DEPARTMENT OF LAND UTILIZATION

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813 • (808) 523-4432

FRANK F. FASI
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DIRECTOR

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DEPUTY DIRECTOR

September 21, 1992

DEPARTMENT OF LAND UTILIZATION
92/SMA-42 (JT)
92/SV-005 (JT)

CHAPTER 343, HRS
Environmental Assessment/Determination
Negative Declaration

Recorded Owner	:	GTE Hawaiian Tel
Applicant	:	City & County of Honolulu
Agent	:	R.M. Towill Corporation
Location	:	7455 Kalanianaole Highway, (Sandy Beach Park) - Maunalua
Tax Map Key	:	3-9-12: portion 2
Request	:	To install a GTE Hawaiian Tel Interisland Fiber Optic Cable Landing site at Sandy Beach Park.
Determination	:	Environmental Impact Statement (EIS) Not Required

We have reviewed the comments received during the 30-day public comment period which began on July 23, 1992. The applicant has responded to the eight comments received and has incorporated them in the final environmental assessment (EA). On the basis of the EA, we have determined that this project will not have significant environmental effect and have issued a negative declaration.

We have enclosed a completed OEQC Bulletin Publication Form and four copies of the EA.

APPROVED Donald Clegg
DONALD A. CLEGG
Director of Land Utilization

DAC:ct

163

1992-10-08-OA-FEA- GTE Hawaiian Tel
Interisland Fiber Optic Cable System, Sandy Beach Park

Oct 8 1992

FINAL

FILE COPY

ENVIRONMENTAL ASSESSMENT for the

GTE HAWAIIAN TEL
INTERISLAND FIBER OPTIC CABLE SYSTEM
Sandy Beach Park, Oahu, Hawaii

AUGUST 1992

PREPARED FOR:

GTE Hawaiian Tel
1177 Bishop Street
Honolulu, Hawaii 96813

RMTC
R. M. Towill Corporation

420 Waiakamilo Rd., Suite 411
Honolulu, Hawaii 96817-4941
(808) 842-1133 • Fax: (808) 842-1937

FINAL

ENVIRONMENTAL ASSESSMENT

FOR THE

GTE HAWAIIAN TEL
INTERISLAND FIBER OPTIC CABLE SYSTEM

SANDY BEACH PARK, OAHU, HAWAII

Prepared for:

GTE HAWAIIAN TEL
1177 Bishop Street
Honolulu, Hawaii 96813

AUGUST 1992

Prepared By:

R. M. Towill Corporation
420 Waiakamilo Road, Suite 411
Honolulu, Hawaii 96817-4941

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PROJECT SUMMARY

Project:	GTE Hawaiian Tel Interisland Fiber Optic Cable System
Applicant:	GTE Hawaiian Tel 1177 Bishop Street Honolulu, Hawaii 96814 Contact: Larry Hartshorn 546-2378
Accepting Authority:	City & County of Honolulu Department of Land Utilization
Tax Map Key:	3-9-12:2
Location:	Sandy Beach Park, Oahu
Project Area:	1,200 Square Feet
Owner	Department of Parks and Recreation City & County of Honolulu 2015 Kapiolani Boulevard Honolulu, Hawaii 96817 961-8311
Agent:	R. M. Towill Corporation 420 Waiakamilo Road, Suite 411 Honolulu, Hawaii 96817 Contact: Brian Takeda 842-1133
Existing Land Uses:	Recreational area, Beach Park
State Land Use District:	Preservation
County Zoning Designation:	Open, allows utility installations

SECTION 1

INTRODUCTION

1.1 PURPOSE AND OBJECTIVES

GTE Hawaiian Tel proposes to develop an interisland submarine fiber optic cable system which will link the Islands of Kauai, Oahu, Maui, and Hawaii to supplement its existing interisland radio system. The system will include three interisland submarine cable segments with 5 landing sites (see Figure 1). The proposed landing sites are in the vicinity of Wailua Golf Course on Kauai; Kahe Point and Sandy Beach Park on Oahu; Mokapu Beach on Maui; and Spencer Beach Park on Hawaii. The purposes of the project are to provide additional telecommunication capacity to accommodate projected interisland telecommunication traffic; to increase system integrity; and, to provide additional path diversity.

GTE Hawaiian Tel is Hawaii's largest phone service provider. In 1990, Hawaiian Tel processed over 7 million calls per day, or over 4,800 calls per minute. Annually, this accounted for approximately 2.6 billion calls. The current level of service experienced by GTE Hawaiian Tel is at the forefront of a growth trend that has continued uninterrupted, since at least 1981, when Hawaii had almost 432,000 telephone access lines. Today that number has increased by almost 30 percent to over 555,000 lines (The State of Hawaii Data Book, 1990).

GTE anticipates that by 1993 its existing radio facilities will be unable to adequately process interisland phone transmissions, due to continuing and increasing levels of service demand. To overcome this limitation GTE proposes to carry out planning and implementation of a submarine fiber optic interisland cable network to handle the increasing volume of telephone traffic.

1.2 PROJECT LOCATION

The proposed Oahu landing site for the Oahu to Maui segment of the submarine interisland fiber optic cable system is the eastern most point of Sandy Beach Park.

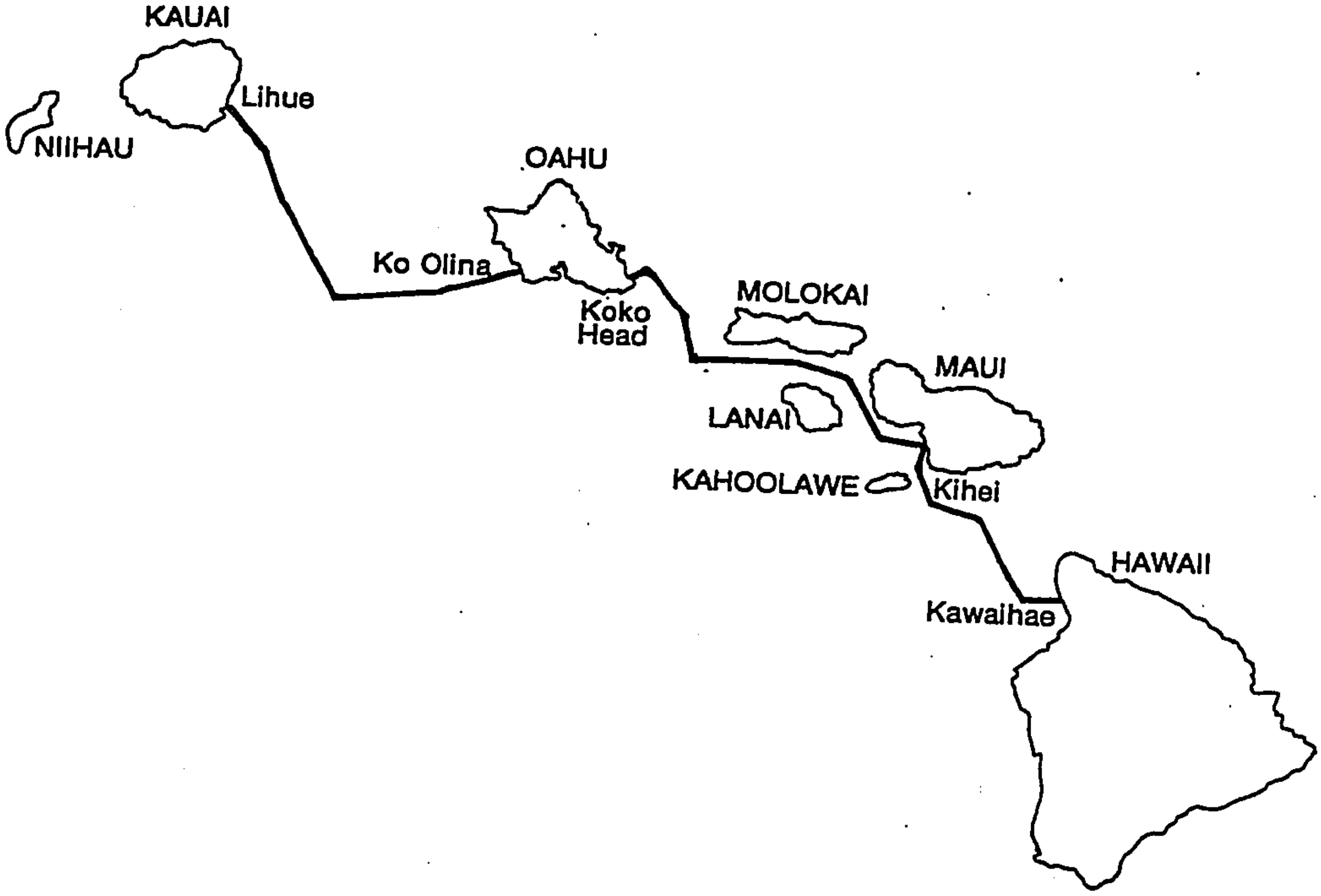

Figure 1
INTERISLAND SUBMARINE FIBER

GTE Hawaiian Tel Interisland
Fiber Optic Cable Project

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Sandy Beach Park is located along the east coast of the Island of Oahu (see Figure 2). The eastern most portion of the Beach Park lies along a rocky shoreline punctuated by short, sandy stretches of beachfront. The proposed landing site is currently undeveloped with little vegetation. To the west is the more heavily used and popular sandy beach section which is approximately 1200 feet long, with a wide and sloping foreshore. Existing features of Sandy Beach Park include two comfort stations, numerous patches of naupaka plants lying between the beach and Kalanianaole Highway, the Sandy Beach Park Access Road, and parking adjacent to each of the comfort stations.

From the beach landing site the cable is proposed to follow the Sandy Beach Park Access Road on the makai side, leading up to Kalanianaole Highway. At the vicinity of the highway and the beach park access road, the cable will be routed into an existing underground duct line which will lead to the GTE Hawaiian Tel Central Office (CO), located at 7664 Hawaii Kai drive. Figure 3 illustrates the proposed alignment of the GTE Hawaiian Tel submarine cable from the landing site to the CO.

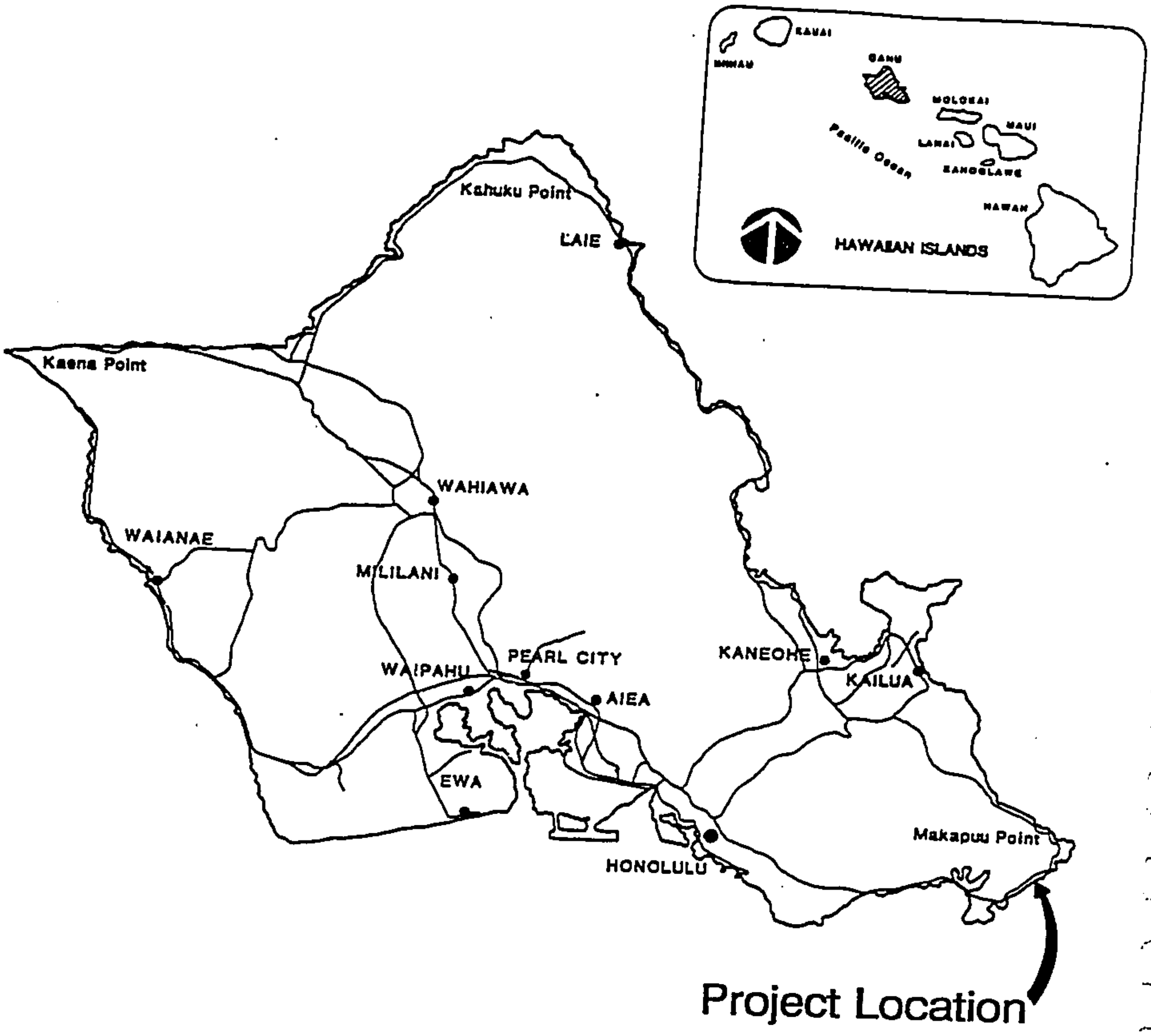

Figure 2
LOCATION MAP

GTE Hawaiian Tel Interisland
Fiber Optic Cable Project

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MILES

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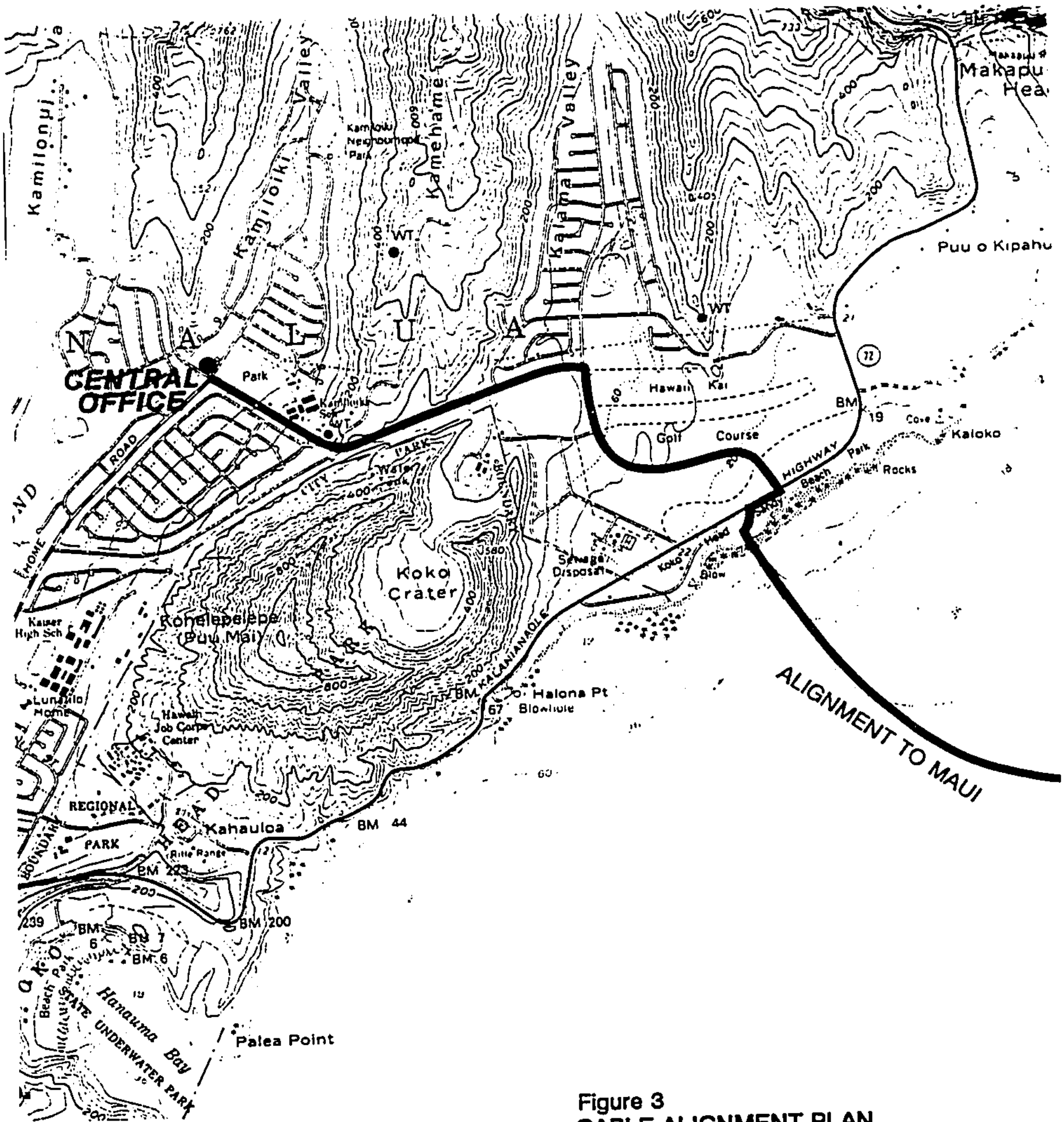

Figure 3
CABLE ALIGNMENT PLAN

GTE Hawaiian Tel Interisland
Fiber Optic Cable Project

0 2000 4000
FEET

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SECTION 2
PROJECT BACKGROUND

2.1 CABLE TECHNOLOGY

The following is a discussion of existing telecommunication cable technology and how the determination was made to use fiber optics.

2.1.1 Copper and Fiber Optic Cables

The alternative to fiber optic cable is the use of copper wire cable. Copper wire cables function using a large number of plastic-coated copper wires housed within a plastic or synthetic outer casing. If necessary, steel or other protective materials would be added to ensure strength and resistance to abrasion and breakage. In order to receive a voice transmission an electrical signal must be sent through a pair of copper wires to a receiver, where the electrical signal is converted back into sound. A typical cable, approximately 4 inches in diameter (without the outer protective casing), would house 600 copper wires with the capacity of approximately 3,600 voice circuits.

The copper wire cable will also require use of a repeater to boost the electrical signal over long distances to ensure adequate signal strength at the receiving station. Repeaters will be necessary approximately every 6,000 feet and require a high voltage power source to operate. Repeater dimensions for a 1,200 voice circuit will be approximately 1 to 2 feet in diameter by 3 feet long. Therefore, to accommodate the 4-inch diameter copper cable described above, at least 3 repeaters would be required every 6,000 feet with a requisite power source supplying power to the cable.

In contrast, fiber optic technology relies on use of optical fibers and the transmission of light pulses which are converted into voice signals by the telephone company receiving station. The proposed fiber optic cable would contain approximately 12 fiber optic strands and would be housed in a plastic and steel casing no more than approximately 3 inches in diameter (see Figure 4). Like the copper cable, steel or other protective materials would be added as needed for strength. Each pair of fiber optic strands would be capable of handling

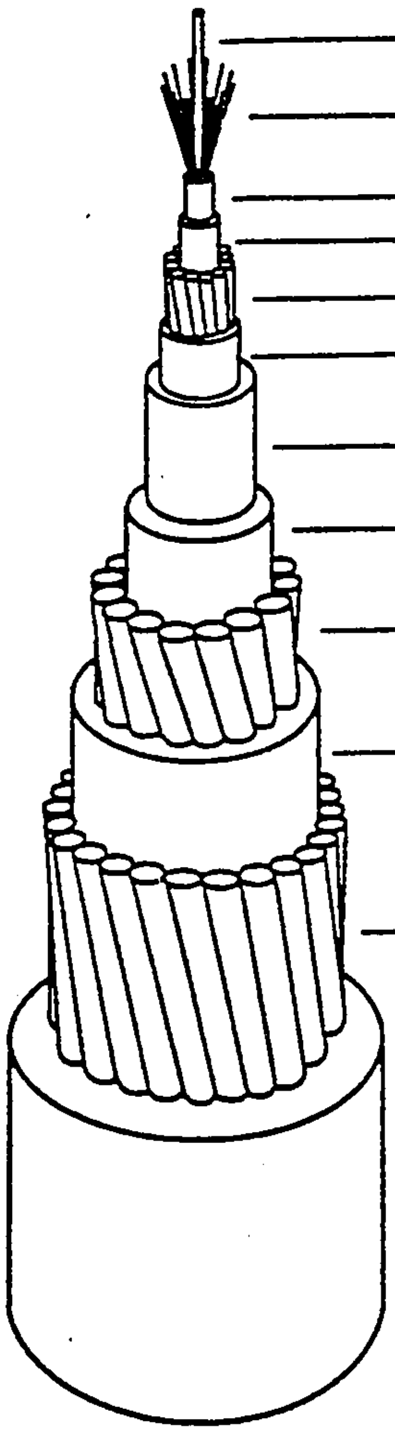

Figure 4
DOUBLE ARMOR FIBER OPTIC CABLE

GTE Hawaiian Tel Interisland
Fiber Optic Cable Project

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approximately 8,000 voice circuits, for a combined total on the order of 40,000 voice circuits (2 strands = 1 pair, 12 strands = 5 pairs working plus 1 pair spare, and 5 pairs x 8,000 voice circuits = 40,000 voice circuits. In addition, in order for a copper cable to achieve the capacity of a fiber optic cable, it would have to approach a diameter of approximately 8 to 10 feet, would require repeaters, and a high-voltage power line in addition to the copper cable.

Fiber optic technology was selected because:

- Fiber optic cables provide superior capacity and do not require high-voltage repeaters;

- The smaller diameter fiber cable ensures there will be minimal disturbance necessary to site the cable. There is less land needing to be graded, cleared and stockpiled in order to site a 3-inch diameter cable versus a 10' diameter cable;

- Sensitive areas that might otherwise be disturbed because of larger equipment and increased mobilization and noise problems would be greatly reduced; and

- Length of time on site would be greatly minimized. Sensitive public or open space areas would not require a lengthy stay by the construction team and therefore would minimize any hardships upon beach users including swimmers, fishermen, surfers and other users.

2.2 SUBMARINE CABLE ROUTE

The submarine cable route selection process involved identification of areas warranting study, based on a set of minimum evaluation criteria. The criteria includes rapid erosion, giant landslides, drowned coral reefs, seismic activity, dumping areas, ship and airplane wrecks, other cables, and the length of routes.

In August 1991 a study was conducted by Seafloor Surveys International (SSI) to preliminarily identify an ocean route for the GTE Hawaiian Tel Submarine Fiber Optic Cable System. The route selected was one that minimized potential hazards to the installation, and eased maintenance and operation of the cable over a projected 25 year lifetime.

The following provides a detailed description of each of these criteria:

2.2.1. Rapid Erosion

The greatest danger to this cable system is in the submarine portion of the route as it is related to the geologically young age of the "Hawaiian Islands and the resulting extremely high erosion rates. The rapid erosion places large volumes of unconsolidated sediment into the shallow waters surrounding the islands. These sediment deposits move rapidly down the steep island slopes when they become unstable. This down-slope sediment movement can be initiated by earthquakes, storm runoff, and storm waves. Installation of cables on steep, sediment-covered submarine slopes should be avoided if possible. Where these slopes cannot be avoided, the cable should traverse as directly up the slope as possible (SSI, August 1991)."

2.2.2 Giant Landslides

Over the past several years, mapping of the Hawaiian Exclusive Economic Zone by the U.S. Geological Survey through the use of the long range Gloria sonar system, a relatively low-resolution, reconnaissance sonar, has discovered a series of large landslides surrounding the Hawaiian Islands (Moore, et.al., 1989). "The primary danger presently posed to the cable by these inactive landslides is their extremely rough surface. The seafloor in the slide areas are known to be littered with huge volcanic boulders. These boulders have been observed from submersibles to often be the size of a house. These slide surfaces pose a serious threat by producing unacceptable cable spans where the cable is draped over individual blocks, as well as the possibility of having the cable getting tangled if it had to be retrieved for repair (SSI, August 1991)."

2.2.3 Drowned Coral Reefs

A series of drowned coral reefs surrounding the islands are considered dangerous to the Interisland Fiber Optic Cable System. "Locally steep slopes associated with these reefs could cause unacceptable cable spans in areas where strong bottom currents can be expected (SSI, August 1991)."

2.2.4 Seismic Activity

"The greatest danger to the cable from earthquakes is not the actual fault displacement itself, but the possibility they will initiate movement of unstable sediment deposits on the slopes of the islands. Epicentral locations of earthquakes with magnitude 3 or larger in the Hawaiian region should be avoided by the fiber optic cable (SSI, August 1991)."

"Seismic activity in the Hawaiian Islands is concentrated in the vicinity of the active volcanoes on the Island of Hawaii, where it is primarily related to the on-going volcanic activity. There are also earthquakes related to the tectonic subsidence of the islands due to the load that the growing volcanoes is putting on the earth's crust. These tectonic earthquakes are also concentrated in the area surrounding the island of Hawaii, where the greatest subsidence is taking place (SSI, August 1991)."

2.2.5 Dumping Areas

"A large, presently inactive, explosive dump is located west of Oahu. This dump will have to be avoided by the fiber optic cable. Navy authorities maintain this area has not been used for ordinance disposal since shortly after World War II. However, they advise against laying cables through the area (SSI, August 1991)."

"Dredge Spoils disposal sites authorized by the U.S. Army Corp of Engineers are also located close to all major island harbors and should be avoided by the cable route (SSI, August 1991)."

2.2.6 Ship and Airplane Wrecks

A complete, high resolution side-scan survey of the proposed cable route should be carried out to determine that the route is free of man-made hazards such as ship wrecks and lost airplanes. There have been numerous ships and airplanes lost at sea in the Hawaiian area which have never been located.

2.2.7 Other Cables

There are several other cables in the planning stage including Pac Rim East (from Hawaii to New Zealand), HAW-5 (from California to Hawaii), the Hawaii deep water electric transmission cable (from Hawaii to Oahu via Maui), and the Tri-Island power cables (linking Maui, Molokai and Lanai). Aside from these commercial cables, the University of Hawaii plans to install a fiber optic cable for neutrino research offshore from Keahole Point north of Kailua, Kona.

Along parts of this route the cable will have to be laid in close proximity to other, presently existing communications cables. In these areas, the recommendations of the International Cable Protection Committee (ICPC) should be used as a guideline. At their 1985 Plenary Meeting in Sydney, Australia, ICPC recommended that no previously existing cable be crossed at less than a 45 degree angle, the closer the crossing can be to a right angle the better, and where possible a spacing of five miles should be maintained.

Prior to making final decisions on cable placement, ICPC also recommends that American Telephone and Telegraph (AT&T) be contacted to determine if there are conflicts with military or other government cables.

2.2.8 Length of Routes Less Than 200 Kilometers

All routes are designed to be less than 200 kilometers in length in order to be serviced by repeaterless cables. The fiber optic cable will operate on a single light transmission source generated from its Central Office and transmitted to a receiving Central Office. Since repeaters will not be required to retransmit the signal, no electrical power will need to be routed through the cable.

2.3 LANDING SITES SELECTION

In August of 1991 a study was conducted to select landing sites for the GTE Hawaiian Tel Fiber Optic Cable System connecting the Islands of Kauai, Oahu, Maui, and Hawaii. A set of criteria was used to reduce the field of potential landing sites. The advantages and disadvantages of each site were evaluated to provide the basis for comparing the sites.

The following is a brief discussion of criteria for determining landing sites:

2.3.1 Shoreline/Nearshore Conditions

The shoreline and nearshore conditions are a consideration because the depth of the water from the landing site towards the ocean must be deep enough to protect the cable. Approximately 50 to 60 feet of water will be required before wave forces diminish to levels where wave action does not affect the cable. Areas with extensive shallow water far from shore (i.e.4,000'+) were considered difficult or suboptimal in providing protection during storms and other high wave conditions.

The composition of bottom conditions limits acceptable landing sites. Sandy bottoms are preferred in order to minimize any possible environmental impacts of anchoring, armoring, or trenching through rock or coral in order to securely fasten the fiber optic cable. Also if the ocean bottom has extensive sand deposits, especially adjacent to the shoreline the cable can eventually be covered by sand, providing maximum protection against wave forces.

2.3.2 Public Use Considerations

It is anticipated that impacts to public recreational areas will be minimal given the short-term and relatively minor requirements for installing a fiber optic cable. However, because of potential for difficulties with area users, landing sites in areas of major public use are considered a constraint to selection.

Areas of potential historical and archaeological significance in close proximity to cable landing sites are also considered a constraint to selection, due to the possibility of destroying a historic site.

2.3.3 Environmental/Natural Resource Considerations

The landing sites should not be within proximity to rare or endangered species or their habitats in order not to disturb them.

Impacts to shoreline and ocean water quality should be kept to a minimum. Sites which would require extensive ocean anchoring and cable protection work (i.e., shielding/dredging) and/or on-shore excavation in ground conditions which promote soil erosion should be avoided.

2.3.4 Alternative Landing Sites

Three possible Oahu landing sites were identified for the Oahu to Maui segment of the fiber optic cable where underwater geology would be most suitable: Sandy Beach Park, Waimanalo Beach, and Kailua Beach Park. Sandy Beach Park was selected as the preferred landing site because the site exhibits positive characteristics including a nearshore alignment that can avoid most of the reefs and coral heads which lie alongside and within a small sandy channel leading away from the shoreline to the ocean. Another positive site feature of Sandy Beach Park is the low likelihood for discovery of archaeological/historic sites (Discussion with DLNR, Historic Sites Office).

Should Sandy Beach Park be removed from consideration, Waimanalo Beach would be the alternate landing site. Waimanalo Beach possesses poorer shoreline and nearshore access given extremely shallow offshore reefs which would have to be crossed by the cable. Waimanalo Beach also has potential for discovery of archaeological remains according to the Department of Land and Natural Resources Historic Sites Office.

SECTION 3
CONSTRUCTION ACTIVITIES

3.1 GENERAL

Construction of the project will be accomplished in two phases: the first phase involves all land side construction activities; and the second phase includes all work necessary to prepare the landing site and actually landing the interisland submarine cable.

The first phase involves land side construction which includes installation of a new manhole and approximately 1,500 feet of underground ducts and cable along Kalanianaole Highway to an existing manhole (No. 6207), located on the makai side of the intersection at Kalanianaole Highway and Kealahou Avenue (see Figure 5). From Manhole No. 6207, the fiber optic cable will be pulled through 9,650 feet of existing underground ducts to connect to the GTE Hawaiian Tel Central Office (CO) at 7664 Hawaii Kai Drive.

The second phase involves landing the submarine fiber optic cable and connecting it to the new manhole at Sandy Beach.

The following provides a detailed description of each of these phases:

3.2 LAND-SIDE ACTIVITY

The new 5'x 5' x 10' deep reinforced concrete manhole will be constructed approximately 200 feet makai of Kalanianaole Highway adjacent to the Sandy Beach Park Access Road. The new manhole will be located approximately 5 feet from the edge of pavement (see Figure 5). Traffic on the Sandy Beach Park Access Road will not be affected except during the cable landing operations when the cable is pulled ashore from the cable laying ship (e.g. via a winch) which will be placed on the mauka side of the Park Road. This

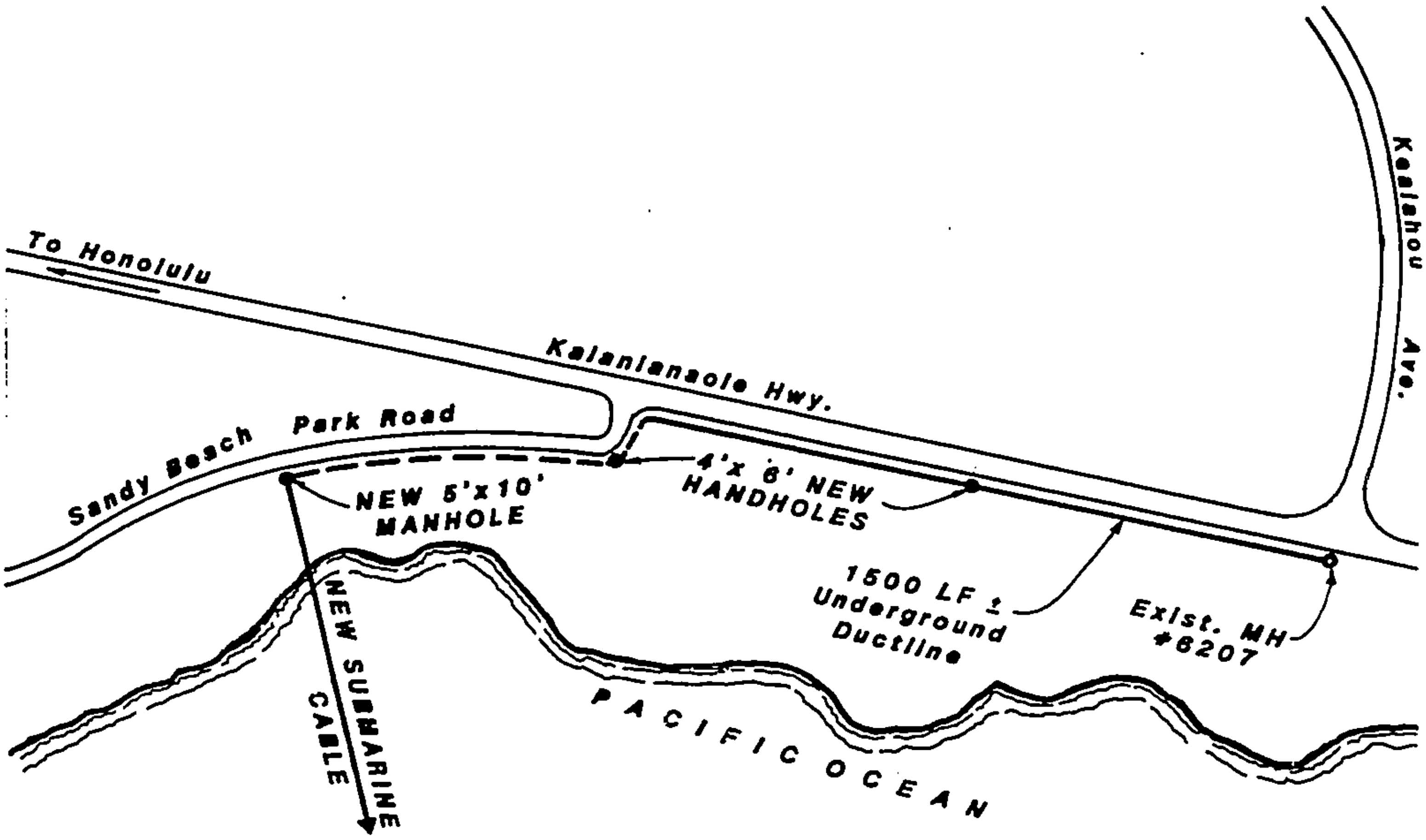

Figure 5
SITE PLAN

GTE Hawaiian Tel Interisland
Fiber Optic Cable Project

Not to Scale

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JANUARY 1992

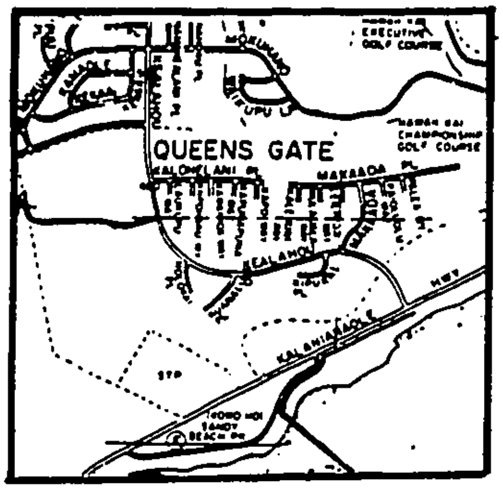
work will be accomplished in one or two days during which the eastern end of the park access road will be closed to traffic.

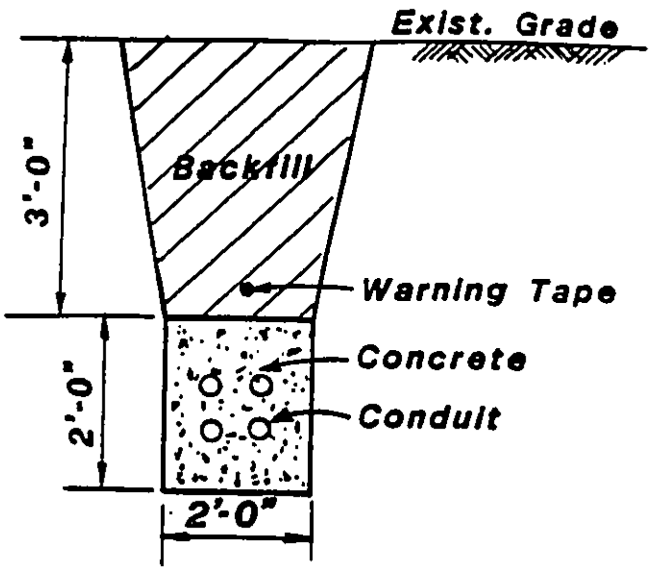
The terminus of the land side activities will be the manhole which will need to be constructed to accept the submarine cable. Four 4-inch diameter PVC ducts will be installed in a trench from the manhole along the makai shoulder of Kalanianaole Highway to existing Manhole 6207 (a permit to perform work upon a state highway will be sought for the proposed project). The PVC ducts will be located approximately 5 feet off the edge of the pavement. These PVC ducts will be encased in concrete and buried under 3 feet of earth cover (See Figure 6A). Only one duct will be utilized while the others remain vacant and retained for future use. Traffic in the makai lane of Kalanianaole Highway may be affected during trenching operations along the road shoulder and may need to be detoured around construction equipment. If necessary, traffic control safety measures to reroute traffic along the mauka shoulder of the highway will include use of temporary traffic control cones or use of flagmen during work activity. Two-way traffic on Kalanianaole Highway will be maintained at all times. Approximately 2 weeks will be required to excavate the trench, lay the ducts, place the concrete and backfill the trench.

3.3 NEARSHORE ACTIVITY

This second work phase involves landing the submarine fiber optic cable and establishing a connection to the new manhole at Sandy Beach.

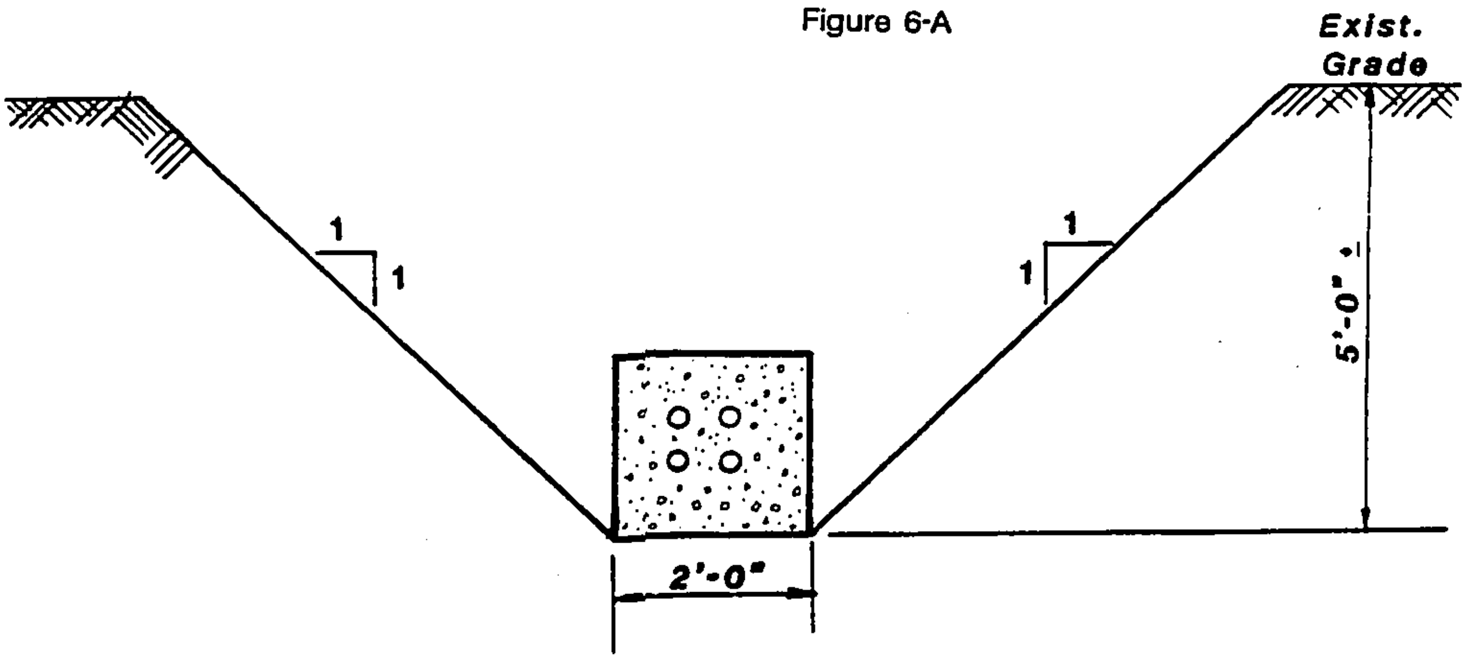
A 200-foot long trapezoidal shaped trench as indicated in Figure 6B will be excavated between the new manhole and the mean low water mark and four 6-inch steel conduits encased in concrete installed within the trench. Only one conduit will be used while the others are plugged and retained should their future use be necessary. The trench will have a 2-foot base and will be approximately 5 feet deep, with a 1:1 side slopes. Approximately 260 cubic yards of sand and rubble excavated from the trench will be stored on the beach adjacent to the cable easement for later use as backfill. The trench will be backfilled after the concrete jacket has cured.





NEW MANHOLE AT SANDY BEACH TO EXISTING MANHOLE NO. 6207

Figure 6-A



NEW MANHOLE AT SANDY BEACH TO OCEAN

Figure 6-B

Figure 6 A and B
TRENCH SECTIONS

GTE Hawaiian Tel Interisland
Fiber Optic Cable Project

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JANUARY 1992

Sand and rubble covering the proposed cable segment may require removal below the level of the prevailing tides. For this process, a backhoe, shovels, or other mechanical means will be used to remove the upper layers. Remaining sand or rubble will be removed using a hydro-jet. If necessary, sandbags will be used to prevent sand from reentering the open trench. Rock outcrops and other hard substrate which cannot be avoided will be also removed using a backhoe or other similar mechanical means.

To reduce potential for turbidity due to construction related work, silt screens or filters will be utilized. Upon completion of construction activities, the construction crew will make every reasonable effort to return the ground to existing preconstruction contours through use of existing excavated materials for backfill.

Two range targets (alignment guide) will be placed on land just prior to the landing of the cables to aid in the cable laying process. The range targets will be placed on temporary structures and will be removed following the cable landing. The range targets will not disrupt traffic movements along Kalanianaole Highway.

A cable laying ship provided by the cable vendor will serve as the primary means of laying the fiber optic cable. The following procedures describe the activities involved during the cable landing operations:

The cable ship will approach the landing site using the two range targets to align the ship as it approaches the shore. The range targets will be placed by a cable receiving party according to previously surveyed coordinates. Once the ship approaches the shore landing to the minimum depth allowable, it will fix its position relative to the landing site using anchoring, tugboats, side-thrusters, or other means. As the ship fixes its position, it will begin laying out cable.

The ship will lay cable while its personnel attach suspension floats at regular intervals to the cable. As the cable is lowered to the water, it will float, allowing it to be pulled toward shore using a winch, small motor boat, or other mechanical means.

The shore landing will be specially prepared to accept the cable. As the cable nears the shore, it will be fed into the steel conduit previously buried in the sand and pulled to the new manhole. When the cable is secured in the manhole, it will be temporarily anchored while the divers readjust the suspension floats in the water to obtain a proper nearshore to shoreline alignment.

A study of the ocean bottom along the proposed cable alignment at the landing site indicates the following features:

The first 600 feet out from the shore is hard substrate, consisting of relatively flat limestone with numerous small to medium (1 to 2-foot diameter) boulders. There are some scattered larger (3 to 4-foot diameter) boulders, particularly in the shallower water. The water depth at the seaward end of this zone is 20 feet. At the seaward limit of this inshore zone, there is a 100 to 150-foot wide band of ledges and other irregularities, with vertical relief on the order of 3 to 7 feet.

Seaward of the ledges, there is a 350-foot wide band of exposed limestone, with scattered coral heads and some sand. The water depth at the seaward end of this band, 950 feet from shore, is 32 feet. From this point to the 70-foot depth contour, located 2,500 feet offshore, the bottom is primarily sand. Because the sand deposit is irregular, the cable will cross two limestone spurs in this area, with a total width of approximately 250 feet. Again, the limestone is relatively flat, with scattered coral heads. Vertical relief is on the order of 1 to 2 feet.

Seaward of the 70-foot depth, the bottom consists of coral rubble, scattered sand, and some scattered limestone mounds and ledges. The coral rubble areas are flat, and the relief of the mounds and ledges is typically 3 feet.

The cable will be protected with cable armoring for the first 950 feet offshore, through the zone of hard substrate. Although the sand deposit appears to be relatively thin, it is extensive enough so that the cable will eventually be covered and protected against wave forces. Depending upon the selected cable vendor and the extent of cable armoring, protection may or may not be required where it crosses the two limestone spurs between the 32 and 70-foot depths. Protection will probably not be required beyond the 70-foot depth.

Depending on subsurface conditions, the cable may need to be curved around fixed underwater obstacles such as coral heads, finger coral, and rock outcrops. Coral, rock and other hard surfaces that cannot be avoided will have to be removed using various means such as:

1. Coral and limestone beds may need to be trenched to a width and depth of approximately 1 to 2 feet, or more, to accept the fiber optic cable. If necessary, tremie concrete can be poured into the trench where it can harden under water. The impacts can be minimized depending on the depth of trenching necessary to accommodate the relatively narrow diameter of the cable. If tremie concrete is used, it will provide a new surface for growth of coral and other marine organisms; or,

2. Shielded cable may be laid with split pipe fastened around the cable and then bolted to the hard rock or coral bed using pneumatic or mechanically driven bolts. This practice will result in minimal environmental impact since little or no coral will have to be displaced to site the cable.

The cable will be anchored in shallow water having a hard rock or coral bottom to prevent abrasion resulting from wave action. Under this situation without anchoring the cable would be exposed to abrasion from movement against hard surfaces caused by weather or geologically (tsunami) induced wave action. In deeper water, cable movement is significantly reduced and the need for wave related abrasion protection is less of a concern. According to Seafloor Surveys International, in deeper waters trenching is generally unnecessary since there are no man-made activities capable of dredging the cable off the ocean floor and damaging it (only commercial trawlers would pose this concern and none are located in Hawaiian waters in the vicinity of the proposed cable alignment).

Once the cable is aligned, the divers will cut the remaining floats away, allowing the rest of the cable to sink to the ocean bottom, and the cable will be permanently installed in the manhole.

Following this action, the cable ship will commence cable laying operations to the next landing site. The ship will follow a prescribed survey route until it reaches the other landing site where the end of the cable can be similarly connected.

3.4 CABLE LANDING PROCESS

The cable landing process includes the use of the landslide range targets (alignment markers) to assist in the alignment of the cable as it is being installed. The cable laying ship may be assisted by two tugboats to maintain proper alignment of the cable ship. This assistance is essential to ensure that the cable is placed within the cable easement. Once the cable laying ship is properly aligned, the cable will be towed from the ship by one of the tugs to a transfer location nearshore. At this location, the leading end of the cable will be attached to a wire rope connected to land based pulling equipment (i.e., winch) and pulled ashore. Once the cable is placed within the steel conduit, the leading end of the cable will be secured within the manhole and spliced together with cable emanating from the central office.

Once the cable has been secured, the open trench will be backfilled and reasonable efforts taken to restore the beach to its original preconstruction condition.

3.5 SAFETY CONSIDERATIONS

During the construction phase on the beach (approximately 30-45 calendar days, May-June 1993), the portion of the beach which contains the open trench will be barricaded from public entry. During the construction period, a security guard may be required at night and weekends to ensure public safety and integrity of the job site.

During the cable laying process (approximately 2 days depending on the weather conditions), the nearshore waters will be closed to ocean activities (surfing, diving, boating, swimming) to ensure the safety of ocean users. The area that will be closed will be approximately 100 to 150 feet wide and 1,000 to 2,000 feet long. The actual area may be more or less depending on the tides. The period when the waters will be closed is not expected to be more than two days, weather permitting. This short-term "closure" of nearshore water areas will be achieved by publishing a notice to advise mariners to avoid the area. Further, during the cable laying process, project personnel will advise beach users to avoid the project site both on land and in the water via small powered water crafts.

3.6 SCHEDULE AND ESTIMATED COST

The first phase (land-side activities) of the project is scheduled tentatively for March and April 1993. The second phase (installation of interisland cable and cable landing operations) is scheduled tentatively for May and June 1993. Construction cost for the first phase is estimated at $512,000.00.

SECTION 4
DESCRIPTION OF THE AFFECTED ENVIRONMENT

4.1 PHYSICAL ENVIRONMENT

4.1.1 Climate

The project site and surrounding area is located on the southeastern side of Oahu which is generally warm and dry. The mean annual temperature is between 72 and 75 degrees Fahrenheit and the annual rainfall is between 15 and 25 inches, most of it occurring during winter months (Atlas of Hawaii, 1983).

Impacts

The proposed project is not expected to impact the local climate of the project area and vicinity.

4.1.2 Topography, Geology, Soils

The project area lies at the base of two geologic formations, the Koolau Mountains and Koolau Volcano. The predominant soil type for the area excluding the landing site, as described in the August 1972 U.S. Department of Agriculture, Soil Conservation Service publication, "Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii," consists of the Koko Series particularly Koko silt loam, 2 to 6 percent slopes (KsB). The surface layer is a dark reddish-brown silt loam about 16 inches thick. The subsoil, about 32 inches thick, is dark reddish-brown or dark - brown soil loam, loam, or clay loam that has subangular blocky structure. Permeability is moderate, runoff is slow and the erosion hazard is slight.

Soils at the landing site consist of rock land. Rock land (rRk) is made up of areas where exposed rock covers 25 to 90 percent of the surface. The rock outcrops and very shallow soils are the main characteristics.

Impacts

With respect to the segment of the cable to be installed subsurface, no long term surface impacts are anticipated since the project involves temporary excavation and filling with the same material. The excavated portions will be returned to its present status by reusing soil excavated for fill.

4.1.3 Hydrology

There are no perennial streams in the subject area. The major drainage feature for the area is an unnamed gulch to the north which is dry except for the rainy season.

Groundwater for the area is basal in sediments and is not a source for domestic use (Atlas of Hawaii, 1983).

Impacts

No adverse impacts are anticipated on surface water or groundwater since the project will not alter existing drainage patterns or have any long term water requirements.

4.1.4 Terrestrial Flora/Fauna

The area's flora is classified as lowland dry shrub and typically contain plant species such as kiawe, naupaka, klu, koa haole, gingergrass, and bristly foxtail. Homesites, pasture, and truck crops are the most common uses for this type of plant environment. No rare or endangered species of plants are known to inhabit the site. Existing flora and fauna of the project site consists mainly of introduced species.

With respect to animal wildlife for the area, no rare or endangered animals are known to inhabit the site. The area has a dry climate and sparse vegetation and does not provide good habitats for rare animals.

Impacts

Because the project area is not known to contain any rare plants or animals, adverse impacts are not anticipated. As part of the proposed development the exposed areas within the cable easement will be replanted.

4.1.5 Marine Flora and Fauna

Sea Engineering carried out a qualitative reconnaissance of the Sandy Beach cable route on 19 June 1991 and a quantitative sampling of this site was done on 7 January 1992 (see Marine Environmental Analysis of Selected Landing Sites, Sea Engineering, Inc., and Environmental Assessment Co., Jan. 1992). To obtain an overall perspective on the extent of the major communities occurring in the study area, divers were towed slowly behind a skiff over most of the study site from shore seaward to at least the 80 foot contour. During the course of the field work notes were taken on the number, size and location of any green sea turtles and other threatened or endangered species seen within or near to the study area.

"Benthic communities in the vicinity of the project site are situated on a hard substratum of basalt rock. The mean coral coverage is 20 percent and it decreases near shore (i.e., the inner 300 feet) to 0.2 percent" (Sea Engineering, January 1992). Diversity and abundance of fish in the area is high due to the plentitude of coral. Invertebrate species richness and abundance is similarly high. The rocky cobble shoreline supports normal tidal zone marine life, including sea urchins, sea cucumbers, algae, crabs and small fishes. The intertidal region fronting the proposed cable landing site is subjected to occasional high energy conditions (waves) which keeps the diversity low.

"The biological survey did not find any rare or unusual species or communities other than a single threatened green sea turtle. It appears that the shallow area is not heavily used by green turtles" (Sea Engineering, January 1992). There has been no evidence to suggest that nesting of sea turtles on Sandy Beach has occurred. Another protected species, the humpback whale was not seen offshore of the study area. As noted by Herman (1979), humpback whales tend to be found in regions remote from human activities, thus relatively fewer numbers of whales are seen around Oahu as compared to other islands.

Impacts

"From the sea the proposed cable alignment enters the shallows through a substrate of sand, where most of the organisms are mobile. Since these forms are motile, deployment of the cable across such a substratum presents little chance of negative impact to resident species because they would probably just move out of the way as the cable was deployed. Additionally since the substratum shifts, it is probable that the deployed cable will sink into the substrate" (Sea Engineering, January 1992).

"In the shallower areas along the route, there are areas where the cable will cross hard substratum and there is a greater possibility of impact to benthic and fish communities. Impacts associated with these construction activities primarily include removal of benthic communities in the cable path, and the generation of turbidity which may impact surrounding communities. The small scale of the proposed activities that would be necessary to protect the cable in shallow water would produce little sediment, and over a relatively short period of time. Turbidity from the construction will be a minor impact, especially when viewed in light of the nearby chronic disturbance to these benthic communities of sewage input that has occurred since the early 1970's" (Sea Engineering, January 1992).

Another concern may be with disturbance to threatened or endangered species. If construction activities are restricted to the period between April through October, the endangered humpback whale (Megaptera novaeangliae) would not be impacted because it is only in Hawaiian waters on a seasonal basis (November through March).

Assuming that deployment of the cable occurs during the period of time that humpback whales are in island waters, it is anticipated that the impacts to whales would be minimal. The deployment of the cable from shallow water (i.e., the 60 foot isobath) to shore should not take longer than one day. In general, this deployment is done by bringing the cable laying ship into about the 60 foot isobath; from this point to shore the cable is buoyed up using floats and small craft are used to maneuver the cable into the appropriate alignment and into shore.

The probable source of local impact to whales would be the production of noise by the cable laying ship and smaller vessels used to bring it ashore. There are variable and conflicting reports as to the impact of vessel traffic on whales. Evidence from the northwest Atlantic and northeast Pacific suggest behavioral changes by whales in response to vessels, but they may show considerable fidelity to specific areas despite vessel traffic (major shipping, trawler activity, etc.; Brodie 1981, Matkin and Matkin 1981, Hall 1982, Mayo 1982). In contrast Jurasz and Jurasz (1980) found a sharp decline in humpback whale numbers in Glacier Bay, Alaska with increases in vessel activity. In a short term study, Bauer (1986) found no correlation between vessel and whale numbers as well as no net movement offshore at Olowalu, Maui in 1983-84. However, a six year study suggested a major offshore movement of mother-calf pods off Maui with increased vessel traffic (Glockner-Ferrari and Ferrari 1985, 1987). This study alone cannot be used to determine whether the observed reductions in sighting around Maui is correlated with vessel traffic; there is no consistent baseline information or comparative studies on humpback whale habitat utilization around Maui which may corroborate the trends reported by Glockner-Ferrari and Ferrari (Tinney 1988).

With respect to the response of individual humpback whales, there is sufficient information to demonstrate that boating and other human activities do have an impact on behavior (Bauer and Herman 1986). Thus it is probably valid to assume that impact to whales could occur if individuals are within several kilometers of the cable deployment. However as noted above the impacts (here noise) are not expected to last for more than one day, and all activities will be concentrated in a very small area.

Sea turtles are permanent residents in inshore Hawaiian habitats thus the potential exists for problems during the construction phase if it entails dredging. The generation of fine particulate material from dredging appears not to hinder the green turtle in Hawaiian waters; at West Beach, green turtles moved from an offshore diurnal resting site about one kilometer offshore to a point about 200m from the construction site within days of the commencement of dredging and the generation of turbid water. The turtles appeared to establish new resting areas in the turbid water directly offshore of the construction site (Brock 1990a). The reason(s) for this shift in resting areas is unknown but may be related to the turtles seeking water of poor clarity to possibly lower predation by sharks (a major predator on green sea turtles).

Any construction activity that generates fine particulate material will lower light levels and in the extreme, bury benthic communities. Sedimentation has been implicated as a major environmental problem for coral reefs. Increases in turbidity may decrease light level resulting in a lowering of primary productivity. When light levels are sufficiently decreased, hermatypic corals (i.e., the majority of the corals found on coral reefs) will eject their symbiotic unicellular algae (zooxanthallae) on which they depend as source of nutrition. However, in nature corals will eject their zooxanthallae and survive (by later acquiring more zooxanthallae) if the stress is not a chronic (long-term) perturbation.

4.1.6 Scenic and Visual Resources

The area is generally void of man-made structures except for light poles along Kalanianaole Highway and the park access road, and beach park amenities such as showers and toilet facilities.

Impacts

No adverse impacts are anticipated on the beach park since the proposed cable will be located below surface until beyond the park. From there the cable will be routed by duct lines under Kalanianaole Highway until it reaches the intersection of Kealahou Avenue and connects to the nearest existing telephone pole for further routing towards the central office on Hawaii Kai drive.

For seven to ten days there will be a temporary impact on the coastal views from construction activities. During the construction period, the beach portion of the

CORRECTION

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

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For seven to ten days there will be a temporary impact on the coastal views from construction activities. During the construction period, the beach portion of the project site will have construction equipment and a mound of sand from the excavated trench.

The beach will be returned to its existing condition at the conclusion of the cable installation. Excess material not utilized for fill will be removed.

Therefore, after the cable is installed no long-term impact is anticipated.

4.1.7 Historic/Archaeological Resources

There are no known features of historic or archaeological significance in the vicinity of Sandy Beach Park (Atlas of Hawaii, 1983). Due to the site's popularity as a recreational destination, any visible remains would have been recovered or destroyed during the development of the park.

Impacts

No short or long term impacts are expected from the development of the proposed project. However, should any unidentified cultural remains be uncovered during cable installation, work in the immediate area will cease and the appropriate government agencies will be contacted for further instructions.

4.1.8 Beach Erosion and Sand Transport

Sandy Beach is about 1200 feet long and is fairly wide with a sloping foreshore. The bottom immediately offshore, a mixture of patches of sand, lava, and reef, drops off abruptly to an average depth of eight to ten feet. This quick change in depth creates the very steep and hard-breaking waves that pound in Sandy's shorebreak. On a big day the surf erodes the sand to form a steep foreshore, which in turn produces a strong, forceful backwash.

Sandy Beach, as described in July 1981 by Dennis Hwang, "Beach Changes on Oahu as Revealed by Aerial Photographs," has historically been an unstable beach system. Sandy Beach may have an annual variation in width of at least 25 feet. However the beach at the project area has remained relatively stable because it lies landward of a basalt lava shelf located at the water line. The lava shelf shelters the sandy areas from typical coastal processes that cause accretion and erosion.

Impacts

The proposed project is not expected to impact beach processes. Upon completion of construction activities, the construction crew will make every reasonable effort to return the ground to existing preconstruction contours through use of existing graded materials for backfill. The existing basal shelf which has kept the beach relatively stable will not be destroyed.

4.1.9 Noise From Construction Activity

During the construction phase of the project, excavation work and cable laying equipment and machinery will be used which will be sources of noise.

Impacts

Noise generated from machinery can be mitigated to some degree by requiring contractors to adhere to State and County noise regulations. This includes ensuring that machinery are properly muffled. Some work at night may be required. Night activities include cable splicing, cable pulling, operation of machinery, etc.

Boats (tugs and a small craft) that are used during the construction period will also be a source of noise. The impact of noise from these vessels cannot be mitigated. The noise impact will be temporary in nature and will not continue beyond the construction and cable laying period.

4.1.10 Air Quality

Air quality of the proposed project area is good due to low emission levels and the almost continual presence of tradewinds or on-shore breezes. The major factor affecting air quality in the area is vehicular traffic.

Impacts

During the excavation process, loose sand and dirt may be cast into the air by wind. The release of sand into the air can be prevented by requiring the contractor to periodically wet down the work area. The areas that are used for the placement of the range targets will also be exposed during the construction period. The target sites should be similarly wetted to control fugitive dust. The work site will be returned to its original state after the cable laying process is completed.

Operation of construction vehicles is expected to temporarily contribute carbon monoxide pollutants in the project vicinity.

4.1.11 Water Quality

Nearshore waters are rated Class "A" by the State Department of Health. Shallow waters experience considerable turbidity even when surf is minimal. Offshore waters are very clear with excellent underwater visibility over reef slopes. Water temperature and salinity are normal for ocean water with evidence of fresh water inflow along the shore.

Impacts

It is anticipated that the nearshore waters may be clouded during the trench excavation and backfilling operations. Silt screens may be erected by the construction crew to lessen and minimize effects of turbidity. Water collected during the dewatering process will be discharged on the beach adjacent to the work area.

4.2 SOCIO-ECONOMIC ENVIRONMENT

4.2.1 Population

Although the population within the Hawaii Kai area numbers 28,636, the population of Honolulu County as of 1989 was 841,600 and is projected to increase to 999,500 by 2010 (The State of Hawaii Data Book, 1990). This projected population increase of 157,900 over the 1989 level requires that the County's communication system be upgraded and expanded to meet future communication needs.

Impacts

No adverse impact on existing resident and worker populations of Hawaii Kai is expected.

4.2.2 Surrounding Land Use

Sandy Beach Park and the surrounding coastal land to the west, which is owned by the City and County of Honolulu, is primarily in recreational use. Queens Beach which is located east of Sandy Beach Park is privately owned. Lands mauka of the coastal beach areas are generally vacant. The Hawaii Kai Golf Course is located mauka of Sandy Beach Park, across the Kalanianaole Highway. The Hawaii Kai Sewage Treatment Center is located 2,000 feet to the west.

Impacts

No short or long term impacts are expected from the development of the proposed project. The cable route will be on vacant land when subsurface and be carried overhead within street rights-of-ways and will not adversely impact surrounding uses.

4.3 PUBLIC FACILITIES AND SERVICES

4.3.1 Transportation Facilities

The project site is served by Sandy Beach Park Access Road. Construction within the roadway right-of-way will involve excavation of the pavement and subsurface within the 10-foot easement, placement of the conduits within the exposed trench, and restoring the roadway to its original condition.

From the Sandy Beach Park Access Road the cable will follow an existing subground duct line of Kalanianaole Highway. The cable will be installed at the intersection of Kalanianaole Highway and Kealahou Avenue within the right-of-ways to the applicants central office located at 7664 Hawaii Kai Drive.

The principal bus stop that will be affected by the construction of the proposed project is located at the intersection of Kalanianaole Highway and Kealahou Avenue (see Figure 7).

Impacts

The proposed project is expected to have no impact on the existing traffic or bus services, after completion of construction activities. Construction will take seven to ten days.

4.3.2 Recreational Facilities

The principal recreational facility in the vicinity of the project site is Sandy Beach Park. The beach park is used for swimming, sunbathing, surfing, bodysurfing, diving, fishing, kiting, and picnicking. The western side of Sandy Beach Park has the widest area of sand beach, and is more heavily used than the eastern side (see Figure 7).

Sandy Beach Park has become very popular among users since it was made accessible by automobile in October 1931. Visitor counts taken for The State of Hawaii Data Book (1990) revealed that approximately 2,815,288 people used the park facilities during that year. This public usage lies in between Waikiki's high usage of 11,173,540 and Kualoa low usage of 71,406.

Impacts

No long term impacts are expected from the development of the proposed project. However, development will temporarily impact land recreation uses on the eastern part of Sandy Beach Park. During construction the eastern part of the park will have to be closed for safety reasons. Construction will take seven to ten days. However the majority of recreational activities occur on the western part of Sandy Beach Park. This impact will be short term, lasting only until construction is completed.

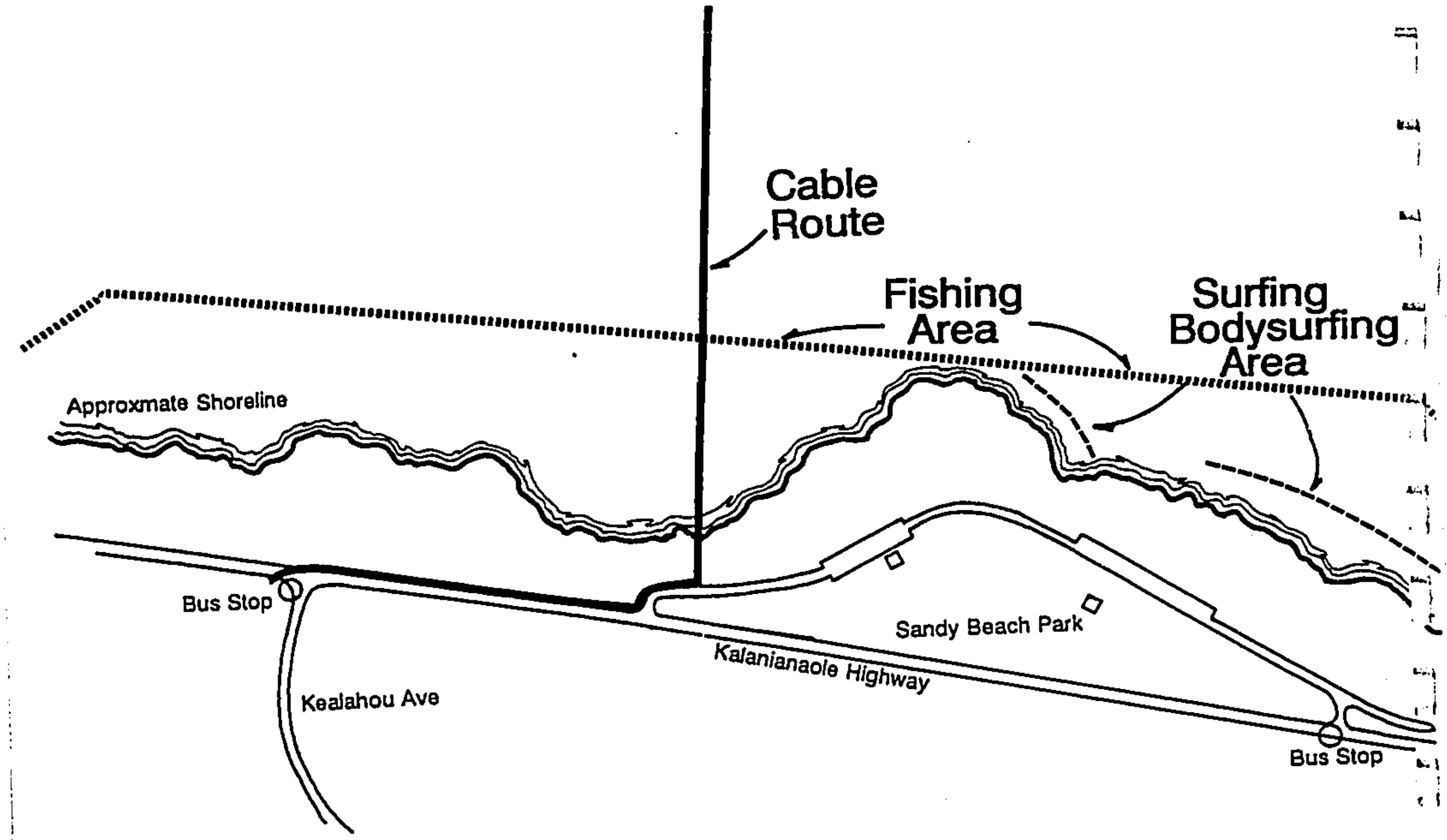

Figure 7
PUBLIC USES

GTE Hawaiian Tel Interisland
Fiber Optic Cable Project

Not to Scale

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JANUARY 1992

SECTION 5

RELATIONSHIP TO STATE AND COUNTY LAND USE PLANS AND POLICIES

5.1 THE HAWAII STATE PLAN

The Hawaii State Plan (Chapter 226, Hawaii Revised Statutes) provides a guide for the future of Hawaii by setting forth a broad range of goals, objectives, and policies to serve as guidelines for growth and development of the State. The proposed project is generally consistent with the Hawaii State Plan. The following objectives of the State Plan are relevant to the proposed project:

Section 226-10.5: Economy - Information Industry
The proposed project serves to assist in the State's objective of positioning Hawaii as the leader in information services in the Pacific Rim. The proposed project will continue development and expansion of Hawaii's telecommunications infrastructure and will help to accommodate future growth in the information industry.

Section 226-14 Facility Systems - In General
The proposed project supports the State's goals for achieving telecommunications systems necessary for Statewide social, economic, and physical objectives.

Section 226-18: Facility System - Energy/Telecommunications
The proposed project will help to ensure adequate and dependable telecommunication services for Hawaii by promoting efficient management and use of existing and proposed facilities and by promoting installation of new telecommunications cables.

5.2 STATE FUNCTIONAL PLANS

The Hawaii State Functional Plan (Chapter 226) provides a management program that allows judicious use of the State's natural resources to improve current conditions and attend to various societal issues and trends. The proposed project is generally consistent with the State Functional Plans. The following objectives of the State Functional Plans are relevant to the proposed project:

Education Implementing Action A(4)(c):
The proposed project will help to ensure adequate telecommunication services necessary for Hawaii's schools objectives.

Education Implementing Action B(3)(d):
The proposed project serves to promote and expand the appropriate use of telecommunications to deliver distance education as well as enhance the learning process and communication competencies of students.

Education Implementing Action(3)(e):
The proposed project enables school library media centers to effectively manage and provide access to information and knowledge through telecommunications.

5.3 STATE LAND USE LAW

The State of Hawaii Land Use District classifications designate Sandy Beach Park as "Limited Use Conservation", and the surrounding areas as "Residential" and "Preservation" (see Figure 8). A Conservation District Use Permit will be applied for as part of this project." The purpose of the preservation districts is to preserve and manage major open space and recreation lands and lands of scenic and other natural resource value." "The purpose of the residential district is to allow for a range of residential densities." The proposed project does not require any amendments in the current State Land Use classification.

5.4 COUNTY ZONING

Zoning for the Sandy Beach Park area is restricted preservation (P-1). The areas surrounding Sandy Beach Park are zoned general preservation (P-2) and residential (R-5) (see Figure 9).

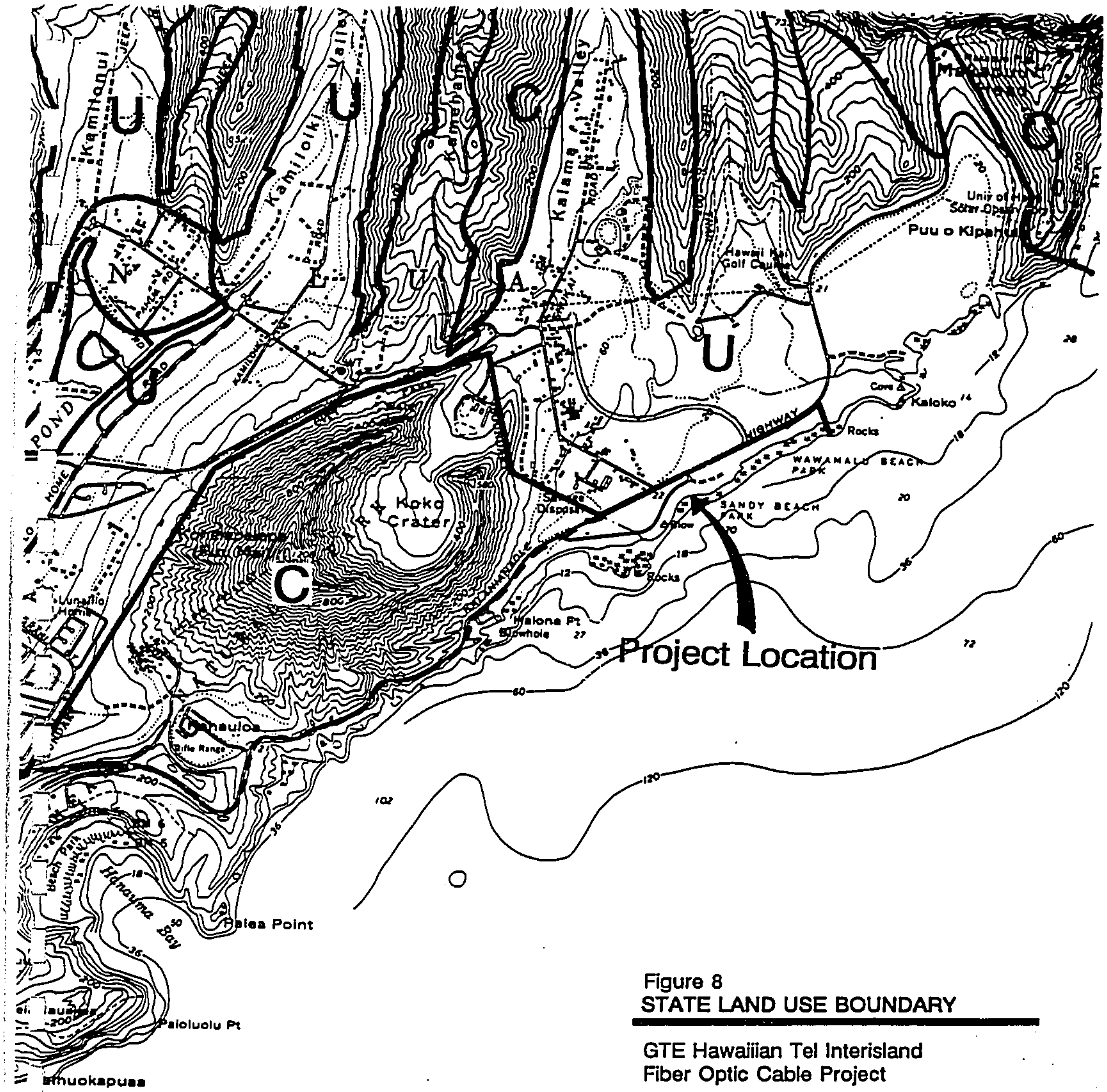

Figure 8
STATE LAND USE BOUNDARY

GTE Hawaiian Tel Interisland
Fiber Optic Cable Project

0 2000 4000
FEET

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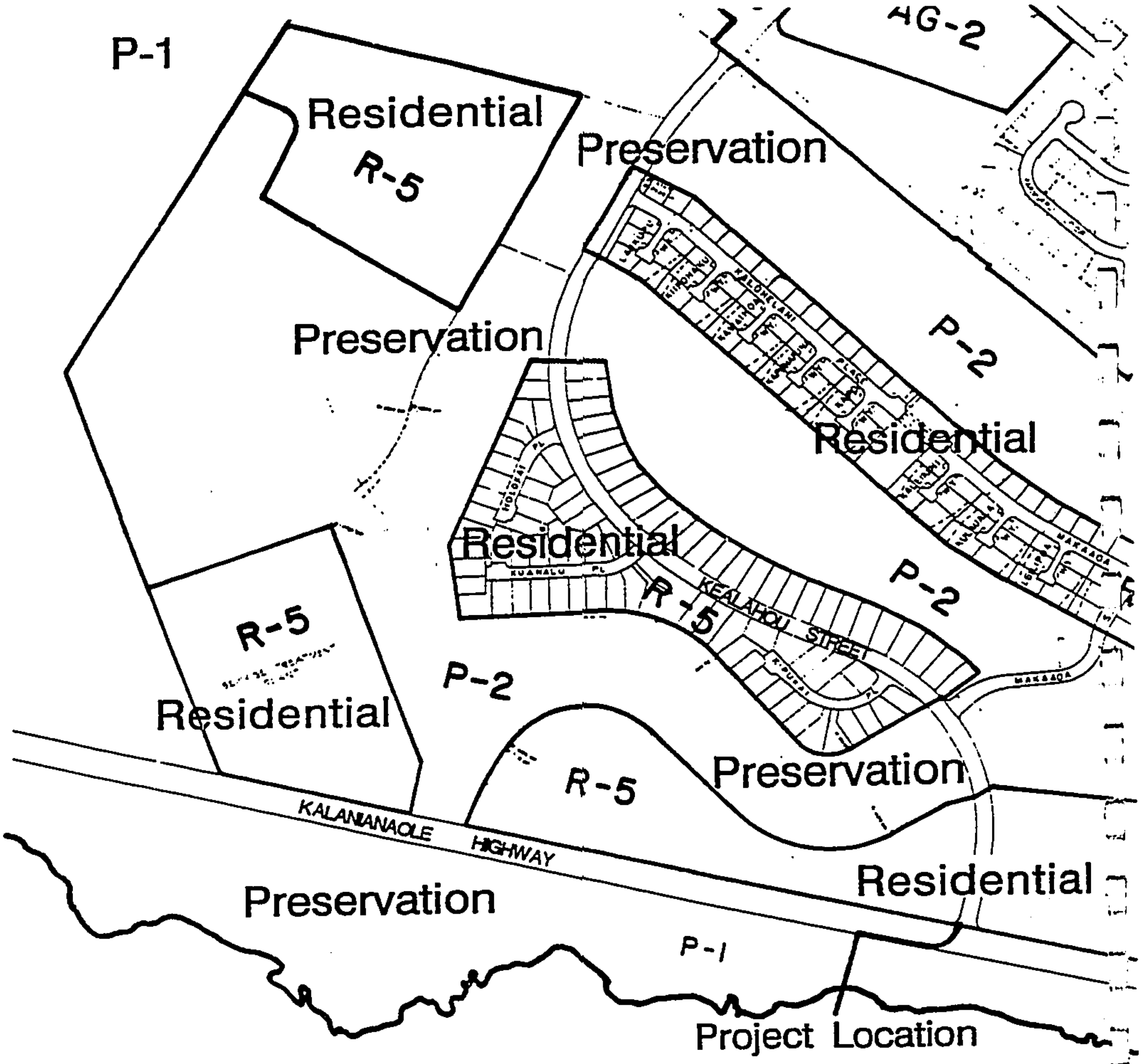

Figure 9
EXISTING ZONING MAP

GTE Hawaiian Tel Interisland
Fiber Optic Cable Project

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A zoning change will not be required for development of the proposed project. A Conditional Use Permit (CUP) will be sought for the proposed project, considered a Utility Installation - Type B.

5.5 CITY AND COUNTY OF HONOLULU GENERAL PLAN

The General Plan of the City and County of Honolulu provides a statement of long range social, economic, environmental, and design objectives for the Island of Oahu and a statement of policies necessary to meet these objectives. A specific objective of the General Plan relating to the proposed project is the maintenance and expansion of existing utilities systems. The proposed project is generally in conformance with the goals and objectives of the City and County General Plan.

5.6 SPECIAL MANAGEMENT AREA

The City and County of Honolulu has designated the shoreline and certain inland areas of Oahu as being within the Special Management Area (SMA). SMA areas are felt to have a sensitive environment and should be protected in accordance with the State's coastal zone management policies. The project area is within the SMA Boundary as defined by the City and County of Honolulu (see Figure 10) A SMA permit will be necessary for development of the proposed project. Review of the project under SMA criteria will be conducted during the processing of the SMA permit with the Department of Land Utilization (DLU), City and County of Honolulu.

The proposed project, portions of which are within the shoreline setback area, is also subject to the provisions of the Shoreline Setback Rules and Regulations of the City and County of Honolulu. A Shoreline Setback Variance (SSV) Permit will be required.

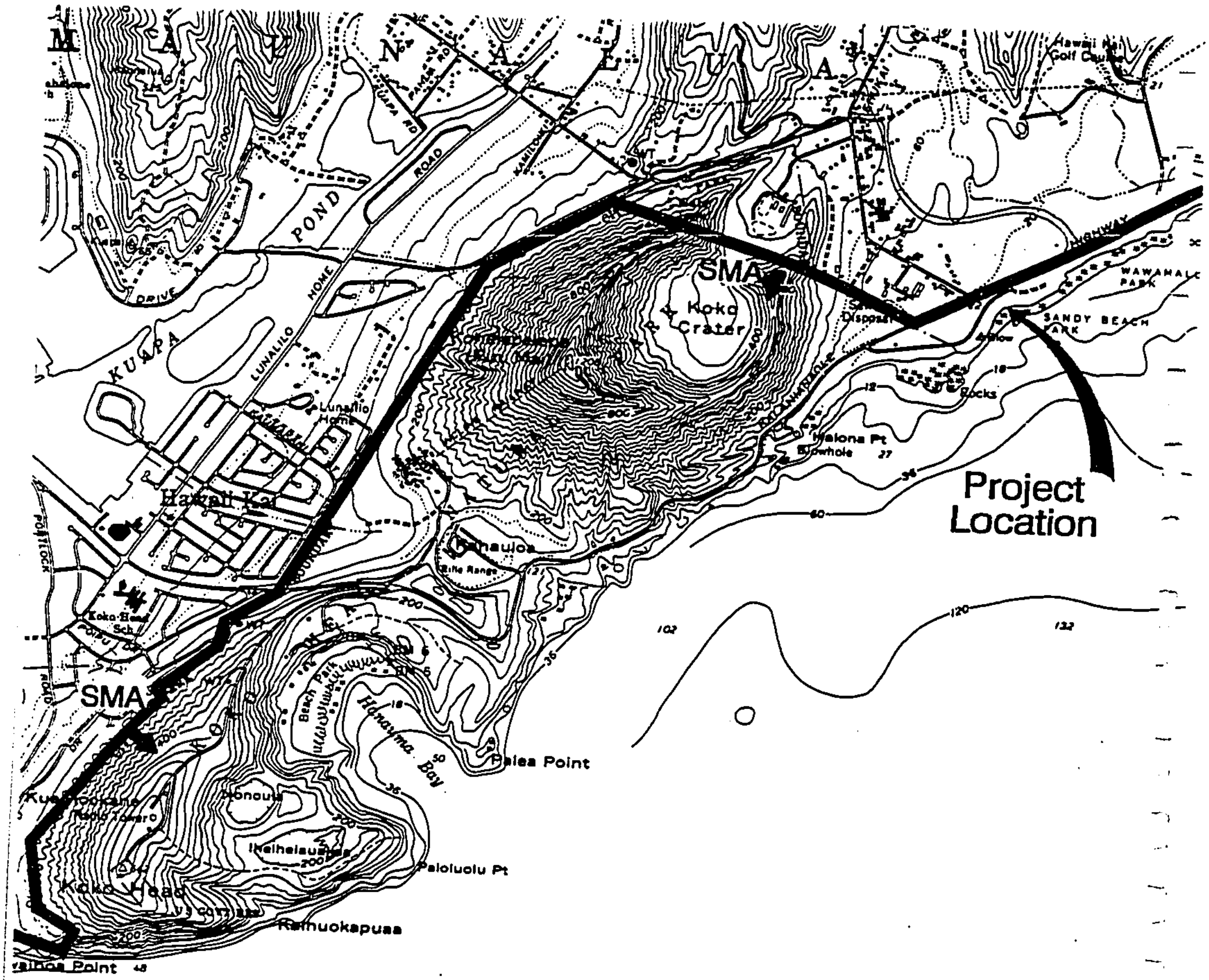

Figure 10
SPECIAL MANAGEMENT AREA BOUNDARY

GTE Hawaiian Tel Interisland
Fiber Optic Cable Project

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SECTION 6

ALTERNATIVES TO THE PROPOSED ACTION

6.1 NO ACTION

The no action alternative will contribute to further degradation of current inadequate interisland telecommunications facilities. A primary disadvantage of this alternative would be that, without the development of a interisland fiber optics cable, GTE will not have sufficient capacity to meet all interisland traffic in 1993. Losses resulting from this alternative would include:

- Lost employment opportunities which would have been realized in connection with the cable laying procedure, maintenance and operation;
- Lost tax revenues for City and State governments from the cable vendor, and increased public and private telecommunication usage; and
- Lost attainment of the City and County of Honolulu General Plan's objective of expansion of existing utilities systems.

6.2 ALTERNATIVE SITES

The area initially considered for the east Oahu cable landing extended from the Hawaii Kai Marina entrance channel to the north end of Kailua Bay, a distance of approximately 18 miles. The areas initially considered but not selected are discussed below:

6.2.1 Hawaii Kai

Disadvantages at this location include the lack of offshore sand deposits and sandy beaches to utilize for a cable landing. The fringing reef off Hawaii Kai is approximately 3500 feet wide and is environmentally sensitive.

6.2.2 Makapuu Beach

A sand channel extending seaward from the south side of the beach provides a potential cable route. However, extremely heavy recreational use and the difficulty of heavy equipment access to that part of the beach precluded further consideration of this site.

6.2.3 Makai Research Pier

"An advantage of this site is that the cable could make landfall at the end of the pier, thereby shortening the ocean route by 900 feet, and eliminating passage through the surf zone. However a 30 foot vertical ledge drops to the 60 to 70 foot water depth 5000 feet from the end of the pier. The cable would require protection from the ledge shoreward (Sea Engineering, January 1992)."

6.2.4 Waimanalo Beach

Waimanalo Beach possesses a poor shoreline and nearshore access. "A shallow reef defines the seaward boundary of Waimanalo Bay, and also marks the end of the sand bottom. The reef is 4 to 8 feet deep and is very irregular. This zone extends seaward for approximately 2000 feet. This shallow reef would present a formidable obstacle to cable placement, since this zone is also subjected to significant wave energy. Seaward of this zone, the bottom is limestone rock and coral. There are no sand channels or deposits (Sea Engineering, January 1992)." Also there is a potential for discovery of archaeological remains according to the Department of Land and Natural Resources Historic Sites Office

6.2.5 Kailua Bay

Kailua Beach has extremely difficult offshore conditions involving an extensive and shallow reef and predominately hard bottom. "There is one large offshore sand channel, but it is very irregular with steep ledges on its borders (Sea Engineering, January 1992)." Other constraining factors are the potential for discovery of archaeological remains and major public use impacts.

6.3 ALTERNATIVE TECHNOLOGY

The following describes the alternatives to fiber optic cable technology:

6.3.1 Microwave Radio Systems

The use of additional or modification of Hawaiian Tel's existing interisland microwave radio systems is not a feasible alternative due to the linear arrangement of the main Hawaiian Islands. The linear arrangement of the main Hawaiian Islands limits the possible transmission paths between the islands and leads to transmission congestion. Problems associated with transmission congestion of microwave radio systems include:

- Introduction of distortion to voice band data and voice transmission; and
- Loss of signal strength and signal reliability.

In comparison with microwave radio systems, fiber optic technology is the only means of providing the capacity necessary for interisland digital circuits without distortion in voice band data and transmission, and problems with signal strength and reliability.

6.3.2 Satellites

Satellites are not a feasible alternative based on the large interisland capacity requirements projected in the GTE Hawaiian Tel forecasts. Extreme disadvantages associated with use of satellites include:

- Transmission delays due to technical and atmospheric limitations involving the distance the radio waves must travel;
- Visual and aesthetic intrusion caused by the need for ground stations and radio antennas which must be constructed to accept the satellite transmissions; and
- Difficulties associated with "double hops" which occur when data must be retransmitted in order to establish a secure voice circuit.

In comparison with satellites, fiber optic technology is the only means of providing the capacity necessary for interisland digital circuits without transmission delays and major visual and aesthetic problems.

6.4 RECOMMENDED ACTION

The recommended action is to proceed with the establishment of a submarine fiber optic cable system with a landing at Sandy Beach. From there, the cable would be located underground or overhead within existing right-of-ways.

SECTION 7

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

No short-term exploitation of resources resulting from development of the project site will have long-term adverse consequences. The appearance of the land portion of the existing site will not be altered. The cable will be visible on the ocean bottom portion of the project site and will alter its appearance.

Once construction activities are completed there will be no affect on recreational activities, marine life, or wildlife.

Long-term gains resulting from development of the proposed project include provision of more effective State telecommunications systems (by means of fiber optic cables). The proposed project will maintain and enhance economic productivity by increasing telecommunications service between islands.

SECTION 8

IRREVERSIBLE/IRRETRIEVABLE COMMITMENT OF RESOURCES BY THE PROPOSED ACTION

Development of the proposed project will involve the irretrievable loss of certain environmental and fiscal resources. However, the costs associated with the use of these resources should be evaluated in light of recurring benefits to the residents of the region, the State of Hawaii and the City and County of Honolulu.

It is anticipated that the construction of the proposed project will commit the necessary construction materials and human resources (in the form of planning, designing, engineering, construction labor, landscaping, and personnel for management and maintenance functions). Reuse for much of these materials and resources is not practicable. Although labor is compensated during the various stages of development, labor expended for project development is non-retrievable.

SECTION 9

NECESSARY PERMITS AND APPROVALS

9.1 STATE

Department of Land and Natural Resources

- Conservation District Use Permit
- Right-of-Entry
- Establishment of Offshore Easement

Office of State Planning

- Coastal Zone Management Consistency Review

Department of Health

- Section 401, Water Quality Certification

Department of Transportation

- State Highway Rights-Of-Way

9.2 CITY AND COUNTY

Department of Land Utilization

- Shoreline Management Area Permit
- Shoreline Setback Variance
- Conditional Use Permit, Type 1

9.3 FEDERAL

U.S. Army COE

- Corps of Engineers Section 404/Section 10

SECTION 10

CONSULTED AGENCIES AND PARTICIPANTS IN THE PREPARATION OF THE ENVIRONMENTAL ASSESSMENT

10.1 FEDERAL AGENCIES

U.S. Army Corps of Engineers
U.S. Coast Guard

10.2 STATE AGENCIES

Department of Land and Natural Resources
- Aquatic Division
- Land Management Division
- Conservation and Environmental Affairs

Department of Transportation
Department of Health
Department of Business and Economic Development

10.3 CITY AND COUNTY OF HONOLULU

Department of General Planning
Department of Land Utilization
Department of Public Works
Department of Parks and Recreation
Mayors Office
Councilman John Felix
Councilwoman Donna Kim

10.4 INDIVIDUALS AND GROUPS

Save Sandy Beach Coalition

SECTION 11

COMMENTS AND RESPONSES TO THE DRAFT ENVIRONMENTAL ASSESSMENT

JOHN WAIHEE
GOVERNOR OF HAWAII

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

REF:OCEA:SKK

JUN 16 1992

FILE NO.: 92-724
DOC. ID.: 839

'92 JUN 17 AM 10 34

The Honorable Donald Clegg, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

SUBJECT: Special Management Area Use Permit (SMP) and Shoreline Setback (SSV) Environmental Assessments for Sandy Beach Park and Kahe Point Beach Park, Oahu, Hawaii, TMK: 3-9-12: 2 and 9-2-3: 15

Thank you for giving our Department the opportunity to comment on this matter. We have reviewed the submitted environmental assessments and have the following comments.

Brief Description:

The City and County of Honolulu, Department of Land Utilization is processing SMA and SSV applications for the proposed project and is soliciting review and comments. The applicant proposes to install an interisland submarine fiber optic cable system to provide additional telecommunications capability. The proposed Oahu sites where the subject cable would come ashore would be at the eastern end of Sandy Beach Park and near the western end of Kahe Point Beach Park.

The fiber optic cable is approximately three inches in diameter without any casing armoring. The applicant proposes to bring a cable ship as close as possible to shore, and use land-based equipment to pull the cable's leading end to shore. Once onshore the leading end would be pulled through steel piping encased in concrete and attached to landward cable ends. The cable would then be either buried (within a trench covered with cement or covered (with split pipe sections bolted to the substrate) to protect it in shallow water depths. At Sandy Beach, it is expected that the first 950 feet of cable (from shore) would have to be protected in this fashion. At Kahe Point, this length is estimated at 500 feet. In-water work for laying the cable is expected to take 2 days at each site.

The applicant's consultant performed substrate characterization and aquatic resources inventory for both alignments. For Sandy Beach, the shoreline to the 20-foot isobath (600 feet), is hard bottom, flat limestone with boulders (1 to 4 feet in diameter). The seaward 100 to 150 feet fraction of this area is characterized by ledges having vertical relief between 3 and 7 feet in height.

The next 350 feet is characterized by flat limestone with scattered coral heads and sand (maximum depth is 32 feet). For Kahe Point, the shoreline to about the 15 feet depth (380 feet) is hard bottom with ridges, channels, and scattered boulders and coral heads. Vertical relief is 3 to 4 feet in height. The next 100 feet is characterized by sand, limestone and coral with vertical relief between 2 and 4 feet in height (maximum depth is 20 feet). At about 500 feet from shore along the alignment, there is a large sand deposit which the applicant proposes to use in its cable alignment.

Division of Aquatic Resources Comments:

Several concerns arise with respect to these applications. The documents provided describe trenching and or covering of the cable in nearshore waters with a split pipe over fairly long distances (950 feet for Sandy Beach and 500 feet for Kahe Point).

In another request for comments on similar county applications, the AT&T company proposed bringing to shore submarine fiber optic cables at Keawaula (Yokohama) Bay. In this application, the applicant anticipated that excavation work would only extend 30 feet seaward of the shoreline.

In order to minimize turbidity and reduce impacts to marine habitat, the GTE applications should clarify the reason as to why their cable systems require more construction effort seaward of the shoreline. The Division would also favor covering the cable using split pipe rather than trenching, as it would involve less impacts to aquatic resources.

The subject documents mention 4 conduits planned for the Sandy Beach site (of which only one is planned for present use) and 2 conduits for the Kahe Point site (of which only one is planned for present use). If trenching and covering with cement is used, subsequent laying of additional cables means retrenching and additional coverings. If feasible, the applicant should consider laying the cables required for present and future use to minimize disruption and excessive adverse impacts from construction.

Finally, consolidating submarine cable alignments merits consideration for minimizing environmental damage. The subject documents mention the planned deployment of other cables (Pac-Rim East, HAW-5, Hawaii deep water electric cable, etc.). The applicant should consider using the AT&T

alignment for its Kauai to Oahu cable. They could also consider using the existing cable easement in Hanauma Bay for its Maui to Oahu cable (This easement is established for submarine cable use for both AT&T and GTE). Consolidating cable easements now and in the future would minimize intrusion into Hawaii's nearshore environments.

Historic Preservation Division Concerns:

Our office has reviewed and concurred with the recommendations of the archaeological assessments for these projects. These recommendations are faithfully reproduced in the Final Environmental Assessments. The historic preservation review process is complete for the Sandy Beach Park project. We look forward to reviewing detailed plans for the Kahe Point Beach Park project as these are developed.

Office of Conservation and Environmental Affairs Comments:

For your information, a Conservation District Use Application (CDUA) and land disposition are required for the proposed cable landings on State beaches and submerged land. In addition, to reduce the impact of cabling on the shoreline and nearshore environment, we recommend that any future cable easements be located in areas which have already been disturbed such as Makaha, Makapuu, and Yokohama, ect.

Thank you for your cooperation in this matter. Please feel free to call Sam Lemmo at our Office of Conservation and Environmental Affairs, at 587-0377, should you have any questions.

Very truly yours,

for John P. Keppeler II

WILLIAM W. PATY

R. M. TOWILL CORPORATION

420 Waiakamilo Rd. #411 Honolulu, HI 96817-4941 (808) 842-1133 Fax (808) 842-1937

July 30, 1992

William W. Paty
Chairperson
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Paty:

SUBJECT: Special Management Area Use Permit (SMP) and Shoreline Setback Variance (SSV) Environmental Assessments for Sandy Beach Park and Kahe Point Beach Park, Oahu, Hawaii, TMK: 3-9-12: 2 and 9-2-3: 15

This is in response to your letter to the City Department of Land Utilization, dated June 16, 1992, which was forwarded to us by them. We wish to offer you the following comments:

GENERAL COMMENTS

The following points should be clarified regarding the description of the fiber optic cable landing activity:

- The 3" diameter of the fiber optic cable includes cable armoring which surrounds the 12-fiber optic strands in the cable center. Split pipe armoring will be used to provide additional cable protection and to help anchor the cable to the ocean bottom.
- Once the cable ship assumes a position close to shore, small surface vessels such as boston whalers or motorized inflatable boats (e.g., zodiacs), will pull the cable from the ship to an awaiting shore party, which will place the cable in the manhole.

DIVISION OF AQUATIC RESOURCES COMMENTS

Selection of both Sandy Beach and Kahe Point are largely based on GTE Hawaiian Tel's requirement that the fiber optic cables be located as close as practicable to the phone company's Central Offices. This is necessary because of the need to ensure protection and reliability for the interisland communications service the fiber optic cable will provide. Each Central Office is designed and constructed to ensure safety and security from both man-made and natural hazards (e.g., terrorist activity, vandalism, major storms, and seismic

disturbances). The Sandy Beach and Kahe Point Beach sites are in good proximity to GTE Hawaiian Tel Central Offices, and addresses this need for security.

SITE LOCATION
Although both the AT&T (Keawaula Bay) and GTE Hawaiian Tel projects involve landing a submarine fiber optic cable on shore, they differ in construction needs due to nearshore conditions. Keawaula (Yokohama) Bay has a sandy nearshore area, whereas both Sandy and Kahe Point Beach have relatively rocky shorelines. At Keawaula, once the cable was deployed there was good opportunity for it to sink into the substrate and be covered by the naturally occurring shifting of the substratum (sand deposits). This is obviously not possible if the substratum is rock, which is the case at Sandy and Kahe Point Beach. The rocky substratum will require that either trenching, or split pipe anchoring be implemented to protect the cable.

CONSTRUCTION EFFORT
The greatest danger to a cable system is the submarine portion of the route, and this necessitates more construction effort than the landside portion. Protection of the cable and public safety are the major factors for ensuring the fiber optic cable is covered or anchored in nearshore waters. Approximately 50 to 60 feet of water will be required before wave forces diminish to levels where wave action does not affect the cable. Until the cable reaches this depth it must be protected. Trenching is preferred, because it provides maximum protection against wave forces and is best for public safety. Public safety is at risk if the cable is left exposed along the nearshore, because someone could trip over it or hit their foot against it. Therefore, GTE Hawaiian Tel must do trenching or cable armoring at Sandy Beach and Kahe Point Beach, in order for the cable and public safety to be protected.

Wherever feasible, however, split pipe will be utilized to minimize turbidity and reduce potential for impacts to marine habitat. We note that in utilizing both trenching and split pipe, that the operations will be short term, will be based on the need for public safety and protection for the cable, and will not constitute a long-term adverse impact.

NEED FOR FUTURE CAPACITY
Future capacity was a major determinant in utilizing fiber optic technology. The proposed cable has a projected 20-year+ service life and is designed to meet GTE Hawaiian Tel's projections for growth well into the 21st century. This is based on GTE Hawaiian Tel's best forecasting capability and is itself an effort to minimize need for additional cables and unnecessary disturbance to the environment.

The use of additional conduits at each of the landing sites are intended for future use beyond the service life of the proposed cable. Should future expansion be required above expectations for growth, the additional conduits will help minimize need for extensive shoreside construction activity to again site a new fiber optic cable.

CONSOLIDATION OF CABLE ALIGNMENTS
Consolidation of cable alignments was considered, but is constrained by the need to locate the cable landing sites as near to Central Offices as possible. The only island where this was not feasible was Kauai, due to poor coastline conditions near the Lihue Central Office. The nearshore area consisted of numerous rock and coral outcrops and would have required extensive cable trenching, anchoring, and armoring. In addition, a steep underwater offshore ledge and a high and steep on-shore bank would have resulted in need for major site excavation activities.

HANAUMA BAY MARINE LIFE CONSERVATION DISTRICT (MLCD)
Use of the old cable easement in Hanauma Bay is not recommended due to the construction work required to lay a new cable. The old cable and easement has since been covered by coral and sediments which are now part of the Hanauma Bay Marine Life Conservation District, established in 1967. In order to utilize this site, major coral and rock outcrops would have to be demolished, much as they were when the old cable was deployed. In addition, there has already been strong public interest and demand for greater environmental protection of Hanauma Bay, and any request for ocean construction and temporary closure of the beach would probably be viewed negatively.

HISTORIC PRESERVATION DIVISION COMMENTS

Thank you for confirming that the historic preservation review process is complete for the Sandy Beach Park project. We are presently working with the Department of Land and Natural Resources, Historic Preservation Division, concerning archaeological recommendations for the Kahe Point Beach project.

OFFICE OF CONSERVATION AND ENVIRONMENTAL AFFAIRS COMMENTS

A CDUA and land disposition are being filed for the proposed landings on State beaches and submerged lands. We agree that when practical cable easements should be located in areas which have already been disturbed such as Makaha, Makapuu, and Yokohama. However, as noted, the landing sites were selected based on specific criteria which required locations which could not be the same as those which have already been utilized.

Thank you for this opportunity to respond. Should you wish to make any additional comments please contact us at our above address.

Very truly yours,

Brian Takeda

Brian Takeda
Senior Planner

cc Joan Takano, DLU, C&C Honolulu
Patrick Mau, GTE Hawaiian Tel
SK, CK, RDE, KY RMTC

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU HAWAII 96843

(2)

June 18, 1992

'92 JUN 19 PM 1 55

TO: DONALD A. CLEGG, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: FOR KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR MEMORANDUM DATED MAY 11, 1992 REGARDING THE SPECIAL MANAGEMENT AREA USE PERMIT, (SMP), (92/SMA-41 & 42), AND SHORELINE SETBACK VARIANCE, (SV), (92/SV-004 & 005), ENVIRONMENTAL ASSESSMENTS FOR THE PROPOSED GTE HAWAIIAN TEL INTERISLAND FIBER OPTIC CABLE SYSTEM, SANDY BEACH PARK, TMK: 3-9-12: 2 AND KAHE POINT BEACH PARK, TMK: 9-2-03: 15

We have no objections to the proposed Fiber Optic Cable System projects at Sandy Beach Park and Kahe Point Beach Park.

For areas where the proposed projects may affect our existing water facilities, the construction drawings should be submitted for our review and approval.

If you have any questions, please contact Bert Kuioka at 527-5235.

R. M. TOWILL CORPORATION
420 Waiakamilo Rd #411 Honolulu HI 96817-4941 (808) 842-1133 Fax (808) 842-1937

July 20, 1992

Kazu Hayashida
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Hayashida:

SUBJECT: Environmental Assessment Reviews for GTE Hawaiian Tel to Land a Fiber Optic Cable at Sandy Beach Park and Kahe Point Beach Park, Oahu

Thank you for your letter dated June 18, 1992, relating to the proposed GTE Hawaiian Tel Fiber Optic Cable landings at Sandy Beach Park and Kahe Point Beach Park. We appreciated your review of these documents.

As requested, you will be provided with construction drawings for the Sandy Beach and Kahe Point Beach Park sites should any construction activities involve existing water facilities.

Should you have any additional questions or comments please contact us at our above address.

Very truly yours,

Brian Takeda

Brian Takeda
Senior Planner

cc Donald Clegg, C&C Honolulu
Patrick Mau, GTE Hawaiian Tel
RDE, CK, SK RMTC

JOHN WAIHEE
GOVERNOR

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

92-00204

REX D. JOHNSON
DIRECTOR

DEPUTY DIRECTORS
JOYCE T. OMINE
AL PANG
JEANNE K. SCHULTZ
CALVIN M. TSUDA

IN REPLY REFER TO
STP 8.4715

'92 JUN 17 AM 10 14

June 5, 1992

Mr. Donald A. Clegg, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

SUBJECT: Special Management Area Use Permit (SMP) and Shoreline Setback Variance (SV) Environmental Assessments

We reviewed the subject environmental assessment and do not believe that GTE Hawaiian Tel's proposal to develop an interisland submarine fiber optic cable system to link the island of Kauai, Oahu, Maui, and Hawaii will adversely impact our transportation facilities. However, all plans for work within the State highway rights-of-way must be submitted to our Highways Division for review and approval.

We have relocated all of our Pokai Bay boating facilities to the Waianae Boat Harbor and are, therefore, uncertain of any plans for future harbor expansion in this bay as stated on Page 13, last paragraph, of the environmental assessment report.

We appreciate this opportunity to provide comments.

Sincerely,

Rex D. Johnson
Director of Transportation

R. M. TOWILL CORPORATION

420 Waiakamilo Rd #411 Honolulu HI 96817-4941 (808) 842-1133 Fax (808) 842-1937

July 20, 1992

Rex D. Johnson, Director
State Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

Dear Mr. Johnson:

SUBJECT: Environmental Assessment Reviews for GTE Hawaiian Tel to Land a Fiber Optic Cable at Sandy Beach Park and Kahe Point Beach Park, Oahu

Thank you for your letter dated June 5, 1992, concerning the subject proposal. We appreciated your review of the documents. As requested, your State Highways Division will be provided with construction drawings of all work to be conducted within the State highway rights-of-way, for review and approval.

We have also noted your point of clarification regarding the uncertain future of harbor expansion at Pokai Bay, Waianae.

Should you have any additional questions or comments please contact us at our above address.

Very truly yours,

Brian Takeda
Senior Planner

cc Donald Clegg, C&C Honolulu
Patrick Mau, GTE Hawaiian Tel
RDE, CK, SK RMTC

Engineers Planners Photogrammetrists Surveyors Construction Managers

DEPARTMENT OF THE ARMY

U. S. ARMY ENGINEER DISTRICT, HONOLULU

BUILDING 230

FT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

June 12, 1992

'92 JUN 15 PM 3 48

(4)

Planning Division

Mr. Donald A. Clegg
Director of Land Utilization
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Thank you for the opportunity to review and comment on the Special Management Area Use Permit (SMP) and Shoreline Setback Variance (SV) environmental assessments and applications for the proposed GTE Hawaiian Tel Interisland Fiber Optic Cable System at Sandy Beach Park (TMK 3-9-12:2) and Kahe Point Beach Park (TMK 9-2-3:15), Oahu. The following comments are provided pursuant to Corps of Engineers authorities to disseminate flood hazard information under the Flood Control Act of 1960 and to issue Department of the Army permits under the Clean Water Act; the Rivers and Harbors Act of 1899; and the Marine Protection, Research and Sanctuaries Act.

a. Representatives from the R. M. Towill Corporation have met with the Operations Division and are aware that a Department of the Army permit is required. File number PO92-078 has been assigned to this project. Should you have any questions, please contact the Operations division at 438-9258 and cite the file number.

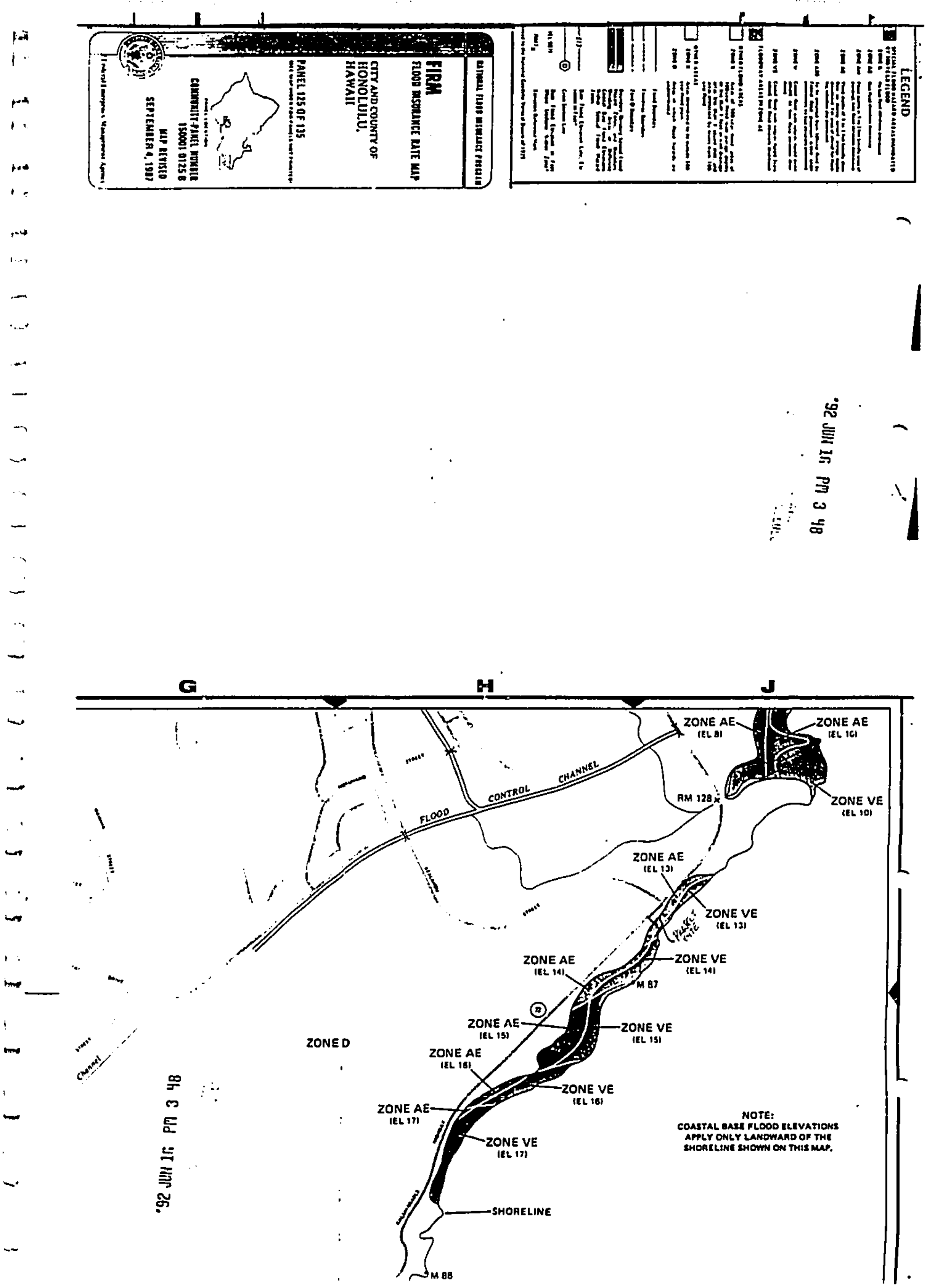
b. According to the Federal Emergency Management Agency's Flood Insurance Rate Map (FIRM), Panel 150001-0125-B, dated September 4, 1987 (copy enclosed), the Sandy Beach Park project site is located in Zone AE (areas inundated by the 100-year flood, with a base flood elevation of 13.0 feet above mean sea level); Zone D (areas in which flood hazards are undetermined); and Zone VE (areas inundated by the 100-year coastal flood with velocity hazards and a base flood elevation of 13 feet above mean sea level).

c. According to the FIRM, Panel 150001-0130-C, dated September 28, 1990 (copy enclosed), the Kahe Point Beach Park project site is located in Zone D.

Sincerely,

Kisuk Cheung, P.E.
Director of Engineering

Enclosures


NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
CITY AND COUNTY OF
HONOLULU,
HAWAII
PANEL 125 OF 135
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Federal Emergency Management Agency
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NOTE:
COASTAL BASE FLOOD ELEVATIONS
APPLY ONLY LANDWARD OF THE
SHORELINE SHOWN ON THIS MAP.
SHORELINE
M 88

R. M. TOWILL CORPORATION

420 Waiakamilo Rd. #411 Honolulu, HI 96817-4941 (808) 842-1133 Fax (808) 842-1937

July 20, 1992

Kisuk Cheung, P.E.
Director of Engineering
Department of the Army
U.S. Army Engineer District, Honolulu
Building 230
Fort Shafter, Hawaii 96858-5440

Dear Mr. Cheung:

SUBJECT: Environmental Assessment Reviews for GTE Hawaiian Tel to Land a Fiber Optic Cable at Sandy Beach Park and Kahe Point Beach Park, Oahu

Thank you for your letter and attached FEMA Flood Insurance Rate Maps, dated June 12, 1992. Your department provided useful information which will assist us when we are ready to file the Department of the Army permit.

Should you have any additional questions or comments please contact us at our above address.

Very truly yours,

Brian Takeda

Brian Takeda
Senior Planner

cc Donald Clegg, C&C Honolulu
Patrick Mau, GTE Hawaiian Tel
RDE, CK, SK RMTC

JOHN WAIHEE
GOVERNOR OF HAWAII

'92 JUN 15 AM 10 00

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

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

In reply, please refer to:

June 9, 1992 (5) 92-176/epo

Mr. Donald A. Clegg
Director, Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Subject: Special Management Area Use Permit (SMP) Shoreline Setback Variance for GTE Hawaiian Tel Interisland Fiber Optic Cable System Sandy Beach Park and Kahe Point Beach Park, Oahu
THK: 3-9-12:2 and 9-2-3:15

Thank you for allowing us to review and comment on the subject request. We have no comments to offer at this time.

Sincerely,

JOHN C. LEWIN, M.D.
Director of Health

R. M. TOWILL CORPORATION

420 Waiakamilo Rd #411 Honolulu HI 96817-4941 (808) 842-1133 Fax (808) 842-1937

July 20, 1992

John C. Lewin, M.D.
Director
State Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

Dear Dr. Lewin:

SUBJECT: Environmental Assessment Reviews for GTE Hawaiian Tel to Land a Fiber Optic Cable at Sandy Beach Park and Kahe Point Beach Park, Oahu

Thank you for your letter dated June 9, 1992, relating to the proposed GTE Hawaiian Tel Fiber Optic Cable landings at Sandy Beach Park and Kahe Point Beach Park. We appreciated your review of these documents.

Should you have any additional questions or comments please do not hesitate to direct them to our above address.

Very truly yours,

Brian Takeda
Senior Planner

cc Donald Clegg, C&C Honolulu
Patrick Mau, GTE Hawaiian Tel
RDE, CK, SK RMTC

Engineers Planners Photogrammetrists Surveyors Construction Managers

LU6/92 428

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU

(6)

TE-2061
PL92.1.159

June 4, 1992

'92 JUN 5 AM 10 39

MEMORANDUM

TO: DONALD A. CLEGG, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: JOSEPH M. MAGALDI, JR., DIRECTOR

SUBJECT: GTE HAWAIIAN TEL INTERISLAND FIBER OPTIC CABLE SYSTEM, ENVIRONMENTAL ASSESSMENT
TMK: 3-9-12: 2; 9-2-03: 15

This is in response to your memorandum dated May 11, 1992 requesting our comments on the subject environmental assessment.

We have no objections to the proposed project; however, the Honolulu Public Transit Authority should be contacted regarding the temporary relocation of the bus stop at the intersection of Kalanianaole Highway and Kealahou Avenue.

Construction plans for all work within the City's right-of-way should be submitted to our department for review.

Should you have any questions, please contact Lance Watanabe of my staff at local 4199.

JOSEPH M. MAGALDI, JR.

R. M. TOWILL CORPORATION

420 Waiakamilo Rd #411 Honolulu, HI 96817-4941 (808) 842-1133 Fax (808) 842-1937

July 20, 1992

Joseph M. Magaldi, Jr., Director
Department of Transportation Services
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Magaldi:

SUBJECT: Environmental Assessment Reviews for GTE Hawaiian Tel to Land a Fiber Optic Cable at Sandy Beach Park and Kahe Point Beach Park, Oahu

Thank you for your letter dated June 4, 1992, relating to the proposed GTE Hawaiian Tel Fiber Optic Cable landings at Sandy Beach Park and Kahe Point Beach Park. We appreciated your review of these documents.

As you have requested the following will be undertaken as soon as the necessary information is available:

1. The Honolulu Public Transit Authority will be contacted regarding the temporary relocation of the bus stop at the intersection of Kalanianaole Highway and Kealahou Avenue; and

2. Construction plans will be submitted to DTS for all work within the City & County of Honolulu right-of-way for review.

Should you have any additional questions or comments please contact us at our above address.

Very truly yours,

Brian Takeda
Senior Planner

cc Donald Clegg, C&C Honolulu
Patrick Mau, GTE Hawaiian Tel
RDE, CK, SK RMTC

LU5/92-4091

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

(7)

C. MICHAEL STREET
Acting Director and Chief Engineer

ENV 92-121

May 27, 1992

92 MAY 29 AM 10 27

MEMORANDUM

TO: MR. DONALD A. CLEGG, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: C. MICHAEL STREET, ACTING DIRECTOR AND CHIEF ENGINEER

SUBJECT: ENVIRONMENTAL ASSESSMENT (EA)
GTE HAWAIIAN TEL INTERISLAND FIBER OPTIC CABLE SYSTEM
TMK:3-9-12:2 & 9-2-3:15

We have reviewed the subject EA and have the following comments:

1. Utility locations in City property should be identified.
2. Will utility easements or right-of-ways be required to be acquired for the proposed project?

C Michael Street
C. MICHAEL STREET
Acting Director and Chief Engineer

R. M. TOWILL CORPORATION
420 Waiakamilo Rd #411 Honolulu, HI 96817-4941 (808) 842-1133 Fax (808) 842-1937

July 20, 1992

C. Michael Street
Acting Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Street:

SUBJECT: Environmental Assessment Reviews for GTE Hawaiian Tel to Land a Fiber Optic Cable at Sandy Beach Park and Kahe Point Beach Park, Oahu

Thank you for your letter dated May 27, 1992, relating to the proposed GTE Hawaiian Tel Fiber Optic Cable landings at Sandy Beach Park and Kahe Point Beach Park. We appreciated your review of these documents.

As you have requested, the following will be provided to your Department as soon as the necessary information is available:

1. Utility locations on City property which will affect the proposed cable alignment will be identified; and

2. Utility easements or right-of-ways that will be required for the subject proposal will also be identified.

Should you have any additional questions or comments please contact us at our above address.

Very truly yours,

Brian Takeda

Brian Takeda
Senior Planner

cc Donald Clegg, C&C Honolulu
Patrick Mau, GTE Hawaiian Tel
RDE, CK, SK RMTC

LU 5/92 4C1

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU HAWAII 96813

'92 MAY 26 AM 8 58

May 21, 1992

TO: DONALD A. CLEGG, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: WALTER M. OZAWA, DIRECTOR

SUBJECT: SPECIAL MANAGEMENT AREA USE PERMIT (SMP)
AND SHORELINE SETBACK VARIANCE (SV)
ENVIRONMENTAL ASSESSMENTS (EA)
PROJECT: GTE HAWAIIAN TEL INTERISLAND FIBER OPTIC CABLE
LOCATION: SANDY BEACH PARK AND KAHE POINT BEACH PARK
TAX MAP KEY: 3-9-12: 2 AND 9-2-03: 15
PROJ. REF. NO.: 92/SMA-41(JT); 92/SMA-42(JT); 92/SV-004(JT) & 92/SV-005(JT)

We have reviewed the EA and have no objection to the application for a SMP and SV for the proposed GTE Hawaiian Tel interisland fiber optic cable system.

Should you have any questions, please contact Lester Lai of our Advance Planning Branch at extension 4696.

For WALTER M. OZAWA, Director

WMO:ei

R. M. TOWILL CORPORATION

420 Waiakamilo Rd #411 Honolulu, HI 96817-4941 (808) 842-1133 Fax (808) 842-1937

July 20, 1992

Water Ozawa, Director
Department of Parks and Recreation
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Ozawa:

SUBJECT: Environmental Assessment Reviews for GTE Hawaiian Tel to Land a Fiber Optic Cable at Sandy Beach Park and Kahe Point Beach Park, Oahu

Thank you for your letter dated May 21, 1992, relating to the proposed GTE Hawaiian Tel Fiber Optic Cable landings at Sandy Beach Park and Kahe Point Beach Park. We appreciated your review of these documents.

Should you have any additional questions or comments please contact us at our above address.

Very truly yours,

Brian Takeda
Senior Planner

cc Donald Clegg, C&C Honolulu
Patrick Mau, GTE Hawaiian Tel
RDE, CK, SK RMTC

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

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May 11, 1992

LOG NO: 5289
DOC NO: 0723t

Mr. Brian Takeda
Senior Planner
R.M. Towill Corporation
420 Waiakamilo Road, Suite 411
Honolulu, HI 96817-4941

Dear Mr. Takeda:

SUBJECT: Chapter 6E Review -- Archaeological Assessment of the Proposed Fiber Optic Cable Landing for East O'ahu
Maunalua, Honolulu, O'ahu
<u>TMK: 3-9-12: 02</u>

Thank you for the opportunity to review this report (Borthwick & Hammatt 1992. Archaeological Assessment of the Proposed Fiber Optic Cable Landing for East O'ahu, Sandy Beach Park. Cultural Surveys Hawaii ms.), which is acceptable as an archaeological inventory survey report. Surface survey, excavation of a 50 x 50 cm test pit, and observation of a faced cut-bank in conjunction with previous sub-surface surveys in the immediate area are sufficient to find all historic sites. No historic sites were found. Therefore, we believe that the proposed fiber optic cable landing at this location will have "no effect" on historic sites.

Sincerely,

DON HIBBARD, Administrator
State Historic Preservation Division

TD:amk

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APPENDIX A

Marine Environmental Analysis of Selected Landing Sites

GTE Hawaiian Tel
Interisland Fiber Optic Cable System

MARINE ENVIRONMENTAL ANALYSIS OF SELECTED LANDING SITES

Prepared For:

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Prepared By:

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March 1992

91-85

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I. INTRODUCTION

GENERAL

GTE Hawaiian Tel is planning the installation of an Interisland Fiber Optic Cable System linking the islands of Kauai, Oahu, Maui and Hawaii. The site selection and evaluation process has been underway since early 1991, and Sea Engineering, Inc. has been retained over that period by the R.M. Towill Corporation to evaluate the marine considerations for potential landing sites and to assist in the preparation of the Environmental Assessments for the recommended landing sites. Dr. Richard Brock of the Environmental Assessment Company, a subconsultant to Sea Engineering, Inc., was responsible for characterizing the nearshore marine biological conditions along the cable routes and also assisted with the impact evaluation.

This report describes the nearshore marine selection process, the alternatives considered, the physical and biological characteristics of the nearshore cable routes, and the anticipated marine environmental impacts.

Figure 1 shows the interisland cable configuration and the recommended landing sites.

ROUTE SELECTION PROCESS

This report describes only the nearshore marine considerations of the selection process. Other considerations included land suitability, deep ocean conditions, public usage and terrestrial and marine impacts. A series of two Working Papers, prepared by the R.M. Towill Corporation (1991), describe in detail the overall selection process, the alternatives considered, and the rationale for the recommended routes.

The coastal sector boundaries for the potential cable landing sites were initially defined by two primary constraints:

1. The total cable length between central offices was limited to a maximum of 200 kilometers, and preferably to less than 185 km. Cable lengths over 200 km would require an expensive subsea repeater.

2. Proximity of the cable landing site to a central office was desirable, along with relatively easy access to the central office via available polelines, duct lines, or other GTE infrastructure.

Given these constraints, sectors of coastline were delineated which bounded the potential landing areas. An office evaluation of each coastal sector was then completed, utilizing existing literature, color aerial photographs, marine charts, coastal inventories prepared by state and federal agencies, and personal knowledge of nearshore physical and biological

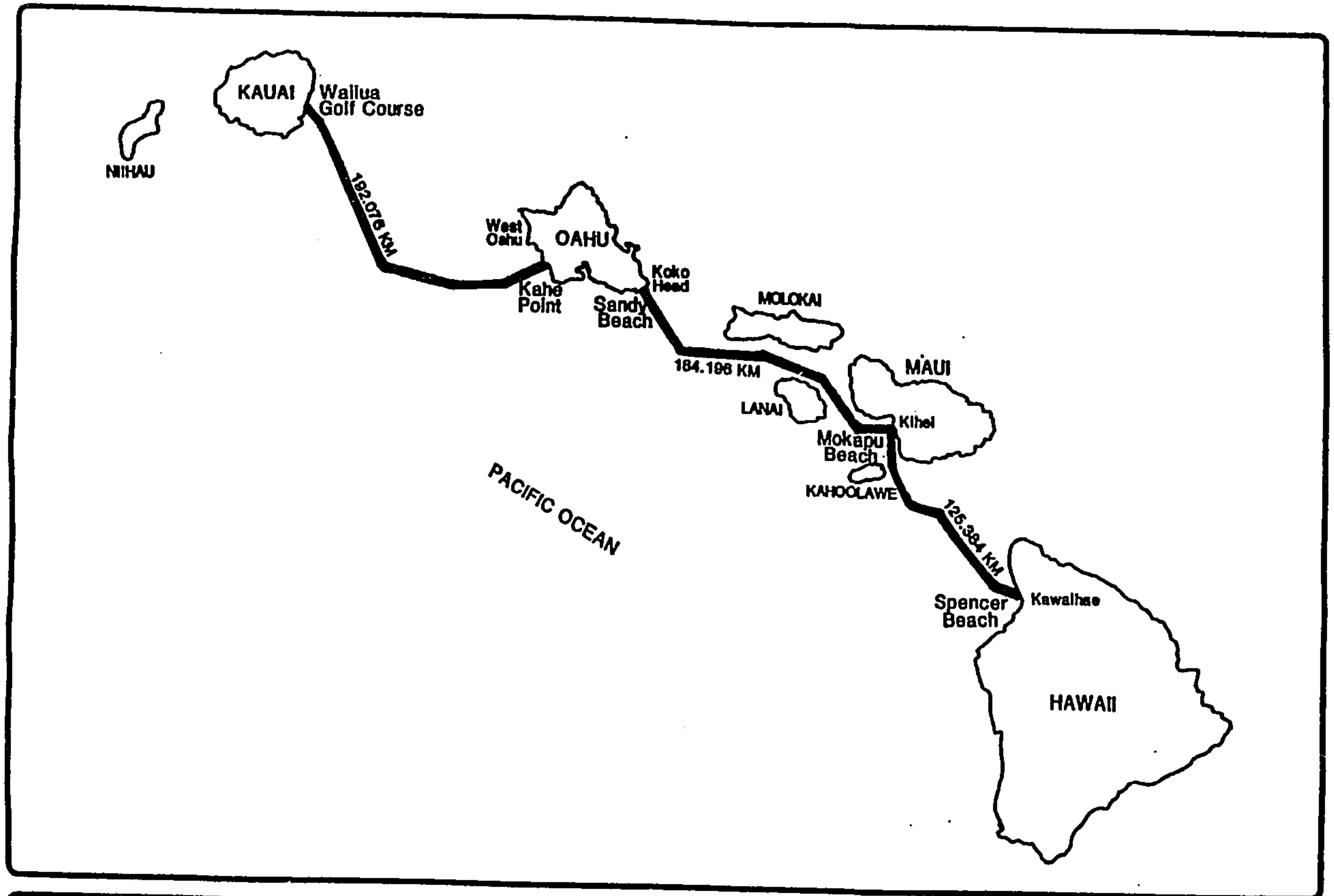


FIGURE 1. SUMMARY OF RECOMMENDED GTE HAWAIIAN TEL FIBER OPTIC LANDING SITES – STATE OF HAWAII

characteristics and uses. A one day field reconnaissance was then conducted in each sector to select three potential landing sites in each sector. If no suitable sites were found within the sector limits, the sector was enlarged as required.

Following the consolidation of all planning considerations mentioned above (terrestrial and marine) a more detailed field study was conducted at each site by an ocean engineer and marine biologist. The objective of this phase was to select the primary and secondary route alternatives.The marine biologist was incorporated into this phase of the study to conduct a preliminary assessment of the selected alternatives and to ensure that there were no overriding environmental constraints.

After initial approval by the client of the recommended route, a detailed bathymetric survey was conducted at each site. During this survey, while accurate positioning equipment was available, a diver was towed along the route centerline, and his visual observations were correlated with the track line and the water depth. This step provided valuable information about the precise conditions along the route, and also ensured that there were no unexpected conditions in the nearshore area.

One additional field trip was made to each site, for the express purpose of describing the physical and biological characteristics of the route and adjacent areas, and to evaluate the potential environmental impacts.

The limit of the diving surveys was the 100 foot depth contour. However, the diving support vessels were equipped with fathometers, and preliminary track lines were run to approximately the 180 foot depth to ensure that no steep ledges were encountered beyond the limit of the visual survey.

MARINE SELECTION CRITERIA FOR NEARSHORE CABLE ROUTE EVALUATION

Throughout the cable route selection and evaluation process the primary objective was to find a suitable, safe cable route which would also result in the minimum environmental impacts for in that sector.

Specific selection criteria included the following:

1. Sandy bottoms and coastlines were preferred, both for integrity of the cable and to minimize environmental impacts. Experience at other cable landing sites on Oahu (Makua Beach, Makaha Beach and Nanakuli Beach) indicates that cables on sandy bottoms tend to sink into the sand. No cable cross section is exposed, and wave forces on the cables are therefore minimal. In most of these areas, the winter surf and shorebreak can be very large, yet the numerous cables making landfall there have remained stable.

   Hawaii beaches are usually in a dynamic balance with a large offshore sand deposit, and the two are frequently linked by a continuous sand channel, thus providing the ideal configuration for a cable route. In addition to the engineering advantages, the environmental effects of a placing a cable on a sandy bottom are much less than placing one across a diverse coral community.

2. Minimizing the horizontal distance from the shoreline to the 60 foot depth was another important factor. This is the zone of maximum wave forces, and the assumption was made that some form of cable protection or anchoring would be required when crossing any hard bottom inshore of the 60 foot contour. This distance also affects the cable landing process. The cable ship can approach shore to approximately the 50 or 60 foot depth, where it is then held in place by tug boats. As the cable is towed to shore by a small boat or tug, floats are attached to the cable as it is paid out, so that it floats on the surface until the shore connection is secured. During this time, the cable position must be maintained along the route centerline. Strong currents or long distances make this process more difficult. The goal was to select a route where the distance from shore to the 60 foot contour was less than 4000 feet.

3. There is a semi-continuous ledge which drops off from the 60 foot contour, and extends through many of the coastal sectors of Hawaii. This ledge was formed during an ancient stand of the sea, and typically has a vertical drop of 30 feet or more. This ledge was present in the Kauai sector, both Oahu sectors and the Maui sector. It was therefore important to find a route which either avoided the ledge or passed through a channel in the ledge. Fortunately, the sand channels connecting the beaches to the deeper offshore deposits often bisect the ledge.

4. Routes were selected to avoid, to the maximum extent possible, environmentally sensitive areas or areas frequented by rare or endangered species. A specific example was the avoidance of areas used by green sea turtles for resting or forage. The marine biological consultant was an early participant in the study, so that environmental input was received during the initial route evaluations.

II. GENERAL OCEANOGRAPHIC CHARACTERISTICS

WINDS

The predominant winds in the Hawaiian Islands are the northeast trades, which are present approximately 70 percent of the time with an average speed of 13 mph. The frequency of tradewinds varies greatly with the season. They occur 90 percent of the time during the months of April to October. The winter season (November to March) is defined by a weakening of the high pressure system generating the tradewinds, and the frequency of occurrence decreases to approximately 50 percent. During the winter season, low pressure systems periodically displace the tradewinds, resulting in south or southwest winds known as "Kona" winds. Kona winds, which occur rarely in summer and 17 percent of the time in the winter, range from light and variable to gale or hurricane force.

PREVAILING WAVE CLIMATE

The general Hawaiian wave climate can be described by four primary wave types; the northeast tradewind waves, south swell, North Pacific swell and kona storm waves. These wave types and their general approach direction are shown on Figure 2.

Tradewind waves may be present in Hawaiian waters throughout the year, but are most frequent in the summer season, between April and September, when they usually dominate the Hawaiian wave climate. They result from the strong and steady tradewinds blowing from the northeast quadrant over long fetches of open ocean. Typical deepwater tradewind waves have periods of 5 to 8 seconds and heights of 4 to 10 feet. During gale conditions tradewind waves may reach heights in excess of 20 feet.

South swell is generated by southern hemisphere storms, and is most prevalent during the months of April through October. These long, low waves approach from the southeast through southwest, with typical periods of 12 to 20 seconds and deepwater heights of 1 to 4 feet. Although their deepwater height is relatively low, the long period results in considerable shoaling near shore with resultant large breaker heights. The surf along the exposed south shores of the islands occasionally reaches heights of 15 feet.

North Pacific swell is produced by winter storms in the North Pacific Ocean and by mid-latitude low pressure areas. North swell may arrive in the Hawaiian Islands throughout the year, but is largest and most frequent during the winter months of October through March. North Pacific swell typically has periods of 12 to 20 seconds and deepwater heights of 5 to 15 feet. The approach direction is typically from the west-northwest through north-northeast. North Pacific swell results in some of the largest waves in Hawaiian waters. For example, breaking wave heights approaching 50 feet were observed in December 1969.

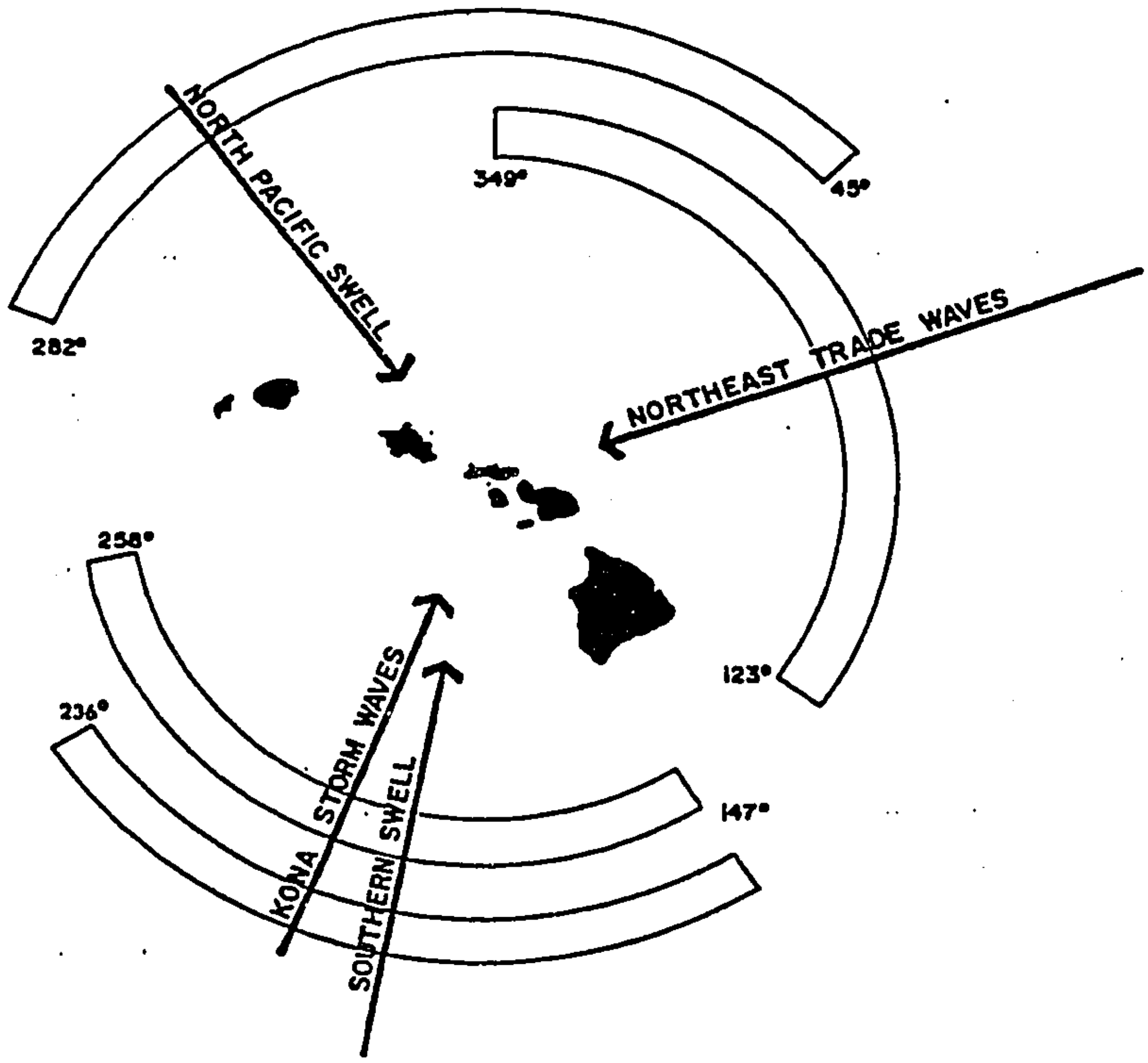


FIGURE II-1.
GENERALIZED WAVE TYPES
(Adapted From The Atlas of Hawaii)

Kona storm waves are generated by intense winds associated with local fronts or low pressure systems and typically have periods ranging from 6 to 10 seconds and typical heights up to 10 feet, but during severe storms heights can approach 20 feet. These waves are most common in late winter and early spring, approaching from the south to southwest.

Hurricane Storm Waves

Hurricanes form near the equator, and in the central North Pacific usually move toward the west or northwest. The primary hurricane season is July through September. These tropical storms or hurricanes usually pass south of the Hawaiian Islands, with a northward curvature near the islands. Late season tropical storms and hurricanes follow a somewhat different track, forming south of Hawaii and moving north toward the islands.

There are many recorded tropical storms or hurricanes which have approached the Hawaiian Islands during the past 35 years, and hurricane waves are generally selected as the design criteria for coastal projects. Most of these storms passed well south or west of the islands, or weakened in intensity as they reach Hawaii, but there have been notable exceptions. Hurricanes Hiki, Della, Nina and Fico passed within about 200 miles of the islands, Dot passed over Kauai, and Iwa passed with 30 miles of Kauai. Kauai.

The report Hurricanes in Hawaii (Haraguchi, 1984), prepared for the U.S. Army Corps of Engineers presents hypothetical model hurricanes for the Hawaiian Islands. The model Hawaiian Hurricane is defined as the probable hurricane that will strike the Hawaiian Islands in the future. The characteristics of the model hurricane are based on the characteristics of hurricanes Dot and Iwa. The predicted wave height and period for the model hurricane are calculated to be 31 feet and 12.0 seconds. This is a worst case scenario; the actual likelihood of this occurring at one particular site is very low. It is more likely that the storm would pass at some distance, thus the wave height at a particular site would depend on the storm track and decay distance over which the waves travel.

TIDES

The tides in Hawaiian waters are semi-diurnal, with pronounced diurnal inequalities (i.e. two tidal cycles per day with the range of water levels being unequal). The average daily tidal range is approximately 2 feet, and the maximum annual range is 2.8 feet.

COASTAL CURRENTS

Coastal currents in Hawaii are influenced by several factors: large scale oceanic currents, tidal currents, wind-driven currents, waves, and island topography. Hawaii is located in the region of the Pacific North Equatorial current, which generally flows to the west with current speeds ranging from 0.1 to 1 knot. The current direction may vary from west southwest to north-northwest, and the average speed is estimated to be approximately 0.5 knots. Eddies may form in this current as it passes through the islands. Large scale eddies may also be caused by wind circulation patterns around the large mountains on the islands, and small scale eddies may be caused by local landforms.

In most nearshore locations in Hawaii, the tidal flow is the primary current component. Tidal currents are reversing and generally follow bathymetric contours. The maximum tidal current speed in most locations is 2 knots, with speeds of 0.3 to 1.0 knot being typical. Surface currents are modified by the prevailing winds. Past studies around Oahu have indicated that the top 5 to 15 feet of the water column is influenced during moderate trade wind conditions.

The resultant circulation at any particular location is due to a combination of the above factors.

TSUNAMIS

Tsunamis, or seismic sea waves, are primarily generated by submarine earthquakes and earth movement with magnitudes greater than about 6.5 on the Richter scale. Coastal and submarine landslides and volcanic eruptions can also generate tsunamis. The Hawaiian Islands are directly exposed to the major tsunami wave generating areas in the Pacific Ocean: the Kuril-Kamchatka-Aleutian region of the north and northwestern Pacific, the west coast of South America, and the seismically active southwest Pacific. Over 80 tsunamis have been observed in the Hawaiian Islands since 1813, and 22 of them resulted in significant damage. The most damaging occurred in 1946 when an earthquake in the East Aleutian Islands generated a tsunami which killed 173 people in Hawaii and caused $26 million in property damage in Hilo alone.

Tsunami wave periods vary from 5 minutes to over 1 hour. Tsunami wave heights in the deep ocean are only a foot or two and their passage is generally not noticeable. However, in coastal regions, the tsunami wave may be subject to extensive transformation by the shallow water processes of refraction and shoaling, and also resonance in bays and harbors, and it may result in a much amplified wave height at the shoreline. A manual was developed for the U.S. Army Corps of Engineers, Pacific Ocean Division to determine tsunami wave elevations along the coastlines of Hawaii for various frequencies of occurrence (M & E Pacific, Inc., 1978). Tsunami runup elevations computed for 50 and 100 year tsunamis in the landing site areas are presented in later sections of this report, with the calculations based upon procedures in the manual.

III. METHODOLOGY FOR MARINE BIOLOGICAL SURVEYS

GENERAL

The quantitative sampling of macrofauna of marine communities presents a number of problems; many of these are related to the scale on which one wishes to quantitatively enumerate organism abundance. Marine communities in the areas surveyed for this project may be spatially defined in a range on the order of a few hundred square centimeters (such as the community residing in a Pocillopora meandrina coral head) to major biotopes covering many hectares. Recognizing this ecological characteristic, the sampling program was designed to delineate all major communities in the limits of the study areas and to quantitatively describe these communities. Thus a number of methods were used.

To obtain an overall perspective on the extent of the major communities or "zones" occurring in the study area, divers were slowly towed behind a skiff over most of the study site from shore seaward to at least the 80 foot contour. This exercise allowed the qualitative delineation of major biotopes based partially on the presence of large structural elements (e.g., amount of sand, hard substratum, fish abundance, coral coverage or dominant coral species). Within each of these, stations were established and quantitative studies were conducted, including a visual enumeration of fish, counts along benthic transect lines and cover estimates in benthic quadrants. Besides these quantitative measures, a qualitative reconnaissance was made in the vicinity of each station by swimming and noting the presence of species not encountered in the transects. All assessments were carried out using SCUBA.

Biotopes are defined by physical characteristics including water depth, relative exposure to wave and current action, and the major structural elements present in benthic communities. The latter include the amount of sand, hard substratum, and vertical relief present as well as the biological attributes of relative coral coverage, fish abundance, and dominant species of the coral community. Biotopes are named for the distinctive features of the zone. It should be noted that the boundaries of each zone are not sharp but rather grade from one to another; these are ecotones or zones of transition.

The locations of stations were subjectively chosen as being representative of a given biotope. Immediately following station selection, a visual census of fishes was undertaken to estimate their abundance. These censuses were conducted over a 4 x 25 meter corridor and all fishes within this area from the bottom to the water surface were counted. Data collected included the number of individuals of each species as well as an estimate of individual lengths of all fishes seen; the length data were later utilized in estimating the standing crop of fishes present at each station using linear regression techniques (Ricker 1975, Brock and Norris 1989). A single diver equipped with SCUBA, transect line, slate and pencil would enter the water, count and note all fishes in the prescribed area (method modified from Brock 1954). The 25m transect line was paid out as the census progressed, thereby avoiding any previous underwater activity in the area which could frighten wary fishes.

Fish abundance and diversity is often related to small-scale topographical relief over short linear distances. A long transect may bisect a number of topographical features (e.g., coral mounds, sand flats and algal beds), thus sampling more than one community and obscuring distinctive features of individual communities. To alleviate this problem, a short transect (25m in length) has proven adequate in sampling many Hawaiian benthic communities (Brock and Norris 1989).

Besides frightening wary fishes, other problems with the visual census technique include the underestimation of cryptic species such as moray eels or puhis (family Muraenidae) and nocturnal species, e.g., squirrel fishes or ala'ihis (family Holocentridae), aweoweos or bigeyes (family Priacanthidae), etc. This problem is compounded in areas of high relief and coral coverage affording numerous shelter sites. Species lists and abundance estimates are more accurate for areas of low relief, although some fishes with cryptic habits or protective coloration (e.g., the nohus or rockfishes, family Scorpaenidae; the flat fishes or paki'is, family Bothidae) might still be missed. Obviously, the effectiveness of the visual census technique is reduced in turbid water and species of fishes which move quickly and/or are very numerous may be difficult to count and to estimate sizes. Additionally, bias related to the experience of the diver conducting counts should be considered in making any comparisons between surveys. In the present study, one individual carried out all of the visual censuses. In spite of these drawbacks, the visual census technique probably provides the most accurate nondestructive method available for the assessment of diurnally active fishes (Brock 1982).

After the assessment of fishes, an enumeration of epibenthic invertebrates (excluding corals) was undertaken using the same transect line as established for fishes. Exposed invertebrates usually greater than 2cm in some dimension (without disturbing the substratum) were censused in a 4 x 25m area. As with the fish census technique, this sampling methodology is quantitative for only a few invertebrate groups, e.g., some of the echinoderms (some sea urchins and sea cucumbers). Most coral reef invertebrates (other than corals) are cryptic or nocturnal in their habits making accurate assessment of them in areas of topographical complexity very difficult. This, coupled with the fact that the majority of these cryptic invertebrates are small, necessitates the use of methodologies that are beyond the scope of this survey (see Brock and Brock 1977). Recognizing constraints on time and the scope of this survey, the invertebrate censusing technique used here attempted only to assess those few macroinvertebrate species that are diurnally exposed.

Exposed sessile benthic forms such as corals and macrothalloid algae were quantitatively surveyed by use of quadrants and the point-intersect method. The point-intersect technique only notes the species of organism or substratum type directly under a point. Along the previously set fish transect line, 50 such points were assessed (once every 50cm). These data have been converted to percentages. Quadrant sampling consisted of recording benthic organisms, algae and substratum type present as a percent cover in six one-meter square frames placed at five-meter intervals along the transect line established for fish censusing (at 0, 5, 10, 15, 20 and 25m).

If macrothalloid algae were encountered in the 1 x 1m quadrants or under one of the 50 points, they were quantitatively recorded as percent cover. Emphasis was placed on those species that are visually dominant and no attempt was made to quantitatively assess the multitude of microalgal species that constitute the "algal turf" so characteristic of many corai reef habitats.

During the course of the fieldwork notes were taken on the number, size and location of any green sea turtles and other threatened or endangered species seen within or near the study area. With green turtles, efforts were made to record the size (straight line carapace length) of the individuals seen as well as the presence of tags, tumors or any deformities. We also attempted to note the presence of appropriate resting and foraging areas for green turtles.

IV. SANDY BEACH

ALTERNATIVES CONSIDERED

The area initially considered for the east Oahu cable landing extended from the Hawaii Kai Marina entrance channel to the north end of Kailua Bay, a distance of approximately 18 miles. This sector is shown on Figure IV-1 and encompasses some of the most rugged coastline on Oahu. Potential cable landing sites along this coastline are limited, and none are ideal. The areas initially considered but not selected are discussed below:

1. <u>Hawaii Kai</u>: Disadvantages at this location include the lack of offshore sand deposits and sandy beaches to utilize for a cable landing. The fringing reef off Hawaii Kai is approximately 3500 feet wide and is environmentally sensitive. In addition, the 60 foot contour is located 9000 feet offshore. This would have necessitated a long length of protected cable and a long and difficult cable pull to shore during the initial installation.

2. <u>Makapuu Beach</u>: A sand channel extending seaward from the south side of the beach provides a potential cable route. However, extremely heavy recreational use and the difficulty of heavy equipment access to that part of the beach precluded further consideration of this site.

3. <u>Makai Research Pier</u>: An advantage of this site is that the cable could make landfall at the end of the pier, thereby shortening the ocean route by 900 feet, and eliminating passage through the surf zone. A cable route located between Rabbit Island and Black Rock just to the south would minimize the distance between the landfall and the 60 foot contour. The bottom from the pier to Rabbit Island is composed of hard substrate, but is relatively flat. At the 35 foot depth contour, located 5000 from the end of the pier, a 30 foot vertical ledge drops to the 60 to 70 foot water depth. The cable would require protection from the ledge shoreward.

4. <u>Waimanalo and Kailua Bays</u>: Both these areas were extensively investigated, but a major disadvantage of this entire sector is the distance from the 60 foot contour to the shoreline, and the absence of suitable sand channels. This distance to the 60 foot contour varies from 9000 to 10000 feet throughout this area. In Waimanalo Bay, potential routes were found where the inshore 3500 feet were predominantly sand, but cable protection would have been required for the remaining 5500 feet. A shallow reef defines the seaward boundary of Waimanalo Bay, and also marks the end of the sand bottom. The reef is 4 to 8 feet deep, and is very irregular, with vertical relief of up to 8 feet. This zone extends seaward for approximately 2000 feet, out to the 20 foot depth contour. This shallow reef would present a formidable obstacle to cable placement, since this zone is also subjected to significant wave energy. Seaward of the this zone, the bottom is limestone rock and coral.

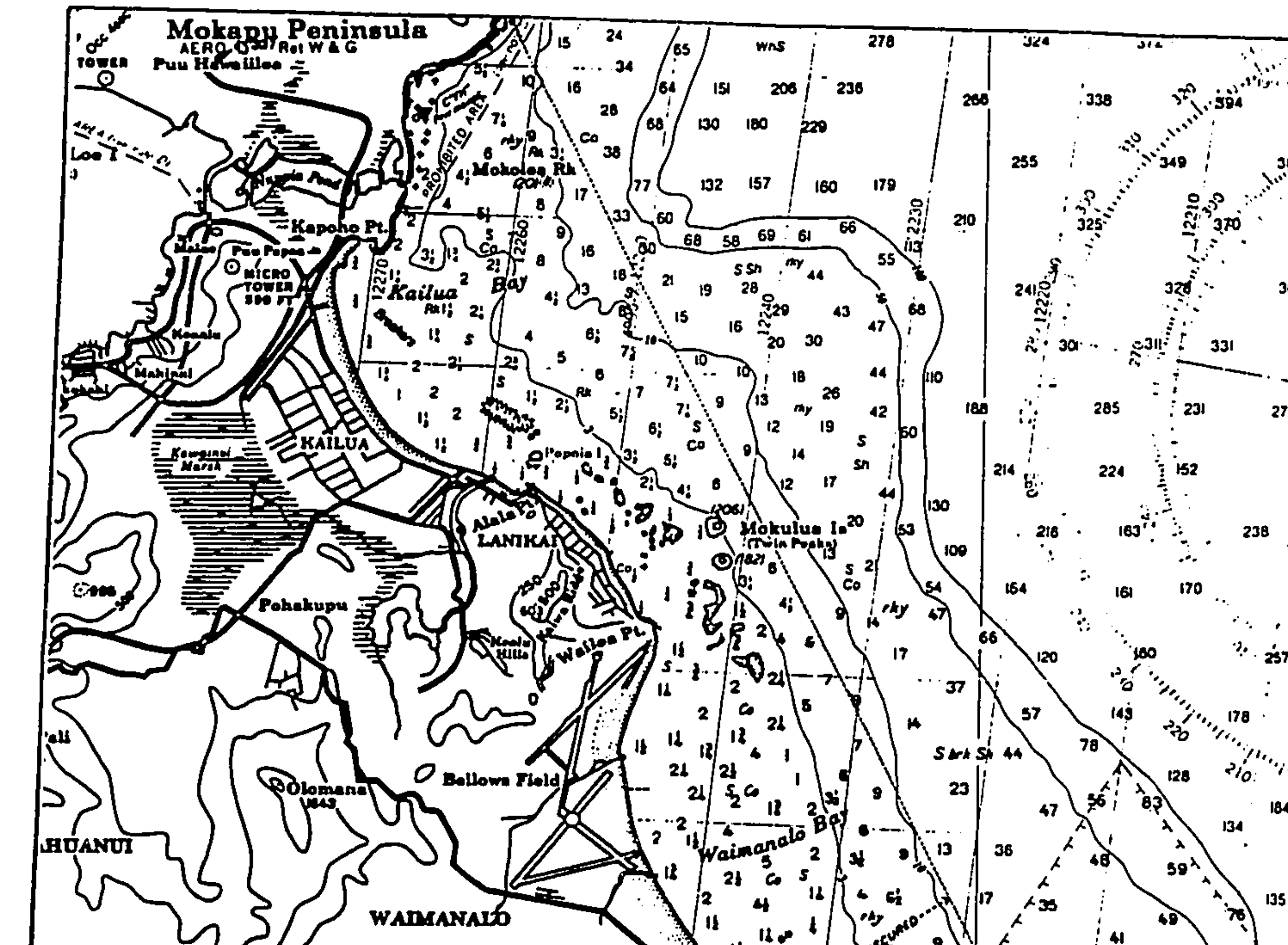


FIGURE IV-1

EAST OAHU SECTOR

There are no sand channels or deposits, but the bottom is relatively flat. Kailua Bay is very similar to Waimanalo Bay. There is one large offshore sand channel, but it is very irregular with steep ledges on its borders. A cable into Kailua Bay would cross predominately hard bottom and, in most areas, an irregular shallow reef just offshore.

DESCRIPTION OF THE SELECTED ROUTE

General

The recommended landing site is located at the eastern end of Sandy Beach in Keawaakio Cove. Figure IV-2, taken from the Oahu Coral Reef Inventory, shows details of the area. The Kalanianaole Highway bounds one side of the beach area. The waterline consists primarily of a rough basalt lava shelf and boulders that makes access to the water difficult. A narrow sand beach that is popular for sunbathing lies between the basalt shelf and the road. The beach is composed of medium grained, well sorted, calcareous sand. The nearshore bottom consists of hard rock. There is no fringing reef offshore; this shoreline is therefore fully exposed to storm waves and strong currents.

Shoreline History

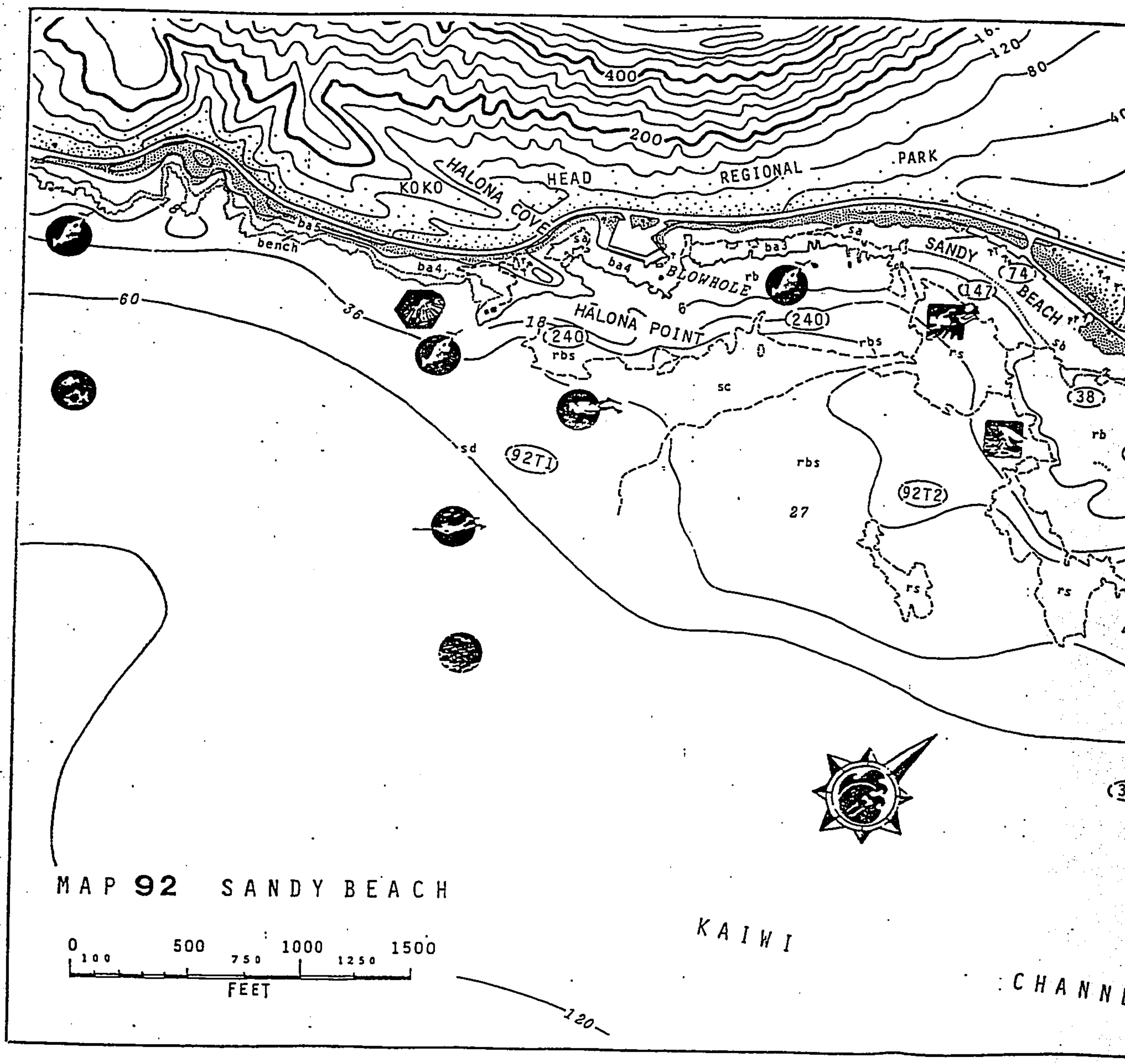
The beach at Keawaakio Cove lies landward of a basalt lava shelf located at the waterline. The lava shelf shelters the sandy areas from typical coastal processes that cause accretion and erosion. The beach has therefore remained relatively stable.

Existing Usage

The shoreline at Keawaakio Cove is heavily used because of its proximity to the comfort station and parking area. Because of the rocky shoreline and difficult ocean access, the recreational uses are primarily sunbathing and pole fishing. Experienced spear fishermen may enter the water at the cove, since there is less wave action here than at other locations within the park. There are no surf breaks within the cove. The main beach area of Sandy Beach begins 500 to 1000 feet to the west of the cove and is heavily used for beach and water activities. Additional facilities at Sandy Beach include another comfort stations, two lifeguard towers, and two other parking areas. The main beach area is heavily used for sunbathing, body surfing, and board surfing.

Physical Characteristics of the Selected Route

Figure IV-3 shows the orientation of the recommended cable route. The selection is based upon several localized factors:



400
200
120
80
KOKO HEAD REGIONAL PARK
HALONA COVE
ba5
bench
ba4
sa
ba3
BLOWHOLE
rb
SANDY BEACH
74
147
HĀLONA POINT
240
rbs
60
36
18
6
0
sc
sd
92T1
rbs
27
92T2
rs
38
rb
rs
MAP 92 SANDY BEACH
0 100 500 750 1000 1250 1500
FEET
KAIWI
CHANN
120

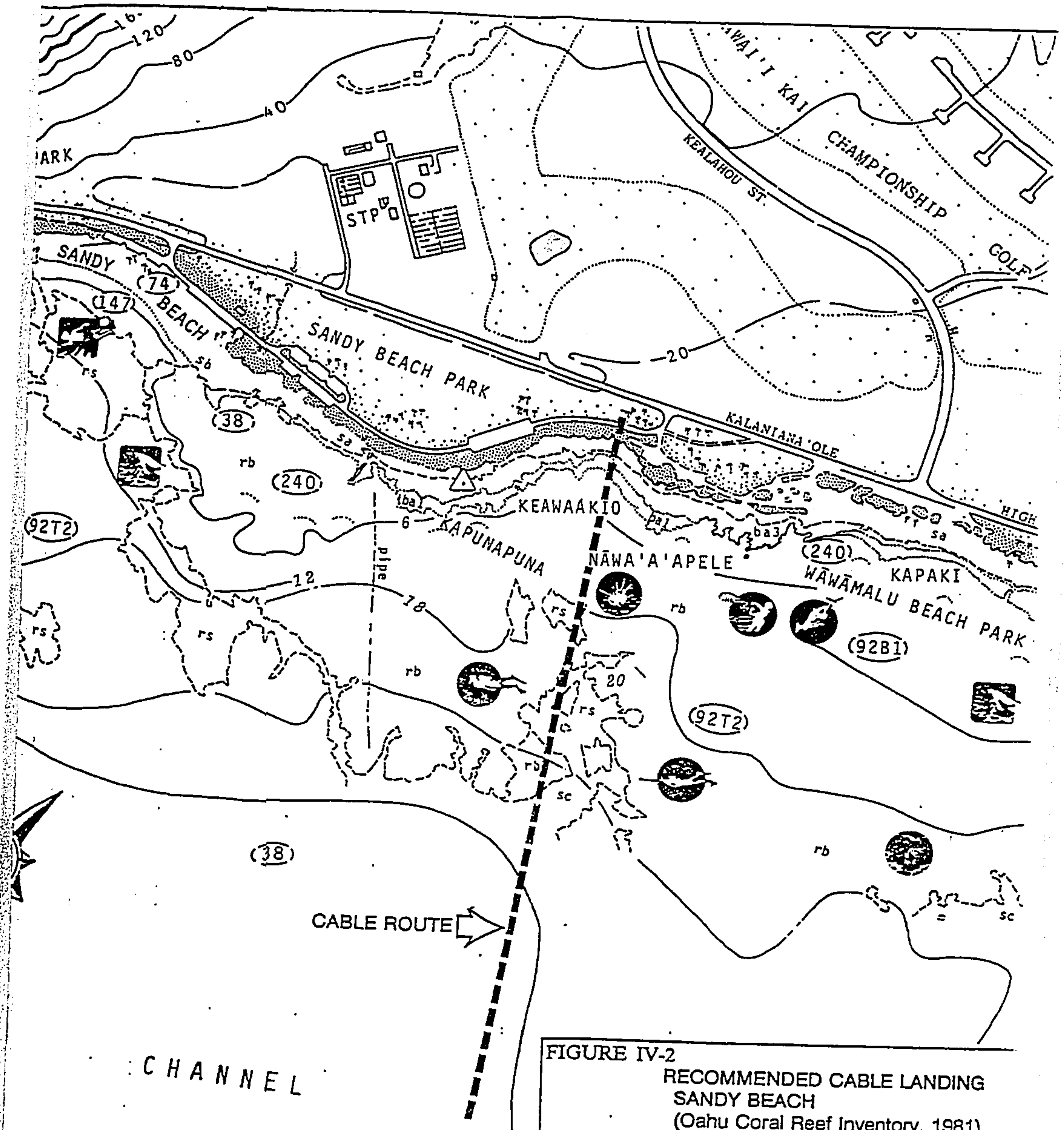
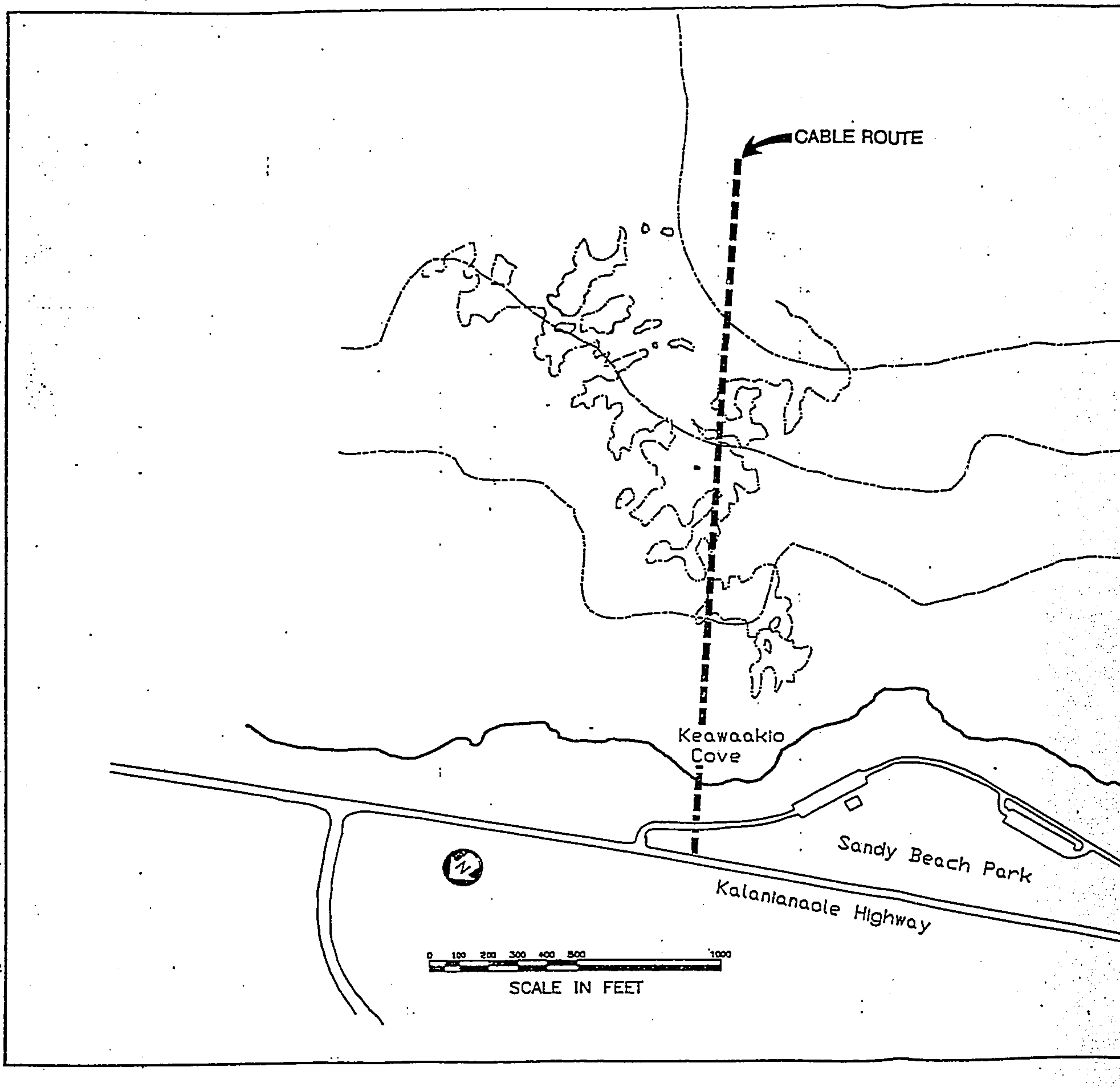


FIGURE IV-2
RECOMMENDED CABLE LANDING
SANDY BEACH
(Oahu Coral Reef Inventory, 1981)


CABLE ROUTE
Keawaakio
Cove
Sandy Beach Park
Kalanianaole Highway
N
0 100 200 300 400 500 1000
SCALE IN FEET

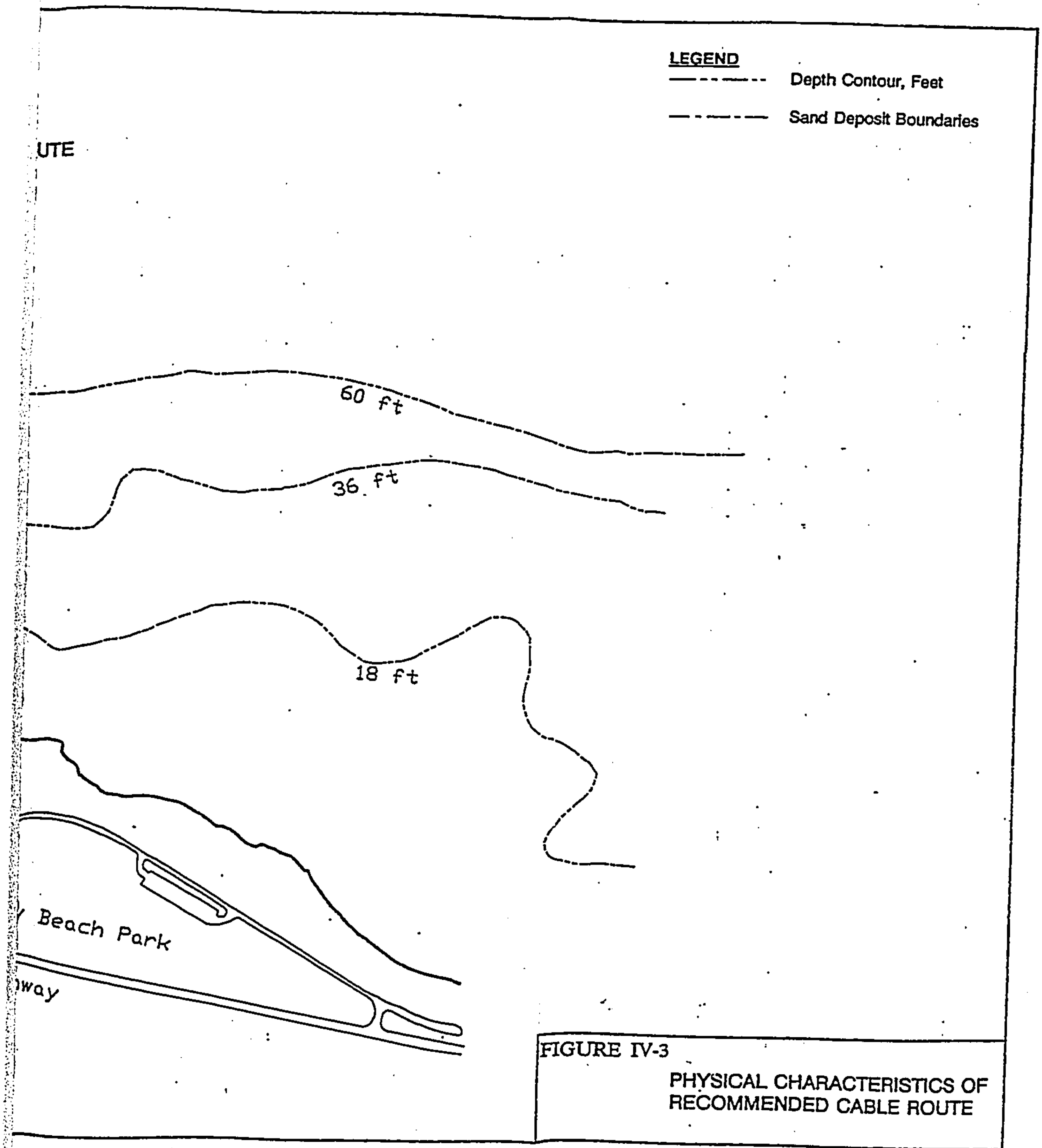


FIGURE IV-3

PHYSICAL CHARACTERISTICS OF RECOMMENDED CABLE ROUTE

1. This route avoids the 60 foot ledge that parallels much of the Sandy Beach coastline. This ledge has vertical drops of up to 30 feet, and presents a major obstacle to cable placement.

2. As shown in Figure IV-3, the route takes maximum advantage of the offshore sand channel, which has a finger extending toward the shoreline.

3. The route makes landfall on the east side of the cove, which has less inshore vertical relief than the west side.

4. The route is oriented along an azimuth of 147 degrees relative to true north. This route results in the cable reaching deep water over a shorter distance than a more easterly orientation would. Just east of the recommended route, the 60 foot contour curves seaward. The recommended route is a compromise between the use of the sand channel and reaching deep water as quickly as possible.

Figure IV-4 shows a schematic view of the bottom conditions encountered along the route out to water depths of 100 feet. The physical characteristics of the bottom can be described by five zones. Zone 1, which begins just seaward of the rock shelf at the shoreline, extends 500 feet seaward. The bottom in this zone consists of a relatively flat limestone shelf, with numerous small to medium sized boulders (1 to 2 foot diameter). There are some scattered larger boulders (3 to 4 foot diameter), particularly in the shallower water. Photo IV-1 shows typical bottom conditions in this zone. The water depth at the seaward end of this zone is approximately 15 to 18 feet.

In Zone 2, the limestone shelf continues seaward, but becomes noticeably more irregular, with ledges, surge channels, depressions and other irregularities with vertical relief on the order of 3 to 7 feet. Photo IV-2 shows typical conditions in this area, which is 100 to 150 feet wide.

Zone 3 is a 350 foot wide band of relatively flat exposed limestone shelf. There are scattered coral heads on the shelf and vertical relief is on the order of 1 to 2 feet. Photo IV-3 shows typical conditions in this zone. The water depth at the seaward end of this zone, 930 feet from shore, is approximately 32 feet.

From the seaward end of the limestone shelf to the 70 foot depth contour, located 2500 feet offshore, the bottom is primarily sand. Because the sand deposit is irregular, the cable will cross two limestone spurs in this zone (shown on Figure IV-4), with a total width of approximately 250 feet. The conditions on the two spurs are very similar to those in Zone 3, with scattered coral heads and some sand.

Seaward of the 70 foot depth, the bottom consists of coral rubble, scattered sand, and scattered limestone mounds and ledges. The rubble bottom is relatively flat, and relief in the areas of the mounds and ledges is typically 3 feet. Photo IV-4 is a typical view of the coral rubble bottom.

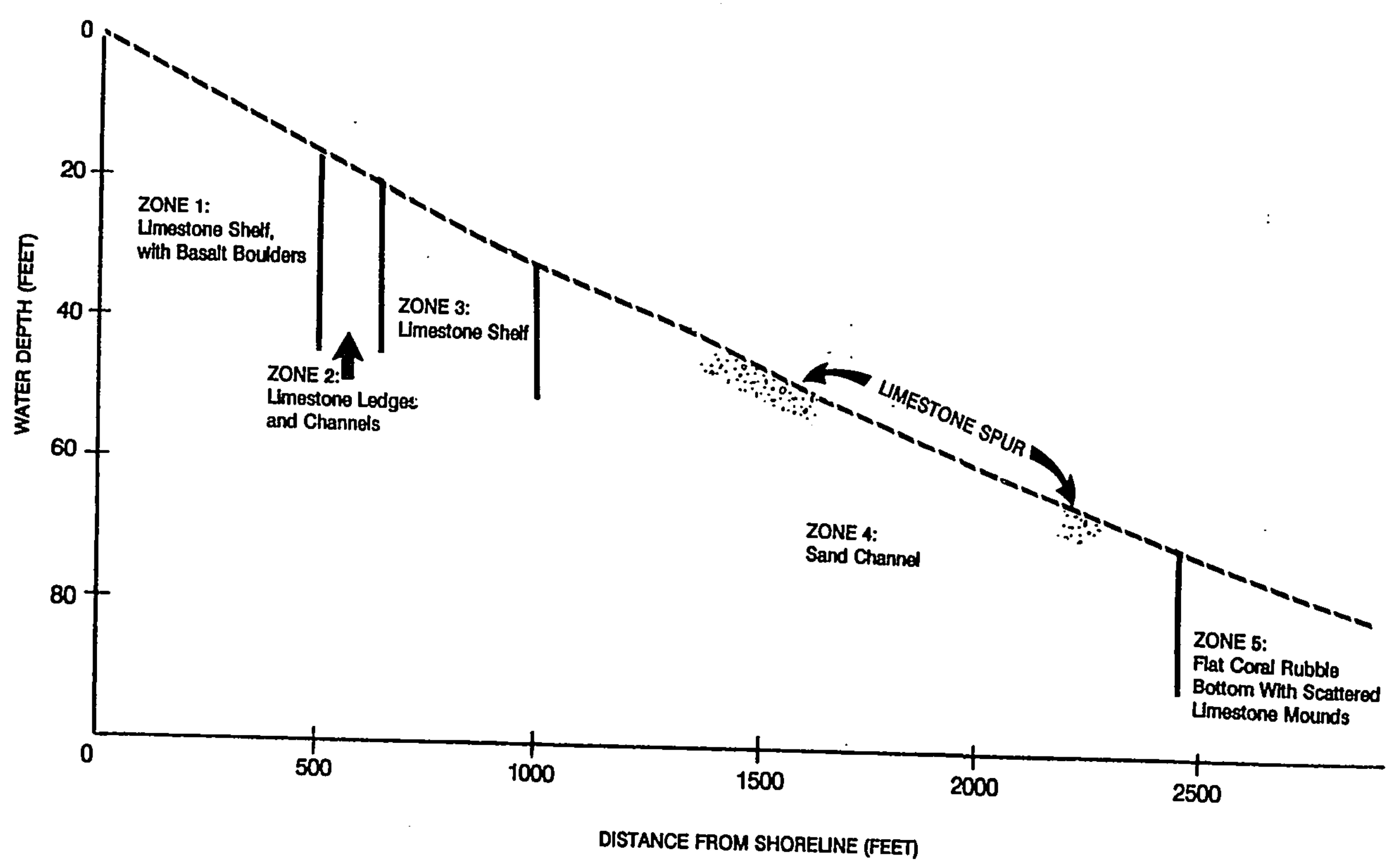
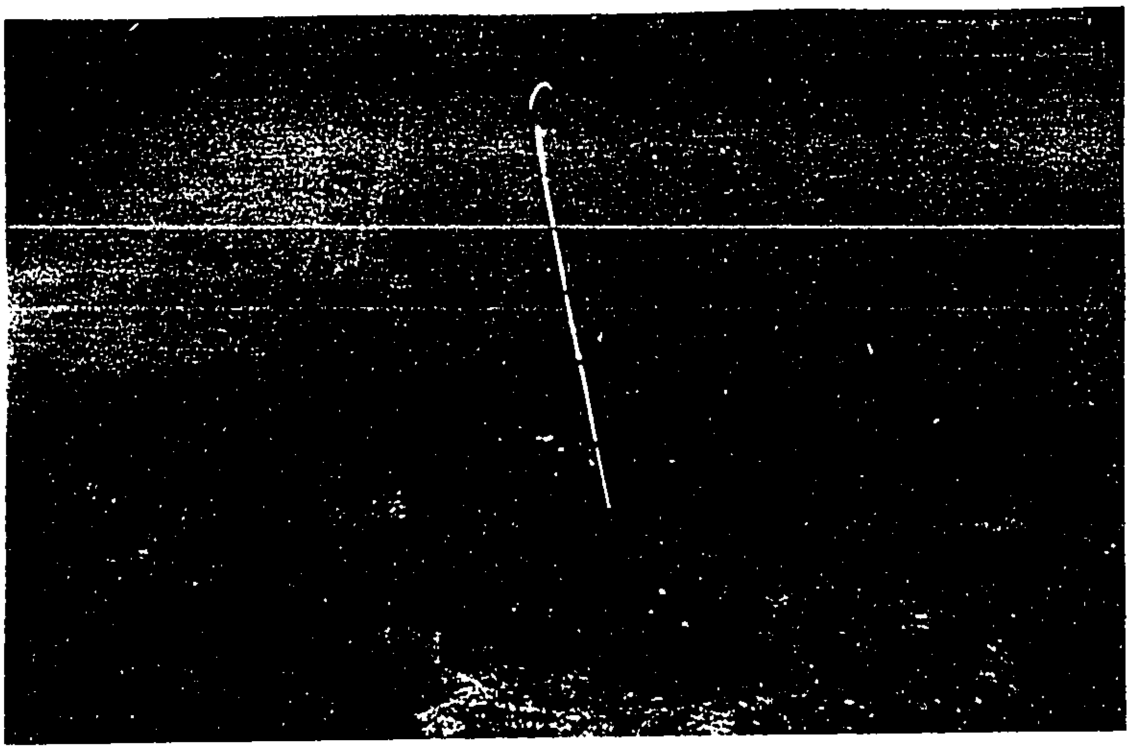


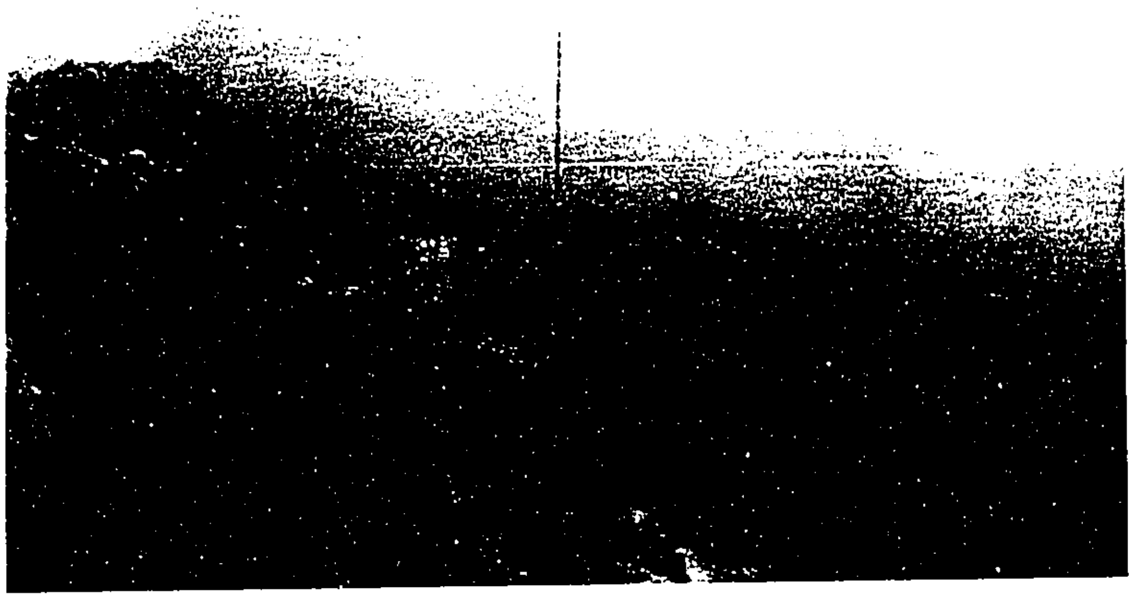
FIGURE IV-4

SCHEMATIC VIEW OF BOTTOM CONDITIONS, PROPOSED ROUTE

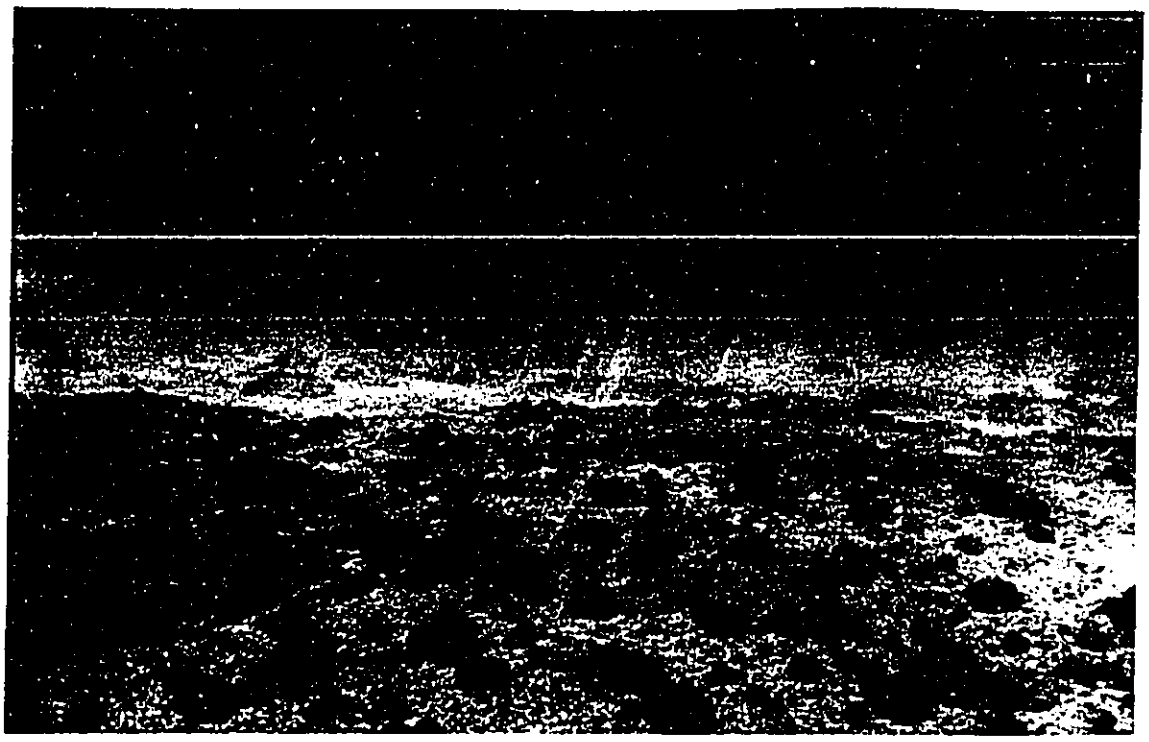


TYPICAL ZONE 1 (SHORELINE TO 20 FT) VIEW.
BOULDERS AND HARD SUBSTRATE VISIBLE IN PHOTO

PHOTO IV-2



VIEW LOOKING SHOREWARD IN ZONE 2, THE NARROW
BAND OF HIGH RELIEF



EMERGENT LIMESTONE SHELF, TYPICAL OF ZONE 3 AND THE TWO LIMESTONE SPURS IN ZONE 4. SAND DEPOSIT IN BACKGROUND

TYPICAL BOTTOM IN THE 80-100 FOOT DEPTH RANGE. LIMESTONE MOUND IN RIGHT FOREGROUND, WITH FLAT CORAL RUBBLE/SAND BOTTOM IN BACKGROUND

The discussion above describes conditions along the recommended route. It is possible, after completion of the cable vendor's subsequent side scan and subbottom surveys, that the route orientation could be slightly changed. Although the exact location of the limestone spurs in Zone 4 will change, as long as the cable makes landfall in Keawaakio Cove, and follows the general longitudinal axis of the sand channel, the above description will apply.

OCEANOGRAPHIC CONDITIONS

The waters in the vicinity of the Sandy Beach landing site are directly exposed to tradewind waves, Kona storm waves and south swell. The winter season north Pacific swell also refracts into the area. As a result, the Sandy Beach area is frequently rough. However, either because of the orientation of the bottom or the coastline configuration, the breaking wave climate in Keawaakio Cove is noticeably milder than at the adjacent Sandy Beach areas. There are popular surf sites both east and west of the cove, but none in the cove.

The site is directly exposed to hurricane generated waves, so the design wave height for the determination of cable protection requirements will be in the range of 25 to 30 feet, depending upon the acceptable degree of risk.

The offshore currents are strong, and often, but not always, reverse with the semidiurnal tide. The prevailing currents parallel the offshore bottom contours. Average current speed in the nearshore area is 0.3 to 0.4 knots, with an approximate maximum of 2.0 knots.

This reach of coast is subject to tsunami flooding. A runup of 23 feet was recorded just east of Halona Point during the 1946 tsunami. The estimated 50 and 100 year tsunami elevations for the Sandy Beach Area are 11.5 and 16 feet, respectively.

The offshore waters in the area have been classified as Class A waters by the Hawaii State Department of Health. An ocean outfall exits the shoreline between the main Sandy Beach area and Keawaakio Cove and discharges up to 5 million gallons per day of treated sewage. The outfall terminates 1400 feet offshore, in 46 feet of water.

DESCRIPTION OF THE PROPOSED PROJECT

A description of the cable landing process and the associated onshore work is described in the Environmental Assessment that accompanies this report. Accordingly, this section describes the work that will be required in the nearshore zone. The inshore section of the fiber optic cable will be double armored to resist chafing and abrasion. Additional protection, in the form of anchoring or trenching, is anticipated along at least the inshore 950 feet of the route, until the cable daylights into the sand channel at a depth of approximately 32 feet. The exact method will depend upon the selected vendor and the preferences and experience of that vendor, but one of the two following work sequences is the most likely:

1. Complete the initial shore landing with no preparatory work on the bottom. Divers would then remove localized high spots and other obstructions to obtain a relatively uniform channel next to the cable. The cable would then be shifted into this channel, and split pipe casing installed around the inshore 950 feet of cable. This casing is supplied in 39 inch lengths and is bolted in place around the cable. Sections are connected by articulated ball joints to allow conformance to the varying bottom terrain. The casing would also be bolted to the bottom to prevent movement. This methods would utilize a small work boat, and the divers would be equipped with either hydraulic or pneumatic tools. Since the excavation would be done by hand, and only where needed, this method would result in the least environmental impact.

2. This second method would involve clearing high spots, boulders and other obstructions prior to the cable landing. A barge equipped with a clamshell bucket would probably be used. The cable would then be laid in the prepared channel, and divers would then install the split pipe casing and bolt it to the bottom. The use of the clamshell bucket would clear a wider path (estimated at 5 feet) than in the above method, and the associated environmental effects would be correspondingly greater.

In addition to the inshore 950 feet, protection may also be required where the two limestone spurs cross Zone 4, for a total protected length of 1200 feet. Although limited manual probing indicated a relatively thin sand deposit in Zone 4, it is extensive enough so that the cable will eventually be covered and protected against wave forces. It is assumed that protection will not be required in the sand or in the rubble and limestone area (Zone 5) beyond the 70 foot depth.

Estimated duration of the follow up work after the initial cable landing is estimated to be 25 to 30 working days for either of the above two methods. The approximate cost of the in-water work is estimated to be $200,000.

No blasting or extensive trenching is anticipated during the cable protection process.

MARINE BIOLOGICAL SETTING

The qualitative reconnaissance of Sandy Beach cable route was carried out on 19 June 1991 and the quantitative sampling of this site was done on 7 January 1992. The qualitative survey extended to about the 100 foot depth approximately 2500 feet from shore. In this area four major biological zones or biotopes were defined. In general, the biotopes approximately parallel shore, but along the proposed cable alignment, the most seaward biotope (the biotope of sand) extends into shallow water towards the beach. As discussed previously, the presence of sand was an important factor in the selection of the route. The biotopes recognized in the vicinity of the proposed cable alignment at Sandy Beach are the biotope of sand, the biotope of emergent hard substratum, the biotope of small channels and the high energy cobble/boulder biotope. The boundaries of these biotopes are shown in Figure IV-5. These biotopes correspond very closely to the zones used to describe the physical characteristics of the bottom along the cable route (see Figure IV-4 for comparison).

The biotope of sand is situated primarily seaward of the project area but encroaches as small channels well into the study site to within 1000 feet of shore. Shoreward of the biotope of sand is the biotope of emergent hard substratum which is encountered at depths from about 40 feet (1200 feet offshore) to 80 feet (about 2000 feet offshore). The biotope of shallow channels is found in shallower water in depths from 20 to 40 feet. The high energy cobble/boulder biotope extends from shore to about the 20 foot depth 900 feet offshore.

The Biotope of Sand

The biotope of sand occurs as a pie shaped wedge pointed toward the shoreline in the area proposed for the cable alignment. As the name implies, the substratum in the biotope of sand is dominated by sand. Because of its shifting nature, the benthic species found in sand habitats are generally adapted for life on an unstable and frequently abrading environment. Many species that are found in this habitat will bury into the sand to avoid predators and the abrasion that occurs with storm waves. Thus many species in the sand biotope are cryptic and difficult to see; among those are many of the molluscs and crustaceans such as the kona crab (Ranina serrata). Hence, without considerable time spent searching in the sand many species will not be seen. The biotope of sand is best developed at greater depths; where it enters the shallow water, many of the characteristic species become less abundant. Therefore, the inshore boundary of this biotope is arbitrarily shown well offshore in Figure IV-5 despite the presence of considerable sand shoreward of this point.

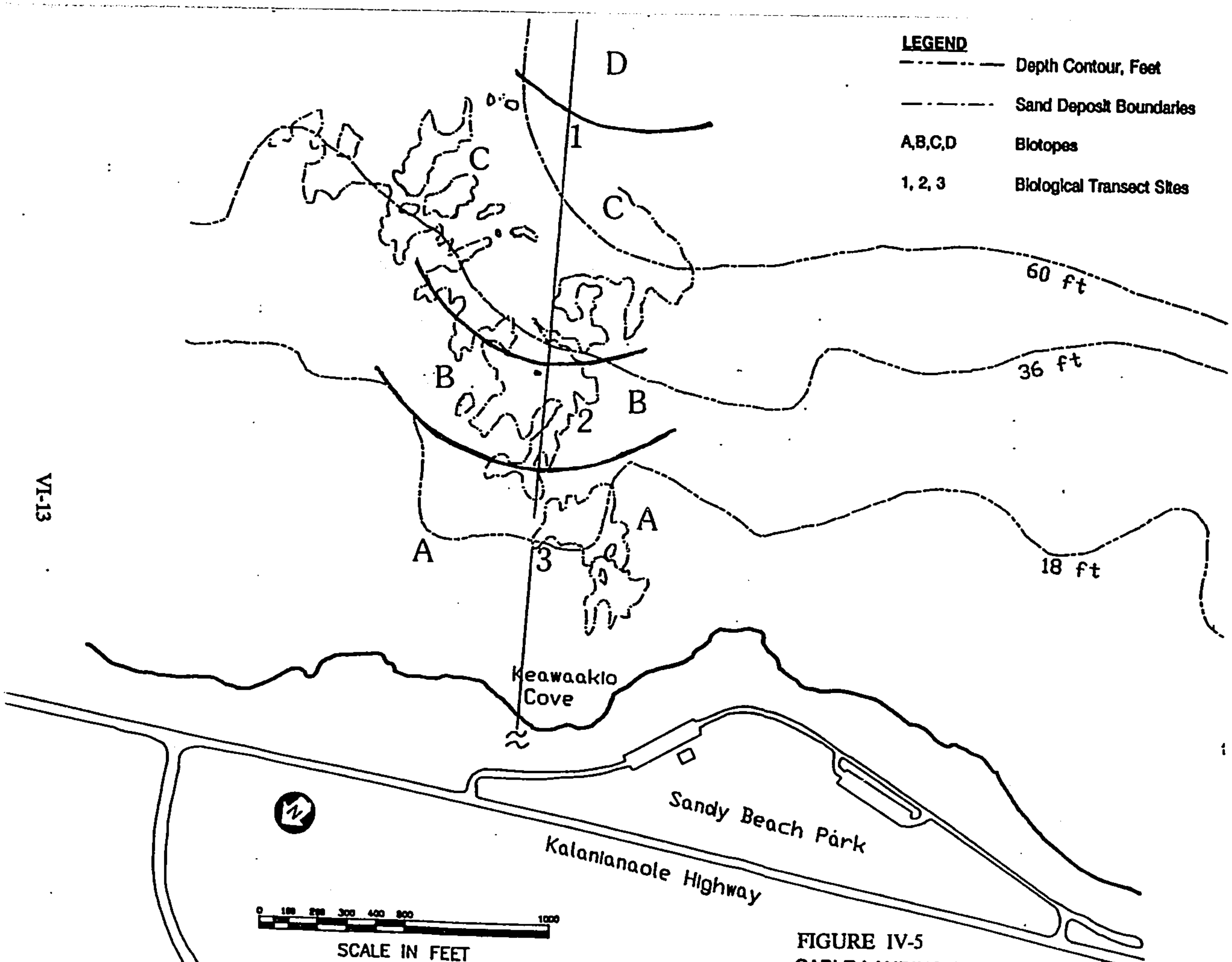


FIGURE IV-5
CABLE LANDING SITE,
SHOWING MARINE BIOLOGICAL BIOTOPES

Because of the depth at which the biotope of sand is found, only a qualitative reconnaissance was made of the habitat in waters from 80 to 100 feet. Species noted in this overview of the biotope include a number of molluscs: the helmet shell (Cassis cornuta), augers (Terebra), T.crenulata, T. maculata and T. inconstans), the leopard cone (Conus leopardus) and flea cone (Conus pulicarius) as well as the sea hare (Brissus sp.), starfish (Mithrodia bradleyi), brown sea cucumber (Bohadschia vitiensis), opelu or mackeral scad (Decapterus macarellus), nabeta (Hemipteronotus umbrilatus), the goby-like fish (Parapercis schauslandi), uku or snapper (Aprion virescens) and the weke or white goatfish (Mulloides flavolineatus). With greater effort many more fish species would be encountered in this biotope.

The Biotope of Emergent Hard Substratum

Shoreward of the biotope of sand is the biotope of emergent hard substratum. The substratum in this biotope is a combination of rubble and sand with areas of emergent hard bottom. The hard substratum supports some coral cover not exceeding 20 percent; these areas of hard bottom are broken by patches of rubble and sand. The rubble/sand areas are from 25 by 50 feet up to 150 by 250 feet in size and they are spaced from 25 to 150 feet apart. The hard substratum has little elevation, not exceeding 3 feet above the sand and rubble. This biotope is situated in water from 40 to about 80 feet deep.

Station 1 was established in 80 feet of water to sample the communities in this biotope. The transect sampled both rubble as well as hard substratum. The hard substratum at this station appeared to be limestone and the rubble was comprised of coral fragments up to 25cm in diameter. The results of the quantitative survey carried out at Station 1 are presented in Table IV-1. The quadrant survey noted one algal species (Polysiphonia sp.) and two coral species (Porites lobata and Pocillopora meandrina) having a mean coverage of 8 percent. The invertebrate census found five species: the isabella cowry (Cypraea isabella), rock oyster (Spondylus tenebrosus), red hermit crab (Aniculus strigatus), boring sea urchin (Echinostrephus aciculatum) and the banded urchin (Echinothrix calamaris). The results of the fish census are presented in Appendix B. In total, 34 species (311 individuals) were observed. The most abundant species include damselfishes (Chromis hanui and C. vanderbilti), alo'ilo'i or black damselfish (Dascyllus albisella), moano or manybar goatfish (Parupeneus multifasciatus) and the malu or onespot goatfish (Parupeneus bifasciatus). The standing crop of fishes at Station 1 was estimated to be 44g/m^2; the species contributing heavily to this biomass include the moano or manybar goatfish (parupeneus multifasciatus) and a single filefish or o'il'i (Cantherhines dumerilii) as well as a puhi oni'o or white-mouth moray eel (Gymnothorax meleagris).

TABLE IV-1.

Summary of the benthic survey conducted in the biotope of emergent hard substratum approximately 580m offshore of Sandy Beach, Oahu on 7 January 1992. Results of the 6m^2 quadrant sampling of the benthic community (expressed in percent cover) are given in Part A; a 50-point analysis is presented in Part B and counts of invertebrates in Pact C. A short summary of the fish census is given in Part D. Water depth is 25m; mean coral coverage is 8.1 percent (quadrant method).

A. Quadrant Survey

Species	Quadrant Number					
	0m	5m	10m	15m	20m	25m
Algae						
Polysiphonia sp.	2				1	
Corals						
Porites lobata		2	4	3	2.5	4
Pocillopora meandrina				12		21
Sand	26	9		2	2	9
Rubble	72	14				14
Hard Substratum	75	96		83	94.5	52

B. 50-Point Analysis

Species	Percent of the Total
Corals	
Porites lobata	6
Sand	16
Rubble	14
Hard Substratum	64

(TABLE IV-1 CONTINUED ON NEXT PAGE)

TABLE IV-1. Continued.

C. Invertebrate Census (4 x 25m)

Species	Number
Phylum Mollusca	
Cypraea isabella	1
Spondylus tenebrosus	1
Phylum Arthropoda	
Aniculus strigatus	1
Phylum Echinodermata	
Echinostrephus aciculatum	1
Echinothrix calamaris	1

D. Fish Census (4 x 25m)

34 Species
311 Individuals
Estimated Biomass = $44 g/m^2$

In the vicinity of Station 1 were seen the bryozoan (Reteporellina denticulata), soft coral (Palythoa tuberculosa),coral (Pocillopora eydouxi), helmet shell (Cassis cornuta), spiny lobster or 'ula (Panulirus marginatus), the brown moray eel or puhi paka (Gymnothorax flavimarginatus), green head moray (Gymnothorax undulatus), uku or snapper (Aprion virescens) and the blenny (Plagiotremus ewaensis).

Biotope of Shallow Channels

The biotope of shallow channels lies shoreward of the biotope of emergent hard substratum in water from 20 to 40 feet deep. The characteristic feature of this biotope is the presence of hard substratum with small channels cut through the substratum. These channels are oriented perpendicular to shore and are from 3 to 15 feet wide, 6 to 75 feet long, and are up to 1 foot deep. On the bottom of some of the channels is a veneer of sand and rubble. The channels are spaced from 10 to 60 feet apart. Most of the hard substratum appears to be limestone but there are some areas of basalt (pahoehoe). The basalt becomes more evident on the shoreward side of the biotope.

Station 2 was established about 1000 feet offshore in 35 feet of water to sample the marine communities in this biotope. The results of the quantitative studies carried out at Station 2 are presented in Table IV-2. The quadrant survey noted 7 coral species (Porites lobata, P. evermanni, Pocillopora meandrina, Montipora verrucosa, M. patula, M. flabellata and M. verrilli) having a mean coverage of 15.3 percent. The invertebrate census found six species including two cones (Conus lividus and C. miliaris) and four sea urchin species: the black sea urchin (Tripneustes gratilla), the slate pencil urchin (Heterocentrotus mammillatus), the banded urchin (Echinthrix calamaris) and the ubiquitous green sea urchin (Echinometra mathaei). Thirty species of fishes (267 individuals) were encountered in the fish census. The most abundant species included the saddleback wrasse or hinalea lauwili (Thalassoma duperrey), the damselfish (Chromis vanderbilti) and the ma'i'i'i or brown surgeonfish (Acanthurus nigrofuscus). The standing crop of fishes was estimated to be $74 g/m^2$ and the species contributing heavily to this biomass include a single large zebra moray or puhi (Gymnomuraena zebra), ma'i'i'i or brown surgeonfish (Acanthurus nigrofuscus), hinalea lauwili or saddleback wrasse (Thalassoma duperrey) and a single a'awa or table boss (Bodianus bilunulatus).

In the vicinity of Station 2 were seen the algae or limu (Amansia glomerata) as well as the edible limu kohu (Asparagopsis taxiformis), soft coral (Palythoa tuberculosa), coral (Leptastrea purpurea), boring sea urchin (Ecninostrephus aciculatum), long spine urchin

TABLE IV-2.

Summary of the benthic survey conducted in the biotope of shallow channels approximately 320m offshore of Sandy Beach, Oahu on 7 January 1992. Results of the 6m^2 quadrat sampling of the benthic community (expressed in percent cover) are given in Part A; a 50-point analysis is presented in Part B and counts of invertebrates in Pact C. A short summary of the fish census is given in Part D. Water depth is 11m; mean coral coverage is 15.3 percent (quadrat method).

A. Quadrat Survey

Species	Quadrat Number					
	0m	5m	10m	15m	20m	25m
Corals						
Porites lobata	4	15	7	4	10	5
Porites evermanni			2			
Pocillopora meandrina	1	1	1	0.2		2
Montipora verrucosa	5	5	4		2	2
Montipora flabellata						3
Montipora patula	3.5					
Montipora verrilli		12	3	0.1		
Sand					2	6
Hard Substratum	86.5	67	83	95.7	86	82

B. 50-Point Analysis

Species	Percent of the Total
Corals	
Porites lobata	8
Pocillopora meandrina	2
Montipora verrucosa	2
Montipora verrilli	2
Montipora patula	2
Sand	4
Rubble	2
Hard Substratum	78

(TABLE CONTINUED ON NEXT PAGE)

TABLE IV-2. Continued.

C. Invertebrate Census (4 x 25m)

Species	Number
Phylum Mollusca	
Conus lividus	1
Conus miliaris	1
Phylum Echinodermata	
Echinothrix calamaris	1
Heterocentrotus mammillatus	6
Tripneustes gratilla	9
Echinometra mathaei	54

D. Fish Census (4 x 25m)

30 Species
267 Individuals
Estimated Biomass = $74 g/m^2$

or wana (Echinothrix diadema), fourspot butterflyfish or kikakapu (Chaetodon-quadrimaculatus), yellow tang or lau'ipala (Zebrasoma flavescens), orangespine unicorn fish or umaumalei (Naso lituratus), boxfish or moa (Ostracion meleagris), hawkfishes (po'opa'a - Cirrhites pinnulatus; hilu piliko'a - paracirrhites forsteri) and squirrelfish or menpachi (Myripristes amaenus).

High Energy Cobble/Boulder Biotope

The high energy cobble/boulder biotope extends from the beach to approximately the 20 foot water depth, 900 feet offshore. This biotope is characterized by a hard substratum with depressions as well as water worn basalt cobble and boulders scattered over it. The depressions range in size from 6 to 60 feet in diameter; most are in complex configurations which lends considerable heterogeneity to the substratum. These depressions are up to 6 feet deep. The water worn basalt rock occurs in a scattered fashion in the more offshore part of the biotope; closer to shore (i.e., within 250 feet of the shoreline) the basalt rock forms a near continuous mat. The mean diameter of this rock is about 1.5 feet but individual boulders up to 5 feet are common. Coral coverage decreases near shore (i.e., the inner 300 feet); this is probably related to the scouring that must occur when surf impinges on this coast. Qualitative observations suggest that mean coral coverage is about 0.2 percent in the shallow areas less than 10 feet deep.

Station 3 was established approximately 450 feet offshore in 20 feet of water to sample the high energy cobble/boulder biotope. The results of the quantitative survey at Station 3 are presented in Table IV-3. Four algal species were noted in the quadrant survey having a mean coverage of 1.6 percent; the species seen were Cladymenia pacifica, Martensia fragilis, Amansia glomerata and Desmia hornemannii. Also present in the quadrant survey was the soft coral (Palythoa tuberculosa) as well as seven coral species (Porites lovbata, P. compressa, Montipora verrucosa, M. flabellata, M. patula, Leptastrea purpurea and Pocillopora meandrina) having a mean coverage of 9.1 percent in the seaward half the biotope. The invertebrate census noted 9 species including the cone shell (Conus lividus), the octopus or he'e (Octopus cyanea), the green sea urchin (Echinometra mathaei), black urchin (Tripneustes gratilla), boring urchin (Echinostrephus aciculatum), slate pencil urchin (Heterocentrotus mammillatus), wana or long spine urchin (Echinothrix diadema), black sea cucumber (Holothuria atra) and the brown sea cucumber (Bohadschia vitiensis). The results of the fish census are presented in Appendix B; twenty-two species (132 individuals) were counted. The most abundant fishes include the hinalea lauwili or saddleback wrasse (Thalasssoma duperrey), the brown surgeonfish or ma'i'i'i (Acanthurus nigrofuscus) and the convict surgeonfish or manini (Acanthurus triostegus). The biomass of fishes at Station 3 was estimated to be $43 g/m^2$ and the species contributing heavily to this standing crop include the ma'i'i'i or brown surgeonfish (Acanthurus nigrofuscus), hinalea lauwili or saddleback wrasse (Thalassoma duperrey) and the manini or convict surgeonfish (Acanthurus triostegus).

TABLE IV-3.

Summary of the benthic survey conducted in the high energy cobble/boulder biotope approximately 135m offshore of Sandy Beach, Oahu on 7 January 1992. Results of the 6m^2 quadrat sampling of the benthic community (expressed in percent cover) are given in Part A; a 50-point analysis is presented in Part B and counts of invertebrates in Pact C. A short summary of the fish census is given in Part D. Water depth is 6m; mean coral coverage is 9.1 percent (quadrat method).

A. Quadrat Survey

	Quadrat Number					
Species	0m	5m	10m	15m	20m	25m
Algae						
Desmia hornemannii		0.1		0.4		
Cladymenia pacifica	0.1		4			
Amansia glomerata				1		
Martensia fragilis					0.2	3
Soft Corals						
Palythoa tuberculosa	1					
Corals						
Porites lobata	2	1	1		9	
Porites compressa				3		
Montipora verrucosa		5	7	2		
Montipora flabellata			2	11		
Montipora patula		3				
Pocillopora meandrina		1				
Leptastrea purpurea			1.5			
Sand				4	2	
Rubble	3					
Hard Substratum	94	89.8	90	77.1	88.8	93

B. 50-Point Analysis

Species	Percent of the Total
Corals	
Montipora verrucosa	6
Montipora patula	4
Sand	4
Hard Substratum	86

TABLE IV-3. Continued.

C. Invertebrate Census (4 x 25m)

Species	Number
Phylum Mollusca	
Conus lividus	1
Octopus cyanea	1
Phylum Echinodermata	
Tripneustes gratilla	13
Echinostrephus aciculatum	1
Heterocentrotus mammillatus	3
Echinothrix diadema	5
Echinometra mathaei	164
Holothuria atra	2
Bodaschadia---------	1

D. Fish Census (4 x 25m)

22 Species
132 Individuals
Estimated Biomass = $43 g/m^2$

In the vicinity of Station 3 were seen the coral (Leptastrea purpurea), cone shell (Conus leopardus), brown sea cucumber (Actinopyga mauritiana), na'ena'e or orangespot surgeonfish (Acanthurus olivaceus), red parrotfishes or palukaluka (Scarus rubroviolaceus) and uhu'ahu'ula (Scarus perspicillatus), moorish idol or kihikihi (Zancleus cornutus), milletseed butterflyfish or lau wiliwili (Chaetodon miliaris), doublebar goatfish or munu (Parupeneus bifasciatus) and cleaner wrasse (Labroides phthirophagus).

A short survey of the intertidal region was made in the area fronting the proposed cable landing site. The substratum along this shoreline is primarily a pahoehoe (basalt) bench broken in places by short stretches of basalt cobble and boulders that form small beaches. The intertidal in this area is subjected to occasional high energy conditions (waves). The high energy appears to keep the diversity low. On the emergent rocks were seen the grey littorine snail (Littorina pintado) and the prosobranch mollusc, Siphonaria normalis; slightly lower down on the rocks are the black snail or pipipi (Nerita picea). Algae seen include limu hulu'ilio (Giffordia breviarticulata) and the encrusting coralline alga (Porolithon onkodes). Also present are a number of unidentified microalgal species that form a fine "turf".

One small green sea turtle (Chelonia mydas) was seen in the high energy cobble/boulder biotope about 200 feet from shore in about 15 feet of water during the 7 January 1992 survey. This turtle was estimated to be about 50cm in carapace length (straight line) and appeared to be "passing through" the area. We saw no unusual features (i.e., tumors, tags or deformities) on this individual.

The Sandy Beach habitat appears to be appropriate for green turtles; there is a reasonable amount of cover or shelter (i.e., undercuts, ledges and caves) at a size and scale appropriate for green turtle resting areas as well as some macroalgae (such as Amansia glomerata) that are used as forage in other locations by green turtles (Balazs,1980, Balazs et al. 1987). However, our survey suggests that the shallow area (from shore to the 80 foot depth) is not heavily used by green turtles and we did not encounter any other turtles in the area. It should be noted that Balazs et al. (1987) noted two juvenile turtles present along the beach on 16 May 1985. These authors state (page 30) that "...surfers periodically report seeing turtles off Sandy Beach, but the area is not known to host a significant aggregation, nor is there a history of such an occurrence". We have found no information to suggest that nesting of sea turtles on Sandy Beach has occurred in historical times.

The biological survey of the proposed cable alignment at Sandy Beach did not find any rare or unusual species or communities other than the single threatened green sea turtle noted above. Another protected species, the humpback whale (Megapteranovaeangliae) was not seen offshore of the study area during the period of our field effort, but whales are known to frequent the area during the winter and spring. As noted by Herman (1979), humpback whales tend to be found in regions remote from human activities, thus relatively fewer numbers of whales are seen around Oahu as compared to the other islands. However, Norris and Reeves (1978) suggest that natural cycles and whaling activities may actually be responsible for the decline off Oahu.

POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Impacts with Construction

The potential for impact to the shallow marine communities will probably be greatest with the construction phase of this proposed project. From the sea, the proposed cable alignment enters the shallows through the biotope of sand. As a substrate to support marine communities, sand is inappropriate for many coral reef forms because many species require a stable bottom (e.g.,corals and many of the associated invertebrates). Thus the species usually encountered in sand areas are usually those that are adapted to exist in an ever-changing, moving substratum. Similarly, much of the benthic production on coral reefs occurs on hard substratum, (i.e., macroalgae require a solid substratum for attachment). Because sand substrates are subject to movement, they may abrade and scour organisms on this substratum. Thus the characteristics of most species encountered in Hawaiian sand communities are (1) that they typically burrow into the substrate to avoid scouring, (2) that they frequently occur low in abundance which may be related to food resources, and (3) that they are mobile because of the shifting nature of the substratum and potential for burial. Since these forms are motile, deployment of the cable across such a substratum presents little chance of negative impact to resident species because they would probably "just move out of the way as the cable was deployed". Additionally since the substratum shifts, it is probable that the deployed cable will sink into the substrate. Personal observations made on other deployed cables shows them to often be partially buried by the natural movement of the sand.

In the shallower areas along the route, there are areas where the cable will cross hard substratum and there is a greater possibility of impact to benthic and fish communities.

The construction techniques selected to clear the inshore pathway for the cable will play a large role in the range of impacts possibly encountered. Impacts associated with these construction activities primarily include removal of benthic communities in the cable path, and the generation of turbidity which may impact surrounding communities.

With any construction is the concern over possible impacts to corals because of their sessile nature and usual slow growth characteristics. One potential impact to corals would be the removal of the entire benthic community in the alignment path. Table IV-4 presents an estimate of the actual loss of coral (expressed in the number of square meters lost) in the alignment path if the high vertical relief were removed from all the hard substratum within the 80 foot depth contour. This estimate is based on the measured linear distance of hard substratum crossed by the cable on the proposed alignment and the known percent coverage by coral in each biotope. These losses are calculated for four arbitrary channel widths; 0.3m wide trench = 5.3 square meters of coral lost, 0.5m wide trench = 8.6 square meters of coral lost, 1.0m wide trench = 17.2 square meters of coral lost and with a 1.5m wide trench 25.9 square meters of coral would be lost. The two extremes, the 0.3m and the 1.5m channels, correspond approximately to the two construction alternatives discussed previously.

TABLE IV-4.

Table estimating the loss of living coral on hard sub- stratum (expressed in square meters) if the proposed alignment at Sandy Beach, Oahu is trenched at one of four arbitary widths (0.3m, 0.5m, 1m and 1.5m). These calculations are based on the estimates of coral cover derived from this study and measured linear distances that the cable would cross hard substratum in water between shore and the 25m isobath. Calculated losses for each trench width are given in the body of the table in terms of square meters.

Biotope		Mean Percent Coral Cover	Distance Traversed on Hard Substrate	Arbitary Width of Destruction 0.3m	0.5m	1.0m	1.5m
Biotope of Sand		0	0m				
Biotope of Emergent Hard Substratum		8.1	15.2m	0.4	0.6	1.2	1.9
Biotope of Shallow Channels		15.3	38.1m	1.8	2.9	5.8	8.7
High Energy Cobble/Boulder Biotope	a.	9.1*	110m	3.0	5.0	10.0	15.0
	b.	0.2*	103m	0.06	0.1	0.2	0.3
Total Destruction of Coral in m^2				5.3	8.6	17.2	25.9

* Coral cover estimated from sampling at Station 3 for the outer half of the high energy cobble/boulder biotope; coral cover estimates for the inner half of this biotope are from a visual assessment.

The coral losses associated with the 0.3m channel correspond to the removal of high spots by divers working with hand tools, and the losses associated with the 1.5m channel correspond to preliminary levelling with the clamshell bucket.

We expect that there would be no direct impacts to the threatened green sea turtle or to endangered humpback whales (Megaptera novaeangliae). As far as the impact to the humpback whales is concerned, if construction activities are restricted to the period between April through October, the impacts are minimal because the whales are seasonal and are only in island waters from November through March. Even assuming that the cable deployment occurs when whales are present in Hawaiian waters, impacts should be non-existent or minimal. The cable ship will not be on site more than one or two days. After departure of the cable ship, all work will be within 1,000 feet of shore. There will be no blasting during the construction of the cable protection.

The most probable source of local impact to whales would be noise generation by the cable laying ship, the support tugs and the small boats. There are variable and conflicting reports as to the impact of vessel traffic on whales (Brodie, 1981; Matkin and Matkin, 1981; Hall, 1982; and Mayo, 1982). With respect to the response of individual humpback whales, there is sufficient information to demonstrate that boating and other human activities do have an impact on behavior (Bauer and Herman, 1985). Thus it is probably valid to assume that impact on whales could occur if individuals are within several kilometers of the deployment site. However, as noted above, these impacts are of short duration, and all activity will be concentrated in a small area.

Sea turtles are permanent residents in inshore Hawaiian habitats thus the potential exists for problems during the construction phase if it entails dredging. The generation of fine particulate material from dredging appears not to hinder the green turtle in Hawaiian waters; at West Beach, Oahu, green turtles moved from an offshore diurnal resting site about 3,300 feet offshore to a point about 600 feet from the construction site within days of the commencement of dredging and generation of turbid water. The turtles appeared to establish new resting areas in the turbid water directly offshore of the construction site (Brock 1990a). The reason(s) for this shift in resting areas in unknown but may be related to the turtles seeking water of poor clarity to possibly lower predation by sharks (a major predator on green sea turtles).

Any clearing activity whether performed by clamshell bucket or by divers, or a combination of the two, will generate fine particulate material that serves to lower light levels and in the extreme, bury benthic communities. Sedimentation has been implicated as a major environmental problem for coral reefs. Increases in turbidity may decrease light level resulting in a lowering of primary productivity. When light levels are sufficiently decreased, hermatypic corals (i.e., the majority of the corals found on coral reefs) will eject their symbiotic unicellular algae (zooxanthallae) on which they depend as source of nutrition. However, in nature corals will eject their zooxanthallae and survive (by later acquiring more zooxanthallae) if the stress is not a chronic (long term) perturbation.

Perhaps a greater threat would be the simple burial of benthic communities that could occur with high sediment loading and concurrent low water movement. Many benthic species including corals are capable of removing sediment settling on them by ciliary action and the production of mucous, but there are threshold levels of deposition where cleaning mechanisms may be overwhelmed and the individual becomes buried. However, the impact of sedimentation on Hawaiian reefs may be overstated. Sedimentation from land derived sources (usually the most massive source) is a natural event usually associated with high rainfall events.

Dollar and Grigg (1981) studied the fate of benthic communities at French Frigate Shoals in the Northwest Hawaiian Islands following the accidental spill of 2200mt of kaolin clay. These authors found that after two weeks there was no damage to the reef corals and associated communities except where the organisms were actually buried by the clay deposits for a period of more than two weeks.

The method involving the absolute minimum of underwater construction involves just laying the cable directly on the substratum without any specific attachment. In this case, subsequent wave induced lateral movement of the cable may serve to abrade corals and other attached biota as well as the outer layer(s) of the cable.

An intermediate method of protecting the cable would involve casing the cable with split pipe, and then bolting the pipe to the bottom. This would reduce the impact to benthic communities over the alternative of clearing a level channel. However, although this alternative may have low initial impacts to marine communities it will have an obvious visual impact to any underwater observer where it "bridges" across high spots. If the channel clearing strategy is used, the cleared area will eventually colonized by corals, algae and other benthic forms.

Fishery Considerations

Access to the shoreline at Sandy Beach is excellent and has been so since the coastal road was developed in 1931 (Balazs et al. 1987); the beach is heavily used by people interested in beach going, body surfing and on the eastern end of the beach, fishing. Fishermen catch fish both from shore as well as offshore from small boats. Occasionally commercial fishermen capture akule or bigeye scad (Selar crumenophthalmus) with large surround nets in the vicinity of the proposed cable alignment. Other commercial fishermen utilize traps through the entire area and further offshore handline fishermen target bottomfish (snappers and groupers) that occur below 300 feet in areas of rugged undersea topography. We are unaware of any individuals that specifically and exclusively use Sandy Beach for subsistence fisheries. However, most of the fishing activity occurring at Sandy Beach is by private citizens who probably consume most of what they catch. Species targeted include papio and ulua (family Carangidae), o'io or bonefish (Abula vulpes), moi (Polydactylus sexfilis), goatfishes (family Mullidae), snappers (family Lutjanidae), surgeonfishes (family Acanthuridae), parrotfishes (family Scaridae), and a host of smaller species such as the aholehole (Kuhlia sandvicensis), aweoweo (Priacanthus cruentatus) and menpachi (Myripristes amaenus). Fishing methods used include nets, spears, traps as well as hook and line.

Water Quality Considerations

With any disturbance to the seafloor, sediment will be generated which will manifest itself as turbidity. This occurs through natural events such as storm surf resuspending fine material that had previously entered the area, through natural events or by human activities, including the directing of storm water runoff into the ocean, or by underwater construction activities. In this instance, underwater construction will generate some amount of fine particulate material that could have a negative impact on corals and other benthic forms if it occurs in sufficient quantity over sufficient time. While numerous studies have indicated a relationship between increased suspended or deposited sediment with reduced coral growth rates, cover and species diversity (Roy and Smith 1971, Maragos 1972, Loya 1976, Bak 1978, Randall and Birkeland 1978, Chansang et al. 1982, Cortes and Risk 1985, Grigg 1985, Hubbard and Scaturo 1985, Kuhlman 1985, Muzik 1985, Hubbard 1987), others (Glynn and Stewart, 1973) found no correlation between these parameters on reefs off the Pacific side of Panama. Other studies (e.g., Dollar and Grigg 1981 noted above) have found that the impact must be at a high level and chronic to affect adult corals.

The small scale of the proposed activities that would be necessary to protect the cable in shallow water would produce little sediment, and over a relatively short duration. This statement is supported by the fact that much of the substratum in the high energy cobble/boulder biotope (the shallowest water and closest to shore) is comprised of a "mat" of water worn basalt stones which should not readily breakup if moved out of the alignment path but remain whole thus not generating much turbidity. Greater turbidity is usually generated with the cutting through solid limestone as was done at West Beach, Oahu. Even on that project, which took 19 months to complete, impacts to benthic communities from dredging were minimal (Brock 1990).

Sandy Beach is a high energy area due to the nearshore wave climate and the relatively strong currents. The resultant high water motion will keep fine particulate and sedimentary material suspended in the water column, reducing the settlement on benthic organisms in shallow water habitats. It will also result in advection of this material out of the areas (less than 300 feet deep) where corals are found. The waters offshore of Sandy Beach are characterized by considerable water movement; easterly tradewinds cause a net current flow to the west and offshore from Sandy Beach (Bathen 1978). This attribute has allowed the nearby discharge of up to 5mgd of sewage since the early 1970's from the Hawaii Kai sewage treatment plant in 42 feet of water with little noticeable impact to nearby marine communities or shoreline areas.

The deposition of sediment on coral reefs has been measured and correlated with the "condition" of the reef corals. Loya (1976) defined a "high" sedimentation rate as $15 mg/cm^2/day$ and a "low" rate as $3 mg/cm^2/day$ for Puerto Rican reefs. Low cover and species diversity were associated with reefs exposed to "high" sediment deposition rates. In contrast, "high" sediment deposition rates on Guamian reefs was defined in the range of 160-200mg/cm^2/day and this rate of deposition limited coral cover and diversity (here less than 10 species and 2% cover; Randall and Birkeland 1978). A "low" rate was defined as 32mg/cm^2/day and was associated with rich coral communities (more than 100 species and 12%+ coral cover). These comparisons demonstrate the relative nature of sedimentation rates; the rate considered to be low in Guam is more than twice the high rate from Puerto Rico. Reasons for this disparity relate to differences in how rates are measured (i.e., lack of a standardized methodology) as well as difficulty in relating environmental factors such as water motion and sediment deposition in sediment traps. Water motion may mitigate or enhance the deleterious effects of sedimentation on the diversity and cover of corals in a given area. Hopley and Woesik (1988) note a chronic sedimentation rate of 129mg/cm^2/day (7 month mean) did not negatively impact an Australian coral reef with high cover and species diversity.

These data suggest that if needed as a means for protecting the proposed fiber optic cable in shallow water, the short term disturbance (probably less than two weeks for the channel clearing) will be a minor impact, especially when viewed in light of the nearby chronic disturbance to these benthic communities of sewage input that has occurred since the early 1970's.

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APPENDIX B

Archaeological Assessment of the Proposed Fiber Optic Cable Landing for East Oahu, Sandy Beach Park

Archaeological Assessment of

the Proposed Fiber Optic Cable Landing

for East O'ahu, Sandy Beach Park

Maunalua, District of Honolulu, O'ahu

(TMK 3-9-12:02)

by

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Prepared for

R.M. Towill Corp.

Cultural Surveys Hawaii
January 1992

Abstract

At the request of R.M. Towill Corp., Cultural Surveys Hawaii conducted an archaeological assessment for a proposed Fiber Optic Cable Landing at Sandy Beach Park, Honolulu, O'ahu. The assessment included surface survey, sub-surface testing, and review of pertinent literature.

The proposed corridor is situated, in part, within the active beach zone till connecting to the existing beach park roadway.

No surface sites exist within the proposed corridor. The sub-surface testing indicated that no significant intact, undisturbed (or non-mixed) cultural layer(s) exist within the cable corridor.

Background literature review suggests an absence of pre-existing permanent coastal habitation within Sandy Beach Park.

The beach park and its facilities have altered the landscape to a considerable degree which is evident within the portions of the beach that were tested. Based on the shallow beach deposits and observed absence of undisturbed beach strata no further archaeological investigations appear warranted. However, it is recommended that a qualified professional archaeological firm be contracted to be available for onsite inspections in the unlikely event significant cultural material is unearthed during construction.

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Introduction

A. Project Description

Cultural Surveys Hawai'i conducted archaeological assessments for four proposed fiber-optic cable landing sites on three of the Hawaiian islands. The proposed sites are located on O'ahu at Sandy Beach Park and Kahe Point Beach Park, on Hawai'i at Spencer Beach Park, and on Kaua'i at the Wailua Golf course.

The assessments were requested by R.M. Towill Corp. and included background research and on-site inspections to determine the potential for encountering archaeological resources at the four proposed cable landing sites. Sub-surface testing was carried out at the Spencer and Sandy Beach Park Sites to gather additional information on stratigraphy.

Individual reports treat each of the proposed cable landing sites. Contained in each report are site-specific scopes of work, field methods, a review of previous research pertinent to the individual landing site, research results, and recommendations for mitigation of existing cultural-archaeological resources.

The proposed Sandy Beach Park Fiber Optic Cable Landing Site (Figs. 1-4) is a narrow (20-foot) corridor within the eastern section of the beach park. The corridor includes a short section (approximately 100 feet) within the active beach zone, and then parallels existing roadways of the beach park and Kalanianaole Hwy.

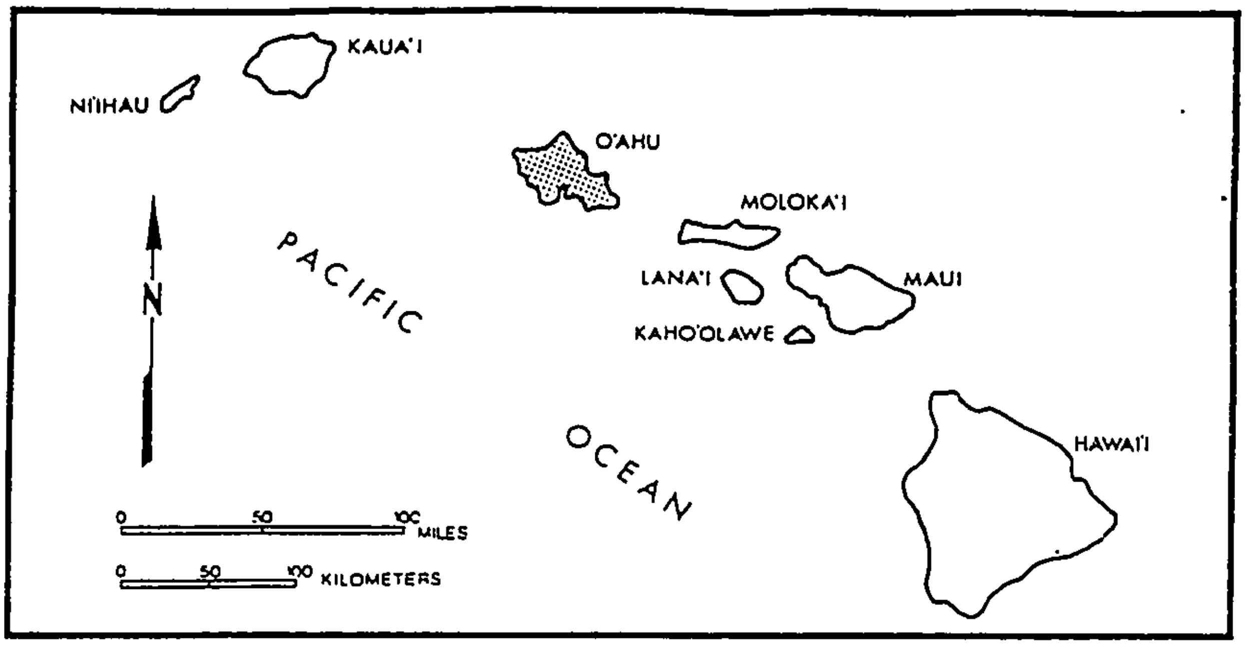

Fig. 1 State of Hawai'i

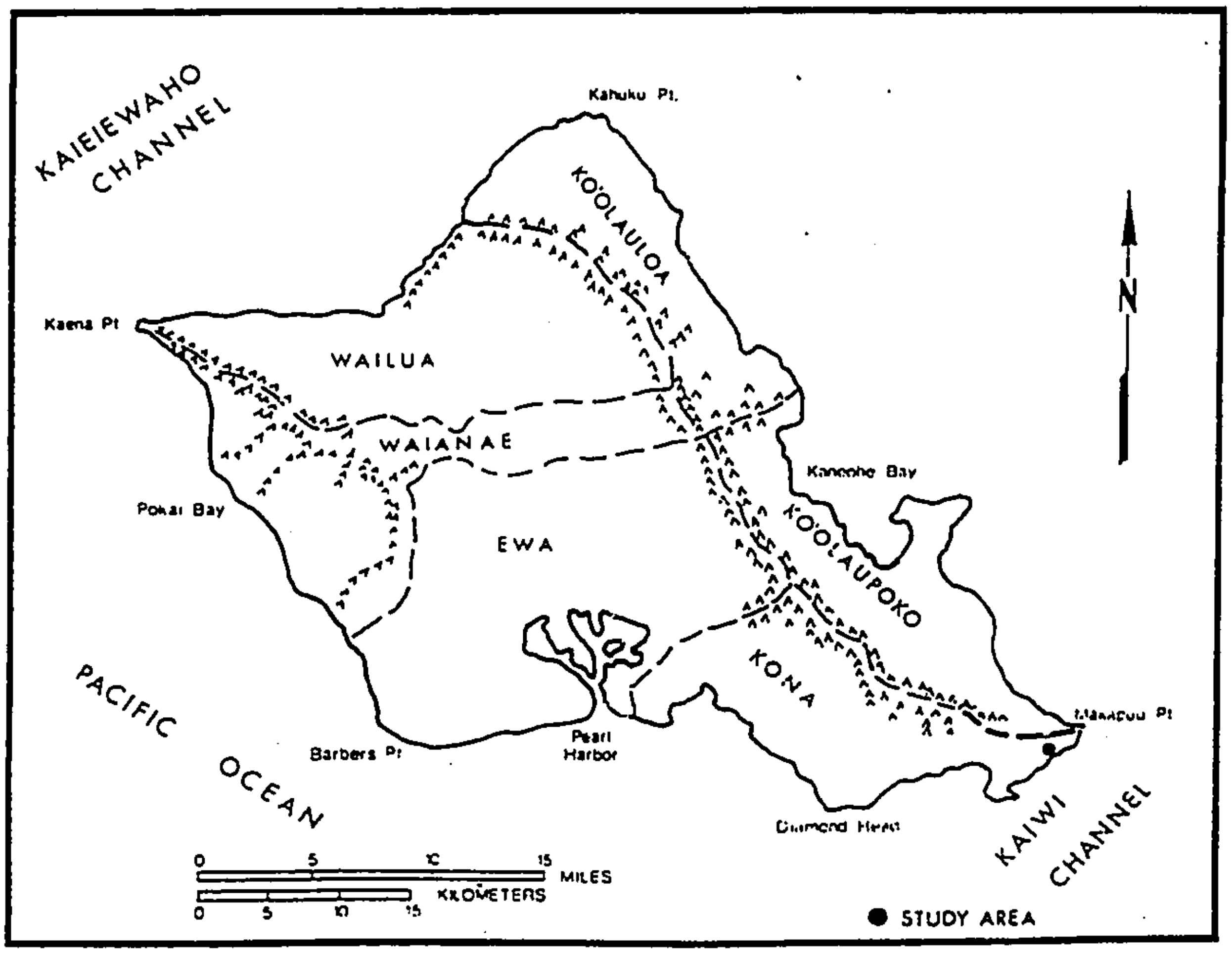

Fig. 2 O'ahu Island Location Map

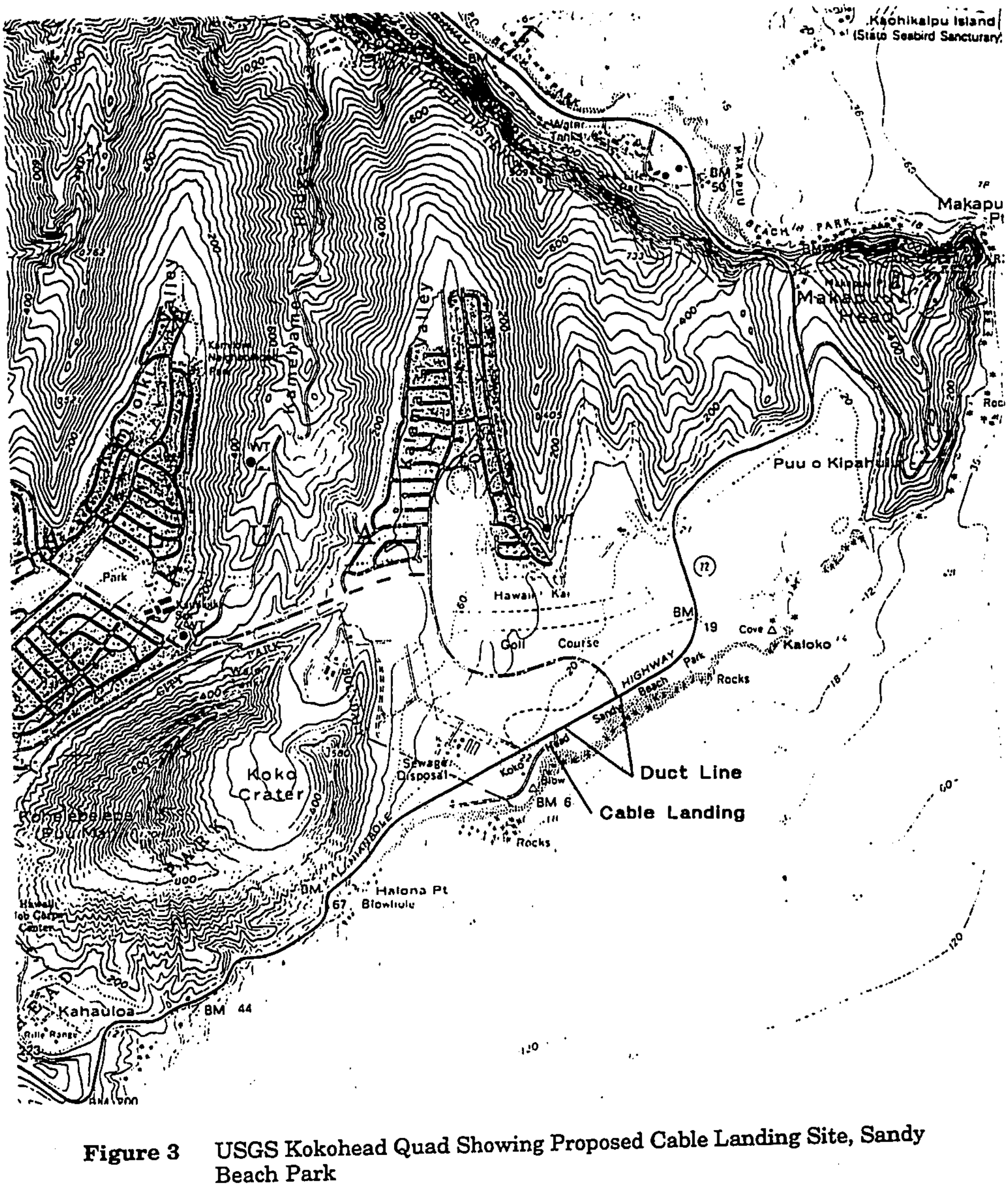

Figure 3 USGS Kokohead Quad Showing Proposed Cable Landing Site, Sandy Beach Park

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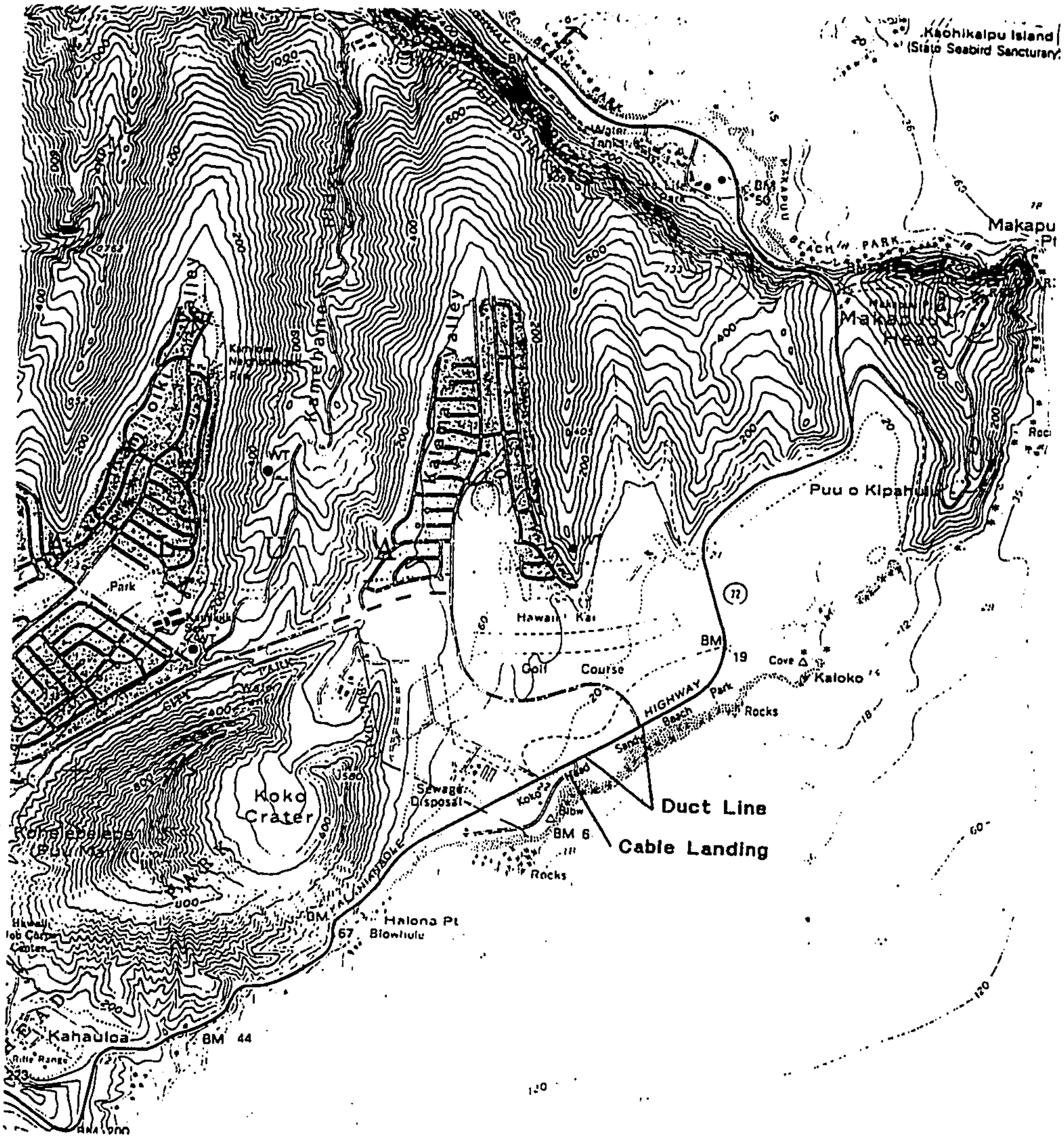

Figure 3 USGS Kokohead Quad Showing Proposed Cable Landing Site, Sandy Beach Park

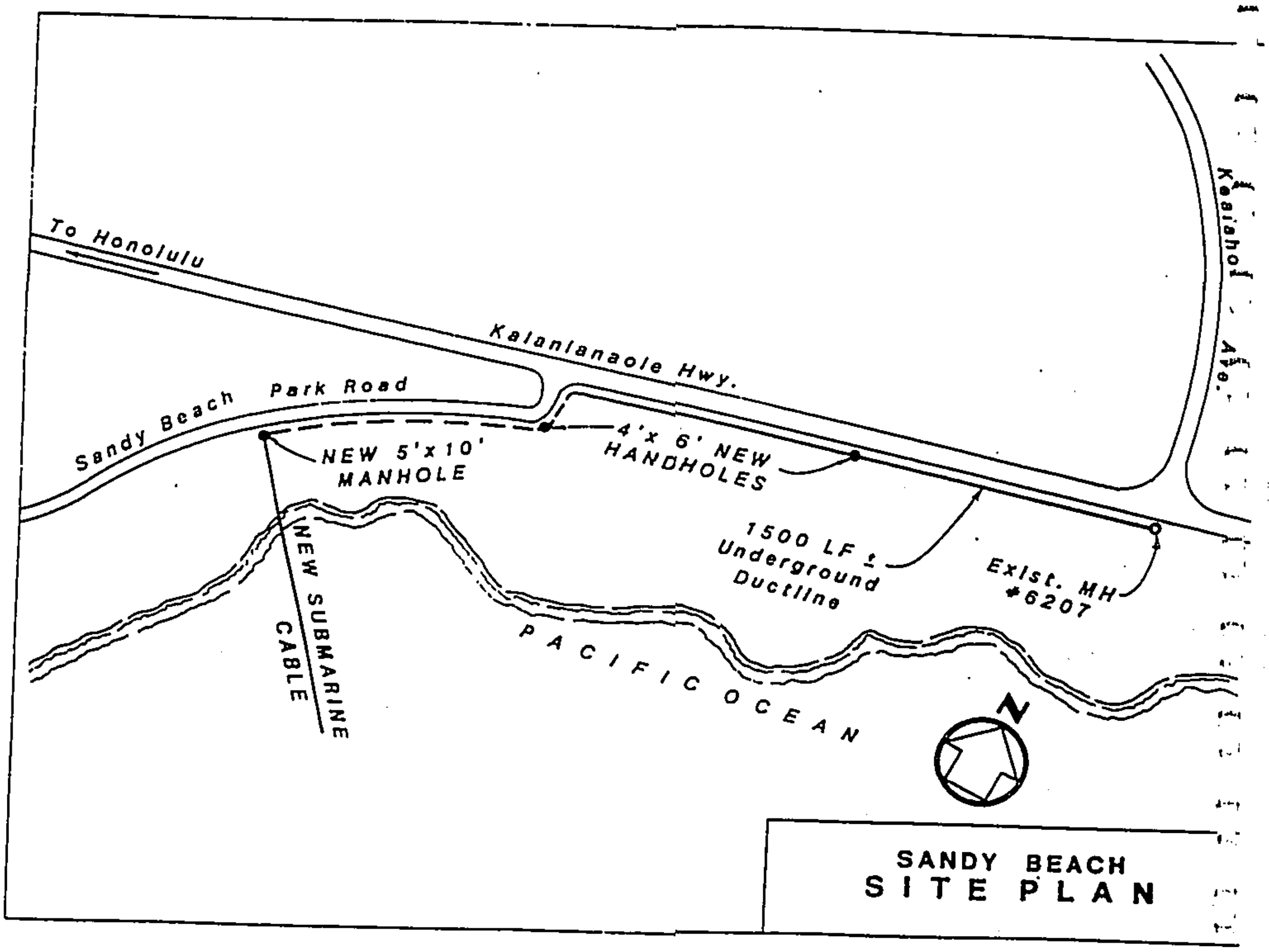

Figure 4 Plan of Project Area, Sand Beach Fiber Optic Cable, from R.M. Towill Corp.

B. Scope of Work and Methods

Specific to the Sandy Beach Fiber Optic assessment, the scope of work included surface survey, sub-surface testing, and review of pertinent literature.

Surface survey and sub-surface testing were conducted on January 24, 1992. The generalized cable corridor (Fig. #4) was followed utilizing an aerial photo supplied by R.M. Towill Corp. The sub-surface testing included a 50cm x 50cm test unit and a four (4) meter long faced, cut bank. Excavated material was screened through 1/4 wire mesh and all cultural material (midden and artifacts) observed was collected. Photographs of the excavations were taken and a representative stratigraphic profile was drawn.

Historic Background

Land Unit

The project area is situated within the traditional land unit of Maunalua ("two mountains"; Pukui, Elbert, Mookini, 1974:149).

There are two reports that detail the history, myths, and legends concerning Maunalua. The two documents are:

1) "Historical/Cultural Essay Report on the Kuapa Pond Area" by Anne H. Takemoto, Pauline King Joerger, Merie-Ellen Fong Mitchell, and Cassandra E. Bareng (1975). This report also includes a certified title search of the Maunalua area with specific references to Kuapa Pond by Herbert Poliala Ewaliko.

2) "Cultural Resources Overview for the Queens Beach Park Feasibility Study, Maunalua, Kona, Oahu" by Marion Kelly, Hiro Kurashima, and Aki Sinoto (1984).

These two reports give in-depth chronological reviews of the land use history of Maunalua. The following is a brief overview based on these reports as well as other sources.

The land unit of Maunalua, in which Sandy Beach Park is situated, is linked with both the Koʻolaupoko and Honolulu districts. Maunalua is recorded in some sources as an *ʻili* (next largest land unit after the *ahupuaʻa*) of Waimānalo in the Koʻolaupoko District. However, even as early as the mid-1850s Maunalua was referred to, in references to Victoria Kamamalu's land claim (LCA 7713) for Maunalua, as being in the Kona District of Oʻahu. The confusion was not cleared up till the 1920s. "The land of Maunalua is an *ʻili* of the *ahupuaʻa* of Waimānalo and originally belonged to Koʻolaupoko District. Maps made as late as 1902 place it in that district. It is situated on the south side of the Koʻolau range and should really be a part of Honolulu District. The many previous acts referring to Oʻahu Districts never did make this sufficiently clear, so in the above amendment (Revised Laws of Hawaii, 1925) of 1932, the descriptions of Honolulu and Koʻolaupoko Districts clarified this point" (J. W. Coulter in Sterling and Summers, 1978:257).

Land Title

Maunalua, as an *ʻili* of Waimānalo, was originally part of the Crown Lands, a possession of Kamehameha III (Interior Department, List of Lands of the King by J. Kaeo Dec. 18, 1847). However, in 1850 Victoria Kamamalu, a granddaughter of Kamehameha I and sister of Kamehameha IV and V, was awarded the *'ili* of Maunalua as part of Land Commission Award (LCA) 7713. In 1883 Bernice Pauahi Bishop inherited Maunalua (and many other lands) as part of the estate of Ruth Keelikolani. The Bernice Pauahi Bishop Estate was created after her death in 1884 and Maunalua was a part of the overall land holdings. Sandy Beach Park, a City and County of Honolulu administered beach park, was acquired from Bishop Estate in 1928 and until the 1960's was an unimproved beach area.

Land Use

The Maunalua area is relatively dry, receiving between 20 and 30 inches of rain per year, and has no permanently flowing streams. Thus the type of agriculture practiced during pre-historic (pre A.D. 1776) and early historic times was probably exclusively dry land agriculture. Ethnographic evidence supports this proposition. "According to the last surviving *kama'aina* of Maunalua, sweet potatoes were grown in the small valleys, such as Kamilonui, as well as on the coastal plain. The plain below Kamiloiki and Kealakipapa was known as *ke-kula-o-Kamauwai*. This was the famous potato-planting place from which came the potatoes traded to ships that anchored off Hahaione in whaling days" (E.S.C. Handy, 1940:155).

Maunalua was probably best known for its large fishpond Keahupua-o-Maunalua (Kuapa Pond). The pond may have covered as much as 523 acres at one time (ca. 1850) (Sterling and Summers, 1978:270). The pond was an early source of revenue to the land owners. In 1856 the pond was leased to the Chun Hoon family for $300 per year, a large sum for those days. In 1873 David Kalakaua leased the pond for $150 per year for a ten- year period. The Kalakaua Estate still had control of the pond's lease into the late 1880s as in a 1889 document records a Chinese firm, Lau Tim & Co., requesting to know if their "application for the lease of the pond at Maunalua will be accepted" (Int. Dept. letter dated November 1889).

The pond is not the only source of fish for Maunalua. The coastline from Makapu'u Point to Maunalua Bay is a very productive near shore and off-shore fishery. This portion of O'ahu's coastline includes Hanauma Bay, which was "a favorite royal fishing resort" (Fornander Coll. Vol. V, p. 278; from Sterling and Summers, 1978:267). Queen Ka'ahumanu was said to have frequented Hanauma Bay as did Kamehameha V (*Ibid.*). Other evidence that the coastline was an important fishery includes the village site of Kaloko (Queen's Beach area), which J. Gilbert McAllister described in his 1930 *Survey of O'ahu Island.* Including in the survey findings at Kaloko were two fishing shrines (*ko'a*), a *heiau*, and a canoe house (*halau*) (J.G. McAllister, 1933:59-65). There were also at least 3 other fishing shrines observed by McAllister within Maunalua.

Commercially organized cattle ranching started ca. 1900 with the lease of most of Maunalua by Maunalua Ranch Co. However, by 1926 this enterprise had folded. In 1932 Alan S. Davis procured a lease for cattle ranching. Alan Davis also went about building a ranch center at the Kaloko area (Queen's Beach). The ranch center included a breakwater and a saltwater swimming pool. These structures, as well as numerous Hawaiian sites at Kaloko were mostly washed away during the 1946 tidal wave with only a few remnants still visible.

Military use within Maunalua has included the Marconi Wireless Station which was first operated ca. 1914, the Coast Guard lighthouse at Makapu'u Point, and the Nike Missile Tracking Station (ca. 1950s-1960s) on Kamehame Ridge.

Since the 1960s Maunalua has been part of the fast-paced urbanization of O'ahu. The Kuapa Pond, Kamilonui and Kamiloiki areas are generally defined as Hawaii Kai. The Kalama Valley portion of Maunalua includes housing and a golf course. Ridge top subdivisions are also progressing with Mariner's Ridge (i.e. Kaluanui Ridge) and more recently Kamehame Ridge. Sandy Beach Park, which was acquired from Bishop Estates in 1928, includes such improvements as parking, comfort stations, and grassed areas. The improvements were begun in the 1960's and continue as conform stations were recently renovated. Presently Sandy Beach Park is one of the most heavily utilized beach parks on O'ahu.

Previous Archaeological Research

Archeological research relevant to Sandy Beach Park includes J. Gilbert McAllister, O'ahu Island Survey J (1933), the two aforementioned reports (Takemoto, Joerger, Mitchell, and Bareng 1975 and Kelly, Kurashima, and Sinoto 1984), a short letter report (Hammatt, 1987), and most recently a large scale testing project which included areas in which the proposed cable route will traverse.

The previous archaeological research has not recorded any sites within the beach park. J.G. McAllister's survey was done prior to the 1946 tidal wave and based on the number and type of sites he recorded elsewhere in Maunalua it would appear that had there been surface sites at Sandy Beach he would have recorded them. Subsurface testing within the park, adjacent to Kalanianaole Hwy also indicated the absence of subsurface cultural deposits.

Subsurface testing along the vehicle log barrier within Sandy Beach Park indicated an absence of subsurface cultural deposits in the eastern portion of the park adjacent to Kalanianaole Hwy. "No material of archaeological significance was found in any of the trenches and it is believed that modern highway construction and beach park landscaping, as well as excavating for water and electric lines has disturbed the upper portion of sand deposits that may once have contained archaeological material" (Hammatt, 1987). However, Hammatt does suggest the possibility of sites along the coast, "Remnants of prehistoric sites may survive in other areas along this coast" (*Ibid.*).

Recent work by Archaeological Consultants of Hawaii Inc. (1992), associated with the proposed eastward expansion of Sandy Beach Park, included 34 backhoe trenches and 50 auger holes. Backhoe excavation and augering were done in areas of active beach as well as areas adjacent to park roadways and Kalanianaole Hwy. Areas tested included sections in which the proposed fiber optic cable line will be located. The extensive testing by Archaeological Consultants did not discover "any significant historic remains" (ACH 1992:66). This was attributed "primarily to the building of the original and realigned Kalanianaole Highways" and tsunami action (*Ibid*:1).

Survey Results

The proposed cable landing and ductline (Fig. #4) were inspected for surface sites of which none exist. Observed during the survey were a number of backfilled backhoe trenches within and near the proposed ductline corridor. The backhoe trenches were associated with an archaeological survey for the proposed eastward expansion of Sandy Beach Park. Discussion of the expansion project is within the previous research section of this report.

The surface survey also revealed that the proposed landing corridor extends northward from the active beach zone to a cement culvert associated with the beach park roadway. The culvert construction has created a cut bank which was inspected for stratigraphic information.

Sub-Surface Testing

A four-meter long section of the cut bank was cleared of vegetation and partially excavated (faced-up) to clearly expose the stratigraphic soil profile. The profile included up to six stratigraphic units I, II, III, IV, V and VI. Stratum I represents modern A - horizon consisting of dark brown (7.5 YR 3/4) clay loam which contains some modern trash and a 10-20% sand component. Stratum II consists of loose coralline beach sand which contains approximately 10% water rounded coral and basalt gravel (pebbles to cobbles). This beach layer continues makai becoming the active beach to the shore line rocks. Stratum II also contains scattered modern trash. Stratum III consists of slightly compact strong brown (7.5 YR 4/6) sandy clay loam. Stratum III contains plentiful (20-30%) water rounded basalt and coral gravel (pebbles to cobbles). This layer appears to have been mechanically altered as it contains marbling and mottling as well as a few modern trash items. Stratum IV consists of a compact dark brown (7.5 YR 3/4) sandy loam with 10 to 15% sand and 20% rock content. The rock component includes both coral and basalt sub-angular to water rounded pebbles to cobbles. No artifacts or midden were observed in association with this layer (i.e. Stratum IV). Stratum V is actually the lower boundary of Stratum IV with IV material as the matrix around boulder-sized rocks. Stratum VI occurs only within active beach deposits and consists of a maxi of beach sand and Stratum IV. Stratum VI consists of a brown (7.5 YR 5/6 - 5/8) sandy loam with water-rounded basalt and coral gravel (pebbles to cobbles)

The stratigraphy observed clearly indicated modern alteration of the natural landscape. Modern era (ca. 1960s - 1970s) trash was observed to depths of 50 cms below surface. The other major observable characteristic within the stratigraphic profiles was the amount and size of the water-rounded gravel in what appeared to be natural or non-mechanically layered strata. This suggests that wave action (i.e., high surf and tsunami) has regularly inundated the section of shoreline in which the proposed fiber optic cable landing is situated.

Summary and Recommendations

Background research indicated an absence of archaeological sites within the proposed fiber optic cable landing and underground duct line. Recent archaeological investigations have, in general, confirmed this.

Test excavations, associated with the Sandy Beach log barrier (Hammatt, 1987), which is on the *makai* side of Kalanianaole Hwy found no archaeologically significant cultural deposits and indicated "that modern highway construction and beach park landscaping, as well as excavating for water and electric lines, has disturbed the upper portion of sand deposits that may once have contained archaeological materials" (*Ibid.*).

Inventory level subsurface investigations, for the proposed eastward expanses of Sandy Beach Park, which included areas that the fiber optic cable and duct line will traverse were also negative in terms of locating significant archaeological resources. Specific to the inventory survey were 34 backhoe trenches and 50 auger holes and "none of the subsurface excavations yielded any artifacts or sites of historic significance" (Archaeological Consultants of Hawaii, 1992:1).

Test excavations done for this project,, along the proposed cable landing corridor, were also negative in terms of locating archaeologically significant cultural deposits. The test excavations indicated that the portion of cable landing within the active beach consists of loose coralline sand overlying a brown sandy loam layer with plentiful water-rounded basalt and coral gravel that lies directly on the basalt bedrock. The portion of the cable landing and duct line by beyond the active beach (i.e., adjacent to park roadway and Kalanianaole Hwy) consists of mechanically altered strata associated with road(s) construction and beach park improvements.

Based on the observed absence of significant surface and subsurface archaeological resources within the proposed fiber optic cable landing and duct line for East Oʻahu no further archaeological research appears warranted. However, this archaeological assessment was not specific to a surveyed and staked cable landing/duct line corridor and though we do not anticipate any significant findings, we recommend that an archaeological firm be contracted to provide on-site inspections during construction for the fiber optic cable landing and duct line.

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Appendix A - Photo Appendix Fiber Optic Cable Landing Site and Duct Line, East O‘ahu

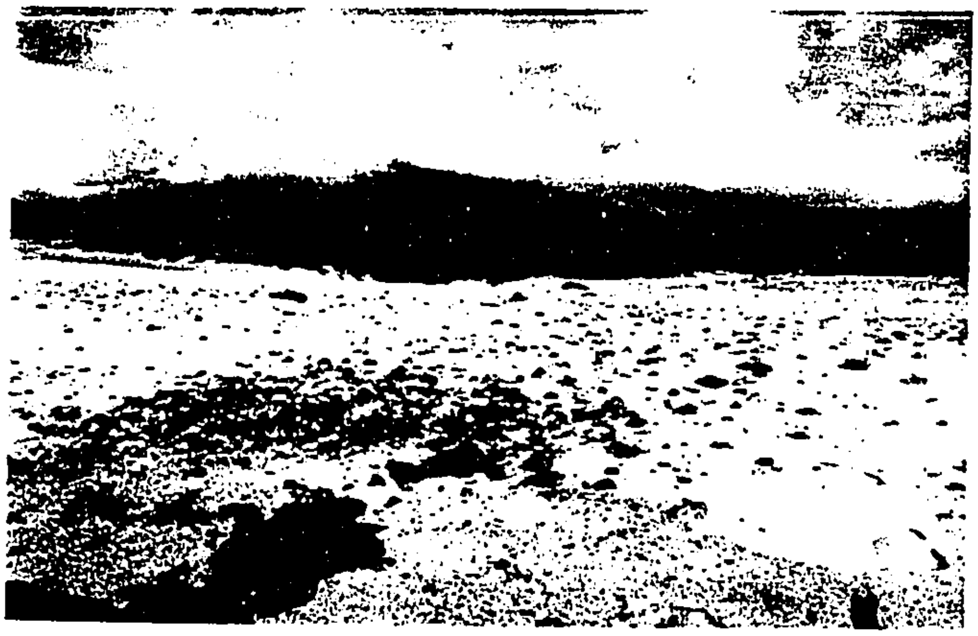

Figure 5 Cable Landing Corridor in Active Beach Park, Roadway Culvert in Background (View to Northwest)

Figure 6 Faced-up Cut Bank of Culvert Showing Mixed Stratigraphic Profile (View to North)

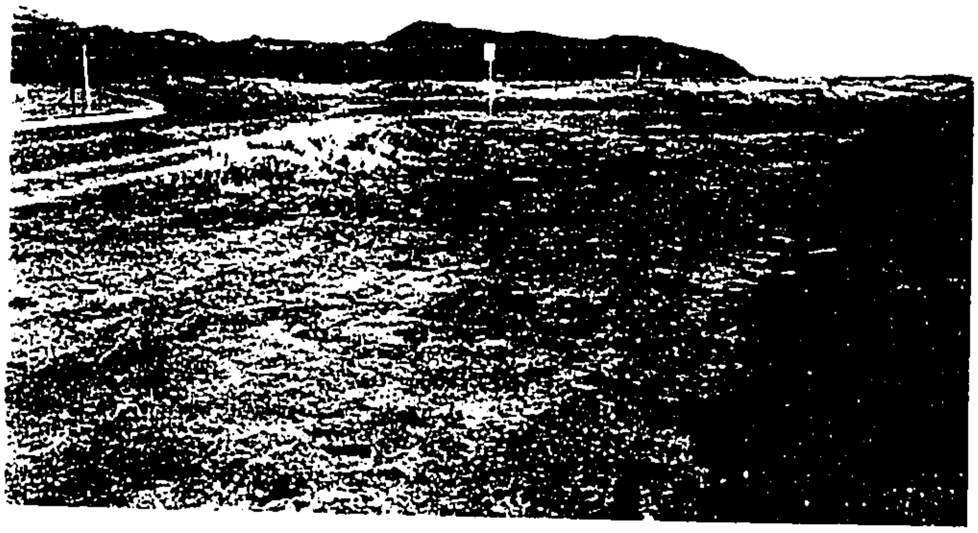

Figure 7 Route of Proposed Underground Fiber Optic Duct Line, Showing Backfilled Backhoe Trench Associated with Park Expansion Archaeological Testing (ACH, 1992) as Exposed Dirt in Center of Photo (View to North).

Figure 8 Kalanianaole Hwy Road Shoulder Portion of Proposed Duct Line (View to Northeast)