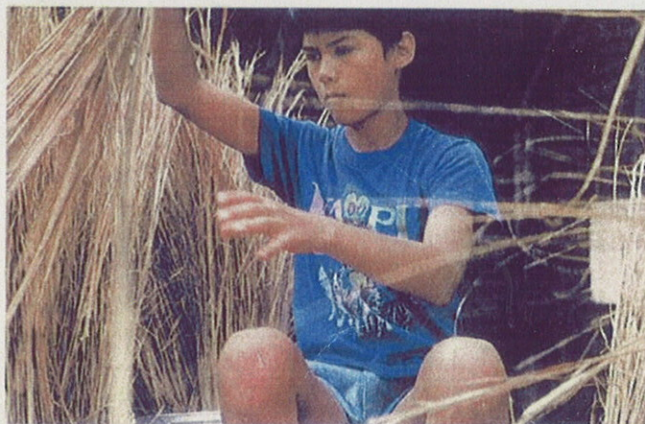




PALAPALA HO'ONOHONOHO MOKU'ĀINA O KAHO'OLawe
KAHO'OLawe USE PLAN



Kaho'olawe Island Reserve Commission
State of Hawai'i

This page intentionally left blank

PALAPALA HO'ONOHONOHO MOKU'ĀINA O KAHO'OLawe
KAHO'OLawe USE PLAN

prepared for

KAHO'OLawe ISLAND RESERVE COMMISSION
STATE OF HAWAI'I

by

PBR HAWAII

in consultation with:

Pualani Kanahale
Leslie Kuloloio
Davianna McGregor.
Rowland Reeve
Hardy Spoehr
Community Planning, Inc.
Geographic Decision Systems International

December 1995

This page intentionally left blank

KŪKULU KE EA A KANALOA

(Reestablish the life and spirit of Kaho‘olawe)

This page intentionally left blank

A NOTE TO READERS

Pursuant to the Memorandum of Understanding (MOU) between the State of Hawai'i and the U.S. Navy, the Kaho'olawe Island Reserve Commission will be consulting with the U.S. Navy concerning the likelihood of the successful cleanup of selected sites and the identification of priority of those sites. As such, this plan may be revised prior to final submittal to the U.S. Navy.

This page intentionally left blank

**‘ŌLELO MUA
(PREFACE)**

KAHO‘OLAWE ALOHA ‘ĀINA

Kaho‘olawe and Aloha ‘Āina have become synonymous in Hawai‘i because of the vision and commitment of Hawaiians and their supporters, who were determined to "stop the bombing" and bring life back to Kaho‘olawe.

IMUA NĀ PUA, LANAKILA KAHO‘OLAWE

May 7, 1994 marked the dawn of a new era in Hawai‘i; a renewed life for Kaho‘olawe and for Hawai‘i's native culture. On this day, Kaho‘olawe and its surrounding waters were returned to the people of Hawai‘i by the U.S. Government. This return and the acceptance of a management regime based upon the Hawaiian concept of aloha ‘āina reflect a growing mood among all of Hawai‘i's people for a return to appropriate values for island living.

KŪKULU KE EA A KANALOA

Now, a new challenge begins for all of Hawai‘i's people — to begin the effort to re-establish the life and spirit of Kaho‘olawe and its surrounding waters. The purpose of this plan is to identify the vision and complementary uses and activities which will bring about this transformation within the context of a Native Hawaiian concept of land use.

MAHALO FROM THE KAHO'OLAWE ISLAND RESERVE COMMISSION

The members of the Kaho'olawe Island Reserve Commission (KIRC) acknowledge the vision, commitment, love and sacrifice that many individuals have made to bring Kaho'olawe and its surrounding waters home. In particular, the KIRC extends its aloha and mahalo to the families of:

George Helm and Kimo Mitchell, sons of Moloka'i Nui A Hina and of Maui A Kamalalawa'u, who inspired our generation to respect and care for the land and who made the ultimate sacrifice.

Aunty Mary Wahineokalani Lee, who brought us together in prayer and led the kūpuna in their support of the 'ōpio.

Aunty Edith Kanaka'ole, who guided and inspired us to be an 'ohana, and to honor Lono-i-ka-makahiki and the deities of our ancestral land.

Uncle Harry Kunihi Mitchell, net on his back, sparkle in his eye, sailing the ocean, working the lo'i, reading the signs of clouds, moon, stars, and winds, reminding us in song and action and laughter of ka waiwai o nā kūpuna— the richness and beauty of the Native Hawaiian lifestyle.

Parley Kanaka'ole, who re-established the importance of traditional protocol through the dedication of Ka Mua Ha'i Kūpuna 'o Kahualele, and who provided a model of cultural identity and strength for today's Hawaiians.

Nawahī, the Hui Aloha 'Āina and the kua'āina of our rural communities on all our islands, whose spirit drives us to seek sovereignty for our land, our people, and our akua.

All the kūpuna, mākua and 'ōpio in the *Protect Kaho'olawe 'Ohana* who are too many to name. Those who have passed on and those who live on and persist in the work to bring life to Kaho'olawe: ke aloha kūpa'a o ka 'āina.

Charles Maxwell, Paul Fujishiro, Herbert Santos, Adrian "Bear" Nakua, Walter Ritte, Noa Emmett Aluli, Richard Hoopii, Gail Prejean, Coats Cobb-Adams, and many, many others that began the movement of reclaiming Kaho'olawe.

Further, the KIRC wishes to thank all those individuals who, in the political arena, kept the Kaho'olawe dream alive and developed the mechanisms and means for the island's return. In particular, the Commission recognizes the on-going efforts of Senator Daniel K. Inouye who has played a pivotal role in Kaho'olawe's return; Senator Daniel K. Akaka; Hawai'i's other Congressional members, Congresswoman Patsy Mink and Neil Abercrombie; Hawai'i's former Congresswoman Pat Saiki; Hawai'i's former Governor John Waihe'e and his Hawaiian affairs staff lead by Norma Wong; Hawai'i's State Legislature, and the former President of the United States George Bush whose courage to stop the bombing on Kaho'olawe created a political climate conducive for the island's return.

The KIRC also acknowledges the work of the Kaho'olawe Island Conveyance Commission as documented in their twenty-one consultant reports on the condition of the natural and cultural resources of Kaho'olawe and the final report to the Congress of the United States entitled Kaho'olawe Island: Restoring a Cultural Treasure (1993).

ACKNOWLEDGMENTS

PBR HAWAII wishes to extend its sincere appreciation to all of those individuals listed below who contributed to the formulation of this use plan. We would also like to thank everyone who participated in the development of this plan, especially those who have reviewed the document and maps, attended the public meetings, and/or provided suggestions and help. There are probably many others that we failed to mention; to those persons, we humbly apologize. To all, Mahalo Nui Loa.

Kaho'olawe Island Reserve Commission

Noa Emmett Aluli, Chairperson
A. Frenchy DeSoto, Commission Member
Nalani Kanaka'ole, Commission Member
Colette Machado, Commission Member
Brian Miskae, Commission Member
Craig Neff, Commission Member
Michael Wilson, Commission Member
Keoni Fairbanks, Executive Director
Momi L. Singson, Administrative Assistant

Island Access

Dan Holmes
Moke Kahiamoe
Manny Kuloloio
Robert Lu'uwai
Burt Sakata
Mark Tsuha

Navigation

Nainoa Thompson

Archaeological Focus

Sara Collins
Ross Cordy
Tom Dye
Michael Graves
Eric Komori
Patrick McCoy
Buddy Neller

Ocean/Cultural Focus

Noa Emmett Aluli
Bernard Bulawan
Eddie Chang Jr.
Palikapu Dedman
Bird Enriques
Paul Fujishiro
Dan Holmes
Manny Kuloloio
Wade Lee
Mark Luning
Robert Lu'uwai
Mac Poepoe
Mark Tsuha
Michael Wilson

Environmental/Habitat Restoration Focus

Patrick Ching
Sam Gon
Bob Hobdy
Dan Holmes
John Obata

Cultural Focus

Tuti Baker
Luana Busby
Hökülani Holt-Padilla
Edward Kanahele
Chinky Mahoe
Nathan Napoka
Craig Neff
Analu Okimoto

Educational Focus

Kau'i Almeida
Mei-Ling Chang
Hökülani Holt-Padilla
Joanne Ka'akua
Kekuhi Kanahele-Frias
Keiki Kawaiae'a
Ka'uhane Lu'uwai
Pi'ikea Miyamoto
Iris Mountcastle
Momi Lovell Singson

Use Plan Team

Royce Jones
Pualani Kanahele
Bernard Kea
Leslie Kuloloio
Davianna McGregor
Rowland Reeve
Hardy Spoehr

PBR HAWAII

Wm. Frank Brandt, Principal-in-Charge
Vincent Shigekuni, Project Manager
Lisa Leonillo Imata, Project Planner
Chris Kimura, Planner
Toshiko Matsushita, Graphic Designer

PAPA KUHIKUIHI
(TABLE OF CONTENTS)

‘ŌLELO MUA (PREFACE)

MAHALO FROM THE KIRC

ACKNOWLEDGMENTS

A NOTE ON PLACE NAMES

1. INTRODUCTION	1-1
Memorandum of Understanding	1-1
Chapter 6K, Hawai‘i Revised Statutes: Kaho‘olawe Island Reserve	1-2
Objectives	1-2
Planning Process	1-3
Overview of Current and On-going KIRC Efforts	1-3
2. VISION STATEMENT	2-1
3. GUIDING PRINCIPLES OF LAND USE	3-1
‘Ike Pāpālua	3-1
Ka ‘Āina, Ke Kai A Me Ka Lewa	3-1
Ka Wai	3-2
‘Ili Concept	3-2
Ho‘olohe I Nā Kūpuna/Ho‘olohe I Ka ‘Āina	3-4
Aloha ‘Āina	3-4
Ho‘ōla Hou (Environmental Restoration)	3-5
E Ho‘omālamalama Hou Ana Ka Maui Ola (Cultural Restoration)	3-5
4. EXISTING CONDITIONS	4-1
Nā Mea Pahu (Unexploded Ordnance)	4-1
Ka Waihona ‘Āina (Topography)	4-1
Ka Makani (Wind)	4-1
Ka Wai (Fresh Water)	4-2
Nā Lepo (Soils)	4-2
Ka ‘A ‘ai Lepo (Erosion)	4-12
Nā Mea Kanu (Flora Habitats)	4-13
Nā Holoholona A Me Nā I‘a (Fauna Habitats)	4-17
Ke Kai (Ocean)	4-18
Ka Lewa (Airspace)	4-18
Nā Kahua Kahiko (Cultural and Historical Sites)	4-18
Nā Mea Hana (Infrastructure)	4-19
5. USES AND ANTICIPATED ACTIVITIES	5-1
Kahua Kauhale (Educational and Cultural Centers/Work Camps)	5-2
Kahua Ho‘omoana (Overnight Campsites)	5-3
Ho‘ōla Hou (Revegetation/Soil Stabilization Areas)	5-4

	Kula (Open Lands)	5-5
	Nā Mea Kanu/Nā Holoholona A Me Nā I‘a (Botanical/Wildlife Preserves)	5-5
	Kahua Kahiko (Cultural/Historical Preserves)	5-5
	Interconnection of Uses	5-6
	Description of Land Use Map	5-6
6.	INFRASTRUCTURE	6-1
	Kihāpai Ho‘oulu Mea Kanu/Pūnāwai (Nurseries/Reservoirs)	6-1
	Alaloa (Roads and Trails)	6-1
	Roads	6-1
	Trails	6-5
	Wai	6-5
	Wells	6-5
	Desalinization	6-5
	Reservoirs/Cisterns/Catchments	6-5
	Storage and Distribution System	6-6
	Drainage	6-6
	Wastewater	6-6
	Awa Kū Moku (Buoy Moorings)	6-6
	Refuse	6-7
	Description of Infrastructure Map	6-7
7.	DESCRIPTION OF ‘ILI	7-1
	Hakioawa ‘Ili	7-1
	Papaka ‘Ili	7-3
	Kuheia/Kaulana ‘Ili	7-5
	Ahupu ‘Ili	7-7
	Honokoa ‘Ili	7-11
	Kealaikahiki ‘Ili	7-13
	Kunaka/Naalapa ‘Ili	7-16
	Kanapou ‘Ili	7-19
	Lua Makika (Lua Moaula)	7-19
8.	CLEAN-UP PRIORITIES	8-1

BIBLIOGRAPHY

APPENDIX

Preliminary Management Recommendations

LIST OF FIGURES

	<u>Page</u>
Figure 1-1: Restoration Timeline	1-5
Figure 3-1: Circa 1895 Kaho'olawe 'Ili Map	3-3
Figure 4-1: Location Map	4-3
Figure 4-2: Vegetation Distribution	4-15
Figure 5-1: Use Map	5-7
Figure 6-1: Typical Sections - Road at Ridgeline and at Hillside	6-4
Figure 6-2: Typical Trail Section	6-5
Figure 6-3: Infrastructure Map	6-9
Figure 7-1: 'Ili Map – Hakioawa	7-2
Figure 7-2: 'Ili Map – Papaka	7-4
Figure 7-3: 'Ili Map – Kuheia/Kaulana	7-6
Figure 7-4: 'Ili Map – Ahupu	7-9
Figure 7-5: 'Ili Map – Honokoa	7-12
Figure 7-6: 'Ili Map – Kealaikahiki	7-14
Figure 7-7: 'Ili Map – Kunaka/Naalapa	7-17
Figure 7-8: 'Ili Map – Kanapou and Lua Makika	7-20
Figure 8-1: Priority Map – Priority 1	8-7
Figure 8-2: Priority Map – Priority 2	8-9
Figure 8-3: Priority Map – Priority 3	8-10
Figure 8-4: Priority Map – Priority 3	8-11
Figure 8-5: Priority Map – Priority 3	8-12
Figure 8-6: Priority Map – Priority 4	8-13
Figure 8-7: Priority Map – Priority 5	8-14
Figure 8-8: Priority Map – Priority 6	8-15
Figure 8-9: Priority Map – Priority 7	8-16
Figure 8-10: Priority Map – Priority 8	8-17
Figure 8-11: Priority Map – Priority 9	8-19
Figure 8-12: Priority Map – Priority 10	8-20
Figure 8-13: Priority Map – Priority 11	8-21
Figure 8-14: Priority Map – Priority 12	8-23

LIST OF TABLES

	<u>Page</u>
Table 8-1: Clean-Up Priorities	8-4
Table 8-2: Summary of Acreage by Priority (Tier Two Clearance)	8-5
Table 8-3: Clean-Up Priorities	8-5

Cover Photo Credits

Top and Bottom Right photos: Rowland Reeve
 Middle Left and Bottom Left photos: Margo Berdeshevsky

A NOTE ON PLACE NAMES

There are many variations of the place names of Kaho'olawe and the spellings of the place names. The use of glottal stops ('okina) and macrons (kahakō) have been avoided where questionable so as not to set interpretations on the meanings of the names. More research should be conducted to find the original meanings of traditional place names and to standardize the names.

1. INTRODUCTION

This page intentionally left blank

I. INTRODUCTION

Memorandum of Understanding

In 1993, the United States Congress returned Kaho'olawe to the State of Hawai'i (Defense Appropriations Act of 1993). As part of the enabling legislation, the United States Navy was required to complete an "environmental remediation program" within ten years. On May 6, 1994, the State of Hawai'i executed a Memorandum of Understanding (MOU) with the U.S. Navy designating the Kaho'olawe Island Reserve Commission (KIRC) as its representative in "all agreements, plans, and protocols" as they relate to the "cleanup and restoration" of Kaho'olawe and its surrounding waters and to the protection of its historical, cultural, and religious sites and artifacts, and access.

The cleanup and restoration of Kaho'olawe and its surrounding waters is the first priority of the KIRC. To facilitate the U.S. Navy's cleanup and restoration, the KIRC has prepared this Kaho'olawe Use Plan in accordance with Section VI of the MOU. The U.S. Navy, using this Use Plan as its planning document, will then prepare its cleanup plan and initiate cleanup and restoration activities on the island and in its surrounding waters. In regards to cleanup, the MOU specifically states:

VI. CLEANUP

A. The use plan: *The KIRC shall submit a detailed use plan to the Navy for the entire island of Kaho'olawe, which specifically identifies the uses to which each site or area on the island will be put.*

1. *Particular sites or areas, totalling in aggregate no more than 25 per cent of the surface of the island, may be specifically identified to be cleaned up to the Tier Two standard described in Section VI.C., in order to accomplish the cultural, historical, and archaeological purposes set forth in Title X. An additional 5 per cent of the surface of the island may be designated by mutual agreement between the Navy and the KIRC for trails or roads necessary to provide access between sites or areas. As part of its use plan submitted to the Navy, the KIRC shall select sites or areas and identify for the Navy the priority of those sites or areas that are to be cleaned up to the Tier Two standard.*
2. *The identification or priority of sites or areas to be cleaned up to the Tier Two standard may be modified by mutual agreement between the Navy and the KIRC, subject to the overall 25 per cent limitation of total area described in VI.A. (1).*
3. *The Navy shall cooperate with the KIRC to provide any reasonable technical and historical information necessary to develop a use plan.*
4. *Prior to submitting its use plan to the Navy, the KIRC and the Navy shall consult with each other concerning the likelihood of successful cleanup of the selected*

sites and the identification of priority of those sites.

5. The KIRC's use plan shall be considered a feasibility study for purposes of Chapter 343-5, Hawaii Revised Statutes.

B. The cleanup plan: After the KIRC submits its use plan to the Navy, the Navy, in consultation with the KIRC, shall develop a cleanup plan for ordnance clearance or removal and environmental restoration. The Navy's cleanup plan shall provide for the removal or clearance of all unexploded ordnance from the surface of the island in accordance with the Tier One standard described in Section VI.C.(1); will be designed to allow the reasonably safe use of Tier Two areas for the purposes listed in Section VI.C.(2), in accordance with the KIRC's use plan; and shall accommodate, to the extent practicable, the KIRC's selection and priorities of areas to be cleaned up...

Chapter 6K, Hawai'i Revised Statutes: Kaho'olawe Island Reserve

In 1993, the State Legislature passed Chapter 6K, Hawai'i Revised Statutes which established the Kaho'olawe Island Reserve to include the island of Kaho'olawe and the submerged lands and waters extending seaward two miles from its shoreline. Under law, the specific uses for Kaho'olawe are as follows:

[§6K-3] *Reservation of uses. (a) The Kaho'olawe island reserve shall be used solely and exclusively for the following purposes:*

- (1) *Preservation and practice of all rights*

customarily and traditionally exercised by Native Hawaiians for cultural, spiritual, and subsistence purposes;

- (2) *Preservation and protection of its archaeological, historical, and environmental resources;*

- (3) *Rehabilitation, revegetation, habitat restoration, and preservation; and*

- (4) *Education.*

(b) *The island shall be reserved in perpetuity for the uses enumerated in subsection (a). Commercial uses shall be strictly prohibited.*
[L 1993, c 340, pt of §2]

Chapter 6K also provides for eventual transfer of the Kaho'olawe Island Reserve to the sovereign Native Hawaiian entity as follows:

[§6K-9]. *Transfer.*

Upon its return to the State, the resources and waters of Kaho'olawe shall be held in trust as part of the public land trust; provided that the State shall transfer management and control of the island and its waters to the sovereign Native Hawaiian entity upon its recognition by the United States and the State of Hawaii.
[L 1993, c 340, pt of § 2]

Objectives Of This Use Plan

The objectives of this Kaho'olawe Use Plan are:

- 1) To provide an overall vision and identify appropriate uses and specific activities consistent with that vision;

- 2) To identify what specific areas of the island are to be used for what purposes and to describe these in detail identifying all facilities and infrastructure requirements; and
- 3) To transmit this plan to the U.S. Navy for its use as a guide in developing its Clean-Up Plan for the island.

Planning Process

The KIRC has worked closely with its consultant to insure that this Use Plan reflects the appropriate vision and values, or guiding principles, for the island and its surrounding waters. Hawaiian culture and its aloha 'āina philosophy form the basis of this effort.

The vision articulated in this plan has been developed by the KIRC in an effort to identify long-term goals and short-term steps necessary to achieve those goals. A set of guiding principles was developed to provide a framework for identifying specific uses and activities deemed appropriate for the island.

The majority of uses and activities in this plan evolved from discussions with focus groups specifically in the areas of archaeology, education, ocean/cultural uses, expanded cultural uses, and environmental/habitat restoration. Participants included cultural experts and practitioners, environmental and archaeological experts, representatives from relevant government agencies, members of the Protect Kaho'olawe 'Ohana, and other KIRC consultants.

Besides information from focus groups, the KIRC has incorporated in this plan many of the past uses and practices on the island as identified in research and planning efforts, particularly that



Some Focus Group Member on Island.

PBR HAWAII

which was conducted by the federally-appointed Kaho'olawe Island Conveyance Commission, the Office of State Planning, and the County of Maui.

Additionally, site visits to the island were conducted by the KIRC and its consultants to spot-check the appropriateness of uses and activities identified in this plan.



Site Verification

PBR HAWAII

Overview of Current and Future KIRC Efforts for Restoration

This Use Plan is just one of several report documents that are being produced by the KIRC and its consultants within the 1995-1996 timeframe. Other studies that have recently begun or are about to begin are the Ocean Management Plan, Cultural Protocol and

Expanded Cultural Use Plan, Site Protection Procedures, Restoration/Revegetation Strategy, and Regulatory Framework.

The Ocean Management Plan will complement this Use Plan and provide an overall vision and a comprehensive resource-based management strategy for the waters of Kaho'olawe. The Cultural Protocol and Expanded Cultural Use Plan will provide guidance on appropriate conduct in and around the island's cultural sites. The Site Protection Procedures report will provide direction for the protection of archaeological, historical, cultural, and religious sites during clean-up. The Restoration/Revegetation Strategy will address and evaluate strategies and techniques for soil erosion control and revegetation with native plants. The Regulatory Framework will address applicable laws, KIRC's role in clean-up decision-making, and all other issues relating to the expectations of clean-up procedures and results.

All of the above reports are interconnected and focus on the island's eventual restoration, and thus, should be completed by 1997. An overview of the overall restoration timeline is shown in Figure 1-1.

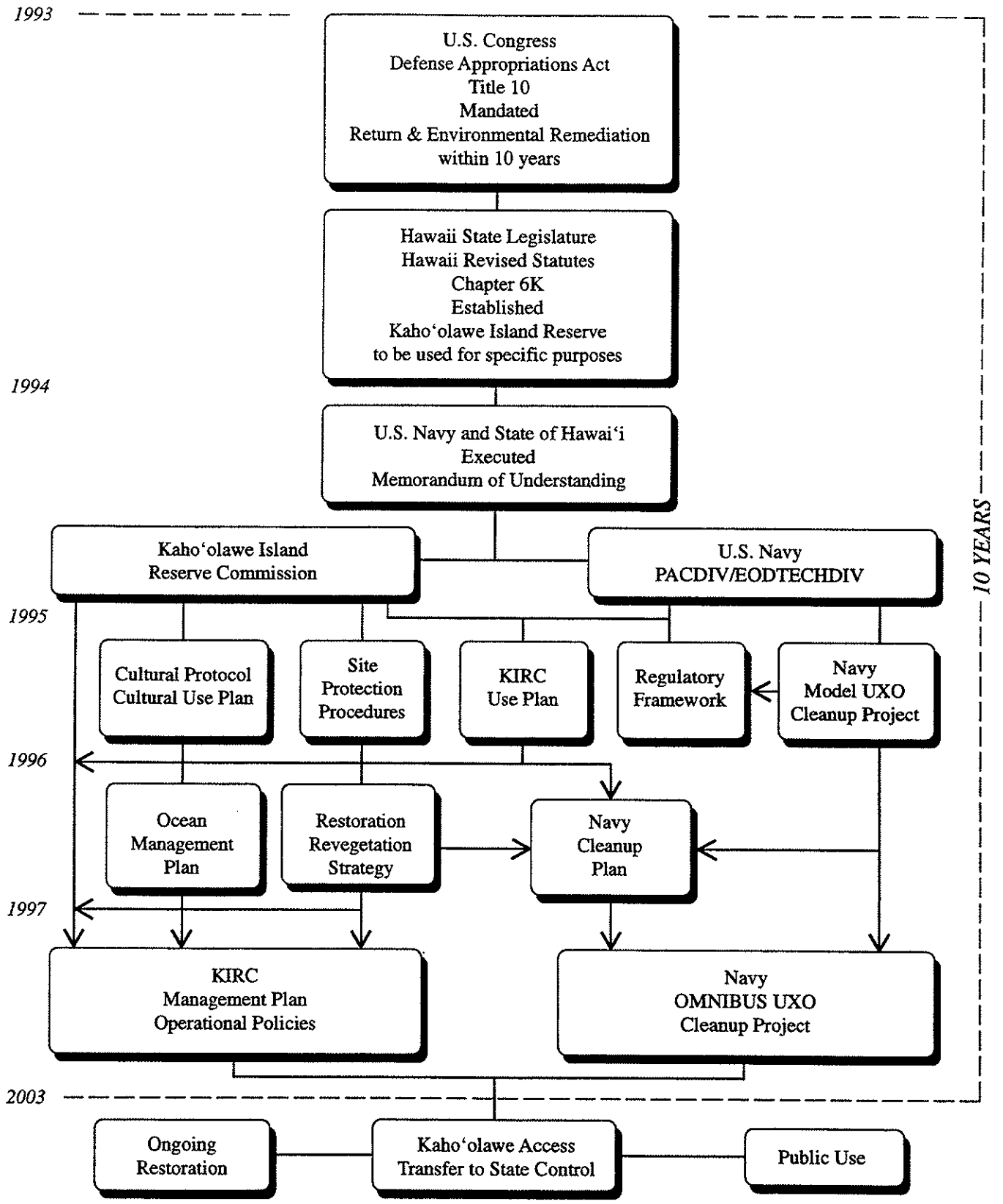


FIGURE 1-1
RESTORATION TIMELINE
KAHO'OLAWA



DEC. 1995

2. VISION STATEMENT

This page intentionally left blank

2. VISION STATEMENT

The kino of Kanaloa is restored. Forests and shrublands of native plants and other biota clothe its slopes and valleys. Pristine ocean waters and healthy reef ecosystems are the foundation that supports and surrounds the island.

Nā po'e Hawai'i care for the land in a manner which recognizes the island and ocean of Kanaloa as a living spiritual entity. Kanaloa is a pu'uhonua and wahi pana where Native Hawaiian cultural practices flourish.

The piko of Kanaloa is the crossroads of past and future generations from which the Native Hawaiian lifestyle spreads throughout the islands.

This vision statement projects the vision for the long-term future condition of the environment and ecosystems of the Kaho'olawe Island Reserve, for the continuing involvement of the people of Hawai'i in caring for the island, and how Kaho'olawe can help in the spread of indigenous Hawaiian culture and its perpetuation to future generations.

The kino of Kanaloa is restored. Forests and shrublands of native plants and other biota clothe its slopes and valleys. Pristine ocean waters and healthy reef ecosystems are the foundation that supports and surrounds the island.

The first paragraph of the Vision Statement refers to the physical as well as spiritual restoration of Kanaloa (Kaho'olawe). Kanaloa is one of the major Hawaiian male gods. He is the god of the ocean (and all things related such as navigation), ocean animals, and fresh water found underground. The island of Kaho'olawe was named for the god Kanaloa and they are considered to be one and the same.

Accomplishing restoration and revegetation envisioned in this statement will be a long and arduous task. For the foreseeable future, much of the activities occurring on the island will revolve around restoration. Moreover, Kaho'olawe presents the people of Hawai'i with a unique and historic opportunity to revitalize the island with native plants and biota in an isolated setting and to create a marine sanctuary that can also help regenerate marine life for Maui and Lana'i.

Nā po'e Hawai'i care for the land in a manner which recognizes the island and ocean of Kanaloa as a living spiritual entity. Kanaloa is a pu'uhonua and wahi pana where Native Hawaiian cultural practices flourish.

This second paragraph acknowledges the traditional role of Kaho'olawe as envisioned by Hawaiian ancestors; as a sacred form and refuge of the life force and energy of Kanaloa. Kaho'olawe is a cultural treasure for all the people of Hawai'i, especially nā po'e Hawai'i (the Native Hawaiian people). There are few places left in today's Hawai'i where one can go

to learn about being Hawaiian. Kaho'olawe offers such a place.

Restoring the island will provide a place and a purpose for a new generation of Hawaiians to be trained in both the rights and responsibilities of "kahu o ka 'āina" (stewards of the land). This involves learning to care for the natural resources, only taking what is needed, and observing a kapu to allow the resources to naturally regenerate from season to season and year to year.

The island will provide a place for Hawaiians and other kama'āina who see Hawai'i as their homeland to experience the intimate connection to the land, the sea, the kūpuna (ancestors), and the akua (gods). Hawaiian arts and sciences related to traditional navigation, fishing, cultivation, etc. will be taught to new generations. Thus, Kaho'olawe will be a cultural learning center where traditional cultural and spiritual customs, beliefs, and practices of the Hawaiian people can take firm root and flourish.

The piko of Kanaloa is the crossroads of past and future generations from which the Native Hawaiian lifestyle spreads throughout the islands.

Traditionally, Kaho'olawe served as the navigational center or piko (center) and crossroads connecting Hawaiians to their ancestral homeland, Tahiti. The Kealaikahiki Channel aligns with the north-south Kāne-Kanaloa line at the zenith of the heavens, dividing east from west. In aligning the stern of a voyaging canoe in the Kealaikahiki channel with Lae O Kealaikahiki on Kaho'olawe, Pu'u O Hōkū on Moloka'i, and Hōkū Pa'a (the North Star) a navigator can set a straight course for Tahiti.

For contemporary Hawaiians, Kaho'olawe serves as the piko for the regeneration of Hawaiian spiritual, cultural and subsistence practices. As more and more people of Hawai'i are able to touch and be touched by the island and experience Hawaiian cultural practices, the Native Hawaiian lifestyle will spread throughout the islands. Again, the KIRC and State of Hawai'i have a unique and historic opportunity to enhance the recognition and perpetuation of the culture indigenous to the Hawaiian islands and existing nowhere else in the world.

**3. GUIDING PRINCIPLES
OF LAND USE**

This page intentionally left blank

3. GUIDING PRINCIPLES OF LAND USE

The following principles have guided the preparation of the Kaho'olawe Island Reserve Use Plan.

'Ike Pāpālua

The Kaho'olawe Island Reserve Use Plan was developed by learning from the land, the ocean and the experience and knowledge of Hawaiian ancestors who originally settled the island. A Hawaiian term for this approach is 'Ike Pāpālua.

This principle can be translated as "developing uses based upon a vision with deeper insight into the quality of the land and its surrounding resources." It acknowledges the inspiration and insight gained from physical observances, but more importantly those feelings perceived from spiritual awareness.



PBR HAWAII

Kaho'olawe is a unique place where one can become more aware of a spiritual connection to the 'āina – the wind, the ocean, the land, and the heavens. Planning for the island began with a clear and open mind and heart in order to learn from the land and the forces which interact upon its landscape. In this manner, this plan is guided by the aloha 'āina philosophy.

Kaho'olawe as a wahi pana and pu'uhonua has been recognized and supported by the federal, state and county governments of Hawai'i's people. As a wahi pana, the island is dedicated to Kanaloa, the Hawaiian deity honored and respected as the energy of the ocean and the foundation of the earth. As a pu'uhonua, the island and its surrounding waters are a refuge or "safe" place of Hawai'i's people to practice and live the aloha 'āina philosophy. This understanding guides how the island and the ocean will be cared for and managed.

Ka 'Āina, Ke Kai A Me Ka Lewa

In the Hawaiian context, uses of the land and ocean are interconnected and inseparable. In Hawaiian tradition, Papa gave birth to Kanaloa (the island which is now known as Kaho'olawe) which was called a "fish child for Papa:"

*Hanau kapu ke kuakoko
Ka'ahea Papa ia Kanaloa he moku
I hanau 'ia he punua he nai'a
He keiki i'a na Papa I hanau,
Ha'alele Papa ho'i I Tahiti.*

Born are the sacred pain
Papa prostrated to Kanaloa an island
He was born a fledgling a porpoise
A fishchild for Papa was born
Papa left, returned to Tahiti.¹

Kanaloa as Kaho'olawe is both the island and its surrounding ocean. Changes on the island impact upon the surrounding ocean. This principle continues to be applied throughout this plan.

¹Edith Kanaka'ole Foundation, p. 18. "Mele A Paku'i"

The atmosphere above Kaho'olawe also impacts upon the landscape and has been considered in projecting planned uses for the island. The atmosphere, where clouds form for rain, is an integral link in the cycle of lifegiving water for the island. Ho'ailona or prophetic natural signs and omens appear in the atmosphere and serve to guide and validate Hawaiian customs and practices. Kaho'olawe is the only island which provides a superior vantage point to observe the ocean, winds, channels, currents, stars, sun, moon, and clouds for practices such as navigation, fishing, astronomy, and the keeping of the calendar. Protecting the airspace is integral to sustaining the integrity of the island reserve.

Ka Wai

Ka wai (fresh water) is the most important component in planning for land uses. Fresh water is the basis of all life and is essential for any use of the island. Without fresh water there can be no revegetation or environmental or cultural restoration on Kaho'olawe. As a guiding principle, the KIRC has placed a priority on water resources to support the identified uses and activities to be conducted on the island. The availability of water is one of the principal factors in determining the potential uses within an 'ili. Water sources, storage, and delivery systems will have to be developed for planned uses and activities within certain 'ili.

'Ili Concept

Hawaiians settled and utilized the resources of an island from the ocean up to the mountains. The basic land divisions which emerged from their pattern of land use were called ahupua'a. Each ahupua'a was further divided into 'ili. The court of the Hawaiian Kingdom described the ahupua'a principle of land use in the case of *In Re*

Boundaries of Pulehunui (1879) as follows:

A principle very largely obtaining in these divisions of territory [ahupua'a] was that a land should run from the sea to the mountains, thus affording to the chief and his people a fishery residence at the warm seaside, together with the products of the high lands, such as fuel, canoe timber, mountain birds, and the right of way to the same, and all the varied products of the intermediate land as might be suitable to the soil and climate of the different altitudes from sea soil to mountainside or top.

For Kaho'olawe, the entire island was an ahupua'a within the Maui district of Honua'ula. Each 'ili of Kaho'olawe extended from the mountains to the sea and included all the natural resources necessary for subsistence. A circa 1895 map found in the State Survey Office (Figure 3-1) identified the names and approximate locations of the 'ili of Kaho'olawe. The interpretation and application of the 'ili concept is the basis for the preparation of the Use Map. The traditional 'ili shown on Figure 3-1 were used as a guide, but were adopted to fit contemporary island conditions. The twelve traditional 'ili have been combined to form eight new 'ili. The 'ili concept is a valuable planning tool because it recognizes the integral relationship between soil disturbance, water, erosion, and runoff that occurs within watersheds.

The 'ili concept helps to define appropriate uses and activities on Kaho'olawe. Each 'ili encompasses several watersheds ranging from the ocean to the central spine of the island.

Ridge lines are used to distinguish the boundaries of the 'ili units. Natural watersheds, valley

Kahoolawe is an ahupuaa
divided into ilis as per maps

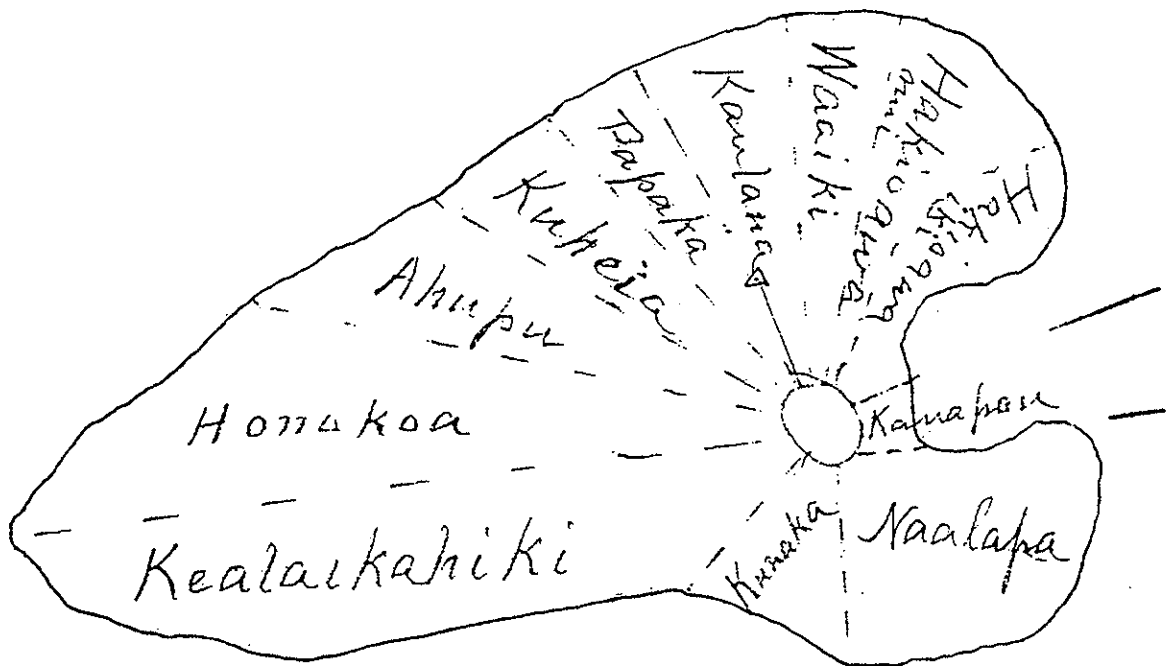


FIGURE 3-1
CIRCA 1895 KAHO'OLAWE 'ILI MAP
KAHO'OLAWE

Source: State Survey Office



DEC. 1995

bottoms, and embayments, as well as traditional and contemporary cultural uses of named places have helped to define the 'ili for the island. This approach will help keep the land use focus on healing the natural and cultural resources of the island.

Ho'olohe I Nā Kūpuna/Ho'olohe I Ka 'Āina

This principle is incorporated within a number of previously identified principles. It's major tenet is that through chants, place names, archaeological and historical records, past residents, or kūpuna, we can gain guidance on present and future uses. The island itself, as a living and evolving entity, will determine future uses. Only from being on Kaho'olawe can the natural resources of the island and the processes affecting them be understood.

Aloha 'Āina

Land, especially within the vast sea, is precious. With this limited resource, Hawaiians understood that the role of humans is to care for the land, not just to use the land. Kaho'olawe can help us to appreciate the Hawaiian view that the land is for the temporary use of humans. Aloha 'āina, mālama 'āina, and ke kahu of ka 'āina (stewardship) are terms defining the relationship of Hawaiians to Kaho'olawe. Explaining this traditional relationship, the late Auntie Edith Kanaka'ole observed, "Our kūpuna leave with us this same thought saying: E mālama pono i ka 'āina; nānā mai ke ola – Take good care of the land; it grants you life."²

To Hawaiians, the land does not belong to anyone. The western concept of private land

"ownership" is not appropriate for, and does not apply to, individuals undertaking and participating in activities on Kaho'olawe. It is a place for restoring environmental, cultural, and human balance or lōkahi.

Underlying this plan are the traditional Hawaiian principles of land management and stewardship. George Helm expressed his thoughts about aloha 'āina and his reason for his commitment to Kaho'olawe as follows:

The truth is, there is man and there is environment. One does not supersede the other. The breath of man is the breath of Papa (the earth). Man is merely the caretaker of the land that maintains his life and nourishes his soul. Therefore, 'āina is sacred. The church of life is not in a building, it is the open sky, the surrounding ocean, the beautiful soil. My duty is to protect Mother Earth, who gives me life. And to give thanks with humility as well as ask forgiveness for the arrogance and insensitivity of man.³

In restoring Kaho'olawe, Hawaiians and others will also restore the relationship of lōkahi (maintaining spiritual, cultural, and natural balance) to their own lives. An inherent aspect of lōkahi is the practice of conservation to ensure availability of natural resources for present and future generations. Rules of behavior are tied to cultural beliefs and values regarding respect of the 'āina. These include the virtue of sharing and not taking too much, and a holistic perspective of organisms and ecosystems that emphasizes balance and coexistence.

²Edith Kanaka'ole. "Hi'ipoi i ka 'Āina Aloha" (recording). Quote from album cover.

³Ritte, p. 27. Copy of a letter signed by George Helm dated January 29, 1977.

Ho'ōla Hou (Environmental Restoration)

Healing and "regreening" the island, or restoring its cultural and natural resources is essential and is a goal, as expressed in the Vision Statement, of this plan. Any projected land use must take into consideration the condition of the cultural and natural resources of the area impacted and how the projected use may affect their condition.

The natural resources of the island and the processes affecting them need to be understood in order to heal the land. Site specific planning for restoration can best be accomplished on-site so as to listen to and understand the land.

The KIRC takes a long term view on the process of restoration of the island. Initial plans may project restoration for the first 40 years, while looking toward the following 400 years, and then to the next 4,000 years. Future generations of Hawaiians will ultimately fulfill the vision a restored island environment.

E Ho'omālamalama Hou Ana Ka Maui Ola (Cultural Restoration)

This guiding principle was the theme of the 1992 healing ceremonies held on Kaho'olawe. Cultural ceremonies, protocol, and uses of the island's natural and cultural sites were at the heart of the effort to stop the bombing and return the island to the people of Hawai'i. Ceremonies recognizing the spiritual connection between man and the environment are important in all indigenous cultures and are needed to help heal the land. Hawaiian cultural ceremonies were revived on Kaho'olawe by the Protect Kaho'olawe 'Ohana, guided by the Edith Kanaka'ole Foundation. The chant, "He Ko'ihonua No Kanaloa He Moku" composed by Pualani Kanahale to chronicle the history of the island recounts the re-establishment of some of

these ceremonies in the later verses:

*Ua ala Hawai'i mai ka moehewa mai
Ho'omaopopo i ke keiki i'a a Papa
'O Kanaloa
Ke moku hei a Haumea
'O Kohemālamalama
Ke kino o Kamohoali'i
E hōola kākou iā Kaho'olawe*

The Hawaiian woke from the nightmare
Remembered was the child of Papa
O Kanaloa
The sacred land of Haumea
O Kohemālamalama
The body form of Kamohoali'i
Save Kaho'olawe

*Ola i ka lani a Kāne
Ola i ke kai a Kanaloa*

To live in the heavens of Kāne
To live in the sea of Kanaloa

*Ua kahea'ia 'o Lono i ka makahiki hou
Ma ka Hale Mua o Lono i kahea'ia ai
Ua kanaloa 'o Kanaloa i
Kohemalamālama
Puka hou a'e ka mana o Kanaloa
Ua kani ka leo pahu i ka mālama
o Hōkū
Kūwāwā i ka houpo a Laka
Ua ala 'o Laka ma Ka'ie'ie i Kanaloa*

Lono was summoned for a new year
At the Hale Mua of Lono, He was called,
Kanaloa was reconfirmed to
Kohemalamālama
The energy of Kanaloa was revitalized
The voice of the drum sounded in the care of
Hōkū
Resounding in the bosom of Laka
Laka awoke at Ka'ie'ie at Kanaloa.⁴

In modern Hawai'i, Kaho'olawe serves as the foundation for the revitalization of Hawaiian cultural, religious, and subsistence practices. These uses and activities will continue and are to be factored into the management and stewardship of the island.

⁴Edith Kanaka'ole Foundation, p. 101.

4. EXISTING CONDITIONS

This page intentionally left blank

4. EXISTING CONDITIONS

Nā Mea Pahu (Unexploded Ordnance)

The use of Kaho'olawe for U.S. military bombing practice began as early as the 1920s, but became intensive with the outset of World War II. In 1941, the military took over all use of the island to train for air and sea attacks as well as for marine landings. While military training lessened at the end of the war, military occupation and bombing practice continued across the entire island and in the nearshore waters until the late 1980s.

A period of joint use commenced in 1980 under a Consent Decree between the U.S. Navy and the Protect Kaho'olawe 'Ohana, pursuant to *Aluli v. Brown*. Following the Consent Decree, ordnance delivery training was limited to the central third of the island and the court mandated the U.S. Navy to surface clear ordnance from 10,000 acres, begin soil conservation and revegetation programs, survey and protect historic and cultural sites on the island, and eradicate goats. The Protect Kaho'olawe 'Ohana was granted limited access to the island for religious, cultural, educational, and scientific purposes.

Both practice (inert) and service (live) ordnance were used on Kaho'olawe. According to experts with the Navy Explosive Ordnance Disposal Technology Division, every type of ordnance item used by the U.S. military since WWII (except for chemical weapons and nuclear devices) has been dropped or fired on Kaho'olawe. The Navy Explosive Ordnance Disposal Technology Division is currently preparing density and location maps of existing unexploded ordnance for use in the projected ten-year clean-up.

Future uses of the island will long be affected by the decades of bombing, training exercises, and occupation of the island by the military resulted in large-scale environmental degradation. Military use also affected the overall character of the island by establishing access controls, major facilities, and rudimentary infrastructure.



PBR HAWAII

Ka Waihona 'Āina (Topography)

Kaho'olawe is approximately 11 miles long and 7 miles wide and consists of approximately 28,800 acres. The highest point on the island is Pu'u Moaulanui which is 1,477 feet above sea level (Figure 6-1). This pu'u and other smaller pu'u including Lua Kealialuna, Pu'u Moaulaiki, Pu'u Moiwī, Pu'u Kamama, Pu'u Kolekole, Pu'u Lai, and Lua Kealialalo were formed by secondary eruptions. The southern and eastern coastlines of the island are characterized by steep sea cliffs, while the north and western coasts are more gently sloping ridges with bays and beaches.

Ka Makani (Wind)

The Hawaiian island chain is subject to constant northeasterly tradewinds for most of the year.

With Kaho'olawe's unique geographic situation, the trades are funneled by the land masses of Haleakalā on Maui and Hawai'i island and approach Kaho'olawe from the east. These easterly winds blow strongly across the island, exacerbating wind erosion on the eastern side and along the crest of the island.

Ka Wai (Fresh Water)

Currently, all of the potable water for the island comes from man-made rainwater catchment systems, desalinization plants, or is brought on to the island. The major source of fresh water on the island is rainfall. Kaho'olawe lies in the lee of Haleakalā, and as a result, rainfall is generally limited to occasional heavy showers that occur during periods of kona (southerly) winds. Annual rainfall on the island averages between less than 10 inches on its western coast near Honokanai'a, and 25 inches at its summit at Pu'u Moaulanui. A water study conducted in 1988-1989 estimates that a potential 50,000 to 100,000 gallons per year could be harvested from rainfall if water catchment and storage systems are developed. The total potential for rainfall harvesting is limited only by the total catchment area installed.

With periodic rainfall, intermittent streams are fed, shallow perched ground water sources are created, and ground water is recharged. Surveys have indicated that the ground water is mostly brackish. A thin basal lens exists at the mouths of major gulches. Historical accounts show that human populations of both pre- and post-contact eras dug shallow wells and/or constructed cisterns to increase the potable water supply. Some of these wells still exist today; however, the basal lens has been destroyed by the introduction of kiawe which is a phreatophyte (plant that draws water from the water table).

The 1988-89 water study found possible dike-impounded water covering an area of thirteen square miles and which is approximately 600 feet thick at its maximum. This source is estimated to be able to provide 150,000 to 500,000 gallons of water annually. Caution should be exercised, however, in the development of groundwater to insure that damage to the aquifers does not occur as a result of developing these resources.

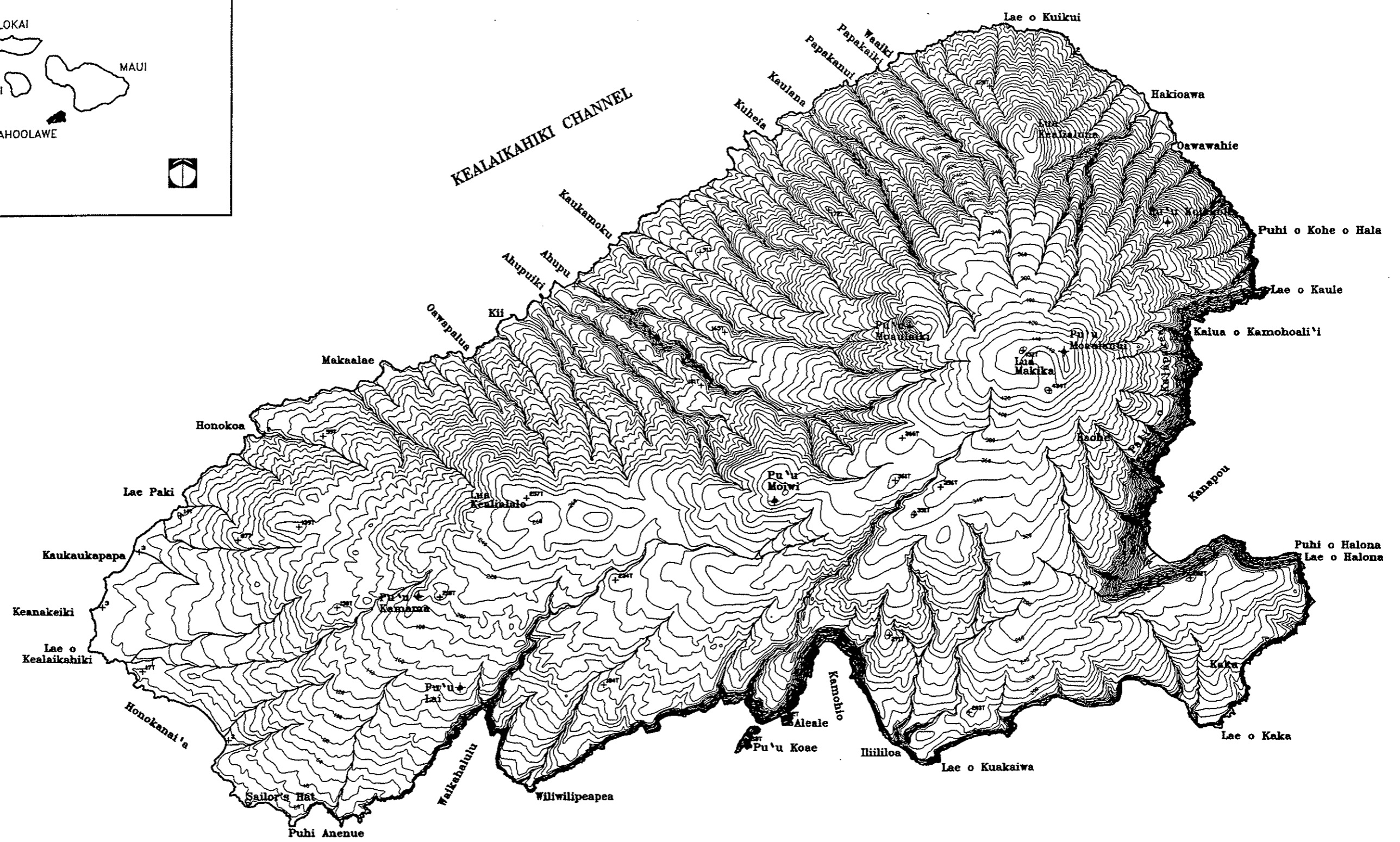
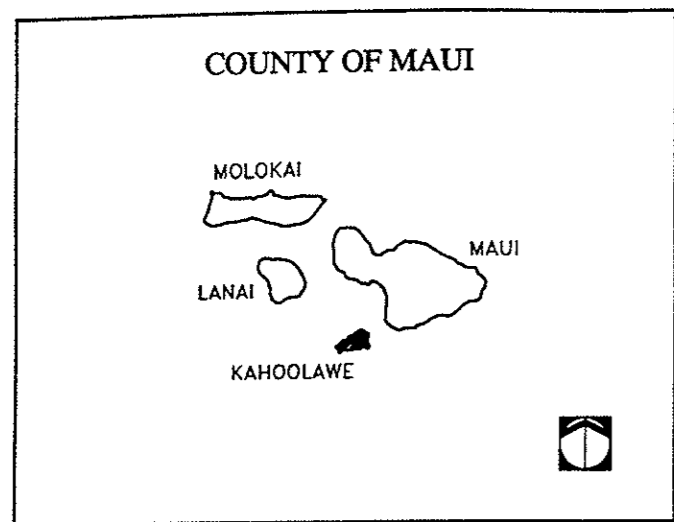
Nā Lepo (Soils)

The island's soils have been surveyed and categorized by the U.S. Department of Agriculture, Natural Resources Conservation Service. The soil types and brief excerpts of the soil descriptions and stability for construction are presented below.

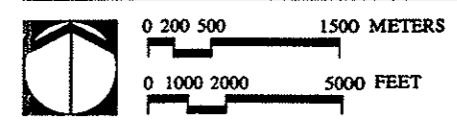
Badland, steep

These are mainly severely eroded areas along the perimeter of the central plateau, cut by numerous gullies created by runoff from the plateau. Slopes are 15 to 30 percent and are short and irregular. Most areas are eroded to highly weathered rock consisting of dark reddish brown, yellowish brown, and very pale brown fine blocky material that crushes to silty clay loam. Other areas have remnants or "islands" of dark reddish brown and dark brown subsoils (Pu'u Moiwi and Kaneloa) isolated by gullies. Many areas are bare of vegetation, but some other areas have a moderate cover of piligrass, buffelgrass, klu, and kiawe. The weathered rock can be dug to provide better root penetration.

These areas require revegetation as they now are the most actively eroding areas on the island. However, runoff must first be controlled on the plateau to effectively reduce gully formation. As gullies cut headward creating new badlands, they also deepen and trigger further sideslope cutting.



**FIGURE 4-1
LOCATION MAP
KAHO'OLAWE**



This could wipe out revegetation efforts on these badland sideslopes. Hand labor must be used in most areas as the short complex slopes and many gullies prohibit effective use of equipment.

Badland, Keauialalo complex, 8 to 15 percent slopes

This is characterized by rolling uplands capped with hummocks of the Keauialalo soil. The badland is severely eroded (see above). The Keauialalo soil has a surface layer that is reddish brown, very fine granular, and very friable silt loam to 11 inches depth. The available water holding capacity is high and is the best on the island. These allow deep root penetration. The subsoil is reddish brown, stratified, very fine sandy loam, loam, silt loam, and silty clay loam to 60 inches. Vegetation occurs mainly on the hummocks of the Keauialalo soil. The hummocks are mainly covered with kiawe, buffelgrass, pitted beardgrass, sourgrass, lantana, and/or Natal redtop.

The Keauialalo soil can easily blow if vegetation is removed. Wind erosion hazard is severe. If native species are to be planted, it should be done with great care to ensure the soil is not exposed for long periods.

Badland, Koele complex, 8 to 70 percent slopes

This type of soil occurs in broad gulches and includes areas of rock outcrop, stones and boulders, and wind-deposited silt loam and silty clay loam sediments from 2 to 6 inches thick. The Koele soils have a surface layer of brown subangular blocky silt loam and a subsoil of dark brown stratified silty clay loam to 60 inches. Available water holding capacity is high and root penetration is relatively favorable. Vegetation on Koele soils are moderate covers of lantana, kiawe, Natal redtop, koa haole, pitted beardgrass,

tobacco, and uhaloa.

Stabilization requires decreasing runoff from the plateau. As gullies cut headward creating new badlands, they also deepen and trigger further sideslope cutting. This could wipe out revegetation efforts on these badland sideslopes.

The Koele soil areas should not have any vegetation removed due to the severe erosion hazard. Wind erosion hazard is severe even in small areas if there is no upwind protection. Conversion to native species on the Koele soil should be done carefully in small increments to ensure that large areas are not bare for long periods.

Beaches

This includes the narrow coves and wider bays or exposed shorelines on the northwest, northeast and southwest sides of the island. The typical profile is stratified fine to coarse coralline sands mixed with basaltic sand to varying degrees. Coral and basalt gravel and cobbles may occur throughout. The underlying material is hard basalt at 40 to greater than 60 inches depth. Vegetation is primarily kiawe.

Kaho'olawe silty clay loam, 8 to 15 percent slopes

These are the rolling to hummocky uplands of the plateau mainly north and west of Lua Makika. It includes small areas of the severely eroded Pu'u Moiwi soils. The surface layer is reddish brown, very fine granular and very friable silty clay loam 12 inches thick. The subsoil is reddish brown, stratified silty clay loam and silty loam to 60 inches thick. Available water holding capacity is high and root penetration potential is deep. Typical vegetation is kiawe, buffelgrass, pitted beardgrass, lantana,

Natal redtop, Japanese tea, sourgrass, and balloon plant.

There is a good stand of vegetation that provides wind protection and serves as a dust trap allowing the unit to grow laterally downwind and thicken in depth. These areas should not be disturbed as removal of any vegetation creates severe erosion hazards, even in small areas. Conversion to native species should be done in small increments to ensure that large areas are not bare for long periods.

Kaneloa silty clay loam, 3 to 8 percent slopes

This type of soil is found in severely eroded, gently sloping upland areas. The surface is typically bare, polished by wind-blown sediment, and may have fine gravel, few grasses, forbs, and occasional trees in impact craters. Available water holding capacity is moderate and the soil structure is favorable for root growth but the sealed surface prevents most water from entering the soil as well as prevents seeds from germinating and taking root.

To establish vegetation, the soil surface should be roughened by cultivation to create large clods that cannot be blown away and can trap wind-blown sediment. Live ordnance may be buried within the plow zone, however, presenting significant risk. Cultivation should be performed by trained personnel using specially modified equipment.

Kaneloa silty clay loam, 8 to 15 percent slopes

This type is similar to the Kaneloa silty clay loam, 3 to 8 percent slopes.

Kaneloa - Blown-out land complex, 3 to 8 percent slopes

This is mainly the severely eroded, undulating upper elevations of the central part of the island. The surface and subsurface layers have been removed by erosion and the exposed subsoil is brown with the silty clay loam becoming dark yellowish brown to a depth of approximately 32 inches. The blown-out land areas consist of areas eroded to weathered bedrock. The material is a mixture of soft and moderately hard, weathered basic igneous rock with hard resistant cobbles and stones.

Vegetation is limited to few Australian saltbushes except within impact craters where wild tobacco and kiawe may be found. Old root channels in the exposed subsoil and its structural condition could allow root penetration; however, raindrop impact and wind dispersion of particles tend to fill the available spaces between the soil units. Thus, wind-blown soil and seeds cannot be trapped; leaving the area bare.

To establish vegetation, the soil surface should be roughened by cultivation to create large clods that cannot be blown away and can trap wind-blown sediment. Live ordnance may be buried within the plow zone, however, presenting significant risk. Cultivation should be performed by trained personnel using specially modified equipment.

Keaulalo silt loam, 3 to 8 percent slopes

This occurs in the depressions and areas protected from the wind within the undulating uplands of the central part of the island. The surface layer is wind-deposited, reddish brown, very fine granular and very friable silty clay loam to 11 inches. The subsoil is wind-deposited, reddish brown, stratified very fine sandy loam,

loam, silty loam, and silty clay to 60 inches. Available water holding capacity is high - the best for the island - and root penetration potential is deep.

Typical vegetation is kiawe, buffelgrass, pitted beardgrass, sourgrass, lantana, and Natal redbtop. Wind erosion hazard is severe if vegetation is removed unless there is upwind protection.

Keauialo silt loam, 8 to 15 percent slopes

These are the rolling to hummocky uplands in the central area of the plateau. The surface and subsoil characteristics, water holding and root penetrating properties, vegetation, and erosion hazards are similar to Keauialo silt loam, 3 to 8 percent slopes.

The vegetation provides wind protection and serves as a dust trap allowing the downwind area to grow laterally and thicken in depth. Vegetation removal would create severe erosion hazards. Conversion to native species should be done in small increments to ensure that large areas are not bare for long periods.

Keauialo silt loam, 15 to 30 percent slopes

These are the hilly uplands in the central area of the plateau. The surface and subsoil characteristics, water holding and root penetrating properties, vegetation, and erosion hazards are similar to Keauialo silt loam, 3 to 8 percent slopes.

Lualualei clay, extremely stony, 3 to 15 percent slopes

These are adjacent to or near drainage ways and on talus slopes. The surface layer is a very dark grayish brown, granular, extremely stony, very sticky, and plastic clay about 22 inches thick.

Many surface cracks appear on the surface when dry. The subsoil is similar and goes to about 60 inches in depth. Kiawe, piligrass, buffelgrass, and ilima are usually found.

These areas are generally well vegetated with exotic and native species. Revegetation with native species should be relatively successful due to high available water holding capacity and favorable rooting characteristics. Road construction is hampered by high rock content, low strength, and slickness. The drying rate after rains is slow. For roads, the application of a suitable road base is necessary. The high shrink-swell potential could affect the stability of buildings, roads, and other structures.

Mala silty clay loam, 0 to 3 percent slopes

This soil is found in the nearly level to gently undulated stream terraces along the coast. The surface layer is a dark reddish brown, platy, silty clay loam about 7 inches thick and the subsurface layer is a dark reddish brown, silty clay loam with coral sand grains to a depth of about 40 inches. The underlying material is stratified dark to light gray sand and dark reddish brown silty clay and silty clay loam. Physical properties for plant growth are favorable and kiawe is usually found. The flooding hazard dictates that conversion to native vegetation should be done carefully with existing vegetative filters left adjacent to the stream as long as possible.

Pu'u Lai very stony silt loam, 3 to 8 percent slopes

These areas are the undulating sideslopes and ridges on the west- and south-facing uplands on the west end of the island. The surface layer is reddish brown, very stony silt loam with weak granular structure about 10 inches thick to an abrupt boundary. The subsoil is brown stony

clay to 31 inches depth and is massive with many vertical cracks. The typical vegetation of these areas are kiawe, buffelgrass, uhaloa, wild zinnia, klu, and piligrass. Native cotton is common in the lower elevation near the southwestern part of the island. The physical conditions suit root growth within the surface layer, but the subsoil is hard. The high rock fragment content precludes normal tillage operations.

These soils are typically well vegetated. Where removal of exotic species and replacement with native species is desired, only the immediate small area should be cleared to prevent erosion. Road construction is impaired due to the high content of rock outcrop and fragments. Suitable base material is required due to the poor strength of the subsoil.

Pu'u Lai - Rock outcrop complex, 5 to 15 percent slopes

This type can be found on the west facing uplands on the west end of the island. The topography of the area is irregular with many knolls and short side slopes. The surface layer is reddish brown, very stony silt loam with weak, granular structure about 10 inches thick to an abrupt boundary. The subsoil is brown stony clay to about 31 inches depth and is massive with many vertical cracks. The underlying material is gray weathered or hard bedrock with dark reddish brown coatings on fracture faces. Typical vegetation is kiawe, buffelgrass, uhaloa, wild zinnia, klu, piligrass, with native cotton at the lower elevations. The physical conditions suit root growth within the surface layer, but the subsoil is hard. The high rock fragment content precludes normal tillage operations.

These soils are typically well vegetated. Where removal of exotic species and replacement with native species is desired, only the immediate

small area should be cleared to prevent erosion. Road construction is impaired due to the high content of rock outcrop and fragments. Suitable base material is required due to the poor strength of the subsoil.

Pu'u Moiwi silty clay loam, 3 to 8 percent slopes

This is the severely eroded, gently sloping central part of the island. The soil is bare except for buffelgrass, Australian saltbush, wild tobacco, or kiawe mainly in small dust filled craters and on hummocks. The surface layer is reddish brown, silty clay loam 6 inches thick and the subsoil is reddish brown, silty clay loam to more than 60 inches depth. The underlying material of some areas has highly fractured and weathered saprolite that can be dug (with difficulty) with a spade.

The soil has had the surface layer removed by water and wind erosion. The present surface layer has old root channels and an adequate structural condition to enable root penetration. However, raindrop impact has dispersed soil fines and wind has blasted soil particles and aggregates across the surface filling the old root channels and spaces between the soil structural units. This gives a finely "combed" and polished appearance to the surface. Incoming soil and seeds cannot be trapped except in the few bomb craters, therefore, the area remains bare.

To establish vegetation, the soil surface should be roughened by cultivation to create large clods that cannot be blown away and can trap wind-blown sediment. Live ordnance may be buried within the plow zone, however, presenting significant risk. Cultivation should be performed by trained personnel using specially modified equipment.

Pu'u Moiwi silty clay loam, 8 to 15 percent slopes

The general description of this area is that it is severely eroded, strongly sloping upper elevations mainly in the central part of the island. The surface layer is reddish brown, silty clay loam 6 inches thick; the subsurface layer is reddish brown, silt loam 24 inches thick; and the subsoil is reddish brown, silty clay loam to more than 60 inches depth. The underlying material of some areas has highly fractured and weathered saprolite that can be dug (with difficulty) with a spade. The physical characteristics and cultivation recommendations are similar to Pu'u Moiwi silty clay loam, 3 to 8 percent slopes.

Pu'u Moiwi silty clay loam, 8 to 15 percent slopes, gullied

This area is mainly the severely eroded east facing slopes of the island's upper elevation. The slopes are steep and there are many gullies, most of which range from 3 to 15 feet wide and 2 to 10 feet deep. Typically, the soil is bare except for sparse scattered grasses, Australian saltbush, or wild tobacco or kiawe in small craters. The surface layer, subsurface layer, subsoil, and underlying material are similar to Pu'u Moiwi silty clay loam, 8 to 15 percent slopes and the physical characteristics and cultivation recommendations are similar to Pu'u Moiwi silty clay loam, 3 to 8 percent slopes, with the exception that the vegetated hummocks should not be disturbed. The large number of gullies, many of which cannot be crossed by farm machinery, could hinder erosion control measures that rely on such equipment.

Pu'u Moiwi silty clay loam, hummocky, 3 to 8 percent slopes

This area is the severely eroded, undulating

upper elevations, mainly in the central part of the island. 15 to 25 percent of the area have hummocks or mounds of silt loam or silty clay loam wind-blown soil 12 to 24 inches thick. Included are a few small bomb craters that have accumulated wind blown soil which are typically vegetated by grasses and saltbush. The surface layer, subsurface layer, subsoil, and underlying material is the same as Pu'u Moiwi silty clay loam, 3 to 8 percent slopes. The soil is bare, except the mounds and impact craters that are covered with buffelgrass, Australian saltbush, shrubs, and occasionally with kiawe. The physical characteristics and cultivation recommendations are similar to Pu'u Moiwi silty clay loam, 3 to 8 percent slopes.

Rock outcrop, extremely steep

This is hard, exposed bedrock on gulch walls and nearly vertical sea cliffs. Loose stones occur on the surface and slopes are 70 to 150 percent. Typical vegetation is scattered grasses and small brush.

Rock outcrop - Lualualei complex, 15 to 30 percent slopes

These are found on gulch sides and along ridges on the south and west sides of the island. The rock outcrop is hard exposed bedrock, mainly on ridges, with loose stones on the surface. The surface of the Lualualei soil is very dark grayish brown, granular, extremely stony, very sticky and plastic clay about 22 inches thick. About 20 to 50 percent of this surface is covered with cobbles and stones and many cracks appear when the surface is dry. The subsoil is very dark grayish brown, blocky, extremely stony, very sticky and plastic clay to a depth of more than 60 inches and has many vertical cracks.

These areas are generally well vegetated,

typically with kiawe, pilgrass, buffelgrass, and ilima. Revegetation with native species should be relatively successful due to high available water holding capacity and favorable rooting characteristics.

Road construction is hampered by high rock content within the soil and rock outcrop, and low strength and slickness when moist. Drying after rains is slow. Application of a suitable road base is necessary.

Rock outcrop - Pu'u Lai complex, 15 to 30 percent slopes

These areas are hilly sideslopes and gulch sides on west facing uplands on the west end of the island. The rock outcrop is hard exposed bedrock, mainly on ridges, with loose stones on the surface. The surface of the Pu'u Lai soil is reddish brown, very stony silt loam with weak granular structure about 10 inches thick to an abrupt boundary. About 30 to 40 percent of this surface is covered with cobbles and stones. The subsoil is brown, stony clay to about 31 inches depth and is massive with many vertical cracks. The underlying material is gray weathered or hard bedrock with dark reddish brown coatings on fracture faces.

These soils are typically well vegetated with kiawe, buffelgrass, uhaloa, wild zinnia, klu, and pilgrass. The physical condition of the soil is well suited to root proliferation within the surface layer. The high rock fragment content precludes normal tillage operations. Where removal of exotic species and replacement with native species is desired, only the immediate small area should be cleared to prevent erosion. Road construction is impaired due to the high content of rock outcrop and fragments. Suitable base material is required due to the poor strength of the subsoil.

Rock outcrop - Ustorthents complex, strongly sloping

These are on irregular topography with many knolls and short side slopes; primarily around the perimeter of the island between the upland central plateau and the shoreline. The slopes are mainly 8 to 15 percent. The rock outcrop is hard exposed bedrock, mainly on knolls and ridges, with loose stones on the surface. The surface layer of the Ustorthents is loose, friable, very stony clay loam or silty clay loam about 4 to 10 inches thick. The underlying material is soft weathered basic igneous rock.

Vegetation of these areas is mostly kiawe and pilgrass. The bare areas are mainly saprolite or rock outcrop. Planting of bare saprolite areas is not of high priority. If roads are constructed, crushed rock surfacing should be used because of the sticky and slick clays and saprolite. Erosion control on roads should include crowns, water bars, and side runoff ditches with frequent diversions to carry runoff to concave or flat areas.

Rock outcrop - Ustorthents complex, steep

This is found in gulches and on ridges having 15 to 30 percent slopes, mainly around the perimeter of the island between the upland central plateau and the shoreline. The rock outcrop, surface layer, and underlying material are the same as Rock outcrop - Ustorthents complex, strongly sloping.

Rock outcrop - Ustorthents complex, very steep

The location and basic characteristics of this type is the same as Rock outcrop - Ustorthents complex, steep, except the percentage of rock outcrop per area is greater and the slopes of the area are 30 to 70 percent.

Rubble land

The area is characterized by a surface of stones and boulders on 3 to 8 percent slopes, and is located above the south and southwest shores of the island. The stones and boulders are hard, unweathered, dense, and subrounded basalt. The Rubble land appears to have been stripped of soil by water erosion, possibly by ancient tsunamis or a higher stand of the sea. The underlying material is unknown.

The area is barren of vegetation except for grasses and kiawe on small pockets of soil along the perimeter. These areas are a good source of hard rock for aggregate and road base but removal may expose softer erosive weathered rock. Plans should be prepared for immediate revegetation, if rocks are to be removed.

Saprolite, 8 to 25 percent slopes

This can be found on strongly sloping wind and water eroded central uplands that are eroded to highly weathered rock. Nearly all the soil has been removed to expose the underlying saprolite which is comprised of soft to moderately hard weathered volcanic rock. The saprolite has 15 to 25 percent hard relatively unweathered basaltic cobbles and stones. The saprolite crushes and textures to silty clay loam and is typically greater than 60 inches thick to hard unweathered rock. The soil is mostly bare of vegetation.

These areas require revegetation as they are actively eroding. The weathered rock can be dug to provide better root penetration. Hand labor must be used in most of these areas as the short steep and complex slopes and many gullies prohibit effective or safe use of equipment.

Usterts, 0 to 8 percent slopes

This type can be found in and near the military camp on the west end of the island where this very sticky clay has been excavated and leveled. The surface layer is very dark grayish brown, stony, very sticky and plastic clay with many surface cracks when dry. The subsoil is very dark grayish brown, blocky, extremely stony, very sticky and plastic clay to a depth of more than 40 inches. It also has many cracks when it is dry. The underlying material is soft weathered and hard bedrock.

The area is generally cleared but contains pili, buffel, and bermuda grasses. Restoration of vegetation requires ripping of the compacted surface 12 inches. Mainly nitrogen and micronutrient fertilizers are required. Buildings and other structures should be designed to withstand the high shrink-swell potential. Septic tank filter fields are poorly suited and cesspools can leach nitrogen and pathogens to coastal water.

Wai Honu, very stony silt loam, 3 to 8 percent slopes

This is found in the rolling sideslopes and undulating ridges on the south facing slopes of the island near Honokanai'a where the main road heads inland. The surface layer is reddish brown, very stony silt loam with weak plates to granular structure about 9 inches thick. The surface is covered with 20 to 50 percent cobbles and stones. The subsoil is dark reddish brown silty clay loam to about 34 inches depth. The underlying material is gray weathered bedrock with dark reddish brown coatings on the fracture faces.

The vegetation is typically kiawe, buffelgrass, uhaloa, wild zinnia, klu, and piligrass. The

physical condition of the soil is well suited to root growth. The high rock fragment content precludes normal tillage operations. Where removal of exotic species and replacement with native species is desired, only the immediate small area should be cleared to prevent wind erosion. Road construction is impaired due to the high content of rock fragments. Suitable base material is required due to the poor strength of the subsoil.

Wai Honu, very stony silt loam, 8 to 15 percent slopes

The characteristics of this type is similar to Wai Honu, very stony silt loam, 3 to 8 percent slopes.

Wai Honu - Pu'u Lai complex, very stony, 3 to 8 percent slopes

This is characterized by undulating south sloping uplands. The Wai Honu soil characteristics are similar to Wai Honu, very stony silt loam, 3 to 8 percent slopes. The Pu'u Lai soil has a surface layer that is comprised of reddish brown, very stony silt loam with weak granular structure about 10 inches thick to an abrupt boundary. Cobbles and stones cover 30 to 40 percent of the surface. The subsoil is brown stony clay to about 31 inches depth and is massive with many vertical cracks. The underlying material is gray weathered or hard bedrock with dark reddish brown coatings on fracture faces.

These soils are well vegetated with kiawe, buffelgrass, uhaloa, wild zinnia, klu, and piligrass. Stones in the surface layer and the included areas of rock outcrop on knolls and ridges make the use of machinery for cultivation very difficult. Road construction is also impaired due to the high content of rock fragments.

Waikapu silty clay loam, 3 to 8 percent slopes, severely eroded

This is found in severely eroded, gently sloping alluvial fans in the central part of the island. The surface layer has been removed by erosion and the exposed subsoil is reddish brown subangular blocky silty clay loam to more than 60 inches. The soil is bare except for sparse scattered grasses, Australian saltbush, wild tobacco, and kiawe, mainly in small impact craters.

The soil has had the surface layer removed by water and wind erosion. The present surface layer has old root channels and an adequate structural condition to enable root penetration. However, raindrop impact has dispersed soil fines and wind has blasted soil particles and aggregates across the surface filling the old root channels and spaces between the soil structural units. This gives a finely "combed" and polished appearance to the surface. Incoming soil and seeds cannot be trapped except in the few dust-filled bomb craters and in vegetated hummocks.

To establish vegetation, the soil surface should be roughened by cultivation to create large clods that cannot be blown away and can trap wind-blown sediment. Live ordnance may be buried within the plow zone, however, presenting significant risk. Cultivation should be performed by trained personnel using specially modified equipment. Vegetated hummocks should not be disturbed.

Ka 'A'ai Lepo (Erosion)

Kaho'olawe has a 200 year history of introduced ungulates such as cattle, sheep, goats, and horses on the island. Many of these animals were left free to roam the island for many years, causing the destruction of vegetation and catastrophic soil

erosion. In addition, military activities such as bombing, road-cutting, and burning contributed to the level of soil erosion.

The constant strong easterly wind and occasional heavy rain fall events cause the soils along the island's interior plateau to be severely eroded. Further west, there are thicker growths of kiawe and grasses which have helped to hold soil in place.



PBR HAWAII

Nā Mea Kanu (Flora Habitats)

Kaho'olawe once supported a variety of vegetation communities including a dry forest, dry shrublands, grasslands, coastal vegetation, and perhaps even an upland mesic forest. There once were different zones of plants and animals that corresponded to certain conditions such as moisture and elevation.

Today, more than 80 percent of the land on Kaho'olawe is characterized by hardpan, barren soil, and/or alien vegetation. Kaho'olawe's present-day appearance is a result of ungulate grazing, anthropogenic (human) burning, and ranching and military activities. The small remaining area of the island, mostly in the western coastal areas, contain the majority of the native vegetation. A map of existing vegetation regimes is shown in Figure 4-2.

Despite the small area, Kaho'olawe still holds a wealth of vegetation types. Fourteen rare plants and a new genus are found on Kaho'olawe. These are as follows:

<u>Scientific Name</u>	<u>Hawaiian Name</u>
Kanaloa kahoowawensis	Palupalu o Kanaloa
Ophioglossum concinnum	Pololei
Lipochaeta byanii	Nehe
Lepidium bidentatum var. o-waihiense	'Anaunau, naunau, kunana
Capparis sandwichiana	Pua pilo, maiapilo
Chamaesyce skottsbergii var. vaccinioides	'Akoko, koko, kokomalei
Sesbania tomentosa (Endangered)	'Ohai
Vigna o-wahuensis (Endangered)	
Hibiscus brackenridgeii ssp. brackenridgeii (Endangered)	Ma'o hau hele
Portulaca molokiniensis	'Ihi
Portulaca villosa	'Ihi
Gouania hillebrandii	
Neraudia sericea (Endangered)	Ma'aloa, ma'oloa, 'oloa
Argemone glauca var. inermis	Puakala

There are five distinctive native terrestrial communities that have been identified on Kaho'olawe. These are the 'Aki'aki Coastal Dry Grassland, the Hawaiian Mixed Shrub Coastal Dry Cliff, the 'Ilima Coastal Dry Shrubland, the Ma'o Coastal Dry Shrubland, and the Pili Lowland Dry Grassland⁵ which are described in the following paragraphs.

⁵Gon, Chun, etal.

For the most part, the 'aki'aki grasslands on Kaho'olawe are simple covers of 'aki'aki (*Sporobolus virginicus*) on loose dunes. These grasslands typically merge with 'ilima (*Sida fallax*) and ma'o (*Gossypium tomentosum*) shrublands or kiawe (*Prosopis pallida*) forests. A few 'aki'aki grasslands occur on the western lowlands of Kaho'olawe between Honokanai'a and Lae Paki. This coastal strand community is found in many places throughout the Hawaiian island chain and is not considered rare. The plants of this community are salt-tolerant and include the beach morning glory (*Ipomea pescaprae* ssp. *brasiliensis*), nohu (*Tribulus cistoides*), and 'ohelo kai (*Lycium sandwicense*). At Kealaikahiki and Keanakeiki the coastal stand is dominated by *Vigna o-wahuensis*.

A particularly unique example of the Hawaiian Mixed Shrub Coastal Dry Cliff community is found on Kaho'olawe's wave-cut stack, Aleale, located along the southern shore. This Aleale community is dominated by the rare 'ihi (*Portulaca mookiniensis*), but in some sections, kawelu bunchgrass (*Eragrostis atropioides*) and kolomona (*Senna gaudichaudii*) shrubs were more abundant. Also found were 'akoko (*Chamaesyce celastroides* var. *amplectens*), *Mariscus phleoides*, 'uhaloa (*Waltheria indica*), ko'oko'olau (*Bidens mauiensis*), nehe (*Lipochaeta lavarum*), the grass *Panicum fauriei* var. *latius*, 'ilima, the dryland fern *Doryopteris decipiens*, another rare species of 'ihi (*P. villosa*), the rare pua pilo (*Capparis sandwichiana*), and a newly discovered genus given the name "Ka Palupalu o Kanaloa" (*Kanaloa kahoowawensis*). Several other islands in Hawai'i have this coastal shrub community.

Equally unique is the flora on the islet called Pu'u Koa, which is approximately 200 yards offshore from Aleale. This steep rocky islet harbors many of the same native plants as Aleale,

but in addition includes the Hawaiian moon flower *Ipomoea tuboides*, ohai *Sesbania tomentosa*, and the spineless Puakala *Argemone glauca* var. *inermis*. This latter plant variety is unique to Kaho'olawe and is presently only known from Pu'u Koa.

On Kaho'olawe, patches of the 'Ilima Coastal Dry Shrubland community consist of stands of 'ilima, ma'o, *Abutilon incanum*, 'uhaloa, pili grass (*Heteropogon contortus*), introduced kiawe, and Natal redtop (*Rhynchelytrum repens*). These shrublands are commonly found adjacent to Ma'o Coastal Dry Shrublands, 'Aki'aki Coastal Dry Grasslands, Pili Lowland Dry Grasslands, and alien kiawe forests. This community is commonly found in lowland areas on several islands and is, therefore, not considered rare.

Kaho'olawe has one of the better, if not the best, ma'o community in the state. Ma'o or Hawaiian cotton shrubland is considered rare and extremely unstable and is only found on the islands of Moloka'i, Lana'i, and Kaho'olawe. These communities are located in very dry areas with shallow weathered clay soil. Besides the ma'o, other plants of this community are the 'ilima, *Abutilon incanum*, 'uhaloa, nehe, pili grass, and panic grasses (*Panicum* spp.). On Kaho'olawe, remnants of this shrubland can be







Ma'o on Kaho'olawe.

PBR HAWAII




LEGEND

NATIVE-DOMINATED VEGETATION

-  MA'O COASTAL DRY SHRUBLAND
-  'ILIMA COASTAL DRY SHRUBLAND
-  'AKI'AKI COASTAL DRY SHRUBLAND
-  ZONE CONTAINING PATCHES OF PILI LOWLAND DRY GRASSLAND
- * LOCATIONS OF HAWAIIAN MIXED SHRUB COASTAL DRY CLIFF AND HIGH SALINITY ANCHIALINE POOL

NUMEROUS EXAMPLES OF HAWAIIAN INTERMITTENT STREAMS AND EPHEMERAL POOLS NOT SHOWN

ALIEN-DOMINATED VEGETATION

-  KIAWE FOREST/WOODLAND
-  GRASSLAND/SPARSE WOODLAND
-  HARDPAN/BARE SUBSTRATE

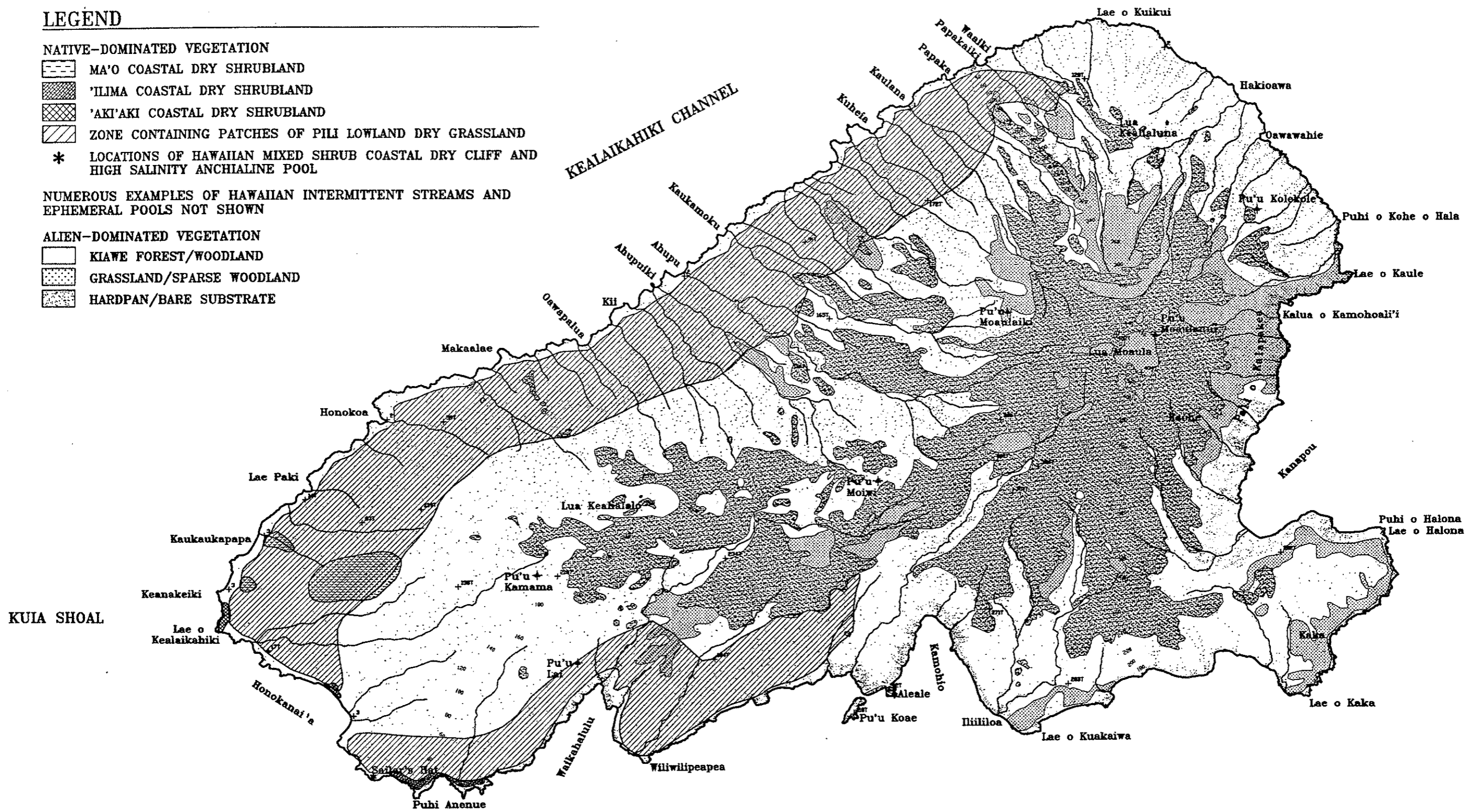
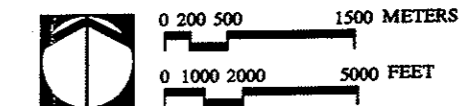


FIGURE 4-2
VEGETATION DISTRIBUTION
KAHO'OLAWA



found on the west coast and lowlands such as Honokanai'a.

On Kaho'olawe, the Pili Lowland Dry Grasslands are located on both the northwest and southwest slopes between sea level and the 600 foot elevation. Kiawe trees are often found in the grasslands, and depending upon elevation, plants such as wiliwili, 'a'ali'i (*Dodonaea viscosa*), 'ilima, ma'o, pa'u o Hi'iaka (*Jacquemontia ovalifolia ssp. sandwicensis*), and 'uhaloa may be interspersed. One rare vine, *Vigna o-wahuensis*, was found in pili grasslands on Kaho'olawe in the latest Hawai'i Heritage Program survey.

Other alien plants that can be found in this community include sweet acacia (*Acacia farnesiana*), *Lantana camara*, pualele (*Emilia fosbergii*), buffel and other grasses.

Overall, most of the known rare plant populations of Kaho'olawe are located on the southern and eastern seacliffs; the most significant location being Aleale.

The introduced alien species of flora present a challenge in the restoration of the island's natural resources as they are more aggressive and faster growing than native plants. The kiawe, especially with its deep tap roots, consumes ground water needed for the native plant species.

Nā Holoholona A Me Nā I'a (Fauna Habitats)

Important areas for native fauna on Kaho'olawe are at Honokanai'a, Kuheia, Lae o Kuikui, and Hakioawa. In these areas, the threatened honu (green sea turtle, *Chelonia mydas*), the endangered 'ilio holo i ka uaua (Hawaiian monk seal, *Monachus schauinslandi*), and the endangered 'ope'ape'a (Hawaiian hoary bat, *Lasiurus cinereus semotus*) have been sighted.

Pueo have also been sighted in the uplands. On the southern shoreline, at Pu'u Koaie and Aleale, seabirds such as red-tailed tropic birds (*Phaethon rubricauda rothschildi*) and brown boobies (*Sula leucogaster plotus*) nest. Pu'u Koaie is the largest and most stable seabird nesting area on all of Kaho'olawe. The offshore areas around Kaho'olawe are also important habitats for endangered koholā (humpback whales, *Megaptera novaeangliae*) and indigenous nai'a (Spinner dolphins, *Stenella longirostris*).

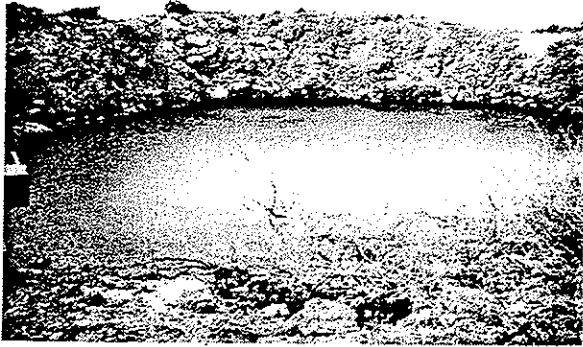
In addition, three distinctive native aquatic communities have been identified on Kaho'olawe, these are the Hawaiian Ephemeral Pool, the Hawaiian Intermittent Stream, and the High-Salinity Lava Anchialine Pool as described in the following paragraphs.

Ephemeral (temporary) fresh-water pools are formed on the island in the basins of intermittent streams after periods of heavy rainfall. Examination of one such pool revealed tadpole shrimps, seed shrimps, phytoplankton, and filamentous algae. The terrain of the island, its many gulches and depressions or lua, can support many ephemeral pools and related organisms.

All streams on Kaho'olawe can be considered intermittent since their water source is not large or consistent enough to support stream flow throughout the year. Intermittent streams often support many species of aquatic insects, snails, and other invertebrates when water is available.

Kaho'olawe's anchialine pool ecosystem at Sailor's Hat is considered unique. It sustains two kinds of shrimp, *Halocaridina rubra* and *Metabataeus lohena*, amphipods, snails, and red polychaete tube worms. It is unknown what other species may be found in this pool which is 160 feet in diameter and approximately 50 feet deep. This pool was created by military testing

when they set off explosives in the area to simulate a nuclear blast. The large hole that the testing carved into the rocky shoreline allowed ocean water and fresh/brackish groundwater to seep in and over time, the anchialine pool community developed. There are no known naturally-occurring anchialine pools on Kaho'olawe.



Sailor's Hat.

PBR HAWAII

The major modern threats to the ecosystems of Kaho'olawe have been introduced animals and military training, as well as the continued soil erosion due to wind and water. With the eradication of feral ungulates, some parts of the island have recovered. Also, the termination of ordnance delivery training on the island has led to an increase in the bird population. However, feral cats continue to roam the island.

Ke Kai (Ocean)

The Kaho'olawe Island Reserve includes the submerged lands and waters extending seaward two miles from its shoreline. The KIRC is currently developing an Ocean Management Plan for addressing issues pertaining to the waters around the island. Kaho'olawe's southern and eastern coasts are characterized by steep sea cliffs, while its north and west coasts are characterized by gently sloping ridges with inland bays. A few of these bays have white

sandy beaches with reefs and lava extrusions. Most, however, are covered with silt and give sad prominence to the impacts of catastrophic soil erosion. Underwater unexploded ordnance have been found on various ocean surveys.

Primary access to the island will continue to be from the ocean. However, at present, there are no docks or moorings in any part of the island. Safe access from the ocean will be a very significant factor in the clean-up, restoration, and future use of the island.

Ka Lewa (Airspace)

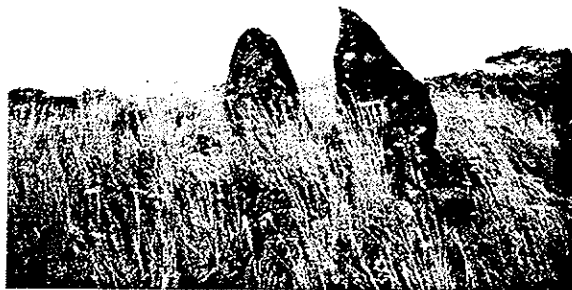
Kūpuna speak of a lei of clouds which, in the days of their youth, extended from Haleakalā to Kaho'olawe, to Lana'i, and to Ho'olehua on Moloka'i. When forests on the slopes of Haleakalā were cleared for ranching, the lei of clouds disappeared. Nevertheless, clouds roll in to Kaho'olawe from Maui, either from Haleakalā or Ukumehame, depending on the wind direction, on an almost daily basis. The clouds bear moisture in the form of kehaul or dew to the mauka section of the island, especially between Moaulaiki and Kealialalo.

Formerly, the airspace above Kaho'olawe was restricted to the 5,000-foot altitude for all commercial flights, whether fixed wing or helicopter. However, this restriction was recently lifted by the Federal Aviation Authority.

Nā Kahua Kahiko (Cultural and Historical Sites)

One of the important features of Kaho'olawe is that many of its historical sites and features remain relatively undisturbed despite the passage of time and human activity on the island. The entire island is a Historic District on the National Register of Historic Places.

Numerous ancient sites such as ko'a (fishing shrines), inland shrines, larger temple structures, habitation, and activity areas have been identified



Pu'u Moiwi

PBR HAWAII

during archaeological surveys. The majority of coastal sites and shrines are located on the island's northern shore between Honokanai'a and Hakioawa. Inland sites and shrines are concentrated within the major upland field system area around Lua Makika and also within the Pu'u Moiwi area. Some sites also are found scattered further south near Kamohio and Lae o Kuakaiwa. Larger heiau (temple) structures exist in Hakioawa. Some heiau and shrines have been rededicated for ongoing religious practices. New cultural sites such as a pa hula (hula platform) and a mua ha'i kūpuna (a platform of remembrance for the ancestors) have been built and dedicated.

Traditional habitation sites on Kaho'olawe were likely to be wherever potable water and/or food sources were available. Based on archaeological and historical evidence, the larger settlements were located at Hakioawa, Papaka, Papakaiki, Kaulana, Kuheia, Kaukamoku, Ahupu, Ahupuiki, Makaalae, Honokoa, and Honokanai'a.

A number of historical sites including stone walls, cisterns, artifacts, house foundations, and a road network can be found at Kuheia, the old

ranching headquarters.

Nā Mea Hana (Infrastructure)

Besides cultural sites, existing improvements currently being used are eroding dirt roads and trails, the U.S. Navy camp at Honokanai'a, and a camp at Hakioawa established by the Protect Kaho'olawe 'Ohana. The U.S. Navy camp at Honokanai'a contains pavilions, generators, desalinization units, barracks, a mess hall, workshops, pit latrines, showers, and other structures. Major improvements at Hakioawa include an ocean water desalinization unit and storage tank, a solar powered potable water system, wooden storage sheds, pit latrines or lua, basic cooking facilities, a shelter for a zodiac boat, a hale (house structure) built in traditional fashion, a historic well, a garden, and irrigation systems linked to mauka storage and catchments. A few temporary sleeping areas also exist.



Existing Water Desalinization and Storage Tank at Hakioawa

PBR HAWAII

Access to the island by air is possible by helicopter. A network of helipads which were installed by the military remain on the island.

**5. USES AND ANTICIPATED
ACTIVITIES**

This page intentionally left blank

5. USES AND ANTICIPATED ACTIVITIES

The provisions of Chapter 6K, HRS and the vision statement of this plan are consistent. However, the format of the statute divides the various uses into pre-conceived and artificial categories. Within this plan's vision, all of the uses listed in the law are interrelated. For example, culture, education, and restoration – three recurring elements in the vision for Kaho'olawe – are often seen as one and the same. Educational activities would focus on the teaching of the Hawaiian culture as well as develop restoration techniques. Restoration of the land could further encourage cultural practices and allow the land to support larger educational groups. Hawaiian cultural values inform both the activities and the philosophies of education and restoration.

Some of the uses and activities that are currently taking place on the island and are expected to continue are fishing and ocean gathering, revegetation, soil conservation, water development, education, overnight camping for cultural, educational, and restoration purposes, and celebrations and rituals related to Kanaloa and Lono.

Because of the interrelatedness of the uses envisioned, any discussion about uses as separate categories is somewhat problematic. In the same way, categorization of specific activities is problematic. For instance, fishing is both a cultural and subsistence activity that is also likely to occur in an educational context with students visiting the island. Similarly, the cultural art of navigation would no doubt be taught at the same time it is being practiced since traditional culture employs a "learn-by-doing" or apprenticeship educational methodology.

Therefore, this plan discusses use categories as clusters of activities that will occur in certain locations rather than types of uses as described in Chapter 6K, HRS. It should be noted that the use categories presented in this plan are intended to fulfill the requirements of the State/Navy Memorandum of Understanding and to implement the Navy clean-up. However, the overall objective is to implement a culturally-guided process of restoration and renewal for multiple, integrated uses and activities on Kaho'olawe. In addition, it is expected that the proposed uses and activities will be further defined as restoration proceeds. Thus, the use descriptions are basically very general in nature and while some specifics may be given, they are subject to change over time.

The following use categories are proposed for the island and are depicted on the Kaho'olawe Use Plan Map:

- ▶ Kahua Kauhale (Educational and Cultural Centers/Work Camps)
- ▶ Kahua Ho'omoana (Overnight Campsites)
- ▶ Ho'ōla Hou (Revegetation/Soil Stabilization Areas)
- ▶ Kula (Open Lands)
- ▶ Kahua Kahiko (Cultural/Historical Preserves)
- ▶ Nā Mea Kanu/Nā Holoholona A Me Nā I'a (Botanical/Wildlife Preserves)

The other major categories that have clearance implications - Alaloa (roads and trails) and Kīhāpai Ho'oulu Mea Kanu/Pūnāwai (Nurseries/Reservoirs) - are discussed in the Infrastructure section and shown on the Infrastructure Map.

Fishing and ocean gathering activities, while not shown on the Use Map, is a cultural use and is expected to occur along the entire coastline.

It should be noted that fishponds have been investigated as a possible use, however, at present there are no known traditional fishponds and the existing conditions are not conducive to the creation of new fishponds. The possibility of re-establishing or creating fishponds in the future and other ocean use issues will be studied in the Ocean Management Plan.

Also, use of the airspace above the island and its surrounding waters affects the uses on land and sea. For example, noise and visual impacts from aircraft could disrupt cultural practices and education. As such, use of the airspace should be restricted to approved access and emergencies. The previous 5,000-foot altitude restriction should be the minimum ceiling.

Kahua Kauhale (Educational and Cultural Centers/Work Camps)

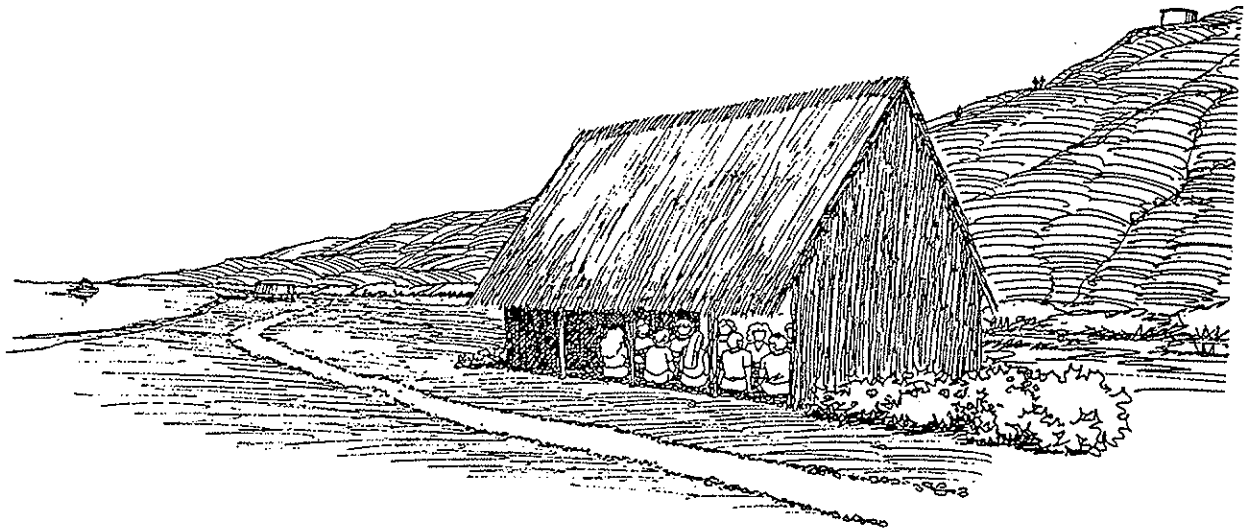
In order to support larger groups for island introductory or longer term visits for apprenticeship or project specific uses, as well as work groups for restoration activities, it is proposed that kahua kauhale (educational and cultural centers) be established in bay areas at Hakioawa, Kuheia and Kaulana, Ahupu, Honokanai'a, and inland at Kealialalo. These kahua kauhale would each have local sources of water via catchment, well, or desalinization techniques. The inland kahua kauhale would also have a back-up system of imported water. A shoreline and mauka-makai trail system would connect these centers to each other and to other parts of the island. A permanent buoy mooring would be placed in each of the above mentioned bays to afford safe access. These centers are where the kahu (steward of the land and cultural

master) could reside with his or her family and where students and other visitors would spend most of their nights.

Therefore, in addition to water sources, most kahua kauhale would have a permanent house (with its own sleeping area, kitchen, lua, storage, etc.) for the kahu and his or her family to live as well as facilities to accommodate apprentices, restoration teams, and other visitors. The design and structure of the facilities will vary in each of the areas selected for a kahua kauhale, according to its historical use and its environment. Hakioawa should remain as it is, with very simple and basic camping facilities. The buildings and facilities at Honokanai'a could remain and new structures, more appropriate in design and function, should be added. Foundations of former ranch structures could be used to rebuild facilities for Kuheia. The structures at Kealialalo will be designed to facilitate implementation and training in natural resource restoration and management. Former marine barracks facilities could be used.

The general facilities in each kahua kauhale should include the following features: sleeping areas or structures; a central kitchen; a central gathering area or structure; an imu; a fireplace for outdoor cooking; a fireplace for burning of combustible wastes; a storage area for sorting and holding other wastes for off-island disposal; a garden for food plants; planting areas for multiple use plants such as wauke for tapa or ipu for gourds; a composting area; lua; storage sheds for tools, equipment, supplies, and assembling materials; and hālau wa'a (canoe houses) or pā wa'a (canoe enclosures).

To accommodate the kahu and for general uses, a solar electric system and a means of communication should also be included. Helipads and land access to the helipads should



Typical Uses and Activities within Kahua Kauhale (Educational and Cultural Centers)

be provided in each kahua kauhale for emergencies and other transportation needs.

Kahua Ho'omoana (Overnight Campsites)

Kahua ho'omoana, like kahua kauhale, are to be used for cultural, educational, and restoration purposes, but with lesser improvements. In general, kahua ho'omoana are designated to provide good resting places and smaller overnight campsites in between shoreline destinations or between coastal and upland destinations. Kahua ho'omoana also provide remote and unimproved areas for smaller groups and more intensive subsistence experiences. Thus, kahua ho'omoana will be established along the shore near a shoreline trail system, such as at Keanakeiki. Additional areas may be designated later depending upon the future kahu. These

kahu will have to learn from the island where the various resources are located and what cultural and educational needs exist.

Many kahua ho'omoana will have no facilities, however, depending on intensity of use, some kahua ho'omoana will include minimal facilities such as a lua, a pā wa'a, a cooking area, and a storage shed for basic fishing, camping, and first aid supplies. A potable water supply and delivery system could also be developed if feasible and appropriate to the environment of each particular site.



Typical Uses and Activities within Kahua Ho'omoana (Overnight Campsites)

Ho'ōla Hou (Revegetation/Soil Stabilization Areas)











The vision statement for this Use Plan states, "The kino of Kanaloa is restored. Forests and shrublands of native plants and other biota clothe its slopes and valleys." Environmental restoration and revegetation is the key to realizing this vision.

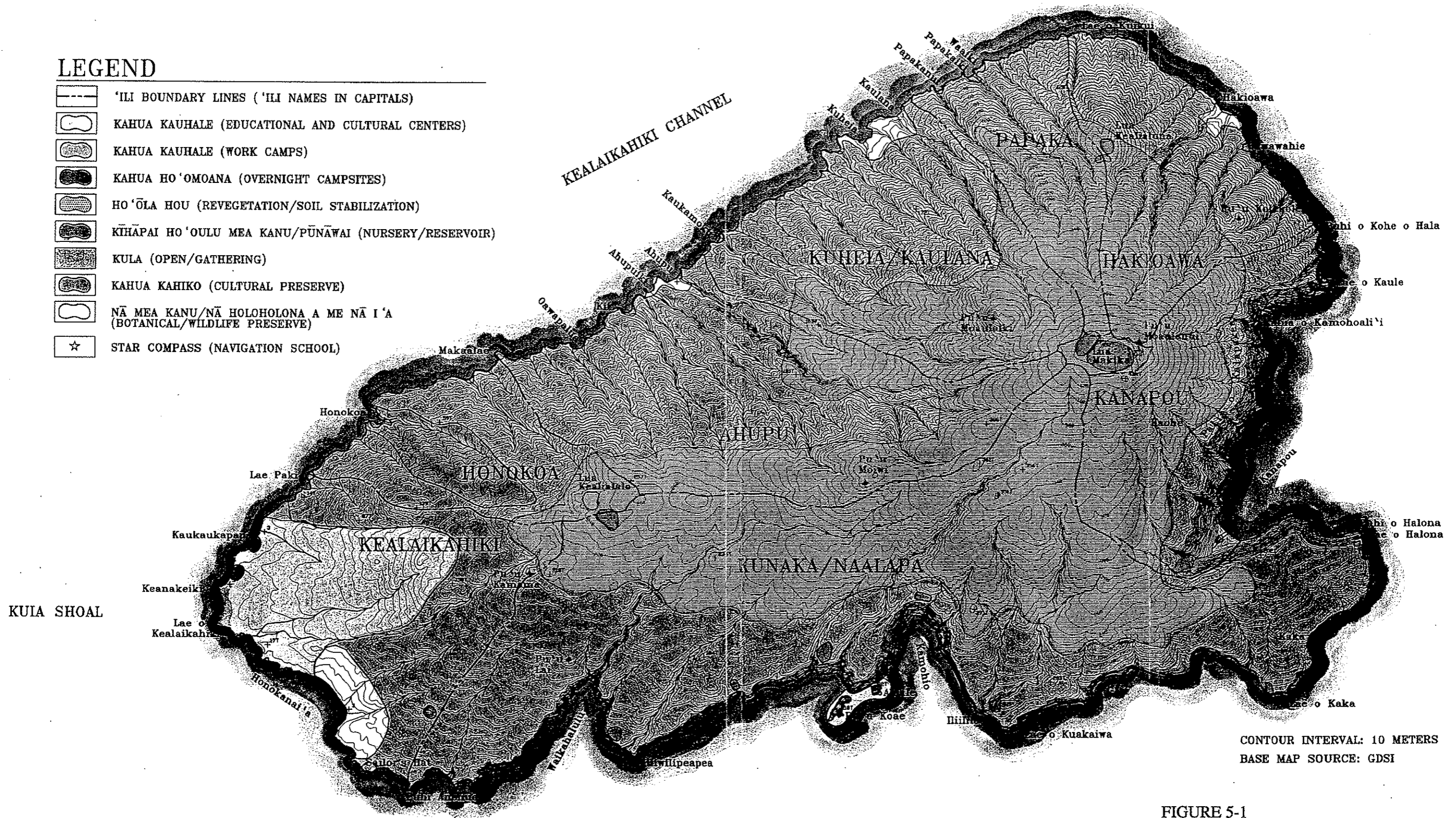
The importance of restoration of the island cannot be over-emphasized. Past activities, including ranching, bombing, and large populations of feral animals, have completely altered and severely degraded the island's environment. Restoration of the island to the condition described in the vision statement is basically four-fold: 1) control of erosion, 2)



Gully Headcut Control Project in Hākiōawa 'Ili. PBR HAWAII

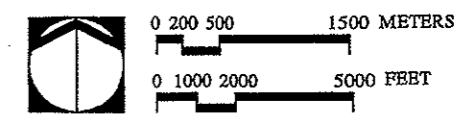
LEGEND

-  'ILI BOUNDARY LINES ('ILI NAMES IN CAPITALS)
-  KAHUA KAUAHALE (EDUCATIONAL AND CULTURAL CENTERS)
-  KAHUA KAUAHALE (WORK CAMPS)
-  KAHUA HO'OMOANA (OVERNIGHT CAMPSITES)
-  HO'OLA HOU (REVEGETATION/SOIL STABILIZATION)
-  KIHĀPAI HO'OULU MEA KANU/PŪNĀWAI (NURSERY/RESERVOIR)
-  KULA (OPEN/GATHERING)
-  KAHUA KAHIKO (CULTURAL PRESERVE)
-  NĀ MEA KANU/NĀ HOLOHOLONA A ME NĀ I'A (BOTANICAL/WILDLIFE PRESERVE)
-  STAR COMPASS (NAVIGATION SCHOOL)



CONTOUR INTERVAL: 10 METERS
 BASE MAP SOURCE: GDSI

FIGURE 5-1
 LAND USE MAP
 KAHO'OLAWA



revegetation, 3) enhancing water table recharge, 4) replacing exotic plants with native species. Projects would include stream diversions, settling ponds, check dams, down slope reservoirs, terracing, climatological monitoring stations, irrigation, and extensive planting of native grasses, vines, shrubs, and trees. The KIRC restoration/revegetation strategy will propose specific projects. The critical areas in need of this attention are the uplands, especially the hardpan area, and the heads of gullies, as depicted on the Land Use Map.

Kula (Open Lands)

Kula designates the open areas over the majority of the island that will have limited public access and lower intensity human use. The Kula is a natural area where the pueo live and individuals can have a "wilderness experience." However, the need to stop erosion and revegetate much of this area implies intensive human activity for the next several decades.

Once the area is restored and revegetated with native plants, cultural use of these areas will continue by those who are staying in the kahua kauhale.

Throughout the island, plant cultivation or stone work activities may occur for subsistence, cultural, or educational purposes. Stone work may also occur for restoration purposes. The types, locations, amounts, and parts of plants that can be gathered will be determined later according to the success of restoration activities and the sustainable yield of the item sought.

Traditional crops that were once cultivated on the upland slopes of the island include 'uala (sweet potato) and ko'ula (sugar cane). The type of crops to be cultivated in the future should be determined according to viability, use,

compatibility with restoration, and water availability. At this point, specific land requirements are access trails to gathering areas.

Nā Mea Kanu/Nā Holoholona A Me Nā I'a (Botanical/Wildlife Preserves)

Nā Mea Kanu (rare plant habitats) of Kaho'olawe, especially at Pu'u Koaie and at Aleale (where the new genus Ka Palupalu o Kanaloa is located), are designated for the protection of rare native plants. Nā Holoholona A Me Nā I'a are the designated wildlife habitats. These designated areas are those in which biological and botanical surveys have found notable species, unique ecosystems, and/or sites that provide good opportunities for cultivating native species. These places should be actively protected from destructive human disturbance, fire, and invasive flora and fauna. Specific land requirements include cleared areas to serve as buffer zones and fire breaks.

Kahua Kahiko (Cultural/Historical Preserves)

A significant amount of archaeological studies were conducted on the island between 1976 to 1980 that identified over 500 sites. The entire island is listed on the National Register of Historic Places. Initially, all cultural sites (including ko'a) should be identified, accurately surveyed on a map, and protected by a physical buffer of 10 feet. In the future, cultural and educational experts will specify exact sites for use and/or preservation. The Use Plan also designates a large portion of one 'ili (Honokoa) as a Cultural Preserve. The designation would allow future generations of Hawaiians to experience first-hand, the unaltered places of their ancient ancestors and facilitate an intimate connection between the generations. Within this preserve, human activity would be controlled.

No improvements should be made except for site protection and restoration purposes.

Interconnection of Uses

All of the uses will overlap and activities will serve more than one purpose. Culture, education, and restoration are the basis for all uses and are concepts that have been discussed as separate, but are viewed as elements of integrated use on the island. Thus, a certain land area may have multiple uses and meanings over time.

The physical linkages between 'ili affect the uses within each 'ili. Access to different parts of the land and ocean is important and should be provided as an integrated island-wide system.

Description of the Land Use Map

Figure 5-1 shows the Land Use Map for the island of Kaho'olawe. The Use Map shows the 'ili that have been defined, based upon historical evidence, place names, and current landform. The 'ili serve as the major land divisions on the island and are the context with which land uses and activities were planned.

For all of the 'ili, cultural/historical site stabilization and utilization are assumed to occur with all designated uses and activities.

6. INFRASTRUCTURE

This page intentionally left blank

6. INFRASTRUCTURE

The following infrastructure categories are depicted on the Infrastructure Map:

- ▶ Kīhāpai Ho‘oulu Mea Kanu/Pūnāwai (Nurseries/Reservoirs)
- ▶ Alaloa (Roads/Trails)
- ▶ Tanks
- ▶ Cisterns
- ▶ Awa Kū Moku (Buoy Moorings)

Kīhāpai Ho‘oulu Mea Kanu/Pūnāwai (Nurseries/Reservoirs)

The most important factor for the success of restoration and the use of the island is the availability of water, the harvesting of water sources, and recharge of the water table. Natural water collecting and storage areas in the uplands, such as at Lua Makika, have been identified and have been designated as reservoir areas. These areas are also good sites for plant nurseries which are needed to help make the revegetation efforts more efficient. At least one of these reservoir areas should be used as a nursery, depending upon feasibility and compatibility with water development and revegetation activities. It is also recommended that at least one coastal plant nursery be developed for the cultivation of coastal and dryland plants.

Alaloa (Roads and Trails)

Physical linkages between places on and around the island are important to integrating the island as a whole. The connection of different levels -- kai, uka, mauka -- and the connection of different uses and activities requires cleared roads, trails, and access routes. Access to different parts of the land and ocean is especially important for

subsistence and restoration activities. It is recommended that new roads and trails be constructed as an integrated island-wide system.



Shoreline trail along Hakioawa shore.

PBR HAWAII

An island-circling trail along the shoreline and the coastal cliffs is recommended for access to fishing areas, subsistence gathering areas, ko‘a shrines, coastal villages, nurseries, etc. This would be linked to a main road via the mauka-makai roads and trails as described in the following section.

Roads

The existing main four-wheel drive dirt road that follows along the spine of the island (from Honokanai‘a to Lua Makika) should be retained

and improved for use. This road connects all 'ili and can be continued to be used for the annual Makahiki ceremony. The existing road should be extended down toward Hakioawa, past "puka in the grass", to an area just before the terrain gets steep. This would greatly facilitate restoration activities in the mauka portion of the Hakioawa 'ili. The road could also circle around the base of Lua Makika to facilitate restoration work in the hardpan. The road should extend to observation points at Lae o Halona and Lae o Kaka for the monitoring of ocean activities and for restoration work; to Iiililoa, just above Kamohio and within viewing range of Aleale and Pu'u Koa'e; and to Wiliwilipeapea within viewing range of Waikahalulu.

On the windward side of the island, a road from Kaulana to Lua Makika should be reopened in order to provide another major access route to the central part of the island for supplies, plants, students, and restoration teams. This road could also facilitate access to Moaulanui for training in navigation. The existing road through the hardpan to just above Ahupu should be improved. A new road from Kealialalo to above Honokoa should be developed to facilitate restoration of this section of the island with native species, fire prevention and control, and to provide vantage points for monitoring of the windward coastline and waters of the reserve. Roads will be important in the management of the entire island, particularly for fire control and for the monitoring of activities on and around the island.

The system of roads could be utilized as part of a firebreak system developed for the island. They should be constructed or modified to improve the drainage pattern and control erosion on the island. They should be designated to

protect sensitive cultural, archaeological, and flora and fauna habitat sites. The roads should be improved with long term maintenance in mind and the feasibility of surfacing need to be studied.

ROAD DESIGN AND CONSTRUCTION

In general, existing roads should be maintained wherever practical and already established and new roads should be designed for the anticipated use, safety, cost efficiency, and minimum maintenance. Based on the anticipated use and on-site resources, dirt and/or crushed rock roads should be adequate.

Roads less susceptible to storm runoff erosion should be constructed with a crushed rock surface to provide a better riding surface and reduce dirt erosion and dust. Normally, roads located on ridge lines with relatively flat slopes (less than 10 percent) should have crushed rock surfaces. Local rock material can be crushed on the island at a nominal cost.

For negotiating steep routes, the road should be constructed to wind back and forth to provide a less steep gradient.

Typical Road Cross-Section

The spine road from Honokanai'a to Lua Makika, should have adequate width for two-way traffic. The suggested travelway width for this road should be 16 feet with shoulder widths of 2 to 5 feet. Other 'ili access roads can be provided with a travelway width of 10 feet with 5-foot wide shoulders. See Figure 6-1.

The roadway surface should be constructed to minimize damage from storm runoff.

Consequently, the travelway surface should be sloped from the centerline to the shoulders at a minimum slope of 2 percent to assure storm water runoff to the side rather than along the length of the road. This also assures that runoff will occur as a sheet flow rather than a concentrated flow. Once concentrated, as in ditches, channels and streams, storm runoff will generally erode the unprotected earth surface and turn the roadway into a drainageway.

Location of Roads

In general, the alignment of roads should be dictated by the existing terrain. To reduce the potential for storm runoff damage, dirt roads should be located along ridge lines or high ground. At those locations, crowning of the roadway assures that storm water will run off to the sides and away from the travelway. See Figure 6-1: Road at Ridge Line.

Where it is impractical to locate the road along ridge lines, the road may be located along the side of the ridge line or on a hillside. However, the road should never be constructed in a drainageway or potential flood area. Crossings, if necessary, should be made over drain culverts to assure passage of the calculated peak storm runoff.

Roads built in locations other than ridge lines should be excavated into the hillside with at least the travelway located on existing stable ground. See Figure 6-1: Road at Hillside. The dirt road travelway should not, if at all possible, be constructed on a fill or unstable area. Normally, the existing natural ground is less susceptible to severe erosion than a fill area.

Storm Drain Provisions for Roads

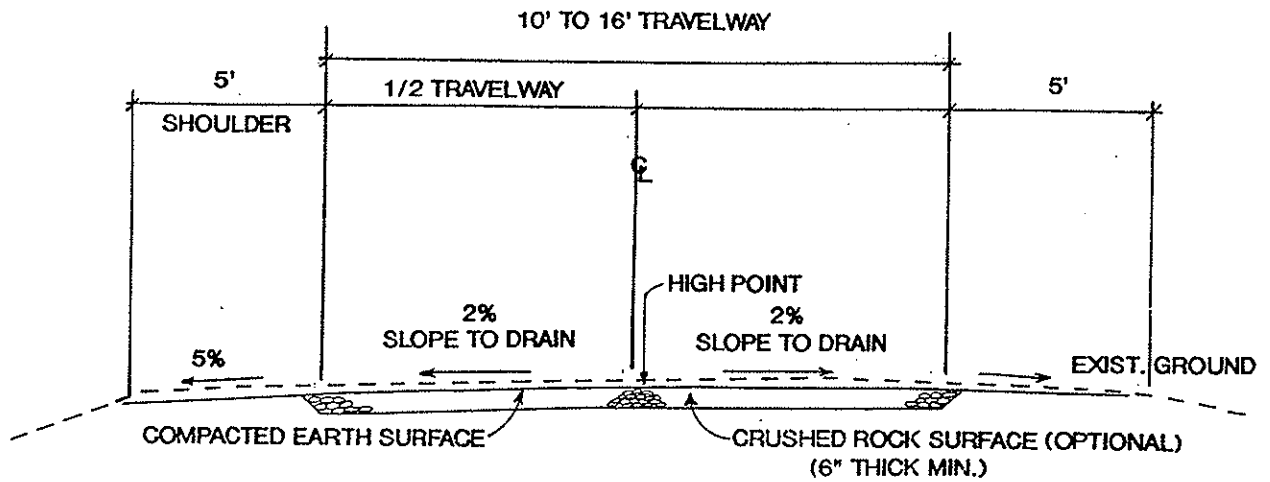
Unless constructed on ridge lines, roads should be protected from storm runoff damage.

Generally, a drain swale should be constructed on the uphill side to convey storm runoff along the side of the road. See Figure 6-1: Road at Hillside. The swale should be sized to accommodate the peak storm runoff from the tributary area. The drain swale should discharge the collected storm runoff as often as practical to adjoining drainageways leading to siltation basins. This can be accomplished, if possible, by diverting the swale away from the road on a hillside or crossing the road in an underground culvert at selected points.

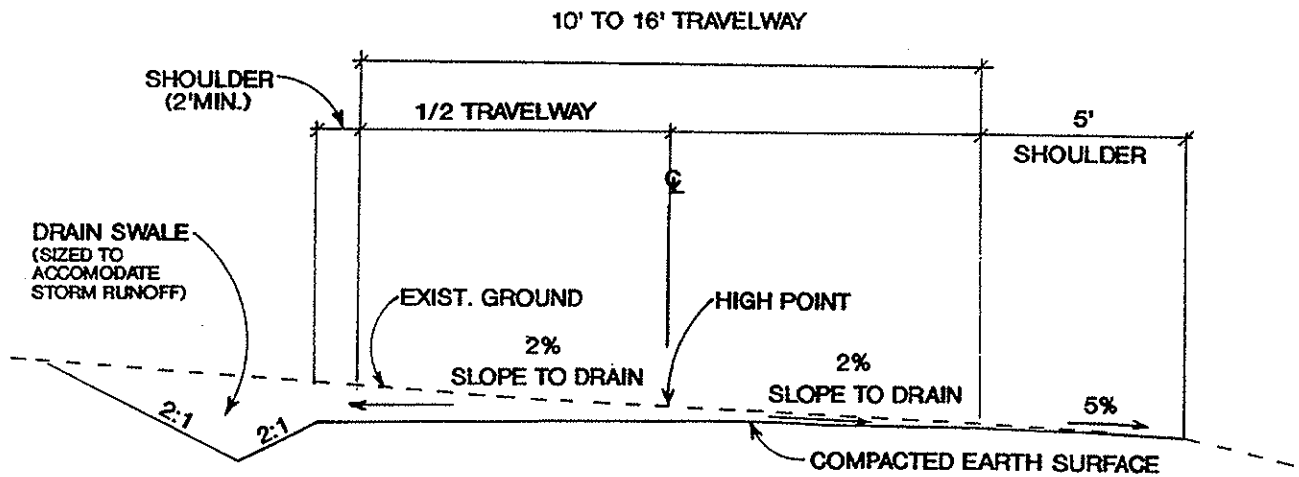
Accumulation of a large quantity of storm runoff in drain swales normally increases the erosion potential and, therefore, should be avoided. Erosion of a roadway drain swale, if left unchecked, will eventually erode the travel way and require extensive repair.

Roads with a crushed rock travelway should be constructed with subsurface drains to remove storm runoff accumulated in the crushed rock bed. Normally, if undrained, the accumulated storm water will flow downhill in the bed of crushed rock and eventually erode the subgrade and wash out the crushed rock material.

For economy purposes, periodically extending the crushed rock through the shoulder to existing grade would serve to drain runoff from the travelway. The crushed rock drain should be of the same thickness, about 2 feet wide, and constructed at an angle of about 45° to the road centerline.



ROAD AT RIDGELINE



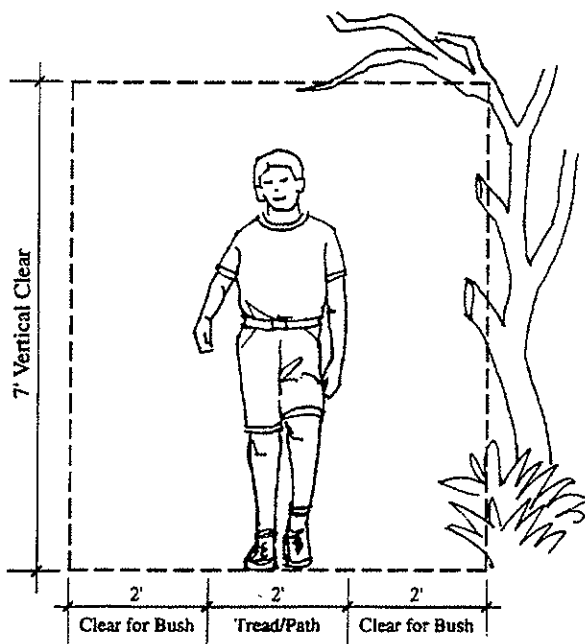
ROAD AT HILLSIDE

FIGURE 6-1
TYPICAL SECTIONS
KAHO'OLAWÉ

Trails

In keeping with the 'ili concept of land use and management, mauka-makai trails should be designed to link the coastline with the mauka portion of each 'ili. This would require new trails to be opened from Honokoa up to the road in the uplands, Makaalae and Kii to Kealialalo, from Ahupu and Ahupuiki to the road through the hardpan, from Papakaiki to Lua Makika, and to Pu'u Kolekole and Oawawahie from the Hakioawa extension road. In addition, the old ranch road that runs from Kaulana to Ahupu should be restored as a trail.

The trails would be mainly designed for walking; however, some segments may be designed to accommodate motor vehicles. Like road alignments, trails will be sited to protect sensitive cultural, archaeological, and flora and fauna features, and to serve as firebreaks where possible.



Source: Na Aia Holo

FIGURE 6-2: Typical Trail Section

Wai

A dependable source of water is needed, but is not addressed by this plan. However, an island-wide system for water catchment, storage, and delivery is recommended for restoration activities, fire control, and to sustain the kahu and the visitors.

While the following offers general ideas on water system development, a more detailed and comprehensive strategy should be developed in conjunction with the KIRC Restoration Plan.

Wells

Historical shoreline wells should be identified and studied for water source potential. The groundwater of the island should be further studied to determine more precisely the size of its supply, its sustainability, and the cost of drawing the water. Windmills are a possible source of energy for drawing groundwater from the basal lens.

Desalinization

Desalinization is currently used at Honokanai'a, and to a lesser degree at Hakioawa. A desalinization system should be considered for Kuheia/Kaulana.

Reservoirs/Cisterns/Catchments

Potential reservoir sites have been identified at Lua Kealialuna, Lua Makika, and Lua Kealialalo. Existing cisterns at Kuheia, Ahupu, and near Honokanai'a should be repaired and utilized. Catchments should be installed throughout the island for fire protection and revegetation/farming purposes.

Storage and Distribution System

Generally, what is envisioned for the island is separate water source, storage, and delivery systems for various parts of the island. Due to the distances involved, the cost of a transmission system from the highest point on the island (Lua Makika) would be expensive. Also, if the source of water for Lua Makika would be primarily rainfall, then the water system for the island would be unreliable.

Short-term visitors, especially those who stay at Hakioawa, Ahupu, Kamohio, and Papaka will probably be required to bring their own water and portable storage.

Rainfall sources (reservoirs, cisterns, catchments) will primarily used for revegetation, farming and fire protection.

Water Pipeline

If transport of potable drinking water is required, high density polyethylene pipe should be considered. The smaller diameter pipe comes in considerable lengths and, therefore, can be rolled in place. Sections of pipe are joined by the method of thermal butt-fusion.

The pipe can be laid on the ground provided that thermal expansion and contraction is designed into the system. The pipeline can also be anchored from movement by placement of rocks.

The pipeline should be appropriately designed and specified for the system operating and installation conditions.

Drainage

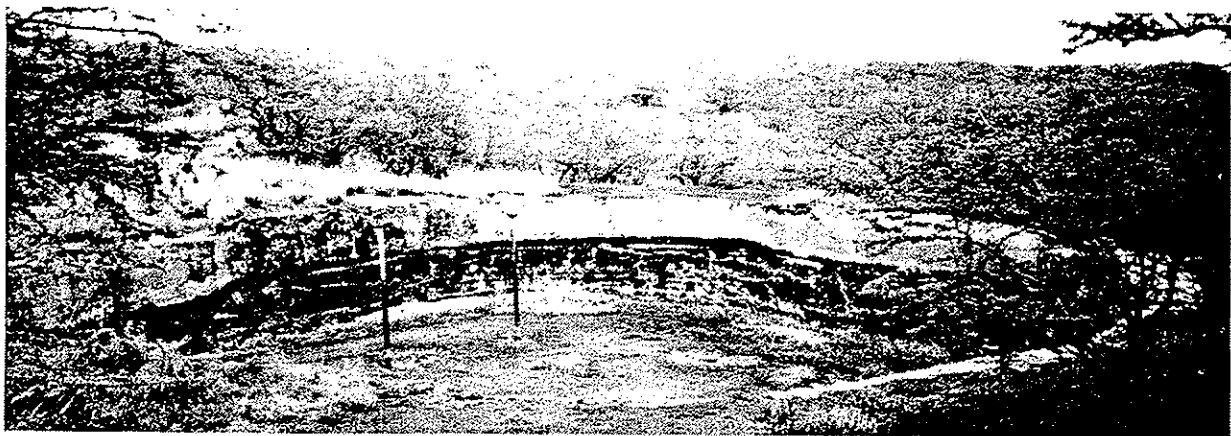
Control of soil erosion from stormwater runoff is of immediate concern on the island. Check dams and any other means to detain and/or retain stormwater should be included with any improvements or land altering activities. Erosion control will be the preliminary focus of the KIRC Restoration Plan.

Wastewater

Some form of appropriate technology wastewater collection, treatment and disposal system should be adopted and utilized on the island to reduce contamination of the groundwater and nearshore environments.

Awa Kū Moku (Buoy Moorings)

Buoy moorings will provide safer access for



Existing Cistern

PBR HAWAII

boats visiting the island. They will also help to protect the reefs from repeated anchoring.

While access to the island should be open to everyone, it should be on a controlled and managed basis. If piers and moorings were to be constructed, it would be easier for people to land on the island unattended and at the same time harder for land managers to control and monitor visitors. This Use Plan calls for only five moorings to be provided at the Honokanai'a, Kuheia, Ahupu, and Hakioawa kahua kauhale, and the Honokoa kahua ho'omoana.

It should be noted that most of the kūpuna stressed the importance of Kuheia as an access point to the island because of the protection afforded by its bay. Many recall the main entry point to Kaho'olawe from Maui to be at Kuheia.

Refuse








Much of the refuse generated by people on the island should be carried off the island when the people leave. A system of sorting and recycling should be implemented. Large-scale refuse collection and disposal systems and landfills are not seen as necessary.

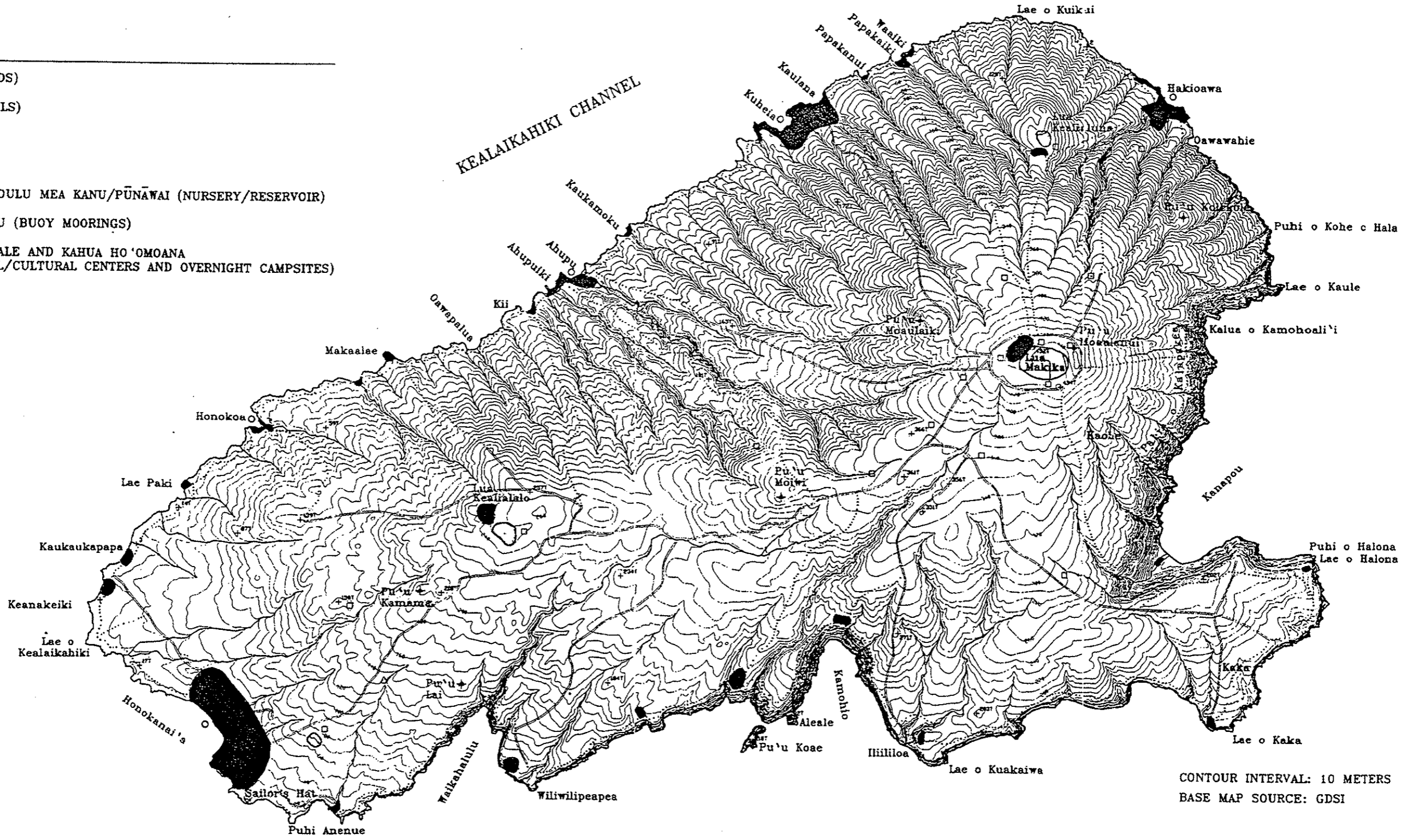
Description of the Infrastructure Map

Figure 6-3 shows the infrastructure that will be concomitant to the uses and the location of the infrastructure. Kahua Kauhale and Kahua Ho'omoana are shown on this map for reference only.



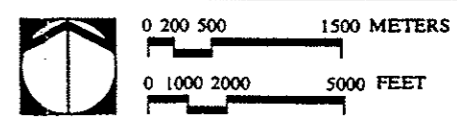
LEGEND

-  ALALOA (ROADS)
-  ALALOA (TRAILS)
-  TANKS
-  CISTERNS
-  KĪHĀPAI HO 'OULU MEA KANU/PŪNĀWAI (NURSERY/RESERVOIR)
-  AWA KŪ MOKU (BUOY MOORINGS)
-  KAHUA KAUAHALE AND KAHUA HO 'OMOANA (EDUCATIONAL/CULTURAL CENTERS AND OVERNIGHT CAMPSITES)



CONTOUR INTERVAL: 10 METERS
 BASE MAP SOURCE: GDSI

FIGURE 6-3
 INFRASTRUCTURE MAP
 KAHŌ'OLAWĒ



DEC. 1995

7. DESCRIPTIONS BY 'ILI

This page intentionally left blank

7. DESCRIPTIONS BY 'ILI

Hakioawa 'Ili

Hakioawa 'ili stretches along the coast from Lae o Kuikui to Puhi o Kohe o Hala and includes the bays of Hakioawa and Oawawahie. It also includes Lua Kealialuna and Pu'u Kolekole in the uplands and continues inland to Lua Makika (Lua Moaula). See Figure 7-1.



Hakioawa Bay

PBR HAWAII

Hakioawa was the primary settlement area during the pre-contact period. It has the highest concentration of cultural sites and use areas. For this reason, Hakioawa will continue to be the center of religious and cultural customs, practices, and ceremonies on the island.

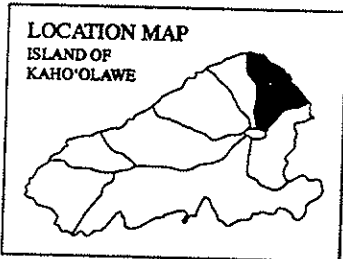
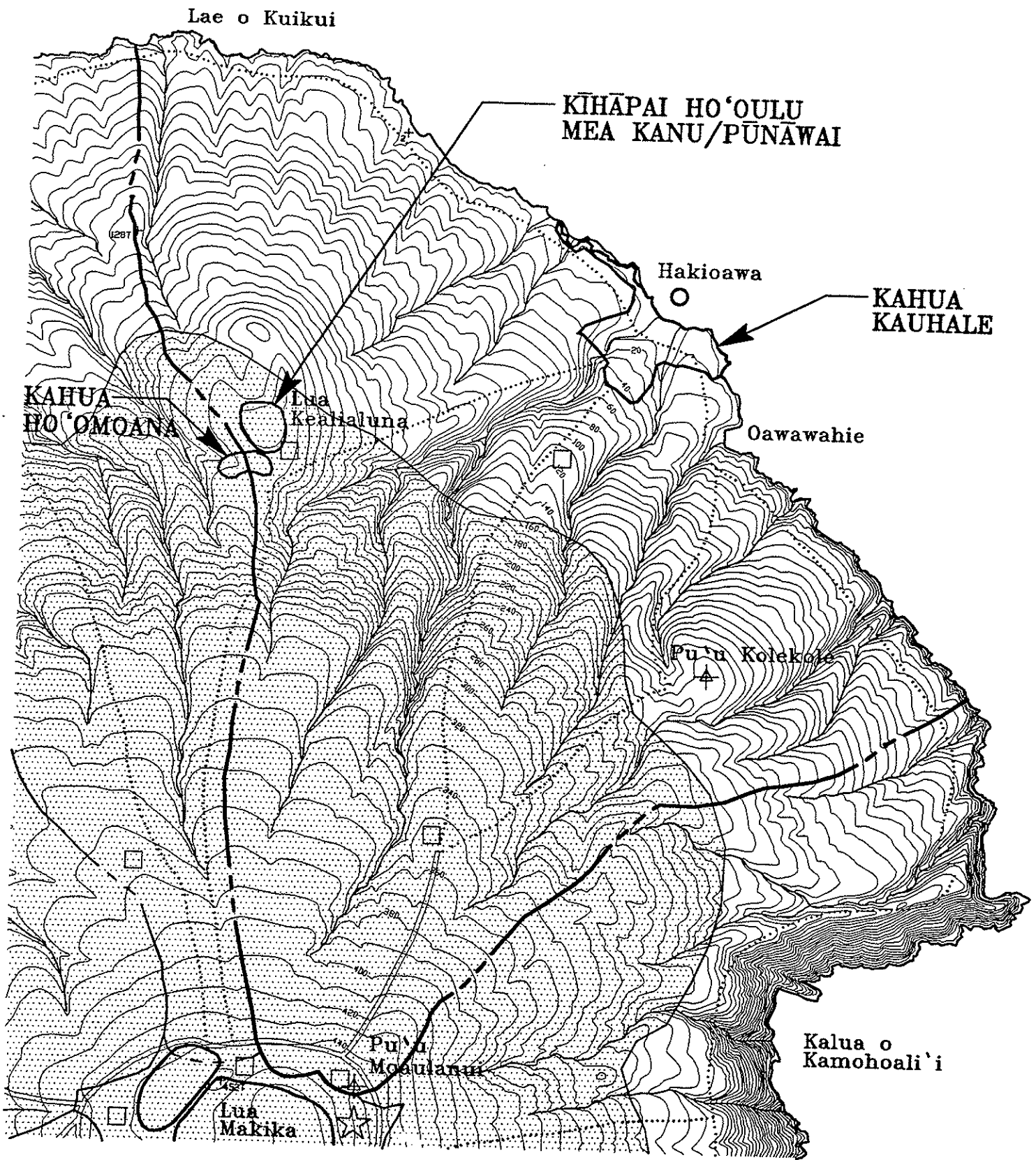
Hakioawa is currently used for religious, cultural, and educational purposes and also serves as a base camp area for the Protect Kaho'olawe 'Ohana. The bay area at Hakioawa is a recognized place of ceremony for Hawaiians. Some of the traditional heiau and shrines have been rededicated and new heiau and shrines have been constructed for religious or cultural purposes. Of special note are the Hale Mua, Hale O Papa, Pā Hula 'o Ka 'Ie'ie, Mua Ha'i Kūpuna 'o Kahualele, and a shrine to Kanaloa.

A few water development and revegetation projects have been conducted near the shore and in the uplands. Currently in place near the bay are an ocean water desalinization unit and storage tank; a solar powered potable water system; wooden storage sheds; pit latrines or lua; basic cooking facilities; a shelter for a zodiac boat; a hale (house structure) built in traditional fashion; a historic well; a garden; water catchment, storage and delivery systems; and irrigation systems linked to mauka catchments. Areas for camping and sleeping have been cleared. Trails lead out of Hakioawa along the shoreline east to Oawawahie and west to Lae o Kuikui. Trails also lead mauka to Moaulanui along both the east and west ridges above Hakioawa.

On the west ridge, there are water catchments, revegetation plots, and a check dam near Kealialuna. On the east ridge, there is water catchment with an irrigation line running into the camp.

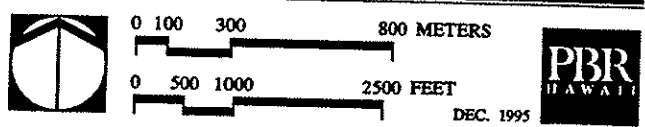
Hakioawa will have a kahua kauhale which will feature simple structures. In addition to what is already in the camp, additional structures may be built to expand the kitchen and cooking facilities, desalinization unit, storage area, sanitary waste collection, waste treatment, and disposal. A hālau wa'a may be constructed utilizing traditional methods. This kahua kauhale will accommodate cultural and religious practitioners as well as students who journey to the island to take part in Makahiki season ceremonies and/or to take part in restoration activities, especially of the Hakioawa 'ili.

Access to Hakioawa from the ocean should be



- LEGEND**
- 'ILI
 - ALALOA (ROADS)
 - ALALOA (TRAILS)
 - TANKS
 - CISTERNS
 - AWA KŪ MOKU (BUOY MOORINGS)
 - HO'ŌLA HOU (REVEG/SOIL STAB.)

FIGURE 7-1
'ILI MAP-HAKIOAWA
KAHO'OLAWE



improved with the installation of awa kū moku (buoy mooring). This will reduce damage to the reef from anchors and will reduce hazards from unexploded ordnance.

Future uses, activities, and infrastructure to occur within Hakioawa are as follows:

Makai

- kahua kauhale (cultural and educational center) at Hakioawa Bay
- coastal garden plots in the intermittent stream bed at Hakioawa Bay
- revegetation of the coast
- awa kū moku (mooring) in Hakioawa Bay
- alaloa (shoreline trails)

Mauka

- kahua ho'omoana near Lua Kealialuna
- kīhāpai ho'oulu/pūnāwai (reservoir and/or plant nursery) in Lua Kealialuna
- kula (open lands)
- ho'ōla hou (revegetation/soil stabilization) of the hardpan areas
- ho'ōla hou (erosion control) and check dams in the gullies
- alaloa (mauka-makai road/trail) from Lua Makika to Hakioawa Bay, with spur trail to Pu'u Kolekole and Oawawahie
- alaloa (mauka-makai trail) from Lua Makika to Hakioawa Bay via Lua Kealialuna
- water system development
- emergency helicopter landing area

Papaka 'Ili

The Papaka 'ili is smaller than Hakioawa 'ili and includes Papaka, Papakaiki, and Waaiki. The land is fairly steep and a small portion of it lies near Lua Makika. Refer to Figure 7-2.

Papaka is unimproved and is recommended to

remain without major modifications. Some improvements should be made for revegetation and restoration use, as well as for overnight camping. Only minimal facilities such as a lua; water systems for potable water and irrigation; and a storage shed would be provided for short-term visits.



Waaiki Shoreline

PBR HAWAII

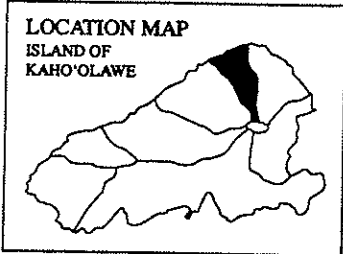
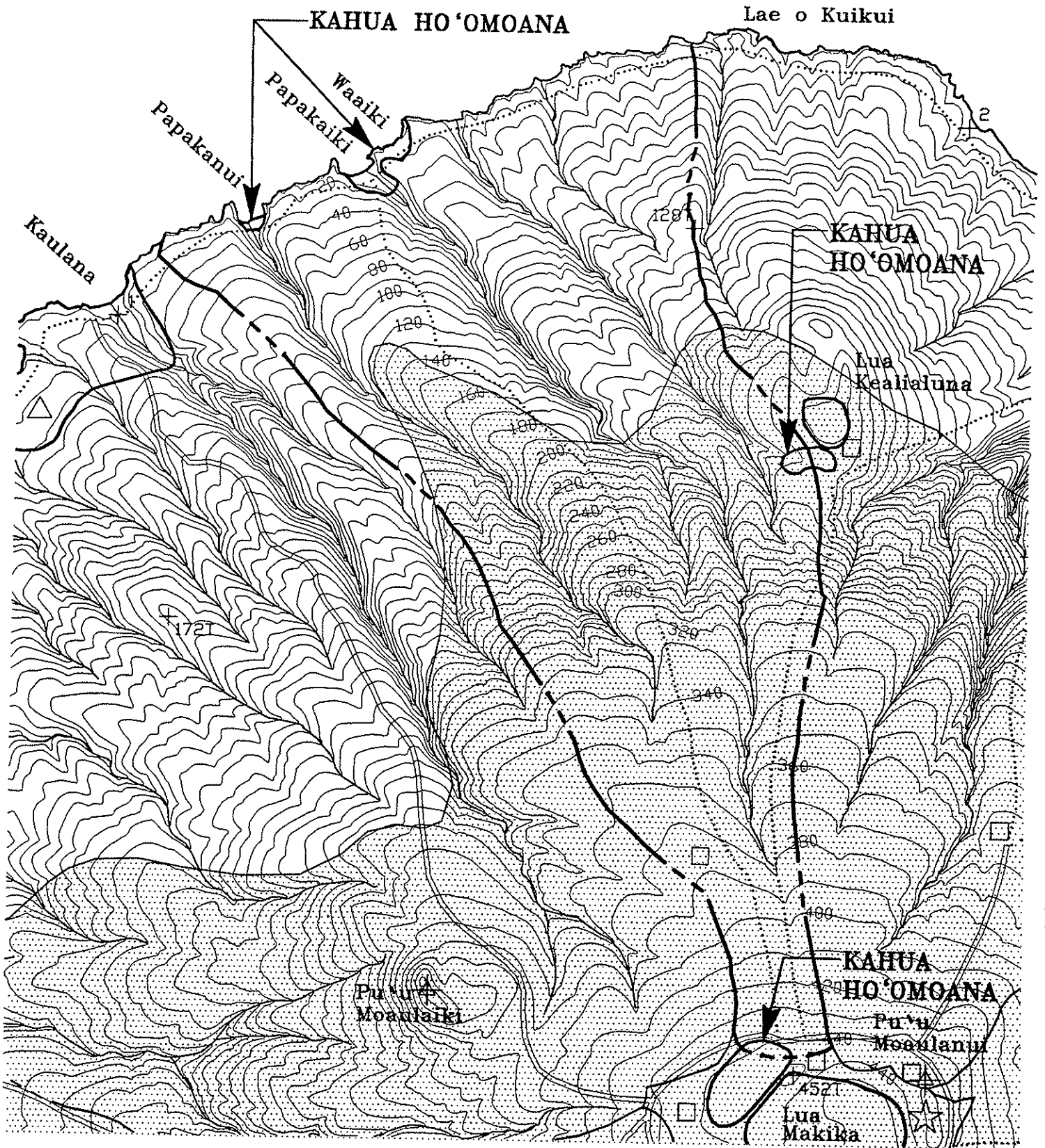
Uses and activities to occur within Papaka are as follows:

Makai

- kahua ho'omoana at Papakaiki and Waaiki
- kahua ho'omoana at Papakanui
- coastal garden plots in the intermittent stream beds at Papakaiki and Papaka
- alaloa (shoreline trail)

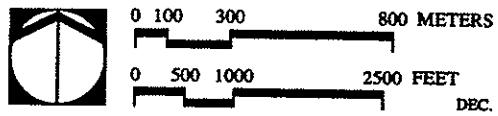
Mauka

- kahua ho'omoana along the rim of Lua Makika
- kula (open lands)
- ho'ōla hou (revegetation/soil stabilization) in the hardpan areas
- ho'ōla hou (erosion control) and check dams in the gullies
- alaloa (mauka-makai trail) from Lua Makika



- LEGEND**
- 'ILI
 - ALALOA (ROADS)
 - ALALOA (TRAILS)
 - TANKS
 - CISTERNS
 - AWA KŪ MOKU (BUOY MOORINGS)
 - HO'ŌLA HOU (REVEG/SOIL STAB.)

FIGURE 7-2
'ILI MAP-PAPAKA
KAHO'OLAW



DEC. 1995

- to Papakaiki
- alaloa (mauka-makai trail) from Lua Makika to Lua Kealialuna
- water system development

Kuheia/Kaulana 'Ili

The Kuheia/Kaulana 'ili encompasses the shore from Kaulana Bay to Kaukamoku Bay and rises to Lua Makika. See Figure 7-3. Kuheia Bay is a well-protected bay area and provides one of the safest ocean accesses to Kaho'olawe year-round.



Kuheia Bay

PBR HAWAII

The safe ocean access makes Kuheia ideal for accommodation of large groups, children, the elderly, and those who are physically challenged. The Kuheia/Kaulana 'ili includes Pu'u Moaulaiki, which is considered one of the most sacred places on the island, offers the potential for training in astronomy, ocean navigation, and way finding. Given these assets, the Kuheia/Kaulana 'ili is to be developed as a cultural and educational center.

Kuheia is the site of a former ranch and should be improved to support kahu and student groups. A kahua kauhale similar to the YMCA camp at Ke'anae should be established at Kuheia with new structures built on the foundations of the former ranch structures where possible.



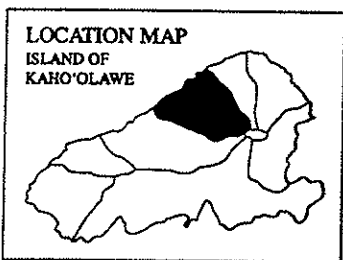
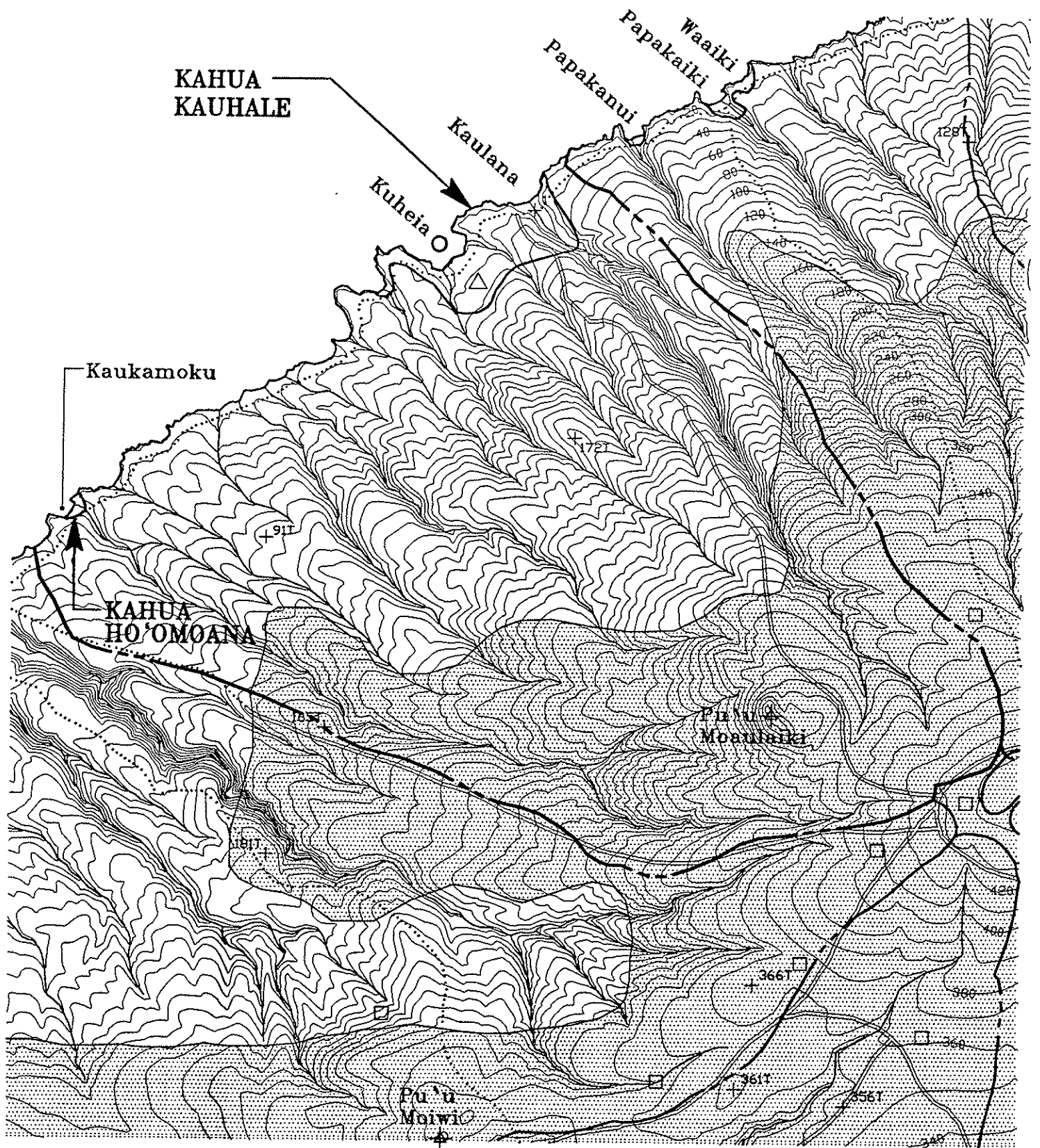
Remains of Ranching Facilities

PBR HAWAII

Improvements should include a water system, restoration of ranch cisterns for farming irrigation and fire protection, a desalinization unit, a solar energy system, a communications system, a central kitchen, a central gathering area, lua, at least four hale moe, maintenance and storage areas, an imu, a fireplace, areas for disposal, treatment and storage of wastes, and a pā wa'a.

Accommodations for kahu should include a house structure, piped water, a kitchen, lua, sleeping area, living area, utilities run on solar power, and ordnance-cleared areas around the perimeter of the house.

As one of the major cultural and educational centers for the island, the Kuheia/Kaulana 'ili should contain the main repository for the island's cultural and historic artifacts. This repository would also function as a hale ho'ike'ike or an interpretive center where Native Hawaiian traditional tools, toolmaking, games, arts, and crafts can be taught. However, instead of merely preserving and displaying pieces in a museum-like structure, the interpretive center should help to keep the Hawaiian culture alive and well-practiced and should be inclusive of the cultural and environmental contexts.



- LEGEND**
- 'ILI
 - ALALOA (ROADS)
 - ALALOA (TRAILS)
 - TANKS
 - CISTERNS
 - AWA KŪ MOKU (BUOY MOORINGS)
 - HO'OLA HOU (REVEG/SOIL STAB.)

FIGURE 7-3
'ILI MAP-KUHEIA/KAULANA
KAHO'OLAWE

0 100 300 1000 METERS
 0 500 1000 3000 FEET

PBR HAWAII

DEC. 1995

Access to Kuheia from the ocean should be improved with the installation of awa kū moku (a buoy mooring). The buoy mooring would reduce hazards from unexploded ordnance when using anchors and reduce damage to the coral reef. Other infrastructure-related improvements at Kuheia include the restoration of a ranch road to Pu'u Moaulaiki. For emergencies, the delivery of materials and supplies, and the off-loading of solid waste, a helicopter land pad should be sited near the shore.

Kaulana is the site of the former penal colony under the regency of High Chiefess Ka'ahumanu. There is an opportunity for an archaeology summer field school to excavate the area and conduct data recovery on the penal colony. Other than those related to the penal colony, the only other cultural or historic features are some ko'a and house sites along the eastern ridge. These should be stabilized and cleared with a 10 foot buffer.

Kaulana should also have an educational center to teach fishing and promote fishing implement making, fishing craft repair and reconstruction, and the study of the ocean.

Within the Kaulana valley, there is vegetation and a lot of silt and sediment. This is a potential site for the clearance of alien species and test planting of native species. The sandy beach in Kaulana may facilitate bringing in machinery for clearance via landing craft. The area could be the site of a coastal plant nursery.

Uses and activities to occur within Kuheia/Kaulana are:

Makai

- kahua kauhale (cultural and educational

center) at Kaulana and Kuheia

- kahua ho'omoana (overnight campsite) at Kaukamoku
- coastal plant nursery in Kaulana for the cultivation of wauke, milo, hau, ipu
- coastal garden plots and plant nurseries in the intermittent stream beds at Kuheia and between the sandy bays between Kuheia and Kaukamoku
- a hale ho'ike'ike (interpretive center) at Kuheia
- alaloa (shoreline trail)
- awa kū moku (mooring) in Kuheia Bay
- water system development

Mauka

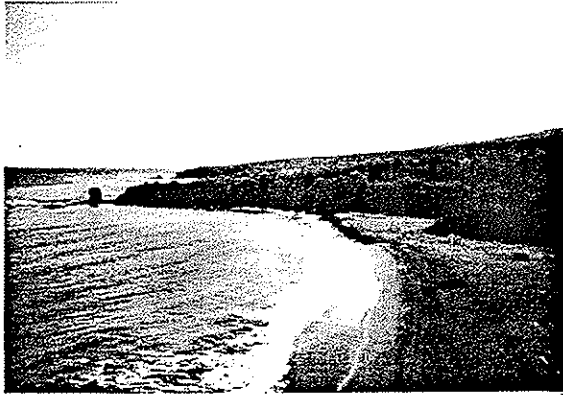
- kula (open lands)
- ho'ōla hou (revegetation/soil stabilization) in the hardpan areas
- ho'ōla hou (erosion control) and check dams in the gullies
- alaloa (mauka-makai road) to link Kuheia and Kaulana Bays and the shoreline trail system to Lua Makika via Pu'u Moaulaiki
- water system development
- emergency helicopter landing area (existing)

Ahupu 'Ii

The Ahupu 'ili is the second largest 'ili and includes Ahupu and Ahupuiki Bays, Kii, Oawapalua, Makaalae, and Pu'u Moiwi. The mauka boundary runs along the spine of the island and contains a small area around Lua Makika. Ahupu is characterized by deep valleys. See Figure 7-4. It was part of the military bombing impact zone until October of 1990. Ahupu Bay provides a good landing area for boats and is an ideal site for a kahua kauhale at Ahupu and Ahupuiki and kahua ho'omoana at Kii and Makaalae. Minimal facilities such as lua and storage sheds would need to be built to

accommodate the kahu and students.

It should be noted that Pu'u Moiwi is the second largest adze quarry in the islands. This site is currently threatened by erosional forces.



Ahupu Bay

PBR HAWAII

The anticipated uses and activities within Ahupu are:

Makai

- kahua kauhale (cultural and educational center) at Ahupu and Ahupuiki
- kahua ho'omoana (overnight campsite) at the bay east of Kii
- kahua ho'omoana (overnight campsite) at Makaalae
- coastal garden plots in the intermittent stream beds at Ahupuiki, and Oawapalua
- alaloa (shoreline trail)

Mauka

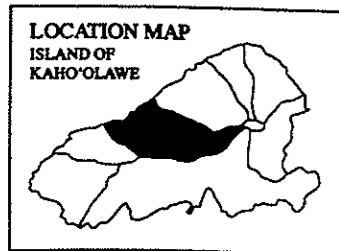
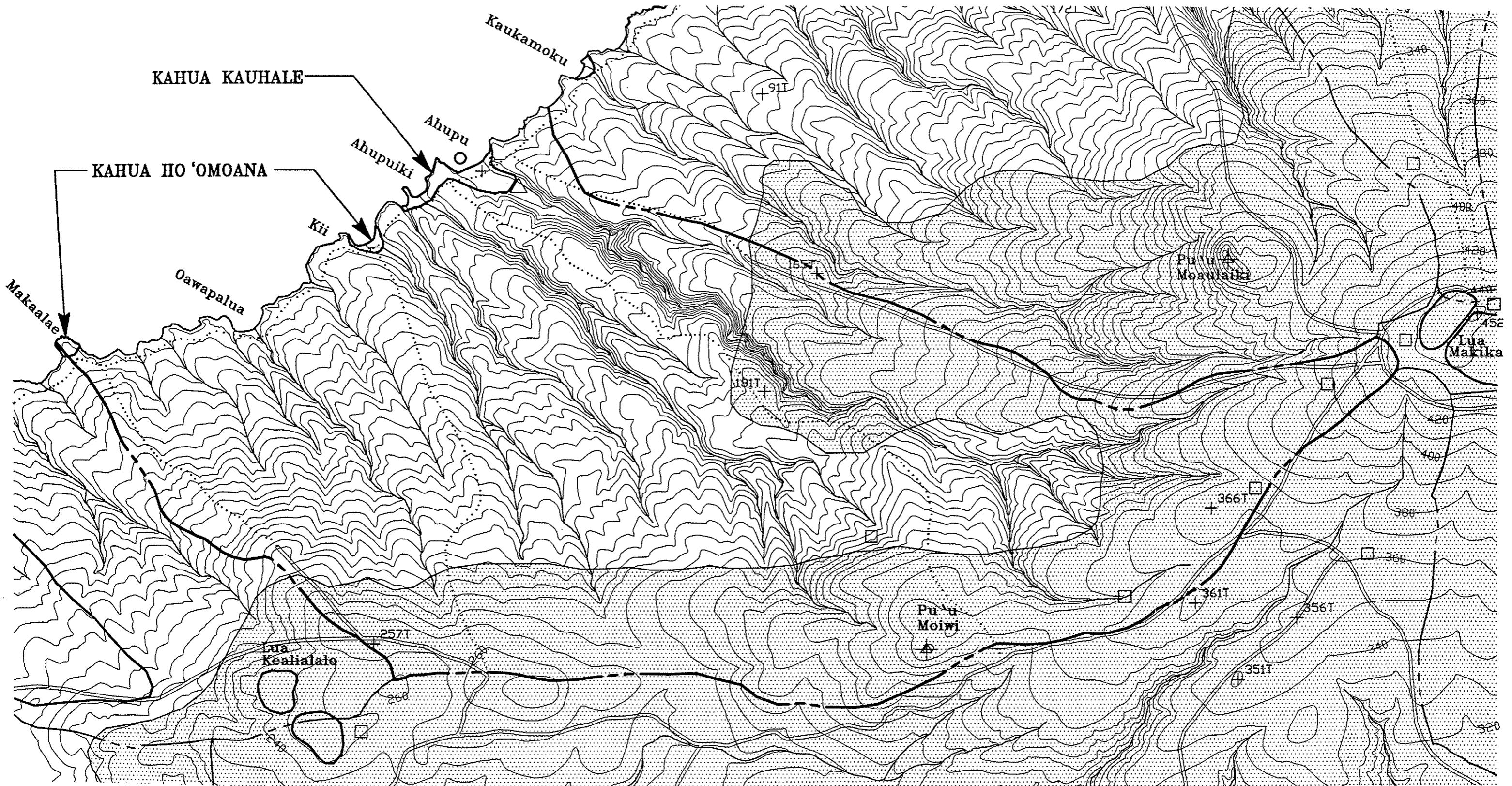
- kula (open lands)
- ho'ōla hou (revegetation/soil stabilization) in the hardpan areas
- ho'ōla hou (erosion control) and check dams in the gullies
- alaloa (mauka-makai trail) from Kii to the main road
- alaloa (mauka-makai road/trail) to link Ahupu Bay to Lua Makika

- alaloa (mauka-makai trail) to link Ahupuiki to Pu'u Moiwi and the main road
- alaloa (mauka-makai trail) to link Makaalae to the main road near the existing Navy structures called "LZ Seagull"



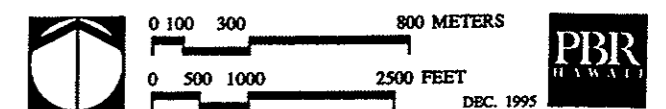
Ahupuiki

PBR HAWAII



- LEGEND**
- 'ILI
 - ALALOA (ROADS)
 - ALALOA (TRAILS)
 - TANKS
 - CISTERNS
 - AWA KŪ MOKU (BUOY MOORINGS)
 - HO'ŌLA HOU (REVEG/SOIL STAB.)

FIGURE 7-4
'ILI MAP-AHUPU
KAHO'OLAWE





Lithic scatter at Pu'u Moiwi

PBR HAWAII

Honokoa 'Ili

The Honokoa 'ili includes Honokoa Bay and Lua Kealialalo. Lua Kealialalo is the highest point in the 'ili; this 'ili does not extend to Lua Makika. See Figure 7-5.

Honokoa contains a wealth of archaeological/historical features such as permanent habitation sites, fishing ko'a, agricultural fields and field shelters, work areas, caves, rock shelters, inland shrines, and petroglyphs. Therefore, a large portion of this 'ili is designated for cultural preservation and should be left intact as a cultural preserve with no modifications except for erosion control and site stabilization.

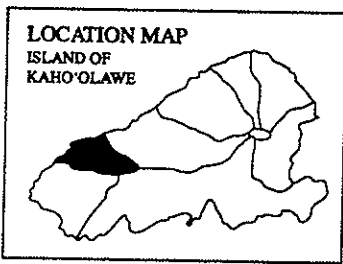
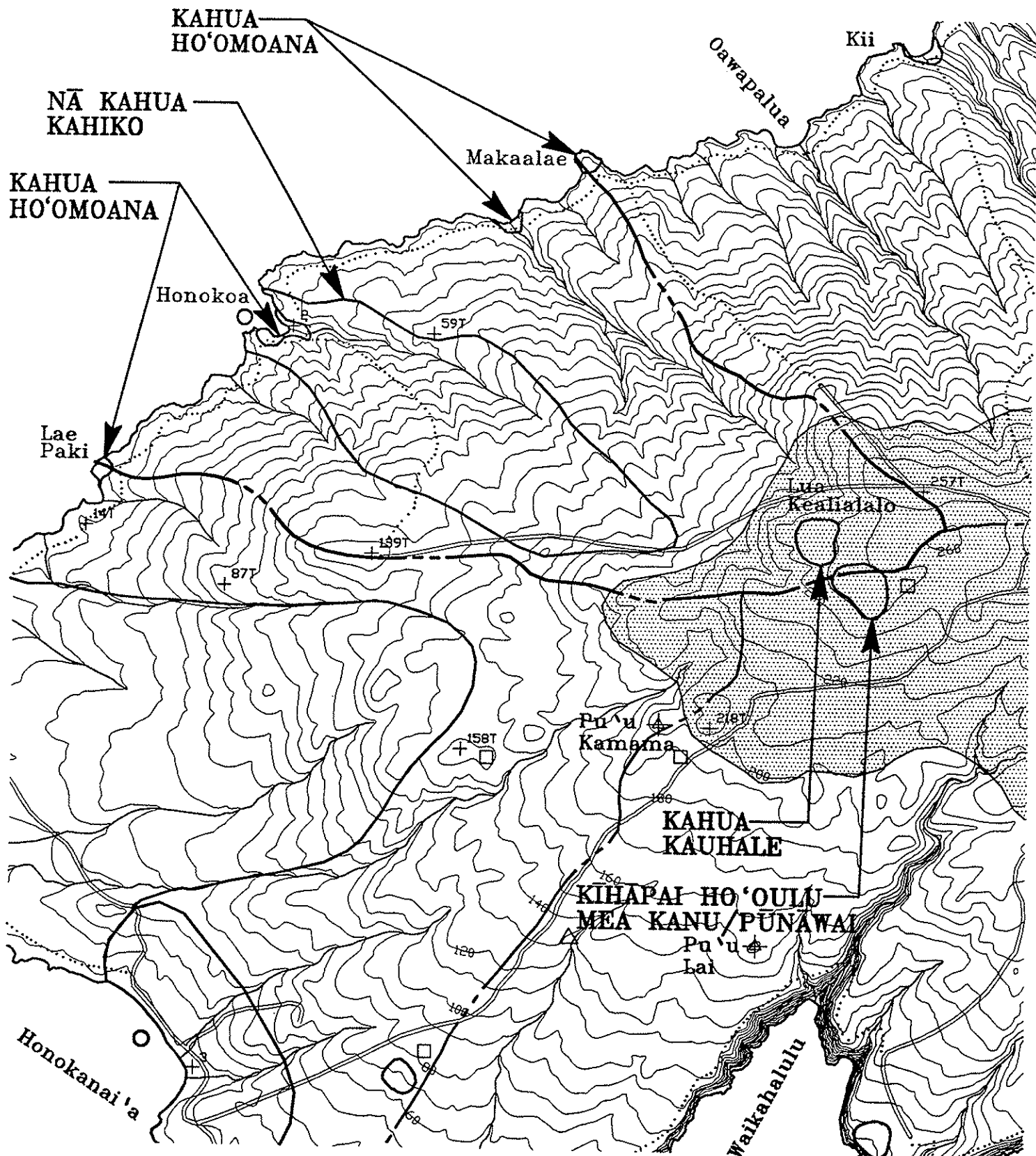
The preserve would allow people a glimpse of the past as it has been preserved in almost total form from ocean to mountain. This preserve

would correspond to the watershed that runs to Honokoa Bay. At the shoreline however, awa kū moku (mooring) and minimal facilities (lua and storage shed) should be provided for accommodating brief visitations and possible overnight stays.

The upland kahua kauhale would be situated near Kealialalo near the existing structures referred to by the U.S. Navy as "LZ Seagull." The purpose of this kahua kauhale would be to house the kahu, students, apprentices, and volunteers involved in the restoration and revegetation of the hardpan and kula areas of the island. Navigation and mauka farming could also be taught. The area currently has aging military facilities and would require new designs and construction to accommodate its planned usage. This work camp can also use the Ke'anae YMCA concept and include a central kitchen and assembly structure; four hale moe for students, apprentices, and volunteers; storage and maintenance areas; lua; a water system which should include catchment, storage, and delivery, as well as storage for imported water; solar and propane utilities with emergency generator; a communications system; an imu; a fireplace; and areas for disposal, treatment, and storage of wastes.

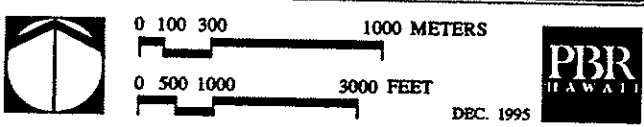
Accommodations for kahu should include a house structure, piped water, a kitchen, lua, sleeping area, living area, utilities run on solar power, and ordnance-cleared areas around the perimeter of the house.

Within the Honokoa 'ili there is a ridge in the uplands that provides a good panoramic view of the land and ocean below. This lookout point would be a good site for monitoring access and activities and for general island management. A



- LEGEND**
- 'ILI
 - ALALOA (ROADS)
 - ALALOA (TRAILS)
 - TANKS
 - CISTERNS
 - AWA KŪ MOKU (BUOY MOORINGS)
 - HO'ŌLA HOU (REVEG/SOIL STAB.)

FIGURE 7-5
'ILI MAP-HONOKOA
KAHO'OLAWE



trail/road should link this lookout to Honokoa Bay and also to the main road.

The uses and activities planned for Honokoa are:

Makai

- kahua ho'omoana (overnight campsite) at the bay east of Makaalae Point
- kahua ho'omoana (overnight campsite) at Honokoa Bay
- coastal garden plots in the intermittent stream beds at Honokoa Bay and near Makaalae
- alaloa (shoreline trail)
- awa kū moku (mooring) in Honokoa Bay

Mauka

- kahua kauhale for restoration/revegetation crews near Kealialalo
- kīhāpai ho'oulu/pūnāwai (reservoir and/or upland plant nursery) at Kealialalo
- kula (open lands)
- ho'ōla hou (revegetation/soil stabilization) in the hardpan areas
- ho'ōla hou (erosion control) and check dams in the gullies
- nā kahua kahiko (cultural preserve)
- alaloa (trail) connecting Honokoa Bay to the Honokoa lookout
- alaloa (road) connecting the Honokoa lookout to the main road along the spine of the island
- water system development
- helicopter landing area

Kealaikahiki 'Ili

The Kealaikahiki 'ili includes Lae Paki, Kaukukapapa Bay, Keanakeiki, Lae o Kealaikahiki, Honokanai'a Bay, Sailor's Hat, and Pu'u Kamama. See Figure 7-6. The bay area at Honokanai'a is presently the most altered,

modernized area on the island. The facilities that the military built are of modern wooden and metal construction rather than traditional Hawaiian design and native materials. However, these facilities should be kept and utilized. The camp has facilities that can accommodate larger groups (such as those involved in the cleanup and revegetation of the island) and could accommodate children, the elderly, and/or people who are physically challenged. As such, a kahua kauhale at Honokanai'a would require very little in the way of infrastructure improvements.

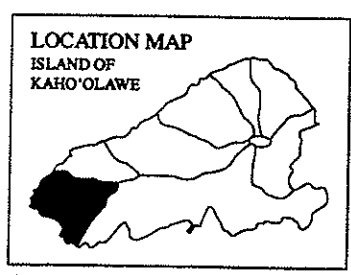
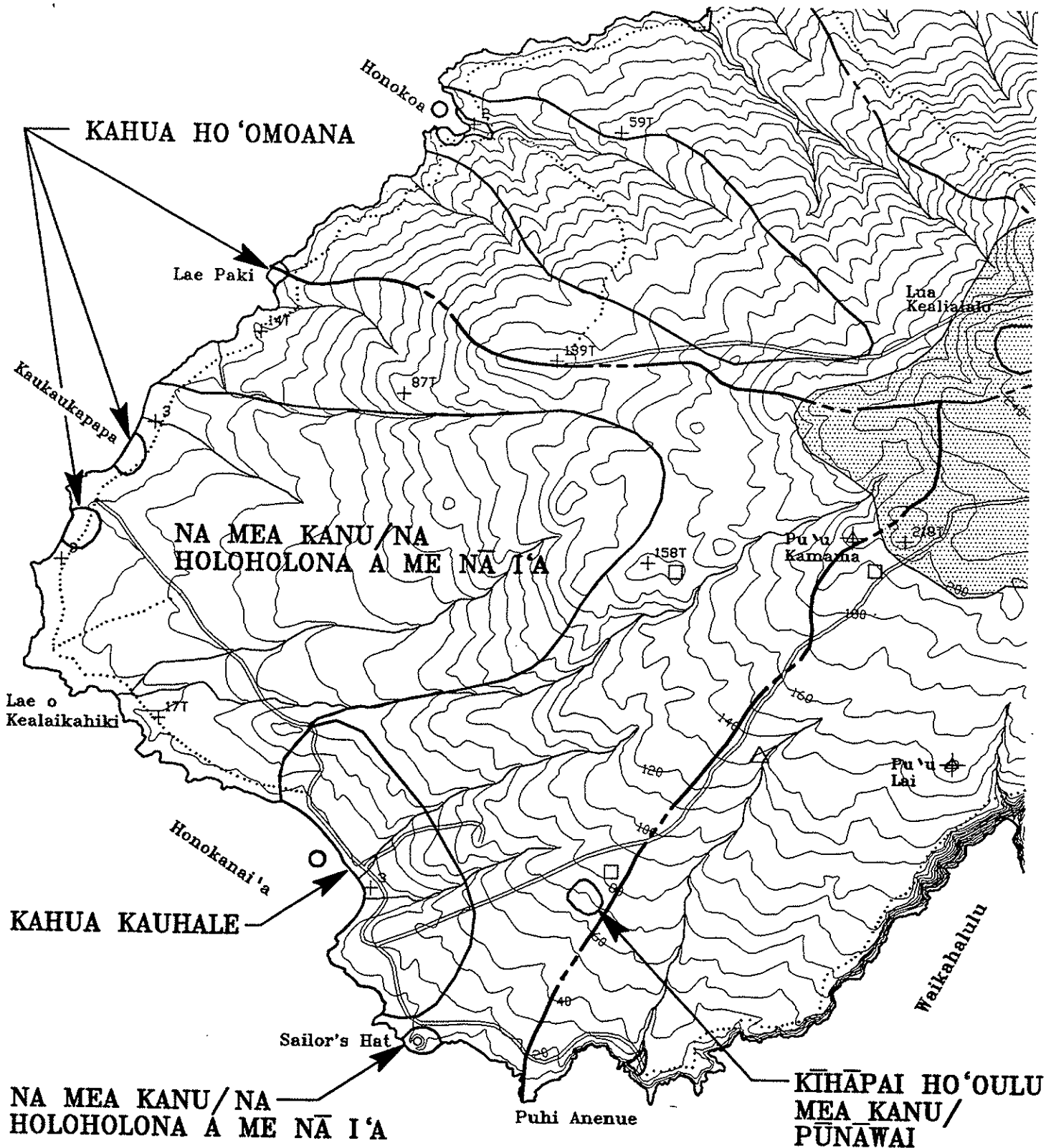


Existing Military Facilities

PBR HAWAII

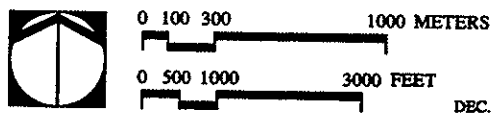
It is envisioned that Honokanai'a will have a more traditional settlement (including a canoe house) developed at an area called "Picnic Table", south of the crescent beach. The kahua kauhale at Honokanai'a should ultimately have an assembly area, kitchen, hale moe, imu, four kahu hale, lua, zodiac shelter, potable water sources and storage, electricity, communications stations, and waste disposal (including composting).

Keanakeiki is currently used for overnight stay in the annual closing ceremonies of the Makahiki in January and is therefore a site of a kahua ho'omoana. There are many ko'a in the area and



- LEGEND**
- 'ILI
 - ALALOA (ROADS)
 - ALALOA (TRAILS)
 - TANKS
 - CISTERNS
 - AWA KŪ MOKU (BUOY MOORINGS)
 - HO'ŌLA HOU (REVEG/SOIL STAB.)

FIGURE 7-6
'ILI MAP-KEALAIKAHIKI
KAHO'OLAW



DEC. 1995

a rock with petroglyphs. The native vegetation is in good condition. The area at the shore should be surface cleared for the Makahiki and occasional overnight fishing. Minor improvements for short over-night stays should also be provided at Kaukauapapa. These kahua ho'omoana at Keanakeiki and Kaukauapapa should include lua, a storage shed, and overnight fishing shelter.



"Picnic Table" Area

PBR HAWAII

Lae o Kealaikahiki (or "the path to Tahiti") is the name for Kaho'olawe's westernmost point that once served as a directional aid for voyagers leaving the Hawaiian archipelago.

Lae o Kealaikahiki should be cleared of ordnance for ceremonial uses and navigation training and revegetated with native species. A water source for plants should be developed at Pu'u Kamama with irrigation lines down to the area. The existing tower on the ridge should be used as a site for monitoring ocean activities in the area. The waters off the point are shallow and is an area that was heavily bombed. According to unexploded ordnance studies of the nearshore water, the area has the highest concentration of unexploded ordnance.

It should be noted that Kealaikahiki contains

notable ma'o shrublands. These should be conserved within nā mea kanu (botanical preserves) and incorporated in revegetation plans.

The southern part of Honokanai'a bay could be an area where fishing, fishing craft repair and reconstruction, and the study of weather and the ocean would take place.

Uses and activities for Kealaikahiki 'ili are as follows:

Makai

- kahua kauhale (educational and cultural center) at Honokanai'a Bay
- kahua ho'omoana (overnight campsite) at Keanakeiki; mainly for Makahiki and other ceremonial purposes
- kahua ho'omoana (overnight campsite) at Kaukauapapa
- kahua ho'omoana (overnight campsite) at Lae Paki
- coastal garden plots in the intermittent stream beds at south Honokanai'a
- kīhāpai ho'oulu (coastal plant nursery)
- na mea kanu/na holoholona a me nā i'a (botanical/wildlife preserve) from Kaukauapapa to north of Lae o Kealaikahiki and inland for monk seals and ma'o
- nā holoholona a me nā i'a (wildlife preserve) from south of Lae o Kealaikahiki to north of Honokanai'a Bay for monk seals
- na holoholona a me nā i'a (wildlife preserve) at Sailor's Hat for high salinity anchialine pool ecosystem
- alaloa (road) linking Honokanai'a Bay to the main road
- alaloa (road) linking Honokanai'a Bay to Keanakeiki with a spur trail to Lae o

Kealaikahiki

- alaloa (shoreline trail)
- water system development
- emergency helicopter landing area
- awa kū moku (mooring) in Honokanai'a Bay

Mauka

- kīhāpai ho'oulu/pūnāwai (plant nursery and/or reservoir) at the 1-mile marker below the cistern
- kula (open lands)
- ho'ōla hou (revegetation/soil stabilization)
- ho'ōla hou (erosion control) in the gullies
- alaloa (main road)

Kunaka/Naalapa 'Ili

The largest 'ili is Kunaka/Naalapa which stretches from Puhi Anenue to Kanapou Bay and includes Waikahalulu Bay, Wiliwilipeapea, Pu'u Koaie, Aleale, Kamohio Bay, Iliililoa, Lae o Kuakaiwa, Lae o Kaka, Lae o Halona, Pu'u Lai, and part of Pu'u Kamama. Refer to Figure 7-7. While this 'ili is mostly coastal cliffs and uplands, a small portion is at the peak near Lua Makika.



Kamohio Bay

PBR HAWAII

Aleale and Pu'u Koaie, which contain the largest number of rare plants on the island such as 'ihi, 'akoko, nehe, pua pilo and Palupalu o Kanaloa

are designated as Botanical/Wildlife Preserves. These areas also serve as a sanctuary for many seabirds that visit and nest on the coastal cliffs.

The heiau (temple) at Kamohio should be restored by appropriate cultural practitioners and following appropriate cultural protocol.



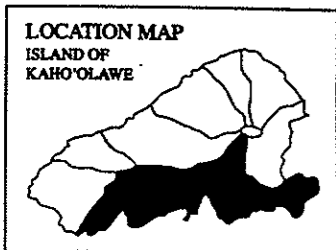
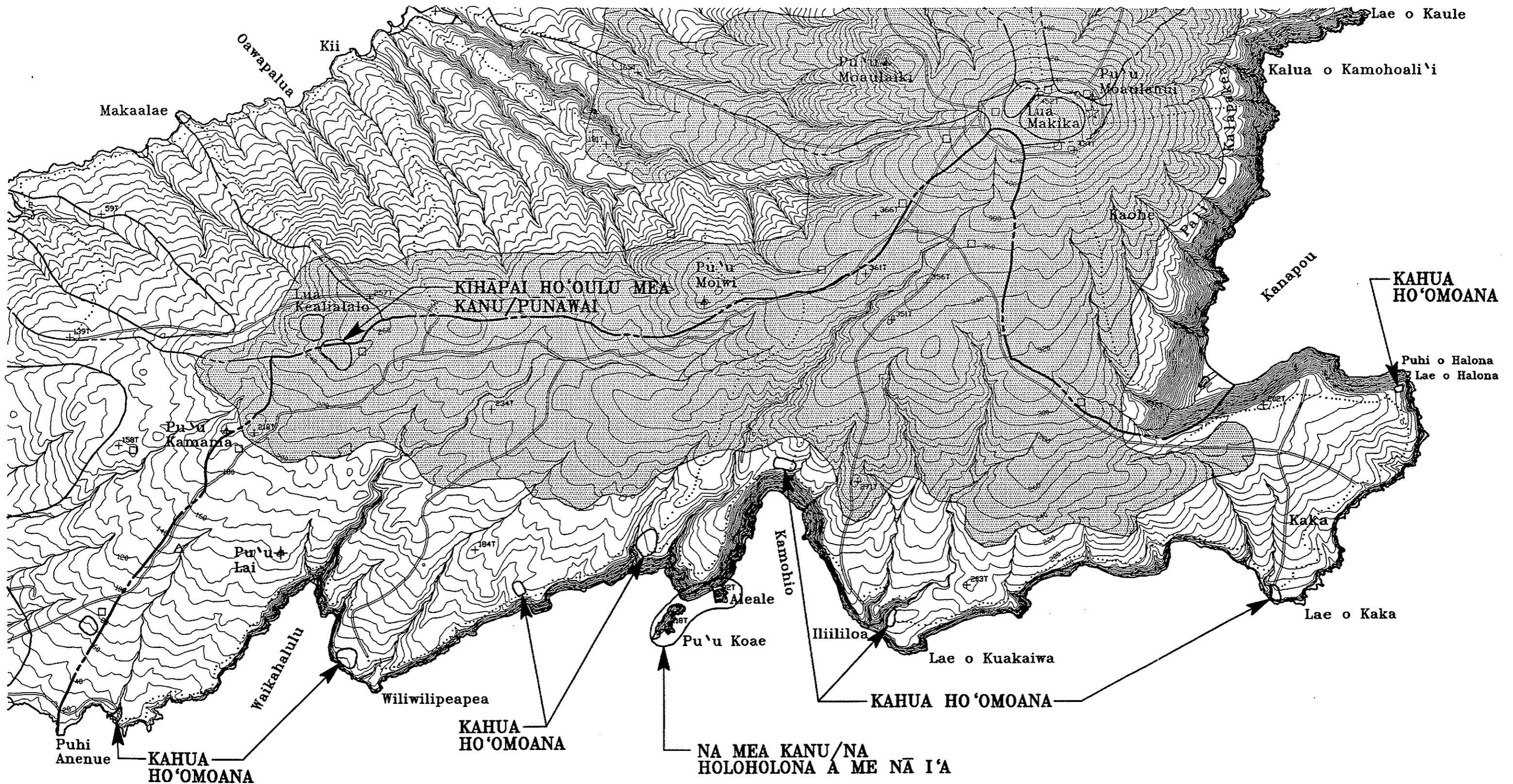
Aleale

PBR HAWAII

Uses and activities anticipated for Kunaka/Naalapa are:

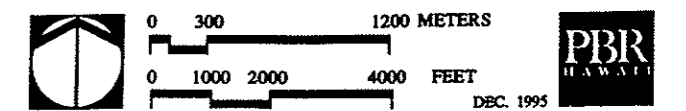
Makai

- kahua ho'omoana (overnight campsite) at the point east of Puhi Anenue
- kahua ho'omoana (overnight campsite) at Wiliwilipeapea
- kahua ho'omoana (overnight campsite) between Wiliwilipeapea and Aleale
- kahua ho'omoana (overnight campsite) west of Aleale
- kahua ho'omoana (overnight campsite) above Kamohio
- kahua ho'omoana (overnight campsite) at Iliililoa
- kahua ho'omoana (overnight campsite) at Lae o Kaka
- kahua ho'omoana (overnight campsite) at Lae o Halona



- LEGEND
- ILI
 - ALALOA (ROADS)
 - ALALOA (TRAILS)
 - TANKS
 - CISTERNS
 - AWA KŪ MOKU (BUOY MOORINGS)
 - HO'ŌLA HOU (REVEG./SOIL STAB.)

FIGURE 7-7
'ILI MAP-KUNAKANAALAPA
KAHŌ'OLAWĒ



- nā mea kanu/nā holoholona a me nā i'a (botanical/wildlife preserve) at Aleale and Pu'u Koae
- lookout at Iliililoa
- alaloa (cliff top trail)

Mauka

- alaloa (main road)
- ho'ōla hou (erosion control) in gullies
- kula (open lands)
- ho'ōla hou (revegetation/soil stabilization) in the hardpan areas
- alaloa (trail) connecting Kamohio Bay to a mauka-makai road
- alaloa (mauka-makai road) connecting Iliililoa to the main road
- alaloa (mauka-makai road) connecting Wiliwilipeapea to the main road
- alaloa (mauka-makai trail) linking the shoreline trail system near Pu'u Koae to the main road
- alaloa (mauka-makai trail) that links the kahua ho'omoana near Aleale to the main road
- alaloa (mauka-makai road) that links the point between Lae o Halona and Lae o Kaka to the main road with a spur road to Lae o Halona and a spur road to the point between Kanapou Bay and Lae o Halona.

Kanapou 'Ili

The Kanapou 'ili spans the Pali o Kalapakea from Puhi o Kohe o Hala to Kanapou Bay and rises up to Lua Makika. See Figure 7-8. The area is set upon steep cliffs and is subject to constant winds. This 'ili is to remain unimproved except for restoration and access purposes. Kanapou will be the only 'ili without facilities. The harsh environment and human isolation that Kanapou provides at the southern tip of the 'ili makes it a good place for Hawaiian



Kanapou Bay

PBR HAWAII

spiritual training and development. Also, the bay at the bottom of the cliffs should be recognized for its significance in Hawaiian tradition.

Uses and activities to occur within Kanapou are:

Makai

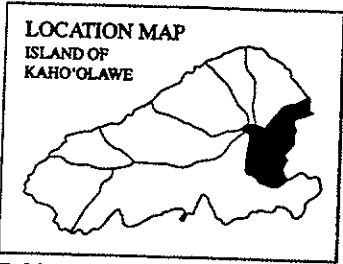
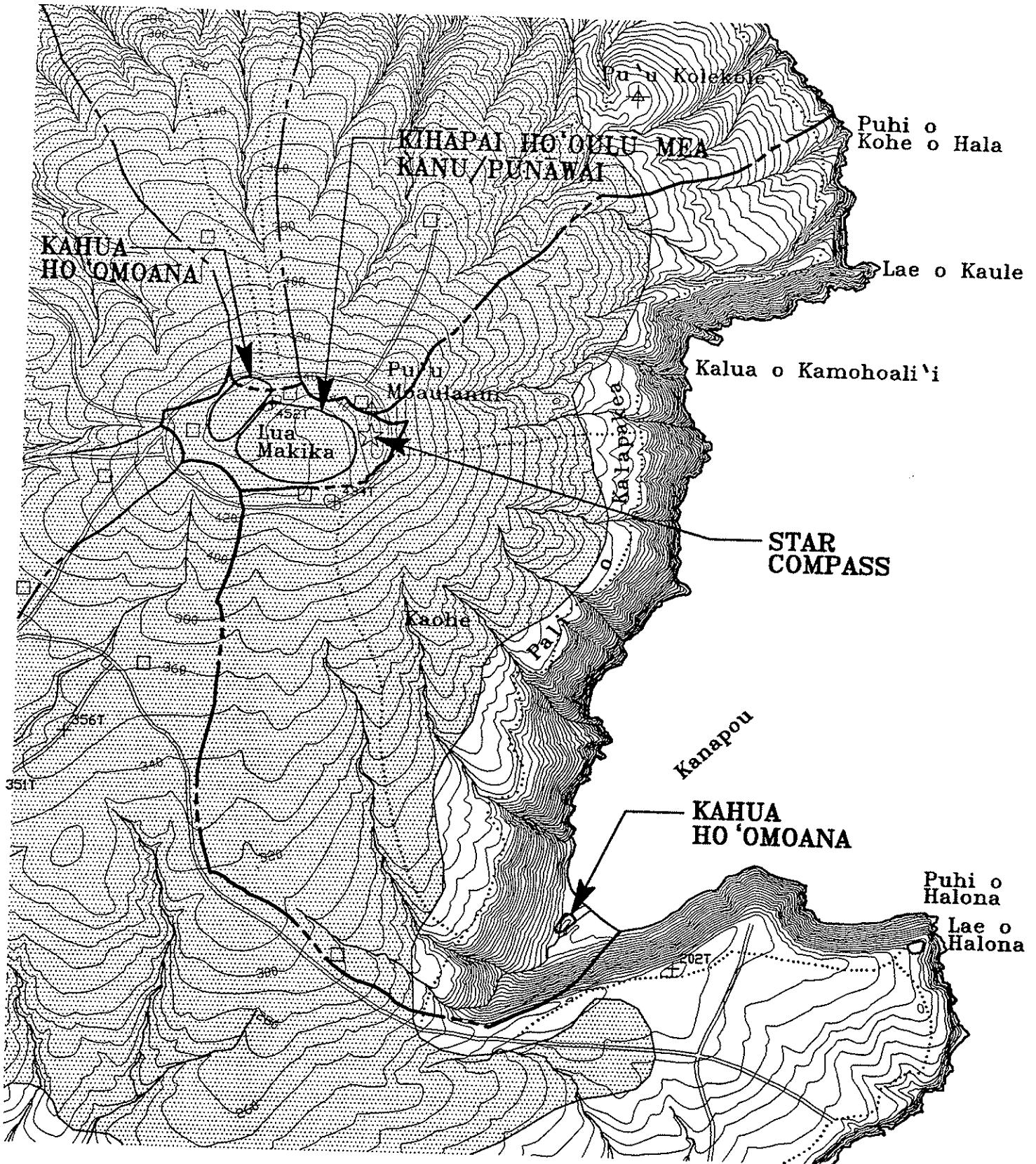
- alaloa (cliff top trail)
- kahua ho'omoana at Kanapou bay

Mauka

- ho'ōla hou (erosion control) in gullies
- kula (open lands)
- ho'ōla hou (revegetation/soil stabilization) in the hardpan areas
- alaloa (mauka-makai trail) linking the coastal trail system near the bay at Kanapou to Lua Makika
- alaloa (mauka-makai trail) linking the coastal trail system near Kalua o Kamohoalii to Lua Makika

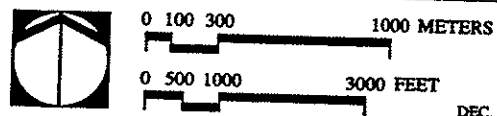
Lua Makika (Lua Moaula)

Lua Makika, or Lua Moaula, is not considered an 'ili, but is viewed as the piko or center of the island from which most of the 'ili radiate. This geographic and topographical location makes the area ideal for water storage and distribution to radiating 'ili.



- LEGEND**
- 'ILI
 - ALALOA (ROADS)
 - ALALOA (TRAILS)
 - TANKS
 - CISTERNS
 - AWA KŪ MOKU (BUOY MOORINGS)
 - HO'ŌLA HOU (REVEG/SOIL STAB.)

FIGURE 7-8
'ILI MAP-KANAPOU AND LUA MAKIKA
KAHO'OLAWA



DEC. 1995

In 1856, it was reported that patches of watermelons and sugar cane that were once cultivated, were still found on the slopes of Lua Makika.

The summit of Pu'u Moaulaiki offers unobstructed views all around the island. It is an ideal location for teaching navigation. Prominent landforms such as Mauna Kea, Haleakalā, West Maui, Lana'i, Moloka'i and on some days O'ahu, as well as the channels in between the islands, can be seen. Nearby Pu'u Moaulanui offers a relatively flat area and is an ideal location for a traditional star compass. At night, the large expanse of the sky, the moon, and the many star constellations can be easily viewed especially since there are no electrical lights on the island except for those at Honokanai'a. The island could again be used for teaching navigation without modern instruments.

Archaeological evidence, along with traditional accounts, indicate that the area was a very important training center for early navigators. For students, being at the top of Kaho'olawe was the next best thing to actually being in a canoe on the open ocean. For modern use as a ceremonial place and a training area, minimal facilities such as low rock wind breaks and a lua should be provided outside of ceremonial and cultural use areas for low intensity short-term use.

Moaulaiki and Moaulanui are ideal for training in navigation at different levels including:

- navigation for fishing which use ko'a as well as natural geographic features such as pu'u and mountain tops for locating fishing grounds
- navigation from island to island which requires an understanding of the

channels and the currents and winds which influenced travel between the islands

- navigation out of sight of land for fishing
- way finding to the broader Pacific islands, particularly Tahiti

The uses within this mauka area are:

- kahua ho'omoana (overnight campsite) to support navigation and observation training, as well as revegetation efforts
- star compass to teach traditional navigation
- kīhāpai ho'oulu/pūnāwai (reservoir and/or plant nursery)
- ho'ōla hou (revegetation/soil stabilization) in the hardpan areas

Refer to Figure 7-8.

Refer to Tables 8-1 and 8-3 for more detail on use acreages.



8. CLEAN-UP PRIORITIES

This page intentionally left blank

8. CLEAN-UP PRIORITIES

Pursuant to the State/Navy MOU, it is the responsibility of the KIRC to select sites or areas and identify for the Navy the priority of those sites or areas that are to be cleaned to the Tier Two standard. Title X establishes Tier One clearance (surface clearance) of the entire island as a U.S. Navy obligation.

The Tier Two standard is the subsurface clearance of all unexploded ordnance and environmental restoration to a condition that allows the reasonably safe use of the area as a grassland or other vegetation area; trail or road; historical, cultural, or archaeological site; reservoir; heliport; or human habitation area.

Clean-up and restoration of Kaho'olawe requires a long-term and large-scale effort. Such an undertaking should be accomplished through integrated phases that distribute effort and attention according to an area's importance and state.

It is proposed that the clean-up prioritization be as described below. The order of priorities implements the vision and principles of this plan by providing first for the healing of the land and by prioritizing areas for cultural revitalization activities to occur. It is the desire of the KIRC that some of the infrastructure needed for ongoing restoration and long-term management will be installed as support infrastructure for the unexploded ordnance clean-up.

The specific phasing and activities proposed for the clean-up can be expected to change over time because of advances in clean-up technology, field experience, and changes in funding.

Priority 1

The first priority is to clean the Ho'ōla Hou area to the Tier One standard. In addition, there should be Tier Two clearance of the following use areas:

- ▶ all Kihāpai Ho'oulu Mea Kanu/Pūnāwai
- ▶ Kahua Ho'omoana near Lua Kealialuna
- ▶ Kahua Kauhale near Lua Kealialalo
- ▶ Kahua Ho'omoana in Lua Makika
- ▶ Star Compass in Lua Makika
- ▶ Kula area within Lua Makika (within the rim road)
- ▶ Alaloa (Road) running from the shore at Honokanai'a to Lua Makika

Priority 2

The second priority for clean-up is Tier Two clearance within Hakioawa 'ili of the following use areas:

- ▶ Kahua Kauhale (including adjacent submerged land)
- ▶ Alaloa

Priority 3

The third priority for clean-up is Tier Two clearance of approximately 67% of the Ho'ōla Hou within Hakioawa, Papaka, and Kanapou 'ili, including the spiritual training area described in the KIRC Cultural Use Plan. The actual amount of area and location will be determined by the KIRC Restoration Plan.

This priority also includes the portion of the trail that links Lua Makika to Papakaiki that crosses

the Ho'ōla Hou. It should also be noted that the Pūnāwai and Kahua Ho'omoana at Lua Kealialuna were specified for clearance in Priority 1, and the portions of the Alaloa within Hakioawa 'ili that cross the Ho'ōla Hou area were previously specified for clearance in Priority 2.

Priority 4

Fourth priority for clean-up is Tier Two clearance within Kealaikahiki 'ili of the following use areas:

- ▶ Kahua Kauhale (including adjacent submerged land)
- ▶ three Kahua Ho'omoana (including the one at Lae Paki)
- ▶ Alaloa (except that portion of the Alaloa to Lua Makika that was already specified for clearance in Priority 1)

Priority 5

Fifth priority for clean-up is Tier Two clearance within Kuheia 'ili of the following use areas:

- ▶ Kahua Kauhale (including adjacent submerged land)
- ▶ Kahua Ho'omoana
- ▶ Alaloa

Priority 6

The sixth priority for clean-up is Tier Two clearance of approximately 67% of the Ho'ōla Hou within Kuheia 'ili. The actual amount of area and location will be determined by the KIRC Restoration Plan.

It should be noted that the portion of the Alaloa that runs from Lua Makika to Kaulana through

the Ho'ōla Hou area was specified for clearance in Priority 5.

Priority 7

The seventh priority is Tier Two clearance within Papaka 'ili of the following use areas:

- ▶ two Kahua Ho'omoana
- ▶ Alaloa (except the portion that crosses the Ho'ōla Hou that was specified for clearance in Priority 3)

Priority 8

The eighth priority for clean-up is Tier Two clearance within Ahupu 'ili of the following use areas:

- ▶ Kahua Kauhale (including adjacent submerged land)
- ▶ two Kahua Ho'omoana
- ▶ Alaloa

Priority 9

Ninth priority for clean-up is Tier Two clearance within Honokoa 'ili of the following use areas:

- ▶ two Kahua Ho'omoana
- ▶ Alaloa

Priority 10

Tenth priority for clean-up is Tier Two clearance within Kanapou 'ili of the following use areas:

- ▶ Kahua Ho'omoana
- ▶ Alaloa (except the portion that crosses the Ho'ōla Hou that was specified for clearance in Priority 3)

Priority 11

The eleventh priority for clean-up is Tier Two clearance of approximately 67% of the Ho'ōla Hou within Ahupu, Honokoa, Kunaka/Naalapa, and Kealaikahiki 'ili. The actual amount of area and location will be determined by the KIRC Restoration Plan.

This priority also includes the portions of Alaloa that crosses the Ho'ōla Hou within the Ahupu, Honokoa, Kunaka/Naalapa, and Kealaikahiki 'ili.

It should be noted that the Pūnāwai and Kahua Kauhale at Lua Kealialalo, as well as the Alaloa that runs from Honokanai'a to Lua Makika were specified for clearance in Priority 1. Also, the portions of the Alaloa that crosses the Ho'ōla Hou within Ahupu and Honokoa 'ili were specified for clearance in Priorities 8 and 9.

Priority 12

The twelfth priority for clean-up is Tier Two clearance within Kunaka/Naalapa 'ili of the following use areas:

- ▶ eight Kahua Ho'omoana
- ▶ Alaloa (except the portion that crosses the Ho'ōla Hou that was specified for clearance in Priority 11)

Priority 13

The thirteenth priority for clean-up is Tier One (surface) clearance of the remainder of the island.

Refer to Figures 8-1 to 8-14, Priority Maps.

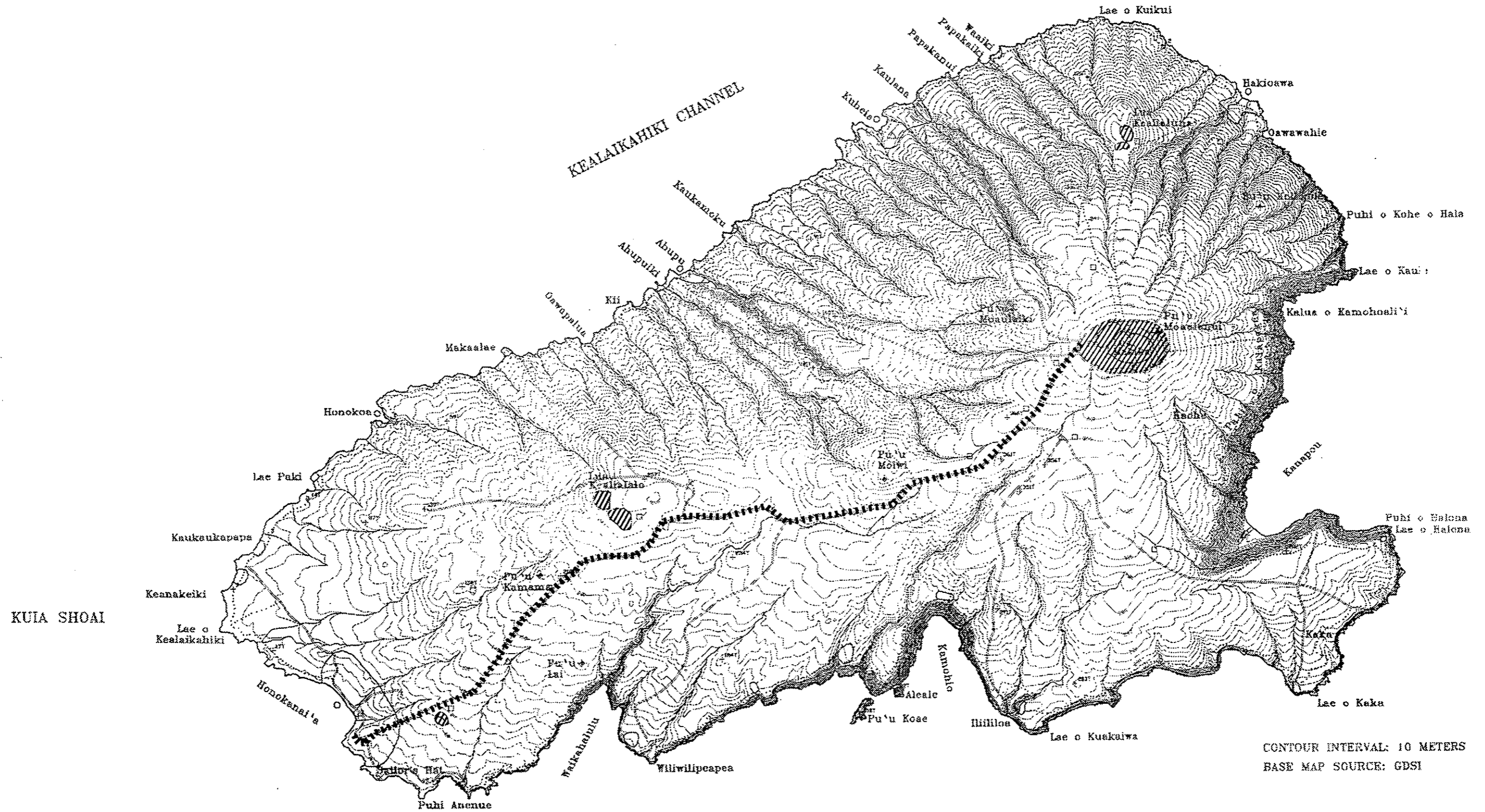
Infrastructure Improvements for Clean-Up

Infrastructure such as roads, water systems, sanitary waste treatment, and living facilities will need to be constructed on Kaho'olawe in order to increase time and cost efficiencies of the clean-up. Some infrastructure will be removed after clean-up, but some could remain on island to support the long-term public uses of the island. Infrastructure built for clean-up efforts should be designed and constructed consistent with the recommendations of this plan to greatest extent possible in order to maximize public benefit of funds expended for those improvements.

TABLE 8-1: CLEAN UP PRIORITIES^a

MOU Tier Two			Total		
Categories of Uses	Use Plan Designations	Locations	Acres	Acres	Priority
Heliport		Within Kahua Kauhale			
Suitable for	Kahua Kauhale	Hakioawa	38.0		2
Human Habitation	(Educational and Cultural Centers/ Work Camps)	Kuheia/Kaulana	91.8		5
		Ahupu/Ahupuiki	22.0		8
		Lua Kealialalo	13.7		1
		Honokanai'a	225.2		4
				390.7	
	Kahua Ho'omoana	Lua Makika	20.3		1
	(Overnight Campsites)	Kanapou	1.8		10
		Lae o Holona	1.3		12
		Lae o Kaka	3.6		12
		Iliiiloa	3.0		12
		Kamohio	6.2		12
		Between Wiliwilipeapea and Aleale	3.6		12
		Near Waikahalulu	8.4		12
		West of Aleale	12.2		12
		Puhi Anenue	2.0		12
		Keanakeiki	8.9		4
		Kaukaukapapa	6.4		4
		Lae Paki	2.7		4
		Honokoa	5.8		9
		Aloha Aina Beach	2.3		9
		Makaalae	3.4		8
		Bay east of Kii	3.4		8
		Kaukamoku	2.2		5
		Papakanui	1.0		7
		Papakanui/Waaiiki	8.0		7
		Lua Kealialuna	5.0		1
				111.5	
Reservoir	Pūnāwai/Kihāpai Ho'oulu Mea Kanu	Lua Kealialuna	8.9		1
	(Reservoirs/Nurseries)	Lua Makika	62.9		1
		Lua Kealialalo	18.5		1
		Honokanai'a	6.8		1
				97.1	
Trail or Road	Alaloa (Roads and Trails)	From Honokanai'a to Lua Makika	63.4		1
		Hakioawa 'ili	67.6		2
		Kealaikahiki 'ili	22.0		4
		Kuheia 'ili	27.9		5
		Papaka 'ili	10.5		7
		Ahupu 'ili	54.3		8
		Honokoa 'ili	20.4		9
		Kanapou 'ili	20.2		10
		Kunaka/Naalapa 'ili	102.2		12
				388.5	
Grassland or Other Vegetation	Ho'ola Hou (Reveg./Soil Stabilization) ^b	Hakioawa	683.0		3
		Kealaikahiki	62.2		11
		Kuheia	890.7		6
		Papaka	517.7		3
		Ahupu	1166.1		11
		Honokoa	138.9		11
		Kanapou	1000.0		3
		Kunaka/Naalapa	3047.5		11
		Lua Makika	72.9		1
				7579.0	
	Part of Kahua Kauhale and Ho'omoana (submerged)/Awa Kū Moku	Offshore of Hakioawa	13.0		2
		Offshore of Kuheia	14.0		5
		Offshore of Ahupu	9.0		8
		Offshore of Honokoa	7.0		9
		Offshore of Honokanai'a	23.0		4
				66.0	
TOTAL TIER TWO ACREAGE				8632.8	

a. Precise locations and boundaries of Tier 2 areas will be determined during the clean-up planning phase, when a survey map of adequate

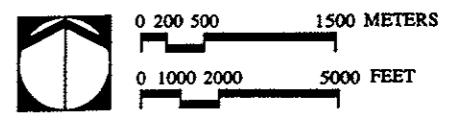


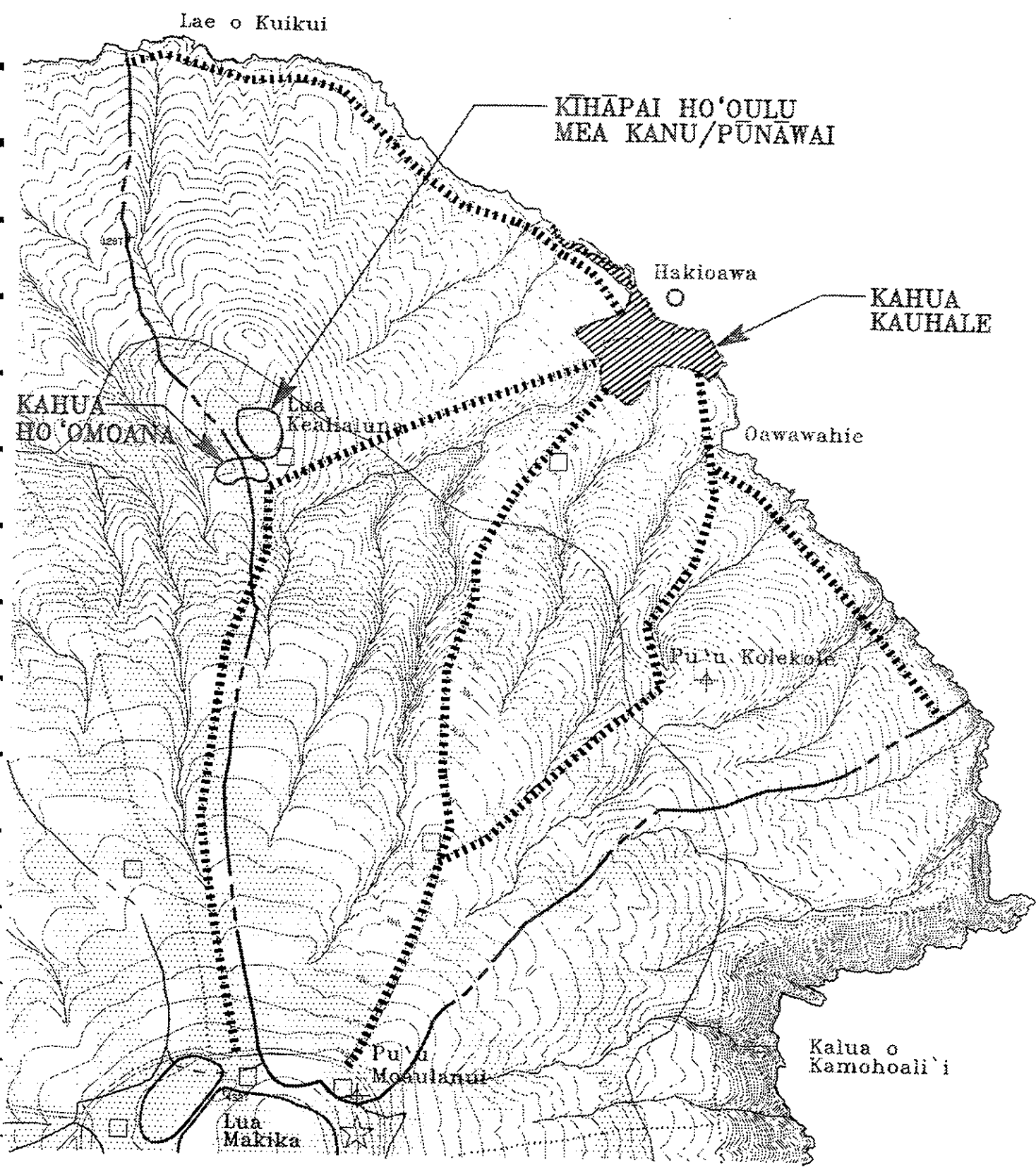
CONTOUR INTERVAL: 10 METERS
 BASE MAP SOURCE: GDSI

LEGEND

-  PRIORITY 1
-  PRIORITY 1

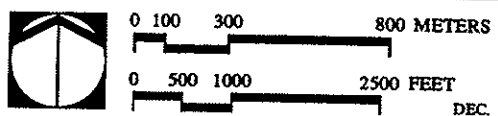
FIGURE 8-1
PRIORITY 1
KAHO'OLAWÉ

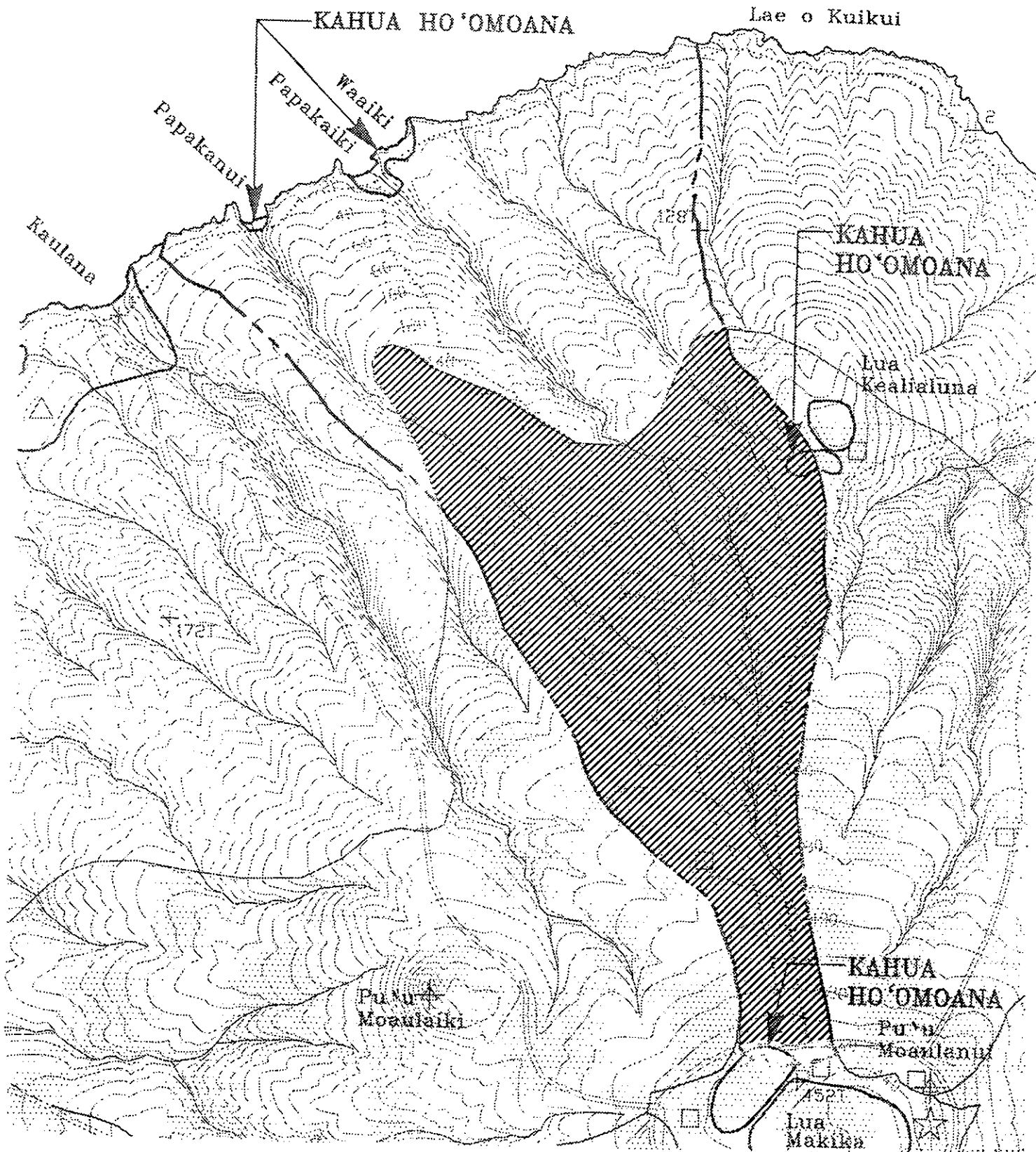




LEGEND
 PRIORITY 2
 PRIORITY 2

FIGURE 8-2
PRIORITY 2
KAHO'OLAWE






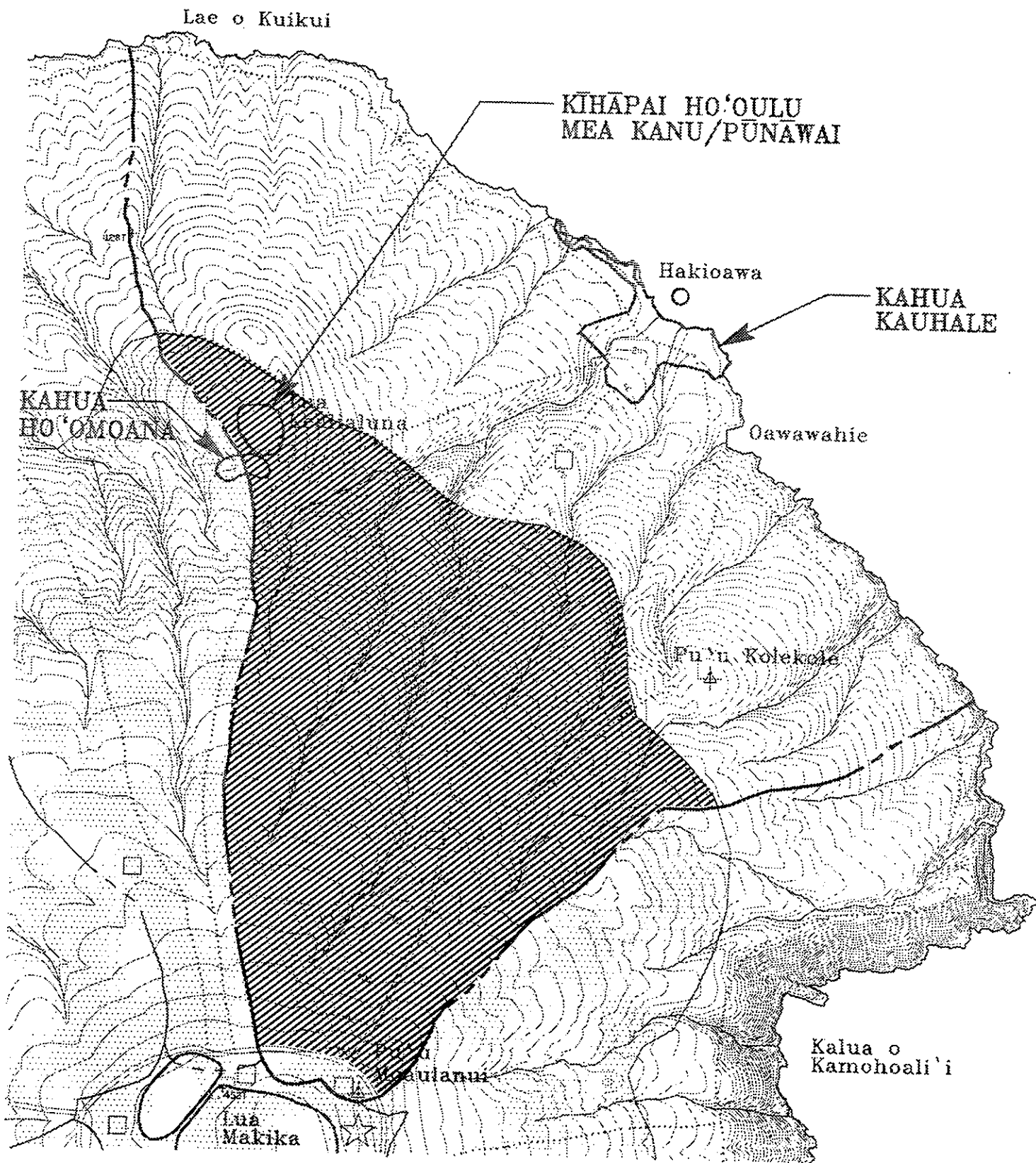
LEGEND
 PRIORITY 3

FIGURE 8-3
PRIORITY 3
KAHO'OLAWA

0 100 300 800 METERS
 0 500 1000 2500 FEET



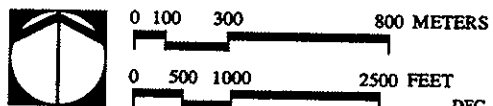
DEC. 1995



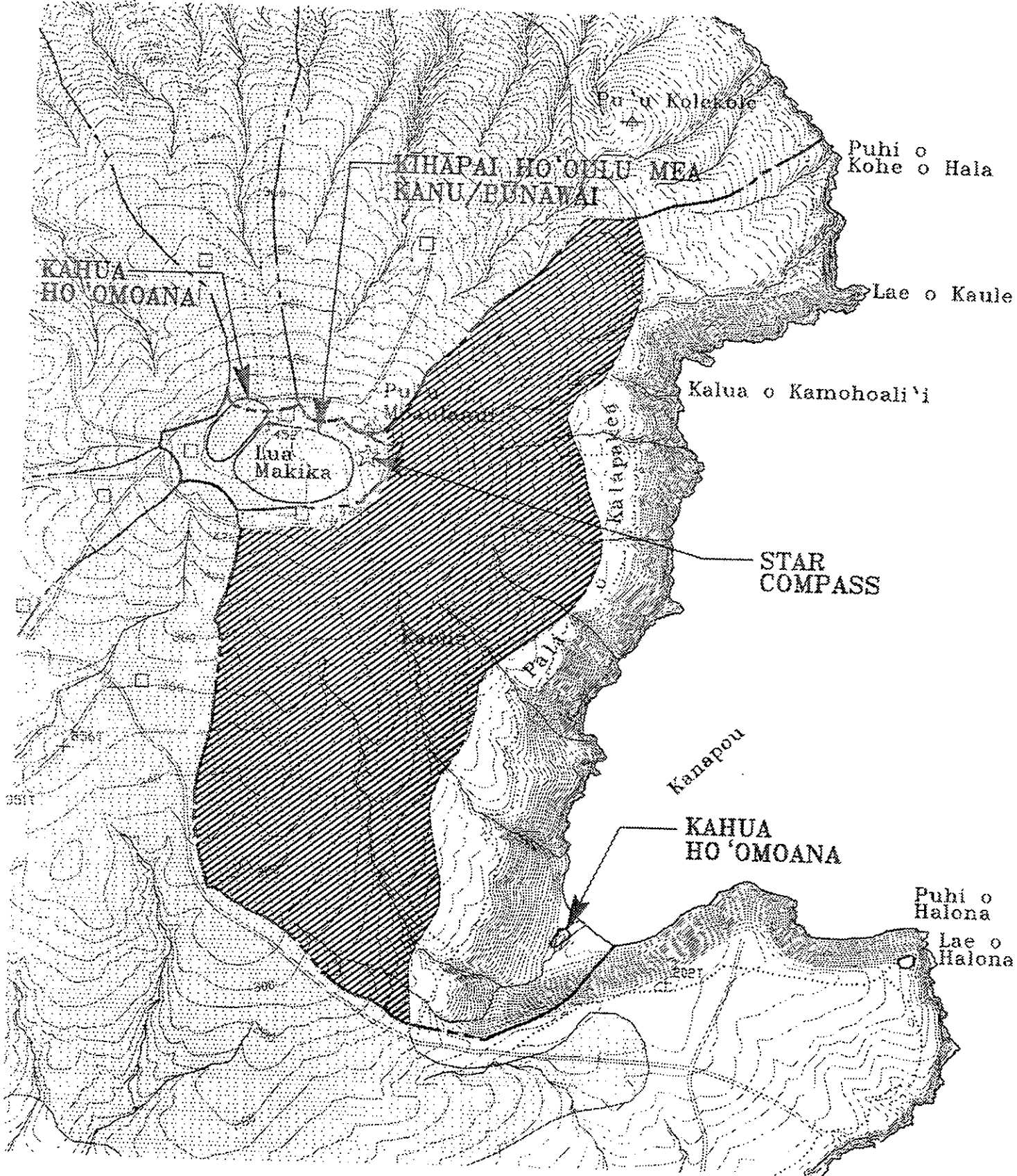
LEGEND

 PRIORITY 3

FIGURE 8-4
PRIORITY 3
KAHO'OLAWE

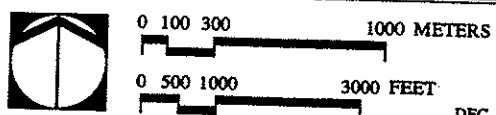


DEC. 1995

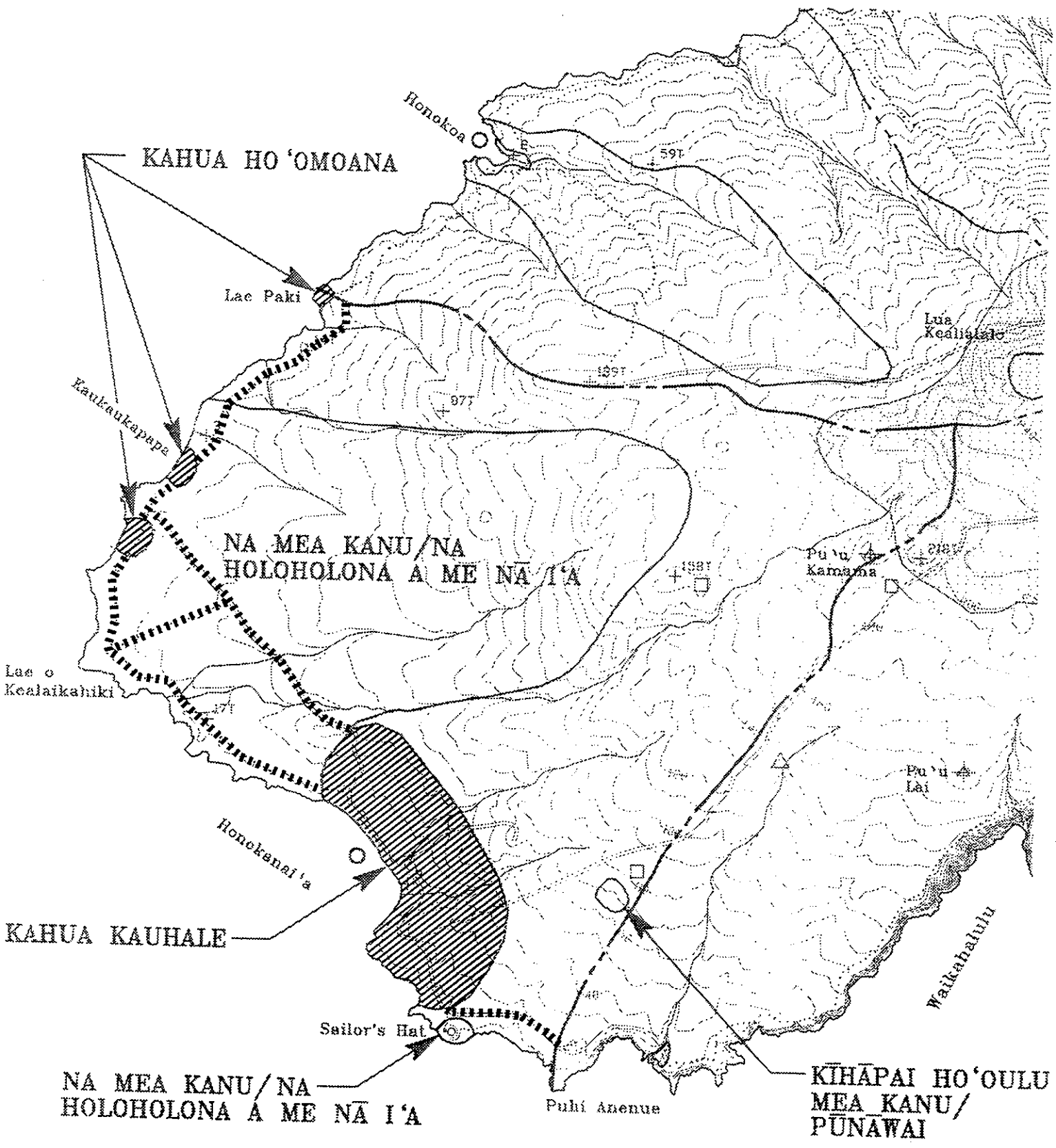


LEGEND
 PRIORITY 3

FIGURE 8-5
PRIORITY 3
KAHO'OLAWA



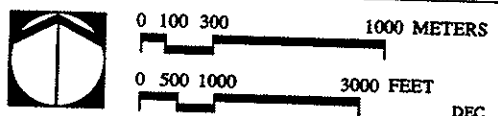
DEC. 1995



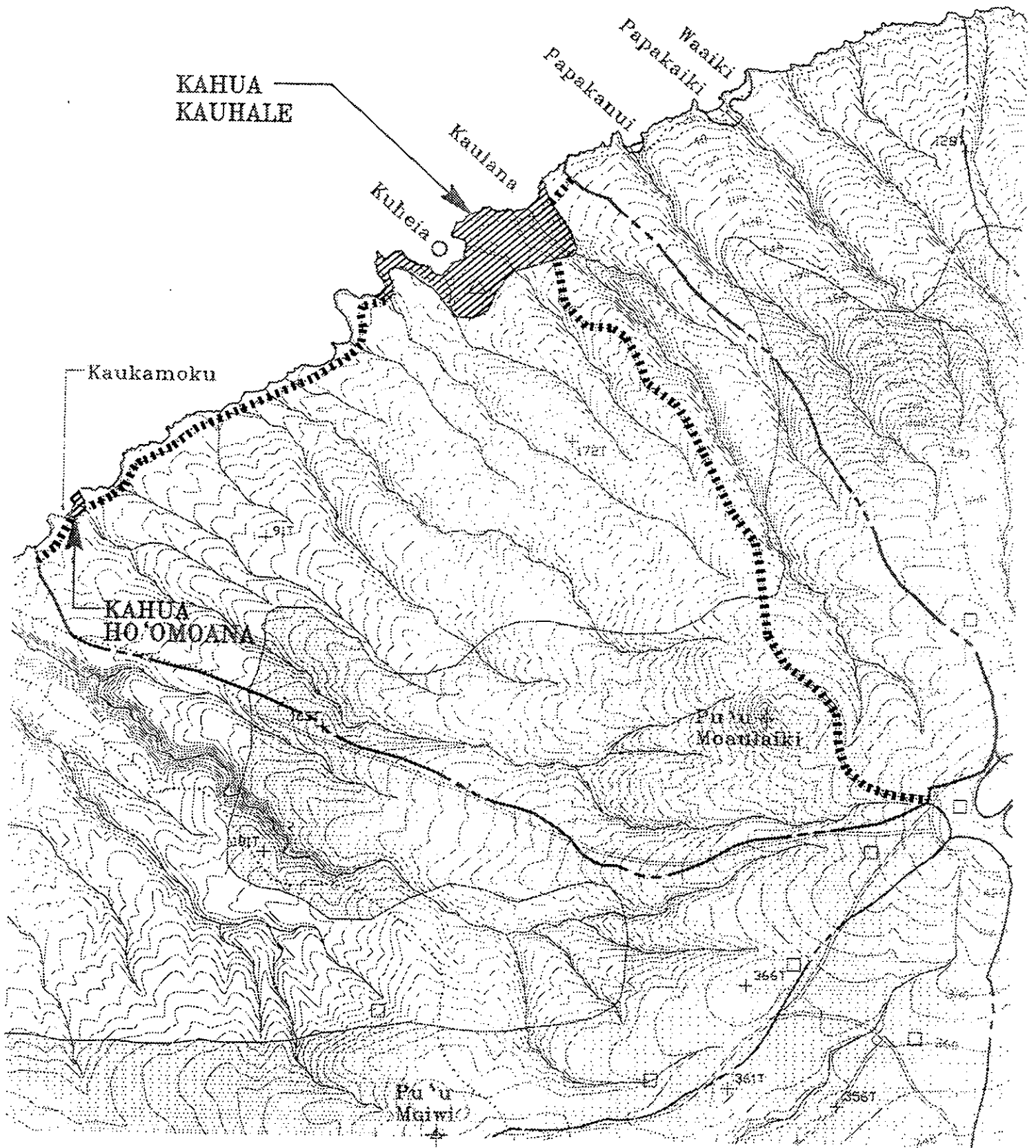
LEGEND

-  PRIORITY 4
-  PRIORITY 4

FIGURE 8-6
PRIORITY 4
KAHO'OLAWÉ



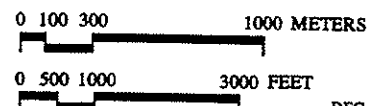
DEC. 1995



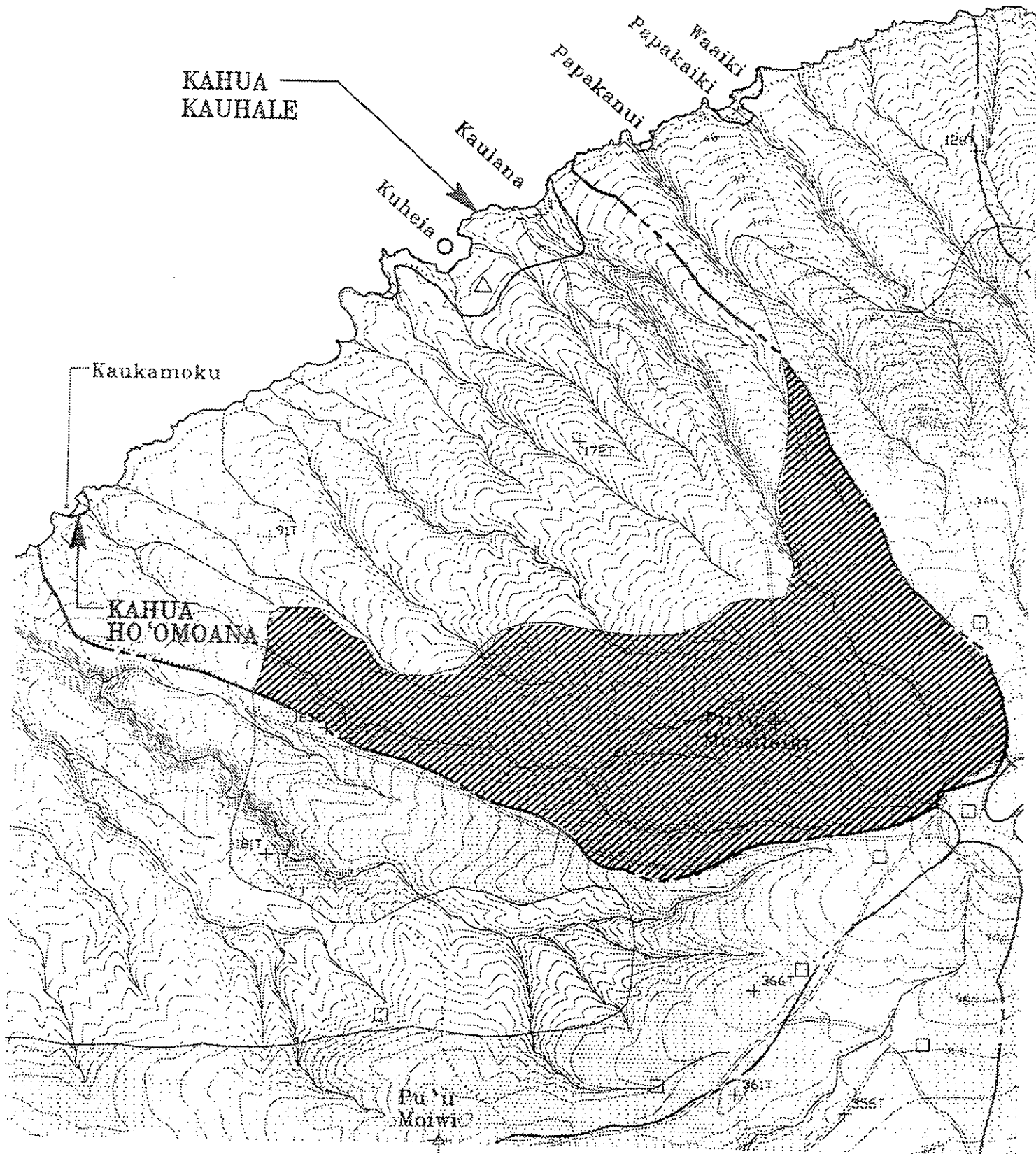
LEGEND

-  PRIORITY 5
-  PRIORITY 5

FIGURE 8-7
PRIORITY 5
KAHO'OLAWE



DEC. 1995



LEGEND
 PRIORITY 6

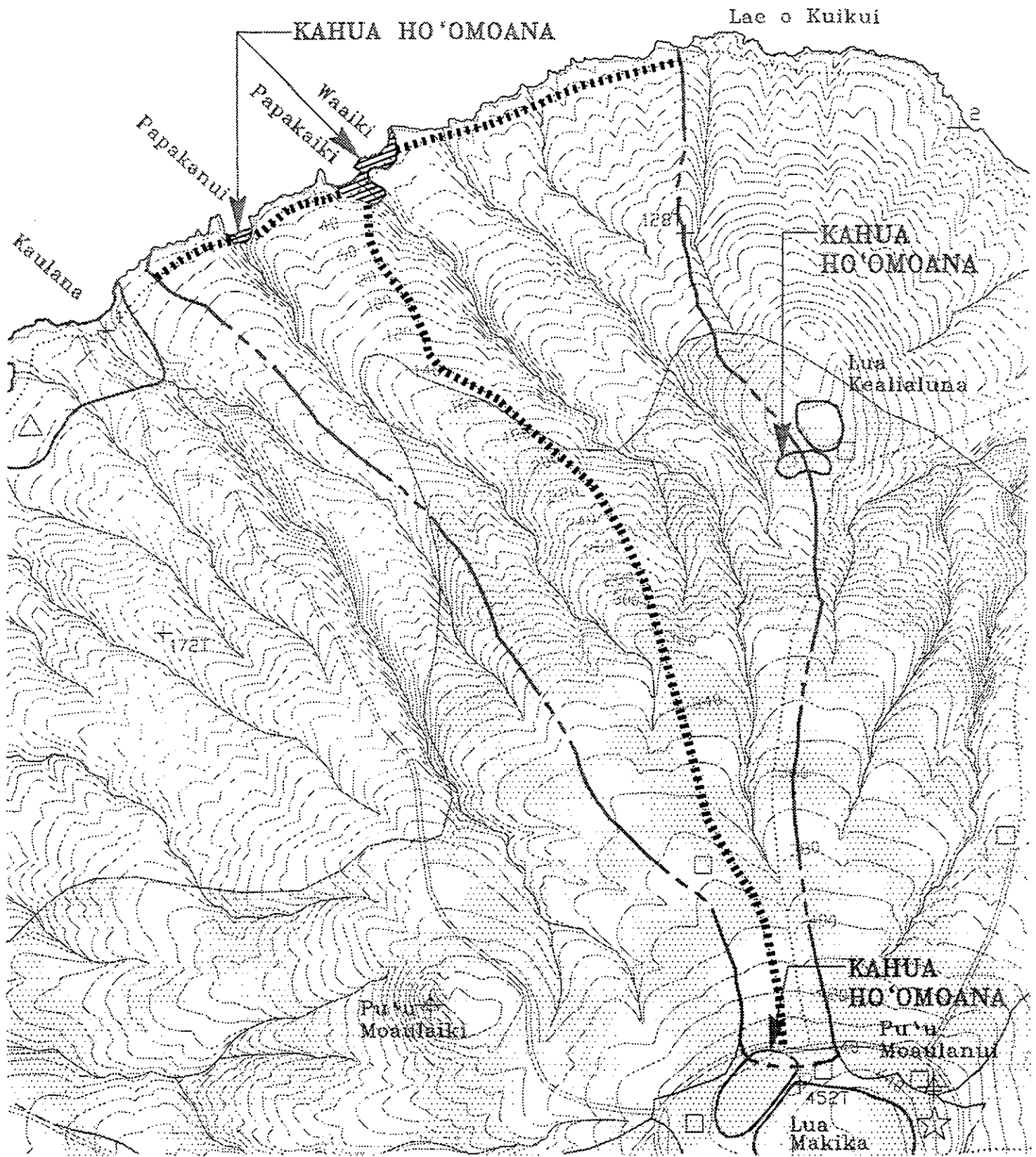
FIGURE 8-8
PRIORITY 6
KAHO'OLAWE



0 100 300 1000 METERS
 0 500 1000 3000 FEET



DEC. 1995



topographical detail is provided.

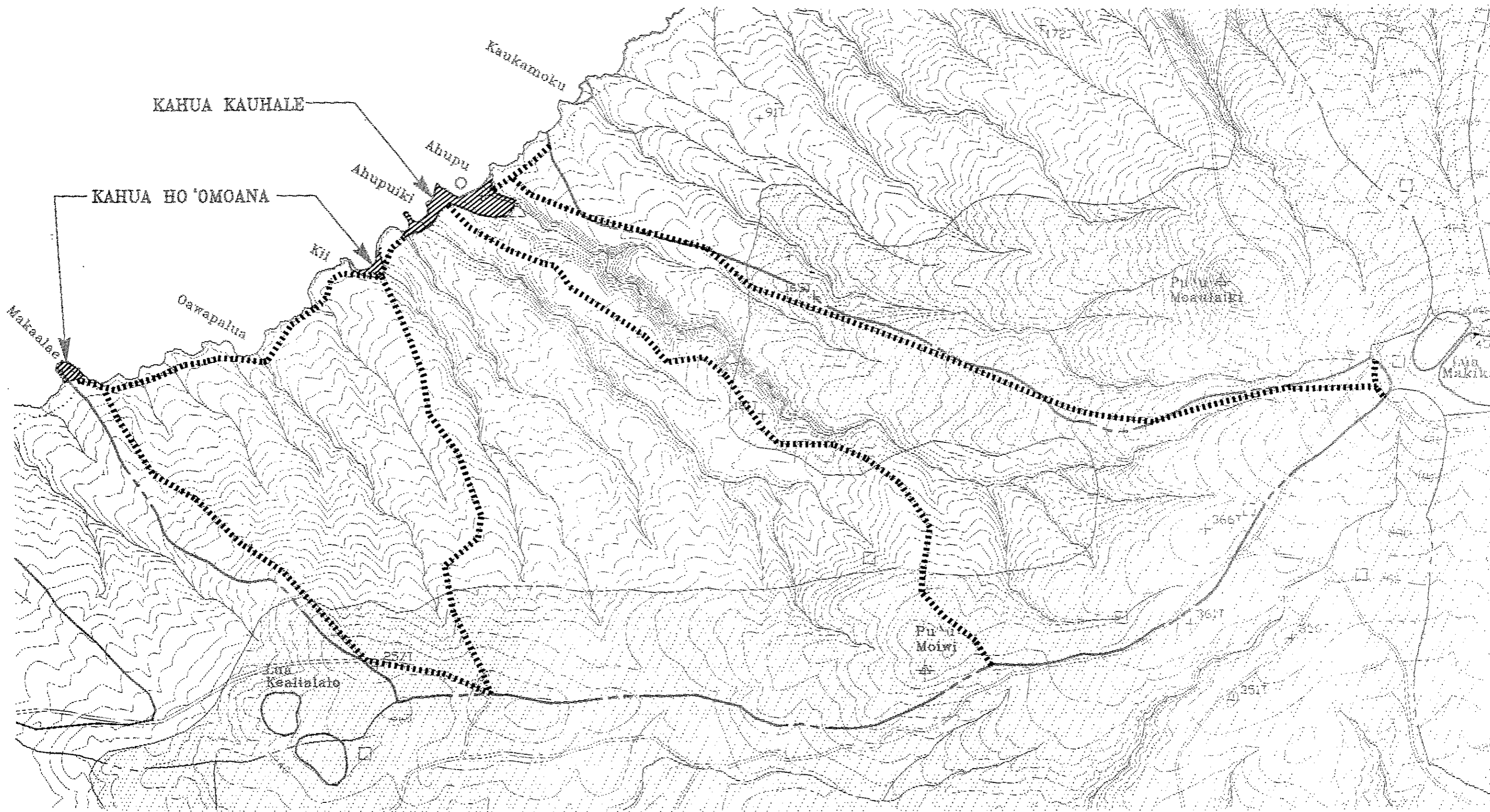
- b. The area shown on the Use Map is approximately 11,200 acres (not including Lua Makika). It is proposed that a percentage be cleaned (approximately 67%) of the 11,200 acres which will equal total Tier Two acreage allowed in MOU (8,632.8 acres) minus the following: 1) Roads and Trails; 2) Areas Suitable for Human Habitation (including heliports and submerged areas); 3) Reservoirs; and 4) Grassland or Other Vegetation (Lua Makika only, includes Star Compass). Location of the resulting 7,579 acres within the 11,200 will be specified after completion of the KIRC Restoration Plan and adjusted pursuant to practical experience gained during the first few years of the clean-up.

TABLE 8-2: SUMMARY OF ACREAGE BY PRIORITY (TIER TWO CLEARANCE)

PRIORITY NUMBER	Suitable for Human Habitation	Reservoir	Trail or Road	Grassland or Other Vegetation	TOTAL ACRES
1	39.0	97.1	63.4	72.9	272.4
2	51.0	0.0	67.6	0.0	118.6
3	0.0	0.0	0.0	2200.7	2200.7
4	266.2	0.0	22.0	0.0	288.2
5	108.0	0.0	27.9	0.0	135.9
6	0.0	0.0	0.0	890.7	890.7
7	9.0	0.0	10.5	0.0	19.5
8	37.8	0.0	54.3	0.0	92.1
9	15.1	0.0	20.4	0.0	35.5
10	1.8	0.0	20.2	0.0	22.0
11	0.0	0.0	0.0	4414.7	4414.7
12	40.3	0.0	102.2	0.0	142.5
ALL	568.2	97.1	388.5	7579.0	8632.8

TABLE 8-3: ACREAGES OF 'ILI AND HO'OLA HOU, KAHUA KAUAHALE, AND KAHUA HO'OMOANA WITHIN 'ILI

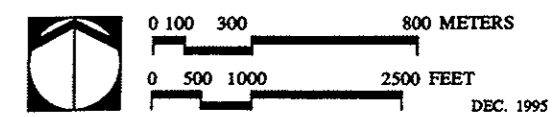
'ILI	TOTAL ACREAGE	HO'OLA HOU	KAHUA KAUAHALE/KAHUA HO'OMOANA (ROUNDED)
HAKIOAWA	2283	1028	41
PAPAKA	1443	775	11
KUHEIA	3429	1329	94
AHUPU	4351	1740	28
HONOKOA	1701	221	22
KEALAIKAHIKI	3276	93	243
KUNAKA/NAALAPA	9626	4566	40
KANAPOU	2511	1492	2
(LUA MAKIKA)	156	156	20
Total	28776	11400	501



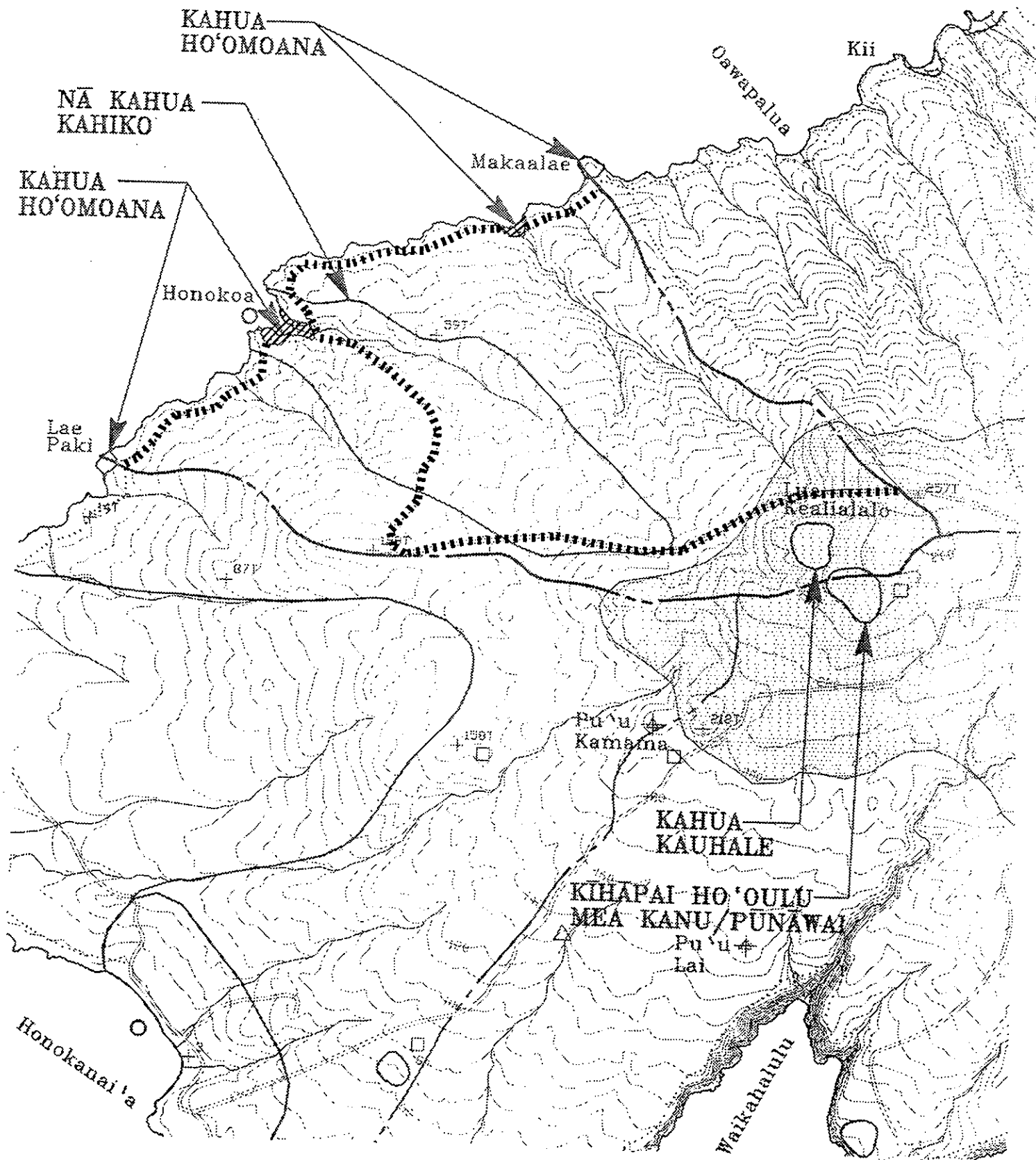
LEGEND

-  PRIORITY 1
-  PRIORITY 1

FIGURE 8-10
PRIORITY 8
KAHO'OLAWE



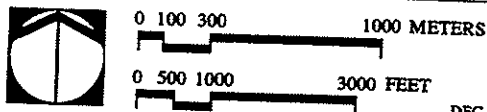
DEC. 1995



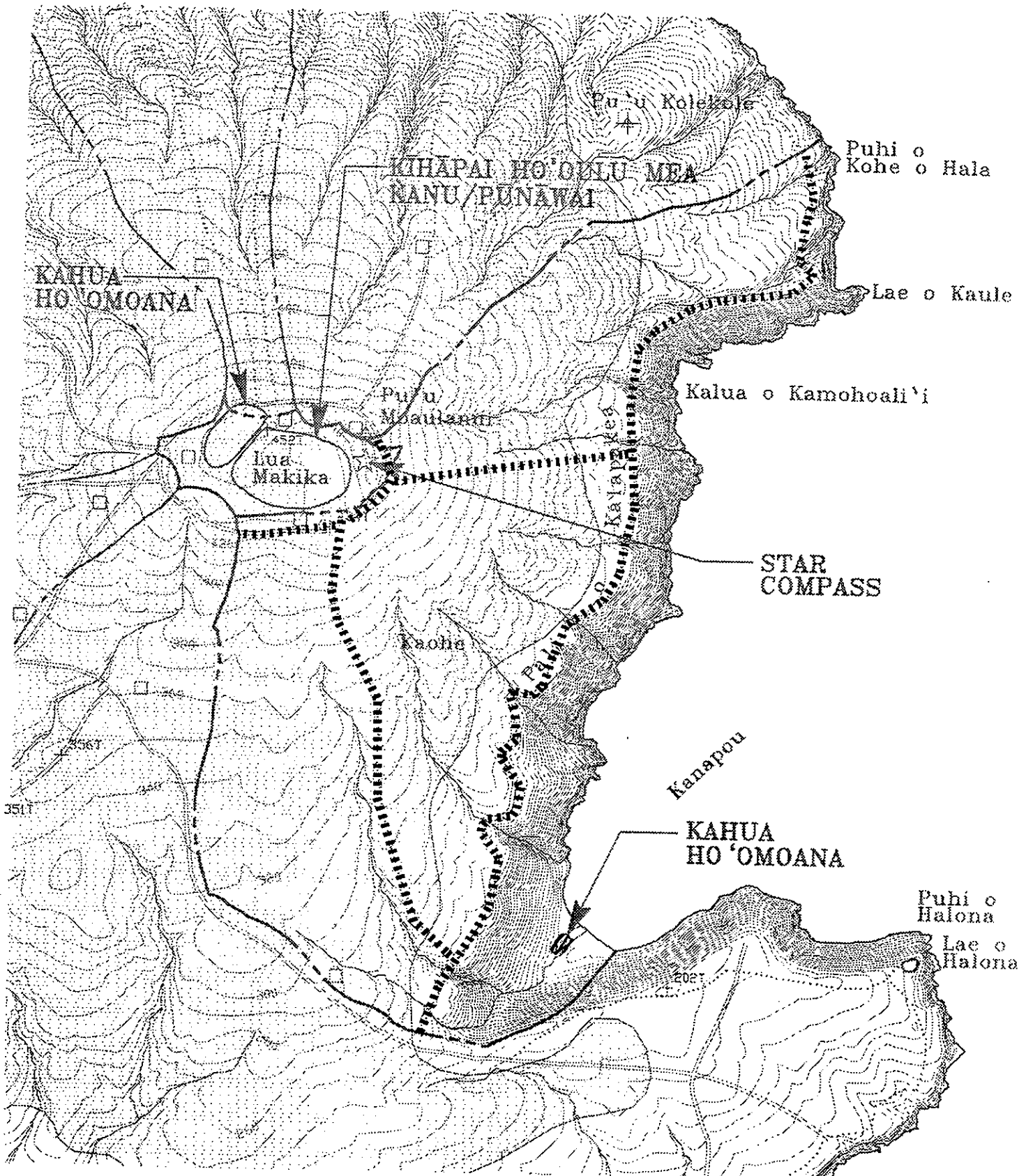
LEGEND

-  PRIORITY 9
-  PRIORITY 9

FIGURE 8-11
PRIORITY 9
KAHO'OLAWE

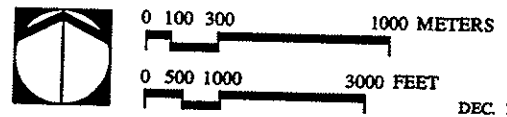


DEC. 1995

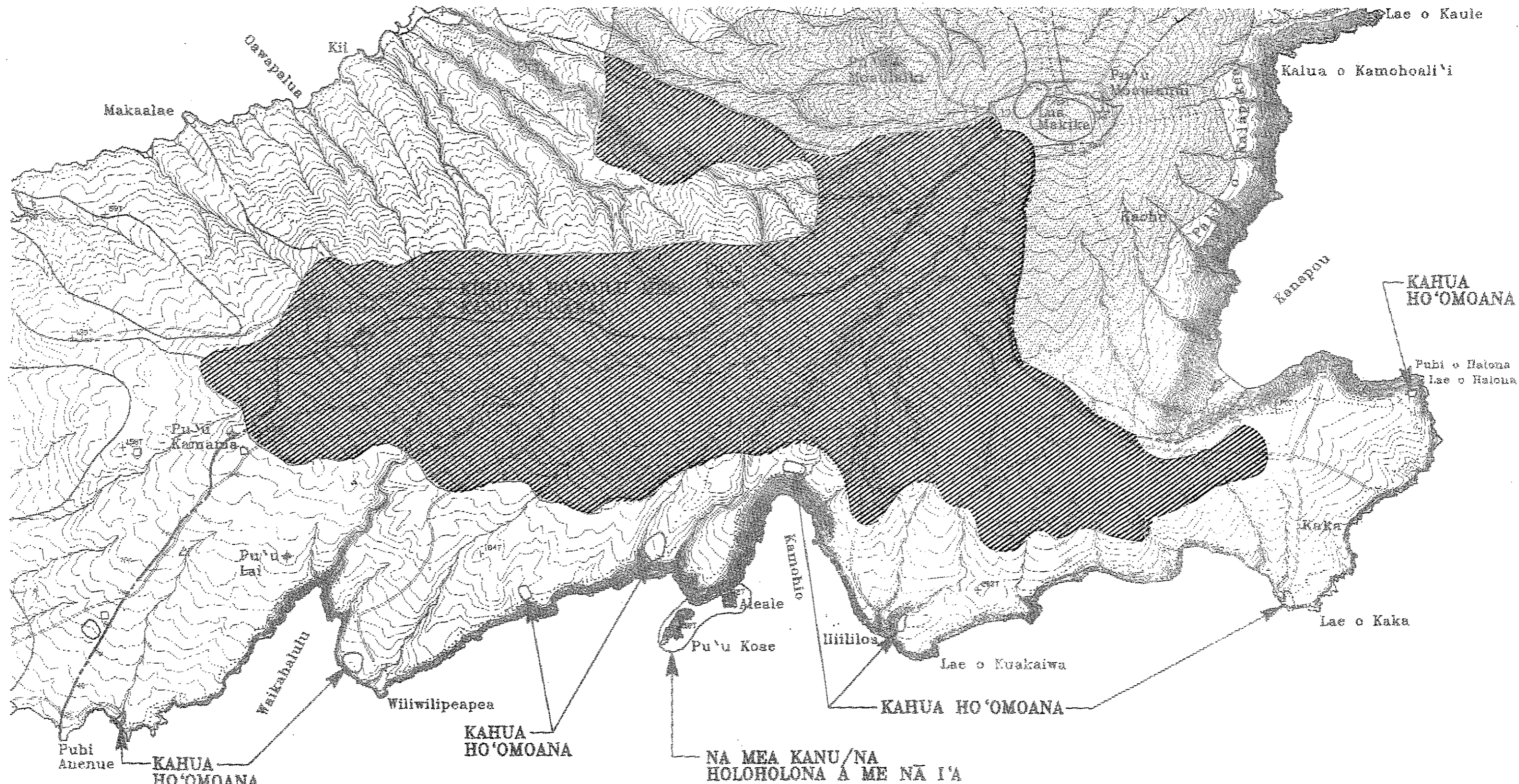


LEGEND
 PRIORITY 10
 PRIORITY 10

FIGURE 8-12
PRIORITY 10
KAHO'OLAWE



DEC. 1995



LEGEND



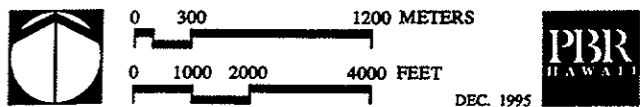
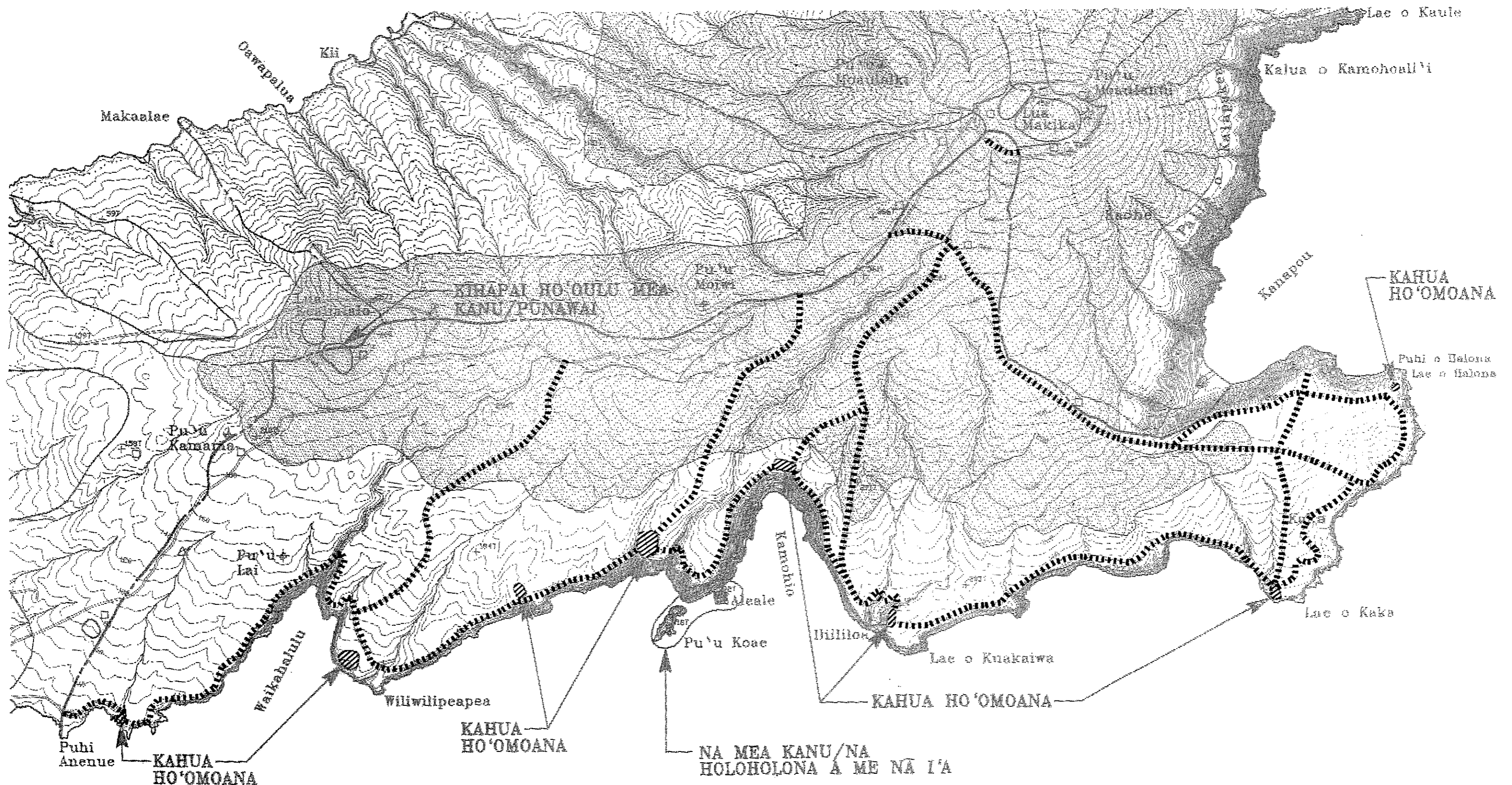
-  PRIORITY 1
-  PRIORITY 1

FIGURE 8-13
PRIORITY 11
KAHO'OLAWA





LEGEND




-  PRIORITY 1
-  PRIORITY 1

FIGURE 8-14
PRIORITY 12
KAHO'OLAWA

0 300 1200 METERS
 0 1000 2000 4000 FEET



DEC. 1995



BIBLIOGRAPHY

This page intentionally left blank

BIBLIOGRAPHY

- Aluli, Noa Emmett and Davianna Pōmaika'i McGregor. "Mai Ke kai Mai ke Ola; From the Ocean Comes Life: Hawaiian Customs, Uses, and Practices on Kaho'olawe Relating to the Surrounding Ocean," Hawaiian Journal of History, Hawaiian Historical Society, Vol. 26, 1992, pp. 231-54.
- Athens, J. Stephen, Jerome Ward, and David Welch for the Kaho'olawe Island Conveyance Commission. Paleobotanical Investigations, Kaho'olawe Island, Hawai'i, International Archaeological Research Institute, Honolulu, 1992.
- August, Joel, Esq. for the Kaho'olawe Island Conveyance Commission. Comprehensive Legal Research Memorandum, Wailuku, 1992.
- Casey, Kendall F., Brian A. Baertlein, and Bryon Donaldson for the Kaho'olawe Island Conveyance Commission. Unexploded Ordnance on Kaho'olawe: Historical Review, Technology Assessment, and Clearance Planning, Ballena Systems Corporation with Donaldson Enterprises, Alameda, 1992.
- Edith Kanaka'ole Foundation for the Kaho'olawe Island Conveyance Commission. E Mau Ana o Kanaloa, Ho'i Hou, Kanaka'ole Foundation, Hilo, 1993.
- Giambelluca, Thomas W. and Keith Loague for the Kaho'olawe Island Conveyance Commission. The Spatial Variability of Near-Surface Soil Hydraulic Properties for Kaho'olawe: A Preliminary Investigation, Honolulu, 1992.
- Giugni, Heather for the Kaho'olawe Island Conveyance Commission. Kaho'olawe: Restoring a Cultural Treasure (A video presentation), Juniroa Productions Inc., Honolulu, 1993.
- Gon, Samuel III, Gail Chun, Etal for the Kaho'olawe Island Conveyance Commission. Biological Database and Reconnaissance Survey of Kaho'olawe Island Including Rare Plants, Animals and Natural Communities, The Nature Conservancy of Hawaii, Hawai'i Heritage Program, Honolulu, 1992.
- Graves, Michael and C. Kehaunani Abad for the Kaho'olawe Island Conveyance Commission. Preservation of Historical Resources on Kaho'olawe: Responsibilities, Natural and Cultural Impacts, and Priorities, Honolulu, 1992.
- Graves, Michael and Gail Murakami for the Kaho'olawe Island Conveyance Commission. Kaho'olawe Settlement Utilizing Radio-Carbon Dating Techniques, Honolulu, 1993.
- Handy, E.S.C. and E.G. Native Planters in Old Hawaii, Bishop Museum Bulletin 233, Honolulu, 1972.

Johnson, Rubellite Kawena, Abraham Piianaia, Aki Sinoto, and Edward Stasack for the Kaho'olawe Island Conveyance Commission. Kaho'olawe's Potential Astro-Archaeological Resources, Honolulu, 1993.

Jones, Royce Allen for the Kaho'olawe Island Conveyance Commission. Kaho'olawe (A Geographic Information System-GIS), Geographic Decision Systems International, Honolulu, 1993.

Kaho'olawe Island Conveyance Commission. "Acreage Estimates for Clearance Standards for Kaho'olawe Island: Incorporating KICC's Special Development Areas and Land Use Recommendations from the Protect Kaho'olawe 'Ohana's Restoration Project and Maui County's Draft Kaho'olawe Community Plan," July 2, 1993.

Kaho'olawe Island Conveyance Commission. Kaho'olawe Island: Restoring a Cultural Treasure-Final Report of the Kaho'olawe Island Conveyance Commission to the Congress of the United States, Maui, March 31, 1993.

Kalama, David for the Kaho'olawe Island Conveyance Commission. Kaho'olawe (A Video Production), Kalama Productions with Lynne Waters Productions, Honolulu, 1993.

Kanaka'ole, Edith. "Hi'i Poe i ka 'Āina Aloha: Cherish the Beloved Land" (recording), Hula Records, 1979.

King, Pauline for the Kaho'olawe Island Conveyance Commission. Kaho'olawe Island: The Uses of Its History, Honolulu, 1993.

Loague, Keith etal. "Land Misuse and Hydrologic Response: Kaho'olawe Hawaii," Pacific Science, February 1995.

Maui Planning Commission. Proposed Kaho'olawe Community Plan, October 1993

McCoy, Pat, Attwood Makanani, and Aki Sinoto for the Kaho'olawe Island Conveyance Commission. Pu'u Moiwi Shrine and Quarry Site, Honolulu, 1993.

McKinzie, Edith for the Kaho'olawe Island Conveyance Commission. Na Mo'i O Kaho'olawe: The Administrators of Kaho'olawe, Honolulu, 1992.

Ogden Environmental and Energy Services Co., Inc. Cultural Resource Management Plan for Kaho'olawe Archaeological District, Honolulu, 1995

Reeve, Rowland for the Kaho'olawe Island Conveyance Commission. Kaho'olawe Place Names, Honolulu, 1992.

Reeve, Rowland for the Kaho'olawe Island Conveyance Commission. Na Wahi Pana O Kaho'olawe,

Honolulu, 1992.

Ritte, Walter L. Jr. and Richard Sawyer. Na Mana'o Aloha o Kaho'olawe, Aloha 'Āina o Na Kūpuna, Inc., Honolulu, 1978.

Silva, Carol for the Kaho'olawe Island Conveyance Commission. Kaho'olawe Historic Documentation: 1970-1990, Honolulu, 1993.

Spoehr, Hardy for the Kaho'olawe Island Conveyance Commission. Kaho'olawe Forest Reserve Period: 1910-1918, Honolulu, 1992.

Spoehr, Hardy for the Kaho'olawe Island Conveyance Commission. Kaho'olawe Honey and Pineapple Ventures: Anecdotes to the Island's History, Honolulu, 1992.

Stasack, Edward for the Kaho'olawe Island Conveyance Commission. Kaho'olawe Petroglyph Survey and Inventory, Associated Rock Art Consultants, Prescott, 1993.

Stasack, Edward; Georgia Lee, and Ronald Dorn. "Ancient Hawaiian Cultural Clues-Petroglyphs of Kaho'olawe," not published, 1994.

State of Hawai'i, Department of Land and Natural Resources, Division of Water and Land Development, "Kaho'olawe Water Resources Study", Draft Report, May 1989

State of Hawai'i, "Long-Range Use Plan for the Island of Kaho'olawe," Office of State Planning, September 1993.

United States Department of Agriculture. Soil Survey of the Island of Kaho'olawe, Hawaii, Natural Resources Conservation Service in cooperation with the US Navy, April 1995.

APPENDIX

This page intentionally left blank

APPENDIX: PRELIMINARY RECOMMENDATIONS FOR MANAGEMENT

Cultural Protocol

Kaho'olawe as a wahi pana is the concept that above all, must guide the planning process, clean-up activities, restoration activities, uses, and land management. The land is sacred; it holds deep meaning and grants spiritual and cultural strength. All programming and resource management activities and approaches should recognize and incorporate Hawaiian cultural values.

Specific cultural use protocols are currently being developed by the KIRC and its consultant. The final Cultural Protocol document would outline culturally appropriate conduct and standards for named or special sites; archaeological and cultural sites; treatment of cultural sites during clean-up and restoration by the U.S. Navy and its agents; and visitor orientation and visitation.

Access and Educational Programs

The island's isolated location, its freedom from modern distractions, its undeveloped state, and its wealth of cultural and archaeological sites provide an ideal setting to nurture traditional cultural practices. Kaho'olawe is an outdoor classroom where people can be taught about the land and Hawaiian culture through actual experiences. Subsistence skills including building (settlements, shrines), fishing, gathering, farming, tool-making, and navigation/voyaging could be taught. In addition, all of the proposed uses could reinforce the usage of Hawaiian language and the teachings of legends and traditions.

While access to the island should be open to everyone, it should be on a controlled and managed basis. It is recommended that only four moorings on the island should be provided and that they should be located at Hakioawa, Kuheia, Ahupu, and Honokanai'a. The kahu 'āina residing at Kuheia to manage this particular 'ili would monitor all mooring activities.

All uses on the island have educational value for the Native Hawaiian culture to some degree. The following, however, describes different levels and purposes of educational visits to the island.

Island Introductory Use

Kaho'olawe is a wahi pana (or special place). It offers a place for students to engage in uncommon experiences and to help them mature and develop greater respect for the 'āina, themselves, and others. In situations where students visit the island with their parent(s), strong bonds are developed among all family members.

Kaho'olawe offers educators and students a broad range of educational opportunities and experiences on the island, ranging from "introductory" experiences (as are commonly experienced by school groups on "open accesses") to "apprentice" experiences.

The current "introductory experience" (which usually consists of a three to four day access at Hakioawa Bay) should not be altered. Accommodations for this introductory experience should remain somewhat "rough". Special accommodations need to be developed for the elderly and people with disabilities at

Honokanai'a and Kuheia, but future facilities at Hakioawa should maintain the current level of "roughness."

At a minimum, short-term visitations to the island should be coordinated to have the following components:

- ▶ coordinator
- ▶ pre-visit, off island orientation
- ▶ safety orientation
- ▶ on island experience which includes:
 - teaching of lōkahi,
 - physical challenge,
 - "rough" condition,
 - challenges and success,
 - absence of modern distractions,
 - some form of contribution to the island

Apprenticeship Use

Kaho'olawe has a potential to serve as a training ground for master-apprentice training in various traditional skills and arts. As previously noted, kahu would teach various aspects of their culture related to their skill (fishing/religion/tapa making, etc.) and would determine what part of the island they may need to practice/teach their skill. These kahu would learn from the island where the various resources are located, and would then decide the location of work sites and temporary habitation sites.

Project Specific Use

Somewhat in between the introductory experience and the apprentice experience is visitation for a few weeks or months (such as the summer period) for specific projects. Some examples of this would be groups of students or other interested people remaining on Kaho'olawe for archaeological field studies, botanical and biological studies, or restoration projects.

Teachers/supervisors may stay with the students at all times or may visit for periodic checks, depending upon the nature of the project.

Kahua Kauhale

Kahua kauhale in the context of this plan would mean habitation of an area for the amount of people and duration of time with which the area can support with minimal physical and biological degradation. The number of people and length of time would also be controlled by management policies. The only permanent residents would be those specially selected kahu or masters of culture or education, as discussed earlier, and/or perhaps kahu 'āina (caretaker of the land or steward).

It should be emphasized that the purpose of the kahua kauhale is primarily to support cultural, educational, and restoration/revegetation uses. The type of structures allowed would be deemed appropriate to the purpose of learning and teaching. In addition, the method of construction of the facilities and the type of materials used in construction should be appropriate to the island. The use of sustainable technologies and renewable energy sources should be explored to promote self-sufficiency.

Restoration/Revegetation

Crucial to the restoration or the restoring of life to the island, is the stabilization of its foundation; the soil. Restoration and revegetation basically involve soil conservation, revegetation, and erosion control. Revegetation of the island, especially of the hardpan area, is the major activity recommended to decrease runoff, water and wind erosion, and associated problems.

The construction of soil conservation structures are important and should be well-planned and

executed. The immediate construction of check dams to slow gully development; with the priority locations being where Nā Kahua Kahiko (Cultural Sites) are threatened or erosion is most severe.

For successful revegetation, some effort may be needed to develop better soils using methods such as or with the same effect as plowing, amending the soil, irrigating, and adjusting pH or soil acidity/alkalinity.

The long-term use requirements on the island in order for the vision to be realized are to revegetate the kula areas of the island with native plants such as pili, ma'o and 'ilima, and to develop water sources. For the short-term, however, revegetation of the hardpan is the most important.

One recommendation for immediate restoration of the hardpan is to propagate salt bushes and native groundcover. Salt bushes currently are able to grow on their own on the hardpan, where they capture wind-deposited soil, moisture, and provide wind protection for the seeds of other plants. Although the salt bush is not a native plant, it is suggested that they be propagated and utilized for seeding native plants since they naturally die off after a few years.

Another recommendation on revegetation of the hardpan is to plant in the lee existing trees. The idea is similar to seeding of salt bushes in that existing trees can provide wind protection. However, if a seedling is planted too close to drought tolerant trees, which tend to have extensive root systems and is very competitive for moisture, the seedling may not survive.

A third recommendation is to plant windbreaks and to plant in between the windbreaks. These will help to lessen wind erosion and provide

protection for seedlings. The windbreaks should be plants that are acidic to better condition the soil. Using ironwood and tamarisk, both of which have been experimentally planted as windbreaks on Kaho'olawe, should be avoided.

In general, native plants that are drought tolerant (Kaho'olawe has 10 to 25 inches of rainfall annually), wind tolerant, provide ground cover, and have high seed viability survive the best.

Revegetation efforts must be well-planned and carefully executed given the fragile and unstable condition of the existing vegetation and soil. Given the potential for soil erosion, removal of any vegetation, including weeds and alien plants, must be done with erosion control measures. Likewise, all surface preparations such as plowing should be implemented with erosion control measures. Newly exposed soil should be revegetated or covered as soon as possible. Revegetation efforts should also be timed to take advantage of seasonal rains.

Issues that need to be addressed in KIRC's Restoration/Revegetation Plan include:

- water source development;
- various options of erosion control;
- stabilization activities required;
- identification of the differing degrees of erosion as affected by location, slope, soil, vegetation, water flow, etc.;
- identification of ecological zones to guide restoration;
- creation of plant nurseries on the island;
- construction of irrigation systems if necessary and where feasible;
- control of invasive plants to lessen the competition for resources;
- maintenance and enhancement of existing ecosystems;

- fire protection;
- introduction of native seedlings in kiawe forests;
- monitoring for introduced weeds;
- removal of alien plants to allow for more native plants to take root;

Wildlife Management

The native plants and animals that bring life to the island may require active management to ensure long-term stability and vitality. A detailed restoration strategy should be developed specifically for the island. Periodic monitoring should be conducted to watch for plant and animal population growth/decline or changes in life cycles. Some active control of threats may be required from time to time. A few examples of these activities may be weeding, fencing, and firefighting. To protect Kaho'olawe's unique plants and animals from destructive human activity, basic rules regarding human presence in an area (including presence for management purposes) should be established and strictly enforced. Enforcement of these rules will also be important. At a minimum, kahu 'āina or land managers who live on the island should be appointed to carry out the management plan.

Land-based wildlife habitats which must be preserved are those of the pueo (Hawaiian short-eared owl, *Asio flammeus sandwichensis*) and various seabirds. The pueo, which are endemic to Hawai'i and listed as endangered on O'ahu, is currently the only native land bird on Kaho'olawe. They are active anywhere between sea level and 8,000 feet and frequently soar at high elevations. They generally nest on the ground in grassy areas and are active during the day, feeding on mice and rats. Adult pueo lay three to six eggs in their nests and begin incubation as soon as the eggs are laid. Pueo are

threatened by human disturbance and hunting. They will probably avoid higher activity areas and reside in the proposed kula use areas.

The coastal cliffs along Kaho'olawe's southern shore are frequented by various seabirds especially at Pu'u Koa'e and at Aleale. Their habitats have been designated as a botanical/wildlife preserve and should be protected.

A program to eradicate the feral cat population in the near future (while the island is still relatively uninhabited) should be considered. Without the threat of cats, seabirds would begin nesting on the island again and pueo and other ground-nesting bird species would benefit.

Ocean Management

In August 1994, the KIRC adopted rules relating to access and fishing (HAR 13-260, Kaho'olawe Island Reserve). These rules essentially continue the Navy's prohibition of access to the island and its surrounding waters out to two miles. These rules were adopted to protect Kaho'olawe's resources and to protect the public from the potential danger of unexploded ordnance. Controlled access has protected many parts of the island from over fishing and should be continued. The KIRC is currently undertaking a separate Ocean Management Plan effort.

Federal funding for the KIRC has provided an opportunity to develop a comprehensive resource management program for the waters surrounding the island. This ocean management plan will be prepared as a separate study. While the management of the ocean surrounding the island will be addressed in the aforementioned study, one of the guiding principles of this plan is that "the land and the ocean are interconnected and inseparable." An obvious connection between

land and ocean is the soil which continually erodes from the island and is carried into the ocean by wind and rain (through storm runoff). Revegetation of the island should have a positive impact on its fishing resources.

Generally, the island's fishing resources are limited and should always be managed to ensure continuity and to educate future generations in traditional Hawaiian fishing practices.

Marine hatchery/sanctuary areas should be designated to help balance the harvesting of ocean resources around the island, to restore natural habitats, to protect endangered species, and to provide a place of peace for native species. Some of the marine animals that are currently associated with the island are the 'Ilio Holo I Ka Uaua (Hawaiian Monk Seal, *Monachus schauinslandi*), Honu (Green Sea Turtle, *Chelonia mydas*), Koholā (Humpback Whale, *Megaptera novaeangliae*), Nai'a (Spinner Dolphin, *Stenella longirostris*), and various anchialine pond species

The 'ilio holo i ka uaua (Hawaiian monk seal) give birth to single pups in shallow waters that provide protection from sharks. Most births occur between the months of February and July. They feed at ocean depths between 30 and 120 feet on reef fish, eel, octopus, and lobster. They have been known to rest on the beaches from Honokanai'a to Keanakeiki. They have also been seen at Kuheia, Lae o Kuikui, and Hakioawa. They are very sensitive to human disturbance and are threatened by debris and longline fishing activities. Thus, a sanctuary area for the 'ilio holo i ka uaua should be away from longline fishing areas and be isolated from human disturbance on shore.

Honu (green sea turtles) use both ocean and land areas throughout their life cycles. Adult honu lay

their eggs in the sandy beaches where they were born, once every two to four years. Eggs are laid three to seven times at 13-day intervals. Most occur between the months of July to November, with hatchings mostly in September/October. Beach access to areas of known resting should be restricted during the egg-laying period. Birthing activities require undisturbed nesting beaches that allow for egg laying, basking, and resting, as well as access to marine plants for feeding hatchlings. Honu are threatened by marine debris, especially plastic, in which they become entangled or they ingest because they mistake it for food.

The Koholā (humpback whale) is an endangered species that spends the winter months in the waters off Kaho'olawe. They are found at depths less than 600 feet. The waters between Kaho'olawe, Maui, and Moloka'i have already been declared a marine sanctuary for humpback whales.

At Kaho'olawe, pods of nai'a (spinner dolphins) have been seen in and around the bays of Honokanai'a and Kamohio, as well as other areas. While they are not endangered species, their habitats around the island should be recognized and protected.

The anchialine pond at Sailor's Hat is unique as it is a high salinity pond that was man-made. Some of the species inhabiting the pond are the 'opae'ula shrimp, amphipods, snails, and red polychaete tube worms. It is not known what other species may be found, thus it should be further studied.

Cultural and Historic Sites

The wealth of archaeological and historical sites, artifacts, and remains provides a unique opportunity to learn from the past and

incorporate the past into future activities.

Adequate protection of these resources must be planned for in the context of clean-up, revegetation, and educational programs that will be occurring on the island. Some of the features should remain untouched (except for preservation and protection purposes) to serve as references or to preserve its significant, yet time specific, status. The features within the proposed Honokoa cultural preserve, for example, would be left intact to allow future generations to learn about their Native Hawaiian ancestors, ancestral activities, and ancestral knowledge. Other features however, could once again be linked into a cultural context and be reconstructed and used to guide and enhance current cultural practices. Fishing ko'a, for example, may once again serve as a place of veneration and ritual for fishing activities.

Specific details as to how each of the more than 500 archaeological and historical features are to be viewed, protected or used, and managed need to be addressed. Additional areas and site complexes may be designated as historic preserves upon completion of a comprehensive resurvey and cultural resource management plan for the island.

Unexploded Ordnance Safety

Kaho'olawe and its surrounding waters will continue to pose hazards of unexploded ordnance. KIRC will need to develop procedures and possible access restrictions to protect public health and safety.