT OF THE PROJECT ON THE ENVIRONMENT

4.1 The breakwater is designed to intercept direct wave attack on the launching ramp area in order to reduce wave heights and surge during the launching and retrieval of boats. The breakwater is also designed to prevent overtopping by waves up to 6.5 feet in height at which point navigation in the approach channel becomes hazardous.

Habitat Modification and Loss.

4.2 The project will modify the marine environment by covering 8,000 square feet of existing marine habitat and destroying marine organisms. However, the breakwater will provide 10,000 square feet of rocky subtidal and intertidal habitat, which would be colonized by assemblages of reef organisms similar to those found in Pohoiki Bay and along the Puna coast.

4.3 The breakwater construction may change the population structure and species composition of organisms behind the breakwater. The extent of these changes depends on habitat modifications caused by the breakwater, such as, reducing swell and surge behind the breakwater, and providing new hard substrates for bottom organisms to colonize. It is expected that the project will significantly reduce surge and wave height within the launching ramp area. Reduced surge stress could result in proliferation of the sea urchin Tripneustes gratilla and sea cucumbers, and in rapid-growing encrusting and branching corals on the stable hard substrate of the breakwater. In addition, this area could develop into a nursery area for juvenile fish. The seaward face of the breakwater should develop population assemblages characteristic of wave exposed headlands and rocky shorelines. However, near the toe of the breakwater the population composition should be similar to the pre-construction communities at the project site. Crevices formed by the armor rock will provide habitats for cryptic or photophobic species. New resting and feeding opportunities for seabirds may be provided by the breakwater. However, the US Fish and Wildlife Service feels that the sides of the breakwater will not provide feeding habitat for coastal seabirds.

Water Circulation and Water Quality.

4.4 The reduction of surge stress and wave activity inside the breakwater except during heavy swell could result in a more distinct thermal layer behind the breakwater. Surface water temperature may increase slightly with a corresponding decline in salinity. Nutrient levels in the bay will continue to be influenced by stormwater runoff, spring water discharges, and cesspool leachates. Marine productivity and water residence time should remain relatively unchanged as the breakwater does not restrict water exchange with the ocean. The breakwater is porous and will allow water to flow through the structure. Wave-mixed areas

outside the site will remain unaffected by the project. The breakwater construction will not affect the rate of flow or location of thermal spring discharge. The use of stone to construct the breakwater is not expected to result in a significant increase in water turbidity.

Construction.

4.5 Stones for construction of the breakwater would be transported to the project site from commercial sources on the island of Hawaii. The stone and gabions of concrete and stone would be placed by crane; the latter would be temporarily stored at the adjacent park shoreline. Portions of a proposed cemented rock border surrounding the parking lot of the proposed Isaac Hale Park improvement may have to be removed and repaired to permit entry of construction equipment. No trees would be removed or trimmed. The work should not conflict with use of the boat ramp. For the period of construction, heavy equipment operation will increase noise and air pollution levels above the present quiet and relatively pristine ambient conditions. In addition, there may be temporary unavoidable traffic or parking conflicts with park users and commercial fishermen. The construction period is estimated to last 3 months.

Boat and Fisherman Use.

4.6 The project will permit safe launching and recovery of the boats at Pohoiki Bay for 99.5 percent of the time in an average year. Navigation within the bay would still be confined to skilled and experienced boatmen. The group of boaters initially aided would be the local, commercial fishermen who would use the area most frequently subject to seasonal variations in fisheries and extreme storm conditions. It is probable that there will be an increase of recreational fishermen and part-time commercial, week-end fishermen. Members of the Hilo Trollers have indicated at public meetings that portions of their 80-boat membership would use Pohoiki Bay if navigational improvement were provided (reference 27). Fishermen cleaning gear and fish on the ramp will contribute to the bacteria and nutrient concentrations and biological-oxygen demand (BOD) loading of the waters near the ramp. This problem could be reduced or eliminated if there were washdown and fish cleaning facilities available near the launching ramp with provisions to divert the wash and rinse water to a sewage treatment system. Development of any such facilities would be the responsibility of the State of Hawaii Department of Transportation.

4.7 Increased use of the boat ramp together with improvements to the Isaac Hale County Park could also create a number of potential use conflicts of the bay area. Concern has been expressed by members of the Hilo Casting Club that the greater boating usage could increase fishing pressure in the vicinity of Pohoiki Bay so that populations of reef and

other nearshore fish could decline (reference 27). Increased public access to the water may also lead to increased use of the nearshore waters by swimmers and divers. The possible conflicting and unsafe use of waters for boating and swimming could be particularly significant in the protected waters around the launching ramp. There may also be a competition for parking spaces among commercial fishermen, recreational and weekend fishermen, recreational boaters, and park users. Increased numbers of boaters, and particularly fishermen, may utilize more freshwater at the park, possibly creating potential conflicts for potable water use by park users, especially during drought conditions.

Social and Economic Effects.

4.8 No sites listed on the National or State Registers of Historic Places will be affected by the construction of the breakwater. The breakwater does not isolate or alter any part of the Hale Park Complex, Pohoiki Warm Springs or Rycroft Coffee Mill historic resources, and does not introduce any visual, audible or atmospheric elements that are considered out of character with the properties or their setting. Construction will cover two metal poles which probably mark the location of the previous landing site at Pohoiki. The metal poles are not considered to be of historic value. Future resort development and highway and park improvements will enhance and increase visitor use of the area, increasing public viewing and use of the resources. As the properties are located on private land, the protection of the historic resources will depend primarily upon the actions of the private landowners.

4.9 The breakwater will be a new visual element at Isaac Hale Park. The breakwater structure was designed to be as low as possible in relation to the predominant ground elevation of 8 feet above MWWL and still provide adequate protection to the launching ramp. Three fishermen interviewed at Pohoiki Bay including the one resident adjacent to the ramp felt that the visual presence of the breakwater was less important than the safety it would provide to boaters (reference 26).

4.10 The project is expected to have an immediate and long-term beneficial effect on the incomes of commercial fishermen residing in Puna District and perhaps for those in other districts who occasionally use Pohoiki launch ramp. An increase in availability of local fish in the markets of Hilo and other points on the island and State may occur. Other sectors of the local economy will also benefit from possibly greater expenditures for goods and services by the existing group of fishermen as well as other fishermen and boaters using the launch ramp. The project is not expected to displace any people or change the existing use of nearby urban and farm land. Improvements to Isaac Hale Park, research and development of the geothermal test well, eventual improvement of the coastal road, and other existing visitor attractions and

economic resources in the Pahoa-Kalapana-Kapoho region could posssibly generate interest in developing Pohoiki Bay into a minor resort as noted in the County General Plan within the long-term future of 10 to 25 years. Future development is expected to significantly alter the quality of the human environmental and land use around Pohoiki.

Effects on Wetlands or Submerged Lands.

4.11 Covering a portion of the marine substrate should not permanently alter food chain production in the coastal marine environment. There will be a change in population structure and species composition in the vicinity of the launching ramp and breakwater as a result of creating new vertical habitat on the breakwater and providing more protected water conditions behind the breakwater. Recolonization of disturbed areas by marine organisms is expected. Water current patterns within Pohoiki Bay may be altered by the project; however, water residence time in the inner bay near the launching ramp is not expected to change significantly. The project will affect neither basal water systems nor salinity distributions within the bay, nor affect upland drainage and storm or floodwater storage. The project will not affect potable ground water supplies.

4.12 The project will not affect any properties listed as a National wild and scenic river, park, wilderness area, shoreline, lake monument, landmark, or historic place, or any listed endangered species or their habitats, marine sanctuaries or refuges.

SECTION 5

ANY PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

5. ANY PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

5.1 Breakwater construction will result in the loss of 8,000 square feet of reef habitat, an amount equal to about 1.6 percent of the total bay substrate surface. Marine organisms will be destroyed within fill areas. The loss should not affect total population and recuperative abilities of any particular species, but will result in a change in population structure and species composition within the affected areas. Significant long-term increases in sedimentation and turbidity during fill operations are not anticipated. Turbid plumes, if any, are expected to be dispersed rapidly because of the openness of the bay to the ocean waves.

5.2 Project construction will create temporary traffic, noise and air pollution nuisances to park users and boaters. Harbor use may generate a number of potential use conflicts between shoreline fishermen and trollers who will compete for fishery resources made more accessible by the proposed *improvements*; conflict between swimmers and boaters may increase within the protected waters behind the breakwater; competition for parking space among full-time fishermen, other boaters and campers, and picnickers, and possible competition for potentially scarce potable water at Isaac Hale County Park may also increase. Traffic volume on the Pahoa-Pohoiki Road may also increase.

SECTION 6

ALTERNATIVES CONSIDERED

6. ALTERNATIVES CONSIDERED

6.1 No Action. This alternative means no action by either the Federal, State, or County governments to improve navigational safety at Pohoiki Bay. Direct ocean wave attack on the existing boat launching ramp will continue to make boat launching and retrieval operations dangerous, hazardous and difficult, and will continue to result in human injury, damage to boats and trainers, and delays in transporting fish catch to market. US Coast Guard and County of Hawaii rescue teams who use the Pohoiki ramp will continue to experience difficulties in responding to distress and emergency calls. During periods when sea conditions prevent the use of the launching ramp, Pohoiki commercial fishermen would be forced to travel 32 miles to Hilo, requiring a 4- to 5-hour one-way trip, in order to reach the fishing grounds or to seek a harbor of refuge. Operating from the Hilo area would impose economic hardship on the small fishing operations which may experience a reduction in fish catch due to a reduction in fishing time, an increase in fuel consumption per pound of fish caught, and possible losses of product quality and price due to the lack of on-board ice or refrigeration units. The no-action alternative did not respond to the public needs to improve commercial fising opportunities and navigational safety as expressed by users of the launching ramp and by the local government.

Kapoho Bay Site Alternative.

6.2 The only other potential site along the Puna coast offering any natural protection is Kapoho Bay. Construction of a small boat facility at Kapoho Bay would require dredging a channel across the reef platform, a turning basin, and building protective structures at the channel entrance. The biological consequence of such a development could be less than the breakwater construction at Pohoiki because of the depauperate state of the biota at Kapoho. The principal objection to siting a small boat harbor at Kapoho Bay comes from boaters who have stated at public workshops that navigation in Kapoho Bay was presently dangerous because of the many shoal areas and large boulders. Moreover, all of the land bordering Kapoho Bay is privately owned, and area residents have expressed strong opposition to any boat launching development there. Because of the high cost of relocating the launch facilities and public access, public opposition to the site, and the lack of greater natural protection than Pohoiki Bay, siting a new facility at Kapoho was considered impractical and an unacceptable course of action.

Alternative Designs

6.3 The project design, as described in Section 1, was selected for implementation because it will improve navigational safety with a minimum of environmental impacts and losses and a maximum of net economic

benefits. One alternative design consisted of construction of a breakwater (same as the selected plan), along with relocation of the launching ramp 50 feet inland (illustrated at Plan 2 on Plate 2, Section D, Detailed Project Report). The other design consisted of a longer and curved breakwater and dredging and improving an entrance channel without relocation of the ramp (illustrated at Plan 3, on Plate 3, Section D, Detailed Project Report). Detailed engineering design and cost features of the two alternatives are presented in Section D of the accompanying Detailed Project Report. Both alternatives improve navigation safety at Pohoiki. Boaters felt that the selected plan best met their needs, and that it would be difficult to navigate around a longer breakwater given the conditions at Pohoiki. Relocating the launch ramp further inland conflicted with park development by reducing the available park area by 1,500 square feet and by increasing traffic management problems. Dredging the entrance channel and constructing a longer breakwater involved higher cost and the most physical change to the environment. The plan would have required 4,500 cubic yards of rock as compared to 2,500 cubic yards for the selected plan, modified 14,500 square feet of benthic habitat as compared to 8,000 square feet for the selected plan, and dredged 3,000 cubic yards of material as compared to no dredging with the selected plan. There was also the risk that dredging could alter groundwater flow into the coastal marine environment, possibly lowering the water level, flow rate and temperature of water in the warm springs. However, the alternative would have provided 16,000 square feet of protected waters as compared with 8,000 for the selected plan.

SECTION 7

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

7. RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

7.1 Construction of a breakwater at Pohoiki Bay would serve the immediate and long-term need for a safe, more efficient, and more frequently usable launch ramp for commercial fishermen. It would also enhance the expansion of a part-time, commercial fishing fleet at Pohoiki. Although 8,000 square feet of marine habitat would be altered, colonization of the new vertical habitats may increase the diversity of marine organisms at the project site. The protective structure would also provide new fishing opportunities for the shoreline fisherman. Improvements to Isaac Hale Park and implementation of land use plans are expected to have a more significant effect on the maintenance and enhancement of long-term productivity in the region than improving navigational safety at an existing boat ramp.

SECTION 8

ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES WHICH WOULD BE INVOLVED IF THE PROJECT SHOULD BE IMPLEMENTED

8. ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES WHICH WOULD BE INVOLVED IF THE PROJECT SHOULD BE IMPLEMENTED.

8.1 The project requires the commitment of monetary, human labor and energy resources. Approximately 2,500 cubic yards of stone and concrete material will be committed to the project. Shallow water marine benthic organisms living within the 8,000-square-foot area covered by the breakwater will be destroyed.

SECTION 9

COORDINATION, COMMENT, AND RESPONSE

9. COORDINATION, COMMENT AND RESPONSE

9. The Draft Detailed Project Report and Environmental Statement were sent to the individuals, organizations and agencies listed on Inclosure 2.

9.2 A public workshop was held on 6 July 1977 in Hilo. The attendees expressed the need for a protective structure to reduce surge and eliminate breaking waves at the launch ramp. They estimated that the ramp was unusable 20 to 25 percent of the time and that a minimum of four persons were needed to launch and recover their boats. When returning after the end of a fishing trip, help to retrieve the boat must be prearranged. The need to remove a large boulder to improve navigational safety and the need for a lighted navigational aid was also expressed. The persons attending the meeting indicated that the improvements should be simple, nothing fancy and realistic in both size and cost. On 16 November 1977, a public meeting was held to present alternative plans to boaters and interested parties. Persons attending the meeting favored the selected plan (discussed in Section 1) stating that it would meet their needs for the least cost and the least impact on other uses of the project area.

9.3 Comments on the Draft Environmental Statement were received from the following agencies (see Appendix A for letters received). No public or special interest groups or individuals responded to the Draft Environmental Statement.

a. Federal Agencies:

US Advisory Council on Historic Preservation
US Department of Agriculture
US Department of Commerce
  Environmental Research Laboratories
  National Marine Fishereis Service
US Department of Housing and Urban Development - no comment
US Department of the Interior
US Department of Transportation, 14th Coast Guard District
US Environmental Protection Agency - no comment

b. State Agencies:

Department of Agriculture - no comments
Department of Defense - no comments
Department of Health - no comments
Department of Land and Natural Resources - no comments
Department of Planning and Economic Development - no comments
Department of Social Services and Housing - no comments
Department of Transportation - endorses the project as discussed in Section 1

Office of Environmental Quality Control
University of Hawaii
Water Resources Research Center - no comments
Environmental Center

c. County of Hawaii:

Department of Parks and Recreation
Department of Water Supply - no comment

9.4 The comments are summarized below and responses to the comments are provided as necessary.

a. Comment: Plan II reduces the amount of parking available in Isaac Hale Park.

Response: The consideration was one of the factors which lead to the selection of the recommended plan discussed in Section 1 of the Environmental Statement, which avoids the reduction of available park land.

b. Comment: The State Historic Preservation Officer should comment on the effect of the project on historic resources listed on or eligible for inclusion on the National and State Registers of Historic Places.

Response: The State Historic Preservation Officer has indicated that the project is not anticipated to have an adverse effect on any historic sites listed on or considered for inclusion to the National or State Registers of Historic Places. This evaluation was based on a meeting with the State Historic Preservation Officer and representations and review of the archaeological reconnaissance report (Inclosure 1).

c. Comment: A large rock near the tip of the breakwater may have to be cleared prior to installation of any navigational aids.

Response: Removal of the large rock is part of the plan of improvement.

d. Comment: The County of Hawaii, Department of Parks and Recreation, has not made a commitment to provide 13 parking stalls for trailered boats.

Response: Reference to the number of parking stalls for the launch ramp was deleted from the final environmental statement.

e. Comment: What is the effect of tsunamis on the structure? Tsunami wave heights of 9 feet have been reported at Pohoiki.

Response: The breakwater has not been specifically designed for a tsunami wave; however, it has been designed for the maximum wave height (12 feet) that can exist at the structure location assuming high tide and storm conditions. Tsunami waves should not severely damage the structure.

f. Comment: What are the effects of tsunamis on structures adjacent to the project area?

Response: The proposed project will not alter existing tsunami inundation hazards in the project area.

g. Comment: Will the project increase risk to life and property because of the construction of ancillary structures?

Response: No increased risk to life or property will result from implementation of the project. The project does not provide for the construction of ancillary structures. Future land development and park improvement will do more to increase risk to life and property than construction of the breakwater to protect the existing boat ramp.

h. Comment: Will there be an increased risk to life because of the placement of moorings behind the breakwater?

Response: The selected plan does not provide a protected area to allow or permit moorings behind the breakwater. Unauthorized moorings will interfere with navigation use of the launch ramp and will have to be removed.

i. Comment: The percent of coral coverage on the substrate covered by the breakwater and outer portion of the bay should be included in the environmental statement to permit evaluation of potential project impacts.

Response: The information has been included in paragraph 2.11 of the final environmental statement.

j. Comment: Other fishing activities at Pohoiki include hand harvesting of opihi (limpets), and limu (algae), diving and spearfishing, throw-net and gill-net fishing and pole fishing.

Response: The information was included in paragraph 2.24 of the final environmental statement.

k. Comment: What is the present and estimated future usage of the launching ramp at Pohoiki?

Response: The existing commercial fleet utilizing the Pohoiki launch ramp averages approximately 15 vessels. Future usage is unknown. The project is formulated to serve the existing commercial fishing fleet.

l. Comment: Surf parameter studies conducted by the J.K.K. Look Laboratory of Oceanographic Engineering presents more recent wave climate data that could be used for the Pohoiki study.

Response: Quantitative wave climate data presented in the Recreational Surf Parameters study report is limited to the Marine Advisors data, which is used in the Detailed Project Report, and limited data obtained from a wave gate off Kewalo Basin, Oahu, applicable only to southern exposures.

m. Comment: Increased fish catch as a result of increased accessibility to the Pohoiki fishing grounds should be identified as an impact.

Response: Increased competition for fishery resources is identified as an environmental concern in paragraph 4.7 of the final environmental statement. The impact of increased fish catches on the fish resource cannot be evaluated due to the lack of fishery information concerning population size and availability of fish resources in the Puna area.

n. Comment: How does the project relate to the State's Coastal Zone Management Act and the Hawaii County's requirements under their Special Management Area ordinance?

Response: The project area lies within the Hawaii County Special Management Area which is an interim measure to implement the Hawaii Coastal Management Act. The State of Hawaii will be required to obtain all necessary land rights, easements and approvals prior to construction as part of their local cooperation agreement. The requirements under the Special Management Area program have been addressed in Section 3 of the final environmental statement.

o. Comment: Will the presence of the breakwater create an erosion problem along the inner bay shoreline?

Response: The breakwater will not create an erosion problem. The existing cobble shoreline shifts considerably during high wave conditions, sometimes covering the launch ramp, and the breakwater should provide some protection for the shoreline. However, during high wave conditions diffracted waves are still likely to cause some shoreline movement and occasional clearing of the ramp may be required.

p. Comment: Will the wave energy reflected off the breakwater affect the surfing sites?

Response: The permeable breakwater face and relatively flat (1 vertical to 2 horizontal) slope should result in no measurable impact to adjacent surf sites.

q. Comment: Are the costs for increasing the parking area, installing the lighted navigational aid, removing the large boulder, and constructing the washdown area included in the project first costs?

Response The project first costs include the navigation aid and removing the large boulder. No ancillary facility development is planned or anticipated.

r. Comment: How was the fish catch used to determine benefits? Benefit calculations could include time saved by not traveling to Hilo to launch fishing boats.

Response: See DPR Sections D and F of the Detailed Project Report.

s. Comment: If fishermen travel to Hilo to sell their catch, then the benefits of the project should be lower.

Response: Benefits are primarily based on increased fish catch using existing mode of operation.

t. Comment: Will the breakwater reduce water circulation in the ramp area?

Response: The short, permeable breakwater will not measurably reduce or restrict existing water circulation in the ramp area.

u. Comment: Tsunami runup in the vicinity of Opihikao and Pohoiki has been reported to be 20 feet in October 1868, and 27 feet in July 1869 by Cox and Morgan, Local Tsunamis in Hawaii, in press.

Response: The information was included in paragraph 2.3 of the final environmental statement.

v. Comment: If cultural remains are discovered during construction, construction should be halted until a qualified archaeologist can evaluate the remains.

Response: Construction does not involve any excavation or clearing of the land area behind the shoreline. However, the construction specifications will require work to be halted until the remains, if any, are evaluated by the State Historic Preservation Office and other proper authorities.

w. Comment: It is doubtful that the steep sides of the breakwater will be utilized as feeding habitat by seabirds found in the project area.

Response: The opinion was included in paragraph 4.3 of the final environmental statement.

x. Comment: Facilities provided on the seaward side of the breakwater for cleaning fish would reduce, if not eliminate, fish cleaning behind the breakwater.

Response: Fishing cleaning facilities are not included as part of this project and would be the responsibility of the State to construct. The potential impacts of fish cleaning and benefits of a facility are addressed in paragraph 4.6 of the final environmental statement.

y. Comment: There is a potential impact on historic resources as a result of increased visitor access to the project area.

Response: The project does not increase visitor access to the Isaac Hale Park. Future resort development and highway improvements will have a more significant effect on providing access to the area than providing protection for the existing boat ramp.

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INCLOSURE 1

CULTURAL RECONNAISSANCE REPORT

CULTURAL RECONNAISSANCE REPORT
FOR
POHOIKI BAY NAVIGATION IMPROVEMENTS
POHOIKI BAY, HAWAII

1. An archeological reconnaissance and historical literature survey were conducted in May 1977 as one of the environmental considerations in planning for possible navigation improvements in Pohoiki Bay, which is near the eastern tip of the island of Hawaii (figures 1 & 2). The cultural reconnaissance was conducted by Mr. Ross Cordy, Archeologist with the US Army Engineer Division, Pacific Ocean with the assistance of Mr. David Sox, Social-Environmental Specialist. The archeological field survey focused on an area adjacent to Isaac Hale Beach Park near the existing launch ramp on the northeastern corner of Pohoiki Bay (figure 3). The historical literature survey extended to the ahupua'a (a Hawaiian land unit) of Pohoiki and district of Puna on the island of Hawaii.

2. *ARCHEOLOGY*

2.1 Previous Knowledge of the Area.

2.1.1 Previous archeological work in the Pohoiki area consisted of a reconnaissance survey performed in conjunction with planning for the proposed Kapoho-Kalapana highway corridor improvement project (Bevacqua & Dye, 1972). Although many archeological sites were found along the Puna coast (figure 2), none were located in the specific federal construction project area (figure 3). Only three sites were identified in the Pohoiki land unit (ahupua'a) between the road and the sea. Site 10-46-2510 is a warm springs and is not considered an archeological feature (Bevacqua & Dye 1972:24). Site 10-46-2511 was an old coffee mill constructed between 1890-1894 by R. Rycroft and was evaluated in the Bevacqua & Dye report as significant enough to be preserved. The coffee mill is located 700 feet northwest of the federal construction project site on private property controlled by the Puna Sugar Company. The mill structure is surrounded by feral coffee trees overgrown with local vegetation. It is not visible from the launch ramp area and its existence is not commonly known. Site 10-46-2515, called Hale Park Complex, consists of a rectangular enclosure, a platform, a wall, and a stone-lined well. All of these features appeared to the researchers to be of recent origin and were evaluated as important but unnecessary to preserve (Bevacqua & Dye 1972:7-8, 14-15). Site 2510, Pohoiki Warm Springs, and Site 2515, Hale Park Complex have been placed on the Hawaii State Register of Historic Places and are considered of Reserve value, the lowest of three evaluation categories.

2.1.2 In addition to these three sites, six more were found on the inland side of the Kapoho-Kalapana road within the Pohoiki ahupua'a. They are designated by the site numbers 2507, 2508, 2509, 2512, 2513, and 2514 (figure 2). All sites but 2514 were small to large enclosures with walls between 0.8 to 1.35 meters high. Site 2514 was a small circular platform thought to be a burial. All of the sites except Site 2514 were considered to be recent origin

and each was considered to be insignificant--not meriting excavation or preservation (Bevacqua & Dye 1972:13-14).

2.2 Analysis of Previous Archeological Data

2.2.1 Site descriptions in Bevacqua & Dye are minimal and dating is subjective as reflected in the use of terms such as "appears recent" or "seem recent." Sites 2507, 2508, and 2513 probably date at least from the historic period based on their common feature of high walls. Highwalls are onsidered by many Hawaiian archeologists to be an archeological feature characteristic of the historic period (Rosendahl 1972; Tuggle & Griffin 1973; Kirch & Kelly; Cordy and others 1975). The "historic period" for this part of Hawaii island dates generally from the early part of the 19th century. Without more exact dating, thorough site descriptions, and functional interpretations, evaluation of the prehistoric significance of these sites cannot be adequately made. The only clear determination applies to the old coffee mill (Site 2511) which is identified as late historic as noted below.

2.3 Archeological Reconnaissance of the Project Area.

2.3.1 An archeological reconnaissance of the immediate project area in the vicinity of Isaac Hale Park and the existing boat launch ramp was performed on 24 May 1977. A walk-through was conducted to look for surface structures and remains eroding out at the beach edge on the Pohoiki Bay side of the Park. No structures nor subsurface remains were found. The park area is level and completely clear except for park-related structures and plantings. Two metal poles emerging from the edge of the bay near the launch ramp were located. Based on other surveys conducted by Engineer personnel, the poles are embedded in concrete blocks broken away from the shoreline rocks. Analysis of these features is made in the historical section below.

3. HISTORICAL SURVEY

3.1 Previous Knowledge of the Area.

3.1.1 According to an interview held in 1971 with John Hale, sole resident at Pohoiki Bay, Pohoiki was a 19th century whaling port and whaling supply depot (Krauss 1971:B-1). Another source refers to Pohoiki as "Puna's shipping port" (A Geographer's Guide to the Puna District, Island of Hawaii, Part I, Tour Guide, n.d.:8). The hypothesis that a whaling port and supply depot had been located at Pohoiki Bay was examined by a follow-up interview with John Hale and a survey of relevant historical literature.

3.2 Interview: 24 May 1977. An interview was conducted by David Sox of the US Army Engineers on 24 May 1977 with Mr. John Hale and Mr. Wayne Naiga, held at Hale's residence on Pohoiki Bay. When asked what structures if any had previously existed on the Isaac Hale Park site, Mr. Hale replied that "two houses" had been there and Mr. Naiga elaborated that "an old fishing village" had been located there. According to Mr. Hale, the metal poles

observed near the launch ramp had been used to secure longboats and canoes during the whaling era. Hale, who is 58 years of age, stated that the whaling era occurred during the "era" of his grandfather and that his house had been there since whaling days. The house is located about 75 feet from the existing launch ramp (figure 3).

3.3 Analysis of Interview Data.

3.3.1 According to a document on whaling activities in Hawaii, the whaling era which began in the 1820's, declined rapidly after 1869 and ended as a significant economic activity in 1880 (Moore 1934:34). In 1896, Moore reports that only 5 ships called at Hawaiian ports. Lahiana on the island of Maui and Honolulu were the main whaling ports, and the only other ports noted were Hanalei on Kauai, and Kealakekua and Hilo on the island of Hawaii (Moore 1934:44). If John Hale is currently 58 years of age, one can assume that his father was about 25 when Hale was born, and that his grandfather was also about 25 when Hale's father was born. Further assuming that each persons "era" --the term used by Hale--was between their ages of 20 and 45 years of age, Hale's grandfather's era would have been between 1889 and 1914, well after the whaling era in Hawaiian history ended. Based on available information, whaling, if it ever occurred at Pohoiki, would have been a rare event and would have been a very minor and insignificant aspect in the history of whaling in Hawaii.

3.3.2 Although it appears likely that whaling was never a significant activity at Pohoiki, the existence of the two metal poles in the bay indicated that there was some substance to Mr. Hale's statement that long boats and canoes had come into Pohoiki Bay. Moreover, the apparent use of the park site as a fishing village was still unexplained. To provide further insight into the historical past of Pohoiki, a more intensive survey of historical literature was conducted.

3.4 Literature Search.

3.4.1 Previous reviews of oral traditions and early historic era documents dating from 1820 to 1970 had indicated that very little information was available on Puna district as a whole, and none was available on Pohoiki (Barrere in Crozier & Barrere 1971). Thus, historic documents applicable to the era from 1820 to 1900 were consulted.

3.4.2 In 1823, Rev. William Ellis travelled west to east through Puna along the coast (Ellis 1969:200-202). He took note of the several ahupua'a and the villages of Kauaea, Malama and Keahialaka between Opihikao and Pualaa (see figure 2). This area was stated to be the most populous area Ellis had been in since he had left Kona District, travelling around the island. The ahupua'a of Pohoiki was not mentioned. Keahialaka, the ahupua'a adjacent and to the southeast of Pohoiki was noted as the residence of Kinao, a chief who was governor of Puna. The remains of Mahinaakaaka heiau (a Hawaiian temple), which is located in Keahialaka ahupua'a about 2,000 feet southeast of the project area, and Lae o-Kahuna (point of the secret place), which is located on the southeast side of Pohoiki Bay, both may be associated with this population locus of early 19th century Hawaiian's.

3.4.3 Another exploration conducted by Charles Wilkes in 1841 passed through Puna several times but no mention of Pohoiki was made either in text or on maps (Wilkes, 1970:Vol IV). The placename Kaundeau located in the area of modern Pohoiki is noted on a map in the frontpiece, but no translation nor transliteration of this non-Hawaiian word is possible. The first clear reference to Pohoiki was made in 1846 by Chester Lyman describing a trip to Puna made with Reverent Coan (Lyman 1924:96-97). These two men stopped at Pohoiki and described it as follows: "There are fine groves of cocoanuts and the situation of the hamlet on an inlet of the sea is very pleasant." Lyman further noted that about 200 people gathered at Pohoiki for a sermon. This figure could serve as a crude estimate of the population at and near the Pohoiki ahupua'a in the mid-19th century.

3.4.4 Another usual source of Hawaiian historical land tenure and land use in the 1850's are Land Commission Award (LCA) claims which were based on legal claims to land made by Hawaiian commoners in 1848. Unfortunately no LCA claims were made in this area (Barrere in Crozier & Barrere 1971).

3.4.5 Early government documents revealed that the next mention of Pohoiki is in reference to its use as a small port from which to ship coffee. Analysis of documents on coffee cultivation in Hawaii showed that by the early 1890's, coffee planting had spread into Olaa and Puna districts from the Hilo region (US Department of Foreign Affairs 1896:12). In 1896, fifty coffee plantations could be found in Olaa district (between the present Puna and south Hilo districts) compared to none in 1890. Apparently much of the growth in the coffee industry was due to construction of a road from Hilo into Olaa. In the more remote district of Puna, the coffee industry was undeveloped except for a coffee plantation and mill established at Pohoiki by Robert Rycroft in or before 1894 (Rycroft 1894:99). Rycroft had planted 35 acres in coffee about 3 miles from the beach at Pohoiki, was processing the coffee at his own mill (Site 2511) located about 700 feet from the existing launch ramp, and was shipping it out at Pohoiki landing. Keauhou to the southwest of Pohoiki was the only other landing in Puna district. A landing in the 1880 to 1920 period was an area where small boats could come into shore to pick up and drop off goods for a mother ship anchored off the coast. Unfortunately the coffee boom in Hawaii ended soon after it began and by 1902, Hawaiian coffee growers could no longer compete with foreign growers (Anonymous 1902: 23). By 1927, a study of coffee in Hawaii showed that no coffee was being cultivated in Puna district (University of Hawaii 1927:3). It is not known when Robert Rycroft abandoned his coffee plantation at Pohoiki, but other records show that he established a soda works manufacturing plant in the Sheridan Tract of Kakaako, Honolulu in 1900 (Pukui and others 1974:209).

3.4.6 A letter written to the Corps of Engineers in 1951 with an accompanying tax map reaffirms the role of Pohoiki as a landing place for inter-island vessels prior to 1900 and indicates that a small dock and unloading facilities once associated with the landing place were abandoned by 1940 (Lyman 1951). The tax map shows an "Old Derrick Anchor Base at former wharf" at the location of the present two metal poles (figure 4). The map also indicates that a Pohoiki Park had already been established at its present site by 1940, but that two dwellings were still located there. The Kalapana Quadrangle map

published in 1924 by the US Coast and Geodetic Survey also shows these structures in addition to the Hale House and a dwelling at the Hale Park Complex (Site 2515) at their present day locations.

3.5 Analysis of Historical Literature.

3.5.1 It appears certain that the local informants' references to "port" activities at Pohoiki seem to be related to the use of the bay as a point from which to ship out coffee from Rycroft's Coffee Mill in the mid-1890's. There is no documentary evidence to support the hypothesis that Pohoiki served as a whaling port.

3.5.2 Documentary evidence also suggests strongly that the two metal poles in the bay near the launch ramp date from the era of shipping coffee from Pohoiki in the 1890's. It could be argued, however, that if the poles had been immersed in sea water for 80 years or more, the salt water would have corroded the metal away by now. This line of argument would suggest that either the metal poles are of much more recent origin than the 1890's or that they have been immersed in the sea only a relatively short period. The latter hypothesis is favored because of the eleven major earthquakes with Richter magnitude ratings at 6 or more that have occurred in the vicinity of Hawaii island since 1940 when the tax map still shows the boat hoist anchor base as a recognizable feature of the old Pohoiki landing. Many of the earthquakes were accompanied by subsidence. The latest of these major earthquakes took place in November 1975 when the coastline at Pohoiki Bay subsided 1.3 feet.

3.5.3 Clearly on the basis of the documents consulted, Pohoiki's only major historical resource of significance is Rycroft's Coffee Mill. Of secondary significance is the associated Pohoiki Bay land and the partially destroyed remains of a boat hoist foundation. Although these features are not listed on the Hawaii State Register of Historic Places, the Hawaii County General Plan recommends that the Old Coffee Mill, as it is called in the plan, should be considered for restoration. The Bevacqua & Dye report, sponsored by Bernice P. Bishop Musuem, also recommends that the coffee mill be preserved (Bevacqua & Dye 1972:14-15). According to the staff at the Historic Sites Division of the State of Hawaii Department of Land and Natural Resources, this site is in the process of being considered for the State Register (Watanabe, personal communication 1978).

4. SUMMARY OF FINDINGS.

4.1 No archeological sites were discovered in the immediate project area, except for two historic metal poles located near shore adjacent to the launch ramp. Although the area inland of Pohoiki Bay and along the existing Kapoho-Kalapana road corridor is characterized by numerous archeological sites, no description of the prehistoric occupance of the Pohoiki area can be made because of a lack of detailed site descriptions and more intensive site analysis.

4.2 Contrary to popular tradition, historical documents seem to indicate that Pohoiki was not a whaling port nor a supply depot for whaling vessels. A description of Pohoiki in the 1840's, when whaling was the most significant modern economic activity in Hawaii, makes no mention of whaling in reference to Pohoiki. It is more likely that references to Pohoiki as "Puna's shipping port" are based on its documented function as a landing from which coffee was shipped in the mid-18900's. This period moreover would have been the era (1889-1914) in which the informant, John Hale, reported that whaling had supposedly occurred. The most significant cultural resources surviving the coffee era at Puna appears to be Rycroft's Coffee Mill. The two metal poles appear also to date from the same era. The other existing house structures date from at least the early 1920's.

5. CULTURAL RESOURCES EVALUATION AND IMPACT ASSESSMENT.

5.1 The Federal construction project area has no evidence of cultural resources except for two partially submerged metal poles that are believed to be the sole remnants of a boat hoist facility at Pohoiki Landing dating from the mid-1890's. The boat hoist mechanism and wharf are destroyed. The boat hoist anchor base into which the poles were placed has broken up into several blocks which lie submerged out of sight. These poles are located along the alignment of the proposed breakwater and would be destroyed during the placement of rocks. Preservation of the metal poles alone is not considered necessary because the integrity of the landing facility has already been irretrievably destroyed due to natural causes. Moreover the sites general function as a launching site for small boats will be preserved by the proposed project. The significance of the remnants of the landing lie principally in their association with Rycroft's Coffee Mill.

5.2 Rycroft's Coffee Mill is probably the most significant historical resource in the Pohoiki Bay region. It is located about 700 feet outside the Federal construction project area on private property and will not be directly affected by the proposed breakwater construction project. Larger numbers of launch ramp and park users which may pass through the area as a result of the Federal project and the County's planned park improvements could conceivably expose the historic structure to disturbance, however, the site is relatively inaccessible and not visible from the launch ramp area. The coffee mill has been recommended by the County of Hawaii General Plan for restoration and based on the recommendation of Bishop Museum, it seems probable that it will eventually be placed on the Hawaii State Register of Historic Places in a Preservation status. No further cultural surveys of the coffee mill site by the Army Engineers seem necessary, but it is recommended that the County of Hawaii in conjunction with the property owner give consideration to restoring the coffee mill as an additional cultural and recreational resource in the Isaac Hale Beach Park area. The significance of Rycroft's Coffee Mill appears to be mainly in terms of its local role in the history of the short-lived coffee industry in Puna. It does not seem as important a representative of Hawaii's coffee industry as would a similar structure in the Kona coast region of the island of Hawaii where America's only coffee industry still survives today.

5.3 Pohoiki Warm Springs is a natural feature which has been modified in recent historic times according to local informants. Its function as a bathing spot is complementary to the use of the launch ramp, Pohoiki Bay, and Isaac Hale Beach Park as public recreational resources. Although the warm springs is located on private property, about 300 feet from the project site, access to the site is open to the general public. The significance of Pohoiki Warm Springs appears to lie in its broad cultural or social value as a natural geothermal feature, the recent modification of which has apparently transformed the natural resource into a popular, recreational resource. Thus the continued and even increased use of Pohoiki Warm Springs should not be construed as an adverse condition. On the other hand, overuse of this natural resource by littering the surrounding area with human debris, polluting its waters, or enlargening the opening of the warm springs pool may be considered as adverse conditions which should be discouraged.

5.4 Hale Park Complex, similar to Rycroft's Coffee Mill, could also conceivably be disturbed by increased usage of the launch ramp and Isaac Hale Park. This site is also on private property located about 600 feet from the project site and in a heavily vegetated, though not inaccessible area.

5.5 In summary, there will be no direct effect of Federal construction activities on any cultural property included in or known to be eligible for inclusion in the National Register of Historic Places or the State of Hawaii Register of Historic Places. No additional cultural surveys are recommended for the sites outside the project area because their potential for site disturbance cannot be directly attributed to construction activities nor solely even to secondary project effects. Responsibility for their protection lies primarily with the private property owner.

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INCLOSURE 2

MAILING LIST FOR DRAFT ENVIRONMENTAL STATEMENT
AND
DETAILED PROJECT REPORT

MAILING LIST
FOR
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