COPY

PLANNING DEPARTMENT
25 AUPUNI STREET

COUNTY OF HAWAII
HILO, HAWAII 96720

January 5, 1987

Phillips, Brandt and Reddick
Financial Plaza of the Pacific
130 Merchant Street, Suite 1111
Honolulu, HI 96813

Gentlemen:

Final EIS - Makalawena Resort

We have reviewed the Final EIS for the proposed Makalawena Resort.

Chapter 343, H.R.S., requirements were triggered by the filing of a petition to amend the county General Plan from Conservation and Open designations to Intermediate Resort, Open and Medium Density Urban designations.

We find that the Final EIS adequately addresses both the content and procedural requirements of Chapter 343, HRS, and thus determine the EIS to be acceptable.

In so accepting the EIS, we would note that other issues which remain unresolved at this early conceptual planning stage, and as is outlined in the Final EIS (Chapter IX), will be resolved in the context of subsequent regulatory approvals.

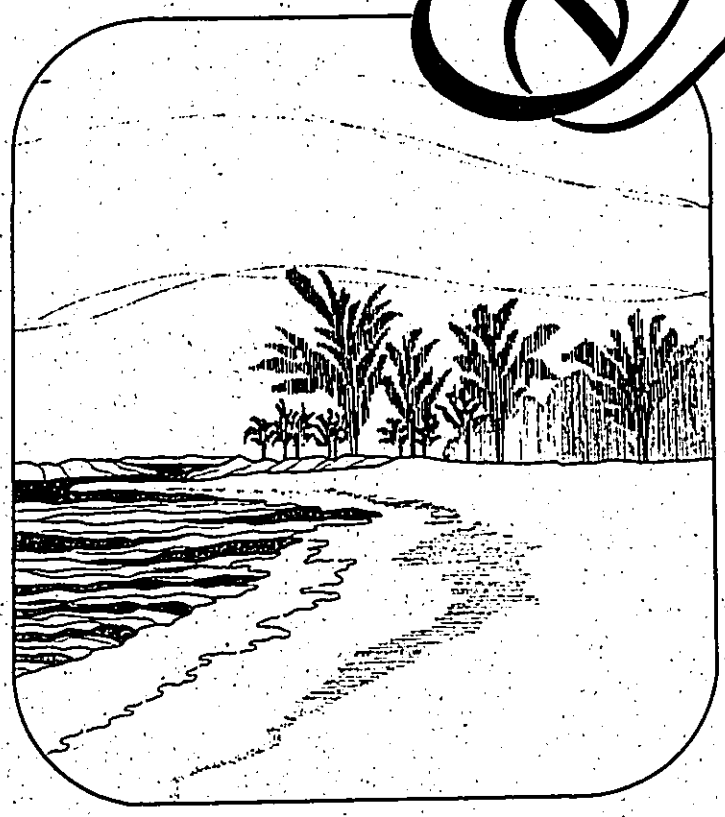
Should you have any questions, please do not hesitate to contact us.

Sincerely,

ALBERT LONO LYMAN
Planning Director

BN:lkt

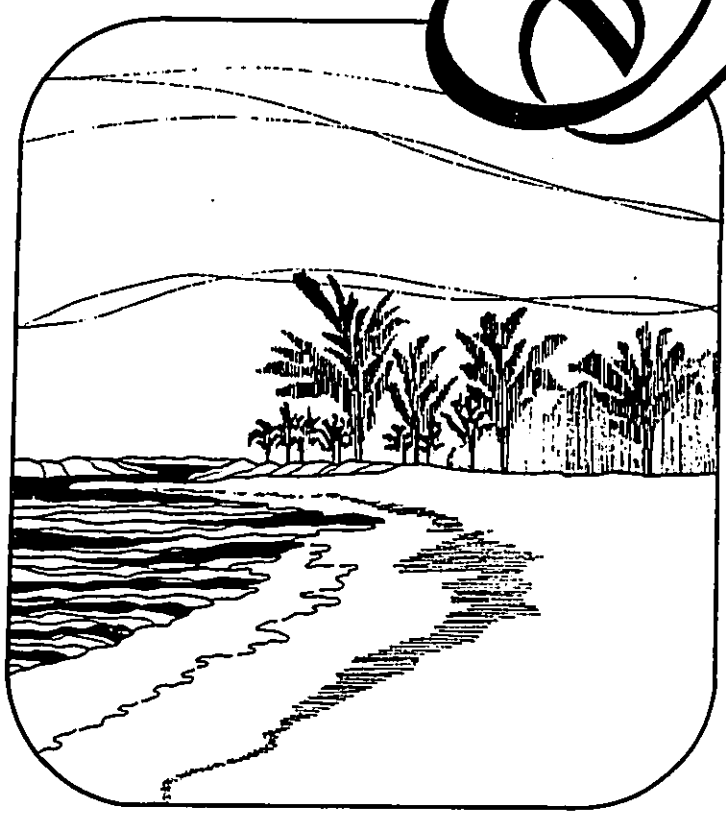
cc: OEQC
LUC



Makalawena Resort

Final Environmental Impact Statement

December 1986



Makalawena Resort

Final Environmental Impact Statement

December 1986

Prepared For: Kamehameha Schools/Bernice Pauahi Bishop Estate
Prepared By: Phillips Brandt Reddick & Assoc. (Hawaii), Inc.
For Submittal To: Planning Department, County of Hawaii

FINAL

ENVIRONMENTAL IMPACT STATEMENT

M A K A L A W E N A R E S O R T

Makalawena, North Kona, Hawaii

Tax Map Key: 7-2-04: 01

Third Division

This Environmental Document is Submitted
Pursuant to Chapter 343, HRS

Prepared for:

Kamehameha Schools/Bernice Pauahi
Bishop Estate

Guido Giacometti
Director, Land Division

Dec 9, 1986
Date

Prepared by:

Phillips, Brandt, Reddick, and Assoc. (Hawaii), Inc.

FOREWARD

This Final Environmental Impact Statement has been prepared for Kamehameha Schools/Bernice Pauahi Bishop Estate to disclose information on its proposed Makalawena Resort situated on that certain property at Makalawena, North Kona on the island of Hawaii.

The preparation and submittal of this document is pursuant to Hawaii Revised Statutes, Chapter 343, Environmental Impact Statements, Chapter 200 of Title 11, Environmental Impact Statement Rules, and Chapter 201 of Title 11, Environmental Council Rules of Practice and Procedure.

The County of Hawaii Planning Department reviewed the environmental assessment which was prepared by Phillips, Brandt, Reddick and Assoc. (Hawaii), Inc. as part of a General Plan Amendment Application, and determined that an Environmental Impact Statement was required. The Environmental Impact Statement Preparation Notice appeared in the OEQC Bulletins dated August 23, 1986 and September 28, 1986. The deadline for requests to be a consulted party was September 22, 1986.

The Draft EIS was officially submitted to the Office of Environmental Quality Control on October 6, 1986 and notice of its availability was published in the October 8, 1986 and October 28, OEQC Bulletin. The deadline for comments and the end of the 30-day public review period was November 7, 1986. On November 13, 1986, a 30-day extension to the fourteen day response period was made to the Hawaii County Planning Department by the applicant. On November 21, 1986 the extension request was granted with the response period (submission of Final EIS) extended to December 19, 1986 and the Final EIS review and determination of acceptability extended to January 4, 1987.

TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

TABLE OF CONTENTS
(continued)

TABLE OF CONTENTS
(continued)

TABLE OF CONTENTS
(continued)

TABLE OF CONTENTS
(continued)

APPENDICES

TABLE OF CONTENTS
(continued)

LIST OF TABLES

TABLE OF CONTENTS
(continued)

LIST OF TABLES

TABLE OF CONTENTS
(continued)

LIST OF TABLES

TABLE OF CONTENTS
(continued)

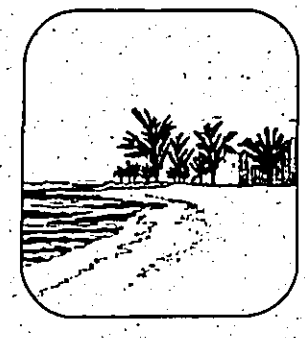
LIST OF TABLES

TABLE OF CONTENTS
(continued)

LIST OF FIGURES

I

INTRODUCTION AND SUMMARY



CHAPTER I

INTRODUCTION AND SUMMARY

1.1 PROJECT PROFILE

Project Title: Makalawena Resort

Action: Applicant action. Petition for General Plan Amendment to allow Intermediate Resort and change the Land Use Pattern Allocation Guide Map (LUPAG) designation for area from Conservation to Intermediate Resort, Medium Density and Open Area. During the processing of the General Plan Amendment or upon receiving a General Plan Amendment, the applicant will petition the State Land Use Commission for a Boundary Amendment from the Conservation District to the Urban District for the subject property.

Applicant: Kamehameha Schools/Bernice Pauahi Bishop Estate
567 South King Street, Suite 200
Honolulu, Hawaii 96813

Attention: Mr. Guido Giacometti
Director, Land Division

Contact for Environmental Concerns:

Phillips, Brandt, Reddick & Assoc. (Hawaii), Inc.
Thomas S. Witten, Principal
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813
Telephone: (808) 521-5631

Approving Agency: Planning Department, County of Hawaii

Proposed Project: Applicant proposes to develop a 45-acre resort hotel site, multi-family residential units, 18 hole golf course, tennis center, wildlife refuge and infrastructure support facilities within the approximate 350 acres of Makalawena (TMK: 7-2-04: 01) in the North Kona District, Island of Hawaii. The site is located approximately 3.5 miles north of Keahole Airport and 10 miles north of Kailua-Kona town.

1.2 INTENDED USES OF THIS EIS

The Environmental Impact Statement (EIS) is prepared in compliance with the requirements of Chapter 343, Hawaii Revised Statutes and the regulations adopted pursuant thereto.

The proposed action is an amendment to The General Plan, County of Hawaii to allow an Intermediate Resort designation and change the Land Use Pattern Allocation Guide (LUPAG) Map from Conservation to Intermediate Resort, Medium Density and Open Area. (Figure II-5).

The county of Hawaii defines an "intermediate resort" area as "a self-contained resort destination area which provides basic and support facilities for the needs of the entire development on a smaller scale than a major resort area. Such facilities shall include sewer, water, roads, employee housing and recreational facilities, etc.:

Maximum visitor units: 1,500 rooms.

Resort acreage: 45 acres.

Active and passive recreation area: 25 acres.

Accessory uses within hotel or resort zoned area shall be based on 50 square feet of floor area per hotel room.

A maximum of 320 acres for residential use when other zoned lands are not available in close proximity for support use.

Employee housing shall be provided at a maximum ratio of one employee unit to every two hotel units built. The required ratio shall be determined by an analysis of housing needs of each district or relative area."

While the document is specifically prepared to satisfy the requirements for a General Plan Amendment for the subject property, it is also intended to serve as the EIS for future planning applications and permits required to implement the overall development program. In this light, this EIS would be reviewed by the various approving agencies (e.g. State Land Use Commission) at each subsequent step of the regulatory process. If additional data requirements are identified, Supplemental Statements to this EIS would be provided.

1.3 PROJECT DESCRIPTION

1.3.1 Location and Ownership

The project site, comprised of approximately 353 acres, is located on the west coast of the island of Hawaii, North Kona Judicial District, Makalawena ahupua'a. The property is identified as Tax Map Key 7-2-04:01. The site is approximately 3.5 miles north of the Keahole Airport and 10 miles north of Kailua-Kona.

The subject property is situated makai and along Queen Kaahumanu Highway and extends to the coastline at Pu'u Ali'i Bay. It is bound on both sides by vacant state owned lands. To the north in the Awake'e ahupua'a, the state owned land runs along almost the entire boundary. The coastal frontage of Awake'e is owned by the Long and Melone, Ltd. Trust.

The Makalawena property is owned by the Bishop Estate except for a single 10,000 square foot parcel, located near the Opae'ula Pond, which belongs to the United Church of Christ, Hawaii Conference. The church is aware of the proposed project through discussions with the landowner and is in the process of weighing various options regarding the disposition of the church property and location.

1.3.2 Conceptual Plan

A General Plan amendment is being sought by the applicant to change the Land Use Pattern Allocation Guide (LUPAG) Map from Conservation to Resort, Medium Density Urban and Open Area designations, in order to accommodate a proposed high quality, low density resort community. The applicant's master plan would include the following:

1. Resort Hotel (45 acres) -- The hotel site would be located adjacent to Pu'u Ali'i Bay and would accommodate 900-1,200 rooms.

2. Multi-Family Residential (90 acres) -- Approximately 900-1,350 units would be located throughout the site.

3. Recreation Area (184 acres) -- An 18 hole championship golf course would be designed around the multi-family residential sites. The golf clubhouse, driving range and tennis center would be situated in close proximity to the hotel site. A shoreline open space and park area would be provided along the entire shoreline with public access to be incorporated into the hotel site development.

4. Wildlife Refuge (approximately 22 acres) -- The Opae'ula Pond would be protected and maintained as a wildlife refuge site due to its important wildlife habitat. The size and boundaries of the refuge have been discussed by the landowner with appropriate federal, state and county agencies. The refuge boundaries are shown in Appendix E.

5. Others (12 acres) -- The remaining project area would be used for roads, a sewage treatment plant and open space.

All necessary infrastructure, including sewage, water, drainage, electrical, telephone and roads, would be constructed to county standards, modified as necessary for resort purposes. The sewage and water facilities may be maintained privately.

1.4 NEED FOR THE PROJECT

Based on projected visitor industry trends and island market shares statewide, the market assessment prepared for the proposed project indicates that Makalawena Resort could capture approximately seven to nine percent of the projected West Hawaii visitors. This translates into approximately 370 to 480 hotel units by 1990 and 750 to 970 hotel units by the year 2005. Additionally, based on visitor projections, existing, planned and proposed condominium units in West Hawaii, it is estimated that the Makalawena Resort could support between 800 and 1,200 condominium units between 1991 and 2005.

The above estimates are dependent upon many factors, including quality of the resort, quality of resort management, marketing expertise, quality of condominium units, pricing and ocean or golf course orientation. However, it appears, based on the market assessment performed, that the proposed project could become an integral part of the West Hawaii visitor accommodations and amenities and would be fully supportable within the time frame analyzed. Further, the benefits of the project to the state and county, that is the ratio of revenues to expenditures, would be positive and the resort would contribute to the tax base of the state and county.

1.5 SUMMARY OF PROBABLE IMPACTS AND MITIGATION MEASURES

The potential for significant environmental effects is summarized in this section. Mitigation measures proposed to reduce project effects to insignificant levels are summarized below and discussed in Chapter IV.

- **Land Use.** In addition to the proposed action, the project would require a State Land Use Petition for Boundary Amendment, Change in County Zoning, Special Management Area (SMA) Permit and several other County, State or Federal permits. Refer to Chapter I, Section 1.9 for the list of necessary permits and approvals. The wildlife refuge to be established at Opae'ula Pond will remain as Conservation District land.

  Mitigation Measures: Resort planning for Makalawena would be coordinated with planning for other potential resort developments in North Kona.

  Coordinated planning, in part through review of this EIS, with adjacent property owners will contribute to sound utilization and protection of the natural resources in the North Kona region.

- **Anchialine Ponds.** Five separate geographic pond basins were identified. As appropriate, the ponds will be incorporated within the project design. Opae'ula Pond will be retained as a passively managed wildlife refuge, with no fill or alteration to the pond complex. Refer to Chapter IV, Section 4.6 and Appendix E.

  Mitigation Measures: A coastal pond and wildlife refuge management plan will be developed with the objectives of preserving existing pond features and providing interpretive and educational opportunities for the public. Refer to Appendix E.

  The effects of withdrawal of groundwaters and/or injection or surface disposal of treated wastewaters or stormwater runoff would be compatible with coastal pond water quality inasmuch as this habitat is characterized by natural subterranean brackish water discharges. Flora and fauna associated with this habitat are euryhaline and would not be adversely affected by short-term alterations in water quality or salinity.

  Diurnal tidal flushing and natural mixing of groundwaters and ocean waters would prevent any significant degradation of coastal pond water quality.

- **Archaeological/Historical Resources.** A total of 49 sites were identified within the overall project area, including several localities and recorded foot trails, with potentially high research, interpretive or cultural values. Refer to Chapter IV, Section 4.8 and Appendix C.

  Mitigation Measures: Most of the archaeological remains present within the project area could be handled adequately by carrying out the appropriate level of further archaeological work needed to recover the significant data present, such

as intensive survey, thereby preserving the valuable archaeological information, rather than the physical remains themselves. At the same time, some of the identified archaeological remains, while having only limited significance in terms of potential research, interpretive, or cultural value, could be considered for preservation and inclusion into the landscaping of the development project area.

A cultural resources management program for significant sites will be formulated with the assistance of the Department of Land and Natural Resources Historic Preservation Program and the Hawaii County Planning Department. The program will include specific recommendations for site preservation, data recovery or test level investigations as necessary.

- **Public Services and Facilities.** The proposed project will result in additional demands for selected public services and utilities, including police and fire protection, school facilities, electrical and telephone services. Privately owned and operated systems for drainage, water supply, wastewater treatment and disposal, and solid waste disposal will be utilized. Refer to Chapter IV, Sections 4.12 through 4.19.

  Mitigation Measures: The requirements and associated costs to provide additional public services to this project will be more than offset by additional revenues generated to the county and state governments that would be responsible for providing these services.

- **Fiscal.** The project-generated recurring revenues to the State and County via property taxes, sales and other tax sources, will significantly exceed recurring costs. Refer to Chapter IV, Section 4.22.

- **Population and Employment.** The project will contribute to direct and indirect population and employment increases which are cumulatively significant within the context of the North Kona district and island of Hawaii development plans. Refer to Chapter IV, Section 4.22.

- **Shoreline Resources.** The project will provide mauka-makai access from the highway to the shoreline and lateral shoreline access within the context of a coordinated Shoreline Management Plan with the county and adjacent land owners. Refer to Chapter IV, Section 4.19.

- **Natural Resources.** The project may result in impacts to flora and fauna, coastal water quality, geology, ambient noise levels, air quality and surrounding land uses which are considered neither directly or cumulatively significant. Refer to the related section of Chapter IV.

Mitigation Measures: All applicable procedures, regulations and laws will be complied with that provide for the protection and proper management of these natural resources.

- **Transportation/Circulation.** The project will ultimately generate approximately 8,620 total vehicle trips per day (ADT), which in combination with traffic generated by other existing and planned resort and residential developments may have a significant cumulative effect on Queen Kaahumanu Highway. The project will place additional air traffic demands upon Keahole Airport. Refer to Chapter IV, Section 4.9.

  Mitigation Measures: Pursuant to detailed development plans, a traffic study will be prepared addressing project related traffic generation, traffic assignment and distribution, turning movements, intersection requirements and phasing and financial responsibility of road improvements. All interior roads will be built to county standards.

1.6 SUMMARY OF ALTERNATIVES CONSIDERED

Alternatives to the proposed resort development have been considered and are described in Chapter III.

As summarized below, all alternatives to the proposed resort development fail to meet the objective of establishing a high quality, low to medium density resort community that is economically viable.

1. Major Resort

   Based on the "major resort" standards of The General Plan, County of Hawaii, this alternative would be a self-contained resort destination area with basic and support facilities for the needs of the entire development. The resort would include approximately 90 acres of resort use with a maximum of 3,000 rooms and active and passive recreation areas of 50 acres. A maximum of 640 acres of residential use would be provided in close proximity for support use.

   The Makalawena lands could not accommodate a resort development of a scale approaching the minimum standards for a "major resort". Development at this intensity could compromise the ability to incorporate significant environmental features into he project design, and would require substantial reductions in open space and recreational use opportunities. Site size limitations would place Makalawena at a competitive disadvantage with respect to other major resorts along the Kona and Kohala coasts and the project objectives could not be realized under this alternative.

2. Retreat Resort

This alternative plan would provide a unique resort experience as a retreat from the urban scale and intensity of other resort developments. As characterized by the standards set forth in The General Plan, County of Hawaii, a "retreat resort" at Makalawena would provide the user with rest, quiet and isolation for an environmental experience. The resort would include a maximum of 100 rooms and provide active and passive recreation areas.

Secluded from intrusions of the highway and urban uses, the resort would provide an isolated bungalow or village-type setting with detached units that would be associated with the beachfront and recreational amenities of the coastline. For recreational amenities, a golf course could also be included, along with a tennis center for those who would like to complement their retreat stay with some recreational activities.

This alternative would provide opportunities to optimize the land use activities, while minimizing impacts on existing archaeological/historical and environmental resources. Due to the high cost of providing the necessary infrastructure to serve a low density resort of this character, both the physical setting and high capital cost and projected low return provide the basic reasons why this alternative is rejected. Additionally, this alternative does not meet the project objectives.

3. Luxury Condominiums Resort

This plan would utilize the coastal area for the development of luxury condominiums at a medium density with a high level of amenities and open space. In conjunction with the ocean-front luxury condominiums, estate lots fronting the 18 hole golf course would also benefit from the coastal amenities of a beach club and private shoreline park. The total project would be secured with entry features and controlled access.

Due to the private residential character of this alternative, there would be limited access to the coastal resources for public enjoyment. Additionally, the access to significant archaeological and historic resources at Makalawena would be severely limited, with little or no opportunity for interpretive material and programs to be provided for the public. The high off-site infrastr cture costs would make this alternative either prohibitively expensive or infeasible depending on market demands and would not meet the project objectives.

4. Residential Estate Lots

This alternative would provide for subdivision of the Makalawena lands into large residential estate lots with controlled access from Queen Kaahumanu Highway. Owned and developed by various owners, each lot would be developed independently.

While total infrastructure costs could be reduced, the minimal improvements would require these lots to be extremely expensive to make the project feasible, and thus, limiting the marketability of this type of project. The coastal resources would have limited access through a development of this nature, although the general open space character of the land may be maintained. The regional economic benefits of this alternative would be minimal due to the lack of employment generators such as resort and commercial uses and would not meet the project objectives.

5. No Build (or "Do Nothing")

This alternative would be consistent with the present State Land Use designation. It would not, however, contribute to county and state goals and policies aimed at promoting employment and economic growth, nor would it respond to projected demand for increased resort opportunities along the West Hawaii coast. Overall environmental impact would be minimized, though the natural attributes and amenities of the site would remain underutilized. The ability to implement programs to manage and preserve the coastal ponds and historical sites, previously subjected to some disturbances and modifications, as well as provision for improved access, is removed with this alternative. This alternative does not meet the project objectives.

1.7 SUMMARY OF UNRESOLVED ISSUES

The General Plan Amendment request is the first of many approvals which must be obtained before Makalawena Resort development plans could be implemented. Other necessary approvals are listed in Chapter I, Section 1.9. Clearly, consideration of the appropriateness of the proposed land use designations within the context of long range General Plan policies is the basic issue to be resolved at this juncture.

With implementation of the mitigation measures (identified in Chapter IV) at appropriate stages of project planning and review, most, if not all, of the significant issues associated with the proposed resort will be resolved. A listing of issues requiring further study at appropriate stages of project planning and review is provided below.

1. Anchialine Ponds. Specifics of a pond management plan to preserve and manage coastal pond resources will be resolved within the context of further detailed site planning and under the provisions for receiving a Special Management Area permit. A Draft Pond and Wildlife Refuge Management Plan is provided as Appendix E.

2. Opae'ula Pond Wildlife Refuge. A wildlife refuge at Opae'ula Pond will be established in conjunction with development of the proposed project. The landowner has been and will continue to meet with appropriate federal, state and county agencies to implement a management plan for this important wildlife habitat. The general wildlife refuge boundaries have been agreed upon (approximately 22 acres) in consultation with the U.S. Fish and Wildlife Service (see Appendix E).

3. Archaeological/Historical Sites. The ultimate disposition of individual sites through further site investigation and development of a cultural resources management program will be accomplished prior to initiating site development.

4. Transportation Improvements. Timing of potential widening of Queen Kaahumanu Highway and intersection improvements in response to cumulative traffic volumes will need to be assessed by the State Department of Transportation when regional traffic conditions warrant improvements.

5. Air Quality and Noise Standards. Compliance with Federal and state standards will be achieved.

6. Housing. Availability of adequate housing opportunities on-site or in surrounding communities to meet project-generated needs will be determined prior to starting construction of the first hotel.

7. Public Access/Shoreline Management. Provisions for public access to and along the shoreline will be provided for in detailed site planning of the resort sites and resolved to the satisfaction of the county with the issuance of a Special Management Area permit. Appropriate county rules, regulations and ordinances regarding the provision of public amenities, e.g., parking restrooms, etc, will be met.

1.8 COMPATIBILITY WITH LAND USE PLANS AND POLICIES

The General Plan Amendment Application and Petition were submitted to the Hawaii County Planning Department on July 18, 1986. Upon acceptance of the Environmental Impact Statement, the General Plan Amendment will be processed by Hawaii County. The remaining approvals will be applied for sequentially or concurrently as allowed by law.

The proposed project will be consistent with: The Hawaii State Plan; the State Functional Plans; the Hawaii County General Plan; the Kona Regional Plan; and the Special Management Area (SMA) Rules and Regulations of the County of Hawaii. The proposed project's relationship to these and other land use plans and controls is described in Chapter VI.

As there are some inherent conflicts in goals and objectives of land use plans, policies and controls, the proposed action's relationship to these various policies must be reconciled against those plan elements, and policies that most appropriately apply. The proposed project is consistent with the applicable Hawaii County General Plan goals, policies and standards except those for which this action is requesting to amend.

One of the most significant ways in which the proposed action fulfills governmental policies, and *therefore*, is thought to offset any adverse effects, is through the satisfaction of the Hawaii State Plan policy which states that "Planning for the State's economy in general shall be directed toward achievement of the following objectives: (1) Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaii's people...To achieve the general economic objectives, it shall be the policy of this State to:...Encourage labor-intensive activities that are economically satisfying...Promote economic activities, especially those which benefit areas with substantial unemployment problems...Encourage businesses that have favorable financial multiplier effects within Hawaii's economy."

No significant adverse effects are expected to result from the proposed Makalawena Resort development. There are some minor impacts, but these are more than offset by the benefits the project will offer. State and county plans have encouraged quality resort development along this coast. The infrastructure ultimately required to serve the project will be largely provided by the project developer. The General Plan Amendment, including Land Use Pattern Allocation Guide Map (LUPAG) change and Intermediate Resort Designation, are initial steps in a process of project review necessary to assure a quality destination resort.

The government policies calling for increased access to the shoreline, increased recreational opportunities and the provision of appropriate housing opportunities for employee housing will also be met in the proposed Makalawena Resort. The archaeological preserves, wildlife refuge, shoreline access and golf course are recreational benefits that further offset any environmental costs associated with the requested General Plan Amendment and subsequent resort development approvals.

Generally, the plan is consistent with relevant government plans and policies. It would fulfill the goals of the Hawaii County General Plan which call for economic growth that maintains a desired physical environment and that meets the needs of Hawaii's people.

1.9 LIST OF PERMITS OR APPROVALS

In order to implement the proposed development program, several regulatory approvals and permits will be required. Although other approvals may be required for specific project construction within the resort, the following are both necessary and/or probable approvals that have been identified.

TABLE I-1
Permits or Approvals Required

Authority/Land Use Designation	Approval Required
COUNTY OF HAWAII	
General Plan	
o Open (LUPAG)	None
o Conservation (LUPAG)	General Plan Amendment with EIS
Zoning	
o Open	Change of Zone
Special Management Area (SMA)	SMA Permit
Tsunami/Flood Zone	None
Subdivision Approval	Subdivision (Preliminary & Final)
Grubbing, Grading Excavation and Stockpiling Permit	Grading Permit
Well Permit	Well Permit
Sign Permit	Sign Permit
STATE OF HAWAII	
State Land Use	
o Conservation District	SLUC Boundary Amendment w/EIS

TABLE I-1 (continued)

Authority/Land Use Designation	Approval Required
Department of Land And Natural Resources o Conservation: Resource Subzone o Conservation: General Subzone o Historic Sites (Chapter 6E Review)	Conservation District Use Application/Permit (Not required once SLUC Boundary Amendment Approved) Review/Approval
Department of Health o Private Wastewater Treatment o Underground Injection Control	Certification/Permit UIC Permit
Department of Planning and Economic Development o CZM Consistency Review	If Coastal Ponds or Shoreline Modified, COE Permit Required
FEDERAL GOVERNMENT	
Army Corps Of Engineers (COE)	If Coastal Ponds or Shoreline Modified, COE Permit Required
U.S. Fish and Wildlife Services	Section 7 Consultation (Endangered Species)

II

PROJECT DESCRIPTION

CHAPTER II

PROJECT DESCRIPTION

2.1 REGIONAL LOCATION

The lands of Makalawena are located on the west coast of the island of Hawaii in the district of North Kona, approximately 3.5 miles north of Keahole airport and 10 miles north of Kailua-Kona town (Figures II-1 and II-2). The property includes Tax Map Key: 7-2-04:01 (353.5 acres). Lands to the north and south are owned by the state of Hawaii (Figure II-3).

2.2 HISTORICAL PERSPECTIVE

Makalawena is located within the ancient North Kona land section of Kekaha. The Kekaha land section is traditionally described as barren and desolate, but also noted for its excellent inshore and offshore marine resources.

The lands of Kekaha supported a substantial prehistoric settlement with a lingering population of permanent residents remaining into the middle of the 20th century. This settlement was located primarily on the coastline in a small pocket of habitable lands such as Kaupulehu, Anaehoomalu, Makalawena and Mahai'ula. These settlements, however, were not isolated self-sufficient entities. They functioned in conjunction with a broader social and economic network which involved regional resources and regional leadership. Kekaha was not a rich land compared to the other parts of the Kona region, but at a broad level the trading and sharing of resources from mountain to ocean established a functional setting for sustained settlement.

A prehistoric coastal trail system established an essential communication link among the distant regions of West Hawaii and brought the remote settlements at places like Makalawena into closer contact with the outside world. Later trails sought more direct routes that passed further inland. Historic trail improvements also took place to accommodate horse and cart traffic. Remnants of a coastal foot trail are visible in the lava area adjacent to Makalawena and an improved trail leads into the uplands from Opae'ula Pond.

Opae'ula was a primary feature in the prehistoric landscape although its significance in terms of settlement has not been fully determined. Red Shrimp or Opae'ula were said to appear

naturally in the pond and may have been harvested prehistorically for bait to catch schooling fish such as opelu and akule.

2.3 STATEMENT OF OBJECTIVES

As developer of this project, Kamehameha Schools/Bernice Pauahi Bishop Estate, the owners, have the financial capabilities to plan, develop and market the planned Makalawena Resort. The objective is to develop a high quality, low density resort community at Makalawena that will provide a luxury hotel, golf-oriented multi-family residences, a tennis complex, a wildlife refuge surrounding Opae'ula Pond and improved public access to the beaches fronting the property. Although capable, the land owners will seek experienced resort developers and hotel operators with proven track records to support the execution of this project. Through their understanding of the site and sensitivity to the valued natural and historic resources along this coastline, the owners are committed to contributing to the continued growth of the visitor industry in West Hawaii and at Makalawena in particular. As a quality master planned resort community, Makalawena Resort would contribute significantly to the North Kona region and become an integral part of the community.

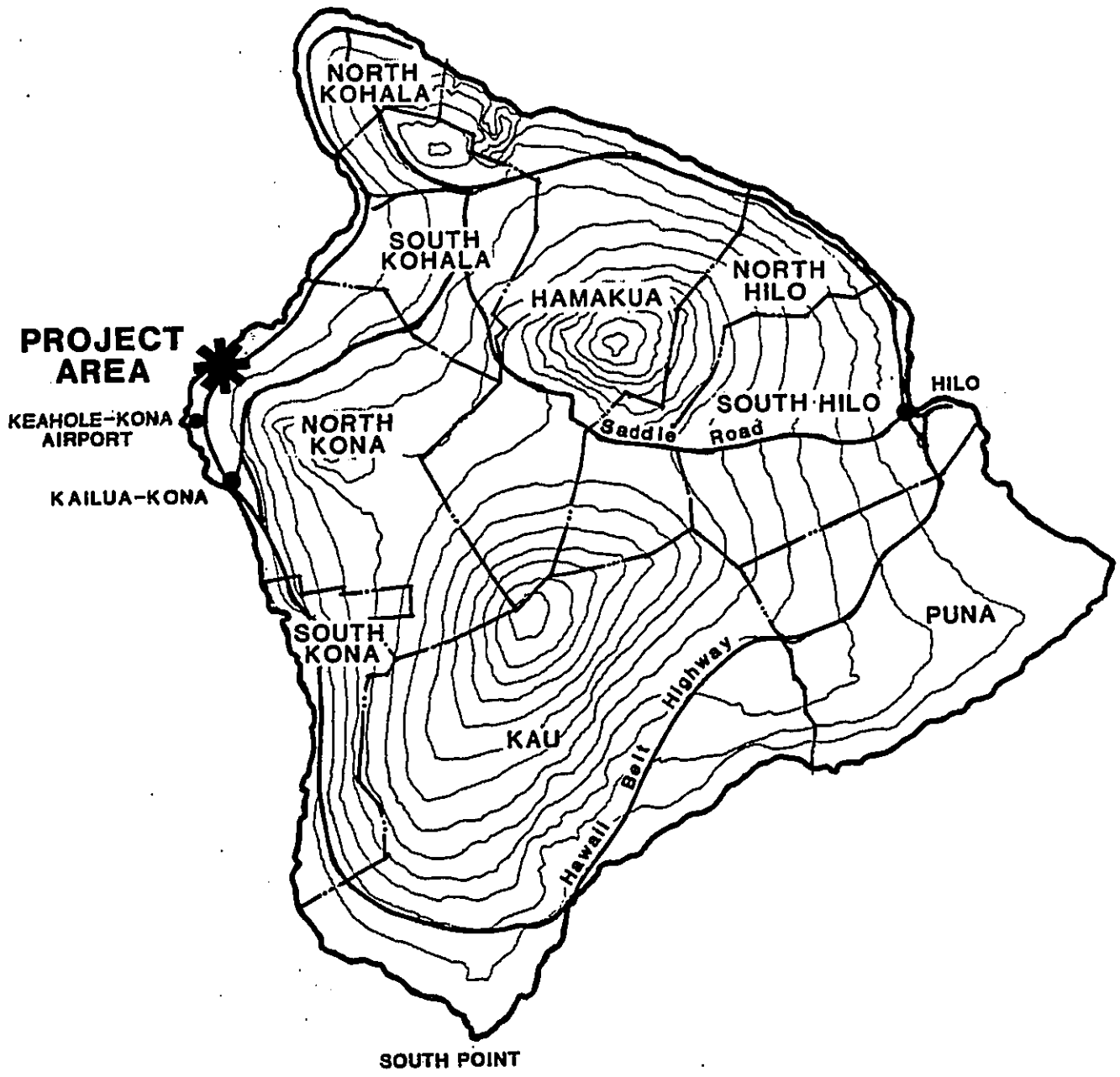
2.4 STATEMENT OF PURPOSE AND NEED FOR ACTION

A General Plan Amendment is needed so the proposed development of the Makalawena Resort would be in complete conformance with the county land use and regulatory controls. Figures II-4 and II-5 indicate the existing and proposed General Plan land use designations. As required by Chapter 343, HRS, as amended, and the County Planning Department, an Environmental Impact Statement is required to address the potential impacts this project may have on the environment.

During the process of the General Plan Amendment or upon receiving county approval, the applicant will petition the State Land Use Commission for a Boundary Amendment to the Urban District that would allow the proposed development. The proposed Opae'ula Pond Wildlife Refuge would remain as Conservation District lands.

2.5 SITE CHARACTERISTICS

The bulk of Makalawena consists of rough lava land and supports a minimum of dry land vegetation. The coastal area is characterized by stretches of white sand beach backed by low lying sand dunes that are covered by Beach Morning Glory and a dense thicket of Kiawe. A grove of Ironwood trees were planted by the land-



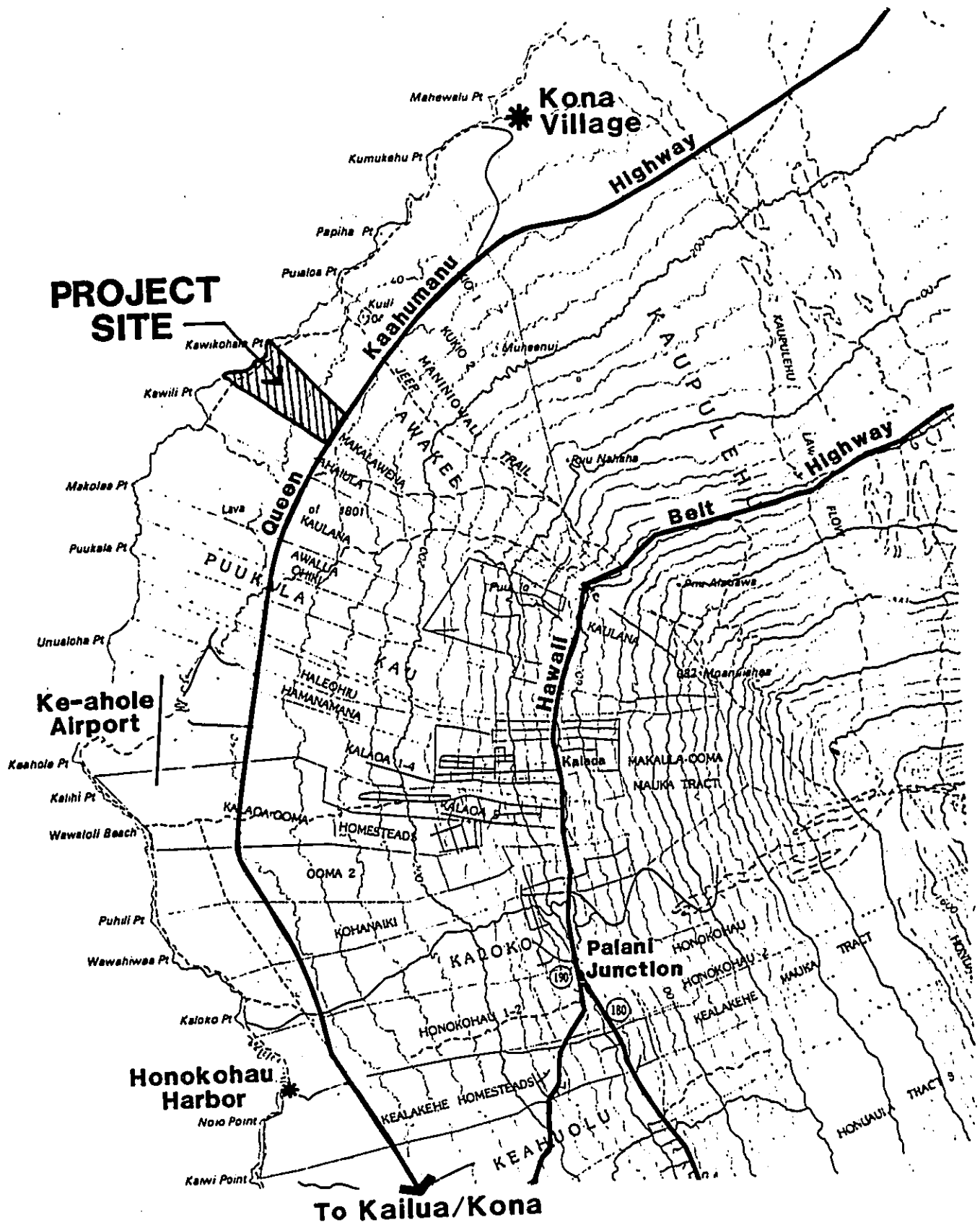
ISLAND LOCATION MAP

MAKALAWENA RESORT

0 3 6 12 MILES

pbr

FIGURE II-1



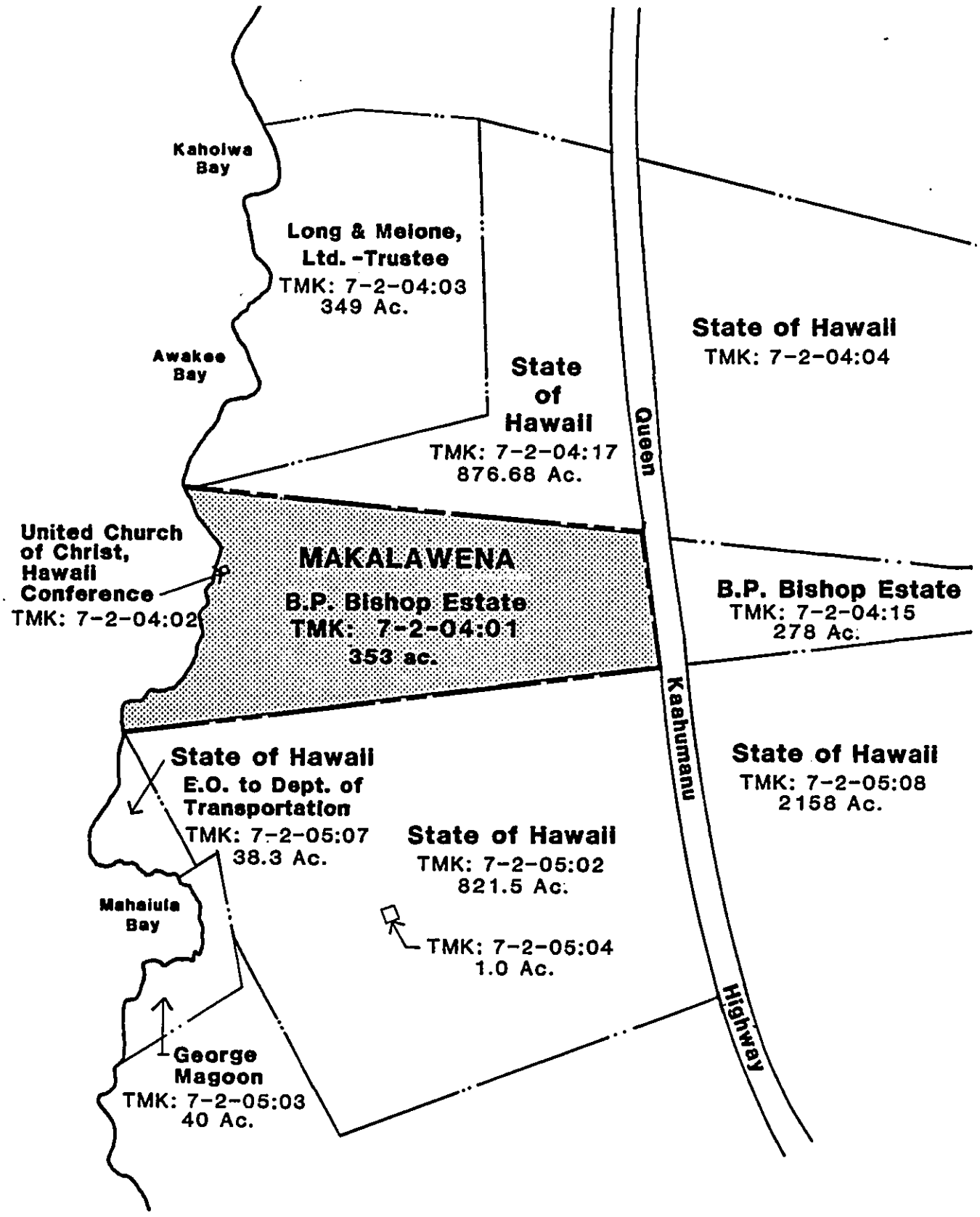
REGIONAL LOCATION MAP

MAKALAWENA RESORT

0 .4 .8 1.6 MILES

pbr

FIGURE II-2



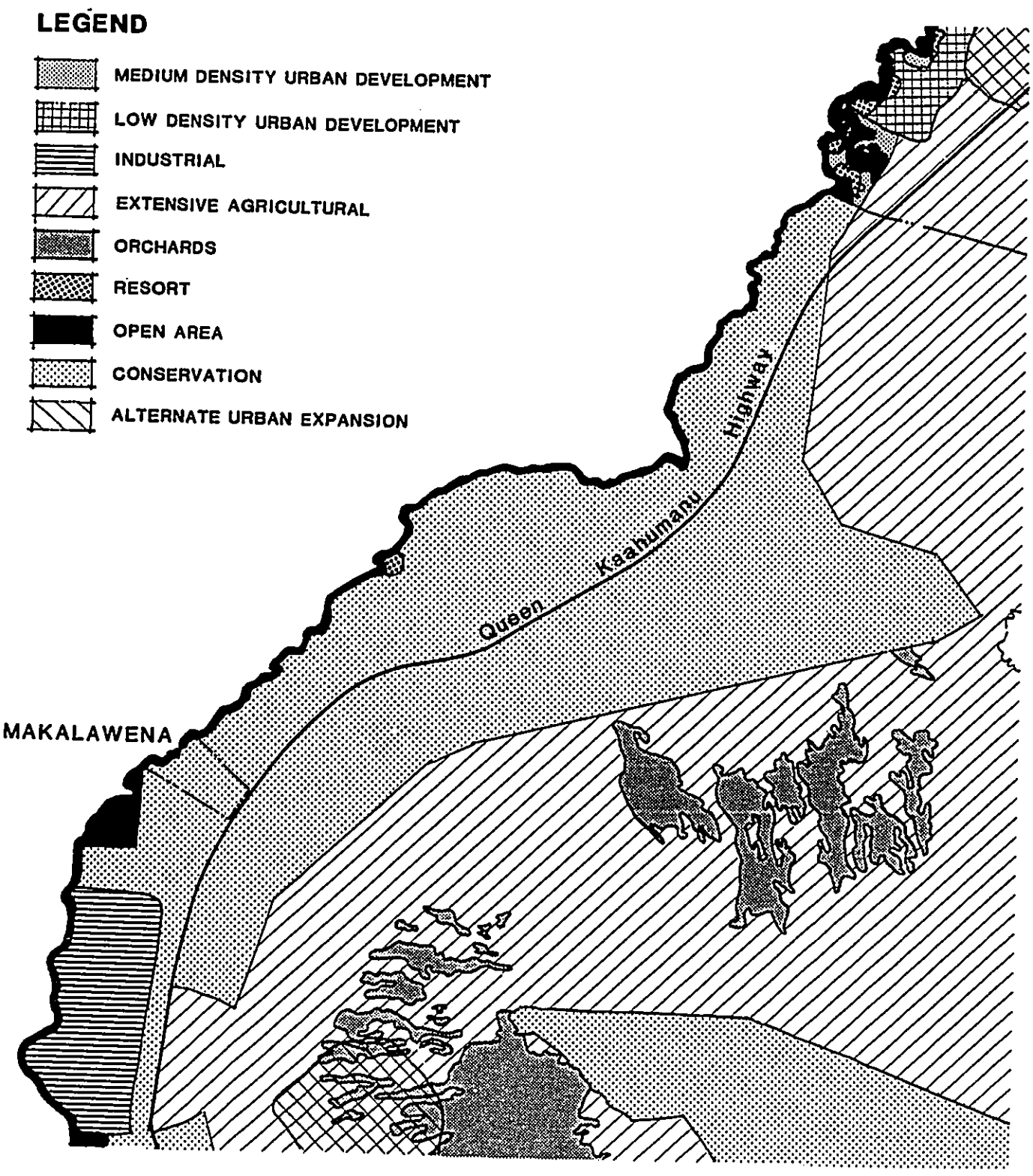
LAND OWNERSHIP/TAX MAP KEY

MAKALAWENA RESORT

0 500 1000 2000 FEET

pbr

FIGURE II-3



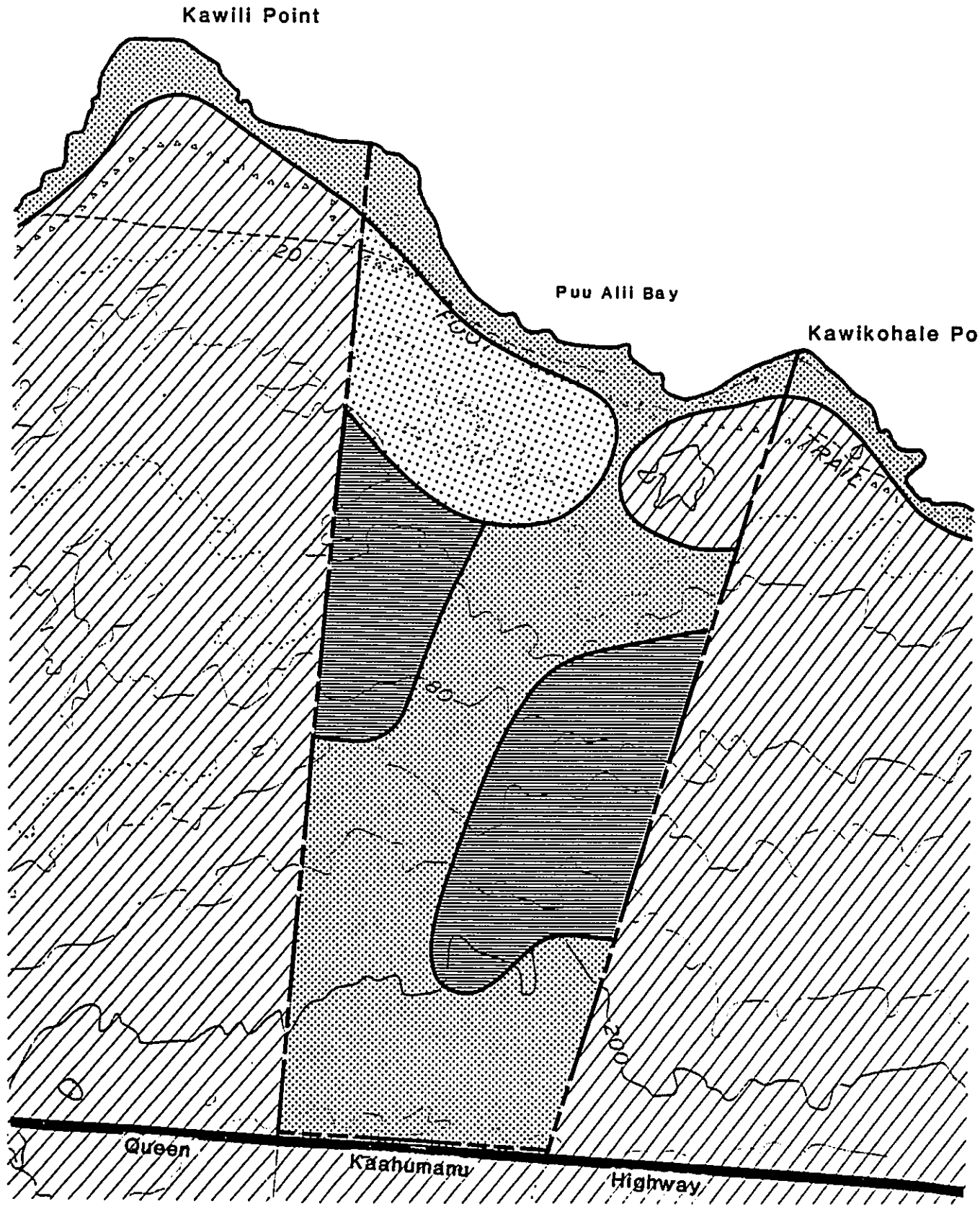
EXISTING HAWAII GENERAL PLAN

MAKALAWENA RESORT

0 .5 1 MILES

pbr

FIGURE II-4



LEGEND

CONSERVATION | OPEN AREA | RESORT | MEDIUM DENSITY

PROPOSED AMENDMENT–HAWAII GENERAL PLAN

MAKALAWENA RESORT

0 250 500 1000 FEET

pbr

FIGURE II–5

owner several decades ago along the northern coastal boundaries and now provides shade and visual diversity on an otherwise barren coastline. Makalawena has one of the few sandy beaches in North Kona and is a significant natural resource for the region as a whole.

Makalawena lies on the leeward side of the island of Hawaii at the foot of Hualalai. The area receives less than twenty inches of rainfall annually, much of which comes from southeasterly or Kona storms during the winter months. Winds are generally variable on a daily basis and lighter than the stiff trades common to the South Kohala coast.

Access to the makai lands of Makalawena is via a jeep road that traverses Awake'e (state lands) north of Makalawena and enters the property near the northwestern corner, adjacent to the beach. The beach area is used frequently by the public for shoreline fishing, camping, picnicking and sunbathing. Access to the coastline and beach from the coastline of public and private lands north and south of Pu'u Ali'i Bay is unrestricted.

Existing facilities at the beach consists of a small wooden caretaker's shelter. No other on site facilities are available.

2.6 DEVELOPMENT PLAN

The conceptual development plan for a high quality, low density resort community at Makalawena includes a 45-acre hotel site that could accommodate 900 to 1,200 rooms, approximately 90 acres of multi-family residences (900 to 1,350 units); and a championship 18 hole golf course, tennis center, wildlife refuge and roadway, and other infrastructure support facilities (Figure II-6). With a distinctive entry drive winding down through the golf course to the coastal area, the golf club house and tennis center are in close proximity to the hotel with access routes provided for residential areas. A shoreline open space and park area is provided along the entire shoreline with public access to be incorporated into the hotel site development. To protect and maintain the important wildlife habitat of the site, Opae'ula Pond would be incorporated into a Wildlife Refuge of approximately 22 acres. A management plan will be provided to assure the continued protection of this portion of the site (see Appendix E).

The preliminary land use allocation based on the conceptual development plan includes:

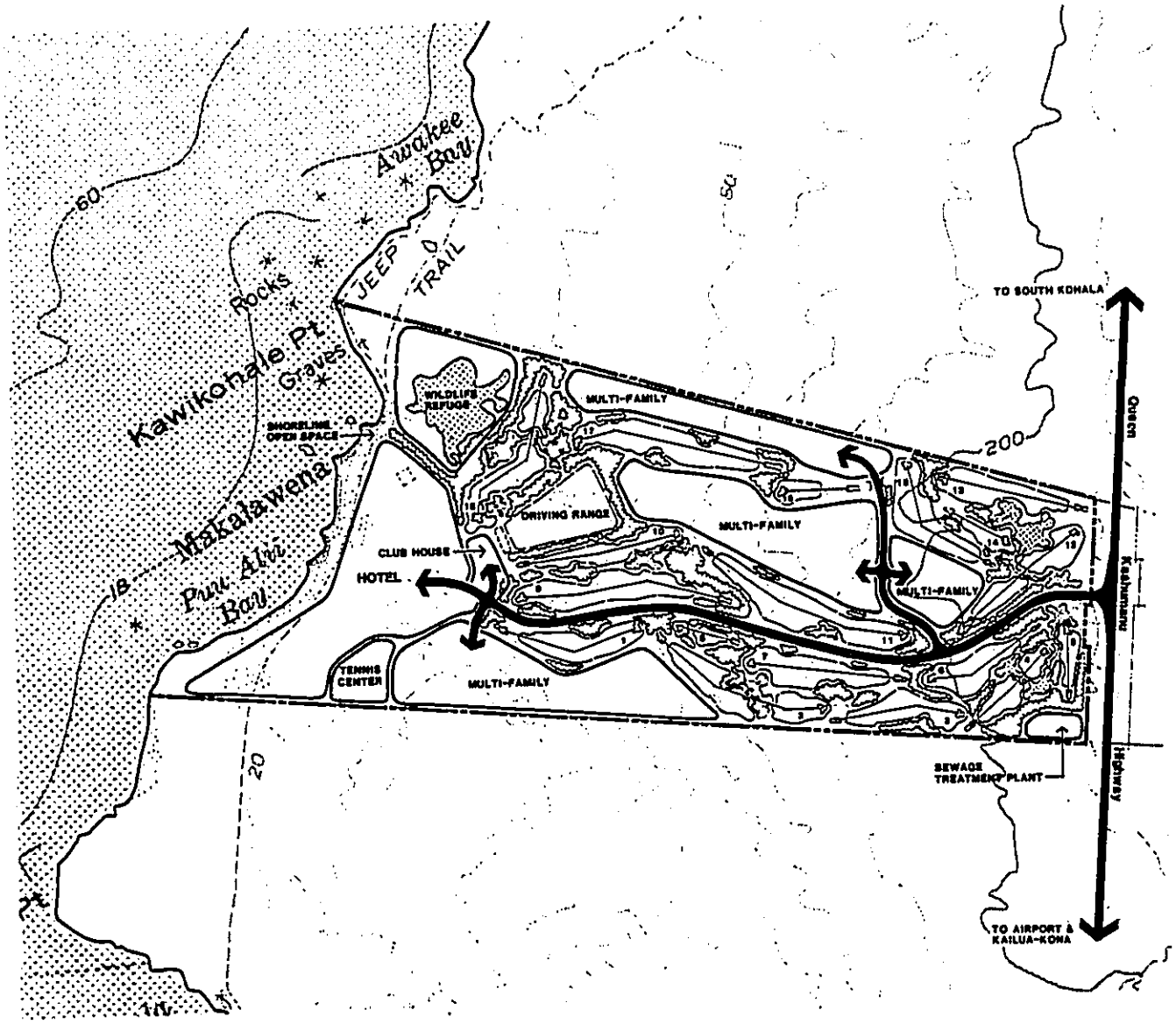
Land Use	Gross Acreage	Density Net	Units
Resort Hotel	45	20 - 25	900 - 1200
Multi-family Residential	90	10 - 15	900 - 1350
Golf Course	163.5	-	-
Tennis Center	5.5	-	-
Shoreline Open Space	15	-	-
Wildlife Refuge	22	-	-
Roads and Other Infrastructure	12.5	-	-
Total:	353.5 Acres		1800 - 2550

The land owner recognizes that there are innumerable land use development plans that could be formulated for Makalawena. However, the development plan presented herein is in keeping with the landowner's responsibility to manage and develop its lands for the long-term financial stability and return that are required to support the Kamehameha Schools.

The coastal brackish water ponds, including Opae'ula Pond, and adjacent historic sites of significance present an opportunity to provide visitors with an understanding of Hawaiian culture and pond ecology, while preserving and integrating these features into the development plan. Permanent structures will be set back from the beach area to increase the recreational opportunities in the coastal area.

Multi-family condominium sites will be located along the open space corridors of the golf course fairways. With a golf course orientation, the low density condominium developments will be linked by a pathway system to the major resort amenities. Approximately 900 to 1,350 multi-family units are planned at varied densities with a mix of compatible product types.

The units will be designed and landscaped to minimize their visual impact from the State Highway and retain sufficient open space to obtain a desirable landscape character. An overall density range of 10 to 15 units per acre is defined for the multi-family areas to provide project flexibility to meet changing market needs. Single family lots are not planned for the resort.



AREA SCALE

10 acres

3 ac | 5 ac | 1 ac

CONCEPTUAL DEVELOPMENT PLAN

SEPT. 1986

MAKALAWENA RESORT

0 325 650 1300 FEET

pbr

FIGURE II-6

An 18 hole golf course is proposed within the resort, with all holes, clubhouse and driving range located makai of the highway.

To assure a quality development with a unified environmental character, it is the applicant's intent to establish comprehensive design guidelines and covenants to control the overall resort development.

2.7 PHASING, TIMING OF ACTION AND TENTATIVE PROJECT SCHEDULE

The resort development will be phased to meet market needs and coincide with the necessary infrastructure improvements including site access and roadways, installation of the water and electrical power system, and the incremental phasing of the sewage treatment plant. Based on current market projections, the Resort would be developed over a period of approximately 15 years (1990 - 2005). Figure II-7 shows the approximate phasing of development for the resort dependent upon receiving the necessary governmental approvals.

Based on the necessary regulatory approvals required, Phase I assumed a 1989 start of construction date with Phase II commencement estimated to begin in 1995 or as required to meet the market needs. Refer to Section 2.9 for project market demands over a 15-year period in five year increments.

Tentative Project Schedule

Project Element	Estimated Start	Estimated Complete	Elapsed Time:
1. Complete EIS	June 1986	Dec. 1986	6 months
2. State Land Use Commission Boundary Amendment	Jan. 1987	Aug. 1987	8 months
3. County General Plan Amendment	Dec. 1986	Sept. 1987	9 months
4. Detailed Planning/Site Designs	Sept. 1987	Feb. 1988	6 months
5. County Zoning and Special Management Area Permit	Feb. 1988	Sept. 1988	8 months
6. Subdivision Approval and Construction Plans	Feb. 1988	Apr. 1989	14 months
7. Phase I Construction - Increment One (Infrastructure, Resort Hotel, Golf Course, Multi-family Residential)	June 1989	Dec. 1990	18 months

TABLE II-1

Summary of Order of Magnitude Development Costs (1986 Dollars)
For Makalawena Resort

Improvements	Total Cost ($1,000,000) Low Range Units (1,800 units)	High Range Units (2,550 units)
Off Site and On Site Infrastructure		
Water (Deep Well and Transmission)	$ 4.210	$ 5.960
Irrigation Well	$ .600	$ .600
Electricity and Telephone	$ 1.850	$ 1.850
Intersection at Highway		
Roads and Intersection	$ 1.160	$ 1.160
Wastewater Collection/Treatment	$ 2.730	$ 3.180
Subtotal:	$ 10.550	$ 12.750
Resort Project Development (includes wildlife refuge)	$ 130.750	$ 174.000
Multi-family Residential Project Development	$ 123.750	$ 177.750
Golf Course, Tennis Center, and Beach Club	$ 9.550	$ 9.550
Subtotal:	$ 274.600	$ 374.050
Contingency (20%):	$ 54.920	$ 74.810
Total:	$ 329.520	$ 448.860

Tentative Project Schedule (continued)

8. Resort Hotel Completed/Open (Increment One)	--	Dec. 1990	--
9. Multi-family Residential Units Completed (Increment One)	--	Oct. 1991	--
10. Phase I Construction Complete, Begin Phase II Construction	1995	2003	8 years
11. Projected Total Resort Development Completed/Units Sold	1990	2005	15 years

As is the case with any development similar to the proposed project, market conditions at any given time, as well as permitting and other governmental procedures, will determine the specific schedules for each element of the project. As the final design and construction drawings and specifications for each project element are developed, specific schedules for those elements will be developed and provided to the public and appropriate public agencies. It is the intent of the developer to keep the community informed of the actions that will take place as soon as definitive schedules for those actions are available.

On-site and off-site infrastructure improvements are estimated at approximately 12 million dollars (1986 dollars). At build-out, the total development costs are estimated at over 330 million dollars (1986 dollars).

Table II-1 summarizes the projected order of magnitude development costs for completing the entire resort.

The resort hotel complex, or first increment thereof, will be included in the first phase along with the wildlife refuge, 18 hole golf course and a portion of multi-family residential units. As projected, the initial phase of development will include approximately 300 acres (over 85 percent of the site).

2.8 NEED FOR THE PROJECT

The lands of Makalawena lie along the scenic west coast of the island of Hawaii, 3.5 miles north of Keahole Airport in the North Kona district. Over the past 20 years, the coastline from Keauhou to Kawaihae, including North Kona and South Kohala, has become the focus of international efforts to develop a world-class destination resort area. These efforts have generated three major resort areas in South Kohala, each with its own identity (Figure II-8). The population base of West Hawaii has increased in support of coastal development and the future of the region reflects continued economic growth.

In a region where sand beaches are the exception rather than the rule, the 3,000 lineal feet of ocean frontage that includes four crescent white sand beaches backed by sand dunes with Beach Morning Glory and Kiawe thicket are a natural resource that would be integrated into the proposed project as both a resort and public amenity.

Additionally, strong tradewinds that buffet the coast of South Kohala are less frequent at Makalawena and climate conditions are excellent for resort development. The site's proximity to the international airport at Keahole Point and the existing resident population base at Kona provide an efficient access for visitors with an existing base of goods and services nearby.

A market assessment, included herein, has been prepared to determine the opportunities for developing a successful resort destination area at Makalawena Beach. This assessment presents a basis for a project feasibility analysis that is appropriate at this stage of planning.

2.9 DEMAND FOR THE PROJECT: MARKET ASSESSMENT

2.9.1 Introduction

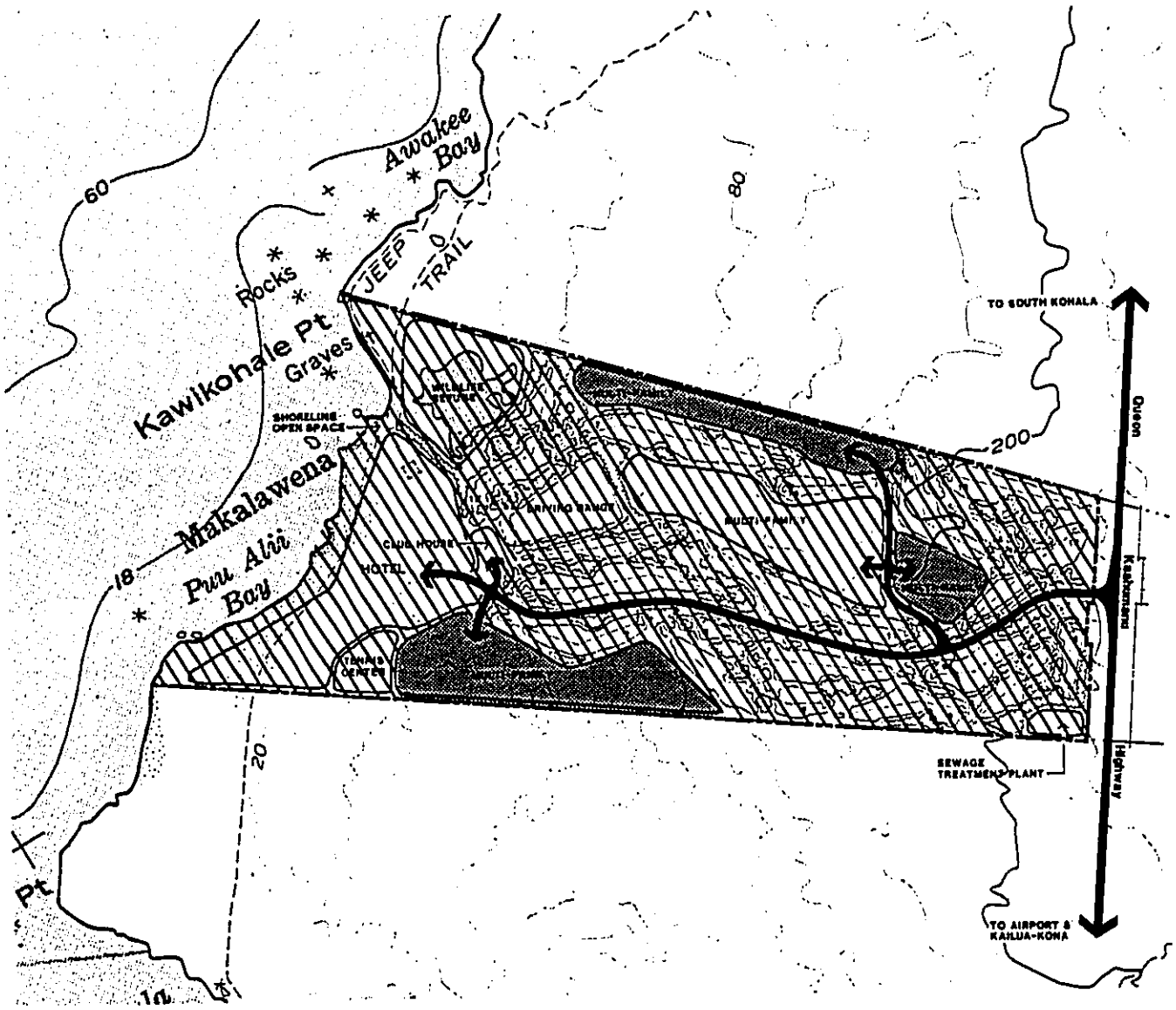
This section assesses market demand for the developments proposed at Makalawena. The subsections below summarize trends in the visitor industry statewide and on the island of Hawaii and present the market analyses for the hotel and multi-family condominium projects proposed.

2.9.2 Visitor Industry Trends

Visitors are the largest source of income to the state of Hawaii, contributing over $4.9 billion to the state economy in 1985. The Hawaii Visitors Bureau (HVB) estimates and reports visitors to the state, separating visitors in terms of travel direction. Westbound visitors are defined as those arriving from North America and traveling to Hawaii and other destinations in the Pacific and Asian areas. Eastbound visitors are defined as those visitors traveling from Asia (primarily Japan) and the Pacific to Hawaii.

2.9.2.1 Statewide Visitor Arrival Trends

Total overnight visitors to the state of Hawaii have grown at 19.4 percent compounded annually from 1960 to 1970, 8.5 percent from 1970 to 1980 and at 4.4 percent per annum since 1980, as shown in Table II-2. Visitor arrivals growth slowed in 1980 and



LEGEND

PHASE I

PHASE II

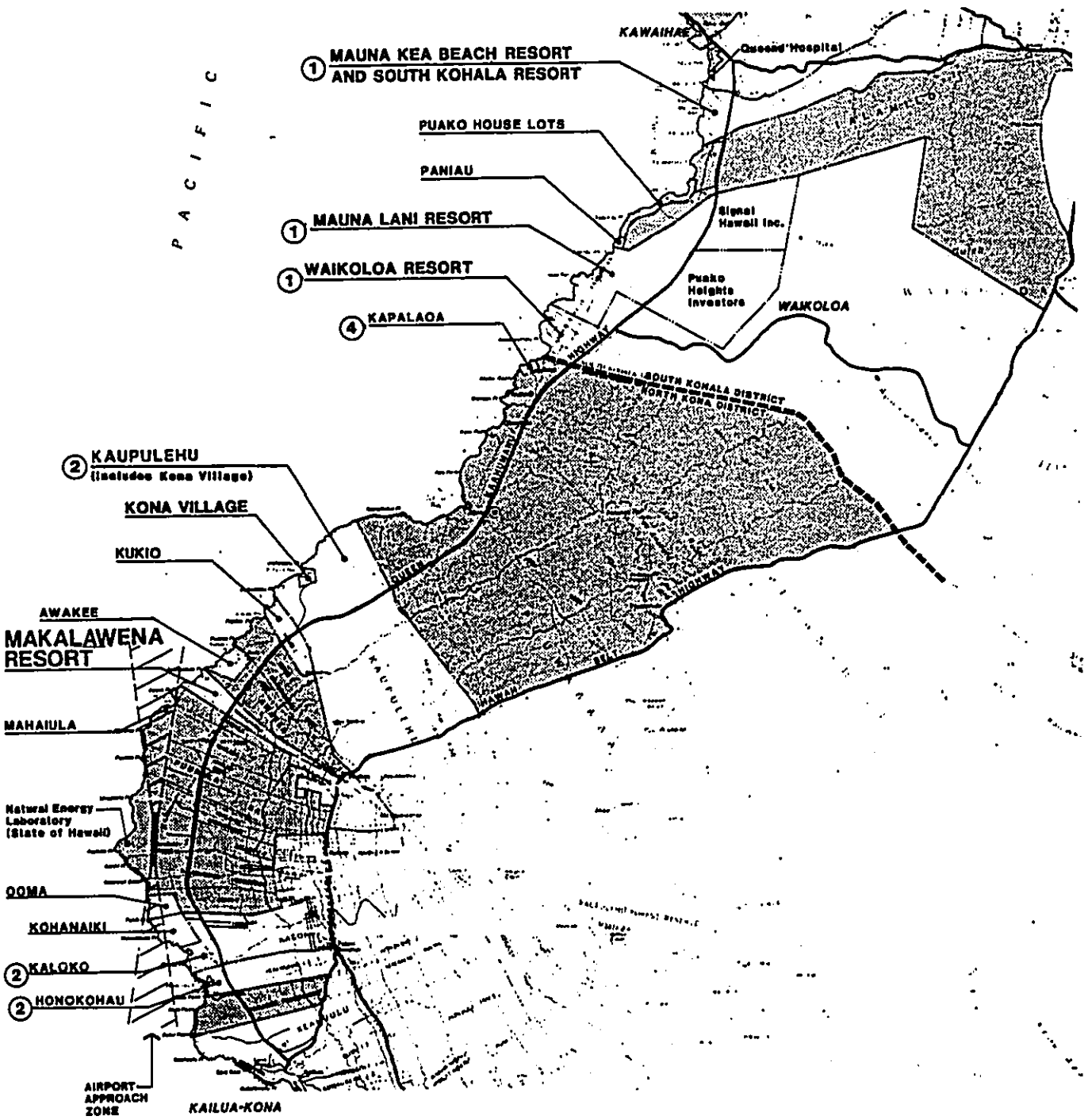
PROPOSED PHASING PLAN

SEPT. 1986

MAKALAWENA RESORT

pbr

FIGURE II-7



LEGEND

GENERAL PLAN DESIGNATION

① Major Resort

② Intermediate Resort

③ Resort Retreat

④ Medium Density Residential

State Land

WEST HAWAII COASTAL DEVELOPMENT

MAKALAWENA RESORT

0 1 2 4 MILES

pbr

FIGURE II-8

1981, following a national slowdown in economic growth, a United Airlines strike and rapidly escalating fuel and air travel costs. Declining visitor arrivals in these years were most evident among westbound visitors, as also shown in the exhibit. Growth in visitor arrivals since 1981 have ranged from a low of 0.3 percent in 1985, due to another United Airlines strike, to a high of 11.9 percent in 1984. In the first six months of 1986, visitor arrivals were up 15.3 percent over the comparable period in 1985.

2.9.2.2 Neighbor Island Visitor Arrival Trends

Prior to the development of resorts on the neighbor islands, visitors to Hawaii primarily stayed in Waikiki. With the development of resort destination areas on the neighbor islands, increased marketing efforts, the provision of "common" air fares and direct flights to the neighbor islands from the U. S. mainland, travel to the neighbor islands has grown dramatically.

Island Market Shares: In 1970, 94 percent of westbound travelers visited Oahu, but this figure has since declined to 76 percent, as shown in Table II-3. Making up this difference, westbound visitors to Maui County have increased most rapidly, from 34 percent of statewide westbound visitors in 1970, to 48 percent in 1986, as also shown in the exhibit. Maui has achieved this growth primarily through the successful development and marketing of destination resort areas and public policy supportive of the industry. By contrast, the island of Hawaii has lost market share over this period, from 36 percent of westbound visitors to the state in 1970, to 18.8 percent in 1985 as also shown in the exhibit. This decline, however, has occurred because Hilo was formerly a common point of landing for westbound carriers entering the state, as well as because of the increasing competitiveness of the other neighbor island destinations.

Table II-2

Overnight Visitors to the State of Hawaii

1960 to 1986

Year	Westbound Number	Westbound Annual percentage growth	Eastbound Number	Eastbound Annual percentage growth	Total	Average annual percentage growth
1960	250,795	- %	45,722	-%	296,517	- %
1965(1)	567,218	17.7	119,710	22.3	686,928	18.6
1970	1,326,135	18.5	420,835	28.6	1,746,970	20.5
1975	2,207,417	12.1	621,688	15.4	2,829,105	13.0
1976	2,551,601	15.6	668,550	7.5	3,220,151	13.8
1977	2,763,312	8.3	670,355	.3	3,433,667	6.6
1978	3,030,999	9.7	639,310	4.6	3,670,309	6.9
1979	3,139,455	3.6	821,076	28.4	3,960,531	7.9
1980	3,046,132	(3.0)	888,372	4.4	3,934,504	(0.7)
1981	2,974,791	(2.3)	959,832	8.0	3,934,623	- (2)
1982	3,278,519	10.2	964,400	.5	4,242,919	7.8
1983	3,395,880	3.6	972,000	0.8	4,367,880	2.9
1984	3,721,380	9.6 (3)	1,134,200	16.7(3)	4,855,580	11.9 (3)
1985	3,708,610	(0.3)	1,175,500	3.6	4,884,110	.3
1986 (January to May)	2,140,680	N/A	689,280	N/A	2,829,960	N/A
Compound annual percentage increase:						
1960 to 1970		18.1		24.9		19.4
1970 to 1980		8.7		7.8		8.5
1980 to 1985		4.0		5.7		4.4

N/A Not applicable.
(1) Visitor statistics collection system was revised in 1964.
(2) Not significant.
(3) Represents change from same period in previous year.

Source: Hawaii Visitors Bureau, annual and monthly reports.

TABLE II-3

Percentage of Westbound Visitors
Visiting the Major Hawaiian Islands

1970 to 1986

Year	Oahu	Hawaii	Maui(1)	Kauai
1970	94.0%	35.6%	33.8%	30.9%
1975	85.6	34.9	42.2	28.7
1976	85.0	32.0	43.5	27.4
1977	83.1	30.4	45.5	26.8
1978	82.3	30.0	46.3	27.6
1979	81.0	27.4	45.2	26.3
1980	78.7	25.0	45.2	25.7
1981	80.6	21.8	45.2	24.6
1982	79.0	21.5	49.1	23.2
1983	76.3	21.0	50.1	21.1
1984	78.0	20.3	49.7	21.7
1985	76.3	18.8	49.4	22.4
1986 (January to May)	N/A	19.0	47.6	23.4

N/A Not available.
(1) Includes the island of Molokai.

Sources: Hawaii Visitors Bureau, Annual Research Report, annual and monthly. Figures reported represent percentage of the state's visitors who intended to visit each island; most tourists visit more than one island during their stay in Hawaii.

Length of Stay: With the increasing visitor attractions and facilities on the neighbor islands, average lengths of stay have also increased considerably. This is again, most noticeable on Maui, the first island to develop and market destination resort areas with complete amenities.

Between 1970 and 1985, average length of stay on Maui increased by 3.4 days, as shown in Table II-4. Kauai also showed a considerable increase, from 2.7 days in 1970, to 5.0 days in 1985, as also shown in the table. In contrast, lengths of stay on the islands of Oahu and Maui, which have logged in the development and marketing of destination resorts, have increased only modestly over the period with the more aggressive pursuit of visitor industry development. The island of Hawaii may also be expected to realize significantly increased lengths of stay in future years.

Island of Hawaii: Westbound arrivals to the island of Hawaii increased at an average 5.5 percent per annum between 1970 and 1980, but declined by an average 1.8 percent per annum between 1980 and 1985 due to the significant loss of visitors in 1985 resulting from the United Airlines strike, as shown in Table II-5. As in the rest of the state, however, arrivals in the first months of 1986 were showing a strong recovery over 1985. Hawaii County's slow visitor growth has been due to its relatively slower facility development, historically greater dependence on agriculture and less prominent market image among westbound travelers compared to the other neighbor islands.

2.9.2.3 Visitor Characteristics

The HVB surveys characteristics of westbound visitors to the island of Hawaii. Although no survey of eastbound visitors has been made, inferences can be made based on the profile of the typical Japanese visitor to the State.

Westbound Visitors: As compared to other state visitors, island of Hawaii westbound visitors are relatively older and are more likely to be retired, as shown in Table II-4. Visitors traveling to the island also tend to stay longer in the state and are more likely to travel as part of an organized tour group. The average length of stay on the island itself is 3.8 days.

Westbound visitors to the island of Hawaii typically reside in the continental United States. The largest segment, representing 32 percent of all visitors to the island of visitors, are residents of West Coast states and Alaska. The residency of island of Hawaii visitors is similar to visitors to the state as a whole, also shown in the table.

Eastbound Visitors: Eastbound visitors are estimated to have represented less than 10 percent of visitors to the island of Hawaii in 1984. Although little specific information on these visitors is available, data on statewide Japanese visitors, also presented in Table II-6, is useful in analyzing this market. Compared to westbound visitors, Japanese visitors are significantly younger and are almost always (90.6 percent) part of a tour group. Most importantly, because of their relatively short average length of stay in the islands (4.9 days), most Japanese visit the neighbor islands on day tours only and do not stay overnight.

TABLE II-4

Average Length of Stay of Westbound Overnight and Longer Visitors by Island

1970 to 1985
(Days)

Year	Oahu	Hawaii	Maui	Kauai
1970	6.03	2.94	2.97	2.68
1975	5.97	3.08	3.42	2.85
1976	5.99	3.04	3.50	2.85
1977	5.88	3.13	3.62	2.97
1978	5.83	3.25	3.77	3.08
1979	5.85	3.39	4.01	3.27
1980	5.78	3.46	4.08	3.40
1981	5.91	3.56	4.13	3.48
1982	5.77	3.62	4.26	3.51
1983	6.96	4.52	5.61	4.22
1984	7.49	3.64	6.47	4.91
1985	7.24	4.21	6.36	5.03
Increase from 1970 to 1985	1.21	1.27	3.39	2.35

Source: Hawaii Visitors Bureau, Research Department, July 1986.

TABLE II-5

Westbound Visitor Arrivals
to the Island of Hawaii

1970 to 1986

Year	Percent of State westbound visitors	Visitor arrivals	Percentage increase (decrease)
1970	35.5%	445,401	- %
1975	34.9	769,779	3.6
1976	32.0	816,514	6.1
1977	30.4	839,008	2.8
1978	30.0	908,983	8.2
1979	27.4	860,940	(5.3)
1980	25.0	761,103	(11.6)
1981	21.8	648,382	(14.8)
1982	21.5	703,901	8.6
1983	21.8	739,050	5.0
1984	20.4	760,940	3.0
1985	18.8	698,340	(8.2)
1986 (January to May)	N/A	339,990	10.8 (1)
Compound annual percentage increase:			
1970 to 1980			5.5
1980 to 1985			(1.8)

(1) Compared to comparable period in 1985.

Source: Hawaii Visitors Bureau, Annual Research Reports.

TABLE II-6

Island of Hawaii Visitor Characteristics

	Island of Hawaii westbound visitors	Visitors to the State of Hawaii: Westbound visitors 1984	Visitors to the State of Hawaii: Japanese visitors 1982
Sex (percentage distribution):			
Male	45.4%	44.8%	48.3%
Female	54.6	55.2	51.7
Total	100.0%	100.0%	100.0%
Median age	45.8	40.1	27.7
Occupation (percentage distribution):			
Professional and technical	36.6	36.3	14.7
Business, managerial official	23.9	25.2	19.6
Clerical, office, sales	7.6	9.6	48.3
Retired	20.8	13.6	N/A
Other	11.1	15.3	17.4
Total	100.0%	100.0%	100.0%
Intended days of stay in:			
State of Hawaii	11.4	10.3	4.9
Island of Hawaii	3.8	-	Less than 1 day(1)
Pleasure trip (percent of total)	80.1%	79.7%	94.7%
Average party size	1.86	1.84	1.66
Repeat visitors (percent of total)	48.3%	47.3%	24.5%
Organized tour group (percent of total)	24.6%	18.8%	90.6%
Stay in hotel	61.3	62.7	97.9%
Stay in condominium	13.2	19.6	N/A
Residence:			
United States:			
West Coast, including Alaska	31.6%	35.2%	N/A
Mountain	7.2	6.7	N/A
Central states	30.3	28.4	N/A
New England	3.2	3.2	N/A
Atlantic	18.8	16.6	N/A
Total United States	91.1	90.1	N/A
Canada	7.7	8.4	N/A
Other foreign	1.2	1.5	N/A
Total	100.0%	100.0%	N/A

N/A Not applicable.
(1) Neighbor islands are commonly visited in a one-day tour.

Source: Hawaii Visitors Bureau, A Study of Westbound Visitors to the Island of Hawaii, 1984; 1982 Annual Research Report.

2.9.2.4 Projected Visitors to the Island of Hawaii

Projections for visitors to the state of Hawaii through the year 2000 reflect continuing increases in both west- and eastbound visitors and are based on projections prepared by the Hawaii State Department of Planning and Economic Development (DPED). According to the DPED, the State could expect to receive about 6.1 million visitors by 1990 and nearly 8.2 million by 2005.

Westbound Travelers: An increasing proportion of state westbound visitors are projected to visit the island of Hawaii. The anticipated increase is expected to result from increased visitor facilities development as well as the aging of the visitor plant on Oahu. As shown in Table II-7, the percentage of the state's westbound visitors traveling to the island of Hawaii is projected to reach 30 percent by 2005, reapproaching the levels experienced in the mid-60s and early 70s. This would result in a compound annual increase in westbound visitors to the island of 4.6 percent from 1986 to 2005.

TABLE II-7

Historical and Projected Visitor Arrivals to the State and Island of Hawaii 1970 to 2005

	Westbound			Eastbound(1)			Total visitors	
	State	Percent of state	Island of Hawaii	State	Percent of state	Island of Hawaii	State	Island of Hawaii
Historical:								
1970	1,320,135	33.6%	445,401	420,836	N/A	N/A	1,740,971	N/A
1975	2,207,417	34.9	769,779	621,688	N/A	N/A	2,829,105	N/A
1980	3,046,132	25.0	761,103	888,372	5.2%(2)	46,200	3,934,504	807,303
1983	3,395,880	21.0	739,050	972,000	4.6 (2)	44,700	4,367,880	783,750
1984	3,721,380	20.0	760,940	1,134,200	5.0 (2)	56,700	4,855,580	817,640
1985	3,708,610	18.6	695,340	1,175,500	5.0 (2)	58,800	4,884,110	754,140
Projected:								
1986(3)	3,850,400	20.0	770,000	1,291,600(5)	5.0	61,000	5,142,000	831,000
1990	4,461,000(4)	23.0	1,026,000	1,622,300(5)	6.0	97,300	6,083,300	1,123,300
1995	5,171,700(4)	27.0	1,396,400	1,880,500(5)	7.0	131,600	7,052,200	1,528,000
2000	5,709,900(4)	30.0	1,713,000	2,076,300(5)	8.0	174,600	7,786,200	1,887,600
2005	6,001,100(4)	30.0	1,800,300	2,182,300(5)	9.0	196,400	8,183,400	1,996,700
Projected compound annual percentage increase - 1986 to 2005	2.4%		4.6%	2.8%		6.3%	2.8%	4.7%

N/A Not available.

(1) Eastbound visitors not estimated prior to 1980.

(2) Estimated based on surveys of Japanese visitors to Hawaii county as reported by the Hawaii Visitors Bureau, Annual Research Report, 1980 and 1983.

(3) Based on the first five months' performance and projected for the year, using historical ratios.

(4) Non-Japanese visitors as projected by the Department of Planning and Economic Development, State of Hawaii, less those estimated to be traveling eastbound.

(5) Japanese visitors as projected by the Department of Planning and Economic Development, State of Hawaii, plus 33% non-Japanese estimated to be traveling westbound.

Sources: Hawaii Visitors Bureau, Annual Research Report, 1985; ibid, Survey of Westbound Visitors to the Island of Hawaii, 1983; and Department of Planning and Economic Development, State of Hawaii, Hawaii Population and Economic Projection and Simulation Model: Updated State and County Forecasts, 1984.

Facilities and Amenities: As shown in the exhibit, all but one of the resorts (Keauhou) have a good swimming beach. Developments completed to date range between 400 units or lots at the smallest (Mauna Kea, the relatively new Mauna Lani Resort and Molokai's Kalua Koi Resort) to 5,500 units at Kaanapali Resort. Amenities generally include golf, tennis and extensive water sports.

Eastbound and Total Travelers: The proportion of eastbound visitors traveling to the island of Hawaii is also expected to increase, but more gradually than are westbound visitors. Due to this increasing market share and the anticipated increase in the total number of eastbound visitors to the state, the number of eastbound visitors to the island could increase at approximately 6.3 percent annually from 1986 to 2005.

Growth Factors: These increases could be driven by the following factors on the island of Hawaii:

- The more rapid development of visitor facilities and amenities
- The diversification of visitor market segments served
- Improved air service to the island
- Increased and more effective marketing of the island
- Increasing disposable incomes in the areas in which visitors reside

Thus, in total, island of Hawaii tourism is expected to increase at 4.7 percent annually to a total of nearly two million visitors per year by 2005. Of this number, westbound visitor arrivals from the United States and Canada could continue to account for up to 90 percent of all visitors to the island of Hawaii.

A preliminary draft of the Hawaii County General Plan presents three sets of projections of westbound visitors to the County of Hawaii. The three sets are as follows:

Projected Westbound Visitors to County of Hawaii

Year	Series A	Series B	Series C
1985	837,000	837,000	837,000
1990	1,096,000	1,096,000	1,242,000
1995	1,337,000	1,396,000	1,500,000
2000	1,485,000	1,713,000	1,664,000
2005	1,553,000	1,800,000	1,973,000

Source: County of Hawaii Preliminary Draft General Plan.

Each set of projection is based on an alternative economic scenario as to the employment growth by industry sector and the

relative dependency on tourism. Series A is the most conservative projection and assume a demise of the sugar industry and a modest expansion of the visitor industry. Series B represents a medium series of projections. Series C is an optimistic outlook of the County's future.

In comparison, the projected visitor arrivals presented in Table II-7 represent the Series B projection or the medium series. These projections assumes that westbound visitor arrivals will increase 4.6% per annum for the period 1986 to 2005.

2.9.2.5 State of Hawaii Resorts

Characteristics of major Hawaii resorts are reviewed to provide a prospective as to the market position of Makalawena in comparison to other Hawaii resorts. Table II-8 presents characteristics of the major destination resorts in Hawaii in terms of site area, site characteristics, existing development, visitor facility, room rates and prices, market appeal and visitor profile.

TABLE II-8

Characteristics of Hawaii Resorts

	Island of Hawaii resorts			
	Keauhou	Waikoloa Beach	Mauna Kea	Mauna Lani
Site area (acres)	890	500	1,100	614
Distance from interisland airport	12 miles (Keahole)	17 miles (Keahole)	26 miles (Keahole)	20 miles (Keahole)
Special site characteristics	Protected bay Several heiaus Burial grounds Ancient settlement areas	Protected bay 2 fish ponds Petroglyphs Burial caves Ancient trail	Isolated beaches Several heiaus Historic building	6 major fish ponds Numerous archaeologic sites and artifacts Ancient trail
Existing development:				
Hotel rooms	1,302	548	310	351
Condominium units	832	66	23	136
Single-family lots	109	-	55	-
Total units	2,243	614	388	487
Amenities:				
Beach	Rocky, poor swimming, public beach nearby	White sand	White sand	Sandy, rocky bottom
Shoreline (linear feet)	13,000	7,000	14,100	14,200
Percent usable for swimming	0%	32%	32%	10%
Commercial space in shopping centers	-	-	-	-
Golf course holes	36	18	18	18
Tennis courts	18	6	9	10
On-site activities	Fishing, hunting, snorkeling, scuba diving	Deep-sea fishing, scuba diving, catamaran cruises, sailing, windsurfing	Deep-sea fishing, scuba diving, catamaran cruises, horseback riding, hunting	Jogging course, hiking scuba diving, horseback riding
Hotel developments:				
Hotel class	Tourist/first-class	Luxury/first-class	Luxury	Luxury
1986 average hotel room rates(1):				
Single	$50 - $115	$55 - $110	$225 - $345	$185 - $375
Double/triple	65 - 130	55 - 110	270 - 360	185 - 375
Typical condominium unit sales prices (1985)(2)	$95,000 - $170,000	$200,000 - $560,000	$750,000 - $1,300,000	$300,000 - $890,000
Market appeal	Activity-oriented resort which benefits from proximity to the Kailua-Kona resort area and area visitor attractions.	Golf-oriented single hotel property expected to significantly broaden its market appeal following completion of a 1,244-room Hyatt in 1988.	World-class destination resort which enjoys a wide reputation and loyal visitor base.	Quality hotel, condominium and golf course development incorporated in a unique natural setting including black lava fie and ancient fish ponds.
Typical visitor profile	Oriented to both GIT and FIT visitors from middle to upper income groups.	Resort-oriented mainly to GIT visitors and convention groups. Planned development to cater to the very upscale world-class market. Average room rates for the planned hotels range from be··ien $200 to $1,000 per da	Caters to travelers who are generally mature, very affluent and return annually.	Marketed to affluent individual visitors.

TABLE II-8

Characteristics of Hawaii Resorts, Continued

	Maui resorts			Kauai -	Molokai -	Punalu'u
	Kaanapali	Wailea	Kapalua	Princeville	Kalua Koi	(as currently operated)
Site area (acres)	1,169	1,450	750	1,713	1,530	599
Distance from interisland airport	28 miles (Kahului)	15 miles (Kahului)	32 miles (Kahului)	28 miles (Lihue)	11 miles (Hoolehua)	57 miles (Hilo)
Special site characteristics	Long stretch of sand beach Rock promontory	Arcuate beaches	Isolated beaches Old fishing village Historic sites	Coastal plateau with cliffs	Rock promontory Island beaches, heiaus	Lagoons and black sand beach
Existing development:						
Hotel rooms	3,857	950	194	300	292	-
Condominium units	1,755	656	528	900	78	76
Single-family lots	147	190	-	673	50	19
Total units	5,559	1,796	722	1,873	420	95
Amenities:						
Beach	White sand	White sand	Sandy cove	Sandy ocean cliff; some beaches below; rough waters.	White sand	Black sand and pebble; generally unsuitable for swimming.
Shoreline (linear feet)	10,400	7,900	9,500	14,300	12,700	-
Percent usable for swimming	94%	N/A	39%	N/A	31%	-
Commercial space in shopping centers	68,000	70,000	22,000	20,000	-	-
Golf course holes	36	36	36	27	18	18
Tennis courts	30	14	10	-	-	4
On-site activities	Sailing, catamaran cruises, surfing	Scuba diving, excursion boats	All water sports	Fishing, horseback riding, rodeos, hiking, boating		Meeting facilities
Hotel developments:						
Hotel class	Luxury/first-class/tourist	First-class	Luxury/first-class	First-class	Tourist/first-class	Tourist class
1986 average hotel room rates(1):						
Single	$64 - $300	$160 - $1,000	$95 - $950	$75 - $350	$80 - $160	N/A
Double/triple	85 - 300	160 - 1,000	95 - 950	75 - 900	80 - 160	N/A
Typical condominium unit sales prices (1985)(2)	$150,000 - $290,000	$150,000 - $320,000	$180,000 - $300,000	$100,000 - $240,000	N/A	N/A
Market appeal	Oriented towards hotels. Promoted as an integrated resort with many attractions identified as one.	Mixture of hotel and condominium units at a wide range of prices. Strong recreational appeal due to prominent golf and tennis facilities.	Oriented to condominium unit development naturally integrated into a sloping terrain.	Oriented to condominiums and single-family lot sales, with only one hotel Resort has a rural appeal with few nighttime activities.	Appeals to visitors who prefer undiscovered destinations and golf, fishing or hunting activities.	Currently golf-oriented resort in Ka'u. Relatively isolated from other visitor activities and attractions.
Typical visitor profile	About evenly divided between GIT and FIT visitors. Primarily younger, travelers from west coast and Canada.	Wide variety of visitors including both GIT and FIT guests. Family and older visitor appeal.	Geared entirely to affluent individual visitors who return annually.	Oriented to upper and middle income travelers and second homeowners including both GIT and FIT travelers. Greater primary home ownership than elsewhere.	Oriented to Hawaii and mainland FIT visitors and package tours.	Older couples from northwest and west coast states.

N/A Not available.

(1) Undiscounted room rates for major hotels or condominiums as published by the Pacific Area Travel Association, Pacific Hotel Directory and Travel Guide, June 1984.

(2) Hawaii Real Estate Investor, Multiple Listing Service and discussions with developers or realtors of the respective resorts.

Source: Compiled by Peat, Marwick, Mitchell & Co. based on the Hawaii Resort Developer's Conference, Economics of Resort Development, 1983 and other published sources.

Facilities and Amenities: As shown in Table II-8, all but one of the resorts (Keauhou) have a good swimming beach. Developments completed to date range between 400 units or lots at the smallest (Mauna Kea, the relatively new Mauna Lani Resort and Molokai's Kalua Koi Resort) to 5,500 units at Kaanapali Resort. Amenities generally included golf, tennis and extensive water sports.

Three of the four resorts on the island of Hawaii cater to the luxury or first-class hotel market (Mauna Kea, Mauna Lani and Waikoloa), while Keauhou Resort caters to the tourist and first-class market. Resorts on Maui, Kauai and Molokai generally cater to a broader range of guests from economy class to the luxury market.

Market Appeal: Market appeal differs markedly between resorts. The majority of the resorts benefit from locational characteristics and recreational, commercial and dining/entertainment facilities offered within the resort. Resorts which cater to the luxury traveler market typically host visitors who are older Free and Independent Traveler (FIT) guests and return year after year. Those catering to the first-class or tourist market have a broader range of age groups including Group Inclusive Tour (GIT) and package groups.

Currently none of the selected Hawaii resorts feature special programs beyond traditional activities to attract visitors to the resort, and instead, rely on traditional recreational amenities such as swimming, golf, tennis and commercial facilities. None of the selected resorts currently offer health or lifestyle educational programs although a few are conducting preliminary planning regarding possible health spa programs.

2.9.3 Hotel Market Analysis

This section presents the market analysis for hotel development at Makalawena. The sections below describe existing and proposed visitor accommodations on the island of Hawaii, average occupancy rates and projected demand for additional units. The last subsection summarizes the market potential for Makalawena.

2.9.3.1 Existing and Planned Hawaii Island Accommodations

Existing Development: In February 1986 the island of Hawaii had a total of 7,280 visitor units, including hotel rooms and resort condominium units. Hotel rooms represent about 72 percent of the total island's visitor plant inventory and condominium units in visitor rental pools the remaining 28 percent. Currently there are 5,228 hotel rooms and 2,052 condominium units in visitor rental pools on the island of Hawaii, as shown in Table II-9.

Quality master planned development has occurred in several resort areas on the Kona and Kohala coast of the island, including:

- o Mauna Kea Resort
- o Mauna Lani Resort
- o Waikoloa Beach and Village Resorts
- o Kona Village Resort
- o Keauhou Resort

In addition, the largest concentration of units on the island is in the Kailua-Kona area. A majority, or 62 percent, of the island's visitor accommodations are located in the Kona area. Including the Kohala district's 19 percent, together the Kona and Kohala area represent 81 percent of the island of Hawaii's accommodations inventory. Hilo, the island's original visitor destination area which grew quickly after statehood, now accounts for only about 18 percent of the visitor room inventory.

TABLE II-9

Distribution of Existing Visitor Accommodations
on the Island of Hawaii
February 1986

	Hotel rooms		Condominium units		Total	
	Number	Percent	Number	Percent	Number	Percent
Hilo/Honokaa	1,189	22.7%	134	6.5%	1,323	18.1%
Ka'u	13	.2	35	1.7	48	.7
Kohala	1,257	24.1	126	6.2	1,383	19.0
Kona	2,732	52.3	1,757	85.6	4,489	61.7
Volcano	37	.7	-	-	37	.5
Total units	5,228	100.0%	2,052	100.0%	7,280	100.0%
Percent of total units		71.8%		28.2%		100.0%

Source: Hawaii Visitors Bureau, Visitor Plant Inventory, February 1986.

During the last three years, the number of hotel units on the island of Hawaii has increased only slightly. This has been due to the closing or conversion of several hotels into commercial or residential condominium units in the Hilo area as a result of low occupancy levels and slow new growth.

Planned Development: Currently planned hotel developments on the island represent about 2,000 units at three locations in South Kohala, as shown in the table below:

Planned Hotel Developments
on the Island of Hawaii

Project name	Location	Number of rooms	Expected quality	Estimated date of completion
Unnamed	South Kohala Resort	350	Luxury	1990
Hyatt Regency Waikoloa	Waikoloa Beach Resort	1,244	First-class to luxury	1989
Unnamed	Mauna Lani Resort, Pauoa Bay	400	First-class to luxury	1990

Sources: Interviews with resort developers; Hawaii Visitors Bureau, Visitor Plant Inventory, February 1986.

In addition, there are numerous proposals currently before county and state agencies for development approval of hotel projects located in the Kona, Kohala and Ka'u areas. There is also significant currently zoned additional capacity at existing resorts in the region.

2.9.3.2 Historical Occupany Rates

Historically, island of Hawaii hotel occupancy levels have been lower than the state's which have ranged between 70 percent and 84 percent, as shown in Table II-10. During the first six months of 1986, hotels and resort condominiums on the island averaged 66.7 percent, as also shown in the table.

2.9.3.3 Hotel Unit Demand Assessment

This section estimates hotel room requirements for the island in order to indicate the level of support for future hotel development at Makalawena.

Projected Daily Occupied Rooms: Total room demand for the island is based on the projected numbers of east- and westbound visitors, as shown previously in Table II-7, and assumptions regarding the average length of stay and the average party size as provided by the HVB. In addition, room demand from state of Hawaii residents is estimated to increase at about 5 percent over current estimated levels, reflecting population growth projected for the state and an increasing attractiveness of the island as a visitor destination.

TABLE II-10

Average Annual Occupancy Rates
for Hotels and Resort Condominiums

1975 to 1986

	1975	1980	1981	1982	1983	1984	1985	1986(1)
Island of Hawaii	59.9%	52.7%	48.3%	44.0%	44.7%	55.6%	57.6%	66.7%
Kailua-Kona	59.3	55.7	48.9	46.9	47.0	54.9	57.5	69.5
Hilo	57.3	39.7	39.5	37.7	39.2	58.2	57.8	55.8
Other	74.3	76.7	72.2	N/A	N/A	N/A	N/A	N/A
State of Hawaii	71.9	67.8	68.2	70.4	69.7	76.0	76.1	83.6

N/A Not available.
(1) Represents average through May 1986.

Sources: Hawaii Visitors Bureau, Annual Research Report and Supplemental Report, annual and periodical; and Pannell, Kerr, Foster, Trends in the Hotel Industry, annual.

Total daily room demand is estimated to increase from about 3,900 rooms in 1986 to 13,600 rooms by the year 2005, as shown in Table II-11. This increase would be the result of two factors:

- Increase in the number of visitors to the island of Hawaii, both east- and westbound
- Increase in the average length of stay for both categories

Westbound visitors are expected to be driven for the greatest portion of the increase in demand, with visitors increasing at an annual rate of about 4.6 percent, while the projected average length of stay increases from 3.5 nights in 1986 to 5.5 nights in 2005.

This would represent an increase in length of stay of 2.0 nights over 19 years. By comparison, average length of stay increased 3.4 nights (or days) on Maui island and 2.4 nights (or days) on Kauai in the 15 years between 1970 and 1985 and increased 0.6 nights (or days) on the island of Hawaii between 1984 and 1985, as shown previously in Table II-4.

As shown in Table II-11, the projected room demand for visitor units on the County of Hawaii is estimated to increase from 3,290 units in 1985 to 13,620 units in 2005. In comparison, the County of Hawaii Preliminary Draft General Plan indicates that the visitor units in Hawaii would expand from 6,100 units in 1985 to 11,200 to 26,200 units by 2005, as shown below.

Projected Visitor Units
County of Hawaii
1985 to 2005

Year	Series A	Series B	Series C
1985	6,100	6,100	6,100
1990	7,700	8,200	12,600
1995	9,400	12,600	18,000
2000	10,500	17,500	22,000
2005	11,200	20,300	26,200

Source: County of Hawaii Preliminary Draft General Plan.

West Hawaii Market Share: As the visitor plant in West Hawaii has grown and resorts such as Mauna Kea and Mauna Lani have gained international reputations, West Hawaii's share of island of Hawaii visitor accommodation demand has grown. The Hilo area has lost market share and some Hilo area hotel units have been converted to condominium or commercial units. Based on visitor unit inventory as of February 1986, as shown in Table II-9, and on hotel and condominium occupancy levels from January through May 1986, as shown in Table II-10, it is estimated that West Hawaii is currently capturing about 84 percent of visitor accommodation demand on the island of Hawaii, as shown in the table below:

Estimated Market Share of Visitor Units
for West Hawaii
January through May 1986

	Visitor units	Occupancy rates	Unit demand	Market share
Kohala/Kona	5,872	64.6%	3,793	84%
Hilo/Honokaa	1,323	55.8	724	16

Even though the Hilo area is experiencing a decline in market share, the Hilo and Volcano areas with their attractions such as macadamia nut orchards, black sand beaches, orchid raising and the Volcanoes National Park, should continue to attract visitors even with the expansion of the visitor plant in West Hawaii. A major resort is also planned at Punalu'u in the Ka'u district. Therefore market share of visitor accommodation demand for East Hawaii could stabilize at about the 15 percent level with West Hawaii capturing about an 85 percent market share in future years.

Hotel Unit Demand in West Hawaii: Projected daily occupied rooms for the island of Hawaii, shown previously in Table II-11 represent about 5,800 in 1990, increasing to about 13,600 by the year 2005. Assuming a market share of 85 percent for West Hawaii and an aggregate visitor unit occupancy level of 75 percent, supportable visitor units in West Hawaii are estimated at about 6,600 units by 1990, increasing to about 15,400 units by the year 2005, as shown in Table II-12.

Insert Table II-11

TABLE II-11

Projected Daily Occupied Visitor Rooms

1984 to 2005

	Historical		Projected				
	1984	1985	1986	1990	1995	2000	2005
Westbound:							
Visitor arrivals	760,940	695,340	770,000	1,026,000	1,396,400	1,713,000	1,800,300
Commercial accommodations demand(1)	684,800	625,800	693,000	923,400	1,256,800	1,541,700	1,620,300
Average stay, nights	2.6	3.2	3.5	4.0	4.5	5.0	5.5
Visitor nights	1,780,500	2,002,600	2,425,500	3,693,600	5,655,600	7,708,500	8,911,650
Average party size(2)	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Daily occupied rooms	2,570	2,890	3,500	5,330	8,160	11,120	12,850
Eastbound:							
Visitor arrivals	56,700	58,800	61,000	97,300	131,600	174,600	198,400
Average stay, nights	0.5	0.5	0.6	0.7	0.8	0.9	1.0
Visitor nights(3)	28,400	29,400	36,600	68,100	105,300	157,100	198,400
Average party size(4)	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Daily occupied rooms	50	50	60	110	170	250	320
Total daily room demand:							
Visitors to Hawaii	2,620	2,940	3,260	5,440	8,330	11,370	13,170
Hawaii residents(5)	330	350	370	390	410	430	450
Total	2,950	3,290	3,930	5,830	8,740	11,800	13,620

(1) About 10% of all visitors projected to stay with friends, relatives, or in other noncommercial accommodations. Hawaii Visitors Bureau, A Study of Westbound Visitors to the Island of Hawaii, 1983.

(2) Historical figure estimated based on Hawaii Visitors Bureau, A Study of Westbound Visitors to the Island of Hawaii, 1983.

(3) All eastbound visitors assumed to stay in commercial hotel or condominium accommodations.

(4) Historical figure based on Hawaii Visitors Bureau Annual Research Report, 1983, Japanese visitor profile.

(5) Projected to increase over estimated 1984 levels at a compounded rate of 5% per year, numbers rounded.

Source: Peat, Marwick, Mitchell & Co.

TABLE II-12

Projected Hotel Unit Demand for West Hawaii

1990 to 2005

	1990	1995	2000	2005
Daily occupied rooms(1)	5,830	8,740	11,800	13,620
West Hawaii share	85%	85%	85%	85%
Total West Hawaii demand	4,956	7,429	10,030	11,577
Aggregate occupancy	75%	75%	75%	75%
Supportable visitor units for West Hawaii	6,600	9,900	13,400	15,400
Hotel share of visitor units	80%	77%	74%	70%
Hotel unit demand for West Hawaii, rounded	5,300	7,600	9,900	10,800

(1) From Table II-11.

Visitor unit demand is served by both hotel units and condominium units which are rented to visitors. It is estimated that 80 percent of visitor unit demand will be served by hotel units and 20 percent by condominium units in 1990, following the development of nearly 2,000 additional hotel units on the island by the year 1990 as currently planned. In years subsequent to 1990, condominiums are expected to serve a greater share of the total accommodations demand as more and more visitors are repeat visitors and as visitors increase their length of stay.

Assuming that 80 percent of visitor accommodations demand is served by hotel units in 1990 and that the portion served by hotel units decreases to 70 percent by 2005, hotel units demand in West Hawaii is estimated to be about 5,300 units in 1990, increasing to about 10,800 units by 2005, as also shown in Table II-12.

Hotel Unit Market Share at Makalawena: Estimated market share of the West Hawaii visitor accommodations for Makalawena is difficult to estimate because it depends on many factors such as quality of resort development, quality of resort management and marketing expertise which are unknown at this time. However, it can be said that there are factors which are favorable toward Makalawena's establishing and maintaining a reasonable market share of the visitor accommodations market including:

- The quality of Makalawena's beaches which are considered to be among the best in West Hawaii
- Inclusion of a quality golf course in the development which has been proven to one of the critical success factors in Hawaiian resort development
- Nearness to Kailua-Kona and the Keahole airport allowing the resort to capture a share of the commercial visitor market to the area
- Opportunity to establish a strong position in the first-class visitor market which is not in direct competition with the luxury resorts of South Kohala such as Mauna Kea, Mauna Lani and the expected first-class to luxury orientation of the Hyatt Waikoloa

Market share of visitor accommodations at the major resort areas in the state of Hawaii are shown in Table II-13. In comparison to other resorts in Hawaii, the future situation at Makalawena could most nearly be compared to Wailea's position on Maui. Wailea, a destination resort with two first-class hotels, white sand beaches, golf courses and resort condominiums, captures about 8 percent of the total visitor accommodations market on Maui. The relationship of Wailea to Kihei could be compared to Makalawena's relationship to Kailua-Kona in terms of proximity and types of visitor facilities. Considering the above factors in favor of Makalawena's establishing a reasonable market share and the assumption that a quality resort with quality management would be developed, it is estimated that Makalawena could be expected to capture between seven and nine percent of hotel unit demand in West Hawaii.

Hotel Unit Demand at Makalawena: Applying the seven to nine percent Makalawena market share of West Hawaii hotel unit demand to the projected West Hawaii visitor unit demand, shown previously in Table II-12, results in an estimated supportable h tel unit demand at Makalawena of between 370 to 480 units by 1990 and 750 to 970 units by the year 2005, as shown in Table II-14. Therefore, one hotel with about 350 to 500 rooms could be supported by 1990 and a second hotel of equal size could be supported by 2005 at Makalawena.

TABLE II-13

Estimated Market Share of Visitor
Room Nights at Selected Hawaii Resorts

1984

	Estimated visitor room nights(1)	Island market share
Oahu:		
Waikiki/Kahala(2)	28,810	93%
West Beach/Leeward(2)	890	3
North Shore(2)	680	2
Other (airport/downtown)	400	2
	30,780	100%
Hawaii:		
Keauhou Resort	1,060	26
Kailua-Kona	1,450	34
Mauna Kea/Mauna Lani/Waikoloa(2)	830	20
Hilo/Ka'u/Volcano	820	20
	4,160	100%
Maui:		
Kaanapali	4,320	41
Napili/Honokowai/Lahaina	2,430	23
Kapalua	220	2
Wailea	820	8
Kihei/Maalaea	2,270	22
Kahului/Wailuku/Hana/Kula	400	4
	10,460	100%
Kauai:		
Princeville	530	15
Poipu/Kalaheo/Kokee	1,060	31
Wailua/Kapaa/Lihue	1,870	54
	3,460	100%

(1) Estimated based on the number of visitor units as reported by the Hawaii Visitors Bureau and the occupancy rate for the areas based on surveys conducted by Peat, Marwick, Mitchell & Co.

(2) Smaller resorts have been combined with larger regions to preserve confidentiality of occupancy rates of individual facilities.

TABLE II-14

Estimated Hotel Units Supportable
at Makalawena

1990 to 2005

	1990	1995	2000	2005
Supportable hotel units at West Hawaii(1)	5,300	7,600	9,900	10,800
Supportable visitor units at 7% market share	370	530	690	760
Supportable visitor units at 9% market share	480	680	890	970

(1) From Table II-12.

2.9.4 Resort Condominium Market Analysis

2.9.4.1 Market Review

Inventory of Resort Condominiums: The island of Hawaii presently includes about 52 condominium projects located in resort areas. These projects represent over 4,200 units, the majority of which are located in the Kona area, as shown in Table II-15. According to the HVB, about 49 percent of these units are kept in transient visitor rental pools, as also shown in the table.

Projects currently under construction on the island include the 116-unit Mauna Lani Point at Mauna Lani Resort and the 120-unit Waikoloa Shores at Waikoloa Beach Resort. According to the HVB, as of February 1986, only one other condominium project with development approvals in place was reported to be planned in the North Kona district. This was the 72-unit Villas at Keauhou I, in Keauhou Resort.

In addition, however, there is significant existing zoned capacity for condominium development at Waikoloa, Mauna Lani and Keauhou Resorts, and there are numerous proposed resorts currently seeking county and/or state approvals for further development.

Sales Trends: Annual sales of new condominiums are based on sales information provided by Hawaii TMK Service and Multiple Listing Service (MLS) for condominiums in the Kohala and Kona areas. As less than 2 percent of the resort condominiums on Hawaii are located outside of these two districts, condominium sales in these areas are representative of the island of Hawaii resort condominium market.

TABLE II-15

Resort Condominium Inventory
for the Island of Hawaii

1986

Properties	Unit count Total(1)	Visitor rental pool(2)	Percent units in rental pool
Hilo	1	134	134	100%
Ka'u	1	76	35	46
Kohala	7	450	126	28
Kona	43	3,570	1,757	49
Total	52	4,230	2,052	49%

(1) Estimated based on Monitor, Hawaii, Inc., 1984, other published sources and interviews with developers.

(2) As of February 1986, Hawaii Visitors Bureau, Visitor Plant Inventory, 1986.

Recorded condominium units which were not sold through MLS are representative of the annual absorption of new condominiums. Table II-16 presents these new condominium sales from 1978 to 1985. As shown in the table, annual new condominium sales have fluctuated dramatically from a low of 118 units in 1983 to over 492 units in 1979, for an average of about 269 units over the period. Using a three-year moving average to smooth the fluctuations of sales, between 200 and 398 units were sold annually for an average of about 280 units per year over the period. New condominium unit sales have slowed in recent years due to the:

- Lack of new inventory development on the island

- o Relatively slow visitor and real estate markets throughout the state
- o Relatively high interest rates
- o Uncertainty over the effects of Federal tax law changes on real estate investment deductions and amortization periods

Because of the ongoing and expected improvements in the visitor market on the island and the recent drop in mortgage interest rates, new condominium development in the region is expected to be met with improved rates of unit absorption. The effects of recent changes to Federal tax law provisions are not fully known, but many industry analysts feel that in the resort condominium market, potential effects of the tax law are considered most likely to be experienced at those projects targeted at investor-buyers where the income potential of units in rental pool usage is slight.

TABLE II-16

Historical Kona and Kohala
New Condominium Sales

1978 to 1985

Year	Annual new condominium sales(1)	Three-year moving average
1978	147	-
1979	492	-
1980	283	307
1981	419	398
1982	205	302
1983	118	247
1984	336	220
1985(2)	150	200
Average	269	279

(1) Estimated based on the number of sales recorded at the Bureau of Conveyances which do not go through a broker as reported by Hawaii TMK Service and the Multiple Listing Service.

(2) Annualized estimate based on first five months.

Sales Prices: Average prices of new condominium units in the Kona and Kohala regions in 1985 ranged from about $159,000 to $250,000 and $450,000 to $1,100,000, respectively, as shown in Table II-17. Average new unit sales prices in the Kohala region increased significantly since the marketing of superluxury properties at Mauna Kea and Mauna Lani Resorts in 1983 and 1984.

TABLE II-17

Average Sales Prices of New Condominium Units
in Kona and Kohala

1982 to May 1985

	Kohala	Kona
1982:		
One-bedroom	$ -	197,400
Two-bedroom	-	146,575
Three or more bedrooms	-	-
All units	-	153,836
1983:		
One-bedroom	302,500	194,440
Two-bedroom	469,571	218,229
Three or more bedrooms	755,000	-
All units	434,902	211,968
1984:		
One-bedroom	307,500	229,050
Two-bedroom	703,718	186,667
Three- or more bedrooms	918,333	-
All units	683,261	197,263
1985 (January to May):		
One-bedroom	-	159,000
Two-bedroom	450,000	250,000
Three or more bedrooms	1,097,500	-
All units	881,667	204,500

Sources: Hawaii TMK Service and Multiple Listing Service.

2.9.4.2 Makalawena Condominium Market Assessment

Factors in Market Demand: The demand for resort condominium units at Makalawena will be supported in part by the general increase in visitor arrivals to the island since significant and increasing shares of visitors seek accommodations in condominiums rather than in hotel units. This trend is increasingly observed in Hawaii as more visitors are repeat visitors to the islands who are familiar with the destination areas of the islands. Such visitors often prefer the additional privacy and convenience of more complete household and kitchen amenities and the greater space that condominium units offer in comparison to hotel units.

Projected Sales Absorption: Since 1978, using a three-year moving average, annual new condominium sales on the island have amounted to about 280 units, as discussed previously. By 1991, about the time of the first potential project completions at Makalawena, this market could be expected to have expanded to represent about 450 units per year due to the strengthening of the general economy, stabilization of interest rates and increased visitor arrivals, and to facility development on the island of Hawaii. Over the next 15 years, from 1991 to 2005, potential average annual condominium sales are expected to increase to about 600 per year as more and more visitors, and especially repeat visitors, are attracted to the island. Thus, new condominium sales on the island could be as shown in the table below:

Projected New Condominium Sales
for the Island of Hawaii

	Units sold	
	Average annual	Total
1991 to 1995	450	2,250
1996 to 2000	550	2,750
2001 to 2005	600	3,000
Cumulative total		8,000

Depending on factors such as quality, pricing, ocean or golf course orientation of the condominiums, Makalawena is estimated to capture a 10% to 15% share of the annual condominium sales on the island of Hawaii. This assumption is based on the relative market shares of other comparable resorts in Hawaii at comparable periods in their development. For example, condominium sales among the island's major existing resorts between 1981 and 1985 were distributed approximately as shown below.

Keauhou	60%
Waikoloa Village	14
Mauna Kea	7
Mauna Lani	19
Total	100%

Thus, from 1991 to 2005, between 800 and 1,200 units are projected to be sold at the resort, as shown in Table II-18. Average sales per year over the 15 year period would range from 53 to 80 units per year, as also shown in Table II-18.

TABLE II-18

Projected Annual Condominium Sales
at Makalawena

1991 to 2005

Years	Total island of Hawaii condominium sales	Estimated Makalawena market share 10%	15%
1991 to 1995	2,250	225	340
1996 to 2000	2,750	275	410
2001 to 2005	8,000	300	450
Total, rounded	8,000	800	1,200
Average annual sales, rounded - 1991 to 2005	533	53	80

2.10 USE OF PUBLIC FUNDS OR LANDS

The proposed project does not anticipate the direct use of any public funds or lands. Through the development of a resort community, public funds will be expended indirectly to support the additional public services to be required of this use such as additional police and fire protection.

Summary

The state's projection provides a point of departure for defining the overall conditions for visitor industry growth. It is, however, only a small piece of the equation to determine the market feasibility of individual projects. Many things enter into that equation including the quality of the individual development, product types, price, amenities, site location and marketing strategy. The key issue is the anticipated share of the total available market that an individual development can hope to acquire based on its development program. Accordingly, it is important that the County General Plan provide the visitor industry with a variety of suitable resort designated properties to supply a diverse and competitive market setting. West Hawaii is becoming a major international resort destination and to limit the further study of potential resort development areas within this region would eliminate the opportunities for competitive creativity that will continue to promote sound visitor industry growth.

The Makalawena site is ideally located, lying approximately 3.5 miles north of the Keahole Airport and 10 miles from the residential areas of Kailua-Kona, which are among the fastest growing in the state. The area is not subject to significant development constraints, such as major flooding and inundation hazards, and is not within the approach and take-off zone of the Keahole Airport.

The makai lands at Makalawena have not been utilized due to their low agricultural utility. In conjunction with Kamehameha Schools/ Bernice Pauahi Bishop Estate's effort to manage its land resources responsibly, the development of Makalawena lands has been accelerated in response to the increasing demand for additional resort sites.

A review of land ownership in the North Kona district indicates a vast amount of state owned property along the shoreline and relatively few privately owned parcels of a size suitable for a master planned resort development. Given this lack of developable shoreline, the projected need for an expanded visitor plant, and the attributes of the site, Makalawena should be considered a primary location for a new resort. Such a development can be seen as a major contribution to the district's economy and an asset to the county as a whole.

III

ALTERNATIVES TO THE PROPOSED PROJECT

CHAPTER III

SUMMARY OF ALTERNATIVES CONSIDERED

Known alternatives which could feasibly attain the objectives of the action, even though more costly, are described in this Chapter. A comparative evaluation of the environmental benefits, cost and risks of the proposed action and each alternative is provided. All the alternatives to the proposed resort development fail to meet the objective of establishing a high quality, low to medium density resort community that is economically viable.

Including the preferred alternative, the proposed "intermediate resort," five alternatives to the proposed project have been considered and evaluated against the project objective.

The landowner is cognizant of the fact that there are innumerable alternative development possibilities for Makalawena. However, it is believed that the alternatives listed below encompass the concepts of the alternatives that could feasibly attain the objectives of the proposed action. It is the landowner's charge to manage its resources to provide long-term financial stability to support the Kamehameha Schools for the betterment of the students attending the schools now and in the future.

3.1 MAJOR RESORT

The General Plan, County of Hawaii characterizes a "major resort" as a "self-contained resort destination area which provides basic and support facilities for the needs of the entire development. Such facilities shall include sewer, water, roads, employee housing and recreational facilities, etc.:

Maximum visitor units: 3,000 rooms.

Resort acreage: 90 acres.

Active and passive recreation area: 50 acres.

Accessory uses within hotel or resort zoned area shall be based on 50 square feet of floor area per hotel room.

A maximum of 320 acres for residential use when other zoned lands are not available in close proximity for support use.

Employee housing shall be provided at a maximum ratio of one employee unit to every two hotel units built. The required ratio shall be determined by an analysis of housing needs of each district or relative area."

The Makalawena lands encompass 353 acres total, and could not accommodate a development of a scale approaching the maximum standards for a major resort. Development at this intensity could compromise the ability to incorporate significant environmental features into the project design, and would require substantial reductions in open space and recreational use opportunities (i.e., golf course). Site size limitations would place Makalawena at a competitive disadvantage with respect to other major resorts along the Kona and Kohala coast. For these reasons, the "major resort" designation is rejected as a viable alternative for the Makalawena site.

3.2 RETREAT RESORT

Characteristic of Kona Village, approximately five miles north of Makalawena, the concept of this alternative plan would be to provide a unique resort expertise as a retreat from the urban scale and intensity of other resort developments.

As characterized by the standards set forth in The General Plan, County of Hawaii, a "retreat resort" area is generally an "area which provides the user with rest, quiet, and isolation for an environmental experience. It shall have sewer, water, roads, employee housing, and recreational facilities, etc.:

Maximum visitor units: 100 rooms.

Resort acreage: 15 acres or less.

Provide active and passive recreation area commensurate with scale of development.

Accessory uses within hotel or resort zoned area shall be based on 50 square feet of floor area per hotel room.

Employee housing shall be provided at a maximum ratio of one employee unit to every two hotel units built. The required ratio shall be determined by an analysis of housing needs of each district or relative area."

Secluded from intrusions of the highway and urban uses, the resort would provide an isolated bungalow or village-type setting with detached units that would be associated with the beachfront and recreational amenities of the coastline. For recreational amenities, a golf course could also be included, along with a tennis center for those who would like to complement their

retreat stay with some recreational activities. With association to the beach club and coastal amenities, portions of the site could be developed with estate lots. Due to the low intensity of this resort concept, few visitor or residential units could be constructed at Makalawena.

This alternative would provide opportunities to optimize the land use activities to minimize impacts on existing archaeological/ historical resources and environmental resources. Due to proposed land use plans on nearby proposed resort lands and the high cost of providing the necessary infrastructure to serve a low density resort of this character, both the physical setting and high capital cost and projected low return provide the basic reasons why this alternative is rejected.

3.3 LUXURY CONDOMINIUMS RESORT

This concept does not include a standard resort-type operation and would utilize the coastal area for the development of luxury condominiums at a medium density with a high level of amenities and open space. In conjunction with the oceanfront luxury condominiums, estate lots fronting the 18 hole golf course would also benefit from the coastal amenities of the beach club and private shoreline park. The estate lots would most probably be second home-type estates, with the total project secured with entry features and controlled access.

Due to the private residential character of this alternative, there would be limited access to the coastal resources for public enjoyment. Additionally, the access to significant archaeological and historic resources at Makalawena would be severely limited, with little or no opportunity for interpretive material and programs to be provided for the public. The high off-site infrastructure costs would make this alternative either prohibitively expensive or infeasible depending on market demands.

3.4 RESIDENTIAL ESTATE LOTS

This alternative would provide for subdivision of the Makalawena lands into large residential estate lots with controlled access from Queen Kaahumanu Highway. Owned and developed by various owners, each lot would be developed independently.

While total infrastructur costs could be reduced, the minimal improvements would require these lots to be extremely expensive to make the project feasible, and thus, limiting the marketability of this type of project. The coastal resources would have limited access through a development of this nature, although the general open space character of the land may be maintained. The regional economic benefits of this alternative would be minimal

due to the lack of employment generators such as resort and commercial uses.

3.5 NO BUILD (OR "DO NOTHING")

This alternative would be consistent with existing zoning and State Land Use designations. It would not, however, contribute to county and state goals and policies aimed at promoting employment and economic growth, nor would it respond to projected demand for increased resort opportunities along the West Hawaii coast. Overall environmental impact would be minimized, though the natural attributes and amenities of the site would remain underutilized. The ability to implement programs to manage and preserve the coastal ponds and historical sites, previously subjected to some disturbances and modifications, as well as provision for improved access, is removed with this alternative.

Implementation of this alternative, and/or development at a lesser scale than that proposed, could result in the retention of the existing wildlife and wildlife habitat characteristics of the project site; maintain present status and character of the historical/archaeological resources of the site. As noted above, the coastal ponds and historical sites have been subjected to some disturbances and modifications (introduction of exotic fish species to the ponds, alteration of the ponds to serve as goat watering holes and destruction or modification of rock walls). These actions could continue unabated with the implementation of this alternative. Similarly, implementation of the "do-nothing" alternative would continue to subject the wildlife of the project site to predation and/or disturbance by feral goats, dogs, cats and mongoose.

The implementation of a smaller scale development would most likely also include implementation of a pond and wildlife refuge management plan, which would increase the ability of the landowner to maintain and preserve environmentally sensitive areas. However, a smaller scale development plan is not considered to be economically feasible, nor does it meet the overall objectives of the proposed project.

3.6 COMPARATIVE EVALUATION

In assessing each of the alternatives and the proposed development plan for the Makalawena Resort, a general comparative evaluation as shown in Table III-1 demonstrates the different benefits, costs and risks associated with each action. None of the alternatives meet the objective of establishing an economically viable resort community of a quality competitive with other resorts in the region.

The rankings listed below are based on both subjective and objective analyses of the alternatives by experienced, professional planning/environmental analyses personnel associated with the development and preparation of this EIS (See Chapter X, Section 10.3). Every reasonable attempt has been made to carefully weigh the advantages and disadvantages and positive and negative aspects of the factors analyzed against the overall goals and objectives of the state and county and the landowner and his responsibility to provide long-term financial stability for the support of the Kamehameha Schools. The proposed project ratings for low cost for public infrastructure, as compared to the other alternatives, are based on the benefit/cost ratios described in Chapter IV, Section 4.22.2.2. Similarly, the ratings for low risk of damage for coastal resources for the proposed project reflect the landowner's intent to protect and preserve the natural resources of the project site.

Table III-1

Comparative Evaluation of
Benefits, Costs and Risks of
Alternative Actions

	Proposed Development	Major Resort	Retreat Resort	Luxury Condo	Estate Lots	No Build
Benefits						
Employment	+	+	o	-	-	-
Income Generation	+	+	o	-	-	-
Tax Revenues	+	+	o	-	-	-
Recreation Facilities	+	+	+	o	-	-
Public Access	+	+	o	-	-	-
Costs						
Public Infrastructure Requirements	-	-	-	-	-	-
Community Services	o	+	o	o	o	-
Environmental Resources	o	+	-	o	-	-
Housing	o	+	-	-	-	-

+ = Positive Impact
o = Minimal Impact
- = Possible Negative Impact

+ = High Cost
o = Medium Cost
- = Low Cost

Table III-1 (continued)

	Proposed Development	Major Resort	Retreat Resort	Luxury Condo	Estate Lots	No Build
Benefits						
Risks						
Archaeological/ Historical Resources	o	+	o	o	+	o
Coastal Resources	-	+	-	-	-	-
Ground Water Quality	-	o	-	-	o	-
+ = High Risk of Damage o = Medium Risk of Damage - = Low Risk of Damage						
Overall Ranking	1	N/A	3	2	4	5

IV

DESCRIPTION OF THE ENVIRONMENTAL SETTING AND PROBABLE ENVIRONMENTAL IMPACTS

CHAPTER IV

DESCRIPTION OF THE ENVIRONMENTAL SETTING AND PROBABLE ENVIRONMENTAL IMPACTS

4.1 PHYSICAL GEOGRAPHY

4.1.1 Existing Conditions

Climate: Environmental conditions at Makalawena are similar to those along the rest of the North Kona and South Kohala coast. Coastal temperatures vary between 75 and 85 degrees Fahrenheit (F) with a mean annual temperature of about 78 degrees F. Cooler temperatures are experienced inland at higher elevations. Makalawena is located south of the strong wind line in South Kohala and is not subject to the intense winds that regularly buffet Waikoloa and the coastal areas around Kawaihae. Winds at Makalawena are usually light and variable, often blowing offshore in the morning and onshore later in the afternoon. Located within the area between Honokohau and Anaehoomalu called Kekaha, meaning literally "the place." These are lava lands, ravaged over the years by flows from both Hualalai and Mauna Loa. The area is dry with an annual average rainfall of 10 to 15 inches.

Topography: Makalawena is situated on the lower slope of Hualalai Volcano and is comprised almost entirely of exposed rockland formed from lava flows.

Excepting a few areas, the terrain exhibits slopes of 10 to 20 percent or less. The site is relatively flat from sea level to the highway, which is approximately 200 feet above sea level.

4.1.2 Impacts

No significant effects on the area's microclimate are anticipated.

The project site is relatively flat makai of the highway. Substantial land form alteration will not be required. Though earthwork quantities are not available, it may be possible to balance cut and fill on-site.

4.1.3 Mitigation Measures

Grading plans of the site, that will be required to develop the site for the proposed resort, will indicate the extent of earthwork, cut and fill areas and any borrow requirements. Grading will be designed by registered civil engineers to conform closely with the existing site features. Cut and fill activities would be balanced on-site if possible. All applicable county grading requirements would be met and all applicable environmental protection regulations will be followed, including those pertaining to dust, sedimentation and erosion control.

4.2 GEOLOGY AND SOILS

4.2.1 Existing Conditions

Makalawena is located on the northwest flank of Hualalai, one of five volcanoes which comprise the island of Hawaii. The oldest volcano, Kohala, is extinct. Mauna Kea has erupted in the past 10,000 years, but not in historic times. Hualalai last erupted in 1800-1801, and Mauna Loa and Kilauea are currently active. Present activity is centered in the southeastern part of the island.

The prominent westward extension of the coast in the Makalawena-Keahole Point region has been formed in the past 3,000 years by lavas flowing from the northwest rift zone of Hualalai. Historic and older lavas from Hualalai underlie the Makalawena site.

Both pahoehoe and aa forms of basalt are represented at the site (Figure IV-1). Relative ages of separate lava flows can generally be distinguished by variations in color and vegetation, with younger flows appearing darker and less vegetated.

Pahoehoe is the more fluid form of lava because of its higher gas content. It flows rapidly and forms a relatively smooth surface characterized by low domes and ridges; a "ropy" surface texture is common. The domes may be badly cracked and may conceal open cavities or blisters which are common in pahoehoe. Lava tubes also are common in pahoehoe and are the empty conduits through which the lava once flowed. The rock is characterized by numerous spherical cavities (vesicles) a fraction of an inch in diameter, and thus it is of relatively low density. Individual flows tend to be only a few feet thick, but several flows from the same eruption may rest above each other to form a relatively thick flow unit.

Aa basalt is more viscous because it has lost the higher gas content of pahoehoe. The molten mass moves so slowly that a rough, jagged clinker layer forms on its surface. This layer is carried forward and cascades down the front of the flow so that a clinker

pavement typically is formed over which the molten interior flows. Thus, in cross section aa basalt has a dense interior sandwiched between layers of volcanic clinker. The amounts of these two types of material in an aa flow can vary greatly, however, so that it is impossible to anticipate exact subsurface conditions at a specific location. Cavities are uncommon in aa flows, although clinker pockets can consist of loose gravel-to-cobble sized fragments. The interior rock has fewer vesicles than pahoehoe and thus is denser; the vesicles usually are stretched as a result of the highly viscous nature of the lava before it solidified. Aa flows tend to be significantly thicker than pahoehoe flows, sometimes several tens of feet thick.

Soil on the basalt rock is nonexistent to very thin because of the relatively young age of the lava flows and the arid climate.

Along the coastline several feet of coral sand has accumulated in a narrow dune ranging from 10 to 20 feet high and about 100 to 150 feet wide, widening to the south. Behind the dune, on the northern side of the property, a thicket of dense Kiawe has developed and the process of soil formation from decaying vegetation is in a very early stage. A similar Kiawe thicket is found at the northwesterly corner of the property, just behind the sand dunes. Other portions of the dune are covered with Beach Morning Glory.

Along the entire coastline of Makalawena, a series of brackish water ponds are found. These ponds represent a geologic feature found frequently along this coastline. These near shore ponds, generally termed anchialine, result from a natural depression below sea level which intercepts the water table as it permeates the fractured basaltic rock. Refer to Chapter IV, Section 4.6 for detailed discussion of coastal ponds.

4.2.2 Impacts

Rough grading for the golf course, building pads, roadways and landscaped areas would be more difficult on pahoehoe lava flows than on aa. In some locations, the pahoehoe may resist blading or ripping. Lava tubes and other shallow cavities in this basalt form could collapse under weight of construction equipment. In contrast, while the aa surface is jagged, it is more readily shaped by conventional bulldozers to the clinker layer.

Although attempts will be made to balance cut and fill quantities, it is likely that the importation of fill materials would be required. It is expected that this material would consist of broken excavated rock or cinder from nearby quarries. With proper care, shallow foundations of this material would be appropriate for all structures. Other suitable borrow material would be used for fine grading of the golf course and backfill purposes.

As soil cover and agricultural potential on site are very limited, no significant soil effects are foreseen (see Chapter X, Department of Agriculture letter). Sufficient quantities of imported screened soil will be required for the golf course and other landscaped areas. The sources of screened soil will be located on-island and provide the project with a natural, fertile and friable soil.

4.2.3 Impacts Which Cannot Be Avoided

Lava particulates or fill materials may be exposed to erosion by wind and water during the short-term grading and construction period. The importation of screened soil would require the removal of this material from another location off-site.

4.2.4 Mitigation Measures

To the extent possible, natural landforms which complement the proposed project plan would be preserved.

An exploratory program to identify potential lava cavities and collapse features will be required prior to project development. Any natural lava tubes or subsurface cavities may offer potential for use as collectors of stormwater runoff and thereby reduce disturbance to local topography and landforms.

A site engineering study and geotechnical assessment will be conducted in conjunction with more detailed site plans.

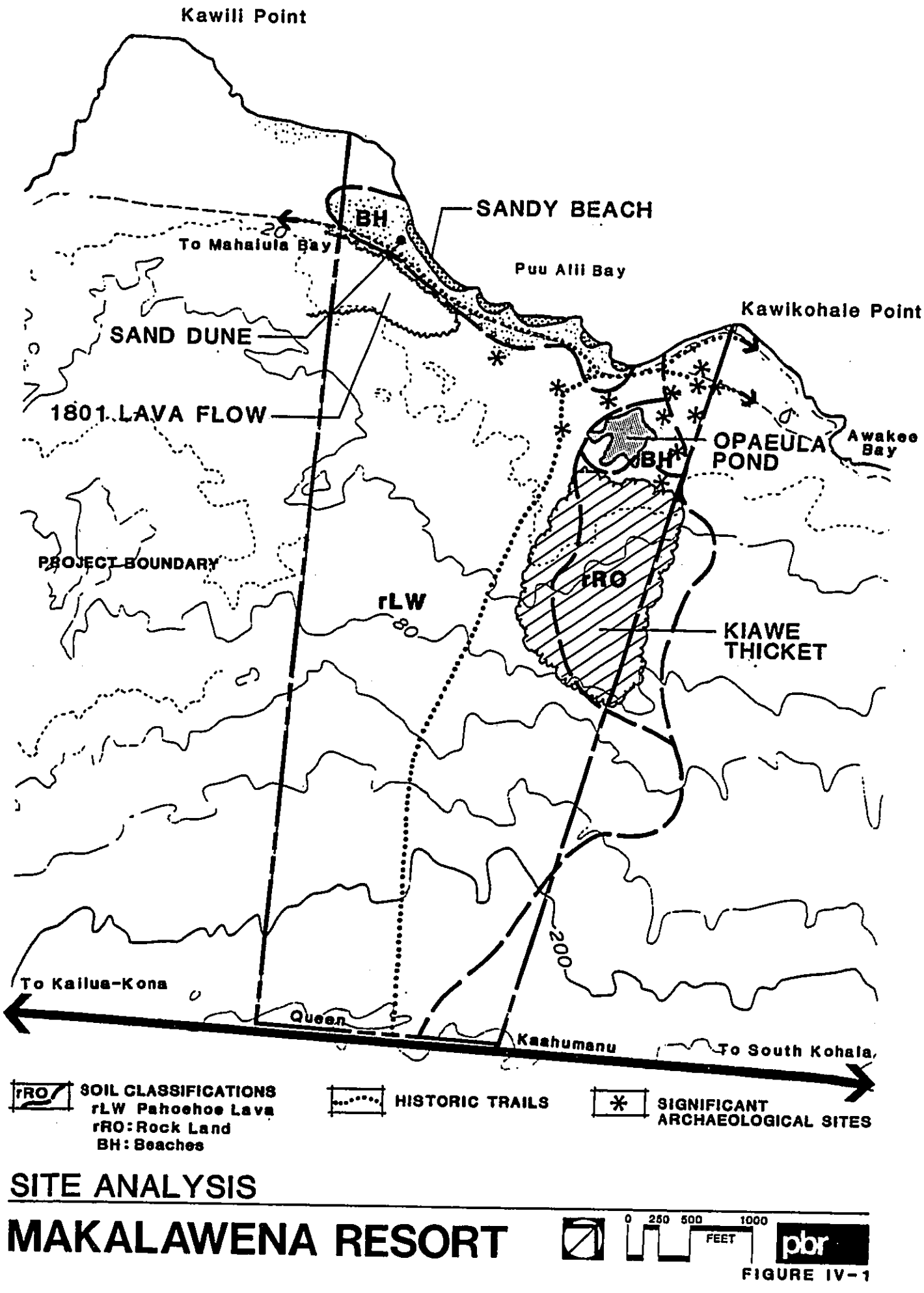
Appropriate measures of controlling dust resulting from heavy equipment operations would be implemented. Similarly, grading activities would be performed such that minimal impacts to archaeological/historic sites and coastal ponds would be experienced. All grading would be in compliance with applicable state and county environmental protection and building rules and regulations.

4.3 NATURAL HAZARDS

4.3.1 Existing Conditions

Volcanic Eruptions and Flows: Hualalai last erupted in 1800-1801. These two eruptions were from vents that opened on the northwest rift zone with lava flows reaching the ocean on both sides of the site.

Available evidence (summarized by Moore, 1970) indicates that the two youngest Hualalai flows erupted in 1800-1801. The first, known as the Kaupulehu flow, poured from a rift at 1676-1829



SITE ANALYSIS

MAKALAWENA RESORT

FIGURE IV-1

meters (5500-6000 feet) on the northwest flank of Hualalai (Stearns and Macdonald, 1946), and flowed seaward, burying Hawaiian fishponds and villages along the shore (Powers, 1920) approximately six to seven miles north of Makalawena. A smaller flow, the Huehue flow, erupted shortly after the Kaupulehu flow and flowed to the sea at Kukio approximately two miles north of Makalawena. Older flows, 1,000 to 3,000 years old occur further south (Moore et al., in press) and underlie the Makalawena site.

The Huehue flow erupted from a line of spatter cones on the northwest rift zone of Hualalai about 6.4 to 8.0 km. (four to five miles) from the coast (Moore, 1970). Most of the flow consists of pahoehoe, though some aa occurs in the lower parts of the flow (Stearns and Macdonald, 1946). The submarine Huehue lavas were described by Moore (1970) and Clague (1982).

Most of the Hualalai eruptions have been small, similar to small or average Kilauea eruptions. The 1800-1801 eruption was a comparatively small one. The eruptions tend to be more explosive than those of Kilauea, because of the chemical composition of Hualalai lavas (alkaline olivine basalt with a high proportion of volatiles). Deposits of three explosive eruptions of the past 3,000 to 4,000 years have been found at Hualalai (Moore, et al., in press).

Current investigations indicate that the recurrence interval of eruptions on Hualalai averages approximately 50 years (Moore et al., in press). There have been 200 eruptions in the past 10,000 years. Therefore, a new eruption in the near future is a possibility that must be considered. Moore and others suggest that an eruption is probable within the next 200 years and could occur in the next few decades.

Volcanic hazards at Makalawena would come from lava flows or pyroclastic material, the products of explosive eruptions (Moore, et al., in press). Lava flows pose the greater hazard and because of the steepness of the west and northwest sides of Hualalai, lavas might flow down the volcano quite rapidly. On the basis of present data it is not possible to predict where the next eruption will occur. However, seismic monitoring instruments located on Hualalai and maintained by the Hawaii Volcano Observatory would permit advance warning of significant seismic activity which could indicate impending volcanic activity. However, some evidence suggests that it might occur on the northwest rift zone.

Future Hualalai eruptions are likely to be of small to moderate size, though possibly explosive, if the pattern of past eruptions continues. There may be some warning time before an eruption, although precursors could be somewhat different from those that signal eruptions at Kilauea. Since Hualalai has been inactive since the 1800-1801 eruptions, there is probably no molten rock

at shallow depths beneath the volcano. Therefore, rising magma could be expected to cause sharper and perhaps somewhat stronger earthquakes than the precursor earthquakes at Kilauea. It is likely that there also would be less ground deformation than occurs at Kilauea which is underlain by a shallow magma chamber. Warning time might be short, perhaps as little as a week or a few weeks. The signals of an impending eruption should be clear and provide time to safeguard lives at Makalawena and elsewhere on the Kona coast.

In evaluating relative risks from volcanic hazards at Hualalai, Mullineaux and Peterson (1974) estimated the risk from lava flow burial, falling rock fragments and volcanic gases to be moderate. Indirect risk from subsidence and surface rupture was judged to be low. In terms of overall relative volcanic hazards, the Makalawena-Keahole Point region is in an area of moderate to high risk. On a scale from A (lowest risk) to F (greatest risk), the Makalawena-Keahole region ranks "DE". Most of the southern half of the island of Hawaii is ranked in zones "E" and "F"; most of the northern half (except for the westernmost area within a 10-mile perimeter of Keahole Point) is ranked "A" and "B".

Earthquakes: The island of Hawaii is seismically active and is in Seismic Zone III of the Uniform Building Code. Although the most recent large earthquakes have taken place under the southern part of the island, a large earthquake offshore from Kealakekua Bay, roughly 20 miles south of the site, occurred on August 21, 1951. Its magnitude was between 6.75 and 7.0, and its Modified Mercalli intensity at the site was estimated to be IV. This intensity level corresponds to nondestructive ground motion felt by many people indoors. By comparison the magnitude 6.6 "Kaoiki" earthquake that occurred November 16, 1983 under the southeast flank of Mauna Loa was assigned an intensity of IV-V at the site. Intensity V corresponds to ground motion felt by nearly all, with some fragile objects broken.

The closest large earthquake to the site probably was the magnitude 6.5 event on October 6, 1929, centered under Hualalai Volcano. Assuming a distance between 10 and 15 miles from the 1929 earthquake, Modified Mercalli intensities at the site of VII to VIII would have resulted. This corresponds to ground motion causing damage ranging between negligible to slight in well built structures and slight to considerable damage in ordinary substantial buildings.

Much of Hawaii's seismicity is not associated with surface faulting. The 1951 Kona earthquake is considered to be related to the Kealakekua fault, however, and is the closest mapped fault to the site considered active.

Tsunami and Flooding: The Hawaiian island coasts are exposed to seismic sea waves, or tsunamis, from both distant and local earthquakes. Tsunami runups for the islands have been documented, but the site is on an essentially uninhabited section of coastline for which no historical tsunami data is available. As identified on the Flood Insurance Rate Maps prepared by the U.S. Army Corps of Engineers, the coastal areas of the property are designated Zone V15 or Coastal High Hazard Areas. The base flood elevation is approximately nine feet above mean sea level with areas of potential 100-year flooding ranging from 75 to 400 feet inland of the shoreline. Other than the area adjacent to the shoreline, the property has been designated Zone C, area of minimal flooding (see Chapter X, U.S. Army Engineer District, Honolulu, letter).

4.3.2 Impacts

In the occurrence of a volcanic eruption, earthquake, tsunami or flooding, risk to life and property would exist within the resort development.

4.3.3 Mitigation Measures

On the basis of present data, it is not possible to accurately predict where the next eruption would occur. Seismic monitoring instruments located on Hualalai would permit warning of significant seismic activity which could indicate impending volcanic activity. Additionally, lava originating from an eruption of Hualalai, if similar to other eruptions on the island, would move slow enough to allow for adequate evacuation time in the occurrence of a volcanic eruption. The existing Civil Defense warning systems could be utilized to evacuate people from the area in the occurrence of an eruption. Not withstanding potential future manmade barriers designed to divert lava flows, there would be no mitigation measures for the potential damage to property due to volcanic eruption.

The project would conform with standards for Earthquake Zone III in the Uniform Building Code to minimize risks from earthquake activity. Further geotechnical surveys will be conducted to determine the presence of lava tubes and subsurface cavities that could pose a hazard to construction workers and future resort visitors and residents.

Conformance to the County regulations regarding construction within tsunami and flood zones would minimize any potential risk to life due to these natural occurrences. Resort structures would be located above the base flood elevation level.

4.4 HYDROLOGY

4.4.1 Existing Conditions

Drainage: Due to low rainfall and highly porous ground conditions, natural runoff from seasonal rainfall is very limited and flood hazards remote. What little surface runoff that occurs during storm events is predominantly carried as sheet flow before percolating to the groundwater table.

Several minor gullies traverse upper reaches of the site, but generally lose their definition before reaching the highway. Drainage culverts are located at intervals along the highway to allow any flood waters to pass under the roadway.

Hydrologic Geology: The Makalawena parcel is coincident with a line of cinder cones, a phenomenon ordinarily associated with a rift zone. However, no surficial evidence of intrusive rocks, dikes or sills exist. At great depths these types of impermeable intrusives constitute a considerable fraction of the bedrock and, consequently, control the movement of groundwater. At Makalawena, these features are apparently too widely spaced in the slightly eroded slopes of Hualalai Volcano to disrupt the regional aquifer. Based on information obtained from deep wells drilled at Kaupulehu, just north of Makalawena, and at Huehue, south and adjacent to Makalawena, groundwater occurs as a basal lens floating on sea water at least as far inland as Mamalahoa Highway (approximately 5 miles).

Groundwater Occurrence and Aquifer Characteristics: A thin basal lens of fresh brackish groundwater underlies Makalawena and continues many miles to the north and south of it. The lens also extends inland for at least five miles. Toward the coast it is brackish with a head (water table elevation above sea level) of one to two feet and thickness of about 50 feet. Inland it freshens as head rises. Where the ground elevation is 200 feet, head is approximately 2.5 feet; at 1,200 feet elevation, head is about five feet. At the inland boundary of the project area the lens is brackish but useable for most irrigation needs; at the 1,200 feet level, it is likely to be fresh and developable for a domestic water supply.

In some places at low elevations, groundwater is visible where the craggy basaltic layers are collapsed. Maciolek and Brock (1974) describe exposures of the basal lens along the Kona coast and call them "anchialine ponds."

The salinity of anchialine ponds is representative of the groundwater lens in coastal areas. Maciolek and Brock measured a salinity of 6 ppt (parts per thousand), equivalent to 3350 mg/1 chloride, for Kapoikai (Opae'ula Pond), and a value as low as 3 ppt (1,680 mg/1 chloride) in smaller ponds nearby. The average

of the smaller ponds was 4 to 6 ppt. These salinities are tolerated by plants growing near the coast which reach to groundwater for moisture.

Brewer (Appendix D) recorded pond temperatures ranging from 24.8 to 28.9 degrees C., with small mauka pools generally demonstrating cooler temperatures than larger makai ponds or pond complexes. A thermal gradient was evident mauka to makai and vertically in the water column only in a single large elongate pond that had pockets in excess of 1 meter in depth. Salinities were variable and ranged from 3.8 to 10.0 ppt. Mauka ponds or pools had generally lower salinities than makai pond waters. Salinity gradients were evident vertically with variations up to 1 ppt detected in Pond 3 (see Figure IV-2). Dissolved oxygen values were generally below saturation as would be expected considering the groundwater origin of the pond waters. Values ranged from 4.4 to 6.6 ppm. Small mauka ponds were generally lower in dissolved oxygen than larger makai ponds.

The high salinity of the basal lens in the coastal region is the result of mixing of sea water and fresh water caused by tidal perturbations. Further inland tidal motion is muted, leaving the lens with good quality brackish water suitable for a wide range of irrigation applications. Within the project site boundaries, brackish water having as low as 500 to 1,000 mg/l chloride content is probably developable.

Aquifers in basalts of the Hualalai series are extremely permeable. This means that groundwater flows easily toward the coast and therefore that heads are low. The proportion of fresh water in a basal lens is governed by head. Where head is less than about five feet, withdrawal of domestic quality water (less than 250 mg/l chloride) at economically feasible rates (about 300 gpm or more) is uncertain. At greater heads, wells producing as much as 700 gpm are possible. Head in Makalawena reaches five to seven feet at approximately the 1,200 feet elevation contour, about four miles from Pu'u Ali'i Bay, or 2.5 miles upslope of Queen Kaahumanu Highway.

Present Groundwater Development in the Region: Three deep wells have been drilled near the inland reach of Makalawena, two at Kaupulehu, a mile and a quarter to the north, and the other in Huehue Ranch, half a mile to the south. The Kaupulehu wells (State nos. 4658-01 and 4658-02) are at elevation 1,345 feet and the Huehue well (State no. 4559-01) is at 1,579 feet. All three wells encountered and successfully pumped fresh water. The aquifer into which these wells were drilled underlies Makalawena also.

At both Kaupulehu and Huehue the head is reported as about seven feet. The Kaupulehu wells are 3.6 miles inland and the Huehue well is about four miles inland. The Kaupulehu wells were tested

at 550 gpm and yielded water having only 38 mg/1 chloride. The Huehue well was tested at 150 gpm and provided water with 84 mg/1 chloride. The test results suggest that wells drilled to about 50 feet below sea level at a distance of four miles or so inland will yield up to 700 gpm (1 mgd) of potable water.

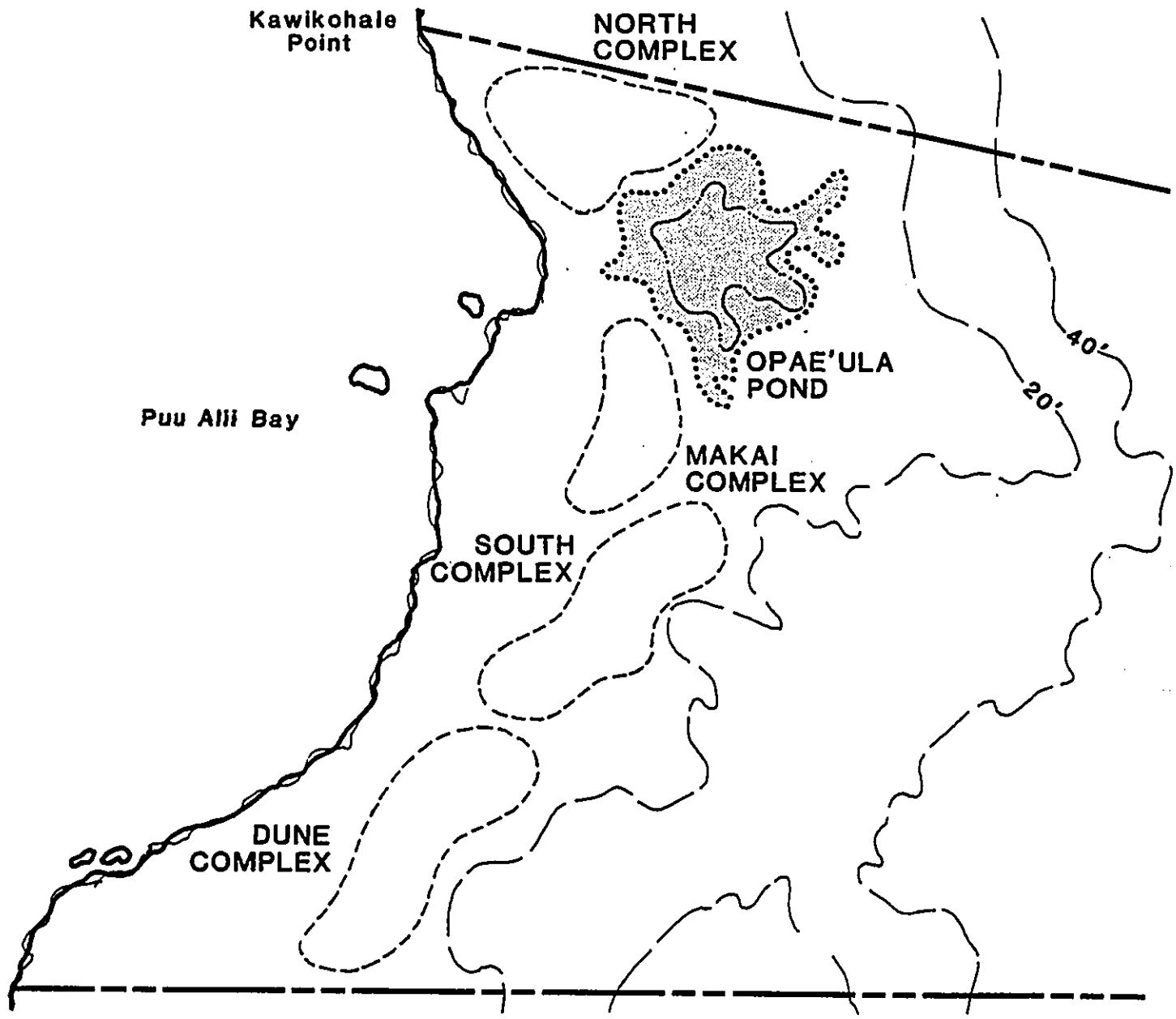
Unsuccessful deep wells further from Makalawena than Kaupulehu and Huehue are the Kona Village wells four miles to the north and the Kalaoa well three miles to the south. The Kona Village wells (State Nos. 4858-01, 02, and 03) are 2.2 miles inland and the Kalaoa well (State No. 4360-01) is three miles inland. The head is reported to be about two feet at Kalaoa and two to three feet at Kona Village. At a pumping rate of 150 gpm the Kalaoa well had 740 mg/1 chloride; at 100 gpm the Kona Village wells yielded water with 400 mg/1 chloride. These salinities, though not fit for drinking, are acceptable for irrigation and for feed water in desalinization.

Potential Groundwater Development in Makalawena: In Makalawena, brackish groundwater is developable within the boundaries of the project site, and fresh water further inland where the ground elevation exceeds 1,200 feet. Brackish water of irrigation quality can be obtained seaward of Queen Kaahumanu Highway, about a mile and more inland of Pu'u Ali'i Bay. In the reach between the highway and elevation 1,200 feet the brackish lens gradually freshens. Domestic quality groundwater may occur at a lower elevation, but economically feasible pumping rates might not be sustainable.

Salinity of the brackish water in the project area is low enough to qualify for small scale methods of desalinization. However, one of the dissolved constituents, silica, may limit the efficiency of membrane based processes. Kona Village has desalinized water from its brackish wells to provide a potable supply for its activities.

4.4.2 Impacts

Runoff: Paving and other impermeable surfaces within the resort, residential areas and roadways will alter drainage patterns and increase surface runoff. Increased surface runoff may adversely affect the baseline water quality in the coastal anchialine ponds by producing short-term reductions in salinity and increases in ambient water temperatures and nutrient levels. However, studies have suggested that the Makalawena pond complex is well flushed through groundwater percolation and tidal exchanges (see Appendix D). Additionally, anchialine pond biota are euryhaline over a range of 2 to 36 parts per thousand (ppt) and temperature tolerant over a range of 19 to 35 degrees Centigrade (Brock, 1985). At the Makalawena pond complex water temperatures ranged from 24.8 to 28.9 degrees Centigrade; salinities from 3.8 to 10.0



COASTAL POND LOCATION MAP

MAKALAWENA RESORT

0 125 250 500 FEET

pbr

FIGURE IV-2

ppt (Appendix D). Any short-term perturbations in water quality are, therefore, not expected to result in any adverse impacts to pond biota.

Effects of Groundwater Development on Groundwater Resources:
Basal groundwater flows toward the coast down a regional gradient of about 1.5 feet per mile and freely discharges along the shore. The average volume rate of flow in North Kona-South Kohala has been estimated by Kanehiro and Peterson (1977) to average 6.38 mgd/mile of coast line. Groundwater withdrawals from the lens will diminish seaward flow, but the effect would be neither locally specific nor directly observable. The consequence of extracting several mgd from deep wells along a line parallel to the coast over a distance of one mile probably would not be measurable in the anchialine ponds or the coastal seepages. The aquifer is so highly transmissive that groundwater will flow down the slightest gradient toward pumping wells from far distances. Similarly, the extraction of groundwater for resort usage (approximately 1.56 mgd) would not significantly decrease available water supplies for other, e.g., agricultural, uses in the vicinity of the project site due to the large quantity of groundwater underlying the project site.

The use of fertilizers and agricultural chemicals within the project site may have a deteriorative effect on the anchialine ponds if excess quantities are applied. Surplus fertilizer nutrients and biocides might percolate to the basal lens, then eventually appear in the ponds. Careful water management could prevent excessive irrigation and its consequences.

Runoff from even the heaviest rain showers is a short distance phenomenon on the permeable surface of the North Kona lava environment. This natural condition together with a low rainfall (10 to 15 inches per year) substantially preclude flood hazards. Virtually all rain water, except the portion quickly consumed by plants, percolates to the water table. Constituents dissolved at the ground surface and along the path of infiltration are carried to the basal lens.

4.4.3 Effects Which Cannot Be Avoided

Sedimentation potential will increase during the short-term grading and construction phases.

4.4.4 Mitigation Measures

A drainage system will be developed to dispose storm water runoff in ways which would minimize the degradation of the shoreline, and the nearshore and anchialine pond water quality. In view of the highly permeable nature of the lava environment in the site,

a drainage system based on a dispersed shallow subsurface disposal scheme would be able to absorb the runoff flow while minimizing the amount of constituents in the runoff percolating to the water table and on to the nearshore waters or anchialine ponds. Even with a soil cover, there should be sufficient percolation rate on the golf course fairway and other open spaces to keep high runoff to a minimum even during heavy rains. Any runoff that might occur could be directed to the treated wastewater holding ponds. Where this is not possible, simple trench drains can be located in low spots to percolate the runoff into the ground. Runoff from the paved areas can be disposed through horizontal dry wells dispersed in and nearby the paved areas.

The effects of withdrawal of groundwaters and/or injection or surface disposal of treated wastewaters or rainwater runoff would be compatible with anchialine pond and nearshore water quality inasmuch as both habitats are characterized by natural subterranean brackish water discharges. Flora and fauna associated with both habitats are euryhaline and would not be adversely affected by short-term alterations in water salinity. Existing data suggest that, given the extremely euryhaline nature of anchialine pond flora and fauna, changes in the biotic composition resulting from groundwater withdrawal is extremely unlikely.

Water currents and diurnal tidal flushing will prevent any significant deterioration of nearshore water quality resulting from the use of treated wastewaters for irrigation purposes. (See Chapter IV, Section 4.6.2 and Chapter XI, DEIS letter from NELH and response thereto for additional information regarding the use of treated sewage effluent for golf course irrigation purposes and effects on coastal water quality.)

Diurnal tidal flushing and natural mixing of groundwaters and ocean waters would prevent any significant degradation of anchialine pond and offshore water quality.

A water study to identify the most feasible potable water system (well or desalination) will be prepared in conjunction with detailed water supply, irrigation and wastewater disposal planning. All applicable State Department of Health and county standards will be met. (See Chapter IV, Section 4.12 for additional information regarding applicable water system regulations.)

Irrigation of landscaping using potable water would have a potential to reduce underlying groundwater salinity and salinity levels down gradient toward the coastal ponds. Conversely, pumping of potential wells in the vicinity of the ponds for brackish irrigation purposes could reduce flows to the ponds and increase their salinity. Any such increases in pond salinity would be offset by increased surface runoff and the high degree

of mixing that characterizes the pond complex. Anchialine pond biota are euryhaline (salinity tolerant) and would not be adversely affected by a change in salinity.

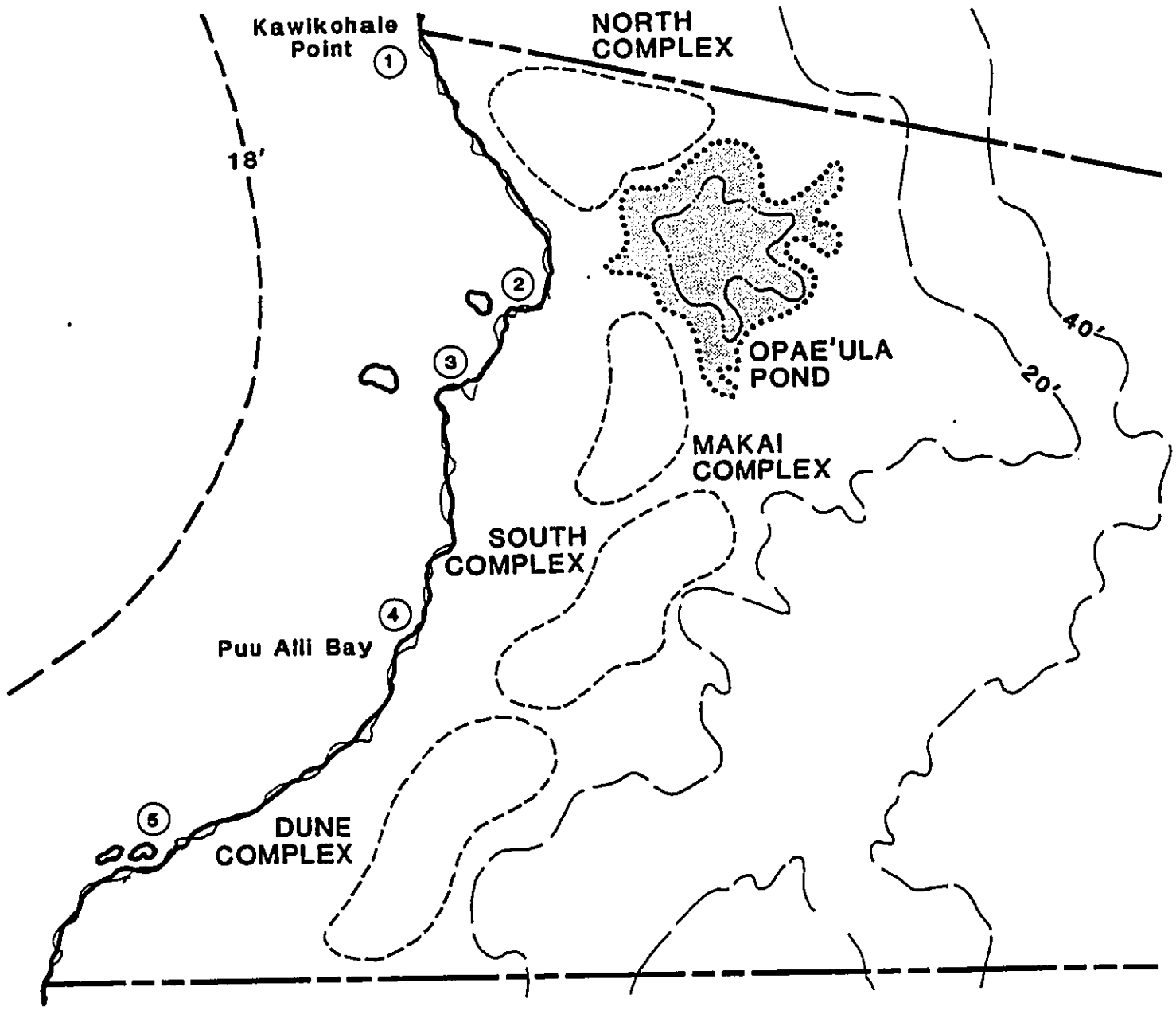
In comparison with other disposal methods (i.e. ocean discharge, disposal wells, leaching fields, sewage ponds), proposed landscape irrigation with treated effluent wastewater probably minimizes risk of adverse effects on the groundwater of the region. Nutrient levels in natural, unmodified anchialine ponds are high in comparison to ocean waters. Although nutrient input into groundwaters by golf course irrigation with treated wastewater effluent has been found to increase concentrations of nitrates, phosphates, and ammonium in nearby anchialine ponds, there was no apparent change demonstrated in phytoplankton activity or water turbidity over baseline levels. Rapid flushing is believed to prevent a buildup of phytoplankton populations that would otherwise reduce water clarity (Oceanic Institute, 1984). Negative impacts have not been demonstrated in anchialine ponds makai of the Mauna Lani Resort golf course and condominium development (Brock, 1985). On-going monitoring programs at Waikoloa and Mauna Lani will be monitored and appropriate measures to minimize adverse impacts on anchialine pond and offshore water quality incorporated into the proposed project water management plans.

4.5 COASTAL AND MARINE ENVIRONMENTS

4.5.1 Existing Conditions

The marine environment at Makalawena extends along 3,000 lineal feet of shoreline and encompasses Pu'u Ali'i Bay with a long, white sand beach backed by sand dunes 15 to 20 feet high. Rocky points border the north and south coasts of the bay. The near shore waters are similar in clarity, chemistry, and marine life to other areas along the South Kohala-North Kona coast. The waters offshore of the project site support a low number of fish species, corals and algae (see Appendix D - Baseline Marine and Coastal Pond Surveys). The relatively low diversity and low population levels of fishes in the nearshore waters of Pu'u Ali'i Bay probably reflects the absence of suitable coral habitat, heavy fishing pressure and the impact of tropical fish collectors. As noted previously (see Section 4.3.1), the west coast of Hawaii is subjected to tsunamis and periodic North Pacific storm waves such as the February 1986 storm, which may also account for the low diversity of corals and macroalgae in Pu'u Ali'i Bay. During the marine survey conducted for this EIS, the effects of the February 1986 storm were apparent and presumably partly responsible for the absence of coral habitat and macroalgae (see Appendix D).

Nearshore Water Quality: Temperature, salinity and dissolved oxygen values were variable and reflected the presence of significant subtidal groundwater discharges throughout the entire length of Pu'u Ali'i Bay. Coastal pond/marine survey sampling locations are shown on Figure IV-3. During low tide periods surface waters (approximately 0.5 m.) demonstrated lower salinities and somewhat lower temperatures than bottom waters (1.5-2.5 m.) at the same sampling station (Table IV-1). The mean surface water (0.5 m.) temperature during the low tide sampling period was 27.9 degrees C.; mean bottom water temperature during the same period was 28.4 degrees C. Vertical stratification was less evident during the afternoon high tide period because of increased wind and wave action and resultant greater mixing. Although variability was apparent between stations, mean surface and deep water temperature for all five stations at high tide was 28.7 degrees C. Groundwater seepage was evident from the lower intertidal zone to an estimated 100 meters seaward during underwater surveys. These discharges were detectable to the diver by way of the noticeably cooler "pockets" of water and the schlieren effect created by the mixing of two water masses of differing densities.



LEGEND

① WATER QUALITY SAMPLING STATIONS

18' CONTOUR

SOURCE: WILLIAM A. BREWER & ASSOC., 1986. BASELINE MARINE AND COASTAL POND SURVEYS, MAKALAWENA, NORTH KONA, HAWAII

COASTAL POND / MARINE SURVEY LOCATIONS

MAKALAWENA RESORT

0 125 250 500 FEET

pbr

FIGURE IV-3

TABLE IV-1

Nearshore Marine Water Quality Date-Physical/Chemical Properties

Parameter:		Depth (M)	Temp. (C.)	Salinity (PPT)	Diss. Oxygen (PPM)
Station #					
Station 1	(Low)	0.5	27.6	29.9	6.7
		1.5	28.5	32.0	6.9
	(High)	0.5	29.0	30.5	7.4
		1.5	28.8	31.4	6.9
Station 2	(Low)	0.5	28.0	30.4	6.5
		1.5	28.6	32.3	6.9
	(High)	0.5	28.9	32.3	7.0
		1.5	28.8	32.2	7.5
Station 3	(Low)	0.5	27.9	31.0	6.9
		1.5	28.3	33.0	7.0
	(High)	0.5	28.8	31.1	6.7
		1.5	28.9	31.7	6.9
Station 4	(Low)	0.5	28.0	29.0	6.6
		1.5	28.2	30.4	7.1
	(High)	0.5	28.5	30.1	7.5
		1.5	28.5	30.2	7.5
Station 5	(Low)	0.5	28.0	32.9	7.0
		1.5	28.3	32.5	7.2
	(High)	0.5	28.1	33.6	6.8
		1.5	28.3	33.5	6.9

Sampling Period: Low Tide: July 19, 1986; 1015-1045 hours
High Tide: July 19, 1986; 1310-1355 hours

Dissolved oxygen levels indicated all samples to be at or in excess of saturation with respect to the prevailing water temperatures and salinities. Dissolved oxygen values were slightly lower in the surface waters during the low tide (morning) sampling period, a factor which may be related to the presence of groundwater and less wind and wave action. Although low saline water can accommodate a significantly higher level of dissolved

oxygen than high saline waters (at the same temperature and pressure), the prevalent groundwater discharges may be contributing waters low in dissolved oxygen. Dissolved oxygen levels during high tide periods were uniform in the nearshore water column with both surface and bottom waters demonstrating a mean of 7.1 ppm.

The temperature, salinity and dissolved oxygen values recorded in the study area are representative of summer nearshore waters along much of the Kona coastline. No single physical or chemical parameter would appear to constitute a limiting factor for any marine organism normally associated with nearshore waters.

Marine Biological Surveys: Pu'u Ali'i Bay is located between Kawikohale Point to the northeast and Kawili Point to the southwest. Within this larger embayment, Makalawena consists of approximately 1,100 meters of coastal frontage, intersected by several prominent basalt headlands which create four cresent-shaped, largely white sand beaches. A massive sand dune dominates the back beach area along approximately 700 meters of the southwest side of the parcel.

Intertidal Zone: The intertidal zone at Pu'u Ali'i Bay, consists of massive, geologically young, basaltic headlands and broad expanses of sand and scattered beach rock. All of the subzones (splash, upper intertidal, middle intertidal, lower intertidal) were nearly devoid of macroscopic plants and animals which may indicate recent storm wave action. A severe winter storm, with waves of 15 to 20 feet, hit the west coast of Hawaii in February 1986. The direction of wave propagation (from the northwest) and the location of Makalawena would have left the coastline and submerged lands extremely vulnerable to storm wave damage.

Beaches on the northeastern, more wave protected, side of the property were bordered by a broad limestone platform that ranged from less than 6 meters to perhaps 20 meters in width. This zone harbored dense assemblages of the rock boring urchins Echinometra mathaei and Echinostrephus aciculatus. Densities ranged from less than 20 to approximately 80 per square meter. The small serpulid worm Portula atypha, and a second species, Spirorbis sp., were locally abundant on a few larger rocks in wave-protected areas. Gastropods were limited to one specimen of Conus lividus, widely scattered Opihi (Cellana exarata) and relatively few Pipipi (Neritea picea (a normally common resident of the high intertidal zone). The Rock Oyster, Isognomon perna, was the only bivalve recorded in the lower intertidal zone, however, they were relatively few in number (18 recorded) and generally restricted to the shore-facing, midwater side, of larger boulders. Only two specimens of the intertidal crab, Grapsus tenuicrustatus, were observed. Small Manini (Acanthurus

triostegus) and juvenile Pomacentrids dominated the fish fauna of small tide pools in this zone, though no species was particularly abundant. The flora of this zone was extremely sparse and limited to small growths of Ulva fasciata (Palahalaha), Enteromorpha ('Ele'ele), and Sphacelaria furcigera.

Unlike the beaches on the northern side of Makalawena, beaches on the southwesterly side of the property lacked an inshore bench and were characterized by unconsolidated sand and occasional rock outcrops. With the exception of two large opihi and filamentous, sand covered blue-green algae, there was no significant intertidal flora or fauna recorded in this area. The southwesterly beaches appear to be exposed to more wave action (from the north) than the northeastern beaches. Wave action maintains a shifting, unconsolidated limestone sand substrate which inhibits biological colonization. The absence of intertidal macroscopic organisms in this area also suggests recent and rather devastating storm-wave action.

Subtidal Zone to 18-Foot Contour: The nearshore marine environment (to approximately the 18 foot contour, or from the shoreline to approximately 100 to 200 meters offshore) at Makalawena is characterized by unconsolidated limestone sands, pahoehoe lava flows with limestone sand veneers, inshore (intertidal and subtidal) limestone benches paralleling the shore, large expanses of rocks, cobbles, and large basaltic boulders, and submerged basaltic headlands with surge channels perpendicular to the shore. Seaward of the 18 foot contour the substrate is dominated by limestone sand with widely scattered rock or limestone outcrops, except at the extreme southwesterly corner of Makalawena where basalt extends seaward from the shore approximately 250 to 300 meters before transitioning to a broad seaward sloping sand bottom.

Diversity and percent coverage of corals was higher by estimation on the north side of Pu'u Ali'i Bay than on the southwest side. Corals were generally found in shallower waters and closer to shore on the north side of the bay. This pattern is due to the presence of beachrock on the north side and the abundance of unconsolidated sands on the south side. However, neither side supported many species and coral coverage was low at both sites. Estimated coral coverage never exceeded one percent in any nearshore area surveyed. Coral coverage in the southwesterly side of Makalawena never exceeded an estimated 0.01 percent.

Pocillopora meandrina was the dominant coral at all sites surveyed at depths less than approximately three meters. Porites lobata occasionally intermixed with P. meandrina but was generally found at depths in excess of three meters. Most of the larger Porites colonies showed evidence of extensive damage from storm waves (sand abrasion and rock impaction). Some colonies were obviously vegetative forms from a former single colony that had been split into several irregularly shaped colonies. Porites compressa and the Zooanthid (soft coral) Palythoa tuberculosa were only rarely observed in scattered small colonies at depths in excess of five meters. Pocillopora damicornis, a common inshore coral in exposed coastal settings, was conspicuous in its absence. This was unusual inasmuch as both P. meandrina and P. damicornis are regarded as pioneer species in wave exposed reef environments.

The most extensive coral coverage at Makalawena was found at depths between approximately 8 to 10 meters, or approximately 400 to 600 meters from the shoreline. However, the depth precluded any detailed examination of this zone. Observations based on abbreviated snorkel dives indicated that coral coverage in this zone may exceed 60 percent. At least six species of corals were tentatively recorded in this zone and included (in relative order of abundance) Porites lobata, Porites compressa, Pocillopora meandrina, Montipora verrucosa, Leptastrea purpurea and Pavona varians.

The seaweed flora of Pu'u Ali'i Bay is sparse with no species particularly abundant. As with the pattern of coral coverage, there was a pattern of increasing diversity and coverage as one moved from the southwest to the north side of the bay. Except for filamentous cyanophytes, macroalgae were limited to the wave zone in rocky, shallow water, inshore areas. Coralline algae were common, but generally overgrown with filamentous epilithic algae and were not conspicuous. Represented coralline algae included Porolithon onkodes and Hydrolithon breviclavium. Enteropmorpha was common in some areas, especially locales influenced by groundwater percolation.

Echinoderms dominated the subtidal macroinvertebrate community at Makalawena. The boring urchins Echinometra mathaei and Echinostrephus aciculatus were the dominant echinoids. Other common urchins included the Slate-pencil Urchin, Heterocentrotus mammilatus, and the Collector Urchin, Tripneustes gratilla. The Long-spined Venomous Urchin Diadema paucispinum (wana) was seen in groups of three to four specimens in four locations. Asteroids (sea stars), Ophiuroids (brittle stars), and Holothurians (sea cucumbers) were not observed in any zone within Pu'u Ali'i Bay.

The nearshore fish fauna at Makalawena was limited, as would be expected, given the absence of any significant coral community. As a result, many of the common "coral reef" fish were absent and overall diversity was low. A total of 13 families, 25 genera and 41 species were recorded. Had underwater surveys encompassed the offshore deepwater coral community, the fish checklist would have most likely been substantially greater. Acanthurids (surgeonfishes), Labrids (wrasses) and the Monocanthid (filefish) Pervagor spilosoma were the most abundant species. Acanthurids were represented by twelve species with Acanthurus triostegus (manini), A. achilles (paku'iku'i), and A. nigroris (maiko) the more abundant species within the family. Naso lituratus (umaumalei) was seen only on three occasions. The labrids were represented by seven species, the more abundant being Coris flavovittatus (hilu), C. gaimard (hinale'aki-lolo), Gomphosus varius ('aki-lolo), Halichoeres ornatissimus ('ohua), and Thalassoma duperreyi (hinalea luahine). Fourteen separate juvenile C. gaimard were observed within an area of approximately 50 square meters. Such a large number of this strikingly brilliant red and white wrass is unusual. Common pomacentrids (damselfishes) were Abudefduf abdominalis (mano), A. sordidus (kupipi), and Plectroglyphidodon imparipennis. Butterflyfishes were uncommon, a consideration which may be related to the absence of coral reef habitat or harvesting by aquarium fish collectors.

The goatfishes Mulloides flavolineatus (weke) and M. vanicolensis (weke-'ula) were found throughout the area, often in mixed schools of 10 to 15 individuals. Both species were also frequently encountered upon the broad offshore sand zone. At least two species of very large parrotfish were frequently seen in groups of five to seven individuals at depths of five to eight meters. Scarus sordidus (ulu) was however, the only species which could be positively identified.

4.5.2 Impacts

Possible impacts to the marine environment from resort development could include the following:

1. Shoreline modifications and shoreline use;

2. Increased sedimentation;

3. Changes to the chemical profile;

4. Changed surface runoff patterns.

Modifications to the shoreline at Makalawena are not expected to occur. However, the proposed development would be designed to maximize its exposure to the coastline and to utilize the beach area as a major site amenity. The coastal waters of Makalawena offer moderate to good recreational opportunities.

Public access to, and use of, the shoreline for fishing, sunbathing and other recreational uses would be increased through the development of the resort. Increased public usage may impact the marine resources by reducing the amount and variety of reef fish.

A potential exists for sedimentation of coastal waters from wind blown dust or runoff during construction phases. This potential is very limited due to the prevalence of lava and lack of soil cover. No significant wind blown dust deposition is expected as a result of earthwork or rock crushing activities.

Changes in storm runoff patterns do not represent a significant adverse effect due to the precautions that would be taken during the design of the storm drainage system (see Chapter IV, Section 4.4.4).

Marine species of concern along the Kona Coast region include the endangered Humpback Whale (Megaptera novaeangliae) and the threatened Green Turtle (Chelonia mydas).

The Hawaiian population of Humpback Whales is the largest of the three Pacific populations, numbering approximately 1,200. The whales usually first appear in Hawaiian waters in November, peak in abundance in mid-February, and are scarce by mid-May. Areas of primary importance are Penguin Bank and the waters between Maui, Molokai, Lanai and Kahoolawe (Shallenberger, 1979). Areas of secondary importance include Kaula, Niihau, the south Kauai coast and the northwest coast of Hawaii. The Humpback Whale Management Plan (USCD, 1983) adds the north and east coasts of Oahu and the bank extending off Ka Lae (South Point), Hawaii.

The threatened Green and endangered Hawksbill Turtles are known to feed and, in the case of the Hawksbill Turtle, breed in Hawaii. In general, the preferred foraging areas are along the southeast coast of the Big Island. The Pacific Ridley Turtle is also occasionally sighted in these waters (Balazs, 1980). More than 90 percent of all breeding by Hawaiian Green Turtles occurs at French Frigate Shoals, and most other nesting sites are in the Northwestern Hawaiian islands. The nearest important resident area of Green Turtles to the Makalawena region is at the north-western tip of Hawaii and, as noted, another important area is found along the southeast coast of Hawaii at Ka'u.

Increased human use of the Makalawena area is, therefore, not expected to produce any direct effects on either the Humpback Whale, the Green or Hawksbill Turtles.

4.5.3 Mitigation Measures

Public access to the shoreline will be provided through a specified public right-of-way, to be determined in conjunction with detailed plans for the hotel sites and adjacent land owners.

Conservation measures may need to be implemented within the nearshore reef areas to minimize the impact of increased public use of Pu'u Ali'i Bay.

Shoreline modifications including extensive vegetative removal, coastal dune alterations and structural improvements are not planned.

Effects of wastewater percolation and possible migration to coastal waters would be addressed pursuant to the formulation of detailed landscape irrigation and wastewater treatment/disposal plans.

Natural lava tubes or subsurface cavities may offer potential as collectors of runoff waters, hence, may represent practical alternatives to manmade storm collection culverts. The use of such structures would minimize perturbations to nearshore water quality during periods of heavy stormwater runoff by allowing for natural filtration of such waters.

The effects of withdrawal of groundwaters and/or injection or surface disposal of treated wastewaters or rainwater runoff would be compatible with nearshore water quality inasmuch as the existing habitats are characterized by natural subterranean brackish water discharges. Flora and fauna associated with these habitats are euryhaline and would not be adversely affected by short-term alterations in water salinity.

Nearshore water currents and diurnal tidal flushing will prevent any significant deterioration of nearshore water quality resulting from the use of treated wastewaters for irrigation purposes.

4.6 COASTAL POND COMPLEXES

4.6.1 Existing Conditions

Mixohaline or anchialine ponds are situated in areas dominated by lavas of recent origin and are generally within 500 meters of the shoreline. They have been described as:

> "...generally small (less than 100 square meters), shallow (less than 1 meter deep) and having rocky basins. These basins are too porous to support ponded water above sea level and are filled with mixohaline water (average salinity 7 ppt), indicating an inland extension of the oceanic water table diluted by the outflow of subsurface freshwater. Consequently, the ponds are restricted to depressions in lava flows that extend downward into the water table." (Maciolek and Brock, 1974.)

Anchialine ponds are also characterized by an absence of surface connections with the sea, but contain saline water and undergo tidal fluctuations. They also harbor a distinctive biota. In the Hawaiian Islands anchialine pools are found along the west and south shorelines of Hawaii, southwest Maui, and Oahu. (Brock, 1985; Wong, 1975.) These ponds once figured prominently in Hawaii culture but have lost this prominence with the decline of the culture (Brock, 1977). Five classes of anchialine ponds have been proposed, based on differences in human use and degree of isolation from the sea (Brock, 1977). Holthuis (1973) was the first to describe the shrimp fauna occurring in coastal ponds and also proposed the term "anchialine" to describe these ponds. The most complete description of anchialine ponds, encompassing some 318 surveyed ponds on the Kona Coast, is found in Aquatic Survey of the Kona Coast Ponds, Hawaii Island (Maciolek and Brock, 1974). Brock (1985) also provided an excellent overview on the status and future of anchialine pond resources in the Hawaiian Islands. A detailed treatment of anchialine pond ecosystems is also found in the Final Environmental Impact Statement, Waikoloa Beach Resort, Waikoloa, South Kohala District, Island of Hawaii (Corps of Engineers, 1985).

A total of 58 ponds were identified during the July 1986 baseline surveys at Makalawena. This represents 33 more ponds than originally inventoried in the pioneering studies of Maciolek and Brock (1974) and may reflect the fact that the surveys were conducted during an exceptionally high (+2.6-foot) tide which probably enabled enumeration of small ponds and pools which would otherwise not be visible during normal tidal periods. With the exception of Opae'ula Pond, which is essentially a brackish water marsh and excellent waterbird habitat, the majority of the remaining 57 ponds displayed the physical and biological features characteristic of anchialine ponds, though all pond basins surveyed demonstrated the presence of at least one species of exotic fish (either Gambusia or Oreochromis (Sarotherodon) mossambicus, or both).

For ease of understanding, the Makalawena coastal pond complex has been divided into five (5) pond "basins" reflecting discernible physical, chemical and/or biological differences identified during baseline reconnaissance surveys conducted in 1986

(Appendix D). The five ponds/pond basins are identified as follows: North Pond Complex, Makai Pond Complex, South Pond Complex, Opae'ula Pond and the Dune Pond Complex. Water quality, biological features and other unique physical, chemical or biological attributes of each identified pond basin or complex are described in the following sections. Refer to Figure IV-2 for the approximate location of each pond/pond basin.

North Pond Complex: The North Complex consists of sixteen ponds and pools within an aa lava basin encompassing approximately four acres (Figure IV-2). Five of the sixteen ponds and pools retain standing water at a 0.0 tide; the remainder are distinguished at low tide periods by white epilithic deposits. Two of the ponds have been modified by construction of walls and removal of rocks from the pond bottoms. Two the of the larger ponds abut large stands of Kiawe on their south sides. Water quality and biological sampling was conducted within six selected pond or pool complexes which represented a cross-section of pond types in terms of size, mauka or makai setting, adjacent vegetation and extent of manmade modification.

- Water Quality: Pond temperatures ranged from 24.8 to 27.2 degree C., with small mauka pools generally demonstrating cooler temperatures than large makai ponds or pond complexes (Table IV-2). A thermal gradient was evident mauka-makai and vertically in the water column only in a single large elongated pond which had pockets in excess of one meter in depth (Table IV-2, Pond No. 3).

  Salinities were variable and ranged from 5.6 to 9.5 ppt. Mauka ponds or pools had generally lower salinities than makai ponds. Salinity gradients were evident vertically with variations up to one ppt detected in Pond No. 3.

  Dissolved oxygen values were generally below saturation as would be expected considering the groundwater origin of the pond waters. Values ranged from 5.0 to 6.6 ppm. Small mauka ponds were generally lower in dissolved oxygen than larger makai ponds.

- Biological Surveys:

  - Structurally Modified Ponds: Two heavily sedimented, structurally modified, ponds occur approximately sixty meters north of Opae'ula Pond. Both have manmade walls and the larg r pond (Pond No. 1) has a flat sedimented bottom. Kiawe thickets encompass approximately one-third of southern end of Pond No. 1. Pond No. 1 is also distinguished by rooted Ruppia maritima which covers approximately 15 percent of the total pond bottom. Approximately 30 percent of the pond is covered with a floating mat of green filamentous algae. The poeciliid

Gambusia (mosquito fish) was the only fish observed. Invertebrates were represented by exceptionally high numbers of the mollusk Melania sp. which were concentrated around the shoreline. Densities often exceeded 300/0.25 square meter.

TABLE IV-2

Coastal Pond Water Quality - North Complex

Parameter:	Size*	Depth (M)	Temp. (C.)	Salinity (PPT)	Diss. Oxygen (PPM)
Station #					
Pond 1 (walled)	2	0.1	26.5	7.3	6.2
Pond 2 (walled)	3	0.2	25.4	6.9	6.6
		0.7	25.5	7.1	6.4
Pond 3 (mauka)	4	0.1	25.5	7.5	5.9
		1.0	24.9	8.2	5.9
(middle)		0.1	25.6	7.8	5.9
		1.0	26.6	8.8	5.7
(makai)		0.1	27.2	9.3	5.4
		0.3	27.2	9.5	5.4
Pond 4	2	0.2	24.9	6.6	5.1
Pond 5	1	0.1	24.8	5.8	5.0
Pond 6	3	0.2	25.0	5.6	5.0

Sampling Period: July 19, 1986; 1430-1510 hours

*Size Classification:
1 = 1 square meter
2 = 1 square meter & 10 square meters
3 = 10 square meters & 50 square meters
4 = 50 square meters & 100 square meters
5 = 100 square meters

Pond No. 2 encompasses approximately eight square meters and rests approximately 20 meters north of Pond No. 1. Unlike Pond No. 1, which averaged less than 10 cm. in depth, Pond No. 2 had a center depth of approximately

0.7 m. Gambusia was common, as was the snail Melania which were concentrated around the shallow perimeter of the pond. A second snail, possibly an ecotype (variant) of Theodoxus cariosa or Theodoxus vespertina was noted on vertical walls of deeper rocks. The specimens were approximately 0.7 cm. in diameter and lacked the lateral wing-like shell protrusions noted for some varieties of T. cariosa with which the author is familiar. This species was not seen elsewhere at Makalawena, but would be extremely difficult to detect wherever it occurs.

- Maciolek & Brock Elongate Pond: The Maciolek and Brock elongate pond is so named because it was photographically documented in the Maciolek and Brock (1974) study. This pond is approximately 50 meters in length and varied from 0.5 meter at its narrowest point to slightly more than two meters in width at its widest point during the survey period. Maximum depth was approximately 1.5 meters. The upper (mauka) two meters of the pond is physically separated by a manmade rock "trail crossing," though the mauka pool is physically part of the same pond.

  Water quality data showed a pronounced mauka-makai increase in temperature and salinity as well as vertical stratification of both temperature and salinity (Table IV-2, Pond No. 3). A photograph of the pond taken during the field survey in July 1986 showed it to be physically identical to the 1972-1973 period when surveyed by Maciolek and Brock (1974) (see Appendix D, Plate No. 3).

  This pond constitutes the classical anchialine pond per the physical and biological definitions of anchialine ponds offered by Holthuis (1973), Maciolek and Brock (1974), and Brock (1985). The mineralized white-to-orange Schizothrix crust is present in deeper, possibly subtidal, waters and there is an absence of bottom sedimentary deposits except in the deepest part of the pond.

  Anchialine pond fauna was characterized by Halocaridina rubra which was infrequently seen in the main body of the pond, but is abundant (5-8/0.25 square meter) in the small mauka portion of the pond, above the trail crossing. Two specimens of the Glass Shrimp Palaemon debilis were seen in the small mauka pool. The difference in abundance between the main body of the pond and the mauka pond is probably the result of the presence of one specimen each of Mugil cephalus, Neoxyxus chaptalii (uouoa), and the Pomacentrid Abudefduf sordidus in the main pond. The main pond was also inhabitated by moderate numbers of Gambusia, whereas no more

than a dozen very small Gambusia were seen in the mauka pool. The manmade rock trail crossing appears to restrict the movements of larger predatory fish which may account for the populations of H. rubra and P. debilis that were observed.

Invertebrates were represented by black esturine crab Metopograpsus thukuhar (four specimens recorded) and rarely, Melania. Metopograpsus was only recorded from this pond and was not observed elsewhere at Makalawena. The difference in abundance of Melania in this pond, as contrasted with the walled ponds in this basin, may be the result of the absence of Ruppia and other sources of soft organic materials that are required for food. There is no vegetation surrounding the Maciolek and Brock pond.

- Mauka Ponds: Three isolated ponds of three size classes (Table IV-2 Ponds Nos. 4, 5, and 6) were selected as representative un-vegetated mauka ponds within the study area. These ponds were generally lower in temperature, salinity and dissolved oxygen than the other ponds previously described and ranged in size from less than one to approximately 15 square meters in surface area. These ponds were found to "disappear" during low to intermediate tidal periods. Because of their intermittent nature, none had the Schizothrix crust characteristic of true anchialine ponds. Instead, a thin, chalkish-white epilithic crust characterized the boundaries of these small depressions.

  The fauna of two of the three ponds was limited to H. rubra at densities of approximately 2-3/0.25 square meter and a few juvenile Gambusia.

- Makai Pond Complex: The Makai Pond Complex (Figure IV-2) consists of nine inventoried ponds or pools in advanced stages of ecological succession. The ponds ranged in size from less than one meter to approximately ten square meters. A much larger number of ponds undoubtedly exists on the southeastern and makai borders of the 7-acre Opae'ula wetland, but inpenetrable Kiawe thickets limited access to only the more accessible ponds.

  - Water Quality: Water temperatures and salinities were higher than in other pond basins and dissolved oxygen levels were generally lower. Temperatures ranged from 26.9 to 28.9 degrees C. and salinities from 8.8 to 10.0 ppt. Dissolved oxygen levels ranged from 4.4 to 6.6 ppm (Table IV-3).

TABLE IV-3

Coastal Pond Water Quality - Makai Complex

Parameter:	Size*	Depth (M)	Temp. (C.)	Salinity (PPT)	Diss. Oxygen (PPM)
Station No. 1	2	0.1	26.9	8.8	6.6
		0.8	26.9	8.8	6.4
Station No. 2	1	0.3	28.9	10.0	4.5
Station No. 3	3	0.4	28.8	9.9	4.4

Sampling Period: July 20, 1986: 1430-1450 hours

* Size Classification: 1 = < 1 square meter
2 = > 1 square meter & < 10 square meters
3 = > 10 square meters & < 50 square meters
4 = > 50 square meters & <100 square meters
5 = >100 square meters

- Biological Surveys: Thick floating mats of filamentous green and blue-green algae dominated most of the generally shallow (rarely more than 10 cm. deep) ponds within this basin, although a few deeper pools (to 0.7 meters) were found mauka of the back beach area and presumably outside of the zone of wind blown beach sand deposition. All of the ponds were covered with dense Kiawe thickets which contribute significant quantities of leaf litter and indirectly reduce water circulation through the buildup of benthic organic materials. As a result, all of the ponds had a eutrophic character, despite the clarity of the water. One small deep pond had a benthic substrate which appeared to be composed of a thick Schizothrix crust which had been overgrown by a dark green Enteromorpha mat.

  The macrofuana of the ponds was limited to Gambusia, occasional Melania, and an unidentified hydrophilid beetle. The deeper ponds generally supported fewer Gambusia than the shallower ponds.

- South Pond Complex: The South Pond Complex encompasses a total of at least 11 ponds or pools which form an estimated 200 meter long basin (Figure IV-2). Five ponds were selected for detailed examination. With the exception of a large,

sedimented pond on the north side of the basin, the remaining ponds share similar biological characteristics. This pond complex appears to represent the H 24-28 series in the Maciolek and Brock (1974) study.

In the author's opinion, this series of ponds represent the most scenic anchialine pond basin within the Makalawena area. The ponds are generally bordered on the north side by Kiawe and on the south side by aa lava and scattered Fountain grass, though some ponds are totally covered with Kiawe. The contrast between green Kiawe leaves, relatively deep (to 1.5 meters) transparent waters, dark brown lava, and orange cyanophyte deposits is often quite striking. The large sedimented pond is also unusual in the near vertical 4+ meter natural lava wall which encircles most of the north and northeastern sides of the pond.

- Water Quality: Table IV-4 shows the water quality characteristics of this pond basin. With the exception of Pond No. 1, which is the largest (>100 square meters) and the only sedimented pond in the basin, the remaining four ponds demonstrated similar chemical and physical properties. Pond No. 1 was the warmest of the ponds within the basin (28.5 to 28.6 degrees C.) a consideration which may be related to it being shallow, heavily sedimented, and having, presumably, poorer circulation than the adjacent, unsedimented ponds. In general, this pond basin demonstrated lower salinities (3.9 to 4.6 ppt) than other pond complexes, though this may in part be the result of the sampling interval which occurred during an afternoon high tide period. Pond No. 1 also demonstrated the lowest dissolved oxygen levels within this pond basin.

  Pond No. 1 was heavily sedimented, except for the extreme southeastern corner which has been modified (deepened) to permit drinking water access for a goat herd which used to occupy Makalawena. This apparent stock watering hole had a surface area of approximately three square meters. The abundance of goat droppings around this pond suggests that this site was a preferred source of drinking water when large numbers of goats were maintained in the area (only about one dozen goats now occupy the Makalawena area).

TABLE IV-4

Coastal Pond Water Quality - South Complex

Parameter:	Size*	Depth (M)	Temp. (C.)	Salinity (PPT)	Diss. Oxygen (PPM)
Station #					
Pond 1 (N. side)	5	0.1	28.5	4.6	4.9
(W. side)		0.1	28.6	4.5	4.7
(S. side)		0.1	28.6	4.6	4.9
Pond 2	2	0.1	27.5	3.9	6.0
		0.5	27.4	4.0	6.0
Pond 3 (inlet)	3	0.4	26.6	3.9	5.8
(outlet)		0.4	26.8	4.0	6.1
Pond 4	2	0.1	26.6	3.9	5.0
Pond 5	1	0.2	27.1	4.0	5.1

Sampling Period: July 20, 1986; 1015-1115 hours

*Size Classification:
1 = 1 square meter
2 = 1 square meter & 10 square meters
3 = 10 square meters & 50 square meters
4 = 50 square meters & 100 square meters
5 = 100 square meters

- Biological Surveys: With the exception of the sediment-laden Pond No. 1, the entire 11-pond complex displayed the physical characteristics of anchialine ponds and, except for the smallest pools or depressions, all also had the characteristic orange Schizothrix substrate.

  The most significant biological feature of this interconnected pond complex was the abundance of tilapia (Oreochromis (Sarotherodon) mossambicus), a generally undesirable introduced species. Large numbers of sexually mature, albeit stunted, tilapia characterize all but the smallest ponds or pools within this basin. Despite dense Kiawe thickets which overhang many of the ponds and pools, there was no evidence of buildup of organic materials within these ponds, except for Pond No. 1 (as contrasted with the Opae'ula makai complex). Tilapia may be grazing on plant materials which find their way into the ponds and may, in part, be

controlling the buildup of organic sediments which could reduce water circulation.

Gambusia is also found throughout most of the basin. The mullets Mugil cephalus and Neomyxus chaptalii also occur in some of the larger ponds, but were not observed within Pond No. 1. One of the six Mugil counted had a length of approximately 20 cm. and was the largest fish observed within the Makalawena anchialine pond system. All of the aforementioned species also co-occurred in a single pond (Pond No. 3, Table IV-4) within this basin.

A large number of an unidentified, two cm. long, apparently terrestrial, isopod (suborder Flabellifera) occurs on moist, intertidal rocks and sediment adjacent to several of the larger ponds in this basin. This species was not observed elsewhere at Makalawena. The snail Melania occurs in relatively small numbers throughout this basin, but is not found in Pond No. 1.

None of the small shrimps characteristic of anchialine ponds were observed within the main 11-pond complex. However, observations of several isolated pools immediately mauka of the main pond basin revealed small populations of H. rubra co-occurring with small populations of juvenile Gambusia. The absence of anchialine pond shrimp in the main pond complex is probably the result of the presence of introduced fish.

- Opae'ula Pond: Opae'ula Pond is a seven-acre body of brackish water located near the coast and the northern boundary of Makalawena. Its average depth was approximately 15 cm. during the survey period, though a deeper, apparently manmade swimming or boat launching area, occurs in the approximate middle of the pond's makai side. The pond is characterized (in the areas surveyed) by a thick layer (exceeding 0.7 meter) of unconsolidated silt and organic material which could best be described as an organic "slurry." There is no benthic algal mat in evidence.

  This body of water is perhaps best described as a brackish water marsh rather than a pond, because of extensive stands of Scirpus and other emergent wetland vegetation. There are approximately 18 small (less than one square meter to several hundred square meters) islands found throughout the marsh which are composed of silt and wetland plants.

  Opae'ula Pond (also referred to as Kapoikai Pond) is somewhat of an enigma, inasmuch as its name refers to Halocaridina rubra, the small red atyid shrimp characteristic of anchialine ponds. However, this shrimp was not observed in the pond areas surveyed, nor does the pond presently support the rocky, hypogeal habitat apparently required by this species.

- Water Quality: Water temperatures were warm and demonstrated a rather uniform temperature of 28.3 to 28.5 degrees C., suggesting poor circulation. Salinity was similarly uniform and ranged from 3.8 to 3.9 ppt. Dissolved oxygen levels ranged from 5.6 to 6.1 ppm (Table IV-5). Maciolek and Brock (1974) described Opae'ula Pond as "turbid," a definition which may apply during windy conditions, but was not the condition observed during the field surveys. Although shallow, the water was very clear. However, even the slightest disturbance of the benthic organic slurry would reduce visibility to zero in localized areas.

TABLE IV-5

Coastal Pond Water Quality - Opae'ula Pond

Parameter:	Depth (M)	Temp. (C.)	Salinity (PPT)	Diss. Oxygen (PPM)
Station No. 1	0.1	28.5	3.8	6.1
Station No. 2	0.05	28.5	3.9	5.8
Station No. 3	0.1	28.3	3.8	5.6
Station No. 4	0.05	28.5	3.9	6.1

Sampling Period: July 20, 1986: 1332-1414 hours

- Biological Surveys: Only the north and northwest shoreline of the pond was surveyed because of the circumferential Kiawe thickets. Efforts to gain access to other pond areas were frustrated by the raucous verbalizations of Hawaiian stilts, a possible suggestion of active nesting by the species. Thus, to prevent further disturbances to this endangered species, the investigator reluctantly abandoned efforts to examine other pond environments. However, recent low altitude color aerial photos (July 1986) indicate that the unsurveyed shoreline was similar, in terms of vegetation, substrate, and depth, to the areas surveyed.

  The surveys indicated that the pond possesses a very limited macrofauna, but a significant infauna and epifauna associated with the surface and upper layers of

the organic bottom slurry. A variety of unidentified amphipods (at least two genera within the Suborder Gammaridea) polychaetes, two unidentified swimming/burrowing beetles, and several larvae of unidentified terrestrial insects were noted. Each appeared to have the ability to readily move between the water column/benthic "slurry" substrate interface.

Macroscopic fauna was limited to the Glass Shrimp Palaemon debilis, which was only occasionally seen associated with shoreline emergent vegetation, and juvenile Gambusia.

- Dune Complex: The dune pond and pool complex consists of at least 21 ponds and pools located parallel to and mauka of the large sand dune on the southwestern side of Makalawena (Figure IV-2). Most of the ponds are small and all occur within 100 to 200 meters of the mauka side of the dune. Collectively, this complex occupies an area of approximately six to seven acres of undulating, unvegetated to slightly vegetated, aa lava. Inland advance of the dune and associated vegetation on the extreme western side of the parcel appears to have resulted in the filling of some ponds and pools. Many of the larger ponds have also been modified for stock watering purposes. Such ponds are easily identified by their flat bottoms and the whitish circumferential rocks tossed well above the high water mark.

- Water Quality: Six of the 21 ponds and pools inventoried demonstrated great similarity in water quality parameters. Temperatures ranged from 26.8 to 27.4 degrees C.; salinities from 4.4 to 5.3 ppt. With the exception of Pond No. 3, which was highly modified and colonized with Ruppia, the remainder of the ponds demonstrated dissolved oxygen levels of 5.7 to 6.6 ppm (Table IV-6).

TABLE IV-6

Coastal Pond Water Quality - Dune Complex

Parameter:	Size*	Depth (M)	Temp. (C.)	Salinity (PPT)	Diss. Oxygen (PPM)
Pond No. 1	2	0.1	27.3	4.4	5.9
		0.3	27.4	4.8	5.8
Pond No. 2	1	0.2	26.8	4.8	5.7
Pond No. 3	3	0.3	26.9	4.6	7.0
Pond No. 4	2	0.3	27.1	5.3	6.6
Pond No. 5	1	0.1	26.8	4.9	5.9
Pond No. 6	1	0.1	26.9	4.9	5.9

Sampling Period: July 20, 1986: 1131-1244 hours

* Size Classification: 1 = < 1 square meter
2 = > 1 square meter & < 10 square meters
3 = > 10 square meters & < 50 square meters
4 = > 50 square meters & <100 square meters
5 = >100 square meters

- Biological Surveys: Biological surveys indicated a rather meager macrofauna consisting of (1) ponds harboring Halocaridina rubra and juvenile Gambusia; (2) ponds harboring only H. rubra; (3) ponds harboring only juvenile Gambusia; and, (4) ponds harboring no visible macrofauna. Pond No. 3, located on the immediate mauka side of the dune and modified for stock watering and/or swimming (sand bottom), was an exception to the preceeding faunal characteristics inasmuch as it harbored extensive growths of Ruppia and large numbers of juvenile and adult Gambusia.

  None of the ponds in the dune complex harbored orange cyanophytic algae and, with the exception of H. rubra, other species usually associated with anchialine ponds. These ponds should be regarded as "intermittent" in character since most would not be visible as surface waters below an estimated +1-foot ocean tide. However, the entire dune complex appears to consist of one very

large underground brackish pond which only occasionally expresses itself as a surface pond or pool in infrequent natural surface depressions. It was possible to see standing water within a meter of the aa lava surface in many low depressions within this extensive flow of geologically young lava.

4.6.2 Impacts

The ponds at Makalawena represent both an environmental resource and a significant site feature. They are also particularly well located to be integrated into the overall site planning process as an attractive and distinctive natural site feature. While no pond filling or alteration is proposed, initial discussions with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service indicate that an environmentally sound pond and management program could actually improve the conservation ecological value of the resource (see Appendix E). Similarly, the developer intends to work with appropriate federal, state and county agencies to create a wildlife refuge at Opae'ula Pond. The refuge would be fenced with a landscaped buffer outside the fence. The U.S. Fish and Wildlife Service recommended refuge boundaries are shown in Figure IV-2 and potential federal and state reports included in Appendix F.

Gambusia are live-bearers of a relatively small size. Their widespread distribution at Makalawena, which included invasion of even the smallest of intermittent mauka pools, suggests that this species has been able to readily adapt to at least a part-time hypogeal (beneath ground) existence. The surveys also indicated that juveniles of this species co-occur with the atyid shrimp Halocaridina rubra, though apparently not with adult fish of the same species. The presence of tilapia in the South pond complex appears to be responsible for the absence of H. rubra within the larger ponds, but not within the small mauka pools associated with this pond complex. Tilapia juveniles, unlike the smaller Gambusia, are apparently unable to move interstitially within an aa lava substratum. Evidence also suggests that tilapia may be effective in retarding pond succession (aging) by grazing on leaf litter which may eventually reduce water circulation. Despite an often dense Kiawe tree canopy in parts of the South pond complex, there was no evidence of leaf litter or visible organic deposits in this basin. By contrast, the Makai pond complex (which lacked tilapia) were noticeably rich in leaf litter and organic materials and demonstrated reduced circulation (as inferred by the prevailing warmer water temperatures).

The presence of the mullets Mugil cephalus and Neomyxus chaptalii and the pomacentrid Abudefduf sordidus in the Maciolek and Brock pond in the 1986 survey was surprising since the same species were reported (apparently in the same pond) during the 1972-1973

surveys of Maciolek and Brock (1974). Although these species are generally not associated with true anchialine ponds, storm waves or fishermen could easily be responsible for their introductions. As with the introduction of exotic species, the presence of these atypical anchialine pond species resulted in greatly reduced populations of Halocaridina rubra and Palaemon debilis. Comparison of a photograph of the Maciolek and Brock pond taken during the 1972-1973 period with a photograph taken in July 1986 (Appendix D) showed a striking similarity, despite an interval of 14 to 15 years. This suggests that despite relatively high human use of the shoreline and nearshore waters, people do not appear to be physically disturbing the pond(s) despite their close proximity to the beach.

Assiminea sp., a small (3.0 to 3.5 mm.) herbivorous snail described as "ubiquitous" in Kona Coast ponds, was not observed at Makalawena, a consideration which may be related to the limited aquatic vegetation present in the area. The absence of Assiminea appears to be consistent with the earlier observations of Maciolek and Brock (1974).

The Makalawena ponds also reportedly harbor ecotypes or variants of the common glass shrimp Palaemon debilis. Taxonomic treatment of this genus has indicated significant differences in morphological features of this species based on geography (Chace, 1972). These geographical morphological variations are apparently not sufficient to qualify for a subspecies designation but, instead, reflect the wide morphological variations which characterize this species.

The Makalawena ponds also demonstrated a number of conspicuous successional stages characteristic of anchialine ponds, as well as varying degrees of natural and manmade disturbance.

Conservative estimates place the number of anchialine (and coastal) ponds on the island of Hawaii at between 600 and 650 (Brock, 1985). The majority (approximately 420, less those recently filled at Waikoloa) occur along the coast from Kawaihae to Kailua-Kona on the west side of the island. From Kailua-Kona to Ka Lae (South Point) there are approximately 90 ponds (based on aerial photo analysis only). Based on the fact that the recent surveys at Makalawena more than doubled the number of ponds thought to exist in the area, the actual number of anchialine ponds on the island is probably considerably higher than estimates suggest.

In 1985, the U.S. Fish and Wildlife Service classified several anchialine pond organisms as "Category 2" species for the purposes of the Endangered Species Act. These include three shrimp (Metabetaeus lohena, Procaris hawaiana and Palaemonella burnsi); a hybrid (Ostromouvia horii); and a snail (Neritilia sp.). Category 2 reflects that the organisms probably should be listed

as endangered or threatened, but insufficient data prevent an assessment of their status for listing on the Federal List of Threatened and Endangered Species. Thus, the organisms are still considered rare, but are not listed on the aforementioned list and are not currently proposed as candidates for listing. None of the species listed under Category 2 were observed during recent surveys at Makalawena, though M. lohena (a known predator on Halocaridina rubra) probably occurs in very small numbers at Makalawena. Neritilia hawaiiensis, a diminutive (1.0 to 1.5 millimeter) snail is reportedly, "...only known from the anchialine ponds at Makalawena" (Brock, 1985). However, recent information suggests that this species is probably more widespread than present data would indicate but, because of its extremely small size, has probably been overlooked (Brock, 1986; personal communication). N. hawaiiensis was not recorded during the July 1986 baseline survey at Makalawena.

Maciolek and Brock (1974) identified and ranked a number of ponds/pond systems on the Kona Coast on the basis of their importance as "natural anchialine ecosystems." The ranking of the ponds was based on two criteria:

Class A: Pond sites of exceptional natural value based on physical structure, diversity, represented aquatic community, and new or endemic species. Preservation as a unique resource is recommended strongly; and,

Class B: Pond sites of significant aquatic natural value whose importance is increased because of their anthropological or waterbird habitat values. They are threatened by development and, generally found in accessible or culturally modified areas.

The ponds in the Makalawena (and Awake'e) area were ranked in Class B (along with ponds found at Lahuipua'a, Honokohau, and Kealakehe). Ponds ranked in Class A included Anaehoomalu, Puuwaawaa, Kohanaiki, Manuka, Kahuku (north and south), Pakini Nui, and Kamaoa Puueo. Many of the Class A ponds in the Anaehoomalu area were recently filled for development of a major resort complex at Waikoloa.

The U.S. Fish and Wildlife Service considers Opae'ula Pond and the surrounding anchialine pond habitats as Resource Category 1 (Federal Register Vol. 46, No. 15. January 23, 1981). Under this category the habitat to be impacted is of high value for the evaluation species (migratory birds and anchialine pond animals like the Opae'ula) and is unique and irreplaceable both on a national basis and in the ecoregion. The mitigation goal for this category is no loss of existing habitat value.

Potentially significant impacts to the ponds could result from a variety of sources, including the following:

1. Removal of existing manmade rock separations and vegetative strips between ponds, which restrict movement of introduced species.

2. Altered water drainage, mixing and percolation rates, through compaction of immediately surrounding substrata by heavy earthmoving equipment.

3. Increased opportunity for introduction of organic materials (i.e. vegetation, leaf droppings, etc.) from surrounding vegetation, resulting in accelerated succession processes or pond aging.

4. Clearing or grubbing of the coastal strand vegetation resulting in wind blown sand deposition in the pond complex.

5. Introduction of additional exotic species and species not typically associated with anchialine ponds.

6. Increased threat of pond contamination resulting from leaking sewer lines, fertilization, petrochemical spills, herbicides, pesticides and other urban pollutants.

Effects not considered significant but having the potential to change the baseline character of the ponds include:

1. Water quality disturbances from upland development activities;

2. Possible addition of freshwater to the ponds from upland irrigation and;

3. Deposition of treated wastewater or runoff from irrigated areas.

The addition of nutrients from irrigation or fertilization of the golf course and landscape plantings has the potential to affect nearshore water quality, either from site runoff (if uncontrolled) or via groundwater introductions. This effect is dampered by rapid dilution and water exchange processes. Although nutrient loading of nearshore waters may result in favorable stimulation of the marine food chain, it would not be compatible with recreational uses.

Nutrient levels in natural, unmodified anchialine ponds are high in comparison to the ocean. Nutrient input into the groundwater by golf course irrigation around anchialine ponds was found to increase nutrient concentrations in the ponds (Oceanic Institute,

1977). A comparison of pre- and post-golf course development nutrient levels in certain ponds recorded elevated levels of nitrates (98 percent increase), phosphates (55 percent increase) and ammonium (134 percent increase) over pre-development conditions. The elevated nutrient levels were related to golf course fertilization and irrigation with sewage effluent. Despite the elevated nutrient concentrations, there was no apparent change in phytoplankton activity or increase in water turbidity. Rapid flushing (twice daily water exchange and groundwater outflow) is believed to prevent a buildup of phytoplankton concentrations that would otherwise reduce pond water clarity (Oceanic Institute, 1984). Negative impacts are not presently observable in anchialine ponds surrounded by the Mauna Lani Resort golf course and condominium development (Brock, 1985).

Studies conducted at the Kukio pond complex and additional studies recently completed at the proposed Waikoloa Beach Resort and South Kohala District, suggest that anchialine ponds are regularly flushed by tidal fluctuations and the continuous downslope movement of groundwaters. This flushing results in a residence time that would be insufficient for any significant impact to occur. It has also been noted that anchialine species are euryhaline and are able to thrive within a broad range of ambient salinities.

Golf course irrigation and fertilization practices at Makalawena are expected to follow sound business and golf course management procedures and include the use of secondarily treated wastewater effluent supplemented with potable water as required. The wastewater effluent would be pumped from the treatment plant to storage ponds located along fairways and withdrawn from the ponds for irrigation purposes. Irrigation would occur five or six days per week, depending on the amount of rainfall received and other golf course maintenance operations.

The golf course is expected to be planted primarily with common Bermuda grass (Cynodon dactylon) with several species of other grasses, trees and shrubs planted along and/or in the fairways. Volcanic soils underlie the golf course and surrounding areas. Existing basal ground water quality measurements (Mink, 1986 and USGS, 1973) indicated that the water is not suitable for potable purposes, but is suitable for irrigation purposes, because of elevated levels of chloride and other salts. Also as noted previously, USGS and other surveys have indicated basal groundwater outflows along the north Kona/South Kohala coastline to be in excess of 6 million gallons per day. The quantity of wastewater effluent that would enter the groundwater stream would be significantly less than that applied due to absorption by the soil, transpiration and evaporation.

The use of treated and untreated wastewater effluent for sugar cane and golf course irrigation purposes in Hawaii has been examined in detail over the past 20 years (Young, et. al., 1967; Chun, et. al., 1972; Peterson and Hargis et. al., 1971; Tenorio, et. al., 1969; Quan, et. al., 1970; Tenorio, et. al., 1970; Lau, 1972; Dugan, et. al., 1975; Dugan, et. al., 1976; Handley and Eckern, 1981; and Chang, et. al., 1977). In general, it has been found that the controlled use of wastewater effluent for irrigation purposes is an environmentally sound and economical method for the disposal of treated wastewaters and is preferred over the use of potable water supplies from a conservation standpoint. After a seven year study of secondary effluent irrigation of grassland and sugar cane, no detrimental effects were found on vegetation, public health or leachates below the root zone on a Hawaiian Oxisol (Dugan, 1980). Further, Handley and Eckern (1981) found that California grass (paragrass) (Brachiaria mutica) irrigated with effluent from secondarily treated domestic sewage showed excellent response as a means for disposal of large amounts of water, effective removal of nitrogen and high production of fodder. Even with the highest effluent irrigation rates, nitrate nitrogen levels in the percolate remained less than the 10 mg/1 recommended maximum for potable water (Handley and Eckern 1981).

Nitrogen, as organic nitrogen, ammonia, nitrate and nitrite, is a major concern due to its potential toxicity and also its encouragement of aquatic growth. The ultimate removal of nitrogen from the effluent depends on the type of crop as well as soil type. Lau, et. al. (1975) found Bermuda grass, with periodic cutting, to be more effective than sugar cane in protecting groundwater supplies and removing nitrogen.

Similarly, mineralized phosphorous occurring in secondarily treated wastewater effluent could cause eutrification of surface waters. Studies (Kardos, 1976) have shown that although higher concentrations of phosphorous are found in soil water samples of effluent irrigated sites as compared to control sites, those concentrations were less than 1 mg/1. Dugan, et. al. (1975) reported that the phosphorous concentration in effluent applied to an Oxisol with Bermuda grass cover decreased to 0.03 mg/1 or less regardless of applied concentration.

Nitrate-nitrogen is typically high in Hawaiian groundwaters, primarily as a result of nitrogen-fixing trees and shrubs such as Kiawe and Koa-haole. For example, the average concentration of nitrogen at the Waiulua Bay spring is over 400 percent higher than that in the adjacent coastal waters. Similarly, phosphorus levels average about 100 percent higher than in adjacent coastal waters (Kay, et al., 1977).

Although pathogens are removed from the wastewater during secondary treatment, they are still an area for concern. Chang and Young (1977) found that the volcanic soils at the Kaneohe Marine Corps Air Station Klipper Golf Course (Oahu) were effective in removing fecal coliforms from the applied secondarily treated wastewater. Further, the quality of the percolate did not present a hazard to the ground water quality and/or adjacent surface waters. Also, it was found that the presence and concentration of aerosolized coliform bacteria in the irrigation spray fallout were not considered a public health hazard to golf course workers, users or nearby residents (Chang and Young, 1977). Lau, et. al. (1975) stated that the absence of enteric viruses in sugar cane and grass percolates sampled over a two year period suggests that the possibility of contaminating deep water resources is extremely remote.

The use of treated wastewater effluent for golf course irrigation purposes has been studied in some detail by the U.S. Corps of Engineers at Waikoloa Beach Resort in the South Kohala District of the island of Hawaii. To date, it has been found that although nutrient levels in coastal (anchialine) ponds were elevated following use of treated wastewater effluent on the golf course, there was no apparent change in phytoplankton activity or increase in water turbidity (COE, 1985). Brock (1985) noted that negative impacts from similar practices at Mauna Lani Resort golf course were not observable in anchialine ponds surrounded by the golf course and condominium development.

Based on the studies performed in Hawaii and elsewhere, the relatively small land area of the golf course as compared to the entire water shed area of Makalawena and the existing water quality characteristics of the basal groundwater, coastal ponds and offshore waters, it appears that use of treated wastewater effluent for irrigation of the golf course and landscape areas would not cause adverse impacts to the water or air quality of the resort area.

4.6.3 Mitigation Measures

A pond and wildlife refuge management program (see Appendix E) will be developed with the objectives of preserving existing pond features and providing interpretive opportunities for the public. Further establishment of a wildlife refuge at Opae'ula Pond and the refuge management plan will protect the plant and animal life inhabiting the pond.

Natural lava tubes or subsurface cavities may offer potential as collectors of runoff waters, hence, may represent practical alternatives to manmade storm collection culverts. The use of such structures would minimize perturbations to nearshore water quality during periods of heavy stormwater runoff by allowing for

natural filtration of such waters. Care would be exercised to insure that any such natural subsurface discharge channels would not degrade anchialine pond water quality.

The effects of withdrawal of groundwaters and/or injection or surface disposal of treated wastewaters or rainwater runoff would be compatible with anchialine pond water quality inasmuch as this habitat is characterized by natural subterranean brackish water discharges. Flora and fauna associated with this habitat are eyryhaline and would not be adversely affected by short-term alterations in water salinity.

Diurnal tidal flushing and natural mixing of groundwaters and ocean waters would prevent any significant degradation of anchialine pond water quality (see Chapter XI, letter from/to NELH).

4.7 FLORA AND FAUNA

4.7.1 Existing Conditions

A botanical reconnaissance survey of Makalawena was carried out in July, 1986 (included as Appendix A). The results indicate that there are no rare or endangered plant species on site and that the area is predominantly covered with introduced exotics, such as Fountain grass and Kiawe. Native vegetation is concentrated around the coastal strand and coastal ponds, including pahuehue vine, kauna'oa, aena and 'akulikuli (Figure IV-4).

There have been no floristic studies that have dealt specifically with the entire Makalawena project area. However, there have been a few studies which have focused on the ponds on the project site. Maciolek and Brock (1974), in their survey of the Kona coast ponds, inventoried an array of smaller anchialine ponds in the vicinity of Opae'ula Pond. Opae'ula Pond is a relatively young wetland with shallow, brackish, sediment-laden water. The wetland vegetation around the pond was surveyed in 1977 by Elliott and Hall. No rare, threatened, or endangered species were found during the later survey.

During this survey, four major vegetation types were recognized and are discussed below. A large herd of goats was kept by the past caretaker, and goat damage to the vegetation is evident on all portions of the project site. The number of goats has since been reduced considerably by the landowner and present caretaker. A total of 39 species of plants were found during the botanical survey performed for this EIS, a rather depauperate flora. In similar botanical surveys conducted on the nearby Kaupulehu (Char 1985) and Kuki'o (Char 1984) lands, twice as many species were inventoried.

1. Grass-scrub association

Of the four vegetation types, the grass-scrub association covers the largest area. It occurs primarily on pahoehoe lava flows.

Pahoehoe flows of various ages cover most of the project area. A few rough, scoriaceous aa flows are occasionally encountered, especially on the makai portion of the project area near the adjacent Mahai'ula ahupua'a. A "slump scarp" (Macdonald and Abbott, 1979), about 18 to 20 feet high, is found in the middle of the project area (near the 80 foot contour line). Here, the front of a prehistoric pahoehoe flow had stopped, and the resultant lava is angular and almost aa-like.

Vegetation cover on the pahoehoe flows varies generally from 40 to 50 percent. On the upper mauka portions of the project area (above 120 feet in elevation), however, the cover becomes denser, 75 to 100 percent.

The aa flows support only very few plants and, generally are largely devoid of vegetation.

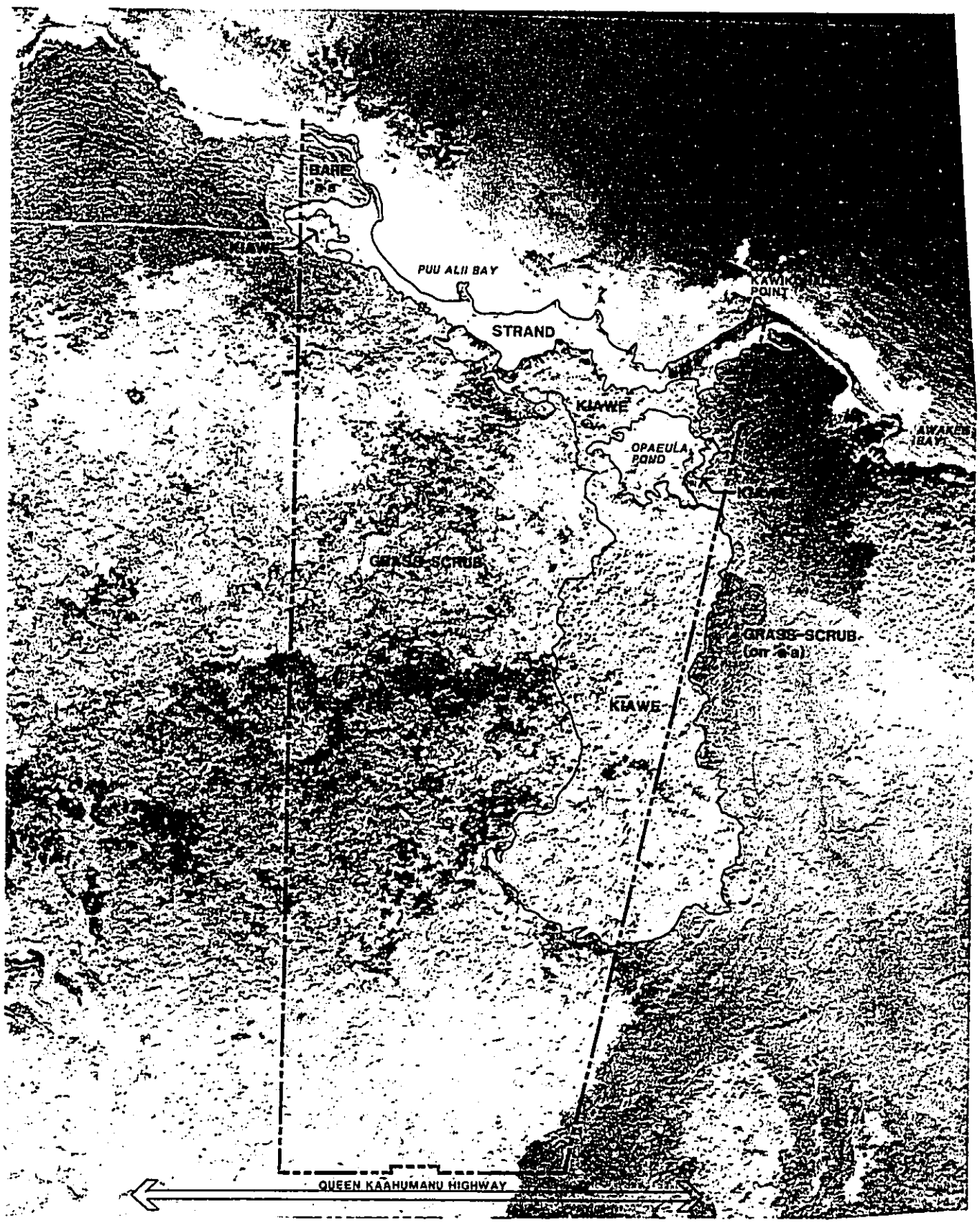
Fountain grass (Pennisetum setaceum) is the most abundant species in this vegetation type. Scattered among the bunches of Fountain grass are small shrubs of 'Uhaloa (Waltheria indica var. americana), Indigo (Indigofera suffruticosa), and 'Ilima (Sida fallax). Kiawe trees (Prosopis pallida) are occasionally observed. They occur as widely scattered, low statured (6 to 9 feet tall) individuals; many have died back and only standing snags remain. Other species which may be found in this association include Noni (Morinda citrifolia), Pili (Heteropogon contortus), Panini (Opuntia fiscus-indica), Hairy Spurge (Euphorbia hirta), Love grass (Eragrostis tenella), and 'Ihi (Portulaca cyanosperma).

Most of the plants showed some signs of browsing by goats or occurred only in very low numbers.

2. Kiawe forest

A large Kiawe forest (Prosopis pallida) is found around Opae'ula Pond. It also extends from back of the pond to near the base of the "slump scarp," close to the 80-foot contour line. Along the seaward (makai) edge of the pond, the forest occurs on the coralline sand; inland (mauka) of the pond it occurs on a very weathered pahoehoe flow. Smaller Kiawe forests are found a ong the makai portion of the project area in the interface between sand and lava substrates.

RECEIVED AS FOLLOWS



VEGETATIVE ZONES

MAKALAWENA RESORT

0 250 500 1000
FEET

pbr

FIGURE IV-4

The canopy cover of these forests varies from open (crowns of trees not touching, cover less than 60 percent) to closed (crowns of trees touching, cover greater than 60 percent).

Along the shore and around Opae'ula Pond, the Kiawe forests are generally closed and trees may reach 25 feet in height. Ground cover is usually sparse in these forests. Scattered plants of Fountain grass (Pennisetum setaceum), Love grass (Eragrostis tenella), Keeled Goosefoot (Shenopodium carinatum), and Hairy Abutilon (Abutilon grandifolium) may occasionally be encountered. The Kiawe forest immediately mauka of Opae'ula Pond is very dense with many smaller Kiawe trees forming a subcanopy layer with interlocking, low branches. Surveying is difficult, as the Kiawe plants form an almost impenetrable tangle of branches and thorns.

The forest on the weathered pahoehoe, near the base of the "slump scarp," is open with the trees 9 to 15 feet tall. Ground cover is dense and consists almost exclusively of Fountain grass.

3. Strand Vegetation

The majority of the coastal area on the project site consists of a sandy beach. Barren aa lava flows occupy small areas near the Mahai'ula boundary and Kawikohale Point.

The vegetation on the sandy beach consists almost entirely of the low, mat-forming Beach Morning Glory vine or Pohuehue (Ipoeoea brasiliensis). Orange-colored patches of the native Dodder vine or Kauna'oa (Cuscuta sandwichiana) can occasionally be found on the pohuehue mats. A few scattered plants of Cocklebur (Xanthium saccharatum), Fountain grass (Pennisetum setaceum), 'Aki'aki' (Sporobolus virginicus), and Kiawe (Prosopis pallida) may be observed in the strand. Also included in the strand vegetation are a large grove of Ironwood trees (Casuarina spp.), 50 to 60 feet tall, near Kawikohale Point and a few smaller scattered clumps of trees along Pu'u Ali'i Bay.

Typically, the strand vegetation on sandy beaches along the Kona coast is composed of an assortment of other species such as Beach Naupaka (Scaevola taccada), Tree Heliotrope (Messerschmidia argentea), Maiapilo (Capparis sandwichiana var. zoharyi), 'Ilima (Sida fallax), Pa'u-o-hi'iaka (Jacquemontia sandwicensis), Hinahina (Heliotropium anomalum var. argenteum), Alena (Boerhavia diffusa), Kou (Cordia subcordata), etc. The absence or very low numbers of these species on the project area is probably due to the large number of goats which were once k pt on the site. The Beach Morning Glory was not eaten as it is toxic.

4. Pond Vegetation

A number of anchialine ponds are found on the project area. These ponds are features which undergo a natural process of aging from barren lava pools to organic and sediment-laden, vegetated wetlands.

Opae'ula (or Kapoikai) Pond represents a somewhat later stage in this aging process. Elliot and Hall (1977), in their wetland survey of the Hawaiian Islands, describe the Opae'ula marsh soil as

> "... a brownish-beige mixture of sand, silt, organic matter and water. Where water has evaporated, the soil appears as spongy flats with occasional crusts of salt crystals. In some places the soil appears much like quicksand."

The vegetation cover is dense and composed primarily of a mixture of medium to very large clumps of hedges--Makai (Scirpus maritimus var. phludosus), 'Aka'akai (Scirpus lacustris ssp. validus), Great Bulrush (Scirpus californicus), and Makaloa (Cyerus laevigatus)--and large to very large patches of the low, mat-forming Water Hyssop (Bacopa monnieria).

A dense growth of Kiawe (Prosopis pallida) forms a closed forest around the mauka (east) perimeter of the pond. Along the remainder of the pond perimeter, an open Kiawe forest or, in a few places, only a very few Kiawe trees are found. Scattered Ironwood trees (Casuarina equisetifolia) are occasionally encountered around the pond area.

A number of Hawaiian stilt or Ae'o (Himantopus mexicanus knudseni) and Coot or 'Alae-ke'oke'o (Fulica americana alai) were observed utilizing this pond area. Opae'ula Pond is considered the premier stilt habitat on Hawaii island (Maciolek and Brock 1974).

Several smaller ponds are scattered along the coast in the lava flows. These are relatively "younger," as they have not developed a substantial accumulation of organic and mineral deposits. Vegetation around these ponds may be moderate to sparse and consists largely of low, mat forming species such as Pohuehue (Ipomoea brasiliensis), 'Aki'aki (Sporobolus virginicus), Makaloa, and Water Hyssop. The aquatic flowering plant, Ruppia maritima or Widgeon grass, may be observed growing in some of these ponds.

A few of the smaller ponds north of Opae'ula Pond have been modified. Rock walls and other stone structures are found in this area.

A complete plant list is included in Appendix A.

Fauna: Six general habitats occur within the project site: 1-Sandy beach and rocky shoreline. 2- Open barren lava flows. 3-Older lava flows covered in grasses and scattered brush. 4-Dense thickets of Kiawe (Prosopis sp.). 5- Shoreline stands of large Ironwood (Casuarina sp.). 6- Wetland habitat, Opae'ula Pond and emergent vegetation primarily Bullrush (Scirpus sp.), Water Hyssop (Bacopa sp.), Fleabane (Pluchea sp.) (Woodside 1979). In addition a number of small anchialine ponds are scattered about the property, some surrounded by Kiawe, others in open barren lava flows.

Resident Indigenous (native) Birds:

American Coot (Fulica americana alai) - (Endangered species): Recent (1982-86) waterbird surveys conducted by personnel of the Division of Forestry and Wildlife, State of Hawaii (Table IV-7), have averaged 24.4 coot on counts taken in summer months and 17.8 during surveys in winter months. These data also reveal a considerable amount of fluctuation in the coot population at Opae'ula Pond which suggests that changes in pond size and food availability may influence the size of the resident coot population. Alternatively population increases and decreases might be due to transient birds which move regularly between ponds along the Kona coast. The results of this August 1986 survey revealed an average of 20.0 coot over the three days that Opae'ula Pond was censused. At least ten of these coot were juveniles. One coot was observed carrying nesting material. Aggressive encounter (chases) between adults were seen which is indicative of breeding activity (Shallenberger 1977, Byrd et al. 1985). Emergent vegetation suitable for anchoring nest platforms is readily available at Opae'ula Pond.

TABLE IV-7

Summary of surveys and inventories of waterbirds in the State of Hawaii. Division of Forestry and Wildlife, State of Hawaii, Job progress Report data from Opae'ula Pond, Makalawena, North Kona, Hawaii. 1982-1986.

Species	American Coot	Black-necked Stilt	Black-crowned Night Heron	*Migratory ducks	*Migratory Shorebirds
W-1982	17	20	--	47	11
S-1982	13	6	1	1	--
W-1983	29	8	3	12	10
S-1983	49	6	--	1	--
W-1984	20	3	--	38	1
S-1984	31	--	--	--	1
W-1985	12	5	--	48	--
S-1985	10	6	--	--	1
W-1986	11	5	--	4	1
S-1986	19	10	--	1	--

* All species lumped in these data.

Black-necked Stilt (Himantopus mexicanus knudseni) - (Endangered Species): Data from Division of Forestry and Wildlife, State of Hawaii, (1982-1986) for Opae'ula Pond reveal an average of 7.4 stilt utilizing the pond in winter months and 5.6 in summer months. These data show little variation in the population. This present survey averaged 6.6 stilt over the three days censused. All stilt seen were adults. The relatively shallow nature of Opae'ula Pond with its exposed mud/sand flats makes it ideal for foraging stilt. However, the accessibility of the site to feral goats which could trample nests and predators such as dogs and mongoose severely limits the present usefulness of the pond to stilts. The creation of bare islands which would isolate predators from nesting stilt could markedly increase stilt breeding success.

Hawaiian Duck (Koloa) (Anas wyvilliana) - (Endangered species): Waterbird surveys by the Division of Forestry and Wildlife, State of Hawaii, at Opae'ula Pond (1982-1986) do not record this species. These data do, however, record a number of migratory duck of several species (Table IV- 7). One Koloa was observed on all three days of this present survey. This bird was seen following coots about the pond. The dark head of this individual probably indicated it was a male (Hawaii Audobon Society, 1984, Pratt et al. 1986). The absence of other ducks at Opae'ula was not unexpected since the migratory ducks do not begin to arrive until November. Occasionally some migrant ducks remain through the summer but do not breed (see Table IV-7). The abundance of emergent vegetation around the southern and eastern boundary of Opae'ula Pond provide ideal nesting habitat for Koloa.

Black-Crowned Night Heron (Nycticorax nycticorax): No Night Heron were observed during the survey. Data from the Division of Forestry and Wildlife, State of Hawaii, reveal Night Heron do occasionally use this site for foraging on small fish, crustaceans, mice and even the eggs and young of other birds (Andrews 1981, Hawaii Audobon Society 1984).

Migratory Indigenous Birds:

Wandering Tattler (Heteroscelus incanus): A total of three tattler were seen during the three days of the field survey. This species usually forages alone rather than in flocks. The exposed rocky intertidal zone is their preferred habitat. Two of the tattler observed still had traces of breeding plumage indicating that they likely had just returned from their arctic breeding grounds. Tattler may exhibit some site faithfulness based on limited data acquired by S. Conant (pers. comm.) in the leeward Hawaiian Islands. Thus, it is possible that the same individuals return each year to a particular locality where they spend the winter nonbreeding months foraging.

Sanderling (Calidris alba): This migrant shorebird likewise breeds in the artic and winters in the Pacific. Sanderling prefer to forage for small invertebrates along sand wave swept beaches or on exposed intertidal zones and mud flats. They are non-territorial under most situations (Myers et al. 1981). A total of three Sanderling were observed during the field survey. All of these individuals were on the exposed mud flats at Opae'ula Pond. The sandy beach which fronts the project site did not have any Sanderling during the times it was censused but is an ideal habitat and thus is likely used by foraging Sanderling.

Ruddy Turnstone (Arenaria interpres): Turnstone tend to forage in flocks and are not known to exhibit territoriality or long-term site faithfulness. They often are seen in open short grass habitats as well as along the intertidal zone and in exposed mud flats around wetlands. This species was not recorded during the

State of Hawaii, Division of Forestry and Wildlife waterbird surveys from 1982-1986. A total of six turnstones were seen on this August 1986 survey.

Pacific Golden Plover (Pluvialis fluva): An average of seven plover were seen each day of the survey. These data are normal for this time of the year as plover return to Hawaii from their artic breeding grounds beginning the first week of August (Johnson et al. 1981, Bruner 1983). While on the wintering grounds here in Hawaii some individuals establish foraging territories that they defend throughout the day. This behavior is apparently imprinted during the first or second year of their life. Each fall as they return from their breeding grounds they reoccupy the exact same territories held in previous years (Johnson et at. 1981, Bruner 1983). Several plover at Opae'ula Pond were observed chasing and acting aggressively towards other plover which usually is a sign of territoriality. Given the amount of suitable space probably fewer than ten plover hold territories at Opae'ula Pond. Several plover were seen around anchialine ponds and along the exposed intertidal at Makalawena.

Exotic (Introduced) Birds:

A total of eleven species of exotic birds were recorded during the three day field survey at Makalawena. Table IV-8 show the relative abundance and habitat preferences of these species. The most unusual sighting of the survey was the discovery of a sizeable flock of Yellow-fronted Canaries (Serinus mozambicus). Previous surveys in areas adjacent to Makalawena did not find this species (Bruner 1984a, 1984b, 1984c, 1985). The localized flock of Canaries at Makalawena might be due to the presence of Ironwood trees which they seem to prefer. It is possible also that a small flock was released here and has yet to establish itself further along the coast. Population densities of each exotic species was typical for habitat of this nature along the Kona coast. The most abundant species were Japanese White-eye (Zosterops japonicus), Nutmeg Mannikin (Lonchura punchtulata), and Yellow-billed Cardinal (Paroaria capitata) (Table IV-8). A number of game birds have been introduced to the island of Hawaii (Schwartz and Schwartz 1949, Berger 1972). Populations of these species tend to be localized. Field surveys by Bruner (1984a, 1984b, 1985) have consistently shown Gray Francolin (Francolinus pondicerianus) to be the most common of the larger game birds along the Kona coast. On this 1986 survey of Makalawena Gray Francolin were also found to be common (Table IV-8). A number of individuals were seen and heard on each day of the survey particularly in and around the Kiawe groves at the edge of Opae'ula Pond. Other species which although not recorded, might occur in the area are: Erckel's Francolin (Francolinus erchelii) and Japanese Quail (Coturnix japonica). These two species are unevenly distributed in the Kona area. The latter species (Japanese quail) is particularly hard to find due to its retiring nature

and thus could easily escape detection on a short-term survey. Also not recorded but known from the Kona coast in habitat similar to that at Makalawena were Northern Mockingbird (Mimus polyglottos), Warbling Silverbill (Lonchura malabarica) and House Sparrow (Passer domesticus).

TABLE IV-8

Relative abundance and general habitat preferences of exotic birds recorded at Makalawena, North Kona, Hawaii. 19-21 August 1986.

Common Name	Scientific Name	Relative Abundance*	Habitat*
Gray Francolin	Francolinus pondicerianus	C = 8.8	K,G
Black Francolin	Francolinus francolinus	U = 2	K,G,W
Spotted Dove	Streptopelia chinensis	U = 1	K,I
Zebra Dove	Geopelia striata	C = 8.9	K,I,G.W
Common Myna	Acridotheres tristis	C = 7.6	I,K.W
Japanese White-eye	Zosterops japonica	A =12.4	K,W,I
Northern Cardinal	Cardinalis cardinalis	U = 4.7	K
Yellow-billed Cardinal	Paroaria capitata	A =17.6	K
House Finch	Carpodacus mexicanus	C = 9.1	I,K,G
Nutmeg Mannikin	Lonchura punctulata	A =18.9	I,K,G
Yellow-fronted Canary	Serinus mozambicus	C = 9.5	I,K,G

* (See Appendix B for key to symbols)

Feral Mammals:

Mongoose were seen on all three survey days. They were particularly common in Kiawe thickets and around Opae'ula Pond. Feral cats also occur on the property as evidenced by tracks and one visual sighting. The caretaker presently has guard dogs which roam freely during the night. Dog tracks were seen around the pond which might indicate a potential for disturbance and harassment of the endangered waterbirds.

Feral goat (Capra hircus) were seen foraging on the emergent vegetation at Opae'ula Pond and in the grasslands east of the pond. As many as 30 goats were seen at one time. Goats have been a problem for a long time in Hawaii and have proven difficult to eradicate (Van Riper and Van Riper III 1982).

Endangered Mammals:

The native Hawaiian Hoary Bat (Lasiurus cinereus), the only endangered mammal found at the proposed project site, occurs sporadically along the Kona coast as evidenced by the sightings reported by Tomich (1969, 1974) and Bruner (1984c, 1985). Two bats were observed foraging over Opae'ula Pond at dusk on 20 August 1986. The present caretaker also reported seeing bats occasionally at Makalawena.

4.7.2 Impacts

Flora: Development of a large portion of the project area will not have a significant impact on the total island populations of the plant species present. These same species occur in similar environmental habitats throughout leeward Hawaii. However, the anchialine pond areas represent a unique type of aquatic ecosystem that provides feeding and nesting sites for endangered Hawaiian waterbirds and migratory bird species. Native plants found around the ponds and along the coastal strand are not threatened or endangered.

Impacts to vegetation of the coastal strand may result from clearing to promote public access and use of the beach.

Fauna: Makalawena contains faunal habitat similar to many sites along the North Kona Coast with barren lava flows, dry grassland with scattered Kiawe trees and a coastal strip of larger and denser vegetation. It is also distinct in that it has a sizable coastal pond and white sand beach with well developed sand dunes. A number of anchialine ponds also occur on the property. Many of the birds rely extensively on the coastal forested area, the much drier and more open uplands support many fewer birds. Opae'ula Pond and its surrounding wetlands is on extremely important habitat for wildlife. Reports by Federal and State Wildlife personnel suggest that Opae'ula Pond is one of the most important wetlands on the island of Hawaii (Kridler 1965; Swedberg 1969; Van den Akker 1972; Woodside 1979). Not only does it provide essential resources for endangered Hawaiian waterbirds (coot, stilt, koloa) but also is utilized by migratory ducks and shorebirds.

The bird survey revealed the typical mix of exotic species that occur along the Kona Coast. The most noteworthy discovery in terms of exotic species was the Yellow-fronted Canary. This species was first reported on the slopes of Mauna Kea (Van Ripper, 1978). Pyle (1979) also records Yellow-fronted Canaries from Hualalai. Recent unpublished sightings (Pyle, Pers. comm) in the town of Kailua-Kona would seem to imply that this species is in the process of expanding its range on the island of Hawaii.

All of the shorebird species that commonly occur in Hawaii were recorded on the project site. With the development of a golf course and residential lawns the Pacific Golden Plover and Ruddy Turnstone should become more abundant. Presently, they are confined to the limited wetland habitat at Opae'ula Pond, around the anchialine ponds and along the shoreline. The inland dry grasslands are not being utilized by these species. Counts of the waterbirds at Opae'ula Pond agree with data acquired by state of Hawaii, wildlife personnel. The only noticeable differences were the absence of the Black-crowned Night Heron and migratory ducks. The later can be easily explained by the fact that migratory ducks *do not* arrive in Hawaii until around November. Black-crowned Night Heron are not abundant along the Kona coast and the few birds that do occur in the area move around a good deal which perhaps accounts for their absence during the survey.

Mongoose were common, particularly around the coastal forest and ponds. Feral goats pose a problem for the wetland and should be removed from Makalawena. The Hawaiian Hoary Bat occurs in small numbers along the Kona Coast. This species nests solitarily. Many areas regarding the natural history of this species remain to be studied. Questions such as how site faithful are local populations, as well as what habitat characteristics are likely to attract them are presently unknown. Whether bats will become more common at Makalawena or be displaced by changes in the habitat brought about by development remains to be seen. Too little is known about the natural history of this species to accurately predict the effect the proposed development might have on this species' abundance. However, the fact that the Hoary Bat occurs on developed property elsewhere on the Kona coast (Bruner, 1984c) might indicate that it is not restricted from foraging in an area simply because of urbanization.

It is possible that, although a wildlife refuge will be established at Opae'ula Pond, the species that the refuge is intended to serve (Hawaiian Black-necked Stilt, Hawaiian Coot, etc.) may be frightened away from the refuge by the presence of increased numbers of people, hotel and condominium buildings. There is some evidence that if the wildlife is denied adequate entry/egress routes, confronted with increased human generated sound levels and subjected to increased night lighting, the wildlife will desert an otherwise suitable feeding, nesting and roosting site. Similarly, there is also evidence that many spe-

cies become habituated to noises and other "unnatural disturbances" in the environment that they pose no harm to them.

Any major change in a habitat such as converting dry grassland lava flows into a golf course and residential area will result in not only the kind of species present but their relative abundance as well. Common Myna and Zebra Dove populations should increase following development. House Sparrows will undoubtedly find their way to this area. As noted earlier, the Pacific Golden Plover and Ruddy Turnstone will also become more abundant. The most pressing concern is the management and protection of Opae'ula Pond and surrounding wetlands. Development plans should make every effort to protect and enhance this important and attractive resource. The anchialine ponds are likewise unique habitats and should be protected, and where possible, incorporated into the design of the resort grounds.

4.7.3 Impacts Which Cannot Be Avoided

Limited habitat and wildlife resources such as dry grasslands and feral goats, will be removed or displaced from development areas.

4.7.4 Mitigation Measures

Loss of sparse, xeric vegetation would be offset by a major landscaping program utilizing indigenous and introduced species compatible with North Kona's climate and soil. The landscaping program would provide a new and more diverse habitat and niches for a variety of native and introduced birds and mammals.

The draft pond and wildlife refuge management plan (Appendix E) would be refined with the assistance of the U.S. Fish and Wildlife Service and the Department of Land and Natural Resources with the objective of preserving existing pond features, water quality, biota, and providing interpretive and educational opportunities for the public (see Appendix E). Further, the landowner is in the process of hiring a qualified person to trap and remove the feral goats, dogs, and cats from the project site.

As noted throughout this EIS, a wildlife refuge will be established at Opae'ula Pond to protect and preserve the endangered species presently inhabiting the pond and immediately surrounding areas (see Appendix E). The refuge will be surrounded by a vegetative or other suitable buffer, fenced or walled and include public interpretive viewing areas. To mitigate the potential loss of attractiveness of the area to the wildlife, care will be taken in the siting and orientation of nearby structures (hotel and condominiums) and nightlighting will be directed away from the refuge. Additionally, adequate entry/egress corridors will be retained and human noise

generating activity areas will be sited away from the refuge boundaries and specifics of the pond and wildlife refuge management plan will be determined through consultation with U.S. Fish and Wildlife Service, State Department of Land and Natural Resources and County Planning Department personnel and established prior to the commencement of development activities on-site. As indicated elsewhere in this EIS, it is the landowner's intent to preserve and protect to the maximum extent possible, the wildlife and other natural and historic resources of the proposed project site for the betterment of those resources as well as to add to the attractiveness and uniqueness of the proposed resort.

Whenever possible native plants such as Lo'ulu palms, Lama trees, and 'Ilima and Nehe shrubs will be employed in the landscaping; these plants are adapted to the environmental conditions of the study area and would require less maintenance, less water, and less soil than the more commonly used introduced landscape plants. Additional plantings of Beach Naupaka would be made seaward of Opae'ula Pond as recommended in the botanical survey (see Appendix A). These plants would provide a screen for the refuge. Vegetation on the proposed refuge site would not be altered.

Potential water features and a pond and wildlife refuge management plan would not only protect fauna but provide additional or ensure improved wildlife habitat.

Water features and open space associated with the golf course and other open areas would provide additional habitats for certain waterfowl and shorebirds as noted previously and in the faunal survey (see Appendix B.) A well conceived anchialine pond maintenance program would protect fauna associated with this system (see Appendix E).

4.8 ARCHAEOLOGICAL/HISTORICAL RESOURCES

A full-scale archaeological reconnaissance was conducted, in compliance with the requirements of a Special Management Area permit application and Environmental Impact Statement rules and regulations, as requested by the Hawaii County Planning Department. The 353 acre area surveyed includes the entire seaward portion of the Land of Makalawena, district of North Kona, island of Hawaii. Field investigations were conducted July 24-August 4, 1986, by a crew of six persons, under the direction of Principal Investigator Dr. Paul H. Rosendahl, Supervisory Archaeologist, Project Director Theresa K. Donham and Field Archaeologist Alan T. Walker.

A total of 49 sites were identified within the project area during the reconnaissance. This total includes nine sites that were previously identified by Soehren (1963), and several features within three sites previously identified by Reinecke in 1930 (Ms.). Complete verbal descriptions, locational data, and significance assessments of these sites are presented in Appendix C. Also included is background information pertaining to the environmental and cultural-historical setting of the project area, a summary of previous archaeological investigations, discussion of research problems and a description of field procedures. The Appendix Conclusion presents site significance evaluation criteria and specific research, interpretive and cultural values that are reflected in the cultural resources of Makalawena. Recommended general treatment is offered for each site. Appended to the report are findings of the preliminary historical documentary research (Silva), and an ethnographic background and local informant interviews concerning the project area (Springer). These reports are summarized in the Introductory section, and the findings have been synthesized with the archaeological data.

4.8.1 Existing Conditions

The Makalawena Coastal Development project area is a single parcel which includes the entire seaward portion of Makalawena, a relatively small land division (ahupua'a) located in central North Kona. This ahupua'a is situated between Mahai'ula to the south, Awakee to the north, and the upland portion of Kaupulehu to the east. The inland (mauka) end of Makalawena is at Akahipuu (2,232 foot elevation), just above the Huehue Ranch cemetery, c. 7.7 km from the coast. As a land division, Makalawena is extremely narrow (c. 300 m) above 600 foot elevation. It is possible that the existing boundaries are historical and were delineated during the Mahele of 1868-1869, when the ahupua'a was awarded to Akahi, a cousin of Bernice Pauahi Bishop.

Makalawena is situated on the lower western slope of Hualalai Volcano, which is the source of prehistoric pahoehoe and historic aa lavas which form the present land surface. Prehistoric pahoehoe covers most of the coastal zone and forms the barren rocklands within the project area. Aa lava from Puhiapele Flow of 1801 covers Makalawena above the project area, between 600 and 1,200 foot elevations. This flow originated from the Puhiapele (also Puhiopele) vent at 1,637 feet, 0.6 km north of Makalawena, and reached the coas: at the southern border of Mahaiula, 1.7 km south of Opae'ula Pond (Macdonald, Abbott and Peterson 1983:60). Aa from a prehistoric Hualalai flow covers a narrow band along the northern border of Makalawena; this aa flow contains a number of anchialine ponds.

The general climatological patterns affecting Makalawena are those characteristic of Kekaha, the dry, barren portion of North

Kona noted for its harsh lava covered terrain and excellent offshore marine resources (see Springer, Appendix C). Rainfall along the coastal areas of Kekaha rarely exceeds 20 inches per year, due to the blockage of moisture laden northeast trade winds by the mountains (Armstrong 1973:57). Upland portions of Makalawena receive an average of 39 inches of rainfall annually, with monthly averages as low as 2.2 inches (July) and occasional monthly highs of 18 to 22 inches in January and December (Hawaii Department of Land and Natural Resources [DLNR] 1970:58-59). Mean temperatures along the coast range from 70 to 76 degrees F. (DLNR 1970:81).

The environmental features of Makalawena are expected to be both limiting and advantageous factors in the history of human settlement and land use within the project area. An ecological approach to archaeological data interpretation attempts to identify and account for the effects of environment on human adaptation, and the effects of human settlement on the environment. Within the framework of this approach, a number of research questions concerning settlement patterning and subsistence practices can be formulated, if there is sufficient environmental and archaeological data. Reconstruction of an environment for specific historic periods is required, as is a reconstruction of extent resource exploitation patterns for specific periods. Archaeological sites with intact deposits of ecofactual remains are significant resources for the ecological study of past human adaptations. Specific questions in human ecology relevant to the Makalawena project area are discussed in Appendix C.

An additional research concern for archaeological studies is the development of local culture histories which can be synthesized with data from other localities to derive regional and interregional patterns of culture and cultural change. In order to address problems in culture history and to develop a reliable temporal framework for a given area, materials must be present within meaningful archaeological contexts which can be dated through absolute or relative dating procedures. One of the goals of reconnaissance level field investigations, therefore, is to identify archaeological sites which contain or potentially contain datable materials. A more specific discussion of this problem area is included in Appendix C.

A culture process approach to archaeological interpretation examines the mechanisms and causes of change in culture systems. The early historic period in Hawaii is particularly amenable to culture process studies, since during this period the traditional Hawaiian culture system was exposed to numerous change-inducing stimuli. The character and contexts of these stimuli and the effected changes are understood primarily through the written observations of foreign visitors, few of which have been supplemented or substantiated with material evidence from archaeological contexts. Historic period studies which utilize both

documentary and archaeological data are particularly appropriate for addressing problems in culture process. Based on the review of past work at Makalawena and on historic background studies, it appears that this area has resources relevant to the study of culture contact and change. The specific research issues concerning culture processes which may be addressed with data collected at Makalawena are discussed in Appendix C.

Research questions in culture process cannot be adequately addressed with data from a reconnaissance survey only. However, such questions can be used to aid in determining the research value of specific sites and in the organization of recovered data. During field investigations, an attempt was made to identify the function of all features, to note the presence of historic materials and their contexts, and to examine the spatial patterning of sites and features. These basic data sets are required before the above questions can be addressed.

A final approach to data analysis and research problem formulation considered here is the reconstruction of past lifeways, based on material culture remains and other information. Research problems that can be addressed in reconstructing past lifeways include the determination of domestic space use patterns, the identification of source areas of raw materials used in the manufacture of tools or of purchased artifacts (i.e., European, Oriental, American), the role of traditional Hawaiian tools and materials in historic period households, and locally important home industries. These data are amenable to comparative analyses both at the local and regional level, and provide important clues in understanding early trade systems, local variation in commodity demands, and in the rates of replacement of specific Hawaiian tool forms and materials. In the context of this approach, sites which contain undisturbed artifact deposits are of relatively high research value. Likewise, sites with material processing debris are also significant. The identification of these sites was one of the goals of reconnaissance.

A 100 percent coverage low level aerial reconnaissance of the project area was conducted July 23, 1986, in order to determine the overall site density pattern and ground conditions within the project area. The entire project area was subsequently covered by pedestrian survey using two intensity levels. The coastal zone (shoreline to 1,000 feet inland, c. 90 acres) was surveyed at a high intensity level, with surveyors spaced at 10.0 m. intervals. A small portion (c. 5 acres) of the coastal zone at the southern boundary of the projec area was covered with recent aa (1801 Flow), and was surveyed at 30.0 m. intervals.

A 20 acre area within the inland survey zone was also surveyed at the high intensity survey level. The area located at the northern edge of the project area was covered with relatively dense Kiawe growth which hindered visibility; therefore, sur-

veyors were spaced at a maximum of 10.0 m. apart in this area. The remaining 238 acres were surveyed at a medium level of intensity, using 30.0 m. intervals between crew members. Areas of older pahoehoe which contained collapsed blisters and more frequent caves were surveyed with 15.0-20.0 m. intervals. Artifacts were collected at four sites. These include a cut shell item (Site T-11), a net sinker (Site T-18), a basalt abrader and three volcanic glass flakes (Site T-22), a spatulate wooden tool and a bowl which contains a fishing net (Site T-42). These materials are illustrated and described in Appendix C.

A total of 49 archaeological sites with 121 component features have been identified within the Makalawena Development Project area. These sites and their component features are summarized in Table 2, Appendix C and their appropriate locations indicated on Figure IV-5.

A total of 24 formal types are represented among the 121 features recorded (Appendix C, Table 3). Over half of these features (58 percent) are accounted for in six formal categories; cairns, overhang shelters, single walls, terraces, cave shelters, and cleared pools. These frequencies reflect the relatively low degree of variability between the sites located. Several of the formal feature categories are represented by one example only. Of noticable absence within the protect area are platforms indicating prehistoric habitation sites, pavements of pebbles and/or coral, shrines, rock mounds, petroglyphs, and other formal and functional types which suggest a permanent prehistoric population.

General functional interpretations were determined for 41 of the 49 identified sites. Categories used include permanent habitation, temporary habitation, recreation and/or aquaculture, animal keeping, transportation, and religious/burial.

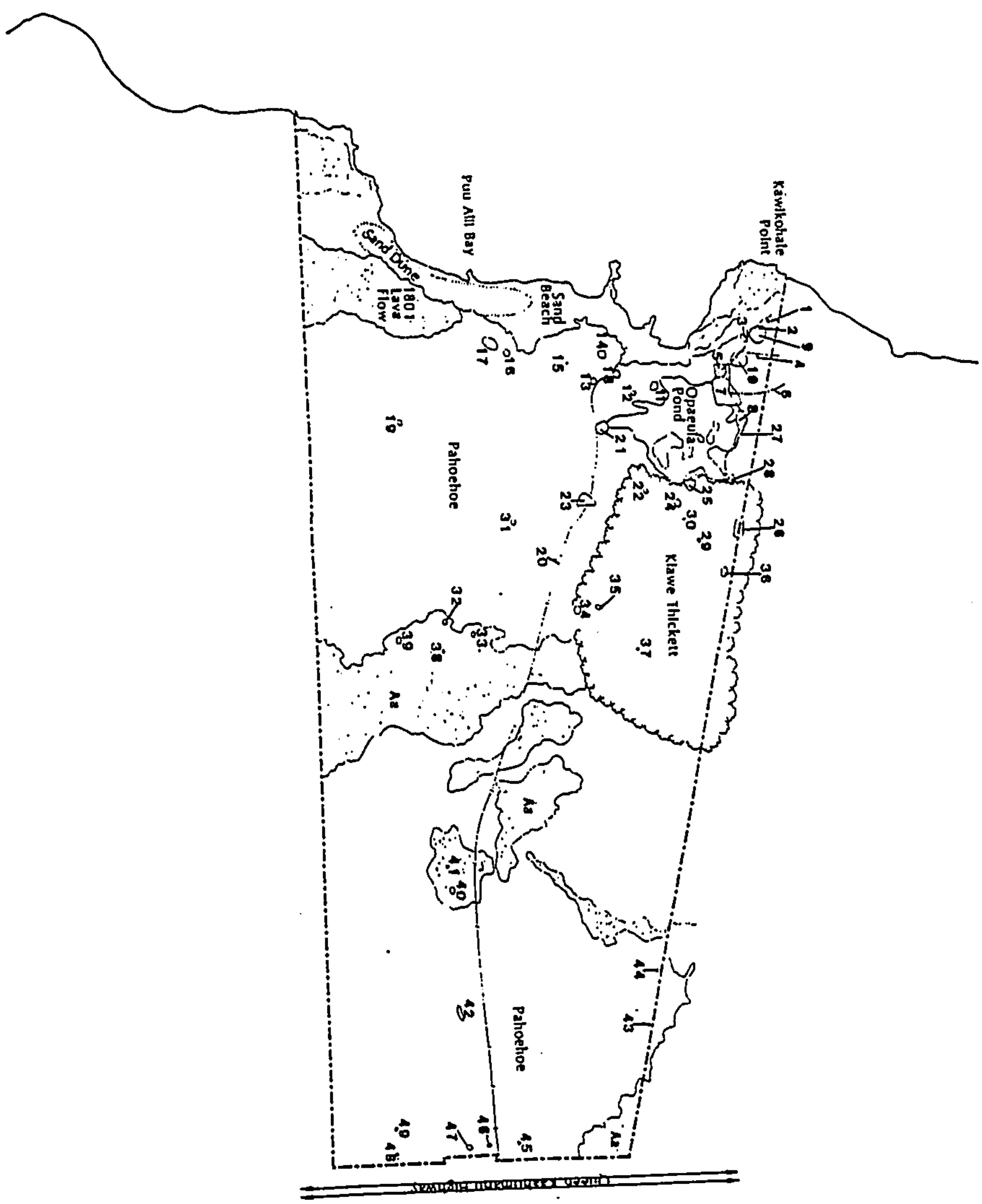
Permanant habitation is indicated by the presence of a structural foundation, an extant structure, or other remnants of a permanent structure inferred to have been used for habitation. Features interpreted as house site remnants were located at five sites within the project area (Sites T-11, -12, -14, and -18). These sites are all located within the coastal zone and are within the spatial boundaries of the village of Makalawena. They are all assigned to the historic period, on the basis of observed artifacts and architectural design. It is likely that they date to the nineteenth/early twentieth century (prior to 1925), since they were described as archaeological sites by Reinecke in 1930. Ecofactual remains were visible on these sites at the time of survey, and it is expected that they contain datable artifacts. Of particular interest is also the presence of both indigenous and non-indigenous artifact classes on Sites T-11 and T-18.

Temporary habitation sites are those which contain walled shelters, C-shape walls, caves and overhangs. Midden deposits at these sites are absent to very light, indicating a brief period or periods of human presence. These sites are most numerouse within the project area and are represented by 14 sites, all of which occur in the inland portion of the project area. Three temporary habitation sites (T-19, -22, and -25) are are just over 1,000 feet from the shoreline; three sites are 1,200 to 1,300 feet from the shoreline (T-23, -24, and -30); and the remaining eight temporary habitation sites are over 1,600 feet from the shore.

Recreation and/or aquaculture is indicated at sites which have modified anchialine ponds or pools. Modifications include the construction of walls around or across the ponds, clearing and deepening by the removal of loose stones, and the construction of access platforms or bridges in or around the ponds. Six such sites were located, including (Sites T-5, -7, -10, -16, -21, and -49). These sites are located around the periphery of Opae'ula Pond or behind the sand dunes and contain such features as walled ponds, cleared pools, single walls, bridges, enclosures, foot-paths, and shelter remnants. These sites occur primarily in loose aa lava which has been extensively landscaped for both access and aesthetic purposes, probably during the period of Makalawena village occupation.

Animal keeping is indicated at Makalawena by high-walled enclo-sures that contain no internal features. These enclosures were located at three sites (T-8, -17, and -26). These sites were all previously identified by Soehren and Reinecke as goat pens, and may have still been in use in 1930 when Reinecke surveyed the area. Makalawena villagers were known historically to raise goats, and a sizable feral herd still ranges within the project area. The enclosures are all located within the coastal zone, either within or adjacent to the loose aa lava fields, which pro-vided building materials for the walls. All three enclosures are in relatively good preservation, with the bulk of wall damage caused by large trees.

The religious/burial category includes two sites, the Kalawina Church (United Church of Christ, Hawaii Conference), and the Makalawena Cemetery (T-9). The former site is still owned by the United Church of Christ; it is regularly maintained and visited annually by the parishioners, even though the superstructure has been moved to Kalaoa. The cemetery is not spatially associated with the Kalawina Church; however, an earlier church site may have once existed on the point where the cemetery occurs. A minimum of seven grave sites were identified during reconnaissance; all have been storm damaged and surface skeletal material was located in association with two features. It is likely that there are additional burials at this site, which is culturally significant as a burial area.



SOURCE: PAUL H. ROSENDAHL, PH.D., INC. REPORT 245-071486, SEPTEMBER 1986

ARCHAEOLOGICAL SITE LOCATION MAP

MAKALAWENA RESORT

0 250 500 1000 FEET

pbr

FIGURE IV-5

The eight sights for which function could not be determined are isolated cairns or rubble piles, all located in the inland portion of the project area. A few of the 17 identified cairns could be given a general function, such as trail marker, site marker, or surveyor's marker. Most cairns are located so as to provide no functional clues; some may indicate the location of a specific event which left no archaeological traces, or a footpath which is no longer identifiable.

Historical research conducted in conjuction with the archaeological survey indicates that the village of Makalawena contained approximately 15 houses during the early twentieth century. Most of these house sites were located on the beach and were completely destroyed by the tsunami of 1946. This and other major storms have undoubtedly removed other archaeological features along the coats of Makalawena; this factor is an important contingency in the interpretation of features that are present. They cannot be construed as a complete material record of past land use and settlement density of Makalawena.

Despite the absence of early twentieth century habitation sites at Makalawena, material remains of human activity is considerable. These include a number of refuse dump sites, located primarily in pahoehoe crevices and dry sinkholes just inland of the beach. Due to the intrusion of recent material, dump sites which predate 1920 are not recognizable from surface observations alone. Much of the upper refuse at these dumps appear to have been deposited after 1950; however, earlier materials occur in refuse pits associated with Site T-14 and T-18.

4.8.2 Impacts

A number of archaeological sites at Makalawena have significant data that are relevant to research problems, despite the somewhat poor preservation of certain structural features. A primary research concern for archaeological studies is the development of local culture histories which can be synthesized with data from other localities to derive regional and interregional patterns of culture and cultural change. The dates of earliest human settlement at Makalawena are currently unknown; likewise, the nature of early coastal habitation and the earliest dates of coastal upland transportation through Makalawena has not been determined. Documentary sources examined to date indicate the dates of nineteenth century school and church foundings, but do not provide data on the beginnings of the Makalawena community.

Of particular interest in the study of the Makalawena community is the determination of its actual role in the social and economic system of the Kekaha region. Kelly has characterized this village as being quite important (see above), and it was the site of a church commissioned by Kamehameha as early as 1868. Was the village a "central place" prior to the establishment of a reli-

gious center at the town? If so, what natural and/or social features of the locale contributed to this status? There is little in the prehistoric archaeological record of Makalawena that indicates the presence of an important place prior to Euroamerican contact. Was the growth of the settlement dependent upon market systems or transportation systems that were introduced with the Euroamericans? How unique was the village in the context of the region of Kekaha and the Kona coast north of Kailua?

The permanent habitation sites of Makalawena are potentially rich sources for information concerning nineteenth and early twentieth century lifeways. The habitation sites that remain at Makalawena should be particularly valuable, since they do not have later twentieth century occupations (after 1930). The historic context of specific historic period sites can often be explicitly determined through archival research; individual residents may even be identified, including their occupation, place of birth, and general economic status. This background development permits greater interpretive latitude in examining the material culture of a given site, and permits the examination of more detailed kinds of questions.

Research problems that can be addressed in reconstructing past lifeways include the determination of subsistence patterns, source areas of purchased artifacts (i.e., European, Oriental, American), role of traditional Hawaiian tools and materials in the household, and locally important home industries. These data are amenable to comparative analyses both at the local and regional level, and provide important clues in understanding early trade systems, local variation in commodity demands, and in the rates of replacement of specific Hawaiian tool forms and materials.

Archaeological resources with significant interpretive value are those which provide well-preserved and integral examples of specific kinds or types of sites. A major condition in accessing significance in this realm is uniqueness of the feature(s) and immediate site setting. Opae'ula Pond, which has been recognized as a significant natural resource (cr. Macioleck and Brock 1984), is also the setting for a number of archaeological features. Taken together, these walled and cleared ponds form a single complex which is an exemplary interpretive site. Included within this complex are Sites T-5, -7, -8, and -11; sections of footpaths T-4, -6, -27; and a bridge, Site T-28. The area in the immediate vicinity of these modified ponds and footpaths has been landscaped, and it appears that the complex has played a major role in the culture and traditions of the Makalawena community.

The development of a local chronology for Makalawena requires the acquisition of volcanic glass and carbonized wood specimens for absolute dating. These items have been observed at two temporary

habitation sites (T-22 and -25) and are expected to occur at a number of other sites which have midden and soil accumulation. These include inland cave shelter sites T-23, -30, -36, -39, and -42. The permanent habitation sites in the coastal zone (Sites T-1, -11, -12, -14, and -18) are also expected to contain materials for both absolute and relative dating. Two (or more) of these sites may contain materials from prehistoric or contact period habitation.

Current land use plans as proposed for the Makalawena Development have recognized the importance of Opae'ula Pond and "...the need to design a protection program to preserve the pond's habitat function" (Phillips, Brandt, and Reddick 1984:II-12). The archaeological complex located along the northern fringes of the pond would provide an interpretive location for the natural and cultural features present, without subjecting the immediate pond to impacts from visitation.

Sites with potentially high cultural values are those locations with traditional uses and locations which have significant meaning in the context of traditional, spiritual, and/or religious systems. In addition to the interpretive value of the complex around the fringes of Opae'ula Pond, this area also has cultural value as a traditional source area for opae'ula; as a locale of freshwater baths, which had both recreational and religious functions; and as a crossroads area, where at least three coastal paths converge.

The Makalawena-Akahipuu Trail is a significant resource with cultural and interpretive value. Additionally, the presence of the trail had important economic implications for the Village of Makalawena, many of which have yet to be fully explicated and understood. Ideally, the entire trail from Makalawena to Akahipuu should be preserved, however, this alternative is not feasible, given the spatial requirements of resort development. An alternative presentation plan is to identify (and mark in the field) the best-preserved sections which would provide representative examples of trail construction and orientation. Reconnaissance survey has indicated that well-preserved sections occur at the eastern end of the project area, at the western end, and through areas of rough lava in the central portion of the project area. It is recommended that selected sections be developed for interpretation, and that an uninterrupted section be preserved that is of sufficient length to provide pedestrians with a realistic sense of traveling the trail.

A site with religious significance is the site of the previous Kalawina Church, which is currently owned and maintained by the United Church of Christ. Despite the fact that the church superstructure has been removed, the site is still visited and cared for, as is the section of a major village trail which leads from the beach to the church (seaward end of the Makalawena-Akahipuu Trail).

The Makalawena cemetery is culturally significant as a burial site. This site has been severely affected by the 1946 tsunami and the exact boundaries of the cemetery could not be determined by surface reconnaissance alone. It is suspected that there are more than the seven to ten graves located to date.

4.8.3 Mitigation Measures

A summary of site evaluations and recommended treatments and/or further archaeological work is presented in the following Table. The general nature and relative degree of significance for each site, and the tasks comprising recommended further work are indicated in Table 2, Appendix C.

Among the 49 archaeological sites located within the Makalawena project area, 36 may be categorized as being significant solely for their information content. Data recovery was completed to a sufficient degree at 23 of these 36 sites during the reconnaissance survey, and adverse effects to their information may be considered mitigated (Table IV-9). Additional data recovery as a mitigative action is recommended at 13 sites that are significant solely for information content. After data recovery at these sites, preservation for interpretive or cultural purposes should not be warranted, unless new information reflecting such is recovered. For example, Sites T-1 and T-2 are within the immediate vicinity of the cemetery and may contain human interments, deposited either before or after use of these features as a shelter (T-2) or a possible residential site (T-1). All of the sites recommended for additional data recovery have been determined to contain information relevant to the research problems outlined in Appendix C. Included in this category are the permanent habitation sites which have no interpretive potential, and the temporary habitation sites which contain significant midden deposits.

Artifacts of significance collected during archaeological recordation and preservation, as well as construction, will be evaluated for disposition by the Hawaiian Studies Institute of the Kamehameha Schools. Institute staff, which includes a qualified archaeologist will recommend to the Board of Trustees alternatives for disposition. This may entail further evaluation by the Bishop Museum or other consulting archaeologist, restoration for display or safekeeping for later study.

Three sites are considered to be significant for both their information content and as good examples of site types with interpretive value. Site T-11 probably has greater research than interpretive value; however, it is the best-preserved house site in the project area and is potentially the earliest remaining site. In addition, it is very close to Opae'ula Pond and has associated small walled ponds. It is possible that the pond preserve boundaries may encompass this site; if such is the case,

then the site information may be left unrecovered at the site only if sufficient measures are taken to insure that the integrity of the information is maintained. At least some limited data recovery is recommended at the site in order to better determine its significance and role in the settlement pattern of Makalawena.

The second site with research and interpretive potential is Site T-8, a large animal enclosure with adjacent terraces on the shoreline of Opae'ula Pond. The research value of this site is primarily focused on the terrace features, which probably supported either residencies or dependency structures. Preservation of this site is again not crucial for the purposes of preserving representative site types; however, it is very close to Opae'ula Pond and would provide considerable variety to an interpretive area, if such were developed along the northern fringe of the pond.

Finally, Site T-21 has potentially significant information content, as well as being a good example of a pond and terrace complex, located immediately on the Makalawena-Akahipuu Trail. The information at this site is primarily in the form of surface midden, which could be collected within a relatively short period of time. The remaining features are in good condition and are on the shoreline of Opae'ula Pond.

Table IV-9

SUMMARY OF GENERAL SIGNIFICANCE ASSESSMENTS AND
RECOMMENDED GENERAL TREATMENTS
MAKALAWENA DEVELOPMENT PROJECT AREA

Site or Feature Number (T-)	Significance Category				Recommended Treatment			
	A	X	B	C	FDC	NFW	PID	PAI
1	+	–	–	–	+	–	–	–
2	+	–	–	–	+	–	–	–
10	+	–	–	–	+	–	–	–
12	+	–	–	–	+	–	–	–
14	+	–	–	–	+	–	–	–
18	+	–	–	–	+		–	–
22	+	–	–	–	+	–	–	–
23	+	–	–	–	+	–	–	–
25	+	–	–	–	+	–	–	–
30	+	–	–	–	+	–	–	–
36	+	–	–	–	+	–	–	–
39	+	–	–	–	+	–	–	–
42	+	–	–	–	+	–	–	–
Subtotal: 13	13	0	0	0	13	0	0	0
8	+	–	+	–	+	–	+	–
11	+	–	+	–	+	–	+	–
21	+	–	+	–	+	–	+	–
Subtotal: 3	3	0	3	0	3	0	3	0

General Significance Categories:

A=Important for information content, further data collection necessary (PHRI=research value);
X=Important for information content, no further data collection necessary (PHRI=research value, SHPO=not significant);
B=Excellent example of site type at local, region, island, State, or National level (PHRI=interpretive value);
C=Culturally significant (PHRI=cultural value).

Recommended General Treatments:

FDC=Further data collection necessary (intensive survey and testing, and possibly subsequent data recovery/mitigation excavations);
NFW=No further work of any kind necessary, sufficient data collected, archaeological clearance recommended, no preservation potential (possible inclusion into landscaping suggested for consideration);
PID=Preservation, with some level of interpretive development recommended (including appropriate related data recovery work);
PAI=Preservation "as is," with no further work (and possible inclusion into landscaping), or minimal further data collection necessary.

Table IV-9

Site or Feature Number (T-)	Significance Category A	X	B	C	Recommended Treatment FDC	NFW	PID	PAI
16	-	+	+	-	-	-	+	-
Subtotal: 1	0	1	1	0	0	0	1	0
4	-	+	+	+	-	-	+	-
5	-	+	+	+	-	-	+	-
6	-	+	+	+	-	-	+	-
7	-	+	+	+	-	-	+	-
20	-	+	+	+	-	-	+	-
27	-	+	+	+	-	-	+	-
28	-	+	+	+	-	-	+	-
Subtotal: 7	0	7	7	7	0	0	7	0
9	-	+	-	+	-	-	-	+
13	-	+	-	+	-	-	-	+
Subtotal: 2	0	2	0	2	0	0	0	2
3	-	+	-	-	-	+	-	-
15	-	+	-	-	-	+	-	-
17	-	+	-	-	-	+	-	-
19	-	+	-	-	-	+	-	-
24	-	+	-	-	-	+	-	-
26	-	+	-	-	-	+	-	-
29	-	+	-	-	-	+	-	-
31	-	+	-	-	-	+	-	-
32	-	+	-	-	-	+	-	-
33	-	+	-	-	-	+	-	-
34	-	+	-	-	-	+	-	-
35	-	+	-	-	-	+	-	-
37	-	+	-	-	-	+	-	-
38	-	+	-	-	-	+	-	-
40	-	+	-	-	-	+	-	-
41	-	+	-	-	-	+	-	-
43	-	+	-	-	-	+	-	-
44	-	+	-	-	-	+	-	-
45	-	+	-	-	-	+	-	-
46	-	+	-	-	-	+	-	-
47	-	+	-	-	-	+	-	-
48	-	+	-	-	-	+	-	-
49	-	+	-	-	-	+	-	-
Subtotal: 23	0	23	0	0	0	23	0	0
Total: 49	16	33	11	9	16	23	11	2

Preservation with no additional archaeological data recovery is recommended for seven sites, all of which have both interpretive and cultural value as parts of the pond complex discussed above. These include modified ponds at Sites T-5 and T-7, footpaths T-4, -6, and -27, and a footbridge (Site T-28). Given the extent of landscaping already completed in the aa terrain of this area, little additional work would be required for interpretive development. Paths connect all features and they are sufficiently preserved so as to require little to no reconstruction or stabilization.

There are additional anchialine pond sites within the project area that should be considered as potential examples of this site type, in the event that the major pond complex is not preserved and developed for interpretation. A cluster of cleared pools and a large walled pond occurs to the south of Opae'ula Pond, some distance from its shoreline (Sites T-16 and T-17). The walled pond at Site T-16 may need to be incorporated into the project area landscaping, and it is an aesthetically pleasing feature.

In addition to the recovery of archaeological data at 16 Makalawena sites, further archival and documentary work focused on the village and its inhabitants, is recommended. More detailed information on the local population should be available from census and tax records. The archival sources at the Kona Historical Society should be examined as well as sources in the Hawaii State Archives and other repositories. A preliminary historic documentary records search is being prepared for the final report of reconnaissance survey. It is likely that this study will provide an indication of the extent and location of additional available archival data on Makalawena.

As an important initial step of further work in the project area, it is recommended that all sites be accurately plotted by professional surveyors, with the aid of an archaeologist, on an appropriate scale topographic map. This would greatly aid development planning as well as the planning of the Opae'ula Pond preserve boundaries. Many archaeological sites occur around the shoreline of the pond, and it is important that their location is known during pond preserve fencing activities.

4.9 TRANSPORTATION/CIRCULATION

4.9.1 Existing Conditions

Roadways and Access: The principal roadway is the Queen Kaahumanu Highway above the Makalawena site. The road is a two lane, limited access, high speed state highway with a two way capacity of approximately 2,000 vehicles per hour. The road is designed with a 24 foot pavement width within a 300 foot right-of-way.

No designated public access from the highway to the shoreline currently exists through the Makalawena lands. However, a jeep road traversing Awakee (State) lands north of and adjacent to Makalawena, provides public access to the beach and Pu'u Ali'i Bay.

Roadway Policies: The Kona Regional Plan (1982) defines General Plan goals, policies and standards for roadways in the region. The plan also provides an overview of traffic conditions, volumes and a roadway plan, focusing primarily on Kailua-Kona and coastal areas to the south. No traffic counts or forecasts along Queen Kaahumanu Highway north of Keahole Airport are provided. The plan forecasts increasing area wide traffic growth and a need for improvements to the regional highway system. However, no new roadways or improvements to existing roadways are planned north of Keahole Airport.

The plan includes the following roadway policies which may be applicable to the proposed Makalawena Resort development:

- "The further development of the area north of Kailua will require additional roads to serve these developments. The roadways should be laid out to interconnect the respective developments providing access within the area without utilizing the Queen Kaahumanu Highway or Palani Road for internal circulation. The moderate slopes and large land holdings in this area are suitable for a network that runs both mauka-makai and north-south; thus movement within this area can be facilitated. Sections of the major north/south roadway should be installed concurrent with any development in this area, while the mauka-makai roads should be installed with the initial development of the affected properties."

- "Improve secondary roads as necessitated by localized growth."

- "Provide improvements for walking, jogging, and bicycling particularly in the densely developed areas."

Additional recent information on highway conditions and future traffic is provided in the Kukio Beach Resort Final Environmental Impact Statement, May 1986. Based on data provided in this document, historic traffic volumes along the highway at points north and south of Kukio are identified in Table IV-10.

TABLE IV-10

Historical 24 Hour Traffic Volumes
on Queen Kaahumanu Highway: 1976 through 1984.

Location	1976 Volume	1978 Volume	1978 Percent Change	1980 Volume	1980 Percent Change	1982 Volume	1982 Percent Change	1984 Volume	1984 Percent Change
South of Waikoloa Road (North of Kukio 1)									
Northbound	607	850	40.0%	645	-24.1%	1,346	108.7%	1,707	26.8%
Southbound	575	842	46.4%	785	-6.8%	1,489	89.7%	1,893	27.1%
Total	1,182	1,692	43.1%	1,430	-15.5%	2,835	98.3%	3,600	27.0%
North of Keahole Airport Road (South of Kukio 1)									
Northbound	858	1,127	31.4%	775	-31.2%	1,478	90.7%	1,966	33.0%
Southbound	851	1,183	39.0%	643	-45.6%	1,520	136.4%	1,945	28.0%
Total	1,709	2,310	35.2%	1,418	-38.6%	2,998	111.4%	3,911	30.5%

Source: Final Environmental Impact Statement, Kukio Beach Resort; Phillips Brandt Reddick and Assoc., Inc.; May 1986; based on State Department of Transportation data.

Airports and Harbors: Three airports serve the Kona and Kohala Coast Resort region. Two of these, Keahole and Waimea-Kekaha (Kamuela), are operated by the State Department of Transportation. The third, the recently opened Waikoloa Airport, is operated by Princeville Airways. The Kamuela and Waikoloa airports are used primarily by commuter airlines and private aircraft, although daily prop-jet service is still provided between Kamuela and other islands by Hawaiian Airlines using its Dash-7 aircraft.

Keahole Airport is located 3.5 miles south of Makalawena and is served by all three of the major interisland air carriers, as well as by several of the commuter airlines and air cargo companies. In 1983, Keahole Airport handled over 1.2 million passengers.

Keahole Airport's 6,500 foot long runway is adequate for the largest interisland aircraft. Wide bodied jet aircraft, such as the DC-10 and L-1011, now make direct flights into it from the West Coast of the United States. In September, 1986, United Airlines announced plans to drop its West Coast, Hilo service at the end of November 1986 and upgrade its Kona-West coast service with daily non-stop service to San Francisco and Los Angeles, using DC-10-30 aircraft. A new Keahole Airport Master Plan is currently being prepared by the Department of Transportation, Air-

ports Division. It is expected that this master plan will be completed during the latter half of 1987. Present, preliminary indications of preliminary aircraft operations are that the runway at Keahole Airport will be lengthened 3,000 feet towards the north. Other options include construction of a parallel runway to serve future forecast aircraft operation levels.

Kawaihae Harbor is a deep water harbor used primarily by interisland barges. The primary cargo handled is building materials, consumer goods, large equipment and machinery, as well as the provisions and supplies needed for resorts in South Kohala and Kona.

4.9.2 Impacts

Access: The entrance to Makalawena Resort would be provided via a new mauka-makai access road to be constructed for the resort. The new access road would be constructed in conformance with the "Hawaii Statewide Design Manual for Streets and Highways."

Golf cart traffic to linking all portions of the Makalawena golf course would be provided and interior roadways would include underground utilities, appropriate street lighting and pedestrian walkways where functional. All interior roads would be built to county standards as modified for resort usage (Figure IV-6).

Public access to the shoreline will be accommodated through a specified public right-of-way. Details regarding public parking and other public beach facilities will be developed at the time specific project development plans are prepared. Applicable state and county rules, regulations and ordinances regarding the provision of public facilities and amenities will be compiled with by the landowner.

Traffic: Preliminary estimates of project-related trip generation, presented in Table IV-11, are based on historical traffic counts on entrance roads to various South Kohala resorts.

TABLE IV-11

Project Trip Generation

Makalawena Resort Use	Max. Units	Vehicle Trips/Day Per Unit	Vehicle Trips (Approx. ADT)
Hotel(s)	1200	3.5/room	4,200
Multi-family	1350	3.2/unit	4,320
Golf Course	18 holes	100/18 holes	100
		Total:	8,620

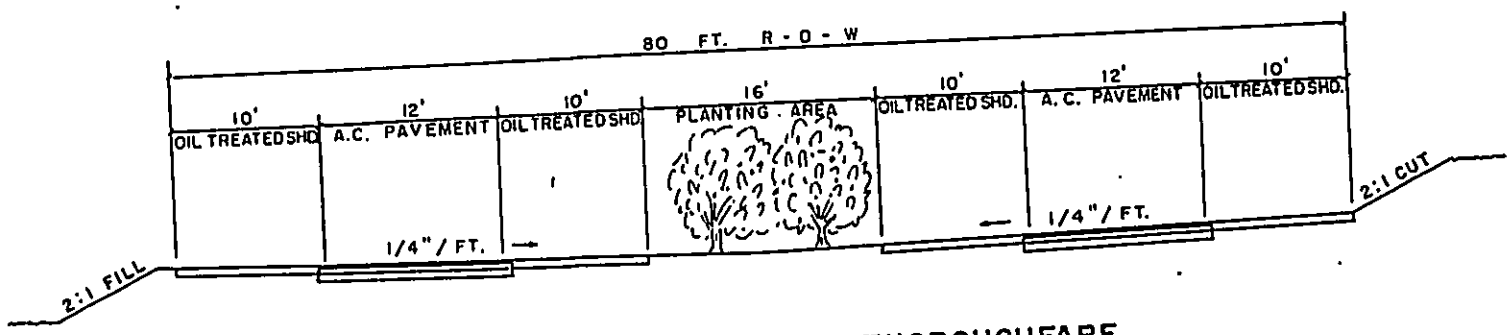
Notes:

1. Trip generation rates derived from Punalu'u Resort Draft EIS (October 1986).

2. Multi-family (resort condominium) use assumed to have peak month occupancy rates of 70 percent. Estimated trip generation rates have been derived from the Institute of Transportation Engineers, Trip Generation 3rd Edition, and modified downward from the 10.5 trips per hotel room and 5.2 trips per residential condominium unit rates given in the above noted publication. The downward modification is based on the rationale that visitors to and residents of the Resort will make fewer in/out trips due to on-site amenities, e.g., recreational facilities, dining opportunities and shopping services. As noted below (Section 4.9.4, Mitigation Measures) a traffic study will be prepared pursuant to detailed development plans. The traffic estimates (ADT) given above will be verified at that time and coordinated with the Department of Transportation, Highways Division planning personnel.

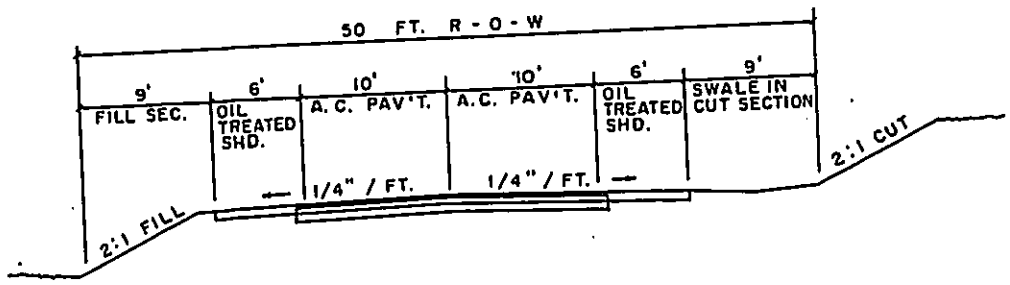
3. Rates represent traffic that enters and leaves the property, and do not account for trips completely internal to the site. Traffic entering and leaving includes employee and service vehicles.

The great majority of usage of commercial space and the golf course is assumed to come from guests of the resort already on site, thereby generating few off site trips other than employee traffic. The table approximates the impact of the project on Queen Kaahum .nu Highway at build-out. As there are no current plans to provide a public roadway link to the Hawaii Belt Highway directly from Makalawena, Queen Kaahumanu Highway will absorb all of the off-site traffic movement. No estimates of future turning movements at the highway intersection are available. The Keahole Airport and Kailua-Kona to the south will be principal origins-destinations for Makalawena Resort traffic. However, it is anti-



TYPICAL SECTION - MAIN THOROUGHFARE

SCALE: 1 IN. = 10 FT.



TYPICAL SECTION - SIDE STREET

SCALE: 1 IN. = 10 FT.

TYPICAL ROADWAY CROSS-SECTIONS

MAKALAWENA RESORT

pbr

FIGURE IV-6

cipated that northerly origins-destinations, such as the South Kohala resorts, Kawaihae and Waimea will also produce a significant proportion of Makalawena related vehicle trips.

Cumulative Effects: Open stretches of Queen Kaahumanu Highway can accommodate as many as 1,800 to 2,000 vehicles per hour (two way totals). Current traffic volumes are relatively low, and the level of service is "A" (best possible) at all times in the project vicinity. Recent traffic analysis performed for other nearby resorts suggest that the highway will operate at a "C" level of service or better until the year 2000. However, it is anticipated that the capacity of the existing two lane roadway will be exceeded near the turn of the century as a result of continuing regional growth. At that time additional lanes will be needed between Kailua-Kona and Waimea-Kawaihae Road. In all likelihood, the State Department of Transportation would undertake these improvements as part of its facility.

Airports: The Makalawena Resort will generate moderate additional air passenger traffic through Keahole Airport. In combination with other planned West Hawaii developments, the project will place significant cumulative demands on airport facilities.

It is clear that substantial expansion of terminal facilities will be required, and lengthening of the runway and other changes to ground facilities will be needed. Keahole Airport improvements have been given a high priority by the State Department of Transportation. Sufficient land area and revenues should be available to support needed improvements.

4.9.3 Effects Which Cannot Be Avoided

The project will contribute to the cumulative long-term need for improvements to Queen Kaahumanu Highway.

4.9.4 Mitigation Measures

Pursuant to detailed development plans, a traffic study will be prepared addressing project related traffic generation, traffic assignment and distribution, turning movements, intersection requirements and phasing and financial responsibility of road improvements.

4.10 AIR QUALITY

4.10.1 Existing Conditions

The West Hawaii region includes no large stationary sources of air pollutants and relatively low levels of vehicular traffic. While there are no continuous air monitoring stations in West Hawaii, air quality is estimated to be good during most of the year. No specific data representative of regional air quality is available.

Based on discussions with appropriate State Department of Health personnel, in all probability, the state's stringent air quality standards for most, if not all pollutant categories, are being met (Table IV-12). Volcanic activity on the island of Hawaii represents an infrequent source of air pollution episodes.

There are no stationary emission sources in the project vicinity. Existing mobile source emissions include only low level vehicular traffic along the jeep access road adjacent to Makalawena, and through traffic along the Queen Kaahumanu Highway.

The Makalawena site is generally sheltered by Hualalai from the strong northeasterly tradewinds prevailing elsewhere along coastal areas to the north. The winds at Makalawena are usually light and variable, often blowing offshore in the morning and onshore later in the afternoon.

TABLE IV-12

State and Federal
Ambient Air Quality Standards

POLLUTANT	SAMPLING PERIOD	FEDERAL STANDARDS		STATE STANDARDS
		PRIMARY	SECONDARY	
1. Total Suspended Particulate Matter (TSP)	Annual Geometric Mean	75	60	--
(micrograms per cubic meter)	Annual Arithmetic Mean	--	--	55
	Maximum Average in Any 24 Hours	260	150	100
2. Sulfur Dioxide (SO2)	Annual Arithmetic Mean	80	--	20
(micrograms per cubic meter)	Maximum Average in Any 24 Hours	365	--	80
3. Nitrogen Dioxide (NO2)	Annual Arithmetic Mean	100		70
(micrograms per cubic meter)				
4. Carbon Monoxide (CO)	Maximum Average in Any 8 Hours	10		5
(milligrams per cubic meter)	Maximum Average in Any 1 Hour	40		10
5. Photochemical Oxidants (as 03)	Maximum Average in Any 1 Hour	240		100
(micrograms per cubic meter)				
6. Lead (Pb)	Maximum Average in Any Calendar Quarter	1.5		1.5
(microg ams per cubic meter)				

SOURCES: State of Hawaii, Title 11, Chapter 59, Air Quality Standards Title 40, Code of Federal Regulations, Part 50

4.10.2 Impacts

Short-term: Construction activity involving earthmoving and construction vehicle movement on unpaved roads will result in fugitive dust emissions. EPA studies indicate average emissions of 1.2 tons/acre per month of activity under conditions of medium activity and moderate soil silt content. There is little or no existing soil on the project site and the silt content of any imported soils is unknown.

Long-term: The potential exists for state emission standards to be exceeded at receptor locations within the proposed project limits as a result of vehicular activity. In particular, future carbon monoxide levels could eventually be exceeded at receptor locations near the intersection of the proposed Makalawena Resort entrance road and Queen Kaahumanu Highway. This condition would most likely occur if the highway is not widened to meet regional traffic volumes, and where intersection improvements (i.e. turning lane and possible signalization) are not provided in a timely manner to meet project-related traffic needs.

Traffic generated by the proposed development will result in a significant net increase in emissions of all major automotive pollutants in the project area.

Emissions resulting from fossil fuel combustion needed to meet electrical demands of the project could be significant. The impact is difficult to predict given the long-term phasing of the project, and potential variability in electrical generating technologies, facilities and potential fuel sources.

4.10.3 Effects Which Cannot Be Avoided

Short-term air quality impacts will occur, associated with grading and construction phases (i.e., dust, equipment emissions).

Long-term air quality impacts may occur from mobile and stationary emission sources if the appropriate mitigative measures are not implemented in conjunction with the resort development.

4.10.4 Mitigation Measures

Prevailing winds at Makalawena, although light, will disperse and dilute emissions from internal combustion engines. Dust control measures will be implemented to reduce airborne particulate dissemination resulting from heavy equipment operations and earth moving activities during construction.

Pursuant to detailed development plans, an air quality assessment would be prepared to address pollutant concentrations during peak hour traffic conditions at primary project intersections. The assessment would address any measures required to comply with Federal and state air quality standards.

To avoid exceeding state emission standards in the long-term, it may be necessary to widen Queen Kaahumanu Highway to meet regional traffic volumes and provide intersection improvements to meet project-related traffic needs.

Should blasting be conducted, all necessary precautions will be implemented to minimize the effects on land/marine communities and measures would be implemented to reduce airborne particulate dissemination resulting from earth moving activities.

4.11 NOISE

4.11.1 Existing Conditions

Existing noise sources on the Makalawena site are limited to:

1. Low volume traffic along Queen Kaahumanu Highway; and,

2. Natural sources (wave action, winds).

The site is sufficiently removed from the Keahole Airport departure zone to the south such that aircraft noise is rarely experienced at the site. As shown on Figure IV-7, Makalawena lands lie outside the 1985 60 LDN noise contours developed by the State Department of Transportation Airports Division.

A number of different noise measurement scales are used to relate traffic noise levels to land use compatibility, and to assess environmental noise in general. Among these are the Equivalent Noise Level (Leq), the Day-Night Average Sound Level (Ldn), and Community Noise Equivalent Level (CNEL). The Leq and Ldn scales are averages of instantaneous A-weighted sound levels, as indicated on a standard sound level meter.

An exterior noise standard for residential uses of 65 Ldn is generally considered acceptable by federal and state agencies.

Table IV-13 includes traffic noise measurements taken north of Makalawena along Queen Kaahumanu Highway at the existing private ranch road intersection (Kona Village Resort entrance) during May 1985. The levels shown are not for peak traffic periods.

4.11.2 Impacts

Potentially significant traffic noise effects are related to future volumes along Queen Kaahumanu Highway and a proposed Makalawena Resort collector road accessing the highway. Preliminary resort plans identify multi-family residential and golf course uses near these roadways.

TABLE IV-13

Typical Highway Noise Levels For Selected Time Periods

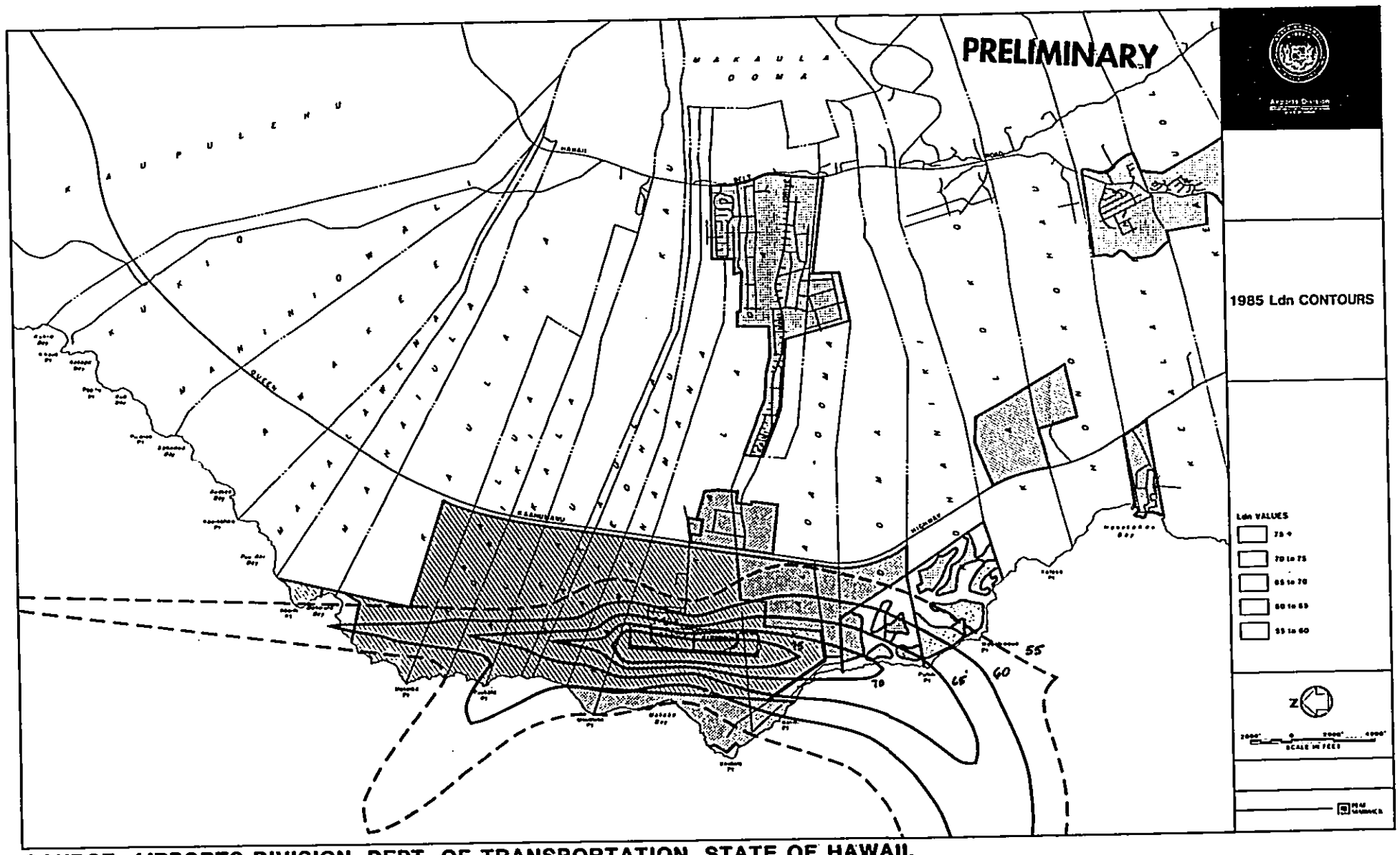
Hourly Traffic Volume

Location	Time (Hrs.)	Avg. Speed (MPH)	Auto	Med. Truck	Hvy. Truck	Meas. Leq (dB)	Pred. Leq (dB)
o 50 feet from centerline of Q.K.Hwy. at entrance to Kona Village Resort (Kukio ranch road)	1720 to 1742	50	299	0	8	60.9	62.0
o 100 feet from centerline of Q.K.Hwy at entrance to Kona Village Resort (Kukio ranch road)	1748 to 1832	50	262	0	4	52.5	52.6

Source: Y. Ebisu & Associates, May 1985. (Mauna Lani Resort Revised Master Plan Draft, EIS, (May 1985)

Construction related noise, including grading, potential rock crushing or blasting of lava formations represents additional noise sources. The timing, duration and sequence of construction phases is unknown. However, these activities should not have any significant effect on populated areas in the vicinity of Makalawena because of the distance to these areas (approximately five miles) and the daytime only occurence. Construction activities will be planned to minimize effects to on-site uses.

Based on evaluations conducted by the Department of Transportation, Airports Division personnel, future aircraft operations noise is expected to be below the 55 to 60 LDN level. Based on Federal and state land use guidelines (Tables IV-14 and IV-15) all residential, commercial and recreational activities planned at Makalawena are compatible with present and forecast aircraft operations at Keahole Airport.



SOURCE: AIRPORTS DIVISION, DEPT. OF TRANSPORTATION, STATE OF HAWAII.

1985 LDN CONTOURS FOR KEAHOLE AIRPORT

MAKALAWENA RESORT

pbr

FIGURE IV- 7

Table IV-14

SUGGESTED LAND USE COMPATIBILITY STANDARDS IN AIRCRAFT NOISE EXPOSURE AREAS

(State Department of Transportation)

Land use	Below Ldn 60	Ldn 60 to 65	Ldn 65 to 70	Ldn 70 to 75	Ldn 75 to 80	Ldn 80 to 85	Over Ldn 85
Residential:							
Residential, other than mobile homes and transient lodgings	Compatible	Compatible[a]	NLR required[b]	NLR required[b]	Incompatible	Incompatible	Incompatible
Mobile homes	Compatible	Compatible[a]	Incompatible[b]	Incompatible[b]	Incompatible	Incompatible	Incompatible
Transient lodgings	Compatible	Compatible[a]	NLR required[b]	NLR required[b]	Incompatible	Incompatible	Incompatible
Public use:							
Schools, hospitals, and nursing homes	Compatible	Compatible[a]	NLR required[b]	Incompatible	Incompatible	Incompatible	Incompatible
Churches, auditoriums, and concert halls	Compatible	Compatible	NLR required[b]	NLR required	Incompatible	Incompatible	Incompatible
Governmental services	Compatible	Compatible	Compatible	NLR required	NLR required	Incompatible	Incompatible
Transportation	Compatible	Compatible	Compatible	Compatible[c]	Compatible[c]	Compatible[c]	Compatible[c]
Parking	Compatible	Compatible	Compatible	Compatible[c]	Compatible[c]	Compatible[c]	Incompatible
Commercial use:							
Offices, business, and professional	Compatible	Compatible	NLR required	NLR required	NLR required	Incompatible	Incompatible
Wholesale and retail--building materials, hardware, and farm equipment	Compatible	Compatible	Compatible	Compatible[c]	Compatible[c]	Compatible[c]	Incompatible
Retail trade--general	Compatible	Compatible	NLR required	NLR required	NLR required	Incompatible	Incompatible
Utilities	Compatible	Compatible	Compatible	Compatible[c]	Compatible[c]	Compatible[c]	Incompatible
Communication	Compatible	Compatible	NLR required	NLR required	NLR required	Incompatible	Incompatible
Manufacturing and production:							
Manufacturing, general	Compatible	Compatible	Compatible	Compatible[c]	Compatible[c]	Compatible[c]	Incompatible
Photographic and optical	Compatible	Compatible	Compatible	NLR required	NLR required	Incompatible	Incompatible
Agriculture (except livestock) and forestry	Compatible	Compatible[a]	Compatible	Compatible	Compatible	Compatible	Compatible
Livestock farming and breeding	Compatible	Compatible	Compatible	Compatible	Incompatible	Incompatible	Incompatible
Mining and fishing resources production and extraction	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible
Recreational:							
Outdoor sports arenas and spectator sports	Compatible	Compatible	Compatible	Compatible	Incompatible	Incompatible	Incompatible
Outdoor music shells, amphitheaters	Compatible	Compatible	Incompatible	Incompatible	Incompatible	Incompatible	Incompatible
Nature exhibits and zoos	Compatible	Compatible	Compatible	Incompatible	Incompatible	Incompatible	Incompatible
Amusements, parks, resorts, and camps	Compatible	Compatible	Compatible	Compatible	Incompatible	Incompatible	Incompatible
Golf courses, riding stables, and water recreation	Compatible	Compatible	Compatible	Compatible	Incompatible	Incompatible	Incompatible

Ldn = Yearly day-night average sound level in decibels.

Compatible = Generally, no special noise attenuating materials are required to achieve an interior noise level of Ldn 45 in habitable spaces, or the activity (whether indoors or outdoors) would not be subject to a significant adverse effect by the outdoor noise level.

NLR = NLR (Noise Level Reduction) is used to denote the total amount of noise transmission loss in decibels required to reduce an exterior noise level in habitable interior spaces to Ldn 45. In most places, typical building construction automatically provides an NLR of 20 decibels. Therefore, if a structure is located in an area exposed to aircraft noise of Ldn 65, the interior level of noise would be about Ldn 45. If the structure is located in an area exposed to aircraft noise of Ldn 70, the interior level of noise would be about Ldn 50, so an additional NLR of 5 decibels would be required if not afforded by the normal construction. This NLR can be achieved through the use of noise attenuating materials in the construction of the structure.

Incompatible = Generally, the land use, whether in a structure or an outdoor activity, is considered to be incompatible with the outdoor noise exposure, even if special attenuating materials were to be used in the construction of the building.

a. In climates where existing structures have thin, single-wall construction with minimal insulation, the Ldn 60 to 65 area may not be compatible without additional noise level reduction incorporated into the design and construction. However, it should be noted that in many urban areas, the ambient noise level may be above Ldn 65, so structures in the Ldn 60 to 65 must be evaluated on a case-by-case basis.

b. The land use is generally incompatible and should only be permitted in areas of infill in existing neighborhoods or where the community determines that the use must be allowed.

c. NLR required in offices or other areas with noise-sensitive activities.

Source: Peat, Marwick, Mitchell & Co., as derived from the U.S. Department of Transportation, Federal Aviation Administration, "Interim Federal Aviation Regulations, Part 150, Airport Noise Compatibility Planning," Table 2, January 24, 1981.

Source: Honolulu International Airport and Environs Study, 1981

TABLE IV-15

LAND USE COMPATIBILITY* WITH YEARLY DAY-NIGHT AVERAGE SOUND LEVELS

Land Use	*Yearly Day-Night Average Sound Level (L_{dn}) in Decibels*					
	Below 65	*65-70*	*70-75*	*75-80*	*80-85*	*Over 85*
Residential						
Residential, other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
Public Use						
Schools, hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Governmental services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
Commercial Use						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail—building materials, hardware and farm equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade—general	Y	Y	25	30	N	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
Manufacturing And Production						
Manufacturing, general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts and camps	Y	Y	Y	N	N	N
Golf courses, riding stables and water recreation	Y	Y	25	30	N	N

(Numbers in parentheses refer to notes.)

* The designations contained in this table do not constitute a Federal determination that any use of land covered by the program is acceptable or unacceptable under Federal, State, or local law. The responsibility for determining the acceptable and permissible land uses remains with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses.

KEY TO TABLE 2

SLUCM	Standard Land Use Coding Manual.
Y (Yes)	Land Use and related structures compatible without restrictions.
N (No)	Land Use and related structures are not compatible and should be prohibited.
NLR	Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
25, 30, or 35	Land used and related structures generally compatible; measures to achieve NLR or 25, 30, or 35 must be incorporated into design and construction of structure.

NOTES FOR TABLE 2

(1) Where the community determines that residential uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal construction can be expected to provide a NLR of 20 dB, thus, the reduction requirements are often stated as 5, 10 or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.

(2) Measures to achieve NLR of 25 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

(3) Measures to achieve NLR of 30 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

(4) Measures to achieve NLR of 35 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

(5) Land use compatible provided special sound reinforcement systems are installed.

(6) Residential buildings require an NLR of 25.

(7) Residential buildings require an NLR of 30.

(8) Residential buildings not permitted.

Source: Reprinted from "Part 150" FAA Regulations, January 1981

4.11.3 Effects Which Cannot Be Avoided

Noise levels will increase on site and off site, most notably as a result of increased traffic volumes.

During grading and construction, short-term noise levels will increase on-site.

4.11.4 Mitigation Measures

Adequate roadway setbacks or other noise attenuation measures (berms, walls) will be integrated into the project design, as necessary, to assure that exterior and interior noise levels meet accepted standards for planned residential uses. Estimates of distances from roadway centerlines to noise contours under future peak hour conditions will provide a basis for reducing any significant effects.

All internal combustion engines will be required to have mufflers or other noise suppression devices in proper working order.

As noted previously, future aircraft operation noise levels at the project site are expected to be below the 55 LDN level. Should future analyses indicate that aircraft noise levels are above the 55 LDN level, appropriate acoustical measures will be taken to sound proof residential and/or hotel units to comply with land use compatibility guidelines. As noted in Tables IV-13 and IV-14, recreational activities are compatible land use activities up to LDN levels of 70 to 75.

4.12 WATER SUPPLY

4.12.1 Existing Conditions

There are no existing potable water supply systems in Makalawena. The nearest public system source of water is the 12" main on Queen Kaahumanu Highway that terminates at the Keahole Airport, some 18,000 feet south of Makalawena (Figure IV-8). The entire North Kona area is currently served with water from the Kahaluu Wells and Kahaluu Shaft. The cumulative safe capacity of these wells is 8.4 mgd. The projected demands of known development proposals along the Queen Kaahumanu Highway and north of Keahole Airport exceed 8 mgd.

The limitation of the existing water sources and lack of development funds for new sources and transmission facilities to keep up with demand forecasts are preventing the Department of Water Supply from allowing the extension of the present Keahole Water System to projects north of Keahole Airport. Further, as has been noted by the County Department of Water Supply (see Chapter

XI, Department of Water Supply letter), the county generally does not fund extensions of mains, especially in undeveloped areas. This situation is likely to continue until new sources of water are found for the North Kona region.

4.12.2 Impacts

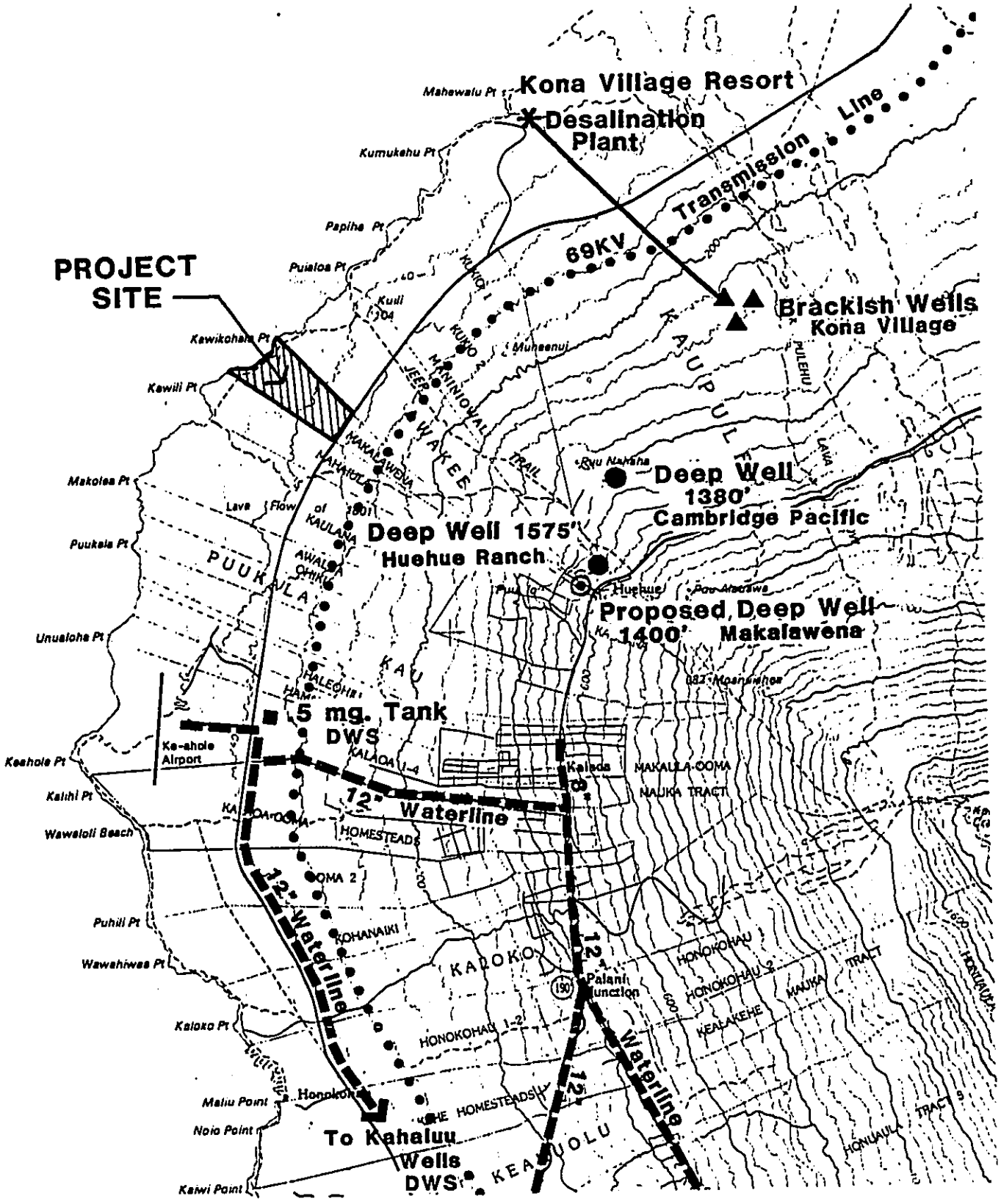
Although exploration for new water sources is being done, there is no target time schedule for the completion of new water sources.

Thus, the following alternatives to obtain water in a timely way are being considered: 1) Buy into an existing water agreement; 2) Participate in a new water agreement; 3) Develop a new private well and transmission facilities; or 4) Develop a new low level private well in combination with a desalinization plant.

Buying into an existing water agreement would provide a limited number of water allocation units, particularly for the start up phase of development. Each unit would be equal to 600 gpd which is the water demand requirement of the Department of Water Supply for one hotel unit or residential unit. However, the number of water allocation units still outstanding and may be acquired is not definite. A transmission line would need to be installed to bring the water from the county's source to Makalawena.

Participating in an exploratory agreement with the Department of Water Supply; and upon discovery of a usable source participating in a source development agreement, including transmission and storage considerations is the second alternative. The sharing of costs among the participants would reduce up front cash requirements during the exploratory and development phases. Upon completion of the well and transmission facilities, the operations and maintenance of the facilities would be assumed by the Department of Water Supply. The major drawback would be the lack of control over performance time in carrying out the terms of the agreements.

The drilling of a private deep well within the Makalawena ahupua'a is another alternative. Wells drilled at about the 1,200 feet contour can be expected to produce as much as 700 gpm (1 mgd) of domestic quality water (Mink, 1986). The projected ultimate water demand for Makalawena is 1.560 mgd. By Department of Water Supply standards, two operating and one standby well will be required to meet this demand. The advantage of developing a private system is having control of production time. The disadvantage is the high front end cost and the continuous operations and maintenance costs.



EXISTING INFRASTRUCTURE

MAKALAWENA RESORT

FIGURE IV-8

The fourth alternative would couple the low elevation brackish water wells with an on site desalinization unit to meet the water needs of Makalawena. The system requires specialized engineering and trained full time personnel to operate and maintain the plant. Several package systems are readily available utilizing either electro-dialysis or reverse osmosis to extract the salt. Once the potable water has been extracted the remaining salt laden water is disposed by reinjection into the ground. Although operational costs are high, initial development costs are less than deep well construction costs.

The State Department of Health is vested with the responsibility to assure that public water systems in the state are providing water which is in compliance with the state's drinking water regulations (Chapter 20, Title II, Administrative Rules) and are in compliance with all other applicable terms and conditions of Chapter Twenty. A public water system is defined as a system serving 25 or more individuals at least 60 days per year or having a minimum of 15 service connections. In the event that a new well is intended to serve these minimum numbers of persons or service connections, the well and distribution system will be subject to the terms of Section 11-20-29 and Section 11-20-30 of Chapter 20 respectively. Section 11-20-29 requires all new public potable water sources to be approved by the Director of Health prior to their use. Section 11-20-30 similarly requires that new or substantially modified public water distribution systems also be approved by the Director of Health.

TABLE IV-16

Projected Water Consumption at 100% Occupancy

Use	No. of Units Low	No. of Units High	Rate Per Unit	Daily Consumption Low	Daily Consumption High
Resort Hotel	900	1200	600 gpd	0.540 mgd	0.720 mgd
Multi-family Residential	900	1350	600 gpd	0.540 mgd	0.810 mgd
Golf Course Clubhouse	--		--	0.015 mgd	0.020 mgd
Tennis Center	--		--	0.005 mgd	0.010 mgd
			TOTAL =	1.100 mgd	1.560 mgd

Note: Projections based on County of Hawaii, Department of Water Supply standards for the resort and residential units and estimates for other facilities. Landscape and golf course irrigation will utilize brackish water and/or treated wastewater effluent.

4.12.3 Mitigation Measures

If the county's water program will not be ready to provide water when required by the resort, one or a combination of the alter native approaches described above will be implemented to meet the domestic water demand for Makalawena. In the event, the private deep well system is implemented, all off-site improvements such as the deep wells and pumps, transmission lines, and the reservoirs will be constructed to meet County standards. The total water system to service the resort will be privately funded. All applicable State Department of Health public water system rules and regulations will be complied with by the landowner.

4.13 WASTEWATER

4.13.1 Existing Conditions

There is no existing public wastewater treatment facility or a facility being planned that is within reasonable distance from Makalawena. An independent wastewater treatment and disposal system will be necessary to service Makalawena.

4.13.2 Impacts

In view of the quantity of wastewater expected to be generated by the development, it must be properly treated and disposed to meet health regulatory requirements.

Although the disposal of treated effluent through irrigation of golf course fairways and landscaped open areas is an accepted practice, there may be some concern in connection with the impact of effluent aerosol on inhabited areas near areas that are spray irrigated. (See Chapter IV, Section 4.6 regarding the use of treated effluent for golf course irrigation and the impacts on all water quality. Minimum affect at the ground surface, such as ponding, is expected because of the high permeability of the underlying soil formation. There might be some percolation to the basal lens of surplus nutrients that were not fully utilized by the plants or soil microorganism, then eventually appear in the anchialine ponds (Mink, 1986). However, the quantity of treated effluent that might enter the basal waters would probably be significantly less than the amount applied because of absorption by the soil and plants, and evaporation. The use of treated effluent for golf course irrigation has been studied in some detail by the U.S. Corps of Engineers at Waikoloa Beach Resort in South Kohala, Hawaii. To date, it has been found that although nutrient levels in coastal anchialine ponds were elevated following use of treated wastewater effluent on the golf course, there was no apparent change in the phytoplankton activity or increase in water turbidity (COE, 1985).

Preliminary estimates of the wastewater generation are shown in Table IV-17.

TABLE IV-17

Wastewater Generation at 100% Unit Occupancy

Use	No. of Units Low	High	Rate Per Unit	Daily Consumption Low	High
Resort Hotel	900	1200	300 gpd	0.270 mgd	0.360 mgd
Multi-family Residential	900	1350	300 gpd	0.270 mgd	0.405 mgd
Golf Course Clubhouse	--		Est.	0.004 mgd	0.005 mgd
Tennis Center	--		Est.	0.001 mgd	0.002 mgd
			TOTALS ≈	0.545 mgd	0.772 mgd

Note: Resort hotel rate based on 200 gpd for room units plus 100 gpd per unit for hotel support services. Multi-family residential rate based on 200 gpd per bedroom at an average of 1.5 bedrooms per MF unit.

4.13.3 Mitigation Measures

A self contained wastewater system meeting all federal, state and county regulatory requirements will be constructed. The system will consist of gravity collection lines located within the sites designated for the various uses, pumping stations to lift the wastewater from the terminus of the gravity collection lines to the treatment plant, force mains leading from the pumping stations to the treatment plant, a treatment plant located at the mauka-Kona corner of the project, ponds within the golf course to hold the treated effluent, and a golf course and landscape irrigation system to dispose the effluent from the ponds.

The controlled use of treated wastewater effluent for golf course and landscape irrigation is an environmentally sound and economical method for the disposal of the treated effluent at Makalawena. It would lessen, considerably, the use of potable water for irrigation and thus also aid in the conservation of potable water. The irrigation system design, and the methods and locations of application will be carefully selected to minimize potential health and safety concerns from the use of treated effluent for irrigation. Percolation of surplus nutrients to the basal lens can be minimized through careful water management to prevent excessive irrigation and innovative design of the treatment plant to reduce excessive nutrient levels in the effluent.

(See Chapter IV, Section 4.6 for detailed discussion of the impact on coastal ponds from the use of treated sewage effuent for irrigation.

4.14 SOLID WASTES

4.14.1 Existing Conditions

The North Kona area is currently served by the Kailua landfill near Kailua-Kona. This facility will continue to serve the district until a planned new landfill, near Pu'uanahulu, 12 miles northeast of Makalawena becomes operational in several years. The collection and delivery system is by transfer stations operated by the county or private collection services that provide on site pickup and disposal at the designated county landfill.

4.14.2 Impacts

Makalawena Resort solid waste generation will have an impact on existing and planned landfill capacities by accelerating the need to provide alternative landfill sites in the future. At completion and full occupancy, the project is projected to generate a maximum of approximately 8 to 12 tons of solid waste per day based on a projection factor of 3.3 pounds per day per person assuming 100 percent occupancy.

4.14.3 Mitigation Measures

Alternatives evaluated for the collection and delivery system for removing solid waste from the development included the utilization of transfer stations, private collection and a combination of both. Due to considerations of convenience, cost efficiency and level of service desired for a first-class resort community, the solid wastes (including by products of the sewage treatment facility) will be removed from the site by private refuse collectors and disposed of at approved county locations according to public health and safety standards. These services will be made a requirement of the Codes, Covenants and Restrictions that will be prepared for the resort community.

4.15 ELECTRICAL POWER AND COMMUNICATIONS

4.15.1 Existing Conditions

There are no transmission or distribution lines available in the immediate area of the proposed project. Hawaii Electric and Light Co. (HELCO) currently maintains a 69 KV transmission line

in a powerline corridor located approximately one mile mauka of Queen Kaahumanu Highway. There are plans to upgrade the line to 138 KV in conjunction with the installation of a new transmission line from Hilo over the Saddle Road to Keeaumoku above Waikoloa.

Based on the extent of conceptual development described in this EIS, HELCO has estimated that the power demand for the Resort complex would be 6,180 KVA; a 7,500 KVA 69-12 KV substation transformer would be required to serve the proposed development; a minimum 120 feet by 120 feet lot near and/or on the project property above Queen Kaahumanu Highway should be deeded to HELCO for the required substation; the estimated cost, in 1986 dollars, of the substation is $650,000, not including the 69 KV overhead transmission line, off-site costs or the 12 KV underground distribution line costs. These costs would be determined after electrical plans are submitted and a service request opened with the HELCO Engineering Department.

The Hawaiian Telephone Company transmits telephone communication from base exchanges to telephone substations located in service areas. Consumers are then serviced from these substations by land lines. There are no substations near Makalawena from which lines can be connected.

4.15.2 Impacts

A new overhead transmission line must be installed from the 69 KV line in the powerline corridor to a substation in an area mauka of Queen Kaahumanu Highway. The powerline to the resort area on the makai side of the highway as well as the power distribution system within the resort grounds will be installed underground. The overhead transmission line and the power substation will be partly visible from the highway.

The Hawaiian Telephone Company intends to provide Makalawena with telephone service via a new microwave circuit. Service lines from the microwave station to users within the resort grounds will be installed underground.

4.15.3 Mitigation Measures

The upgrading of the 69 KV power line to 138 KV will assure that sufficient supply of energy will be available even with the large increase in demand from the proposed developments along the Kona-Koh la coast. Careful placement and landscape of the substation site will minimize any visual disturbance by the facility.

4.16 POLICE AND FIRE PROTECTION

4.16.1 Existing Conditions

The nearest police and fire services are based out of Kailua-Kona with an approximate 10 to 15 minute response time to service Makalawena, some ten miles to the north (Figure IV-9). According to the County Police Department, the North Kona district retained 55 uniformed police officers in 1984, representing 22 percent of the total uniformed officers countywide, and matching the district's proportion of total county resident population. The Kailua-Kona Fire Station is a multiple engine company equipped with a ladder truck. The County Fire Department is currently evaluating possible opportunities for additional station sites in South Kohala to serve area wide resort needs.

Similarly, immediately above Queen Kaahumanu Highway near the Honokohau Harbor, a 10-acre site has been set aside for a new Kailua police station, which is now being designed. Presumably, construction will begin as funding allows following design.

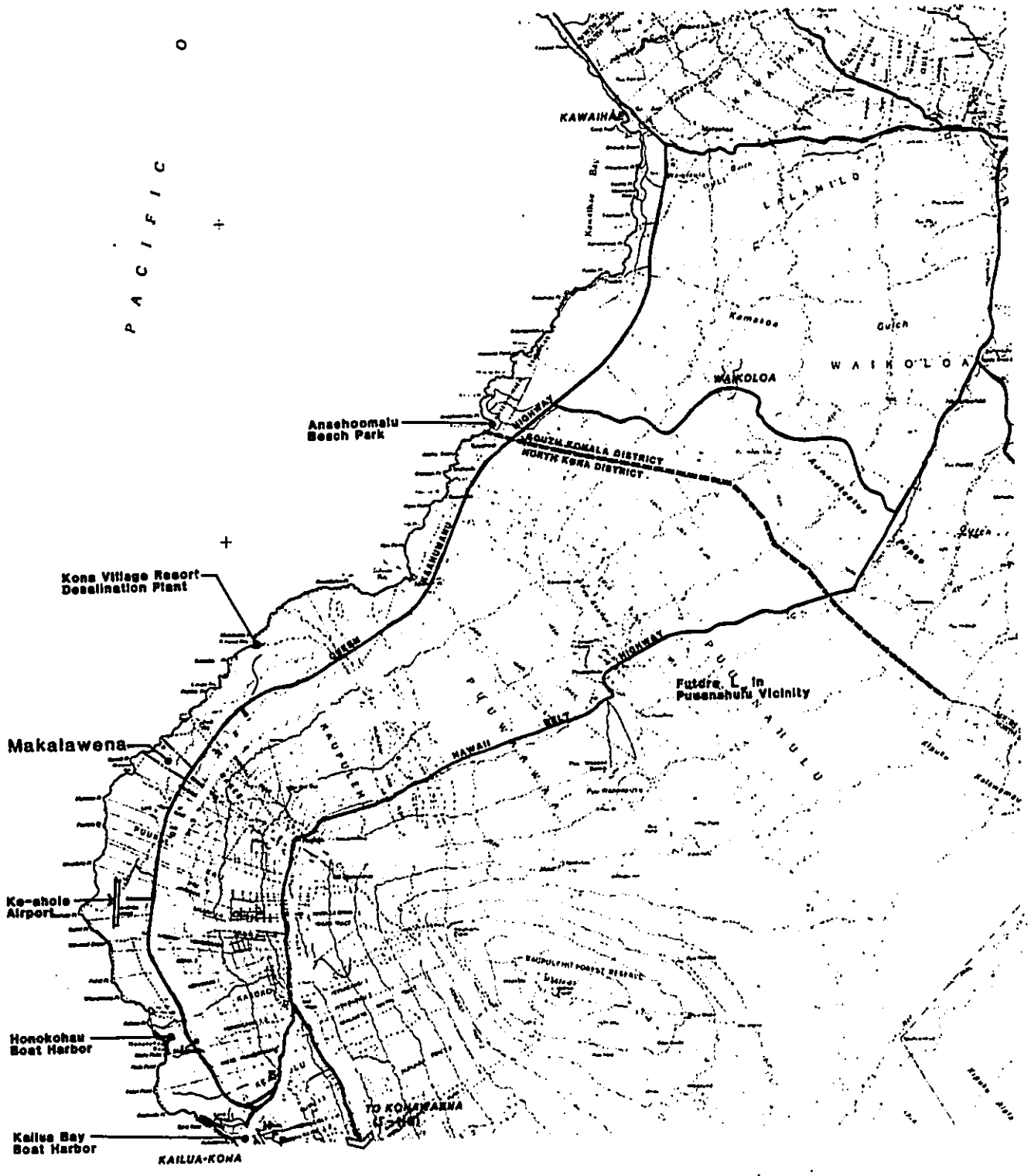
The Kohala Coast Resort Association is funding the full construction of a new 24-hour fire station and fire fighting equipment (except emergency medical service vehicle) within the Mauna Lani Resort in South Kohala. Located approximately 20 miles to the north of Makalawena, the county would provide the personnel and administrative and operational costs. Funding would be through the floating of bonds by the County wherein retirement (repayment) of the bond would be by the Association. To date, engineering and design for the facility have been completed and construction bidding for the fire station is expected to begin in early December 1986. The construction period is estimated to be six months, with beneficial occupancy expected approximately July 1, 1987.

4.16.2 Impacts

The development of the Makalawena Resort community will result in increased demands for police and fire protection services and facilities. Makalawena Resort demands on police and fire services may be significant within the context of cumulative resort development plans in North Kona and South Kohala. A coordinated program for provision of police and fire facilities and services will be needed.

4.16.3 Mitigation Measures

Demands on county police services at Kailua-Kona will be partially offset by on site security personnel and nightwatch services. As the resident population increases in the region,



PUBLIC FACILITIES

MAKALAWENA RESORT

0 1 2 4 MILES

pbr

FIGURE IV-9

additional uniformed police officers will need to be retained in conjunction with the County Police Department needs assessment. These public service needs should be met by the county based on the revenue generated by the development of Makalawena Resort. At present, the County Police Department foresees no adverse effects on their operations as a result of the proposed project (see Chapter XI, letter from County Police Department).

Fire protection will be provided from the Kailua-Kona Fire Station until such time that the cost/benefits justify the provision of a new station in close proximity to the proposed development. In conjunction with the proposed resort development at Kaupulehu a new fire station, privately owned and operated or developed and turned over to the county as proposed by the Kohala Coast Association, could improve the level of service and reduce insurance costs for the resort.

Additionally, all resort facilities will be designed and constructed in accordance with all applicable county fire requirements and building code provisions.

4.17 MEDICAL FACILITIES

4.17.1 Existing Conditions

The full service health care facility nearest to Makalawena is the Kona Hospital, with a total of 79 beds, 53 of which are for acute care and 26 for long-term care. According to the State Department of Health, the hospital has a staff of 36 physicians. An administrator in the State Department of Health described Kona Hospital's resources as inadequate to meet existing regional population needs.

Two additional state operated hospitals are in Kohala. Existing major long-term care facilities in West Hawaii are operating at or above their desired capacities.

The State Department of Health has the overall responsibility to ensure that the public is provided adequate health care. At present, these services are provided by private groups and agencies, which, presumably would be increased as market demand and economic factors warrant.

4.17.2 Impacts

Makalawena Resort development will place additional demands upon Kona Hospital and other West Hawaii medical facilities which are already considered inadequate to meet regional needs. The resort's impact is considered cumulatively significant in combination with projected demands of other resort development in South Kohala-North Kona.

4.17.3 Mitigation Measures

Market demand for additional medical care facilities will dictate future expansion in private and public sector medical services requirements.

4.18 SCHOOLS

4.18.1 Existing Conditions

Students from resort based families and new employee families are expected to attend classes at schools in North and South Kona, South Kohala, North Kohala and Hamakua. A total of 22 public elementary schools and 5 public high schools are located in these service regions. North and South Kona combined, include 7 elementary schools and 1 high school. An additional elementary school has been proposed for Waikoloa to the north. Two private schools are located in Waimea and South Kohala; one school serves grades K through 12 and the other serves grades 7 through 12. The State Department of Education has estimated that the proposed project would result in 10 to 30 new students in grades K through 5, 4 to 8 new students in grades 6 through 8 and 4 to 8 new students in grades 9 through 12. Students in grades K through 5 and 6 through 8 would attend Kealakehe Elementary and intermediate schools respectively and students in grades 9 through 12 would attend Konawaena High School. The preceding assumes all students would attend public schools.

4.18.2 Impacts

Makalawena Resort development will have direct and indirect effects on public schools. New students will be generated from on site residences and as dependents of hotel employees, both on site and off site. Schools in the area are at capacity but Kealakehe Intermediate and Konawaena High schools will be able to accommodate the small enrollment. Kealakehe Elementary will require monitoring because an additional classroom may be required.

4.18.3 Mitigation Measures

Demand for additional educational facilities will influence future expansion needs in private and public sector schools. The Department of Education will be kept informed of the status of the project in order that funds can be requested from the Legislature to provide the necessary classroom facilities on a timely basis.

4.19 RECREATIONAL FACILITIES

4.19.1 Existing Conditions

Recreational facilities in both South Kohala and North Kona are extensive. Those in North Kona include a golf course, beaches, small boat harbors, historic sites, hunting areas and other amenities and attractions. The district has three County beach parks (Pahoehoe, Kahaluu and Disappearing Sands), the Old Kona Airport State Park, and the Hulihee Palace State Monument. Throughout the district are numerous historic sites, including fishponds, trails, heiaus and buildings. The U.S. Army Corps of Engineers has established wetlands at Honokohau and Kiholo Bay. Several hiking trails are also available in the North Kona district. The Judd Trail provides access to the State Keauhou 2 Nene Sanctuary. Bikeways are proposed throughout most of the district. According to State Department of Transportation, Highways Division personnel, a bikeway along Queen Kaahumanu Highway is planned but not budgeted in the next five-year period.

There is currently one golf course in the North Kona District; the Keauhou-Kona Golf Course located near Keauhou and a proposed golf course at Kaloko to be situated near the Kona Palisade Estates.

Many other recreational amenities similar to those in North Kona are also available in South Kohala and in other neighboring areas of West Hawaii. State and County lands are available for the development of additional public recreational facilities.

Pending preparation of a specific resort development plan and determination of coastal use recreation activities, it is not possible at this time to identify specific activities that may be conducted on the beach or in the waters immediately adjacent to the proposed project. However, it is likely that fishing, swimming, snorkeling, sunbathing, picnicking and the small boat activities will take place and it is possible that the boating and snorkeling activities would be partially commercially operated.

4.19.2 Impacts

Makalawena Resort development would increase access to the recreational amenities located on the site. New public access ways to the sho.eline would be provided to give residents and visitors additional shoreline access. Improved access is likely to lead to increased ocean and other recreational activities.

Access to archaeological sites will have the beneficial effect of exposing visitors and guests to Hawaiian culture. On the other hand, it has the potential adverse effect of increasing the likelihood of vandalism.

Makalawena Resort's 18 hole golf course, driving range and clubhouse and tennis center would increase the golfing and tennis facilities in North Kona and allow for added public enjoyment of the sport.

Residents and visitors of the proposed resort community are expected to contribute to increased usage of recreational amenities off-site.

4.19.3 Mitigation Measures

Extensive recreational amenities will be provided at Makalawena Resort including an 18 hole golf course, driving range, and clubhouse, a shoreline park and a tennis center. These recreational facilities comprise approximately 49 percent of the total site area. These provisions for on site recreational opportunities for both resort guests and residents would tend to offset the higher usage of off site amenities. Thus, the burden of public recreational facilities off-site is not expected to be significant.

4.20 LAND USES

4.20.1 Existing Conditions

Makalawena lands have not been utilized for ranching or other agricultural uses due to their low agricultural utility. However, the beach area has been used for recreational purposes by those with four-wheel drive or other vehicles that are able to travel on the jeep road on the State lands adjacent to and north of Makalawena.

Lands to the north and south of Makalawena are owned by the state of Hawaii and are also currently not utilized. There are no current or foreseeable plans for improved access over these coastal lands for public and/or private use.

4.20.2 Impacts

On site: Both private and public recreational opportunities will be greatly expanded with resort development.

If left in its existing undeveloped state, natural resources of the site would be protected but public access would continue to be restricted. Development of the proposed resort complex would facilitate public access to anchialine ponds, wildlife refuge, historic sites and coastal recreational resources.

Surrounding lands: The Makalawena Resort is a master planned resort development, providing a range of uses and requiring no major extensions of infrastructure through adjacent areas.

The project would require no new extensions of infrastructure through state lands to the north or south. Impacts on adjacent state lands may be limited to occasional public access from the resort.

The project does not result in a significant loss of open space within the North Kona district or West Hawaii.

No adverse impact is expected on the other existing or planned resorts to the north or south due to the physical distances between sites.

In examination of the land ownership of coastal lands of North Kona and South Kohala (Figure II-3), the majority of the lands are owned by the state of Hawaii. Major private lands that are large enough to accommodate a destination resort along this coastline are all separated by major expanses of State land, thus the major destination resorts of West Hawaii will retain their uniqueness and general isolation from other urban land uses or population centers. With the addition of Makalawena Resort being developed along this coastline, there is no significant detrimental effect on the existing resorts of Waikoloa, Mauna Lani and Mauna Kea.

Together with other existing and planned developments, the proposed Makalawena Resort contributes to the need for long range management planning of state owned lands in West Hawaii.

4.20.3 Effects Which Cannot Be Avoided

The project will commit existing open space to resort uses.

4.20.4 Mitigation Measures

Resort planning for Makalawena would be coordinated with planning for the nearby Kaupulehu lands of the Bishop Estate. Development of Makalawena and Kaupulehu lands would consolidate resort development in North Kona, north of Kailua-Kona on private landholdings, thereby, facilitating efficient management of extensive state lands to the north and south. Coordinated planning will contribute to sound utilization and protection of the natural resources in the North Kona region.

4.21 VISUAL/AESTHETIC

4.21.1 Existing Conditions

The Makalawena site is essentially undifferentiated from surrounding lands in terms of topography, vegetation zones, and visual character (Figures IV-10 through IV-12). The Ironwood trees on the northern coastal boundary appear as the only visually distinctive features in the immediate vicinity. Coastal views from Queen Kaahumanu Highway are generally uninterrupted along the Kona Coast north of Kailua and Keahole Airport, reflecting the open space character of these predominantly state owned lands.

For the most part, the overall visual or aesthetic appeal of the site is linked to the open space character of surrounding lands. Exceptions include the distinctive natural amenities of the site, including the 3,000 lineal feet of white sandy beach, and the cluster of anchialine ponds and Kiawe thicket just mauka of the coastal strand.

All structures, i.e., hotel, condominium units, etc., will be designed to blend in with the surrounding lands and mountainous background such that a pleasing and visually attractive setting is maintained. It is probable that the hotel would be five to six stories in height and that the condominium units would be two-story structures.

4.21.2 Impacts

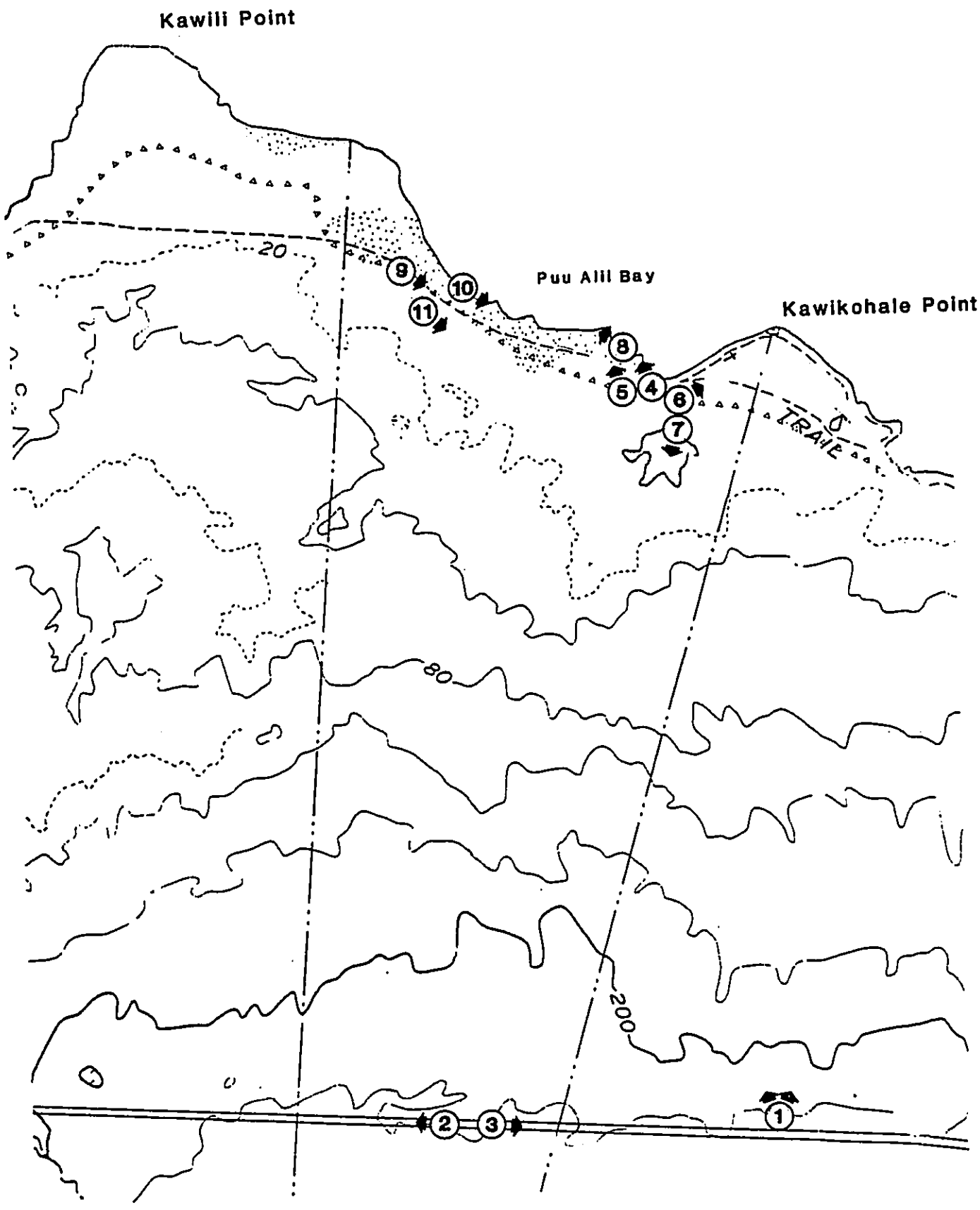
The proposed project will result in the development of visually prominent manmade features within a predominantly natural setting. While the resort complex, including any multi-story hotel, may contrast visually to some degree with surrounding lands, buildings and extensive landscaping will provide visual interest which enhances the aesthetic aspects of the site.

4.21.3 Effects Which Cannot Be Avoided

The resort development will alter the natural vistas of the site and surrounding lava flows.

4.21.4 Mitigation Measures

In order to minimize the visual impact of the buildings from the Queen Kaahumanu Highway, attention will need to be given to the linear development edges along the property boundaries and the highway. The preliminary development plan has included a buffer zone along the highway and, with appropriate design criteria, all



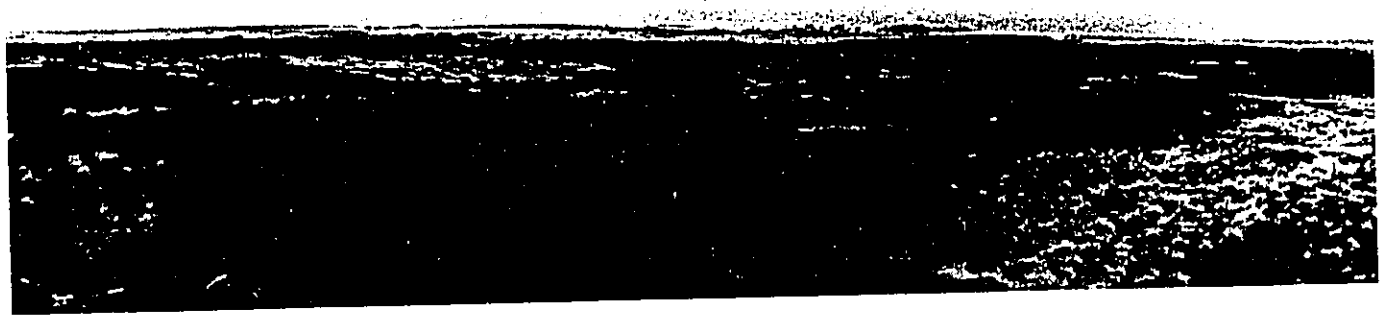
SITE PHOTOS – VISUAL ANALYSIS

MAKALAWENA RESORT

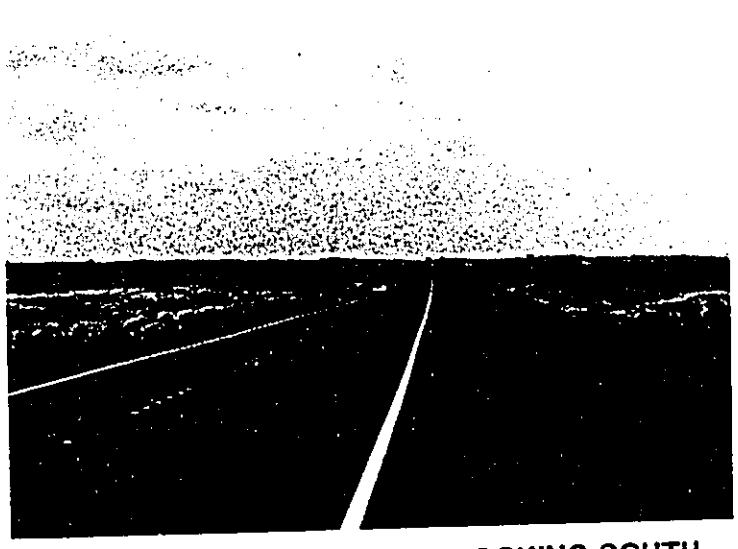
0 250 500 1000 FEET

pbr

FIGURE IV-10



1. VIEW FROM QUEEN KAAHUMANU HIGHWAY



2. QUEEN KAAHUMANU HWY. LOOKING SOUTH

3. QUEEN KAAHUMANU HWY. LOOKING NORTH

4. EXISTING CARETAKERS HOME

5. RUINS OF OLD RESIDENCE

SITE PHOTOS - VISUAL ANALYSIS

MAKALAWENA RESORT

pbr

FIGURE IV-11

6. IRONWOOD GROVE ALONG BEACH

7. OPAEULA POND

8. PUU ALII BEACH LOOKING SOUTH

10. SHORELINE DUNE ALONG PUU ALII BAY

9. SHORELINE TRAIL ALONG SAND DUNE

11. ANCHIALINE POND

SITE PHOTOS - VISUAL ANALYSIS

MAKALAWENA RESORT

pbr

FIGURE IV-12

structures will be developed to assure no adverse visual or aesthetic impacts. An extensive landscaping program utilizing indigenous species will offset losses of natural, albeit depauperate, lava vegetation.

4.22 SOCIO-ECONOMIC

4.22.1 Existing Conditions

Regional Economic Setting: The entire island of Hawaii is defined for projection purposes as the resort's impact area. However, economic and fiscal impacts will tend to be concentrated in the North and South Kohala and North and South Kona districts. North and South Kohala and North and South Kona may collectively be referred to as West Hawaii. A generation or two ago, the Kohala area was an agrarian community dominated by sugar plantations and pasture lands, while Kona was an area of coastal fishing villages with a handful of independent farmers on the mountain slopes. The economy of this region has changed considerably since Hawaii's statehood.

Coffee production and ranching provided Kona's economic base through much of this century, but it was an unsteady economy due to great fluctuations in the international coffee market. In the years following statehood and the introduction of jet service to the islands, the Kona coastline began to host an increasing number of visitors. In the 1960s and 1970s, North Kona fueled a building boom that spread to South Kohala and resulted in hundreds of new hotel and condominium units and residential dwellings.

Today the region is primarily supported by its real estate and visitor industries. The Kohala and Kona districts have ideal weather conditions, a black lava coastline with scattered sandy beaches and important historical sites. Among the major visitor attractions of the region are the City of Refuge, Captain Cook monument and Kona billfishing. Currently the South Kohala and North Kona districts are the heart of the island's visitor industry. As of February 1986 the 5,870 hotel and visitor condominium units in these two districts represented 80 percent of the island's total.

The availability of large parcels of land under single ownership and the establishment of horizontal property regime laws have permitted high quality aster planned development in several resort areas along this coast. Six resort areas currently exist in the South Kohala and North Kona districts. In South Kohala these are:

- o Mauna Kea Resort
- o Mauna Lani Resort
- o Waikoloa Village and Waikoloa Beach Resort

And in North Kona:

- o The Kailua-Kona area
- o Keauhou Resort
- o Kona Village Resort

As noted in Chapter II, currently planned hotel developments on the island represent about 2,000 units at three locations: South Kohala, Waikaloa Beach and Mauna Lani. In addition, there are numerous proposals for other resorts in the Kona, Kohala and Ka'u areas.

Population: Nearly one-third of Hawaii island's population resides in the two Kohala and two Kona districts. The resident population of these four districts was 27,518 in 1980, as shown in Table IV-18. Since 1970 the resident population for the area has increased at a compounded annual rate of growth, of 6.6 percent per year, or nearly twice the 3.8 percent rate of growth for the county as a whole. The North Kona district (which includes Kailua-Kona, Kona Village and Keauhou Resorts) experienced the most rapid population growth at 11 percent per year, followed by the South Kohala district (including the Mauna Lani, Mauna Kea and Waikoloa Resorts) at 7.1 percent per year. There were 8,960 households in the Kohala and Kona districts in 1980 with an average household size of 3.07 persons each (Table IV-19).

Resident population growth on the island since 1980 has been more gradual than during the 1970's and continues to be most rapid in the North Kona and South Kohala districts. Between 1980 and 1984, population grew 6.9 percent and 6.3 percent per year in North Kona and South Kohala, respectively, compared to 5.3 percent for the Kona and Kohala region as a whole and 3.5 percent for the island, as shown in Table IV-18.

Growth in the island's de facto population, including visitors present but excluding residents absent, has also slowed since the 1970's. De facto population grew about 3.1 percent per year between 1980 and 1984, or slightly less rapidly than resident population growth during the period.

TABLE IV-18

Total Population and Demographic Breakdowns: State of Hawaii, County of Hawaii, and Possible Affected Areas, 1970 and 1980

	COUNTY OF HAWAII		NORTH KONA (C.T. 215-216)		SOUTH KONA (C.T. 213-214)		SOUTH KOHALA (C.T. 217)		NORTH KOHALA (C.T. 218)	
	1970	1980	1970	1980	1970	1980	1970	1980	1970	1980
TOTAL POPULATION	63,468	92,053	4,832	13,748	4,004	5,914	2,310	4,607	3,326	3,249
ETHNICITY*	%	%	%	%	%	%	%	%	%	%
Caucasian	28.8	35.0	44.0	53.8	17.7	30.0	39.2	46.5	25.6	27.8
Japanese	37.5	26.6	23.1	11.8	39.6	27.5	24.4	14.6	23.8	16.1
Chinese	2.9	1.7	3.7	1.6	0.8	0.8	1.3	1.4	4.3	1.0
Filipino	16.5	13.9	8.4	7.2	26.2	13.0	6.6	5.6	29.2	24.0
Hawaiian	12.3	18.8	19.3	22.1	14.7	23.5	26.4	28.5	15.3	24.7
Other	2.0	4.1	1.5	3.5	1.0	5.2	2.0	3.4	1.7	6.4
AGE										
Less than 5 yr.	8.6	9.1	9.1	9.1	9.0	9.8	9.3	10.2	10.0	9.2
5 - 17 yr.	27.8	21.5	27.0	20.3	29.8	20.7	28.3	23.6	29.4	22.9
18 - 64 yr.	54.4	59.2	55.7	63.9	48.9	58.8	56.1	58.6	51.1	54.4
65 or more yr.	9.2	10.2	8.2	6.7	12.4	10.6	6.4	7.7	9.5	13.6
Median age	28.9 yr	29.4 yr	28.6 yr	28.9 yr	29.7 yr	29.7 yr	28.1 yr	29.3 yr	27.3 yr	31.9 yr
PLACE OF BIRTH*	%	%	%	%	%	%	%	%		
Hawaii	NC	70.5	NC	54.4	NC	71.2	NC	64.9	NC	75.6
Other U.S.**	NC	20.0	NC	39.9	NC	20.8	NC	30.4	NC	13.6
Foreign country	NC	9.4	NC	5.7	NC	7.8	NC	4.7	NC	10.8
RESIDENCE 5 YRS. PREVIOUS (people aged 5+)										
Same house	62.5	52.9	51.1	38.8	56.1	57.4	45.6	50.7	49.9	68.9
Same island	NC	24.9	NC	28.1	NC	22.9	NC	17.3	NC	12.1
Different island	NC	8.1	NC	7.0	NC	6.5	NC	14.9	NC	4.4
Different state	NC	11.1	NC	23.1	NC	10.7	NC	16.4	NC	11.6
Different country	NC	3.1	NC	3.0	NC	1.2	NC	0.7	NC	3.1
EDUCATION* (selected-people aged 25+)										
0-8 years only	37.2	20.1	28.9	8.0	26.1	23.6	24.1	8.6	44.2	29.0
Hi school only	31.6	35.5	66.0	40.9	21.9	33.8	34.2	37.0	30.0	39.0
College, 4+ yr.	7.5	15.2	8.8	18.8	6.4	12.4	13.1	20.7	5.9	8.1

Notes: *Figures based on 15% sample; hence, numbers represent estimate.
**Including persons born in U.S. territories, and persons born abroad or at sea to American parent/s.

"NC" = 1970 categories or bases "Not Comparable" to 1980 (1970 Census kept a "non-response" category, while 1980 Census allocated non-responses to other categories shown).

Sources: U.S. Bureau of the Census, 1970 Census of Population and Housing--Census Tracts--Honolulu, Hawaii, PHC(1)-88; 1980 Summary Tape Files 1-A and 3-A; State of Hawaii, 1973, Community Profiles for Hawaii.

TABLE IV-19

Family Characteristics and Income Levels: State of Hawaii, County of Hawaii, and Possible Affected Areas

	COUNTY OF HAWAII		NORTH KONA (C.T. 215-216)		SOUTH KONA (C.T. 213-214)		SOUTH KOHALA (C.T. 217)		NORTH KOHALA (C.T. 218)	
	1970	1980	1970	1980	1970	1980	1970	1980	1970	1980
POPULATION IN FAMILIES	N/A	81,728	N/A	11,543	N/A	5,235	N/A	4,114	N/A	2,961
as percentage of total population	N/A	88.8%	N/A	84.0%	N/A	88.5%	N/A	89.3%	N/A	91.1%
NUMBER OF FAMILIES	14,533	22,825	1,131	3,339	848	1,378	533	1,204	741	826
HEAD	%	%	%	%	%	%	%	%	%	%
Husband/wife	87.1	82.1	87.4	84.0	88.3	83.4	90.1	79.7	88.0	84.0
Male only	5.2	5.2	4.1	4.7	4.4	6.1	3.6	7.6	6.7	6.2
Female only	7.7	12.7	8.5	11.4	7.3	10.5	6.4	12.7	5.3	9.8
WITH OWN CHILDREN UNDER 18	57.4	52.7	53.4	54.4	59.3	51.5	63.2	51.6	58.0	52.2
Female head	4.0	7.4	5.0	4.8	3.5	5.4	4.5	9.1	2.2	5.9
BELOW POVERTY LEVEL	9.7	10.3	13.0	8.0	17.3	9.8	11.8	5.7	10.5	12.2
MEDIAN FAMILY INCOME	$9,750	$19,132	$9,000 to $9,999	$21,100	$10,000 to $11,999	$19,128	$9,182	$17,924	$9,421	$15,719

Notes: All figures (except "Population in Families") based on 15% sample; hence, numbers represent estimates.
"N/A" = "Not Available" in published form. However, other published 1970 and 1980 census data lead to the conclusion that families generally comprised a smaller percentage of Hawaii's 1970 population than of the 1980 total.

Sources: U.S. Bureau of the Census, 1970 Census of Population and Housing--Census Tracts--Honolulu, Hawaii, PHC(1)-88; 1980 Summary Tape File 3-A; State of Hawaii, 1973, Community Profiles for Hawaii.

Social Characteristics: The social characteristics of the West Hawaii population were reviewed in terms of education, ethnicity and age in 1970 and 1980. All four districts of the Kona and Kohala region have changed over the intercensal decade in terms of increasing educational achievement, as shown in Table IV-18. This change was most pronounced in North Kona and South Kohala where development during the 1970's brought new economic opportunities.

All districts of West Hawaii showed increases in the share of population of working force age; South Kona, North Kohala and South Kohala also showed relative growth in the population aged 65 or older.

In 1980 the median age in the region ranged by district from 28.8 to 32 years of age, with the relatively older population residing in areas less impacted by the visitor industry and recent population growth. Labor force size and characteristics and housing stock and characteristics for the county and the Kona/Kohala area are shown in Tables IV-20 and 21.

TABLE IV-20

Labor Force Size and Characteristics: State of Hawaii, County of Hawaii, and Possible Affected Areas, 1970 and 1980

	COUNTY OF HAWAII		NORTH KONA (C.T. 215-216)		SOUTH KONA (C.T. 213-214)		SOUTH KOHALA (C.T. 217)		NORTH KOHALA (C.T. 218)	
	1970	1980	1970	1980	1970	1980	1970	1980	1970	1980
POTENTIAL LABOR FORCE (aged 16+)	43,075	67,205	3,632	10,115	2,629	4,265	1,446	3,290	2,240	2,286
	%	%	%	%	%	%	%	%	%	%
not in labor force	39.5	38.7	44.3	27.8	41.6	33.8	34.2	35.9	38.4	39.8
armed forces	0.4	0.3	0.0	0.1	0.0	0.0	0.0	0.0	1.1	1.0
civil. labor force	60.1	61.0	55.7	72.1	58.4	66.2	65.8	64.1	60.5	59.3
CIVILIAN LABOR FORCE	25,889	41,006	2,022	7,293	1,535	2,823	951	2,110	1,355	1,355
unemployed	2.7%	7.0%	4.8%	5.2%	2.3%	5.7%	4.1%	6.3%	1.9%	9.2%
TOTAL EMPLOYED CIVIL. LABOR FORCE	25,180	38,150	1,925	6,913	1,500	2,662	912	1,978	1,330	1,230
OCCUPATION	%	%	%	%	%	%	%	%	%	%
service	16.3	16.5	19.3	21.5	16.0	17.3	15.9	18.0	25.9	34.2
manager./profes.	NC	20.0	NC	21.2	NC	13.6	NC	20.6	NC	15.2
technical, sales & adminis.	NC	26.1	NC	28.2	NC	24.8	NC	19.2	NC	13.7
farm/fish/forest	NC	10.3	NC	7.1	NC	19.5	NC	14.0	NC	14.2
precision, craft, repair	NC	12.7	NC	12.1	NC	14.8	NC	16.5	NC	9.7
operators, fabricators, laborers	NC	14.4	NC	9.9	NC	10.0	NC	11.8	NC	12.9
INDUSTRY (selected)										
agric., forest, fish, mining	12.5	11.2	N/A	6.2	N/A	19.4	N/A	16.8	N/A	8.1
construction	10.6	9.1	23.6	11.2	20.4	14.3	13.6	12.3	2.6	5.0
manufacturing	15.0	8.3	1.0	1.9	3.2	1.2	2.3	5.1	29.3	8.1
retail trade	14.8	17.5	13.1	23.6	8.9	18.4	15.9	13.8	2.9	7.0
financial, insur., real estate	2.8	5.7	4.0	8.6	3.5	4.5	3.5	7.6	1.1	2.3
personal, entertain. & recreat. services	11.2	10.9	N/A	20.7	N/A	15.2	N/A	16.0	N/A	31.4
health, educ, & professional	14.1	16.7	7.8	11.4	18.3	13.1	13.9	14.8	14.7	20.5
public adminis.	6.5	7.3	4.2	2.7	3.7	4.8	3.1	2.1	5.5	8.1
COMMUTE TO WORK										
45 minutes or more	N/A	6.0	N/A	4.8	N/A	6.8	N/A	13.9	N/A	22.6
mean travel (min.)	N/A	16.5m	N/A	16.4m	N/A	20.6m	N/A	21.7m	N/A	24.1m

Notes: All figures based on 15% sample; hence, numbers represent estimates.
"N/A" = "Not A ilable" in published form. "NC" = 1970 categories or bases "Not Comparable" to 1980 Census.
Sources: U.S. Bureau of the Census, 1970 Census of Population and Housing--Census Tracts--Honolulu, Hawaii, PHC(1)-88; 1980 Summary Tape File 3-A; State of Hawaii, 1973, Community Profiles for Hawaii.

TABLE IV-21

Housing Stock and Characteristics: State of Hawaii, County of Hawaii, and Possible Affected Areas, 1970 and 1980

	COUNTY OF HAWAII		NORTH KONA (C.T. 215-216)		SOUTH KONA (C.T. 213-214)		SOUTH KOHALA (C.T. 217)		NORTH KOHALA (C.T. 218)	
	1970	1980	1970	1980	1970	1980	1970	1980	1970	1980
TOTAL YEAR-ROUND HOUSING UNITS	18,939	33,954	1,975	6,894	1,131	2,052	798	1,959	941	1,121
	%	%	%	%	%	%	%	%	%	%
vacant (total)	9.0	13.9	27.4	33.3	6.4	9.7	18.5	24.3	6.6	8.8
vacant for sale	0.6	1.3	3.2	3.2	0.0	2.9	0.1	2.9	0.7	0.3
vacant for rent	2.0	5.5	8.3	18.9	0.3	2.1	1.9	4.1	1.1	1.8
TOTAL YEAR-ROUND OCCUPIED UNITS	17,260	29,237	1,431	4,602	1,059	1,853	650	1,483	879	1,022
TENURE	%	%	%	%	%	%	%	%	%	%
owner-occupied	56.9	60.6	44.7	55.1	36.9	52.7	48.8	59.3	66.6	67.7
renter-occupied	43.1	39.4	55.3	44.9	63.1	47.3	51.2	40.7	33.4	32.2
SELECTED CONDITIONS										
lacking some or all plumbing	17.1	6.4	26.3	7.3	55.8	28.4	15.4	2.0	17.6	7.3
1.51 or more persons/room	6.5	5.0	14.1	6.1	13.1	10.1	8.2	5.3	9.7	3.1
PERSONS PER HOUSEHOLD	3.61	3.09	3.36	2.92	3.71	3.14	3.51	3.07	3.75	3.16
MEDIAN CASH RENT (renter-occupied)	$54	$223	$150 to $199	$331	$60 to $79	$200	$116	$307	$38	$153
MEDIAN VALUE* (owner-occupied)	$24,800	$70,300	$35,000 to $49,999	$114,000	$35,000 to $49,999	$102,600	$31,800	$95,700	$16,000	$64,200

Notes: * For 1980, median values are for non-condominium housing units.

Sources: U.S. Bureau of the Census, 1970 Census of Population and Housing--Census Tracts--Honolulu, Hawaii, PHC(1)-88; 1980 Summary Tape File 1-A; State of Hawaii, 1973, Community Profiles for Hawaii.

4.22.2 Impacts

4.22.2.1 Economic Impacts

This section describes the expected economic impacts of resort development at Makalawena in terms of additional visitor expenditures, employment, resident income, population and housing. These impacts are assessed for the proposed hotel and condominium developments at Makalawena.

4.22.2.1.1 Visitor Expenditures

Development at Makalawena will generate direct, indirect and induced visitor expenditures in the state and county of Hawaii. Visitors to the resort will make direct expenditures for food, accommodations, gift items and other goods and services. These expenditures will, in turn, require those establishments serving direct visitor demands to purchase goods and services from other establishments in the state. The latter expenditures are considered an indirect effect of the original visitor expenditures. Induced expenditures are those made by employees and proprietors with income derived from the establishments serving the direct and indirect visitor demands.

In order to estimate these expenditure effects, the analysis begins with a projection of the growth in visitor population expected to be driven by the proposed developments.

4.22.2.1.2 Visitor Population

Estimation of the average daily visitor population at Makalawena is the basis for projecting the additional visitor expenditures resulting from resort development. The projected visitor population is based on the proposed facilities for visitor accommodations and on average occupancy and party size assumptions derived from a survey of comparable properties in the state.

Facility Development: The proposed residential and visitor unit facility development at Makalawena amounts to 1,800 to 2,550 units by project completion. The facility development would consist of about 47 percent hotel units 53 percent condominium units as presented in Table IV-22.

Assumptions: All of the hotel units and 55 percent of the condominiums units could be assumed to be used for visitor rentals. Occupancy rates were assumed to average 75 percent for the hotel units and 50 percent for the condominium units at project completion. Party size was estimated at 1.9 and 2.1 for the hotel and condominium units, respectively. Table IV-23 presents the assumptions regarding resident/visitor distribution, occupancy rates and average party size for the planned facilities.

TABLE IV-22

Cumulative Residential and Visitor Unit
Facility Development

Facility type	At project completion(1) Low	High
Hotel units	900	1,200
Condominium units	900	1,350
Total units	1,800	2,550

(1) Assumed to occur in year 2005; 100% of hotel and condominium units completed.

Source: Peat, Marwick, Mitchell & Co.

TABLE IV-23

Assumptions for On-Resort Population Projections

Facility and occupational types	Percentage distribution(1)	Occupancy	Average party size(2)
Hotel units - visitors	100%	75%	1.9
Condominium units:			
Full-time residents	15	95	2.5
Part-time residents	30	25	2.5
Visitors	55	50	2.1

(1) Distribution of uses within facility type.
(2) Occupied units only.

Sources: Based on interviews with resort operators and brokers at similar first-class resort developments and Hawaii Visitors Bureau, Profile: The Resort Condominium Market and Profile: The Resort Hotel Market, 1985.

Projected Visitor Population: Based on the above assumptions and the facilities proposed for development, additional visitor population at Makalawena could be expected to range from about 1,800 to 2,500 persons by project completion, as presented in Table IV-24.

TABLE IV-24

Projected Visitor Population

Facility type	At project completion(1) Low	High
Hotel units	1,283	1,710
Condominium units	520	780
Total	1,803	2,490

Source: Peat, Marwick, Mitchell & Co.

4.22.2.1.3 Visitor Expenditures

Direct Expenditures: Direct visitor expenditures are projected based on average daily 1986 expenditures of $93 and $86 for hotel and condominium guests, respectively. These expenditures were estimated based on 1983 Hawaii Visitors Bureau (HVB) expenditure data and consumer price index trends as reported by the U.S. Bureau of Labor Statistics. The direct visitor expenditures, in 1986 dollars, could amount to $60 million to $83 million per year by project completion, as shown in Table IV-25.

Indirect and Induced Visitor Expenditures: Based on multipliers derived from the most recent information available from the Department of Planning and Economic Development's (DPED) state Input/Output Model, the direct visitor expenditures could be expected to generate indirect and induced expenditures amounting to $56 million to $77 million per year at project completion, as also shown in Table IV-25.

Total Expenditures: Including direct, indirect and induced effects, expenditures in the state attributable to the Resort visitors are projected to total about $116 million to $159 million per year at project completion, in 1986 dollars.

Table IV-25

Projected Total Annual Visitor Expenditures

(In 1986 dollars; millions)(1)

Expenditure type and place of stay	At project completion Low	High
Direct:		
Hotel(2)	$ 43.5	58.0
Condominium(3)	16.3	24.5
Subtotal	59.8	82.5
Indirect and induced	55.7	76.7
Total(4)	$ 115.5	159.2

(1) 1983 Hawaii Visitors Bureau expenditure data updated to 1986 dollars based on consumer price index data reported by the U. S. Bureau of Labor Statistics.

(2) Average daily expenditures estimated at $93 in 1986 dollars.

(3) Average daily expenditures estimated at $86 in 1986 dollars.

(4) Projected at $1.93 per $1.00 direct expenditure. Based on unpublished 1984 data from the Department of Planning and Economic Development, personal communication.

Sources: Hawaii Visitors Bureau, 1984 and 1983 Visitor Expenditure Survey; First Hawaiian Bank - Research Department, January/February 1986, Economic Indicators; and U. S. Bureau of Labor Statistics, 1984.

4.22.2.1.4 Employment Impact

Planned developments at Makalawena will generate short-term employment during the construction of new facilities and long-term employment in the operation and support of those facilities. Employment effects may also be classified as being direct, indirect or induced. Direct effects are those directly supported by visitor expenditures, such as the employment at hotels and other establishments that serve visitors. Direct employment would generally be located in the county of Hawaii both at and outside of the Resort.

Indirect effects occur when directly affected establishments purchase goods or services from other businesses in order to fill new visitor demand. Induced effects are those supported throughout the state's economy when employees or proprietors directly or indirectly dependent on visitor expenditures spend their earnings.

4.22.2.1.5 Construction Employment

Direct Employment: Direct construction employment is that which would be supported directly by the construction of the various facilities. Such employment would include the on-site laborers, operatives and craftsmen, as well as the professional, managerial, sales and clerical workers whose usual places of employment may be elsewhere on the island or in the state.

Direct demand for construction employees is estimated based on the employment experiences of comparable resort-related facility construction projects in the state. Direct construction employment demand may be expected to require about 2,100 to 2,900 person-years over the entire construction period to project completion, as shown in Table IV-26. This would represent an average annual employment of about 140 to 190 full-time equivalent persons per year.

Indirect and Induced Construction Employment: The direct employment of construction workers at Resort projects will stimulate additional purchases of goods and services on the island and elsewhere in the state. In its most recent (1982) revisions to a model of the construction industry in Hawaii, the DPED calculated that 2.4 full-time jobs are created in the state for every full-time job in the building construction industry. This multiplier is used to project the indirect and induced employment to be supported by the direct construction employment.

Table IV-26

Projected Direct Employment for Facility Construction

(Person-years)

Facility type	Total project		Average person-years per year for 15-year period	
	Low	High	Low	High
Hotel units(1)	900	1,200	60	80
Condominiums(2)	945	1,418	63	95
Infrastructure(3)				
Recreational amenities(4)	75	75	5	5
Other(5)	160	160	11	11
Total person-years	2,080	2,853	139	190

(1) Employment demand calculate at 0.5 full-time equivalent jobs per year per unit and an average two-year construction period per hotel.

(2) Demand calculated at 0.7 full-time equivalent jobs per year per unit and an average 18-month construction period per project.

(3) Estimates based on construction cost estimates provided by Phillips, Brandt, Reddick & Associates.

(4) Amenities include an 18-hole golf course, club house and tennis center.

(5) Other includes sewage treatment, roads, water well, water lines, electrical facilities and reservior, estimated to cost about $15 million.

A 1975 study of Kauai's economy suggested a regional capture rate of total indirect and induced employment amounting to about 20 percent of direct employment. Although the island of Hawaii's future economy may be expected to be more developed than was Kauai's economy in 1975, this figure is assumed to be appropriate due to the number of construction workers who are expected to come from off-island. (The actual share of construction employment going to off-island workers will depend on the timing of other major projects planned throughout the state.)

Table IV-27 applies these findings to project the indirect and induced employment effects of construction for the total project. Indirect and induced construction employment effects are expected to provide employment equivalent to 2,900 to 4,000 person-years for the entire project as shown in the exhibit. The county could be expected to capture between 420 and 570 person-years of indirect and induced construction employment effects for the entire project representing about 30 to 40 full-time equivalent positions in an average year.

Total Employment: In total, the direct, indirect and induced employment generated by the construction of the proposed facilities could represent about 5,000 to 6,800 person-years of work over the development of the project. This would represent a total employment effect of about 330 to 460 persons in an average year of the project's construction, as also shown in Table IV-27.

4.22.2.1.6 Operational Employment

Direct Employment: The majority of direct operational employment at Makalawena would occur in the proposed hotels because of their relatively large size and their expected first-class levels of service. First-class resort hotels in Hawaii are found to employ between 0.8 and 1.0 full-time equivalent direct employees per hotel unit. The direct hotel operational employment at the Resort is projected at 0.9 full-time equivalent employees per unit. Condominium units at the Resort are estimated to generate 0.2 full-time equivalent employees per unit.

Thus, Makalawena could be expected to have generated about 1,030 to 1,390 full-time equivalent direct operational positions at project completion, as shown in Table IV-28.

Indirect and Induced Employment: The direct operational positions would also generate add tional employment elsewhere in the state. Recent studies on the economic impacts of tourism by the DPED indicate that each full-time hotel, resort residential and resort administrative employee supports about 0.9 indirect and induced full-time equivalent positions elsewhere in the state. Thus, indirect and induced operational employment could be expected to amount to 930 to 1,250 full-time equivalent positions at project completion, as shown in Table IV-29.

Total Employment: Total direct, indirect and induced operational employment is estimated to represent between 1,950 and 2,650 positions at project completion, as also shown in Table IV-29.

Table IV-27

Projected Indirect and Induced Employment
for Facility Construction

(Total person-years)

Type of employment	Total project		Average person-years per year for 15-year period	
	Low	High	Low	High
Total employment(1)	4,992	6,847	333	456
Less direct employment(2)	2,080	2,853	139	190
Indirect and induced	2,912	3,994	194	266
Indirect and induced:				
On island(3)	416	571	28	38
Elsewhere in state	2,496	3,423	166	228

(1) Direct employment multiplied by 2.4. State of Hawaii, Department of Planning and Economic Development, Hawaii Construction Model: Further Developments, 1982.

(2) From Table IV-27.

(3) Direct employment multiplied by 0.2. Anderson, et al., Kauai Socioeconomic Profile, 1975.

Table IV-28

Projected Direct Employment
for Resort Operations at Makalawena

Facility type	At project completion Low	High
Hotel(1)	810	1,080
Resort residential(2)	180	270
Resort administration(3)	38	43
Total operational employment	1,028	1,393

(1) Projected at 0.9 full-time equivalent jobs per hotel unit.

(2) Projected at 0.2 full-time equivalent jobs per condominium unit.

(3) This category includes miscellaneous resort employment such as resort administration, property development and sales, accounting, grounds-keeping and infrastructural facilities.

Table IV-29

Projected Direct, Indirect and Induced Employment
for Resort Operations

Type of employment	At project completion Low	High
Direct(1)	1,028	1,393
Indirect and induced(2)	925	1,254
Total	1,953	2,647

(1) As shown in Table IV-29.

(2) Related to direct employment at the hotels, condominium units and in resort administrative positions. Estimated as 0.9 indirect and induced employees per direct employees. State of Hawaii, Department of Planning and Economic Development, The Economic Impact of Tourism in Hawaii: 1970-1980, 1983.

4.22.2.1.7 Resident Income

Resort development at Makalawena could be expected to have a significant impact on personal and household income for residents of the island and state. Makalawena would generate resident income as employee wages, salaries and fringe benefits and as income to proprietors.

4.22.2.1.8 Personal Income

Personal income is defined as the wages and salaries paid to the direct construction and operational employees at Makalawena. Personal income is projected on the basis of average industry wages and salaries for the various types of employment anticipated and on the projected future employment demands.

Personal income paid to Hawaii residents may be expected to range between $17 million and $23 million per year at project completion, in 1986 dollars, as shown in Table IV-30.

4.22.2.1.9 Household Income

The dispersion of indirect and induced employment effects among many industries make it difficult to project the total income benefits of resort development at Makalawena. However, estimation of total household income effects based on visitor expenditure levels permits a perspective on the statewide income benefits that would result from resort development at Makalawena.

Total household income generated by visitor expenditures at Makalawena would include the fringe benefits and proprietor's income paid by establishments that sell goods and services directly to visitors as well as the wages and salaries noted above. In addition, household income includes income generated through the multiplier effects of indirect and induced visitor expenditures.

The DPED reports that the multiplier effects of visitor expenditures throughout the community have declined in recent years, but that each $1.00 spent by visitors in 1985 is estimated to have generated $0.71 in total income to households in the state. Assuming a similar multiplier effect for the expected expenditures of visitors to the Resort, it is projected that the Resort could contribute between $42 million and $59 million per year in total household income to the state at project completion, in 1986 dollars, as also shown in Table IV-30.

Table IV-30

Projected Annual Personal and Household
Income From Direct Employment

(In 1986 dollars; millions)(1)

Type of employment	At project completion Low	High
Construction(2)	$ 3.2	4.5
Hotel and resort(3)	13.6	18.4
Total personal income	$ 16.8	22.9
Total household income(4)	$ 42.5	58.6

(1) 1984 State of Hawaii, Department of Labor and Industrial Relations data updated to 1986 dollars.

(2) Average annual wage of $24,734, reflecting 30% workers from off-island and an average income of $29,152 for construction workers throughout the state and $22,840 for construction workers in the county of Hawaii (State of Hawaii, Department of Labor and Industrial Relations, 1985, pages 2 and 10).

(3) Excluding tips. Hotel, resort residential and resort administration employment wages projected at the county of Hawaii hotel industry average of $13,196 (State of Hawaii, Department of Labor and Industrial Relations, 1985, page 10).

(4) Based on State of Hawaii, Department of Planning and Economic Development estimate of $0.71 total household income for each $1.00 spent by visitors to the state in 1985.

Sources: State of Hawaii, Department of Labor and Industrial Relations, Employment and Payrolls in Hawaii: 1984, 1985.

4.22.2.1.10 Projected Population Impact

The development of facilities will increase population at Makalawena and elsewhere on the island. On any given day there will be visitors staying at the resort's hotels and in residential units that have been put in visitor rental pools. There will also be persons residing during most or parts of each year in condominium units at the resort. In addition, operational and construction employees attracted from off-island will add to the population of the region. This section discusses the on-resort and employee population impacts of resort development at Makalawena.

4.22.2.1.11 Off-Resort Population Impact

Makalawena will impact the county's population by attracting employees for the resort's construction and operation from off-island. Additional population growth will come from household members who accompany the in-migrant construction and operational employees. Based on projections of employment at other resorts, it was assumed that 20 percent of operational employment would be filled by in-migrants at project completion.

Based on past experience, between 20 percent and 50 percent of direct construction employees may be expected to come from off-island with the actual amount related to the amount and scheduling of other major constuction projects in the state. For purposes of projection, about 30 percent of construction workers at Makalawena were assumed to come from off-island labor pools.

Operational supervisory and managerial employees at Makalawena were assumed to have two additional household members, while other operational employees were assumed to average one additional household member. Construction workers temporarily resident on the island are assumed to be accompanied by an average of one-half an additional household member. Based on the above assumptions, total off-resort population impact is projected to range from about 510 to 690 at project completion, as shown in Table IV-31.

4.22.2.1.12 On-Resort Population Impact

On-resort population is comprised of visitors staying at the hotels and condominiums and residents in condominiums at the resort. Average daily visitor population was projected to be about 1,800 to 2,490 at project completion, as previously shown in Table IV-24. On-resort resident population was projected using the assumptions concerning condominium development at Makalawena shown previously in Table IV-22 and assumptions about full- and part-time residential usage of the condominium units

Table IV-31

Projected Off-Resort Population Impact

(Average daily population)

In-migrant type	At project completion Low	High
Managerial and supervisory:		
Operational employees(1)	37	51
Other household members(2)	74	102
Subtotal	111	153
Other:		
Operational employees(3)	168	228
Construction employees(4)	39	54
Other household members(5)	188	255
Subtotal	395	537
Total	506	690

(1) In-migrants projected to accout for 20% of operational employment at project completion based on projections at other resorts. Managerial and supervisory positions assumed to be 11% of total operational employees of which 33% are filled from off-island.

(2) Projected at two additional persons per household.

(3) Remainder of off-island operational employee in-migrants.

(3) Assuming 30% of workers come from off-island. Actual distribution will depend on the timing and

(4) Projected at one additional person per operational employee and one-half additional person per construction employee.

found previously in Table IV-23. On-resort resident population was projected to be between 490 to 730 at project completion, as shown in Table IV-32. Resident population would represent about 22 percent of on-resort population at project completion.

Table IV-32

Summary of On- and Off-Resort Population Impact

(Average daily population)

Population category	At project completion Low	High
On-Resort:		
Visitor(1)	1,802	2,490
Resident	489	734
Subtotal	2,291	3,224
Off-Resort(2):		
Operational employees	205	279
Construction employees	39	54
Other household members	262	357
Subtotal	506	690
Total population impact	2,797	3,914

(1) As shown in Table IV-25.
(2) As shown in Table IV-31.

4.22.2.1.13 Total Projected Population Impact

In summary, the facility development at Makalawena is projected to generate population growth at Makalawena by visitors and residents at the resort's facilities, and in the community by the in-migrant operational and construction employees and their accompanying household members. Total projected population impact is projected to range from about 2,800 to 3,910 persons at project completion, as also shown in Table IV-32.

4.22.2.1.14 Employee Housing Requirements

This section presents the analysis of the additional housing required to support the direct construction and operational employment expected to be generated at Makalawena.

4.22.2.1.15 Construction Employees

Construction employment is temporary and therefore does not generate the long-term housing demands that are associated with operational employment. With the generous housing subsidy allowances typically paid to construction workers, the demand for residential housing by construction employees is expected to be absorbed by units available in the short-term rental market of the Kona region. This approach has been found to be the most satisfactory solution to meeting construction employee housing needs at other major development projects in the Kona and Kohala regions.

4.22.2.1.16 Operational Employees

Table IV-33 shows the anticipated labor market sources of Makalawena's direct operational employees. The majority are expected to come from "available" sources of labor such as unemployed and underemployed persons and labor market entrants.

In Table IV-34, figures from Table IV-33 are used to project the number of employees that may be expected to demand new housing.

Table IV-33

Projected Mix of Operational Employees

Labor supply component	At project completion Low	High
On-island sources:		
Available labor(1)	328	445
Regional turnover(2)	288	390
Other turnover(3)	206	279
Off-island sources - in-migrant(4)	206	279
Total operational employment	1,028	1,393

(1) Unemployed and underemployed persons on island and labor market entrants. Projected to account for 40% of on-island labor component.

(2) Persons attracted from other work in North Kona. Projected to account for 35% of on-island labor component.

(3) Persons attracted from other work elsewhere on the island. Projected to account for 25% of on-island labor component.

(4) Based on projections of employment at other area resorts, projected to account for 20% at project completion.

Table IV-34

Direct Operational Employees Projected to Demand Additional Housing

Labor supply component	At project completion Low	High
On-island labor:		
Available labor(1)	49	67
Regional turnover(2)	-	-
Other turnover(3)	21	28
Off-island labor:		
Managerial(4)	37	51
Other(5)	168	228
Total	275	374

(1) New household formation projected at 15%.

(2) Assumed to be already settled in area or accustomed to commute.

(3) About 10% of transfers projected to generate additional housing demand on island.

(4) About 11% of operational employees assumed to be in a managerial and supervisory position of which 33% of managerial and supervisory positions assumed to be filled from off-island.

(5) Remainder of off-island in-migrants.

- Off-island labor - The largest segment is expected to be in-migrants from off-island, all of whom would require additional housing.

- Available labor - Those hired from the "available" labor pool of the island may form new households in conjunction with their new employment, especially those who are recent graduates. It is projected that about 15 percent of the "available" labor component may be expected to seek housing after becoming employed at Makalawena.

- Regional turnover - Persons formerly employed elsewhere in Kona are presumed to be already settled in the area, or to be accustomed to commuting to work. Some of this labor segment may have taken new employment in order to be closer to their place of residence. Hence, no additional housing demand is projected for the regional turnover group.

- Other turnover - Those who had previously worked elsewhere on the island may be expected to generate some in-migration into the North Kona area. The homes that movers vacate are likely to be within commuting distance of Kona and hence could serve as potential housing for employees hired to refill the jobs that are vacated. However, 10 percent of this labor supply component may be expected to create additional demands for housing in the North Kona region as a result of employment at Makalawena.

The demand for additional housing on the island of Hawaii is projected to be less than the number of employees requiring housing because households could include more than one resort employee. The projected demand for additional housing units is shown by class of worker in Table IV-35. About 18 percent of the off-island in-migrants that were shown in Table IV-33 could be expected to be experienced personnel brought to fill managerial or specialty positions. Such persons may be expected to be principally heads of households; thus, each managerial level in-migrant is projected to generate demand for one additional home. On the other hand, experience has shown that many service employees share housing. Thus nonmanagerial and nonspecialty employees in need of new housing are projected to generate a housing unit demand at a ratio of 1.5 employees per additional housing unit.

The cumulative demand for additional housing directly attributable to resort development at Makalawena is projected to amount to about 200 to 270 units at project completion, as shown in Table IV-35. About 19 percent of this unit demand would occur among persons in managerial or specialty positions with a relatively greater ability to afford housing. The remainder of the projected additional housing demand, about 160 to 220 units at

project completion, would come from resort nonmanagerial and nonspecialty employees who would have lower incomes and a lesser ability to afford housing.

Table IV-35

Projected Additional Housing Unit Demand
for Direct Operational Employees
for the Island of Hawaii

Class of worker	At project completion Low	High
Managerial or specialty(1)	37	51
Other(2)	159	215
Total	196	266

(1) Projected at 1.0 hotel employee per household.
(2) Projected at 1.5 hotel employees per household.

4.22.2.1.17 Housing Affordability

Data on the household incomes of hotel employees from the Hawaii State Department of Health's Health Surveillance Survey enables estimation of income distribution of the households projected to demand new housing. The survey suggests that about 40 percent of resort service related household incomes fell below $27,000 per year and about 50 percent fell below $30,000 per year, in 1986 dollars. A household earning $27,000 per year would be able to afford a housing unit costing $73,000 assuming an 11 percent interest rate, 30-year amortization period, 10 percent down payment and mortgage payments equal to 28 percent of gross monthly income. A household income of $30,000 per year would enable purchase of a housing unit costing about $82,000 under the same financing assumptions.

A survey of the pricing structure of a single family home for sale in the North Kona district taken from the Hawaii Island Kona Board of Realtors Multiple Listing Service, January 1986, shows a limited availability of single family homes priced at or below

$80,000. Only about 8 percent of total single family listings were priced at $80,000 or below. Assuming employees with annual household incomes of $27,000 or less would not be able to find affordable housing and employees with annual household incomes between $27,000 and $30,000 would have difficulty in finding affordable housing, about 60 to 110 affordable housing units would be demanded in the county by project completion, as shown in Table IV-36.

Table IV-36

Projected Affordable Housing Required
By Development at Makalawena

	At project completion	
	Low	High
Total housing requirement(1)	196	266
Less managerial or speciality employee requirement(1)	37	51
Total	159	215
Share in affordable housing range:		
At 40%	64	86
At 50%	80	108

(1) From Table IV-36.

4.22.2.2 Fiscal Impacts

This section describes the expected fiscal impacts of the proposed developments in terms of additional revenues and expenditures to the county of Hawaii and the state of Hawaii.

4.22.2.2.1 Revenues

Development at Makalawena would bring additional tax revenues to the county and state government. County revenues would be principally in the form of real property taxes on the new facilities. Revenues to the state would be composed principally of general and specific excise taxes and personal income taxes. The following sections project the additional revenues that could be generated for the county and state governments as a result of resort development at Makalawena.

4.22.2.2.2 County

Real property in the county is currently taxed at $10.00 per $1,000 of assessed value for land and $8.50 per $1,000 of assessed value for buildings, for all uses with the exception of unimproved residential land which is taxed at $8.50 per $1,000 assessed value.

Based on these rates, the hotel, condominium and recreational facilities envisioned at Makalawena could be expected to generate between $3.0 million and $4.3 million per year at project completion, in 1986 dollars, as shown in Table IV-37.

4.22.2.2.3 State

Tax revenues to the state would be generated by the state's 4 percent general excise tax on direct, indirect and induced expenditures by visitors to Makalawena and also on expenditures by the resort's part- and full-time residents. In addition, the resort's full-time residents would pay individual income taxes and other state taxes such as liquor, tobacco, fuel, inheritance, estate and conveyances taxes. Based on state tax receipts in fiscal year 1984, it is estimated that the individual income and other taxes paid by residents could amount to an average $980 per full- or part-time resident, in 1986 dollars.

Accounting for the amount of visitor expenditures and number of full- and part-time residents projected previously, total tax revenues to the state are expected to range between $6.6 million and $9.3 million per year at project completion, in 1986 dollars, as shown in Table IV-38.

Table IV-37

Projected Annual Real Property Tax Revenues
Attributable to Development at Makalawena

(In 1986 dollars; millions)

Source of property tax revenue	At project completion Low	High
Hotel units(1)	$ 1.17	1.57
Multifamily units(2)	1.82	2.73
Golf course(3)	.01	.01
Total revenues	$ 3.00	4.31

(1) Based on estimated value of $145,000 per room and a combined land and building tax rate of $9.00 per $1,000 assessed value.

(2) Based on estimated value of $225,000 per unit and a combined land and building tax rate of $9.00 per $1,000 assessed value.

(3) Based on 160 acres at an assessed value of $5,500 per acre and a tax rate of $10 per $1,000 and club house at $500,000 at a tax rate of $8.50 per $1,000.

Source: Peat, Marwick, Mitchell & Co., County of Hawaii Tax Assessor and cost estimates by Phillips, Brandt, Reddick, Inc.

Table IV-38

Projected Annual Revenues to the State Government Attributable to Development at Makalawena

(In 1986 dollars; millions)

Revenue source	At project completion Low	High
Visitors :		
General excise tax(1)	$ 4.6	6.4
Hotel room tax(2)	1.5	2.2
On-Resort residents:(3)		
General excise tax(4)	.2	.3
Individual income and other taxes(5)	.3	.4
Total	$ 6.6	9.3

(1) Based on 4% of direct, indirect and induced visitor expenditures.

(2) Based on 75% hotel occupancy with an average achieved room rate of $80 and 50% occupancy of condominium units kept in visitor rental pools, with an average achieved unit rate of $90. State revenues calculated at 5% of transient accommodations room revenues.

(3) Full-time and part-time residents of the resort's condominium, less 15% estimated to have already been residents of the state.

(4) Based on 4% of selected household budget items. Household incomes assumed to be $60,000 for full-time residents and $150,000 for part-time residents based on a survey of resort developers and real estate brokers at other resorts by Peat, Marwick, Mitchell & Co.

(5) Estimated at $980 per year per on-Resort full-time resident.

Sources: State of Hawaii, Department of Planning and Economic Development, The State of Hawaii Data Book, 1984, 1985. Tax Foundation of Hawaii, Government in Hawaii: A Handbook of Financial Statistics, 1985.

4.22.2.2.4 Expenditures

The visitors and the part- and full-time residents that could be expected to live at the resort condominium units would also necessitate additional expenditures of public resources. County expenditures on behalf of residents would also increase in proportion to the number of employees coming from off-island to work in the construction and operations of the new resort.

Visitors are seen to necessitate public costs in terms of (1) public safety (such as increased needs for police and fire protection), (2) development and upkeep of highways, recreational facilities and natural resources, (3) health and sanitation measures and (4) cash capital improvements. Residents necessitate public costs in all the aforementioned areas, and also in education, retirement and pension funds, public welfare and other government functions.

4.22.2.2.5 County

The various county government expenditures for fiscal year 1984 were analyzed with respect to the relevant population served by each of the government functions. This analysis indicates that county government expenditures in 1984 totaled about $540 per resident and $340 per visitor, as shown in Table IV-39. More recent per expenditure estimates are not available and there is little evidence to suggest that 1986 expenditures would be significantly different on a per capita basis from 1984 expenditures.

Based on these county government outlays, public expenditures by the county on behalf of the resort's residents or visitors and employee in-migrants to the county could be expected to total about $1.2 million to $1.6 million per year at project completion, in 1986 dollars, as shown in Table IV-40.

Table IV-39

County of Hawaii Per Capita Government Expenditures

1984

Function	Expenditures (000s)(1)	Service population(2)	1984 annual expenditure: Per resident	1984 annual expenditure: Per visitor
General government	$ 8,157	106,800	$ 76.38	-
Public safety	22,701	114,600	198.09	198.09
Highways	5,214	114,600	45.50	45.50
Health and sanitation	2,922	114,600	25.50	25.50
Public welfare	2,406	106,800	22.53	-
Education	281	106,800	2.63	-
Recreation	5,300	114,600	46.25	46.25
Interest	3,563	106,800	-	-
Bond redemption	1,177	106,800	-	-
Retirement and pension	7,485	106,800	70.08	-
Mass transit	1,342	106,800	12.57	-
Cash capital improvements	2,891	114,600	25.23	25.23
Miscellaneous	1,442	106,800	13.50	-
Total	$ 64,881		538.26	340.57

(1) County operating expenditures for fiscal year ended June 30, 1984 (Tax Foundation of Hawaii, Government in Hawaii, 1985, page 47).

(2) Resident or de facto population estimates for the county as of January 1, 1984.

Source: Peat, Marwick, Mitchell & Co.

Table IV-40

Projected Annual County Government Expenditures
Attributable to Development
at Makalawena

(In 1986 dollars; millions)

Population and expenditure type	At project completion Low	High
Population:		
On-Resort visitors	1,802	2,490
On-Resort residents	489	734
Off-Resort residents	506	690
Total population	2,797	3,914
Expenditures:		
On-Resort visitors(1)	$ .6	.8
On-Resort residents(2)	.3	.4
Off-Resort residents(2)	.3	.4
Total expenditures	$ 1.2	1.6

(1) Visitors estimated to require $340 per capita in county government expenditures.

(2) New country residents attracted by employment opportunities provided by Makalawena estimated to require $540 per capita in county government expenditures.

Source: Peat, Marwick, Mitchell & Co.

4.22.2.2.6 State

A similar analysis of state government expenditures and the relevant populations for the various services indicates that expenditures in 1984 totaled about $2,000 per resident and $210 per visitor, as shown in Table IV-41.

As in county expenditures, the 1984 figures are the most recent available and are considered valid indicators of current per capita government expenditures. State government expenditures are projected to total between $1.2 million and $1.7 million per year at project completion, as shown in Table IV-42.

Table IV-41

State of Hawaii Per Capita Government Expenditures

Function	1984 Expenditures (000s)(1)	Service population(2)	1984 annual expenditure Per resident	Per visitor
General government	$ 128,131	1,028,500	$ 124.58	-
Public safety	73,344	1,127,700	65.04	65.04
Highways	49,041	1,127,700	43.49	43.49
Natural resources	17,172	1,127,700	15.23	15.23
Health and sanitation	72,631	1,127,700	64.41	64.41
Hospitals and institutions	114,557	1,028,500	111.38	-
Public welfare	328,400	1,028,500	319.30	-
Education	696,258	1,028,500	676.96	-
Recreation	13,827	1,127,700	12.26	12.26
Utilities and other enterprises	76,990	1,028,500	74.86	-
Debt service	213,293	1,028,500	207.38	-
Retirement and pension	126,006	1,028,500	122.51	-
Employees' health and hospital insurance	24,856	1,028,500	24.17	-
Unemployment compensation	78,278	1,028,500	76.11	-
Grants-in-aid to counties	18,173	1,028,500	17.67	-
Urban redevelopment and housing	11,618	1,028,500	11.30	-
Cash capital improvements	9,987	1,127,700	8.86	8.86
Miscellaneous	25,111	1,028,500	24.42	-
Total	$ 2,077,673		1,999.93	209.29

(1) State operating expenditures for fiscal year ended June 30, 1984 (Tax Foundation of Hawaii, Government in Hawaii, 1985, page 45).

(2) Resident or de facto population estimates for the state as of January 1, 1984.

Source: Peat, Marwick, Mitchell & Co.

Table IV-42

Projected Annual State Expenditures Attributable to Development at Makalawena

(In 1986 dollars; millions)

Population and expenditure type	At project completion Low	High
Population:		
On-Resort visitors	1,802	2,490
On-Resort residents(1)	416	624
Total	2,218	3,114
Expenditures:		
On-Resort visitors(2)	$ .4	.5
On-Resort residents(3)	.8	1.2
Total expenditures	$ 1.2	1.7

(1) Full-time and part-time residents at the resort's condominium units, less 15% estimated to have already been residents of the state.

(2) Visitors estimated to require $210 per capita in state government expenditures.

(3) Residents estimated to require $2,000 per capita in state government expenditures.

Source: Peat, Marwick, Mitchell & Co.

4.22.2.2.7 Revenue/Expenditure Analysis

The net fiscal impacts of the Makalawena's development to the county and state are estimated by comparison of the projected government revenues and expenditures.

4.22.2.2.8 County

Comparison of projected public revenues and expenditures indicates that the county may expect to net about $1.8 million to $2.7 million per year at project completion, in 1986 dollars, as shown in Table IV-43. The analysis also indicates that additional county revenues generated by the resort would be 2.5 to 2.7 times the expenditures incurred by the county at project completion, as also shown in the table.

TABLE IV-43
County Government Annual Revenue
and Expenditure Comparison

(In 1986 dollars; millions)

	At project completion	
	Low	High
New revenues	$ 3.0	4.3
New expenditures	1.2	1.6
Net additional revenues	$ 1.8	2.7
Revenue/expenditure ratio(1)	2.5	2.7

(1) New revenues divided by new expenditures.

Source: Peat, Marwick, Mitchell & Co.

4.22.2.2.9 State

Net fiscal benefits to the state are projected to range from $5.4 million to $7.6 million per year at project completion, in 1986 dollars, as shown in Table IV-44. The analysis also indicates that additional state revenues generated by the resort would be about 5.5 times the expenditures incurred at project completion, as also shown in the table.

TABLE IV-44

State Government Annual Revenue
and Expenditure Comparison

(In 1986 dollars; millions)

	At project completion	
	Low	High
New revenues	$ 6.6	9.3
New expenditures	1.2	1.7
Net additional revenues	$ 5.4	7.6
Revenue/expenditure ratio(1)	5.5	5.5

(1) New revenues divided by new expenditures.

Source: Peat, Marwick, Mitchell & Co.

4.22.2.3 Qualitative Social Impacts

With the possible exception of concerns related to the Makalawena beach area and associated human activities, the proposed project has no clearly identifiable unique characteristics which would generate social impacts differing from those of other proposed West Hawaii resorts. Rather, impacts on the human social environment are likely to be a cumulative function of Makalawena and numerous other existing and planned resorts.

In conjunction with environmental impact studies for another proposed Kona resort, Community Resources, Inc. (1986) prepared a study of potential cumulative resort impacts earlier this year. The following section both summarizes that study and also provides additional information and analyses developed for the present impact assessment project.

Methods for this analysis -- and for subsequent recommended mitigations focusing largely on local labor supply issues -- involved both review of published studies and extensive field interviews with social service agencies and resort managers. In addition to 31 key informants interviewed for the earlier project, Community Resources interviewed 25 individuals for this project (Table IV-45).

Community Issues and Concerns: According to recent published public opinion surveys, the major public concerns on the Big Island involved the need for more jobs and an improved economy. In the State's Hawaii State Plan Survey (SMS Research, 1984), Big Island residents were more frequently concerned about these economic issues than were residents of other islands in the state. In the County of Hawaii's Survey of Big Island Residents on Planning and Housing Concerns (Hawaii Opinion, 1983), Kona residents were as concerned as other Big Island residents about economic development, and they were even more concerned about the high cost of living and/or housing.

Both in these surveys and in an earlier poll commissioned by the Big Island Visitor Appreciation Committee (Ward Research, 1982), attitudes toward tourism were generally quite favorable. However, the surveys do indicate a desire for more economic diversification. Major perceived benefits from resort development have to do with jobs and economic growth, while perceived disadvantages (particularly in West Hawaii) involve impacts on housing cost, destruction of historic sites, infringement on open space, and rapid population growth and inmigration of transients.

Social Structure: To a large extent, the visitor industry has already shaped much of West Hawaii's current social structure. However, continued impacts may derive from the growing presence of three new population groups associated with resort developments:

TABLE IV-45

Individuals Interviewed for This Project

(NOTE: The following interviews were supplementary to interviews conducted in April 1986 with approximately 31 visitor industry or social service agencies for another proposed West Hawaii resort project. The earlier interviews focused more on social agencies, and so the interviews for the present project were weighted somewhat more toward visitor industry informants.)

Government (or Private Social) Agencies

Amefil Agbayani, Program Officer,
Office of Vice President for Academic Affairs
University of Hawaii

Aaron Fujioka, Office of Community Services,
Hawaii State Department of Labor and Industrial Relations

Leonard Hoshijo, ILWU

Milton M. Leslie, Kona Coordinator,
Center for continuing Education and community Service

Woody Mott, AFL-CIO Local 5

Miri Murayama, Job Developer,
Refugee Employment and Social Assistance Program,
Catholic Immigrant Services Program

Earl Tanimoto, Officer Manager,
Kona Employment Office,
Hawaii State Department of Labor and Industrial Relations

Royden Watanabe, Social Service Section Administration,
Hawaii State Department of Social Services and Housing

Visitor Industry

Dr. Barney Brazin, Resident Manager,
Mauna Lani Terrace

Vivian Dryer, Personnel Assistant,
Sheraton Royal Waikoloa

K. Herkes, Hawaiian Branch Manager,
Chaney Brooks and Company

Robert Herkes, General Manager,
Kona Surf

Adi Kohler, General Manager,
Mauna Kea Hotel

Henry Lion, Resident Manager,
Waikoloa Villas

G. Masunaga, Head Gardener,
Keauhou Kona Surf and Racquet Club

Bill Mielke, Vice President,
Mauna Kea Properties

Mahmoud Moinpour, Controller,
Kona Bay Hotel

Jordin Nahoopii, Director of Personnel,
Mauna Lani Bay Hotel

Donna souza, Accounting/Personnel Payroll,
Kona Lagoon

William R. Stayton, Senior Land Manager,
The Kamehameha Schools/B.P. Bishop Estate

Marilyn Tanabe, Personnel Director,
Keauhou Beach Hotel

M. Thompson, Director Human Services,
Kona Hilton

Dan White, Resident Manager,
Keauhou Palena

Noelani Whittington, Executive Director,
Kohala Coast Resort Association

Marti Wulelic, Personnel Director,
Hotel King Kamehameha

- Visitors provide jobs and an economic base for amenities shared by residents as well. However, they may also sometimes be sources of irritation for residents, and the nature of resident attitudes toward visitors is a significant social concern for both the industry and the wider community. Overviews of various studies on resident-visitor interaction (Knox, 1978; Farrell, 1982; Kendal and Var, 1984) have led to the conclusion that resident attitudes usually depend less on perceived economic benefits from tourists than on factors such as residents' age, perceived visitor respect for local culture, displaced political resentment, and competition for resources. An overflow of the visitor population into traditionally "local" places can be particularly problematic. However, past interviews with car rental agencies and travel desks suggest that only about 15 percent of guests at self-contained destination resorts such as the proposed Makalawena project go sightseeing outside the resort on any one day (Community Resources, 1984; Community Resources and A. Lono Lyman, Inc., 1985).

- Resort residents may initially have little interaction with the surrounding community, although they ultimately do become involved and may intensify prevailing Kona political trends for a more conservative philosophy and increased pressure for more government services. Most, however, are part-time residents and do not become involved in the local electoral process.

- In-migrating workers attracted by direct or indirect resort employment can cause resentment among local residents if a sense of competition for jobs develops. Another concern is the potential for value conflicts and intercultural adjustments between longtime residents and newcomers. Both of these phenomena occurred to some extent in Kona during the late 1960's and 1970's, when young Mainland "transients" filled many newly-created resort jobs. Today, however, the newcomer Caucasian population is generally older and more affluent, and tensions have greatly subsided. Visitor industry informants contacted for this report frequently reported that Hawaii-born residents have greatly increased their share of supervisory and management positions despite the earlier influx of Mainlanders. There have been some reported recent increases in the number of Filipino and other Asian immigrants, who have the reputation of being willing to work hard for low wages and are thus sometimes viewed as potential job competitors by other residents.

  However, the major social impacts which may be caused by an immigrating work would be the potential strains on

housing and other infrastructure, resulting in indirect effects on social cohesion and mental health (below).

Indicators of Social Cohesion: Crime, family problems, and mental health are all measures of social cohesion and stress. (Such measures tend to be negative in nature because public agencies have little incentive to collect data on positive outcomes.)

These indicators are usually most affected by (1) the nature of resort work or (2) sudden population growth which exceeds the capacity of the local housing stock and other social infrastructure. Interviews with West Hawaii social service agencies (Community Resources, 1986) suggest that the second factor has been a more significant cause of social impacts in Kona to date. Several visitor industry sources interviewed for this report expressed concern that stresses associated with lack of affordable housing may be affecting some employees' performances at work.

- Crime: Linkages between tourism and crime have been comprehensively reviewed in other resort social impact assessments (Community Resources, 1984; Community Resources and A. Lono Lyman, Inc., 1985). Scholarly statistical analyses produce contradictory conclusions, although there is some consistency in finding a relationship between tourism and increased rates of robbery and rape, as well as juvenile delinquency in places with "street scenes." In Kona, crime rates are high, but they increased less rapidly than in other parts of the island during the 1970's, when tourism growth was greatest.

  Interviews with police officers in various parts of rural Hawaii produce a consensus view that on-site crime at destination resorts is minimal. Off-site, the major crime impact is likely to involve increased petty thefts from visitors at beach parks or other tourist attractions. Population increases also typically result in higher rates of reported crime.

- Family-Related Impacts: Although the reported number of child abuse/neglect incidents quadrupled in west Hawaii from 1982 to 1984, social agency informants suggest this is due more to problems associated with rapid population growth than to any particular economic activity such as tourism.

  Studies of early tourism development in West Hawaii featured reports of both marital discord and neglect children as wives first entered the tourism work force (Cottington, 1969; Smith, 1972; Hawaii State Department of Planning and Economic Development, 1972). Resort and

social agency informants report that initial adjustment problems such as husbands' jealousy have been overcome, but other concerns have emerged -- interference with family time due to night or weekend shift work; low wage structures resulting in two working parents and consequent child care problems; male sex role adjustments associated with "service" work and/or initial experiences with multiple female co-workers; etc. More significant than these work-related factors, however, have been the family stresses associated with lack of affordable housing and consequent crowded conditions. The combination of all these factors is felt by some social workers to contribute to increased divorce, teen-age pregnancy rates, and other family problems in Kona (personal communication, Royden Watanabe, Hawaii State Department of Social Services and Housing, August 25, 1986).

- Individual Stress and Mental Health Indicators: Studies conducted by the State Department of Health's Mental Health Division show the Big Island has high rates of drug and alcohol abuse and of psychiatric symptomatology, but results are not available for the West Hawaii area alone. Social agency informants believe there are serious problems in the region, but they also feel the link with tourism, if any, is an indirect one -- the strains of rapid population growth rather than the nature of resort employment. Newcomers tend to have less of a social support network than longtime residents and are therefore more likely to internalize stress and develop classic psychiatric symptoms. These reported conditions are similar to those observed in so-called "boomtowns" created by energy developments in western states during the 1970's and early 1980's. Sociological studies of these rapidly growing rural areas originally assumed that mental health and other social problems there were caused mostly by the influx of "outsiders" with different values, but more recent studies suggest that the problems are temporary ones associated with lack of housing and similar strains on infrastructure.

4.22.3 Effects Which Cannot Be Avoided

Resort development at Makalawena will, in conjunction with other existing, planned and proposed resort developments in West Hawaii, cumulatively cause an increase in resident and visitor population levels; increase new and resident employment levels; increase competition for employment; increase resident personal and household income and expenditure levels; increase demands on existing housing inventories and demand for new housing; increase demands on public facilities; increase potential adverse social

stress as perceived or experienced by residents; and increase social and recreational amenities and opportunities.

4.22.4 Mitigation Measures

In general, the economic impacts of the proposed project are expected to be positive and not require mitigation measures. However, to mitigate increased employment competition from new residents, job training programs may be required as discussed below. The following are additional socioeconomic mitigation measures that could be taken to minimize potential adverse impacts.

- The project will provide on-site housing opportunities to meet direct project-generated needs that cannot be absorbed by existing or known future housing projects.
- Employer or industry sponsored child care centers and shuttle bus systems could possibly maximize employment among some types of residents.
- Small business advisory services and/or loan programs could encourage entrepreneurship among residents or West Hawaii to increase regional capture rates of the substantial economic benefits that are expected to be generated by visitors to Makalawena Resort.
- Additional research to aid social impact management efforts could provide a basis to implement a rational and effective employee housing program, training programs and other programs to mitigate social impacts generated from the tourism industry.

In addition to the above, the following job training and related mitigated measures could be provided.

Resident-Oriented Job Training: Resident-oriented job training could reduce undesirable levels of inmigration and consequent exacerbation of housing shortages and associated social impacts. Such programs -- which would need to be industry-wide in West Hawaii rather than confined to Makalawena -- should focus primarily on increasing labor force participation rates (or decreasing unemployment rates) among targeted components of the existing regional labor market. A secondary focus could be on assuring that needed in-migrant workers consist largely of groups which are socially compatible with the current West Hawaii population.

In interviews conducted for this report with resort personnel department, a frequent comment was that current or potential "labor shortage problems" reflect not so much lack of actual

workers as lack of people with appropriate skill, attitudes, and/or resources needed to enter the labor force. These are problems which could be alleviated with education or support services aimed at particular target groups.

Specific groups for targeting could include:

1. Females have a labor force participation rate some 22 percentage points less than that for males in the area from South Kona through North Kohala (57 percent for females vs. 79 percent for males, as of the 1980 Census). Women with young children at home have a particularly low labor force participation rate (50 percent). While this may in some cases reflect values and preferences, the particularly high participation rate of women with older children (70 percent) suggests that many mothers may wish to work but face child care problems.

2. Disadvantaged/Discouraged Residents are those for whom chronic unemployment or lack of job preparation has resulted in withdrawal from the labor force. Social agency informants suggest these are largely young adults, often of native Hawaiian ancestry. Barriers to developing this labor source would be largely cultural and attitudinal, followed by lack of job training or (particularly for career advancement past entry-level jobs) basic skills. Some would also need transportation assistance.

   It is difficult to estimate the number of people in this category, but various informants contacted for this report (both in the visitor industry and in social agencies) believe there are numerous such pockets. One example would include the physically handicapped, who could be trained to perform clerical or similar functions.

3. Future High School Graduates will be a particularly important labor source, especially given that the size of graduating Konawaena High School classes in the 1990's may be nearly double the 1986 figure of 280. While many graduates will naturally seek visitor industry employment, even more could be attracted through greater exposure to the industry and more vocational classes. South Kohala resort operators have been establishing closer ties with public schools in that district to further these goals.

An additional obstacle --- which pertains to most other groups as well -- is the perception that hotel jobs are insecure (because of seasonal or other fluctuations in

the tourist market) and lack scheduling convenience or predictability (split- or night-shift work, "on-call" status, etc.). This is in fact relatively true for entry-level workers, although employees with seniority have greater job security and choice of desirable working conditions. Increased community outreach and education can be of assistance in making the latter point more widely known.

4. East Hawaii Residents Seeking Employment would include the unemployed or others initially entering the labor force --e.g., former sugar workers or their children. In addition to some of the previously discussed obstacles, a major potential barrier to their movement across the island could be any continuation of Kona's housing shortage. High rents and residential land values in Kona could make other islands or the Mainland seem more promising.

5. Former West Hawaii Residents may in some cases be interested in returning home if more jobs become available. The State's Kona Employment Service office manager reports a recent increase in telephone inquiries from former residents about emerging job opportunities (personal communication, E. Tanimoto, August 26, 1986). Again, the stability of those jobs and the availability of affordable housing could be major factors in the decision of former residents whether to return to the area.

6. Immigrants from the Philippines or other Asian countries may face or even cause some social adjustment problems. However, they would contribute to the historically unique cultural blend of both the Hawaii population and the resort workforce. Filipinos, now the largest immigrant group in Hawaii, may be expected to keep joining their families on a natural basis, and this tendency will increase as more jobs become available in any given area. Southeast Asian refugees now tend to live in enclaves on Oahu and -- according to social agencies interviewed for this report -- are unlikely to move to the Neighbor Islands unless a concerted recruitment effort is made. However, social service agency informants uniformly report that resort employment is very attractive to both refugees and immigrants in general. All immigrant groups would require assistance in communication skills and assistance in obtaining housing and other social services.

While individual hotels normally conduct their own in-house training efforts, there is a possible role in West Hawaii for a broader effort to supplement these hotel specific programs.

Specifically, the sort of activities not usually provided by hotel programs include:

- o job preparation (basic skills and job search courses);
- o attitudinal and career counseling;
- o referrals for needed vocational training;
- o community outreach and education, to stimulate interest on the part of target groups;
- o information on resources for entrepreneurial training.

Many of these services are already available in the Kona area, although provided by different agencies which sometimes do not communicate or coordinate with one another. These include the State Employment Service; Department of Education high school vocational and adult educational programs; Alu Like (which successfully encouraged many off-island native Hawaiians to take jobs at the recently opened Sheraton Princeville); and particularly the West Hawaii branch of UH-Hilo's Hawaii Community College. The latter recently began a Culinary Arts training program in Keauhou and has tentative plans to add courses next year in front-desk operations, groundskeeping, and mid-management skills. On the private sector side, the Hawaii Hotel Association has taken the lead in organizing input to the college planning.

Thus, the major needs for West Hawaii appear to have less to do with creating new programs than with facilitating coordination of existing efforts in order to assure a more effective and integrated approach. There may also be a need to provide an overview of industry labor force needs from the private sector's (as opposed to the public sectors's) own viewpoint. Community college officials currently are intensifying their efforts in such areas as assessing future needs, but it may also be valuable to create private-sector funded staff who have more flexibility in working on programs outside the University system's mandate --e.g., basic skill, attitudinal counseling, liaison with public schools to assure earlier student exposure to resort work, etc.

While it has been suggested in some parts of Hawaii that responsibility for such supplementary job training programs should be vested with resort developers, the situation in West Hawaii lends itself more to increased cooperative efforts by hotel operators. This is because the Kona visitor plant consists of numerous destination areas, as opposed to a single developer whose resort would become the region's sole major employer. Additionally, the local chapter of the Hawaii Hotel Association already has begun to assume a leadership role in improving training programs.

<u>Support Services to Increase Resident Employment</u>: Child care and transportation assistance were both mentioned in the preceding discussion as potential obstacles to maximizing employment among some types of residents. Possible mitigations therefore might include employer- or industry-sponsored child care centers and shuttle bus arrangements such as have been provided in Kohala.

However, actions of this sort should be preceded by a careful study of economic feasibility and analysis of whether the responsibility appropriately rests with government, developer, or operators. For example, it may be counter-productive to emulate the current Oahu move to require resort developers to provide land (but no facilities or staff) for child care. That is because Kona's need more likely is for a few centralized, 24-hour operations, rather than a larger number of land parcels sited on various developments but without adequate individual resources to begin actual operations.

Development of Industry-Community Communication Linkages: Many social impacts -- including these related to labor availability -- can be mitigated by improved communication between the community and developers (and/or operators). The need for such linkages has become increasingly apparent in Hawaii, in part because the ultimate resort operators are not always aware of (or in agreement with) representations made to the community by the initial developer.

Several attempts are now under way in various parts of Hawaii to create ongoing communication mechanisms. In Kohala, a citizens' South Kohala Advisory Committee has been formed to provide community input to resort developers. On Oahu's North Shore, the Kuilima resort developer has agreed to maintain communication throughout the project's life with the Kuilima/North Shore Strategy and Planning Committee, which is in the process of incorporating as a nonprofit corporation.

There are numerous industry and community groups in the Kona area, but no forum dedicated expressly to the purpose of fostering communication among all four affected interest groups (i.e., developers, operators, government, and general public). The participation of all such groups is needed to assure both (1) that communication is not just a one-way process and also (2) that private-public actions to address development concerns are effective and enjoy broad-based support. Subcommittees or task forces of the larger body could explore acceptable approaches to both environmental concerns and also such pressing socioeconomic concerns as housing, job training, and related support activities.

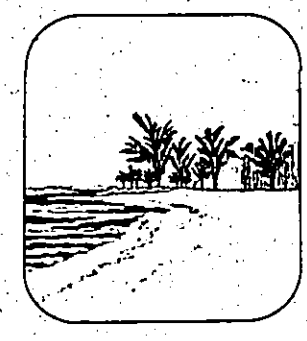
Research to Aid Social Impact Management Efforts: At present, Alu Like is conducting a statewide research effort to identify obstacles (including cultural and attitudinal barriers) faced by Hawai ans seeking careers in the visitor industry. This along with the community college's ongoing needs assessment for training, will help inform efforts to manage tourism impacts in West Hawaii.

However, no known efforts are currently underway to obtain other key data, and a government- or industry-sponsored research effort could be valuable to learn more about such things as (1) the location, characteristics, and willingness to relocate of current Big Island unemployed residents; (2) changes in the demographic profile of the resort industry, both in West Hawaii and in other areas which have experienced labor shortages; (3) actual survey data to document the true extent and magnitude of family impacts associated with tourism employment or tourism driven rapid population growth.

The proposed "Tourism Social Impact Management System" approved by the 1986 State Legislature (but not yet implemented by the Department of Planning and Economic Development) represents one possible vehicle for obtaining some of this information, since it would involve a research effort focusing on communities with "high tourism impact." However, the pilot report (Coopers & Lybrand, 1986) recommends that population growth impacts be ignored. Since these are crucial to West Hawaii, it is suggested that the county government and visitor industry disagree with this aspect when the system is implemented.

V

ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES



CHAPTER V

ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The construction and operation of the proposed project would involve the irretrievable commitment of certain natural and fiscal resources. Major resource commitments include the land upon which structures are actually constructed (does not include open space areas, such as the golf course, anchialine ponds, and wildlife refuge), money, construction materials, manpower and energy. The impacts of using these resources should, however, be weighed against the economic benefits to the residents of the region, County and State, and the consequences resulting from taking no action.

Large areas of the project site would be devoted to open space. Approximately 15 acres of beach area and ponds, 165 acres of golf course, and approximately 20 acres (including the tennis center, roadways and open space buffer along highway and the electrical easement), will be retained in open space for a total of 230 acres. Approximately 65 percent of the site area will remain in open space, therefore, only approximately 135 acres will represent a permanent, irreversible or irretrievable commitment of land.

The commitment of resources required to accomplish the project includes labor and materials, which are mostly non-renewable and irretrievable. The operation of the project will also include the consumption of potable water and petroleum-generated electricity which also represents the irretrievable commitment of resources. However, it should be noted that most of the potable water used will be reused for the irrigation of the golf course and landscaped areas within the project.

VI

RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES AND CONTROLS FOR THE AFFECTED AREA

CHAPTER VI

RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES AND CONTROLS FOR THE AFFECTED AREA

The General Plan Amendment Application and Petition were submitted to the Hawaii County Planning Department on July 18, 1986. Upon acceptance of the Environmental Impact Statement, the General Plan Amendment would be processed by Hawaii County. The remaining approvals would be applied for sequentially or concurrently as allowed by law.

The proposed project would be consistent with: the Hawaii State Plan; the State Functional Plans; the Hawaii County General Plan; the Kona Regional Plan; and the Special Management Area (SMA) Rules and Regulations of the County of Hawaii.

The proposed project's relationship to these and other land use plans and controls is described in sections which follow.

6.1 HAWAII STATE PLAN

The Hawaii State Plan, (Hawaii, State of, Department of Planning and Economic Development, 1978) establishes a set of goals, objectives and policies which are to serve as long range guide lines for the growth and development of the state. Among its stated objectives is a clear statement of intent to support the visitor industry as a major element of steady growth in Hawaii's economy.

Policies related to the development of the visitor industry emphasize the need for cooperation between the public and private sectors to assure a viable industry that is responsive to the economic, social, environmental and aesthetic values of the community as a whole. The proposed development at Makalawena would be consistent with the economic and social policies of the State Plan.

The proposed project is in conformance with the State Plan since the plan generally supports the expansion of the visitor industry (sec. 226-8(a), -103(b)(3), (10), HRS), especially on the neighbor islands (sec. 226-5(b)(2), HRS). Additionally, the project would improve opportunities for public use of coastal resources and would be planned and designed in such a way as to be compatible with the environmental and cultural resources of the site.

In general, the proposed Makalawena Resort is consistent with the overall intent of the State Plan. Specific objectives, policies and priority actions contained in the State Plan most relevant to the proposed project are discussed below.

Objective and policies for population include:

> "(1)(a) Guide population growth to be consistent with the achievement of physical, economic, and social objectives of the State Plan."
>
> "(2)(b) Encourage an increase in economic activities and employment opportunities on the neighbor islands consistent with community needs and desires."
>
> "(3)(b) Ensure that adequate support services and facilities are provided to accommodate the desired distribution of future growth throughout the state."
>
> "(4)(b) Promote increased opportunities for Hawaii's people to pursue their socio-economic aspirations throughout the islands."

Discussion: At a time when employment opportunities are decreasing in the agricultural sector of Hawaii's economy, opportunities are increasing in the visitor industry. Permanent operational employment at Makalawena Resort would be significant and indirectly, employment throughout the state would also be stimulated by this development.

Adequate services and facilities would be ensured by the resort developers. State and county tax revenues generated by the resort (property taxes, income taxes, etc.) would contribute toward the cost of providing services to visitors and new residents.

Objectives and policies for the economy in general, Section 6(a) states:

> "(1) Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaii's people."
>
> "(6)(b) Strive to achieve a sustained level of construction activity responsive to, and consistent with, state growth objectives."

Other applicable policies for the economy, Section 6(b), include:

> "(9) Encourage labor intensive activities that are economically satisfying."

"(11) Promote economic activities, especially those which benefit areas with substantial unemployment problems."

"(14) Encourage business that have favorable financial multiplier effects within Hawaii's economy."

Discussion: When fully developed, the labor intensive resort development would provide employment and new business opportunities (to service the resort development) for the Kona and Kohala districts. Refer to Chapter IV, Section 4.22.

Relevant Hawaii State Plan policies for the economy-visitor industry, Section 8(b) are as follows:

"(a) A visitor industry that constitute a major component of steady growth for Hawaii's economy."

"(3)(b) Improve the quality of existing visitor destination areas."

"(4)(b) Encourage greater cooperation between the public and private sectors in developing and maintaining well designed and adequately serviced visitor industry and related developments."

"(5) Ensure that visitor facilities and destination areas are carefully planned and sensitive to existing neighboring communities and activities."

"(6)(b) Develop the industry in a manner that would provide the greatest number of primary jobs and steady employment for Hawaii's people."

"(7) Provide opportunities for Hawaii's people to obtain job training and education that would allow for upward mobility within the visitor industry."

"(9)(b) Foster an understanding by visitors of the aloha spirit and of the unique and sensitive character of Hawaii's cultures and values."

Discussion: State and county tax revenues generated by the development would contribute toward the cost of providing services to new residents and visitors. Makalawena Resort would be carefully planned and located in a coastal area planned for intermediate resort development. Makalawena Resort intends to maintain the high standards set by other resorts in the South Kohala and North Kona area.

The proposed project would further the policy of providing opportunities for Hawaii's people to obtain job training and would allow for upward mobility within the visitor industry. The pro-

posed development would offer short-term and long-term employment to residents of the state and county of Hawaii and would contribute to sustaining the level of construction activity in the State. Operational employment would provide workers with higher than average total compensation based on wages and gratuities.

As noted in Chapter II, Section 3.3, Need for the Project, the projected market support for development at Makalawena would support 370 to 970 hotel rooms and 800 to 1,200 condominium units. To be carefully planned and developed to meet market demands, the resort would provide a diverse range of employment opportunities within the region.

Relevant Hawaii State Plan objectives and policies for the physical environment - land-based, shoreline and marine resources, Section 11(b) include:

> "(1)(a) Prudent use of Hawaii's land-based, shoreline, and marine resources."
>
> "(2)(a) Effective protection of Hawaii's unique and fragile environmental resources."
>
> "(2)(b) Ensure compatibility between land-based and water based activities and natural resources and ecological systems."
>
> "(3) Take into account the physical attributes of areas when planning and designing activities and facilities."
>
> "(8)(b) Pursue compatible relationships among activities, facilities, and natural resources, especially within shoreline areas."
>
> "(9) Promote greater accessibility and prudent use of the shoreline for public recreational, educational, and scientific resources."

Discussion: The major physical features within the project have been identified as Opae'ula Pond, Pu'u Ali'i Bay and beach and significant historic sites. These important physical attributes of the site would be preserved and/or integrated into the resort plans.

The applicant is proposing to provide opportunities for public recreational, educational and scientific use of the shoreline fronting the project site.

Relevant Hawaii State Plan policies for socio-cultural advancement - education, Section 21(b) include:

> "(4) Provide job preparation training for groups experiencing critical unemployment conditions."
>
> "(6) Assist individuals, especially those who are disadvantaged in meeting job qualifications, through manpower and other related training opportunities."

Discussion: Refer to the previous discussion of the Hawaii State Plan policies for the economy - visitor industry: Section 8(b), (7).

Relevant Hawaii State Plan objective and policy for socio-cultural advancement - culture, Section 23 include:

The enhancement of cultural identities, traditions, values, customs and arts of Hawaii's people.

> "(1)(b) Foster increased knowledge and understanding of Hawaii's ethnic and cultural heritage and the history of Hawaii."

Discussion: The sites of cultural interest at Makalawena Resort are predominately of Hawaiian origin. Significant sites would be preserved and interpreted for the public and resort guests.

Relevant Hawaii State Plan policies for socio-cultural advancement - leisure, Section 23 include:

> "(4) Promote the recreational and educational potential of natural resources having scenic, open space, cultural, historical, geological, or biological values."
>
> "(5) Ensure opportunities for everyone to use and enjoy Hawaii's recreational resources."

Discussion: The planned resort would provide lateral and mauka-makai access to the recreational resources of the shoreline. The historic and archaeological resources of significance would be preserved and/or restored and integrated into the design of the resort.

Relevant Hawaii State Plan objective and policies for the physical e vironment - scenic, natural beauty and historic resources, Section 12 include:

> "(1)(a) Enhancement of Hawaii's scenic assets, natural beauty, and multi-cultural/historical resources."

"(1)(b) Promote the preservation and restoration of significant natural and historic resources."

"(4)(b) Protect those special areas, structures and elements that are an integral and functional part of Hawaii's ethnic and cultural heritage."

"(5)(b) Encourage the design of developments and activities that complement the natural beauty of the islands."

Discussion: The North Kona and South Kohala region, including the lands of Makalawena, is rich in natural and cultural resources. Makalawena Resort proposes to preserve significant individual archaeological sites. As mentioned previously, the shoreline area, including the ponds, except for Opae'ula Pond that would become a wildlife refuge, is not planned to be altered. The low density, landscaped character of the resort would provide a means for the development to accommodate and be complemented by the surrounding environment.

Relevant Hawaii State Plan objective and policy for the physical environment - land, air and water quality, Section 13 include:

"(2)(a) Greater public awareness and appreciation of Hawaii's environmental resources."

"(1)(b) Foster educational activities that promote a better understanding of Hawaii's limited environmental resources."

Discussion: Increased access to the Makalawena lands and the shoreline would be made available to the general public via the Makalawena Resort. Access to archaeological sites would support activities that promote a better understanding of Hawaii's heritage. Preserving the anchialine ponds contained in the shoreline area would serve to further both visitors' and residents' understanding of Hawaii's unique natural heritage.

Relevant Hawaii State Plan objective and policies for facility systems - solid and liquid wastes, Section 15 include:

Maintain basic public health and sanitation standards relating to treatment and disposal of solid wastes.

"(1)(b) Encourage the adequate development of sewer systems that complement planned growth."

"(2)(b) Encourage reuse and recycling to reduce solid and liquid wastes and develop a conservation ethic."

Discussion: Makalawena Resort intends to construct a sewage treatment facility which treats sewage to the secondary level. This would create an effluent which would be safe to use for golf course irrigation while serving to conserve and recycle water.

Relevant Hawaii State Plan objective and policies for facility systems - water, Section 16 include:

Provide adequate water to accommodate domestic, agricultural, commercial, industrial, recreational and other needs within resource capacities.

> "(1)(b) Relate growth activities to existing and potential water supply."
>
> "(3)(b) Reclaim and encourage the productive use of runoff water and wastewater discharges."

Discussion: Water for Makalawena Resort would be supplied either from high elevation wells (approximately 1,200 foot elevation) within Makalawena lands, mid-elevation brackish water wells that would be desalted for potable use or joint use of other developed water sources in the area. A wastewater treatment plant would be designed so that wastewater can be recycled; effluent mixed with brackish water can be used to irrigate the resort golf course.

Priority Directions

The Economic Implementing Actions of the Hawaii State Plan include the following relevant priority actions:

> "(1)(a) Stimulate the economy to provide needed jobs for Hawaii's people without stimulating unnecessary in-migration."
>
> "(3)(b) Maintain or enhance the quality of existing and future hotels and resort destination areas which conform with regional carrying capacities and state policies providing for adequate shoreline setbacks and beach access."
>
> "(5)(b) Preserve and enhance Hawaii's significant natural environment and scenic, historic, and cultural sites."
>
> "(6)(b) Develop and maintain career opportunities in the visitor industry for Hawaii's people, with emphasis on managerial positions."
>
> "(13)(d) Encourage the expansion of the statewide agricultural base through the promotion of products for export and local consumption."
>
> "(1)(f) Promote a consistent and stable level of construction activity."

Discussion: The resort development would provide a steady level of construction employment over a period of several years, lead to the establishment of permanent full-time and part-time opera-

tional jobs, and stimulate employment growth in other sectors of Hawaii's economy. It is estimated that many employees would be Hawaii Island residents, and that most of the remaining employees would be from other islands.

Development at Makalawena Resort would conform with relevant State and County land use regulations, as well as other regulations pertinent to the proposed development.

Local agricultural products, including fish, meat, vegetables and fruits, would be purchased for consumption at the resort, contributing to the maintenance and expansion of the agricultural base.

Population Growth and Distribution

The Population Growth and Distribution Implementing Actions of the Hawaii State Plan include the following relevant priority actions:

> "(2)(a) Encourage hiring of Hawaii's people by firms doing business in the state."
>
> "(2)(b) Plan the development and availability of land and water resources in a coordinated manner so as to provide for the desired levels of growth in each geographical area."

Discussion: The proposed project would be constructed according to a phased schedule as demand warrants and resources allow and employ locally available labor for long-term employment at the resort.

Land Resources

The Hawaii's Land Resources section of the Hawaii State Plan include the following priority action that is relevant for Makalawena Resort:

> "(a) Preserve and improve shoreline open spaces and scenic resources."

Discussion: The master plan includes the provision of public access to the shoreline from Queen Kaahumanu Highway and lateral access along the shoreline. An open space area between the shoreline and resort facilities would provide a buffer.

Other Various State Plan Sections

The project also conforms to other factors contained in the State Plan as follows:

1) Provides adequate shoreline setbacks and beach access (sec. 226-11(b)(9), -103(b)(3), HRS).

Discussion: No structures would be located in the county's setback area. Public access to the shoreline would be provided.

2) Preserves and enhances significant scenic, historic and cultural sites (sec. 226-12(b)(1)- (5), -103(b)(5), HRS).

Discussion: Along shore views would be preserved. Additional archaeological studies would be conducted and significant archaeological sites would be preserved.

3) Protects rare or endangered plant and animal species (sec. 226-11(b)(6), HRS).

Discussion: There are no rare or endangered plant species. The anchialine ponds, which are habitats for several endangered waterbirds and a potentially endangered shrimp, would be preserved and a wildlife refuge will be created at Opae'ula Pond.

4) Designed with sensitivity to existing neighboring communities and activities (sec. 226-8(b)(5), HRS).

Discussion: The project design would be sensitive to existing communities in the region by giving employment preference, as much as possible, to residents in the area; providing public shoreline access; and ensuring an aesthetic development.

5) Fosters an understanding by visitors of the unique and sensitive character of Hawaii's cultures and values (sec. 226-8(b)(9), HRS).

Discussion: Management and interpretive programs would be developed for the anchialine ponds and for significant archaeological sites to foster an understanding of Hawaii's culture and ecology.

6) Provides adequate support services (sec. 226-5(b)(3), Hawaii Rev. Stat.) without unreasonable public expenditures (sec. 226-104(c)(2) HRS).

Discussion: The water and wastewater systems would be privately constructed and operated, thus avoiding public expenditures. Certain public services, such as police and fire protection, would eventually have to be expanded to meet the growing regional demand. The revenues generated by the pr ject would more than offset the project's share of the cost to provide these additional services.

7) Protects surface, ground and coastal water quality (sec. 226-13(b)(3), HRS).

Discussion: Potable groundwater sources would be protected from potential wastewater disposal and irrigation practices by complying with the Department of Health Underground Injection Control Permit and the Safe Drinking Water Permit. Compliance with these permit requirements should also protect the coastal water quality since groundwater seepage is the primary pathway for pollutants in the area. Surface water quality is not a concern since there are no streams in the area.

8) Maintains or enhances aural and air quality (sec. 226-13(b)(4), HRS).

Discussion: Prevailing tradewinds would disperse the increased vehicle emissions in the area. Without the necessary widening of Queen Kaahumanu Highway, the ambient standards for carbon monoxide may be exceeded. Adequate setbacks from the roadways would mitigate noise impacts to the proposed residential units located along the roadways.

9) Reduces threat to life from erosion, flooding, tsunamis, earthquakes and other natural or man-induced hazards and disasters (sec. 226-13(b)(5), HRS).

Discussion: The threat from erosion, flooding, lava flow and subsidence hazards is minimal. Tsunami hazards would be mitigated through adequate shoreline setbacks and flood-proofing measures. Earthquake hazards would be mitigated through proper structural design.

10) Provides wastewater reclamation as a means to conserve water (sec. 226-16(b)(3), HRS).

Discussion: Treated wastewater effluent would be used to irrigate the golf course and landscaped areas, thereby reducing the overall water demand.

Although the State Plan prefers growth in existing urban areas (sec. 226-104(c), HRS), a resort project that complies with the above factors would be consistent with the State Plan since impacts to critical areas would be mitigated (sec. 226-104(c)(4), (5)), HRS), unreasonable public expenditures to provide support facilities would be avoided (sec. 226-104(c)(3), HRS), and the character of the surrounding community would not be affected (sec. 226-104(c)(8), HRS).

6.2 STATE FUNCTIONAL PLANS

The Hawaii State Plan mandated the creation of twelve functional plans to provide detailed guidelines to implement its broad range of planning objectives. Ten of these plans were adopted by the 1984 legislature, with the remaining two adopted in 1985.

Development at Makalawena would consider the guidelines of the functional plans and integrate the relevant goals and objectives of each.

The relevant state functional plans were examined to determine the relationship of the proposed Makalawena Resort. All of the plans had been adopted by 1985; they function as guidelines only and are not to be interpreted as law or statutory mandate.

State Historic Preservation Functional Plan - Historic Properties

"B. Objective: Compilation of an inventory that adequately locates and describes a significant portion of Hawaii's historic properties."

Discussion: A "Full Archaeological Reconnaissance Survey" (Paul H. Rosendahl, 1986) was completed for the project area to locate, describe and determine the significance of historic sites and features within the project area. The findings and recommendations of this survey are summarized in Chapter IV, Section 4.8 and Appendix C.

State Housing Functional Plan

"B. Objective: Assist the orderly development of residential areas sensitive to community needs and other land uses."

Discussion: If the necessary governmental approvals are received as requested, and a need is determined, the applicant would assist in providing low to moderate income housing.

State Recreation Functional Plan - Access

"D. Objective: Assure the provision of adequate public access to lands and waters with public recreation value."

Discussion: The project would conform to the objective of assuring adequate public access to waters with recreational value, by providing unobstructed pedestrian access along the shoreline, and providing mauka-makai access to the shoreline and providing parking facilities for public use.

State Tourism Functional Plan - Physical Development

"B. Objective: Development and maintenance of a well designed and adequately serviced visitor industry and related developments in keeping with the needs and aspirations of Hawaii's people."

Discussion: The applicant has initiated physical planning for the proposed resort in order to develop a visitor facility of high quality. Implementation of a master planned resort would

eliminate the need for government funds for capital improvements. Planning for the proposed resort has taken into consideration land and water resources. The master plan for the resort reflects consideration for environmental, scenic and cultural resources.

The proposed site provides the necessary coastal resources (white sand beaches) to satisfy the market need for additional resort development and would contribute to the appropriate expansion of the resort resources of West Hawaii.

State Tourism Functional Plan - Employment and Career Development

"C. Objective: Enhancement of career and employment opportunities in the visitor industry."

Discussion: Makalawena Resort would provide significant employment, construction related and operational, that would enhance career opportunities in the visitor industry. The direct and indirect employment generated from the resort is significant. Refer to Section 3.22.

State Tourism Functional Plan - Community Relations

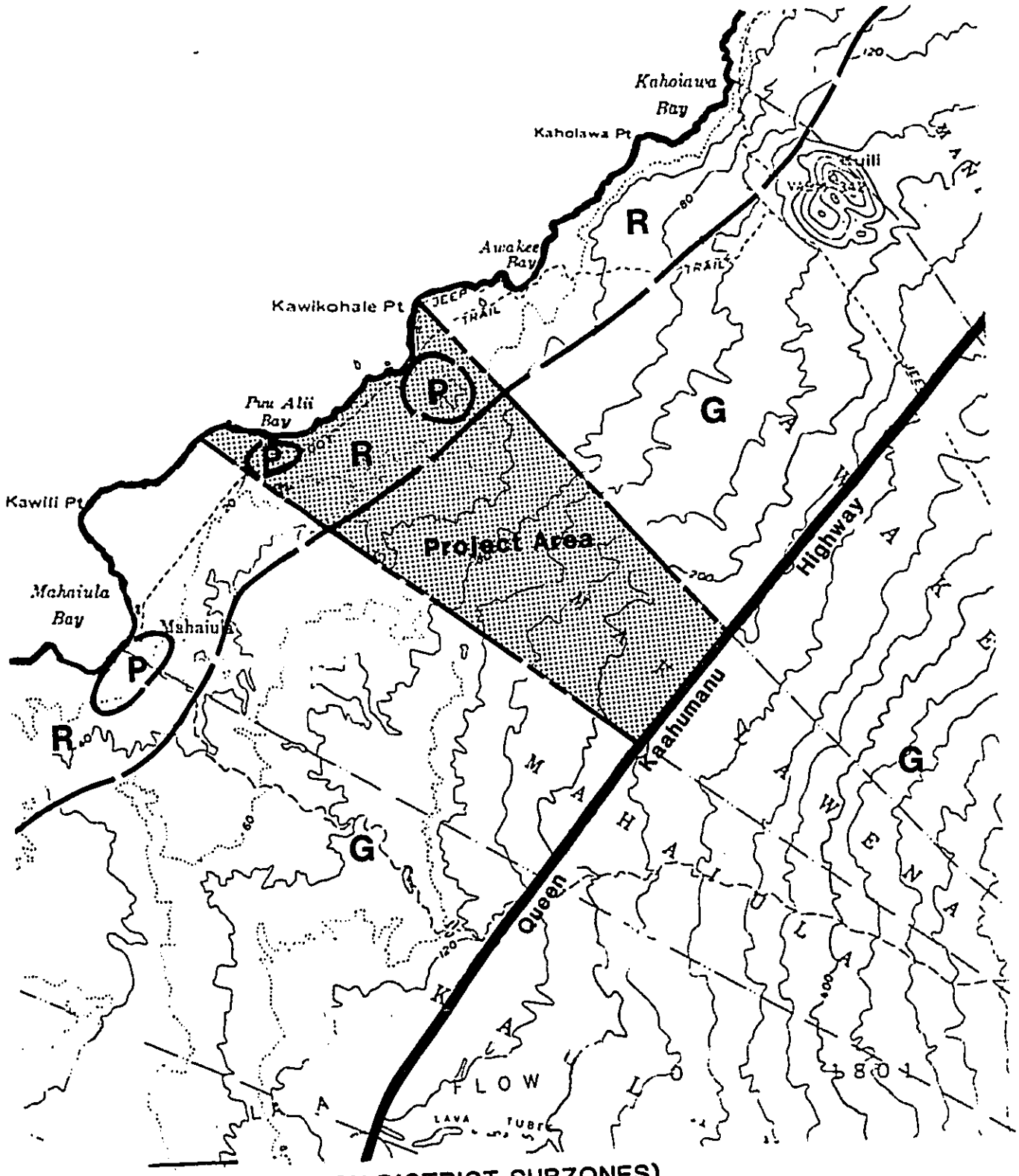
"D. Objective: Development of better relations and mutual awareness and sensitivity between the visitor industry and the community."

Discussion: The development at Makalawena Resort would be sensitive to the community concerns of the North Kona and South Kohala region. Far removed from any existing communities, the proposed resort would become a destination resort community.

6.3 STATE LAND USE

All 353 acres of the proposed Makalawena development lie within the State Conservation District (Figure VI-1). A petition to amend the land use boundary designation from Conservation to Urban would be required in order for the project to proceed (Figure VI-2).

In 1961, when the State Land Use Commission was established and initial land use designations determined, the bulk of the undeveloped coastal land in North Kona and South Kohala was designated as a Conservation District. Since that time, several major coastal resort developments including Mauna Kea, Waikoloa, Mauna Lani and Kona Village have amended the Conservation District to allow for urban uses similar to those being proposed for Makalawena.



LEGEND (CONSERVATION DISTRICT SUBZONES)

- G — GENERAL SUBZONE
- R — RESOURCE SUBZONE
- P — PROTECTIVE SUBZONE

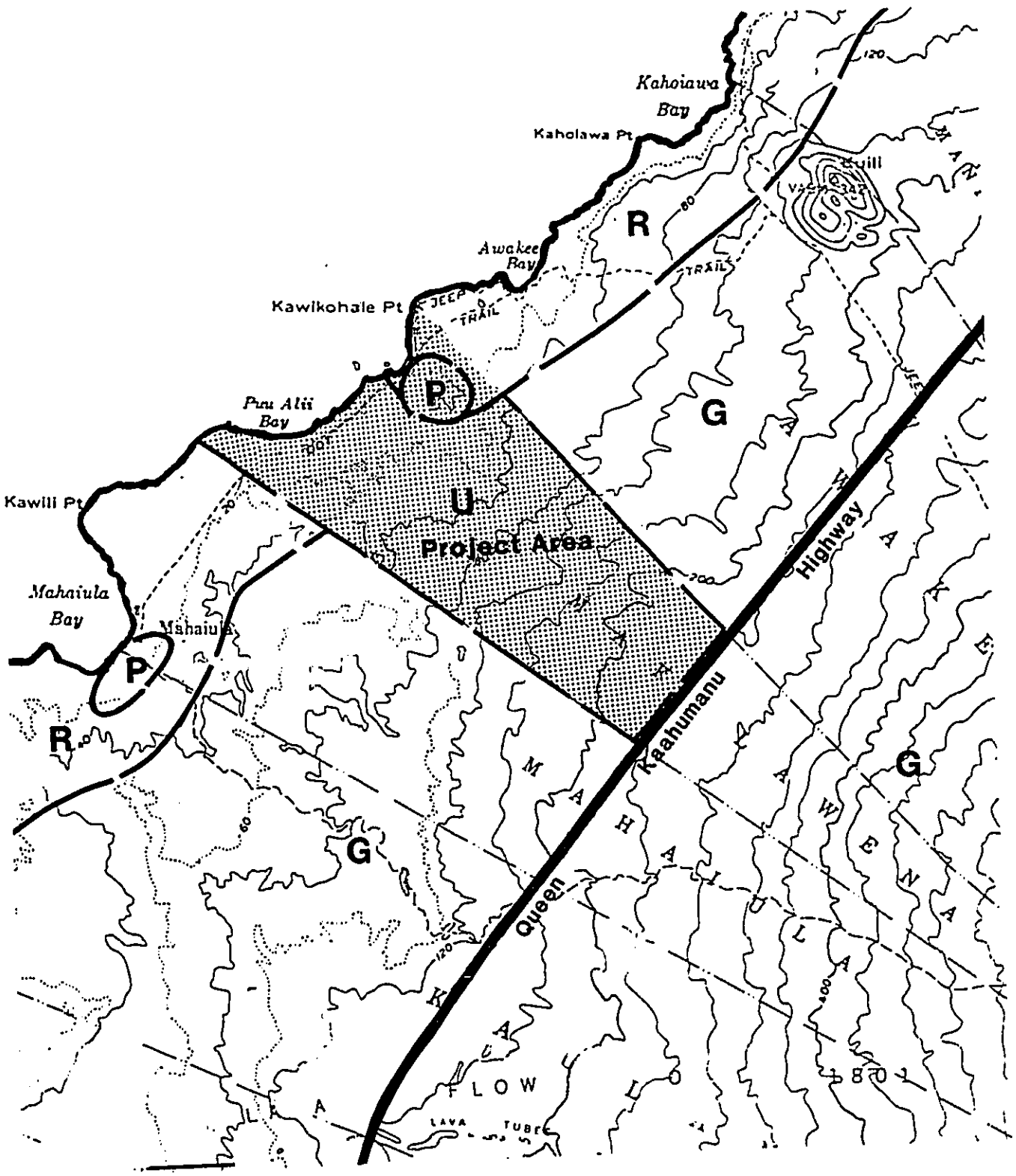
EXISTING STATE LAND USE

MAKALAWENA RESORT

0 500 1000 2000 FEET

pbr

FIGURE VI-1



LEGEND

G CONSERVATION GENERAL SUBZONE	P CONSERVATION PROTECTIVE SUBZONE
R CONSERVATION RESOURCE SUBZONE	U URBAN

PROPOSED STATE LAND USE

MAKALAWENA RESORT

0 500 1000 2000 FEET

pbr

FIGURE VI-2

Section 205-2, Hawaii Revised Statutes

Pursuant to Chapter 205, HRS (Section 205-17)as amended, the Hawaii State Plan and Functional Plans, the State Land Use Commission shall specifically consider the following decision making criteria on its review of any petition for reclassification of district boundaries.

(1) "The extent to which the proposed reclassification conforms to the applicable goals, objectives, and policies of the Hawaii State Plan and relates to the applicable priority guidelines of the Hawaii state plan and the adopted functional plans;"

Discussion: As summarized in Section 6.1 and 6.2, the proposed resort and associated urban land uses conform to the applicable goals, objectives and policies of the Hawaii State Plan and guidelines of the Functional Plans.

(2) "*The extent to which the proposed reclassification conforms* to the applicable district standards;"

Discussion: The applicable district standards for an Urban District are given in Section 2-2 of the Land Use District Boundary Regulations and discussed below to demonstrate the conformance with these district standards and inapplicability of the conservation district standards with the proposed resort. The required amendments to the State Land Use District boundaries are not violative of the basic standards for determining boundaries that are set forth in Section 205-2, HRS.

"(a) It shall include lands characterized by "city-like" concentrations of people, structures, streets, urban level of services and other related land uses."

Response: Not applicable. The proposed resort when completed would be characterized by "city-like" structures with an extensive open space system including a golf course. The necessary infrastructure would be provided to serve the hotel, multi-family residential and commercial uses meeting all applicable county and state standards.

"(b) It shall take into consideration the following specific factors:

1. Proximity to centers of trading and employment facilities except where the development would generate new centers of trading and employment.

2. Substantiation of economic feasibility by the petitioner.

3. Proximity to basic services such as sewers, water, sanitation, schools, parks, and police and fire protection.

4. Sufficient reserve areas for urban growth in appropriate locations based on a ten (10) year projection."

Response: The resort would generate a new center for employment opportunities. The project's feasibility has been demonstrated in part by the market assessment that determined a need for the project. Basic infrastructure would be provided by the applicant including roads, and water and sewer systems. Public services such as schools, parks, police and fire protection are available within the region. Refer to Chapter IV, Section 4.16 through 4.19.

The applicants financial capabilities to execute a project of this magnitude would be fully disclosed to satisfy the requirements of the State Land Use Commission.

"(c) Lands included shall be those with satisfactory topography and drainage and reasonably free from the danger of floods, tsunami and unstable soil conditions and other adverse environmental effects."

Response: The lands at Makalawena are suitable for the proposed resort development. They are reasonably free from natural hazards such as flooding, tsunami and unstable soil conditions.

"(d) In determining urban growth for the next ten years, or in amending the boundary, lands contiguous with existing urban areas shall be given more consideration than non-contiguous lands, and particularly when indicated for future urban use on State or County General Plans."

Response: Although the Makalawena lands are not contiguous to other proposed expansions of the urban district for intermediate resort and golf course uses, Makalawena is in the same general area and would compliment other proposed resorts.

"(e) It shall include lands in appropriate locations for new urban concentrations and shall give consideration to areas of urban growth as shown on the State an . County General Plans."

Response: Makalawena is an appropriate location for a resort development due to the natural attributes of the site and the region's desirable climate. A request to amend the Hawaii County General Plan is the initial action the applicant is addressing in this EIS.

"(f) Lands which do not conform to the above standards may be included within this District:

1. When surrounded by or adjacent to existing urban development; and

2. Only when such lands represent a minor portion of this district."

Response: Standard not applicable.

"(g) It shall not include lands, the urbanization of which would contribute towards scattered spot urban development, necessitating unreasonable investment in public supportive services."

Response: The urbanization of these lands, would not necessitate unreasonable investment in public supportive services. Based on the fiscal impact analysis, this project would have a cumulative positive fiscal impact on the county and the state. Refer to Chapter IV, Section 4.22.

"(h) It may include lands with a general slope of 20 percent or more which do not provide open space amenities and/or scenic values if the Commission finds that such lands are desirable and suitable for urban purposes and that official design and construction controls are adequate to protect the public health, welfare and safety, and the public's interests in the aesthetic quality of the landscape."

Response: The petition area does not contain slopes which exceed 20 percent.

(3) "The impact of the proposed reclassification on the following areas of state concern:

(a) Preservation or maintenance of important natural systems or habitats;"

Response: The anchialine ponds and Opae'ula Pond, which are habitats for endangered water birds and potentially endangered shrimp, would be preserved. A wildlife refuge will be created at Opae'ula Pond.

"(b) Maintenance of valued cultural, historical, or natura' resources;"

Response: Significant archaeological resources would be preserved.

"(c) Maintenance of other natural resources relevant to Hawaii's economy, including, but not limited to, agricultural resources;"

Response: The petition area does not have agricultural value.

"(d) Commitment of state funds and resources;"

Response: The project would not require any state funds or resources.

"(e) Provision for employment opportunities and economic development;"

Response: The project would provide substantial employment opportunities and stimulate regional economic development. Refer to Chapter IV, Section 4.22.

"(f) Provision for housing opportunities for all income groups, particularly the low, low-moderate, and gap groups."

Response: The project would provide affordable housing opportunities to mitigate demands that the resort may place on the existing housing supply.

Conservation Districts. In determining the boundaries for the Conservation District, the following standards shall apply:

"(a) Lands necessary for protecting watersheds, water sources and water supplies shall be included in this District except as otherwise provided for in other sections of these regulations."

Response: These lands are not necessary for protecting watershed, water resources and water supplies of the region. Rainfall is less than 20 inches annually and hydrologic studies in the region indicate sufficient water resources can be developed to support the proposed resort (Mink, 1986).

"(b) Lands susceptible to floods, and soil erosion, lands undergoing major erosion damage and requiring corrective attention by the state or Federal government, and lands necessary for the protection of the health and welfare of the public by reason of the lands' susceptibility to inundation by tsunami and flooding, to volcanic activity and landslides may be included in this district."

Response: These lands are not unreasonably susceptible or exposed to undue danger from natural hazards.

"(c) Lands used for national or state parks may be included in this district."

Response: Not applicable.

"(d) Lands necessary for the conservation, preservation and enhancement of scenic, historic or archaeologic sites and sites of unique physiographic or ecologic significance shall be included in this district except as otherwise provided for in other sections of these regulations."

Response: The project area contains some significant historic and archaeological features and areas of ecological significance (anchialine ponds). These features within the site can be adequately protected and enhanced within the proposed development. An archaeological and pond management program would be developed to insure adequate conservation measures are provided for with the resort.

"(e) Lands necessary for providing and preserving parklands, wilderness and beach reserves, and for conserving natural ecosystems of endemic plants, fish and wildlife, for forestry, and other related activities to these uses shall be included in this district except as otherwise provided for in other sections of these regulations."

Response: The preservation and conservation of the shoreline resources within the site would be provided for within the project. The natural ecosystem of the anchialine ponds would be preserved with a management plan implemented to monitor the pond system so that any indirect or unanticipated impacts may be mitigated.

"(f) Lands having an elevation below the maximum inland line of the zone of wave action, and marine waters, fish ponds and tide pools of the State shall be included in this district unless otherwise designated on the district maps. All offshore and outlying islands of the state of Hawaii are classified Conservation unless otherwise indicated."

Response: The lands below the maximum inland line of the zone of wave action would remain within the Conservation District.

"(g) Lands with topography, soils, climate or other related environmental factors that may not be normally adaptable or presently needed for urban, rural or agricultural

use, shall be included in this District, except where such lands constitute areas not contiguous to the Conservation District."

Response: These lands have no topographic, soils, climate or other related environmental factors that would make it unadaptable for urban use. The market assessment (Chapter II, Section 3.3) has determined the need for these lands for resort use.

"(h) Lands with a general slope of 20 percent or more which provide for open space amenities and/or scenic values shall be included in this district except as otherwise provided for in other sections of these regulations."

Response: The general slope of the lands at Makalawena are less than 20 percent.

"(i) Lands suitable for farming, flower gardening, operation of nurseries or orchards, growing of commercial timber, grazing, hunting, and recreational uses including facilities accessory to such uses when said facilities are compatible with the natural physical environment, may be included in this district."

Response: The lands at Makalawena are of very low agricultural value due to an almost non-existence of soil.

(3) The impact of the proposed reclassification on the following areas of state concern:

"(A) Preservation or maintenance of important natural systems or habitats;"

Response: The Opae'ula Pond, located within the site, is recognized as an important natural system and habitat that should be preserved. The plan includes the establishment of a wildlife refuge at the pond and formulation of a refuge management plan to insure any indirect impacts of developing the surrounding lands would be monitored and, if necessary, mitigated to minimize impacts.

"(B) Maintenance of valued cultural, historical, or natural resources;"

Response: The "Full Archaeological Reconnaissance Survey" has identified the significant cultural and historic resources of the site that should be documented and/or preserved. As recommended, the plan would maintain those sites that are of significant value, where they do not unreasonably encumber the proposed improvements. All necessary scientific documentation would be completed prior to disturbing any sites.

"(C) Maintenance of other natural resources relevant to Hawaii's economy, including, but not limited to, agricultural resources;

Response: The loss of the agricultural resources of this site would not impact Hawaii's economy.

"(D) Commitment of state funds and resources;"

Response: There are no direct requirements for the commitment of state funds and resources due to this project. The fiscal impact assessment summarized in Section 3.22 projects a positive impact to county and state revenues through taxes generated.

"(E) Provision for employment opportunities and economic development;"

Response: The resort would provide significant employment opportunities to support its development and operation. The direct and indirect economic impact to the region is discussed in Chapter IV, Section 4.22.

"(F) Provision for housing opportunities for all income groups, particularly the low, low-moderate, and gap groups."

Response: A provision for providing housing opportunities for the low-moderate and gap groups would be provided as the need is determined due to increased employment associated with development of the resort community.

Interim Statewide Land Use Guidance Policy

The Interim Statewide Land Use Guidance Policy was repealed by Act 230 of the State Legislature in its 1985 session. However, SLUC district regulations have not yet been amended accordingly, and the specific interim policies contained in those regulations may still need to be addressed. Following is a discussion of the proposed action's consistency with the relevant policies.

(1) Land use amendments shall be approved only as reasonably necessary to accommodate growth and development, provided there are no significant adverse effects upon agriculture, natural, environmental, recreational, scenic, historic, or other resources of the area.

Discussion: As discussed previously, the necessary land use amendment is reasonably necessary to accommodate the quality growth and proposed development. This environmental impact statement disclosed the impacts that might result from the development of the proposed Makalawena Resort and details the mitiga-

tion measures that would be taken to avoid or minimize these effects. With the mitigation measures proposed there would be no significant adverse effects.

(2) Lands to be reclassified as an Urban District shall have adequate public services and facilities or as can be so provided at reasonable cost to the petitioner.

Discussion: The projected demand from the project for additional public services and facilities as a result of development has been taken into account. Since the developers would provide the project's infrastructure (much of which is considered a public service/facility, such as a wastewater treatment plant, water system, etc.), it is not expected to foster extensive public expenditures.

(3) Maximum use shall be made of existing services and facilities, and scattered urban development shall be avoided.

(4) Urban districts shall be contiguous to an existing urban district or shall constitute all or a part of a self-contained urban center.

Discussion: Other developers have proposed Urban designations for lands near Makalawena. As a master planned resort, the project has been designed as a self-contained destination resort.

(5) Preference would be given to amendment petitions which would provide permanent employment, or needed housing accessible to existing or proposed employment centers, or assist in providing a balanced housing supply for all economic and social groups.

Discussion: The Makalawena Resort development would add to the economic stability of the area and allow for high quality development and permanent employment opportunities. Housing requirements attributed to the development would be resolved with the appropriate county and state agencies.

(6) In establishing the boundaries of the districts in each county, the Commission shall give consideration to the general plan of the county.

Discussion: The relationship of the proposed Makalawena Resort plan to the Hawaii County General Plan is addressed in this section. A General Plan Amendment is currently pending before the County of Hawaii Planning Department.

(7) Insofar as practicable conservation lands shall not be reclassified as urban lands.

Discussion: There is no compelling reason for retaining in Conservation the Makalawena lands that are to be requested for Urban redesignation.

(8) The Commission is encouraged to reclassify urban lands which are incompatible with the interim statewide land use guidance policy or are not developed in a timely manner.

Discussion: The developer's plan for the land it would be requesting be redesignated Urban is compatible with the interim statewide land use guidance policy and would be developed in a timely manner.

6.4 HAWAII COUNTY GENERAL PLAN

The 1971 Hawaii County General Plan expresses the broad goals and policies for long range development of the island of Hawaii. It also provides a legal basis for more detailed levels of County Land Use controls and the expenditure of public improvement funds. An administrative effort to update the General Plan is currently underway. This update would evaluate areas of strength and weakness in the initial plan and reevaluate the thirty year horizon of the plan in relationship to current and anticipated economic and social conditions.

In the 1971 Plan, resort development areas in North Kona were designated at five locations, Holualoa Makai (Minor), Kailua (Major), Keauhou-Kahaluu (Major), Honokohau-Kaloko (Intermediate) and Kaupulehu (Retreat). Since that time the visitor industry has grown significantly and Kaupulehu was designated as an Intermediate Resort. Industry growth has taken place in each of the designated areas, except for Honokohau-Kaloko. Due to historic and environmental considerations, these lands have been identified by the federal government for public park purposes. Based on the significant growth in the visitor industry in the North Kona district and projected continued market demand, consideration of additional resort area designations in conjunction with the General Plan Update is necessary.

The Land Use Pattern Allocation Guide (LUPAG) maps in the 1971 General Plan designate the 40 foot wide coastal strip of the Makalawena property for Open Space. The remainder of the site is designated Conservation. In order for the proposed development to proceed at Makalawena, the General Plan would need to be modified o allow an "intermediate resort" and the LUPAG map would need to be amended to reflect a mix of land uses including resort, medium density, low density and open space as shown on Figure II-5.

The current proposed action for the Makalawena lands (i.e. General Plan Amendment application) would facilitate the timely review of the General Plan policies and land use designations, and provide necessary information to support the requested changes to designate Makalawena as an intermediate resort.

The applicable goals, policies, standards and courses of action are provided below along with the applicants position related to the proposed action.

1. Economic Element

Goals:

o The economic system of the county should provide its residents with opportunities to improve their quality of life.

o Economic development and improvement should be accomplished in an orderly manner which is in balance with the physical and social environments of the Island of Hawaii.

o The county of Hawaii should strive for stability in its economic system.

Policies:

o Strive for an economic climate which provides its residents an opportunity for choice of occupation.

o Encourage the development of visitor industry which is consistent with the social, physical, and economic goals of the residents of the county.

o Require a study of the total social and physical impact of large developments prior to approval.

o Encourage the expansion of higher and continuing educational services and institutions.

o Study the feasibility of establishing a business development loan program.

o Consider the land, water, air, sea and people as an essential economic resource for present and future generations and to protect and enhance the use of economic incentives.

o Strive for full employment.

o Reevaluate all economic goals and policies, particularly in the area of tourism.

Courses of Action:

o Resort development in the area shall be in balance with the social and physical goals as well as economic desires of the residents of the district. Necessary pollution controls should be available prior to development. Other necessary support facilities such as transportation and nursery facilities shall also be provided.

Position: The utilization of this land resource would result in an increased quantity and variety of job opportunities for local residents resulting in higher employment and better wages which in turn increases the opportunities to improve their quality of life. Utilizing sensible planning principles, and developing facilities in an orderly manner, minimizing the adverse effects on the physical and social environment of the area and expanding the variety and quality of services available to the community. The proposed improvements would create a successful resort development which in turn would be a stable economic force within the island's economy. The resort development therefore would not only result in minimal adverse social and physical impact, but would also create more employment and therefore, would provide for more economic stability in the region.

2. Environmental Quality

Goals:

o Reduce air pollution.

o Improve water quality.

o Eliminate soil pollution.

o Establish acceptable solid waste disposal systems.

o Minimize noise pollution.

Policies:

o Take positive action to further maintain the quality of the environment for residents both in the present and in the future.

o Reinforce and strengthen minimum controls established by the federal and state governments pertaining to the control of pollutants that effect the environment.

o Encourage the concept of recycling wastes.

Position: The resort developers would endeavor to maintain environmental quality and would act in a manner which is consistent with minimizing the adverse impacts. The plan has no inherent adverse impacts on environmental quality.

3. Flood Control and Drainage

Goals:

o Conserve scenic and natural resources.

o Protect human life.

o Prevent damage to manmade improvements.

o Control pollution.

o Prevent damage from inundation.

o Reduce surface water and sediment runoff through the employment of soil conservation measures.

Policies:

o Maintain standards which minimize the danger to life and property in areas of recurrent flooding.

o Minimize the threat of tsunami inundation.

o Restrict land use and building structures in areas of severe wave action impact.

o Maintain drainage systems as well as to assist in developing comprehensive flood damage prevention programs, and in the construction of flood control features.

Position: The resort development would respect, preserve and improve the scenic beauty and natural resources found within the project area. The plan avoids areas with flood potential or takes protective measures. Infrastructure improvements and mitigating measures during construction would minimize potentially adverse environmental impacts associated with development of the resort.

4. Historic Sites

Goals:

o Protect and enhance the sites, buildings and objects of historical and cultural importance to Hawaii.

o Agencies, either public or private, pursuing knowledge about the historic sites should keep the public apprised of projects.

o Access to significant historic sites, buildings and objects of public interest should be made available.

Policies:

o Evaluate and protect important historic sites, buildings and objects in appropriate ordinances.

o Require developers of land to provide a historical survey prior to clearing or development of land where there is an indication of historical significance.

o Acquire public access to significant historic sites and objects.

o Give preference to complexes with a preponderance of original materials rather than single isolated sites unless they are of great significance.

o Encourage the restoration of significant sites on private lands.

o Collect and distribute historic site information for public interest and to keep a current inventory of sites. Aid in the development of a program of public education concerning historic sites.

o Encourage the installation of sites explaining historic sites, buildings and objects that are in character with the surrounding area and cultural aspects of the feature.

o Evaluate the significance of historic sites.

Position: The resort development would preserve and incorporate important historical sites into a pedes rian network which would be accompanied by educational and cultural interpretative information. Historic sites have been identified, and their protection, restoration and access are part of the plan for the resort and are considered an important resource. Presence of the resort would stimulate interest in the historic sites and their preservation and restoration.

5. Housing

Goals:

o Encourage safe, sanitary and livable housing.

o Attain diversity of socio-economic housing mix throughout the different parts of the county.

o Maintain a housing supply which allows a variety of choice.

Policies:

o Assure that safe, sanitary and livable housing is available to persons of all ages, income and ethnic groups, and to provide a choice as to location and types.

o Promote the volume of construction and rehabilitation of housing to meet growth needs.

o Encourage construction of specially designed facilities for active, elderly persons.

o Encourage the use of new housing design and construction and to increase the volume of production through further use of technological innovations.

o Encourage private programs intended to increase the supply of housing to create a variety for choice.

o Promote and support the use of turn-key developments and encourage the use of cluster and planned unit developments.

o Protect residential property values from depreciating influences.

Standards:

Housing Standards shall consist of and comply with:

o Housing code.

o Building code.

o Electric code.

o Plumbing code.

o Zoning ordinance.

o Subdivision ordinance.

- o Uniformity of housing information system.

- o Standards listed for single family and multiple residential land use elements.

Position: Housing within the resort would be available as primary housing. As may be indicated through more specific housing studies, employee housing would be provided for.

6. Natural Beauty

Goals:

- o Protect and enhance the integrity of areas endowed with natural beauty.

- o Protect scenic vistas from becoming obstructed.

- o Maximize opportunities for present and future generations to experience natural beauty.

Policies:

- o Establish viewplane regulations to preserve views of scenic or prominent landscapes from specific locations.

- o Identify and develop view sites.

- o Review criteria for safeguards of natural beauty in the design of developments so that manmade elements would blend with the natural setting.

Position: The integrity and natural beauty of the shoreline areas would be maintained. The plan contemplates a number of view planes and view corridors using golf or other recreational amenities for this purpose. Since beautiful views are integral to economic values, the development has identified significant views worthy of preservation.

7. Natural Resources and Shorelines

Goals:

- o Protect and conserve the natural resources of the county of Hawaii from undue exploitation, encroachment nd damage.

- o Provide opportunities for the public to fulfill recreational and educational needs without despoiling or endangering natural resources.

Policies:

o Require users of natural resources to conduct their activities in a manner that avoids or minimizes the adverse effects on the environment.

o Encourage a program of collection and dissemination of basic data concerning natural resources.

o Maintain the shoreline for recreational, educational and/or scientific manner that is protective of resources and is of the maximum value to the general public.

o Protect from the encroachment of manmade improvements and structures.

o Coordinate programs to protect natural resources with other government agencies.

o Investigate methods of beach replenishment and sand erosion control.

Position: Scientific surveys and studies of the environment have been made and plans developed which would not adversely impact the environmental conditions. The integrity of the shoreline and the related recreational resource of the area would be enhanced by the resort development. Public access and utilization would not be impaired. Presence of the resort would stimulate interest and funding to keep public shoreline areas clean. By providing certain services in the resort, the adjacent public uses of the shoreline are enhanced. Opae'ula Pond would be preserved and maintained as a wildlife refuge and an integral part of the resort complex.

8. Public Facilities

Goals:

o Provide public facilities that effectively service community needs and continue to seek ways of improving public service through better and more functional facilities which are in keeping with the environmental and aesthetic concerns of the community.

Policies:

o Continue to seek ways of improving public service through the coordination of service and by maximizing the use of personnel and facilities.

Position: The proposed resort development, through increased revenues to the state and county, would support the goal of expanded protection services and health and sanitation installations throughout the district. The resort would provide public dining, entertaining and recreational facilities that service the community needs.

9. Public Utilities

Goals:

o Ensure that adequate, efficient and dependable public utility services would be available to users.

o Maximize efficiency and economy in the provision of public utility services.

o Improve the physical appearance of public utility facilities and/or to conceal them from public view.

Policies:

o Provide utilities and service facilities which minimize total cost to public and effectively service the needs of the community.

o Design utility facilities to minimize conflict with natural environment and natural resources.

Position: The necessary infrastructure systems would be constructed to implement the proposed development plans, including roadways, sewer and water systems, drainage and electric systems. Use of underground utilities would improve the physical appearance while increasing safety and reliability. The sewer treatment plant would be located in such a way as to be screened from view. The facilities would conform to modern standards as to efficiency and quality.

10. Recreation

Goals:

o Provide a wide variety of recreational opportunities for the residents of the county.

o Maintain the natural beauty of recreational areas.

o Provide a diversity of environments for active and passive pursuits.

Policies:

o Improve existing facilities for optimum use. Features shall be incorporated for use by all age groups, including the handicapped and the elderly.

o Construct facilities which reflect the natural, historic and cultural character of the area, and encourage recreational land uses which are compatible with the adjoining areas.

o Provide compatible, multiple use recreational facilities.

o Coordinate recreational programs and facilities with both governmental and private agencies which would offer a wider range of recreational opportunities.

o Identify, designate and acquire areas of recreational importance, such as sandy beaches and other prime shoreline areas.

o Provide public access in accordance with adopted programs.

o Establish a system of trails to places of scenic, historic, natural or recreational interest.

o Identify and evaluate marine and terrestrial natural areas for preservation of unique Hawaiian wildlife, especially rare and endangered species.

o Conduct an ongoing educational program to obtain the cooperation of all people in maintaining the quality of recreation areas.

o Disseminate recreational information for the public use.

o Require subdivisions to provide land area for park and recreational use.

Courses of Action: Establish public access to, and the development of, shoreline regions along the North Kona coast so as to provide recreational opportunities in areas such as Keawaiki, Kiholo Bay, Kaupulehu, Kukio and Kapapa Bays, Kua Bay, Kahoiawa, Makalawena, Mahaiula and Honokohau.

Position: The resort development would enhance the natural beauty of the area. Facilities would be constructed in keeping with the natural, historic and cultural character of the area. Public access to the shoreline would be provided. Golf and tennis would be two intensive recreational amenities available at

the resort. The resort improvements would increase the recreational resources available to the community.

11. Transportation

Goals:

o Provide an efficient, safe, comfortable and economical transportation system.

Policies:

o Promote and encourage improvement of existing transportation systems and allowing for future demands.

Position: The presence of the resort would have a minimum impact on transportation. The internal road system is efficient in its service of the resort. The resort itself is of a scale and plan as to be primarily pedestrian in nature. A number of operational schemes would be considered to facilitate efficient transportation between the resort and the airport.

12. Land Use

The following goals relate specifically to resort development.

Goals:

o Guide the orderly development of the visitor industry.

o Provide for resort development that maximizes conveniences to its users.

o Ensure that resort developments maintain the social, economic and physical environments of Hawaii and its people.

Policies:

o Impose incremental and conditional zoning based on performance requirements to ensure the orderly use of resort zoned areas and to curb speculation and resale of undeveloped lots in order to assure a certain percentage of buildings would be constructed.

o Promote and encourage utilization of resort areas which are presently served by basic facilities and utilities.

- o Grant zoning in resort areas when the proposed development is consistent with and incorporates the stated goals, policies and standards of the County of Hawaii General Plan.

- o Encourage the visitor industry to provide resort facilities which provide an educational experience of Hawaii, as well as recreational activities.

- o Reevaluate existing undeveloped resort zoned areas and reallocate zoned land in appropriate locations.

Position: There is a need for a tourism based employment facility in the North Kona district in order to provide a variety of employment opportunities.

The orderly development of a master planned resort community would provide the visitor industry with the necessary facilities to adequately serve the projected increase in visitor travel.

6.5 KONA REGIONAL PLAN

The draft Kona Regional Plan, adopted by the Hawaii County Planning Commission in April 1984, but yet to be acted upon by the County Council, is intended to provide a more detailed policy framework for the implementation of the County General Plan. It provides specific regional projections for economic and population growth and serves as a guide for future land use action.

The economic element of the Kona Regional Plan includes a set of scenarios depicting potential growth trends in the Kona region to the year 2000. Population is projected to increase from 20,000 in 1980 to between 33,200 and 46,300 by the Year 2000, depending on the degree to which the inventory of current land uses for hotel and resort condominiums is developed and to which new development areas are designated and developed.

The Plan includes resort development within a low priority land use category in terms of its ability to respond to identified community needs, such as affordable housing. This priority is identified despite resort development's comparative market strength. Policies encouraging private participation in capital improvements for infrastructure and infrastructural extensions (i.e. roads) north of Kailua in phase with development are also included.

The Kona Regional Plan land use concept map prepared under the current General Plan, identifies the proposed development area at Makalawena in the Open designation.

Makalawena Resort plans include significant private participation in infrastructure development for the resort (i.e. sewage treatment plant, water supply and on site roads). While providing significant housing opportunities, the proposed project is not anticipated to contribute significantly to the County's supply of affordable housing.

6.6 COUNTY ZONING

The current county zoning maps designate the entire project area as Open (O). The Open Zone was established to protect scenic and environmental resources and is applied to lands south of Makalawena along the coastline except for the Keahole Airport. Although designated on the county zoning map as Open, the entire site is within the State Conservation district and thus the county has no authority to regulate these lands under the County Zoning ordinance.

In order to proceed with the physical development of the Makalawena Resort, the Conservation district must first be changed to the Urban district and then the county zoning would be applied for under the existing zoning ordinance. Proposed zoning would include a Resort-Hotel district, Village-Commercial district, several Multiple Family Residential districts and Open district.

6.7 COASTAL ZONE MANAGEMENT/SPECIAL MANAGEMENT AREA (SMA)

Regulations regarding the use of coastal lands and resources were established through the State Coastal Zone Management Act (Chapter 205A, HRS) and are administered by the County Planning Department. The intent of Coastal Zone Management and SMA regulations is to assure that adequate attention is paid to coastal resources and that development impacts are mitigated before damage occurs. Special controls on developments within an area along the shoreline are necessary to avoid permanent losses of valuable resources and the foreclosure of management options, and to ensure that adequate access, by dedication or other means to public owned or used beaches, recreation areas and natural resources is provided. It is the state policy to preserve, protect, and where possible, to restore the natural resources of the coastal zone.

The designated SMA boundary includes all land makai of the Queen Kaahumanu Highway or all 353 acres of the proposed project area (Figure VI-3). Accordingly, an SMA permit would be required prior to the development of the Makalawena Resort.

The resort as planned would be consistent with the objectives and policies of the Coastal Zone Management program and SMA policies and regulations as summarized below.

1. Recreational Resources

Objective:

o Provide coastal recreational opportunities accessible to the public.

Policies:

o Protect unique coastal recreational resources;

o Replace areas of recreational value as damaged or destroyed by development;

o Provide adequate public access;

o Develop new coastal recreational opportunities;

o Encourage the dedication of coastal areas with recreational value for public use.

Position: At present, access to the shoreline at Makalawena from Queen Kaahumanu Highway is via a jeep road that traverses the state owned Awakee lands to the north of Makalawena. By developing the site for resort use, the public would be provided unrestricted access to the coastal recreational opportunities by way of a designated public right-of-way. Provisions within the development plan would protect the ecologically sensitive areas along the shoreline as well as the adjacent coastal anchialine ponds. Provisions such as parking facilities for the public and other ancillary facilities would be determined in conjunction with detailed site development plans and Special Area Management Permit application.

2. Historic/Archaeological Resources

Objective:

o Protect, preserve and where desirable, restore significant historic and cultural resources.

Policies:

o Identify and analyze significant historic resources;

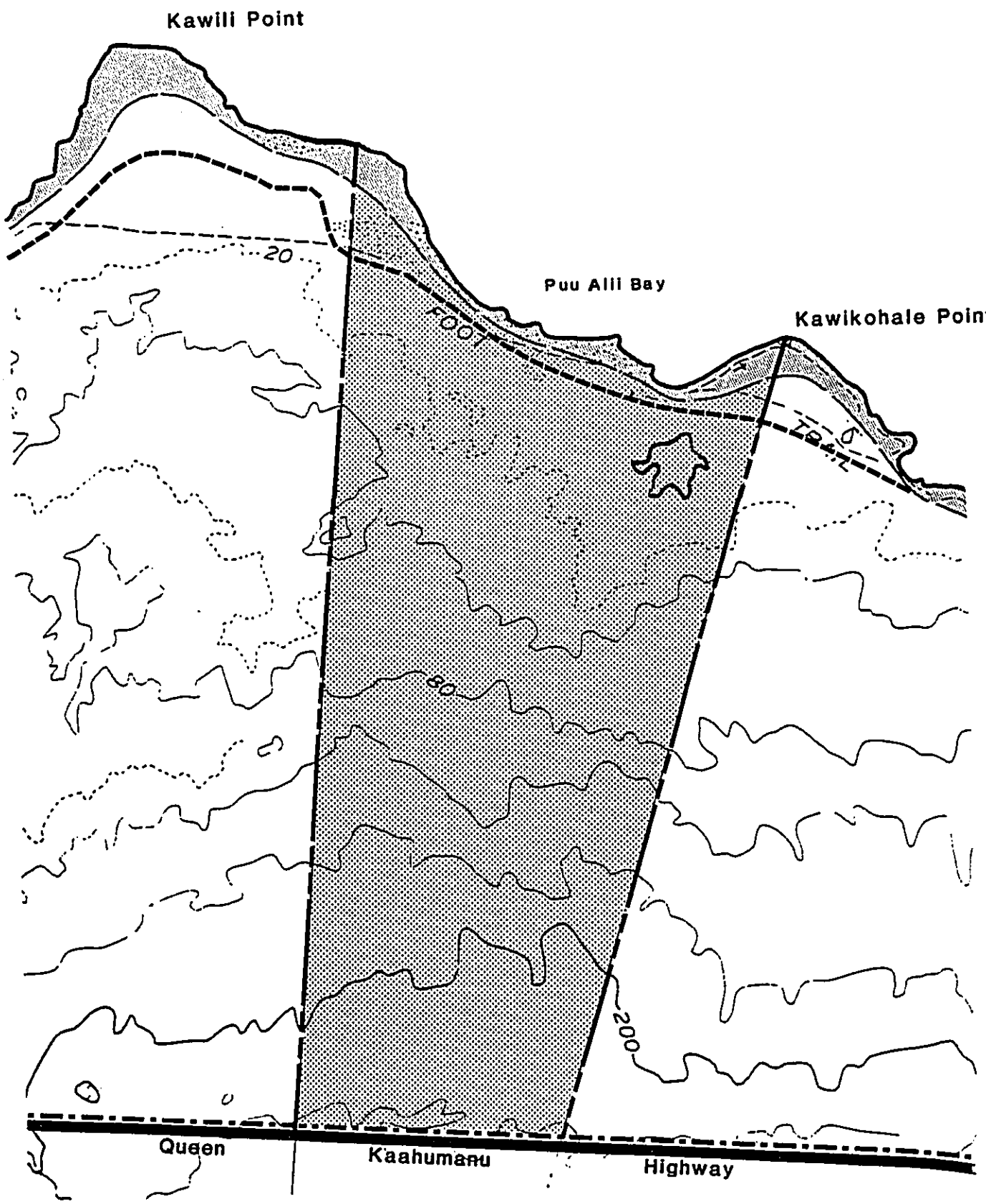

Kawili Point
Puu Alii Bay
Kawikohale Point
20
FOOT
6
80
200
Queen
Kaahumanu
Highway
LEGEND
100 TO 500 YEAR FLOOD BOUNDARY
LIMIT OF COASTAL HIGH HAZARD AREA
LIMIT OF SPECIAL MANAGEMENT AREA
FLOOD HAZARD AND SMA
MAKALAWENA RESORT
0 250 500 1000
FEET
pbr

FIGURE VI-3

o Maximize information retention through preservation and salvage.

Position: A Full Archaeological Reconnaissance Survey (Appendix C) has been completed for the project area and several significant archaeological sites have been identified within the resort area. The resort project proposes to protect, preserve and foster the restoration of significant historic and cultural resources where feasible.

The general mitigation plan calls for preservation/exhibition of 3 sites -- the cemetery, Kalawina Church and Opae'ula Pond complex. The remaining sites would undergo archaeological data recovery or preservation. Archaeological data recovery would be in two stages --(1) detailed mapping, sample surface collection, test excavation, and selected dating and then (2) further excavation and data recovery work as needed to recover adequate and reasonable amounts of information in sites to be destroyed. Analysis of relevant research problems, lab analyses and report write-up would also be integral parts of the data recovery work. Specific preservation and data recovery plans and execution of the plans would be reviewed and approved by the State Historic Preservation Office and County of Hawaii Planning Department.

3. Scenic and Open Space Resources

Objective:

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

Policies:

o Ensure that new developments are compatible with the visual environment;

o Preserve and maintain shoreline open space and scenic resources;

o Encourage developments which are not coastal dependent to locate inland.

Position: The resort development would protect, preserve, and where desirable, restore or improve the quality of coastal, scenic, and open space resources. Building improvements would be set back from the shoreline a minimum of 40 feet so that it retains its pristine character. The resort hotels would include attractive water play facilities to be built inland and thus would reduce pressure on the shoreline resource. A shoreline promenade would be provided along the shoreline to preserve and maintain the open space and scenic resources of Pu'u Ali'i.

4. Coastal Ecosystems

Objective:

o Protect valuable coastal ecosystems and to minimize adverse impact on all coastal ecosystems.

Policies:

o Preserve valuable coastal ecosystems of importance;

o Minimize disruption of coastal ecosystems;

o Protect water quantity and quality management practices.

Position: The proposed development does not adversely affect the coastal ecosystem or anchialine pond complex. Refer to Chapter IV, Section 4.5 for detailed discussion. In the implementation of a Pond Management Plan, a Department of the Army permit and CZM Federal consistency determination by DPED may be required if the ponds are to be altered or the actual coastline modified.

Regarding the project drainage system, storm water runoff and the potential impacts on water quality and near shore waters, refer to Section 3.4 Hydrology for a detailed discussion.

5. Economic Uses

Objective:

o Provide public and private facilities and improvements important to the state's economy in suitable locations.

Policies:

o Concentrate coastal dependent development in appropriate areas;

o Ensure coastal dependent developments minimize adverse social, visual and environmental impact;

o Direct location and expansion of development to existing designated areas.

Position: Makalawena has the desired scenic and climatic environment to support a destination resort development. As a coastal dependent development, the proposed resort would minimize adverse social, visual and environmental impacts as discussed in Chapter IV.

There is projected market demand for increased resort and residential uses within the region. Expanded resort facilities would improve the local economy by providing additional employment opportunities. The Big Island as a whole and the State's economy overall would also benefit from the resort development as summarized in Chapter IV, Section 4.22.

6. Coastal Hazards

Objectives:

o Reduce hazards to life and property from tsunami, storm waves, stream flooding, erosion and subsidence.

Policies:

o Control development in areas subject to coastal hazards;

o Ensure that developments comply with the requirements of the Federal Flood Insurance Program.

o Prevent coastal flooding from inland projects.

Position: The development plan has addressed the coastal hazards so as to minimize any potential threat to life or property. Adequate setbacks and building designs would be utilized to reduce any potential hazards to the coastal area of the resort.

6.8 FLOOD HAZARD CONTROL

The proposed plan for the resort would be in compliance with the Hawaii County Code - Chapter 22, Flood Hazard Control as follows:

Statement of Purpose:

To promote the public health, safety and general welfare, and to minimize public and private losses due to flood conditions in specific areas by provisions designed:

1. To protect human life and health;

2. To minimize expenditure of public money for costly flood control projects;

3. To minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;

4. To minimize prolonged business interruptions;

5. To minimize damage to public facilities and utilities located in areas of special flood hazard;

6. To help maintain a stable tax base by minimizing future flood loss;

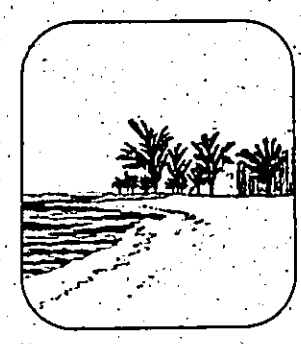
7. To assist in notifying potential buyers that property is in an area of special flood hazard; and

8. To insure that those who occupy areas of special flood hazard assume responsibility for their actions.

Position: Appropriate measures would be taken in areas that present some risk. Although construction is not expected to have an impact on potential flood hazard, the proper mitigating measures, as required by regulatory agencies and as recommended by consulting engineers, would be implemented in order to minimize adverse environmental effects.

VII

OFFSETTING CONSIDERATIONS OF GOVERNMENTAL POLICIES



CHAPTER VII

OFFSETTING CONSIDERATIONS OF GOVERNMENTAL POLICIES

As there are inherent conflicts in goals and objectives of land use plans, policies and controls, the proposed action's relationship to these various policies must be reconciled against those plan elements and policies that most appropriately apply. Discussed in Chapter V, the proposed project is consistent with the applicable Hawaii County General Plan goals, policies and standards except those for which this action is requesting to amend. One of the most significant ways in which the proposed action fulfills governmental policies, and therefore, is thought to offset any adverse effects, is through the satisfaction of the Hawaii State Plan policy which states that "Planning for the State's economy in general shall be directed toward achievement of the following objectives: (1) Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaii's people...To achieve the general economic objectives, it shall be the policy of this State to:...Encourage labor-intensive activities that are economically satisfying...Promote economic activities, especially those which benefit areas with substantial unemployment problems...Encourage businesses that have favorable financial multiplier effects within Hawaii's economy."

No significant adverse effects are expected to result from the proposed Makalawena Resort development. There are some minor impacts, but these are more than offset by the benefits the project will offer. State and county plans have encouraged quality resort development along this coast. The infrastructure ultimately required to serve the project will be largely provided by the project developer. The General Plan Amendment, including Land Use Pattern Allocation Guide Map (LUPAG) change and Intermediate Resort Designation, are initial steps in a process of project review necessary to assure a quality destination resort.

Analysis of the direct, indirect and induced public revenues versus public expenditures the resort will generate indicates that the cost/benefit ratio will be favorable.

As identified in Chapter IV, Section 4.22, the net fiscal impacts of the Makalawena Resort development to the county and state are estimated by comparison of the projected revenues and expenditures. The county may expect to net about $1.8 million to $2.7 million in additional annual revenues at project completion, in

1986 dollars. The additional county revenues generated by this project would range between 2.5 and 2.7 times the expenditures incurred by the county.

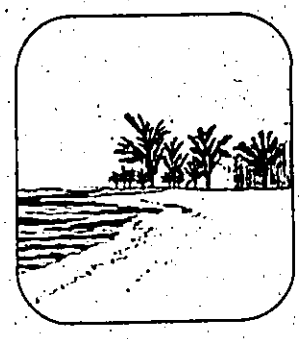
While this analysis did not incorporate the less quantifiable environmental costs, the environmental impacts of the proposed resort are not major. Although the existing lava dominated landscape will be transformed into a resort environment, the important resources of this land (including anchialine ponds, quality of the marine environment and shoreline, and significant archaeological sites) are expected to be preserved. The project will fulfill the implementing actions of several of the state functional plans which call for access to, and interpretation of, archaeological resources and unique coastal resources to foster visitors' and residents' understanding of Hawaii's history.

The government policies calling for increased access to the shoreline and increased recreational opportunities will also be met in the proposed Makalawena Resort. The archaeological preserves, wildlife refuge, shoreline access and golf course are recreational benefits that further offset any environmental costs associated with the requested General Plan Amendment and subsequent resort development approvals.

Generally, as discussed in Chapter VI, the plan is consistent with relevant government plans and policies. It would fulfill the goals of the Hawaii County General Plan which call for economic growth that maintains a desired physical environment and that meets the needs of Hawaii's people.

VIII

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



CHAPTER VIII

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

The principal long-term benefits of the existing site use and General Plan designations relate to the provision of uninterrupted open space, natural vistas and preservation of environmental features, such as coastal resources, the anchialine ponds and historical features. Additional possible advantages include avoidance of any public costs associated with extensions of infrastructure and services to the site.

As demonstrated in this document, the proposed Makalawena Resort does not appear to pose any long-term risks to health and safety, and includes provisions to maintain, enhance or make available to a broader public the long-term benefits associated with existing site use. Measures to ensure coastal resource integrity, including anchialine pond management and cultural resources management are integral features of the proposed development.

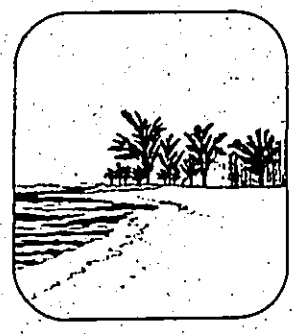
Existing views of the site and surrounding lands, while natural in character and uninterrupted, are dominated by barren lava fields. Over the long-term, these views will be replaced by man-made features and landscaped open space. These open space areas, including the golf course and the shoreline, will be maintained and landscaped so that the visual character of the resort is enhanced.

Other benefits of the proposed development include long-term employment opportunities and other economic benefits which it will bring to the region, county and state. Economic benefits will more than offset aggregate public costs associated with providing services to the resort and other indirect increases in population generated by increased employment opportunities in the region.

Because the area is largely barren lava fields with little or no agricultural value, future options for alternate uses of the land are limited. Thus, viable future options for use of the land and resources are limited, and the range of beneficial uses of the environment will not be significantly narrowed.

IX

UNRESOLVED ISSUES



CHAPTER IX

UNRESOLVED ISSUES

The developer is aware of concerns regarding the proposed project as well as other proposed resorts in West Hawaii. To resolve these issues, the developer is working with appropriate State, County and local agencies and groups. The following identifies known concerns that are being or have been addressed to date.

The General Plan Amendment request is the first of many approvals which must be obtained before Makalawena Resort development plans could be implemented. Other necessary approvals are listed in Chapter I. Clearly, consideration of the appropriateness of the proposed land use designations within the context of long range General Plan policies is the basic issue to be resolved at this juncture.

With implementation of the mitigation measures (identified in Chapter IV) at appropriate stages of project planning and review, most, if not all, of the significant issues associated with the proposed resort will be resolved. A listing of issues requiring further study at appropriate stages of project planning and review is provided below.

1. Anchialine Ponds. Specifics of a pond management plan to preserve and manage coastal pond resources will be resolved within the context of further detailed site planning and under the provisions for receiving a Special Management Area permit. A Draft Pond and Wildlife Refuge Management Plan is provided as Appendix E.

2. Opae'ula Pond. A wildlife refuge at Opae'ula Pond will be established in conjunction with development of the proposed project. The land owner has been and will continue to meet with appropriate Federal, State and County agencies to implement a management plan for this important wildlife habitat. The general wildlife refuge boundaries have been agreed upon (approximately 22 acres) in consultation with the U.S. Fish and Wildlife Service (see Appendix E).

3. Archaeological/Historical Sites. The ultimate disposition of individual sites through further site investigation and development of a cultural resources management program will be accomplished prior to initiating site development.

4. Transportation Improvements. Timing of potential widening of Queen Kaahumanu Highway and intersection improvements in response to cumulative traffic volumes will need to be assessed by the State Department of Transportation when regional traffic conditions warrant improvements.

5. Air Quality and Noise Standards. Compliance with Federal and state standards will be achieved.

6. Housing. Availability of adequate housing opportunities on site or in surrounding communities to meet project-generated needs will be determined prior to starting construction of the first hotel.

7. Public Access/Shoreline Management. Provisions for public access to and along the shoreline will be provided for in detailed site planning of the resort sites and resolved to the satisfaction of the county with the issuance of a Special Management Area permit.

X

CONSULTED PARTIES AND THOSE WHO PARTICIPATED IN THE PREPARATION OF THE DRAFT EIS

CHAPTER X

CONSULTED PARTIES AND THOSE WHO PARTICIPATED IN THE PREPARATION OF THE DRAFT EIS

10.1 CONSULTED PARTIES

The notice of availability of the Environmental Impact Statement Preparation Notice (EISPN) for Makalawena Resort development was published in the OEQC Bulletin by the Office of Environmental Quality Control on August 23, 1986. The agencies, organizations and individuals listed below were sent copies of the EIS Preparation Notice and were requested to comment on the project. Everyone believed to have an interest in the project or who requested consulted party status was included in the mailing. Those who responded to the request for comments are marked with an asterisk (*) and copies of the correspondence with them is included in this Chapter.

10.2 PARTIES TO BE CONSULTED FOR THE PREPARATION OF THE EIS

The agencies and organizations listed below will be sent copies of the EIS Preparation Notice (EISPN) and requested to comment on the proposed project.

Federal Agencies

* U.S. Army Corps of Engineers, Engineering Division
  U.S. Army Corps of Engineers, Pacific Ocean Division
* Department of Agriculture, Soil Conservation Service
* Department of Commerce, National Marine Fisheries Service - Honolulu
* Department of Energy
  Department of Health, Education and Welfare
* Department of Housing and Urban Development
* Department of Interior - Fish and Wildlife Service
  Department of Interior - Geological Survey, Water Resources Division
  Department of Labor, Occupational Safety and Health Administration
  Department of Transportation - Federal Aviation Administration
  Department of Transportation - U.S. Coast Guard
  Environmental Protection Agency

State Agencies

* Department of Accounting and General Services
* Department of Agriculture
* Department of Budget and Finance
* Department of Defense
* Department of Education
* Department of Hawaiian Home Lands
* Department of Health
  Department of Labor and Industrial Relations
  Department of Land and Natural Resources
* Department of Planning and Economic Development
* Department of Social Services and Housing
  Department of Taxation
* Department of Transportation
  Office of Environmental Quality Control
  Office of the Governor
  Office of Hawaiian Affairs

Congressional Representatives

* The Honorable Daniel K. Inouye
* The Honorable Spark M. Matsunaga
  The Honorable Daniel K. Akaka

State Legislatures

Senator Richard Henderson
Senator Richard M. Matsuura
Senator Malama Solomon
Representative Virginia Isbell
Representative Andrew Levin
Representative Robert Lindsey
Representative Wayne Metcalf
Representative Harvey Tajiri
Representative Dwight Takamine

Hawaii County

Mayor Dante K. Carpenter
* Department of Public Works
* Department of Parks and Recreation
  Department of Water Supply
* Department Research and Development
* Fire Department
* Office of Housing and Community Development
  Safety Coordinator
  Civil Defense Agency
  Finance Department
  Hawaii Redevelopment Agency
  Planning Department
* Police Department

Hawaii County Council

* James K. Dahlberg
* Frank De Luz, III
Takashi Domingo
Robert Herkes
Lorraine Jitchaku
Russell Kokubun
Merle K. Lai
Spencer Kalani Schutte
Stephen K. Yamashiro

Public Utilities

Hawaii Electric Light Company
Hawaiian Telephone
Gasco, Inc., Hawaii Division

Community Organizations, Individuals and Other Public Interest Groups

Big Island Chamber of Commerce
Big Island Business Council
Hawaii Hotel Association
Hawaii Visitors Bureau - Big Island Chapter
Moku Loa Group, Hawaii Chapter Sierra Club
* Kona/Kohala Chamber of Commerce
Hawaii Portugese Chamber of Commerce
ILWU
* Hawaii Audubon Society
* Alu Like
Board of Realtors - Island of Hawaii
Kona Historical Society
Conservation Council for Hawaii
Hawaii Island Economic Development Board
Hawaii Leeward Planning Conference
* Na Ala Hele
Hawaii Technology Development Company
* Sherry Berliner
* Rick Gaffney & Assoc. Inc.
* Mr. R.S. Marshall
* Mrs. W.R. Glover
* West Hawaii Today
* Hawaii Conference Foundation
* Natural Energy Laboratory of Hawaii

10.3 ORGANIZATIONS AND INDIVIDUALS WHO ASSISTED IN THE PREPARATION OF THIS DRAFT EIS

This Draft Environmental Impact Statement was prepared for Kamehameha Schools/Bernice Pauahi Bishop Estate by Phillips Brandt Reddick with input provided by the planning team and sub-consultants. The following organizations and persons were involved:

Planning Team

Kamehameha Schools/Bernice Pauahi Bishop Estate

Guido Giacometti, Director
Wallace Tirrell, Area Development Manager
Sydney Keliipuleole, Land Manager

Phillips Brandt Reddick & Associates, Planners

Wm. Frank Brandt, President
Thomas S. Witten, Principal-In-Charge

Subconsultants

Peat, Marwick, Mitchell & Company,
Marketing and Economic Consultant

Malcolm Tom
Ann Bouslog
John Frasier

Hilo Engineering, Inc.

Rodney M. Kawamura

William A. Brewer & Associates,
Marine/Coastal Biology and Chemical Oceanography

William A. Brewer, President

Char & Associates, Botanical Survey

Winona Char, Botanist

Paul H. Rosendahl, Ph.D., Inc., Archaeologist

Paul H. Rosendahl, Ph.D.
Theresa K. Donham
Alan T. Walker

Community Resources, Inc., Sociological/Cultural Analyses

John M. Knox, Ph.D.

Avifaunal and Feral Mammal Survey

Phillip L. Bruner

Hydrologist

John F. Mink

PHILLIPS BRANDT REDDICK

Wm. Frank Brandt	President
Thomas Witten	Principal-In-Charge
Gordon Chapman	Technical Writer
Russell Chung	Landscape Architect
Greta Bergdahl	Graphic Designer/Editor
Edith Masaki	Graphic Designer
Grace Wang	Word Processor
Debbie Takiguchi	Word Processor
Lisa Teruya	Word Processor
Lynn Warning	Editor

ENCLOSURE

SAMPLE LETTERS REQUESTING CONSULTATION

Phillips Brandt Reddick

August 22, 1986

Mr. Kisuk Cheung
Chief Engineering Division
U.S. Army Corps of Engineers
Pacific Ocean Division
Building 230
Fort Shafter, Hawaii 96858-5440

SUBJECT: MAKALAWENA RESORT DRAFT EIS PREPARATION NOTICE

Dear Mr. Cheung:

Enclosed for your review and comment is Kamehameha Schools/Bernice Pauahi Bishop Estate's (KS/BE) Environmental Assessment and Notice of Preparation for an Environmental Impact Statement (EIS) for the Makalawena Resort located in North Kona, Island of Hawaii.

In September 1984, a resource assessment, development strategy land use plan for the approximately 353 acres at Makalawena was submitted to the Hawaii County Planning Department for consideration in the update of the Hawaii County General Plan. Prepared for the Trustees of the KS/BE as part of their long-range planning for the coastal lands of Makalawena, the report concluded that these lands located 3.5 miles north of the airport with expansive stretches of white sand beaches, provide an outstanding setting for a quality low-density resort development.

Due to the uncertain time schedule of the current Hawaii General Plan Update process, an application for amendment has been submitted. The proposed General Plan Amendment requests an "Intermediate Resort" designation with various land uses including resort, medium density urban, open area, and conservation. The EIS will address cumulative effects of developing the proposed Makalawena Resort.

Should you, your agency, or organization have any comments or concerns that you would like to have addressed in the Draft EIS, please contact us.

Sincerely,

Thomas S. Witten, ASLA
Principal, PBR-Hawaii

Enclosure

cc: Mr. Albert L. Lyman, Director, Planning Department
Mr. Wallace K. Tirrell, KS/BE
OEQC

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

July 18, 1986

CHAPTER 343, HAWAII REVISED STATUTES

ENVIRONMENTAL IMPACT STATEMENT

NOTICE OF PREPARATION

for

MAKALAWENA RESORT

PROJECT LOCATION:	Makalawena, North Kona District, County of Hawaii TMK: 7-2-04:01
APPLICANT:	Kamehameha Schools/Bernice Pauahi Bishop Estate P.O. Box 3466 Honolulu, Hawaii 96801
EIS CONSULTANT:	Phillips, Brandt, Reddick & Assoc., Inc. (PBR-Hawaii) 130 Merchant Street, Suite 1111 Honolulu, Hawaii 96813
ACCEPTING AUTHORITY:	Department of Planning, County of Hawaii 25 Aupuni Street Hilo, Hawaii 96720
PROPOSED ACTIONS:	(1) Amendment to the General Plan and Land Use Pattern Allocation Guide Map from Conservation to Intermediate Resort Medium Density, and Open Area; and (2) State Land Use Boundary Amendment from Conservation to Urban.
DETERMINATION:	Pursuant to Chapter 343 HRS, as amended, a request for a General Plan Amendment is being submitted to the Hawaii County Planning Department. Since the project as a whole may have a significant impact, an Environmental Impact Statement will be prepared for the Makalawena Resort.

I. Background

Makalawena lies on the dry, leeward coast of the island of Hawaii in the district of North Kona (See Exhibit 1). The project area consists of approximately 353 acres extending from the Queen Kaahumanu Highway (elevation 220 feet) to the coastline at Puu Alii Bay. The parcel is roughly rectangular in shape with a slightly broader width on the coastline than on the highway. The parcel contains 3,000 feet of ocean frontage and 2,000 feet of frontage on the highway. The proposed project site is located approximately 3.5 miles north of Keahole Airport and 10 miles north of Kailua-Kona town. The bulk of the land consists of older lava flows now covered with a scattered cover of fountain and pili grasses. Along the coast are four crescent white sand beaches backed by sand dunes, brackish ponds and Kiawe thicket.

The beaches of Makalawena are among the finest anywhere along the Kona Coast. The sand is white and fine grained with substantial inland deposits that have grown into coastal dunes now covered with Beach Morning Glory and Kiawe thicket.

Another of Makalawena's distinct coastal features is a grove of Iron Wood trees along its northern coastal boundaries. These were planted by the landowner several decades ago and now provide shade and visual diversity on an otherwise barren coastline.

Located inland from the beach are brackish water ponds ranging in size from several square yards to as much as 7 acres. The largest pond is called Opaeula. This pond is a major feature on the site, both in size and in environmental significance. Opaeula has been identified by State and Federal Wildlife experts as an important habitat for native and exotic waterfowl, including the Hawaiian Silt, the Hawaiian Coot, and a variety of migratory ducks and plovers.

Makalawena lies in the area of North Kona that was traditionally referred to as "Kekaha" meaning literally "the place". These are lava lands, ravaged over the years by flows from both Hualalai and Mauna Loa. The area dry and remote with an average annual rainfall of 10 - 15 inches.

The lands of Kekaha supported substantial prehistoric settlement with a lingering population of permanent residents remaining into the middle of the 20th century. This settlement was located primarily on the coastline in small pocket of habitable lands such as Kaupulehu, Anaehoomalu, Makalawena and Mahaiula. These settlements, however, were not isolated self-sufficient entities. They functioned in conjunction with a broader social and economic network which involved regional resources and regional leadership. Kekaha was not a rich land compared to the other parts of the Kona region, but at a broad level the trading and sharing of resources from mountain to ocean established a functional setting for sustained settlement.

A prehistoric coastal trail system established an essential communication link among the distant regions of West Hawaii and brought the remote settlements at places like Makalawena into closer contact with the outside world. Later trails sought more direct routes that passed further inland. Historic trail improvements also took place to accommodate horse and cart traffic. Remnants of a coastal foot trail are visible in the lava area adjacent to Makalawena and an improved trail leads into the uplands from Opaeula Pond.

Opaeula was a primary feature in the prehistoric landscape although its significance in terms of settlement has not been fully determined. Red Shrimp or Opaeula were said to appear naturally in the pond and may have been harvested prehistorically for bait to catch schooling fish such as opelu or akule.

The proposed project site is surrounded on the north and south by barren lava flow, lands owned by the State of Hawaii. Refer to Exhibit 2.

II. Objective

Kamehameha Schools/Bernice Pauahi Bishop Estate's objective is to develop a high quality, low density resort community at Makalawena that will provide a luxury hotel, golf-oriented multi-family residences, a tennis complex, a wildlife refuge surrounding Opaeula Pond and improved public access to the beaches fronting the property.

The resort community will be a portion of the visitor industry facilities in West Hawaii and will provide necessary employment opportunities and income to the residents of the area. To achieve the objective, it is necessary to amend the Hawaii County General Plan and obtain a boundary amendment to the State Land Use district.

III. Description of the Proposed Project

The conceptual development plan for a high quality, low density resort community at Makalawena includes a 45 acre hotel site that could accommodate 900 - 1,200 rooms; approximately 90 acres of multifamily residences (900 - 1,350 units); and a championship 18-hole golf course, tennis center, wildlife refuge and roadway, and other infrastructure support facilities (Refer to Exhibit 3). With a distinctive entry drive winding down through the golf course to the coastal area, the resort master plan includes isolated multifamily residential sites with golf course frontage. Oriented towards pedestrian or cart traffic, the golf club house and tennis center are in close proximity to the hotel with access routes provided the residential areas. A shoreline open space and park area is provided along the entire shoreline with public access to be incorporated into the hotel site development. To

protect and maintain the important wildlife habitat of the site. Opaeula Pond is incorporated to a Wildlife Refuge that will provide a management plan to assure the continued protection of this portion of the site.

The preliminary land use allocation based on the conceptual development plan includes:

Land Use	Gross Acreage	Density (Net)	Units
Resort Hotel	45	20 - 25	900 - 1200
Multifamily Residential	90	10 - 15	900 - 1350
Golf Course	167.5	-	-
Tennis Center	5.5	-	-
Shoreline Open Space	15	-	-
Wildlife Refuge	18	-	-
Roads and Other Infrastructure	12.5	-	-
Total:	353 acres		1800 - 2550

IV. Description of the Affected Environment

Makalawena lies on the leeward side of the Island of Hawaii at the foot of Hualalai. The area receives less than twenty inches of rainfall annually, much of which comes from southeasterly or Kona storms during the winter months. Winds are generally variable on a daily basis and are generally lighter than the stiff trades common to the South Kohala Coast.

The soils of Makalawena consist primarily of pahoehoe and a'a lavas. The Soil Conservation Service Soil Survey indicates four soil types in the area including a'a lava (rLU), pahoehoe lava (rLW), rock land (rRO), and beach (BH). The Land Study Bureau Soil Classification Study indicates a similar breakdown of soil types and assigns the entire area an "E" classification on a productivity scale from A (best) to E (worst). Since both the Soil Conservation Service and the Land Study Bureau based their classification on reconnaissance aerial surveys, they do not reflect micro-soil conditions that exist on the fringe of Opaeula Pond. Substantial amounts of organic material and sand deposits have collected in the pond creating 2-4 feet of sediment which supports plant life. The pond is however subject to tidal fluctuations that saturate much of the sediment deposits on a daily basis and limits the vegetation types to those common to coastal wetland areas.

Makalawena also has substantial sand deposits with a concentration of sand dunes on the southern end of Puu Alii Bay. The sand consists of white, fine grained coral and is considered to be among the best sand deposit on the Kona Coast. Recent beach erosion has exposed a rock base in some places along the shoreline. The sand dunes behind the beach are stable and are covered with Kiawe and Beach Morning Glory.

Opaeula Pond is a 7-acre body of brackish water located near the coast and northern boundary of Makalawena (Refer to Exhibit 4). The pond is shallow with an average depth of 4-12 inches. The bottom is muddy and the pond generally resembles a marsh rather than an open fishpond as commonly found elsewhere along the Kohala Coast. The pond is surrounded by a dense Kiawe thicket and a number of smaller satellite ponds are scattered in the general vicinity.

A preliminary survey of Opaeula indicates only limited evidence that the pond was improved or actively utilized by early Hawaiians. Named for the red shrimp that inhabit the pond, local lore tell of these shrimp being caught in nets by fishermen and used as bait to attract schools of opelu.

State and Federal wildlife agencies have indicated that Opaeula is home for several species of native waterfowl. Hawaiian stilts, coots and ducks all inhabitat the pond with active breeding populations and are dependent on its marshlands for nesting and protection.

In addition to native waterfowl, Opaeula is also the seasonal home for several species of migratory birds. Plovers, ducks, widgeons, tattlers, and turnstones have all been sighted at Opaeula during the winter months. Like the native waterfowl, these migratory birds depend on the marsh ecosystem of Opaeula and other coastal ponds along the Kona Coast.

Opaeula is a major feature in Makalawena and will receive early planning attention to minimize any potential impacts. A wetlands permit requirement from the Corps of Engineers, the Endangered Species Act, and preliminary discussions with the U.S. Fish and Wildlife Service indicate the need to design a protection program to preserve the pond's habitat function. Such a program might include the fencing of specific refuge boundaries and the limiting of public access to specific interpretive locations. A refuge management program could also be implemented to improve and monitor habitat activities.

Details of a protection program for Opaeula will be developed cooperatively with the Owners, County, State and Federal wildlife agencies.

Archaeological studies conducted on the site indicate that Makalawena does not appear to have been the site of extensive settlement. However, a few dwelling sites and house foundations have been located (Refer to Exhibit 4). A comprehensive archaeological reconnaissance survey and a cultural resources management plan will be prepared to assure the long-term protection of Makalawena's historic resources.

V. Major Impacts

Implementation of the proposed project will involve grading, vegetation removal and replacement, the development of potable water supplies and installation of water transmission and distribution lines, development of a sewer treatment plant, the construction of the hotel, multi-family residences, 18-hole golf course and tennis complex, improving public access to the beaches along Puu Alii Bay and development and management of a wildlife refuge at Opaeula Pond. The potential exists for significant environmental effects, including the following, many of which are considered beneficial to the North Kona District:

- o Reconfiguration of the terrain due to grading and landscaping;
- o Change in the visual character of the site due to new landscaped areas, buildings and recreational areas;
- o Airborne dust and nois during the construction period;
- o Impacts on historical and archaeological sites that will be mitigated through recordation and preservation;
- o Improved public access, increased usage of the beaches along Puu Alii Bay and may affect coastal water quality;
- o Development of new potable water supplies, construction of a sewer treatment plant, and increased use of public utilities and services;
- o Increased short- and long-term employment;
- o Increased population levels;
- o Increased personal income and business activity;
- o Increased employee demand for housing;
- o Increased governmental revenues and expenditures;
- o May affect a rare, threatened, or endangered species of animal or plant or their habitat; and

- o Development and management of a wildlife refuge at Opaeula Pond.

VI. Determination and Supporting Reasons

Kamehameha Schools/Bernice Pauahi Bishop Estate is requesting an amendment to the Hawaii County General Plan and will be requesting a boundary amendment to the State Land Use district. Since the project, as a whole, may have a significant effect on the environment, an EIS, per Chapter 343, Hawaii Revised Statutes, will be prepared. It is planned that marine coastal biological and oceanographic, terrestrial flora and fauna and archaeological surveys will be conducted as part of the EIS process. It is also planned that a market assessment, socioeconomic and public facilities and services analysis will be conducted as part of the EIS process. The benefits as well as potential adverse environmental impacts will be fully documented in the EIS.

VII. Parties to be Consulted for the Preparation of the EIS

The agencies and organizations listed below will be sent copies of the EIS Preparation Notice (EISPN) and requested to comment on the proposed project.

Federal Agencies

U.S. Army Corps of Engineers, Pacific Ocean Division
Department of Agriculture, Soil Conservation Service
Department of Commerce, National Marine Fisheries Service - Honolulu
Department of Energy
Department of Health, Education and Welfare
Department of Housing and Urban Development
Department of Interior - Fish and Wildlife Service
Department of Interior - Geological Survey, Water Resources Division
Department of Labor, Occupational Safety and Health Administration
Department of Transportation - Federal Aviation Administration
Department of Transportation - U.S. Coast Guard
Environmental Protection Agency

State Agencies

Department of Accounting and General Services
Department of Agriculture
Department of Budget and Finance
Department of Defense
Department of Education
Department of Hawaiian Home Lands
Department of Health
Department of Labor and Industrial Relations

Department of Land and Natural Resources
Department of Planning and Economic Development
Department of Social Services and Housing
Department of Taxation
Department of Transportation
Office of Environmental Quality Control
Office of the Governor
Office of Hawaiian Affairs

Congressional Representatives

The Honorable Daniel K. Inouye
The Honorable Spark M. Matsunaga
The Honorable Daniel K. Akaka

State Legislatures

Senator Richard Henderson
Senator Richard M. Matsuura
Senator Malama Solomon
Representative Virginia Isbell
Representative Andrew Levin
Representative Robert Lindsey
Representative Wayne Metcalf
Representative Harvey Tajiri
Representative Dwight Takamine

Hawaii County

Mayor Dante K. Carpenter
Planning Department
Department of Public Works
Department of Parks and Recreation
Department of Water Supply
Department Research and Development
Fire Department
Office of Housing and Community Development
Safety Coordinator
Civil Defense Agency
Finance Department
Hawaii Redevelopment Agency
Planning Department
Police Department

Hawaii County Council

James K. Dahlberg
Frank De Luz, III
Takashi Domingo
Robert Herkes
Lorraine Jitchaku
Russell Kokubun
Merle K. Lai

Spencer Kalani Schutte
Stephen K. Yamashiro

Public Utilities

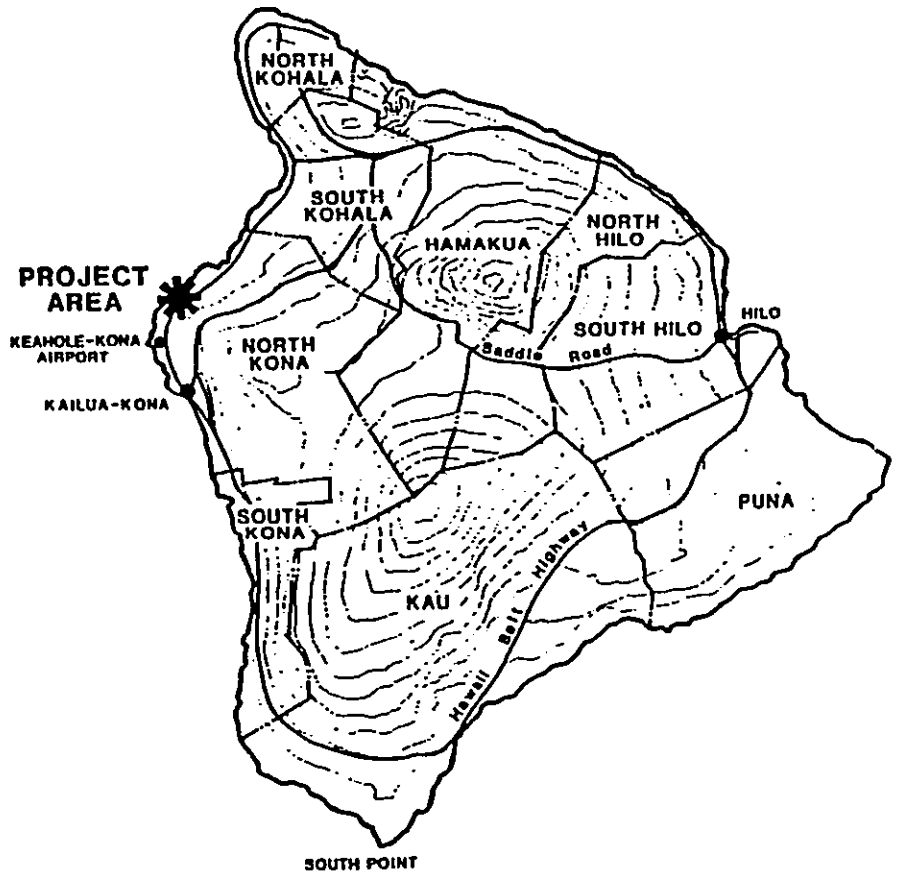
Hawaii Electric Light Company
Hawaiian Telephone
Gasco, Inc., Hawaii Division

Community Organizations and Other Public Interest Groups

Big Island Chamber of Commerce
Big Island Business Council
Hawaii Hotel Association
Hawaii Visitors Bureau - Big Island Chapter
Conservation Council for Hawaii
Hawaii Leeward Planning Conference
Kona/Kohala Chamber of Commerce
Sierra Club, Hawaii Chapter
Na Ala Hele

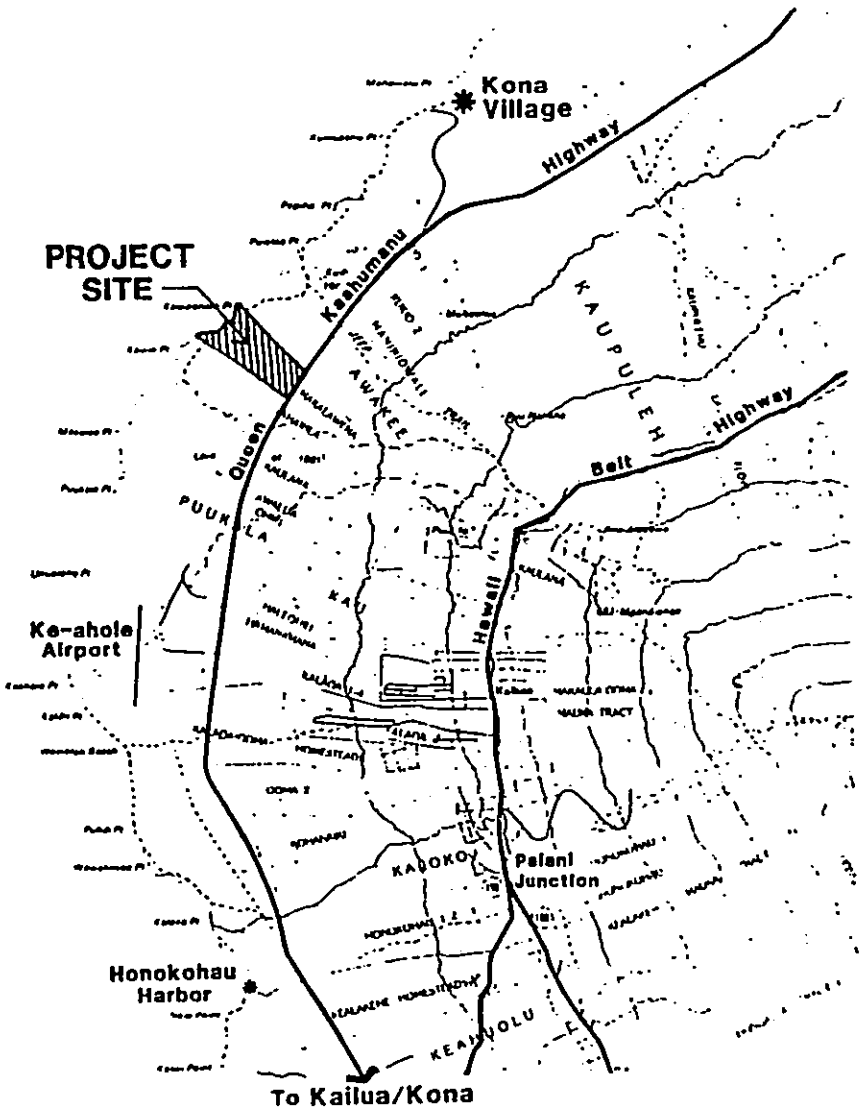
Exhibits

1. Regional Location
2. Land Ownership
3. Conceptual Development Plan
4. Archaeological Sites
5. Existing Hawaii County General Plan
6. Proposed General Plan



ISLAND LOCATION MAP

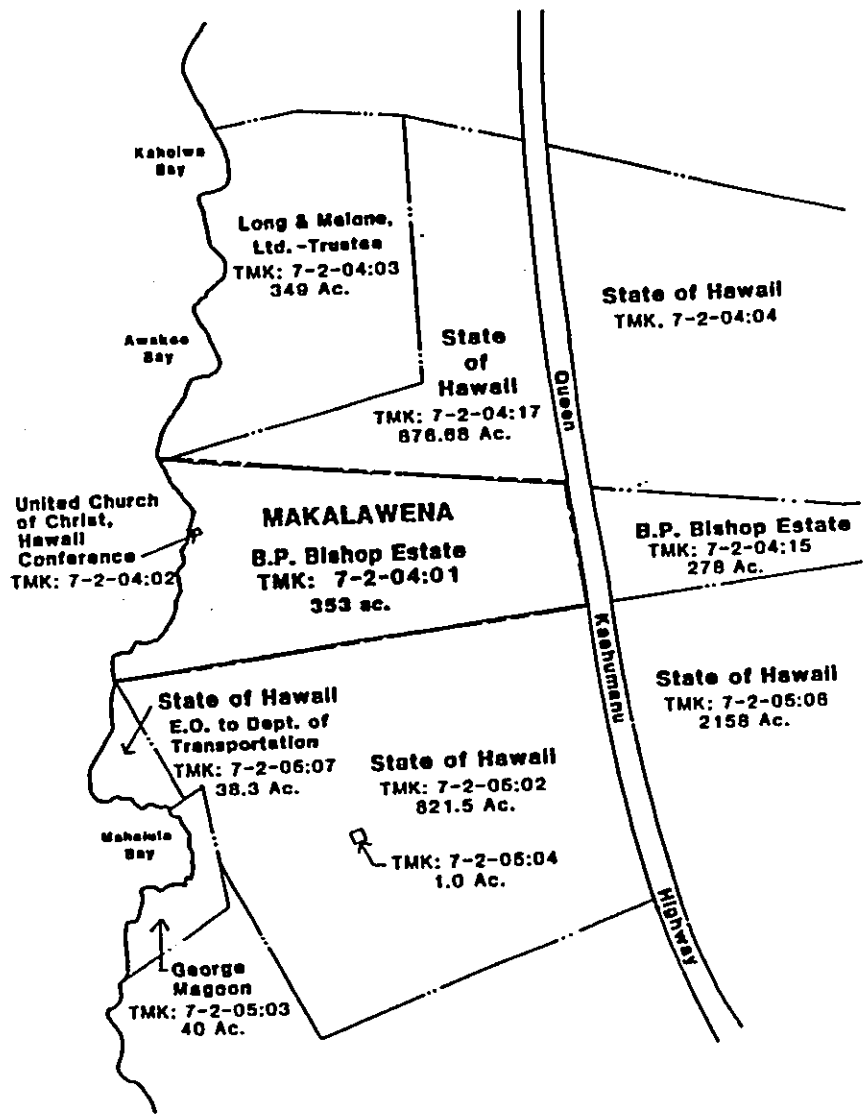
MAKALAWENA RESORT



REGIONAL LOCATION MAP

MAKALAWENA RESORT

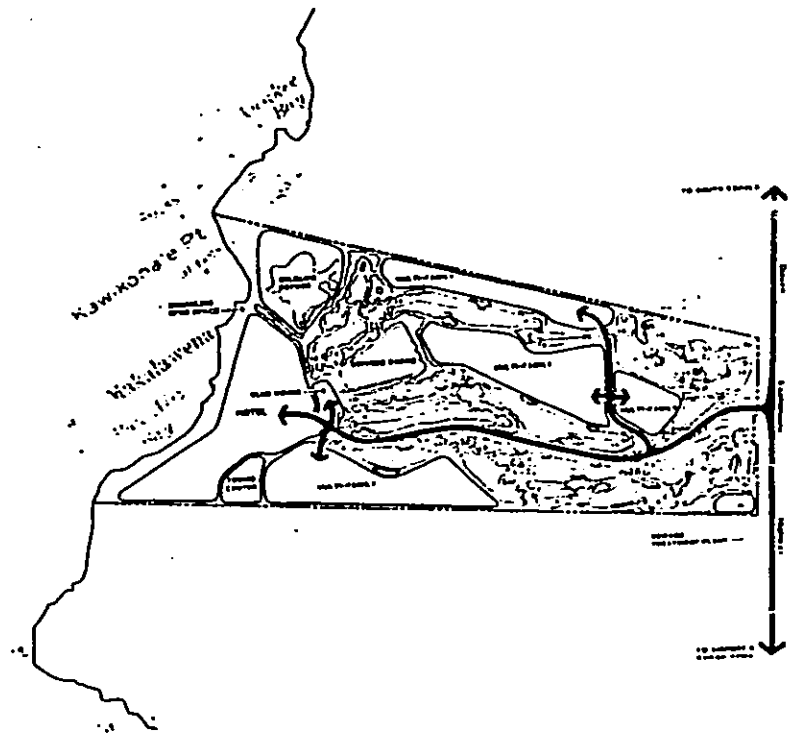
EXHIBIT 1



LAND OWNERSHIP/TAX MAP KEY

MAKALAWENA RESORT

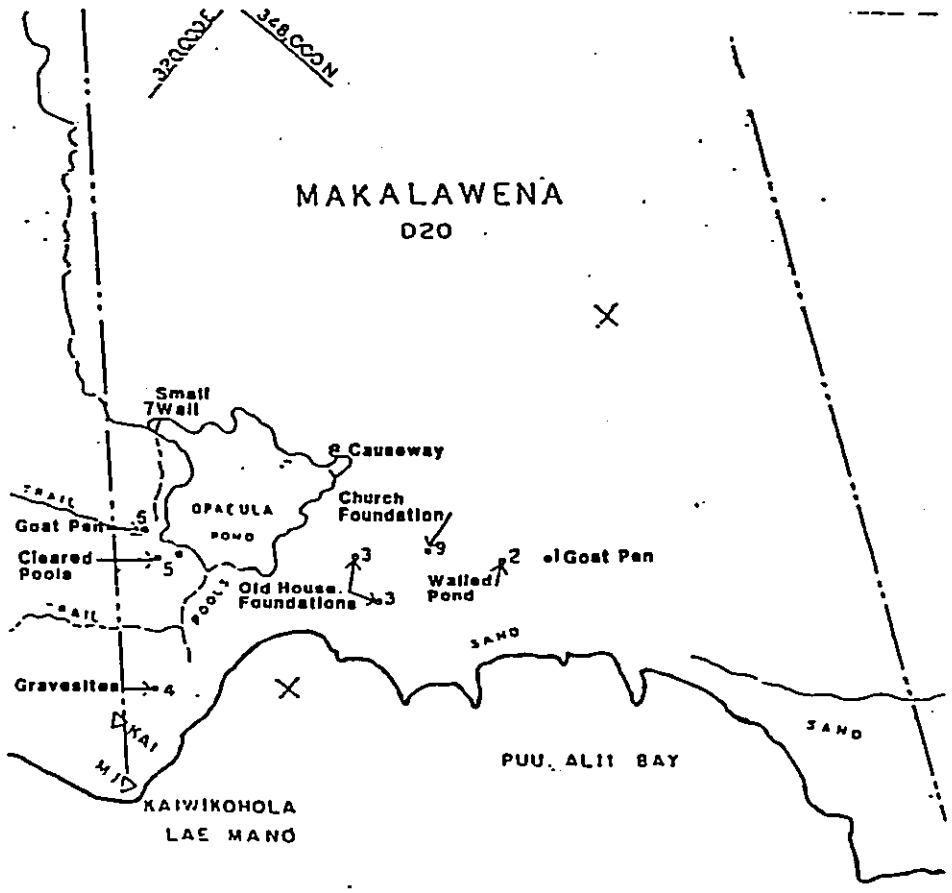
EXHIBIT 2



CONCEPTUAL DEVELOPMENT PLAN

MAKALAWENA RESORT

EXHIBIT 3

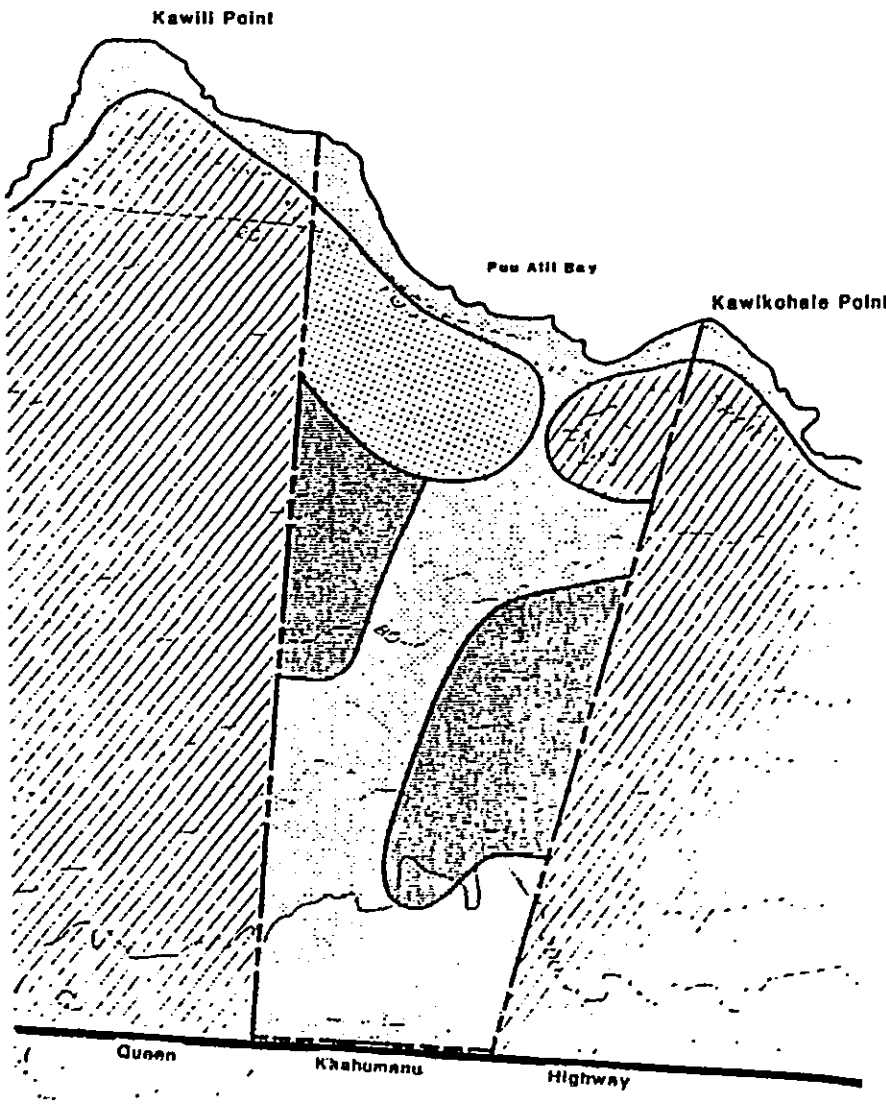


Source: Archaeology and History in Kaupulehu and Makalawena, Kona, Hawaii, Lloyd J. Soehren, Bishop Museum, 1963

ARCHAEOLOGICAL SITES

MAKALAWENA RESORT

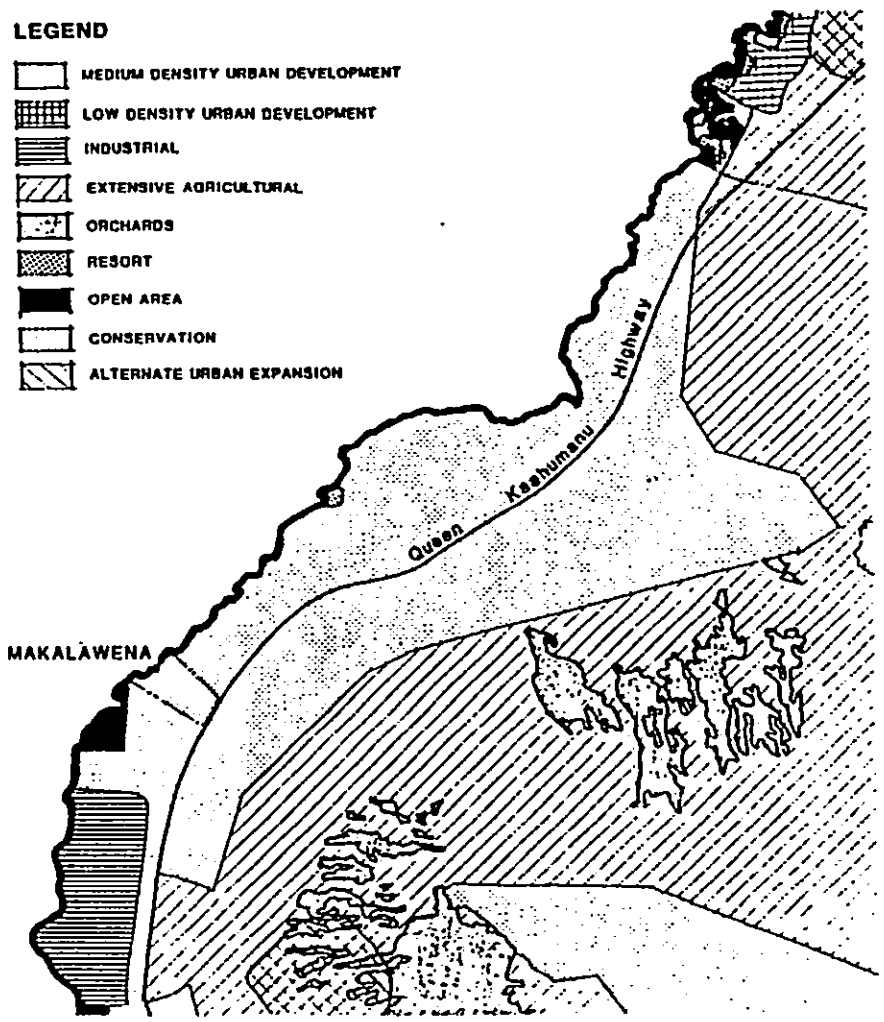
EXHIBIT 4



PROPOSED AMENDMENT-HAWAII GENERAL PLAN

MAKALAWENA RESORT

EXHIBIT 5



EXISTING HAWAII GENERAL PLAN

MAKALAWENA RESORT

EXHIBIT 6

COPY

PLANNING DEPARTMENT
25 AUPUNI STREET

COUNTY OF HAWAII
HILO, HAWAII 96720

RECEIVED
AUG 11 1986
PHILLIPS BRANDT

August 5, 1986

Office of Environmental Quality Control
Pekuaneon Building, Room 115
465 South King Street
Honolulu, HI 96813

Gentlemen:

Environmental Impact Statement
Preparation Notice

Enclosed please find one original and three copies of an environmental assessment and preparation notice for the proposed Makalawena Resort Community at Makalawena, North Kona, Island of Hawaii (TMK: 7-2-04:1).

The applicant, Kamehameha Schools/Bernice Pauahi Bishop Estate, seeks to change the General Plan designation from Conservation to Resort, Medium Density Urban and Open Area designations.

Comments on the EIS Preparation Notice should be sent to the consultant:

Mr. Thomas S. Witten, ASLA
PBR - Hawaii
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

With copies to:

Mr. Albert L. Lyman, Director
Planning Department
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Mr. Wallace K. Tirrell
Area Development Manager
P. O. Box 3466
Honolulu, Hawaii 96801

Should you have any questions, please feel free to contact our office.

Sincerely,

ALBERT LONO LYMAN
Planning Director

AK:aeb

enclosure

cc: Mr. Wallace K. Tirrell (w/encl.)
Mr. Thomas S. Witten (w/encl.)

ENVIRONMENTAL ASSESSMENT &
NOTICE OF PREPARATION OF AN
ENVIRONMENTAL IMPACT STATEMENT

MAKALAWENA RESORT COMMUNITY
North Kona, Island of Hawaii

I. APPLICANT

Kamehameha Schools/Bernice Pauahi
Bishop Estate
P. O. Box 3466
Honolulu, Hawaii 96801

CONSULTANT

Phillips, Brandt, Reddick & Assoc., Inc.
(PBR-Hawaii)
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

II. ACCEPTING AUTHORITY

Planning Department
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

III. CLASS OF ACTION

General Plan Amendment Petition

IV. PROJECT DESCRIPTION

A. Location and Ownership

The project site, comprised of approximately 353 acres, is located on the west coast of the island of Hawaii, North Kona Judicial District, Makalawena ahupua'a. The property is identified as tax map key 7-2-04:1. The site is approximately 3.5 miles north of the Keahole Airport and 10 miles north of Kailua-Kona.

The subject property is situated makai and along Queen Ka'ahumanu Highway and extends to the coastline at Pu'u Ali'i Bay. It is bounded on both sides by vacant state-owned lands. To the north in the Awake'e ahupua'a, the state-owned land runs along almost the entire boundary. The coastal frontage is owned by the Long & Melone, Ltd. Trust.

The property is owned by the Bishop Estate except for a single 10,000 square foot parcel, located near the Opae'ula Pond, which belongs to the United Church of Christ, Hawaii Conference.

B. Conceptual Plan

A General Plan amendment is being sought by the applicant to change the Land Use Pattern Allocation Guide (LUPAG) Map designation from Conservation to Resort, Medium Density Urban and Open Area designations, in order to accommodate a proposed high quality, low density resort community. The applicant's master plan would include the following:

1. Resort Hotel (45 acres) -- The hotel site would be located adjacent to Pu'u Ali'i Bay and would accommodate 900-1,200 rooms.

2. Multi-family Residential (90 acres) -- Approximately 900-1,350 units would be located throughout the site.

3. Recreation Area (173 acres) -- An 18-hole championship golf course would be designed around the multi-family residential sites. The golf clubhouse, driving range and tennis center would be situated in close proximity to the hotel site. A shoreline open space and park area would be provided along the entire shorel - with public access to be incorporated into the hotel site development.

4. Wildlife Refuge (18 acres) -- The Opae'ula Pond would be protected and maintained as a wildlife refuge site due to its important wildlife habitat.

5. Others (27 acres) -- The remaining project area would be used for roads, a sewage treatment plant and open space.

All necessary infrastructures for sewage, water, drainage, electrical, telephone and roads would be constructed to County standards. The sewage and water facilities may be maintained privately.

V. DESCRIPTION OF AFFECTED ENVIRONMENT

A. Setting

Makalawena lies on the leeward coast of the island of Hawaii in the district of North Kona. The project area consists of approximately 353 acres extending from the Queen Ka'ahumanu Highway (elevation 220 feet) to the coastline at Pu'u Ali'i Bay. The parcel is roughly

rectangular in shape with a slightly broader width on the coastline than on the highway. The parcel contains 3,000 feet of ocean frontage and 2,000 feet of frontage on the highway. The bulk of the land consists of older lava flows now covered with a scattered cover of fountain and pili grass.

The area is dry and remote with an average annual rainfall of 10-15 inches, much of which comes from southeasterly or Kona storms during the winter months. Winds are generally variable on a daily basis and are generally lighter than the stiff trades common to the South Kohala Coast.

Along the coast are four crescent white sand beaches backed by sand dunes, brackish ponds and Kiawe thicket. Makalawena has substantial sand deposits with a concentration of sand dunes on the southern end of Pu'u Ali'i Bay. The sand consists of white, fine grained coral and is considered to be among the best sand deposit on the Kona Coast. Recent beach erosion has exposed a rock base in some places along the shoreline. The sand dunes behind the beach are stable and are covered with Kiawe and Beach Morning Glory.

Another of Makalawena's distinct coastal features is a grove of Iron Wood trees along its northern coastal boundaries. These were planted by the landowner several decades ago and now provide shade and visual diversity on an otherwise barren coastline.

B. Anchialine Ponds

Located inland from the beach are brackish water ponds ranging in size from several square yards to as much as 7 acres. The largest pond is called Opae'ula. Opae'ula Pond is a 7-acre body of brackish water located near the coast and northern boundary of Makalawena. The pond is shallow with an average depth of 4-12 inches. The bottom is muddy and the pond generally resembles a marsh rather than an open fishpond as commonly found elsewhere along the Kohala Coast. The pond is surrounded by a dense Kiawe thicket and a number of smaller satellite ponds are scattered in the general vicinity.

Substantial amounts of organic material and sand deposits have collected in the pond creating 2-4 feet of sediment which supports plant life. The pond is however subject to tidal fluctuations that saturate much of the sediment deposits on a daily basis and limits the vegetation types to those common to coastal wetland areas.

C. Flora/Fauna

Opae'ula Pond is a major feature on the site, both in size and in environmental significance. State and Federal wildlife agencies have indicated that Opae'ula is home for several species of native waterfowl. Hawaiian silts, coots and ducks all inhabit the pond with active breeding populations and are dependent on its marshlands for nesting and protection.

In addition to native waterfowl, Opae'ula is also the seasonal home for several species of migratory birds. Plovers, ducks, widgeons, tattlers, and turnstones have all been sighted at Opae'ula during the winter months. Like the native waterfowl, these migratory birds depend on the marsh ecosystem of Opae'ula and other coastal ponds along the Kona Coast.

D. Historic/Archaeological Resources

Makalawena is in an area traditionally referred to as "Kekaha." The lands of Kekaha supported substantial prehistoric settlement with a lingering population of permanent residents remaining into the middle of the 20th century. This settlement was located primarily on the coastline in small pockets of habitable lands such as Kaupulehu, Anaehoomalu, Makalawena and Mahaiula. These settlements, however, were not isolated self-sufficient entities. They functioned in conjunction with a broader social and economic network which involved regional resources and regional leadership. Kekaha was not a rich land compared to the other parts of the Kona region, but at a broad level the trading and sharing of resources from mountain to ocean established a functional setting for sustained settlement.

A prehistoric coastal trail system established an essential communication link among the distant regions of West Hawaii and brought the remote settlements at places like Makalawena into closer contact with the outside world. Later trails sought more direct routes that passed further inland. Historic trail improvements also took place to accommodate horse and cart traffic. Remnants of a coastal foot trail are visible in the lava area adjacent to Makalawena and an improved trail leads into the uplands from Opae'ula Pond.

Opae'ula was a primary feature in the prehistoric landscape although its significance in terms of settlement has not been fully determined. Red Shrimp or Opae'ula were said to appear naturally in the pond and may have been harvested pre-historically for bait to catch schooling fish such as opelu or akule.

Archaeological studies conducted on the site indicate that Makalawena does not appear to have been the site of extensive settlement. However, a few dwelling sites and house foundations have been located. A comprehensive archaeological reconnaissance survey and a cultural resources management plan will be prepared to assure the long-term protection of Makalawena's historic resources.

E. Soils

The project area are lava lands, ravaged over the years by flows from both Hualalai and Mauna Loa. The soils of Makalawena consist primarily of pahoehoe and a'a lavas. The Soil Conservation Service Soil Survey indicates four soil types in the area including a'a lava (rLU), pahoehoe lava (rLW), rock land (rRO), and beach (BH). The Land Study Bureau Soil Classification Study indicates a similar breakdown of soil types and assigns the entire area an "E" classification on a productivity scale from A (best) to E (worst). Since both the Soil Conservation Service and the Land Study Bureau based their classification on reconnaissance aerial surveys, they do not reflect micro-soil conditions that exist on the fringe of Opae'ula Pond.

VI: Summary of Major Impacts and Mitigation Measures

A. Coastal Resources

1. Shoreline -- Storm flooding at the project site is not a serious concern because of the low rainfall and highly permeable soils. The necessary setbacks and structural floodproofing will be complied with State and County regulations to minimize the hazard of possible tsunami inundation.

   Preserving the beauty of Pu'u Ali'i Bay and shoreline area of Makalawena is essential to the success of the proposed project. Therefore, the design of the project will include appropriate setbacks and view corridors to protect the coastal vistas.

2. Water Quality -- Drainage and wastewater facilities will be designed to mitigate impacts on coastal water quality. Further analysis of the environmental impacts of the proposed project will be provided through the EIS.

3. Public Access -- The proposed project will provide public access to, and the development of, the shoreline for recreational uses, maintaining and restoring significant historic trails, and establishing a wildlife refuge around Opae'ula Pond.

B. Flora and Fauna

Native plants and wildlife will be protected by creating a wildlife refuge that will encompass all of Opae'ula Pond. Also, the few anchialine ponds along the coastline will be retained in the site plan, and the use of native dry land and coastal strand plant species included in the landscaping.

C. Anchialine Ponds

Opae'ula is a major feature in Makalawena and will receive early planning attention to minimize any potential impacts. a wetlands permit requirement from the Corps of Engineers, the Endangered Species Act, and preliminary discussion with the U. S. Fish and Wildlife Service indicate the need to design a protection program to preserve the pond's habitat function. Such a program might include the fencing of specific refuge boundaries and the limiting of public access to specific interpretive locations. A refuge management program could also be implemented to improve and monitor habitat activities. Details of a protection program for Opae'ula will be developed cooperatively with the owners, County, State and Federal Wildlife agencies.

D. Population and Employment

Employment opportunities will result from the construction activities, hotel services, vacation rentals, and other retail operations. Directly and indirectly, the proposed development will increase regional employment and resident population growth will be anticipated. Mitigation measures for employee housing demands need to be addressed as part of the EIS preparation. The increased economic activity is expected to yield concomit : increases in State and County tax revenues through income, property and excise taxes.

VII. DETERMINATION OF SIGNIFICANCE

The proposed project has the potential of significantly altering the environment. Therefore, it is determined that the preparation of an Environmental Impact Statement is warranted. The reasons supporting this determination, which are based on the significance criteria in Section 11-200-12 of the Environmental Quality Commission EIS Rules, are as follows:

A. The proposed action may involve an irrevocable commitment of resources.

B. The proposed action may involve substantial secondary impacts, such as population changes or effects on public facilities.

C. The proposed action is individually limited, but cumulatively may have an effect upon the environment or involve a commitment for larger actions.

D. The proposed action may effect a rare, threatened, or endangered species of animal or plant or their habitat.

E. The proposed action is likely to affect coastal water quality.

VIII. PARTIES TO BE CONSULTED FOR THE PREPARATION OF AN EIS

The agencies and organizations listed below will be sent copies of the EIS Preparation Notice (EISPN) and requested to comment on the proposed project.

Federal Agencies

U.S. Army Corps of Engineers, Pacific Ocean Division
Department of Agriculture, Soil Conservation Service
Department of Commerce, National Marine Fisheries Service
-Honolulu
Department of Energy
Department of Health, Education and Welfare
Department of Housing and Urban Development
Department of Interior - Fish and Wildlife Service
Department of Interior - Geological Survey, Water Resources
-Division
Department of Labor, Occupational Safety and Health
-Administration
Department of Transportation - Federal Aviation Administration
Department of Transportation - U.S. Coast Guard
Environmental Protection Agency

State Agencies

Department of Accounting and General Services
Department of Agriculture
Department of Budget and Finance
Department of Defense
Department of Education
Department of Hawaiian Home Lands
Department of Health
Department of Labor and Industrial Relations
Department of Land and Natural Resources
Department of Planning and Economic Development
Department of Social Services and Housing
Department of Taxation

Department of Transportation
Office of Environmental Quality Control
Office of the Governor
Office of Hawaiian Affairs

Congressional Representatives

The Honorable Daniel K. Inouye
The Honorable Spark M. Matsunaga
The Honorable Daniel K. Akaka

State Legislatures

Senator Richard Henderson
Senator Richard M. Matsuura
Senator Malama Solomon
Representative Virginia Isbell
Representative Andrew Levin
Representative Robert Lindsey
Representative Wayne Metcalf
Representative Harvey Tajiri
Representative Dwight Takamine

Hawaii County

Mayor Dante K. Carpenter
Department of Public Works
Department of Parks and Recreation
Department of Water Supply
Department of Research and Development
Fire Department
Office of Housing and Community Development
Safety Coordinator
Civil Defense Agency
Finance Department
Hawaii Redevelopment Agency
Planning Department
Police Department

Hawaii County Council

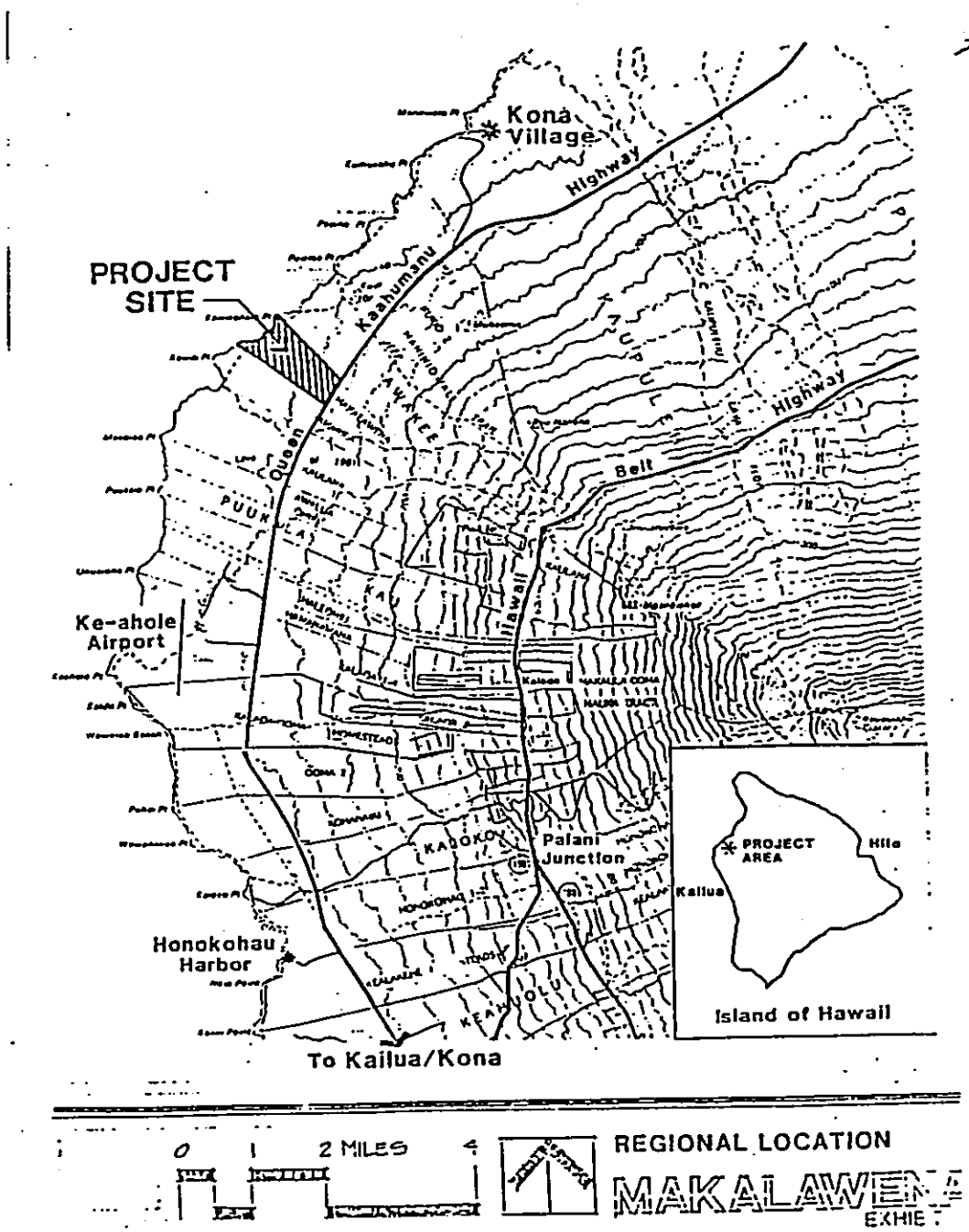
James K. Dahlberg
Frank De Luz, III
Takashi Domingo
Robert Herkes
Lorraine Jitchaku
Russell Kokubun
Merle K. Lai
Spencer Kalani Schutte
Stephen K. Yamashiro

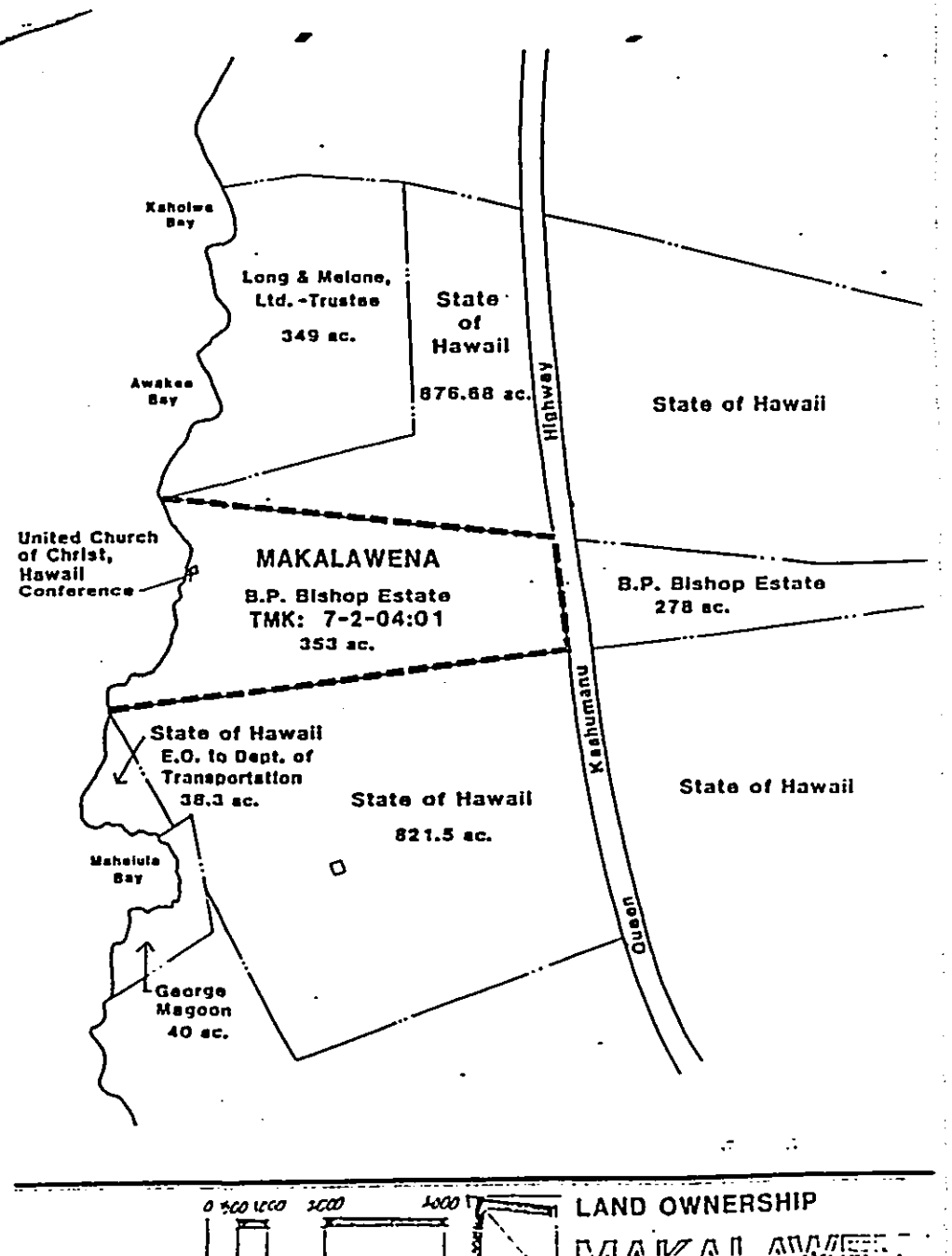
Public Utilities

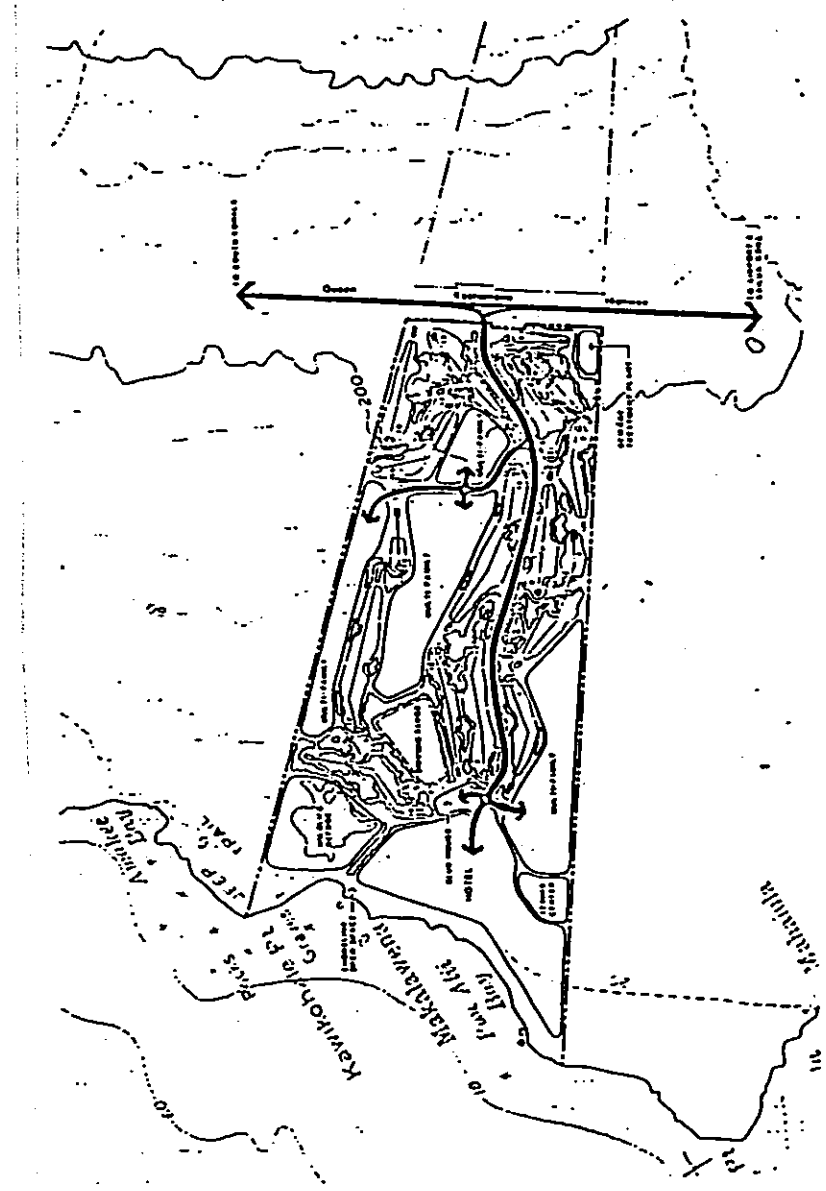
Hawaii Electric Light Company
Hawaiian Telephone
Gasco, Inc., Hawaii Division

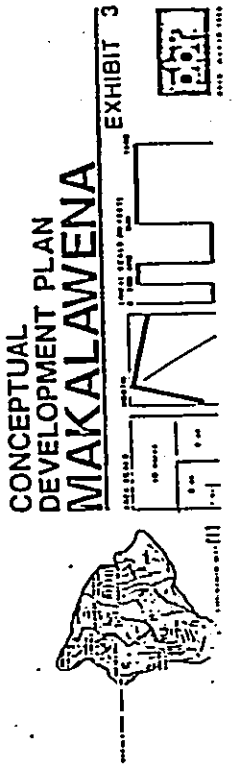
Community Organizations and Other Public Interest Groups

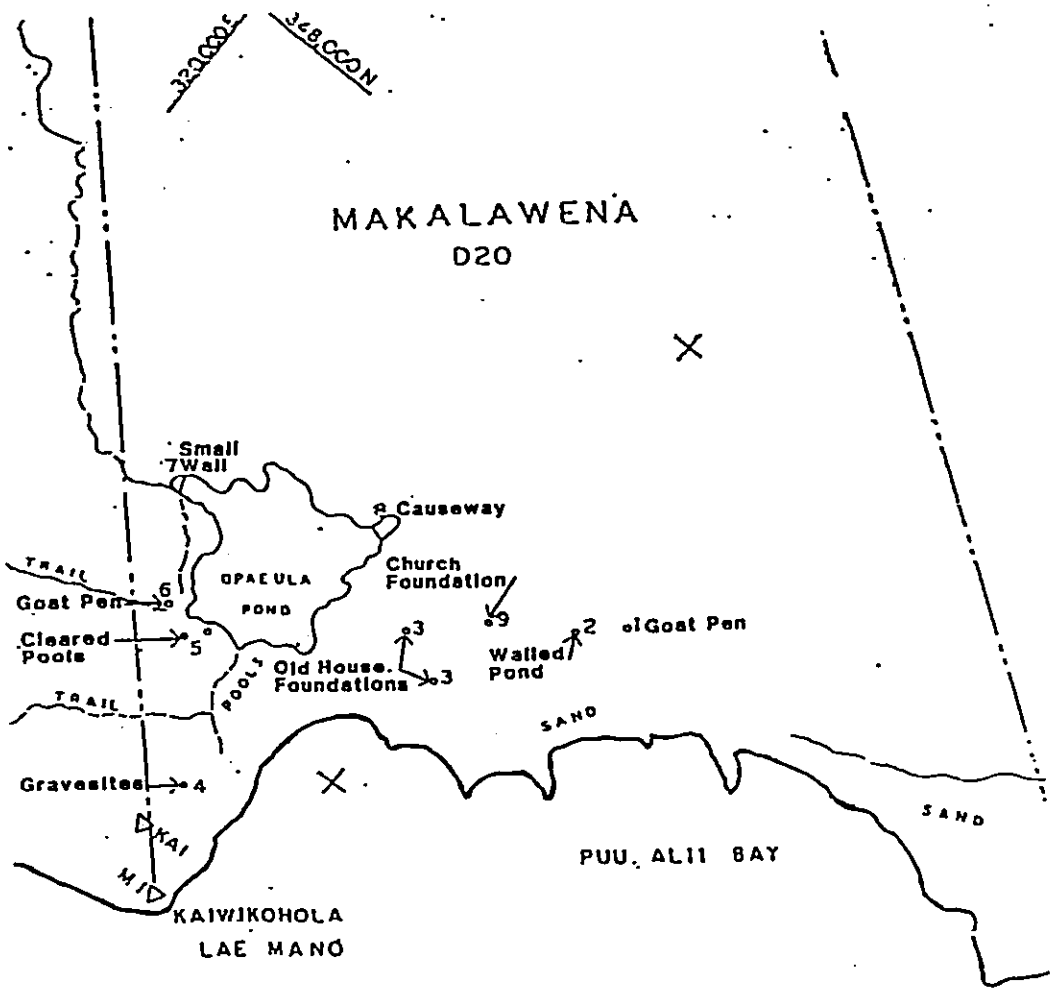
Big Island Chamber of Commerce
Big Island Business Council
Hawaii Hotel Association
Hawaii Visitors Bureau - Big Island Chapter
Conservation Council for Hawaii
Hawaii Leeward Planning Conference
Kona/Kohala Chamber of Commerce
Sierra Club, Hawaii Chapter
Na Ala Hele

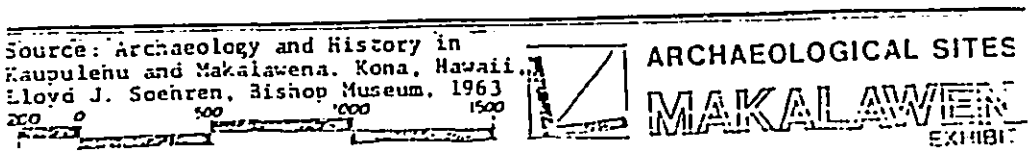

PROJECT SITE
Kona Village
Kaahumanu
Highway
Queen
Belt
Ke-ahole Airport
Honokohau Harbor
Palani Junction
KAILUA
KEAHUOLU
To Kailua/Kona
PROJECT AREA
Hilo
Kailua
Island of Hawaii
0
2 MILES
4
REGIONAL LOCATION
MAKALAWENA
EXHIBIT

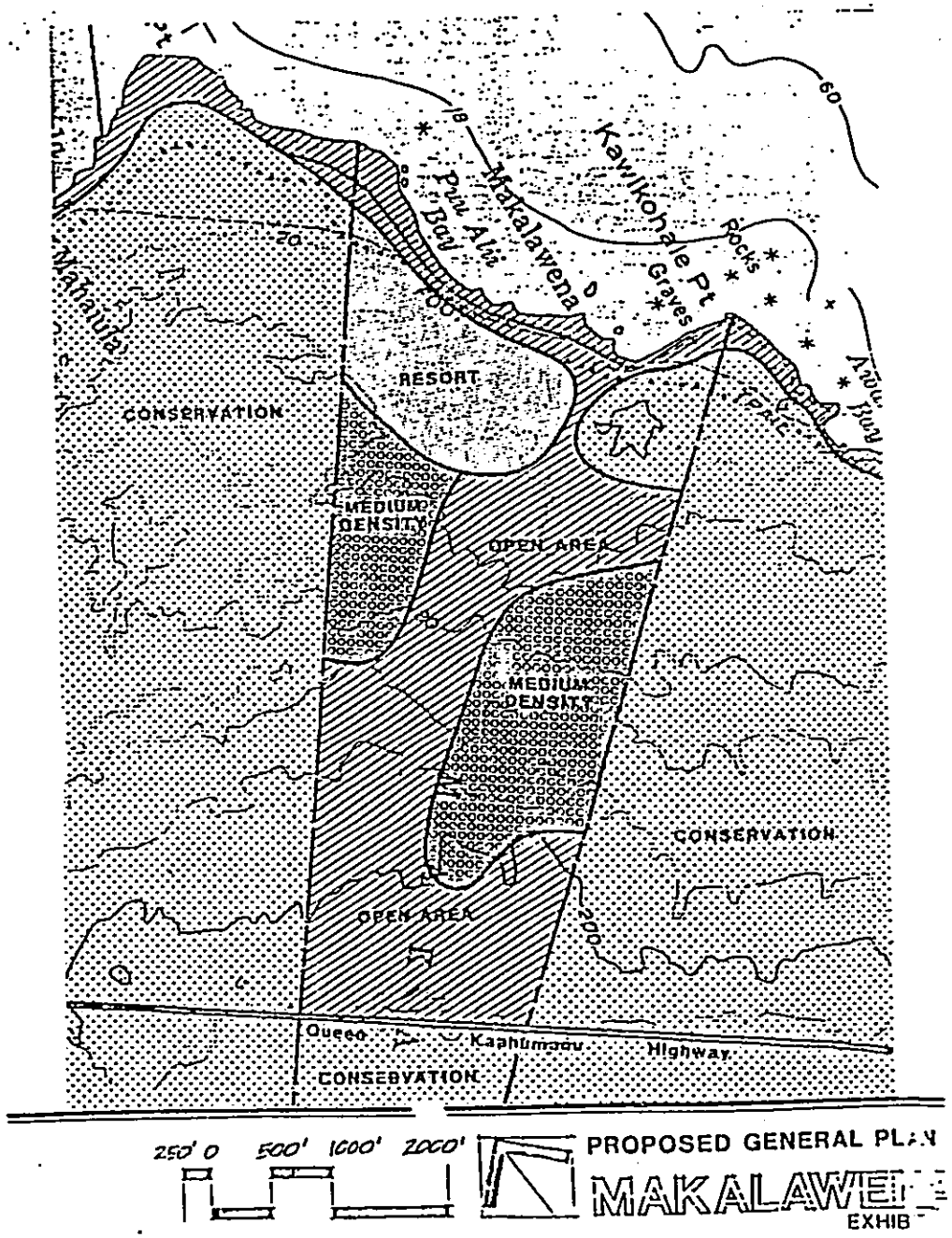

Kaholwe Bay
Awakee Bay
Long & Melone, Ltd.-Trustee
349 ac.
State of Hawaii
876.68 ac.
Highway
State of Hawaii
United Church of Christ, Hawaii Conference
MAKALAWENA
B.P. Bishop Estate
TMK: 7-2-04:01
353 ac.
B.P. Bishop Estate
278 ac.
State of Hawaii
E.O. to Dept. of Transportation
38.3 ac.
State of Hawaii
821.5 ac.
State of Hawaii
Kaahumanu
Queen
Maheiula Bay
George Magoon
40 ac.
0 500 1000 2000 3000
LAND OWNERSHIP
MAKALAWENA




CONCEPTUAL
DEVELOPMENT PLAN
MAKALAWENA
EXHIBIT 3


MAKALAWENA
D20
320,000E
348,000N
Small Wall
Causeway
TRAIL
Goat Pen
OPAEULA POND
Church Foundation
Cleared Pools
Old House Foundations
Walled Pond
Goat Pen
POOLS
TRAIL
SAND
Gravesites
KAI
MIO
SAND
PUU ALII BAY
KAIWIKOHOLA
LAE MANO


Source: Archaeology and History in Kaupulehu and Makalawena, Kona, Hawaii. Lloyd J. Soehren, Bishop Museum, 1963
200 0 500 1000 1500
ARCHAEOLOGICAL SITES
MAKALAWENA
EXHIBIT



DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
BUILDING 230
FT SHAFTER, HAWAII 96858

REPLY TO ATTENTION OF:

September 4, 1986

RECEIVED
SEP - 8 1986
PHILLIPS BRANDT

Mr. Thomas S. Witten
Phillips & Brandt Reddick
Financial Plaza of the Pacific
130 Merchant Street, Suite 1111
Honolulu, HI 96813

Dear Mr. Witten:

Thank you for the opportunity to review and comment on the EIS preparation Notice for Makalawena, North Kona, Hawaii. The following comments are offered:

a. A Department of the Army permit may be required for activities in ponds and shorelines. Future correspondence and coordination with the Corps should be forwarded to our Operations Branch.

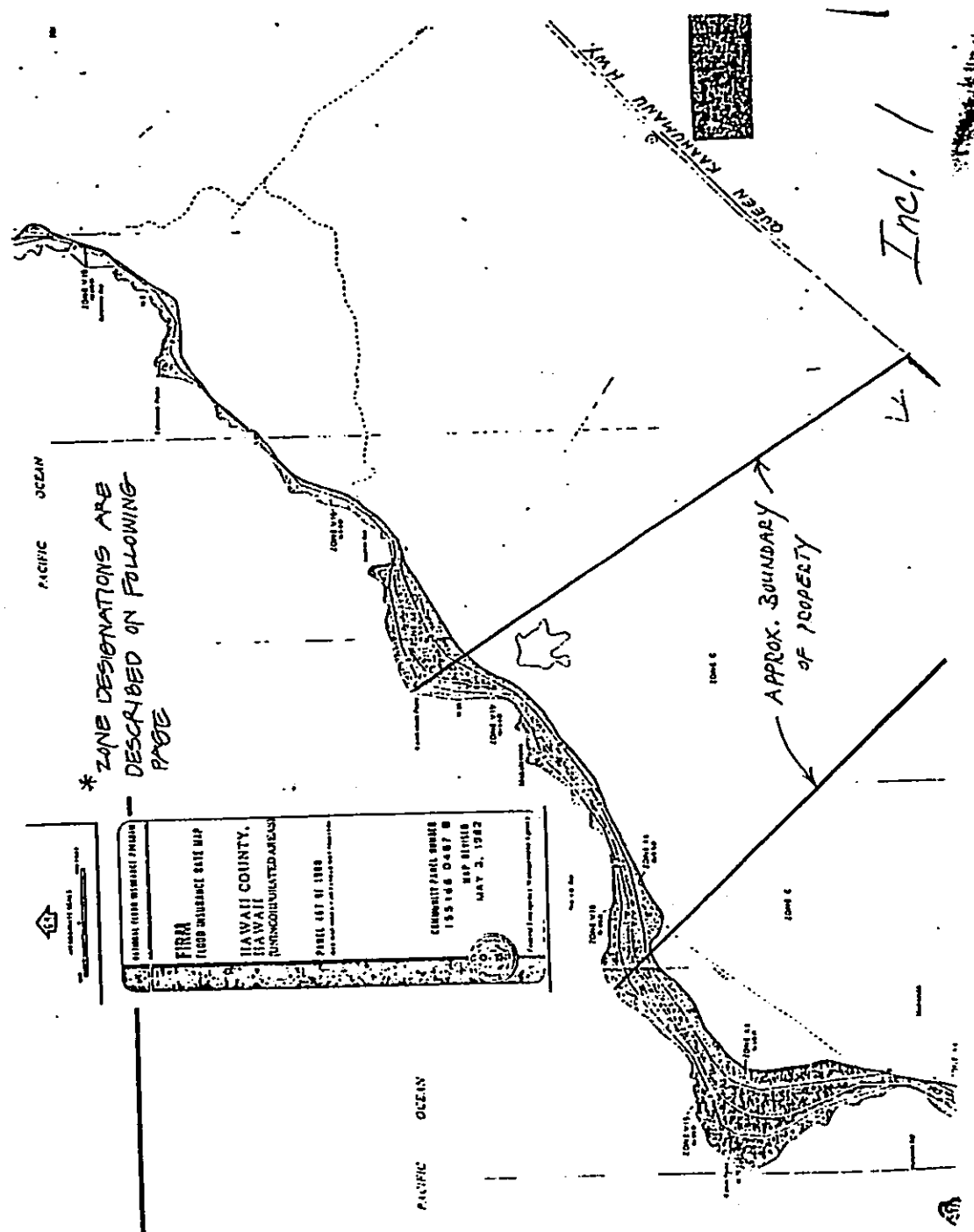
b. Most of the subject property is in Zone C, an area of minimal flooding. Along the coastal shoreline, the property is subject to coastal flooding from the tsunami (Enclosure 1). The coastal inundated area is in Zone V15 and Zone A4 with a base flood elevation line of eight feet above mean sea level. An explanation of the zone designation is attached as Enclosure 2.

Sincerely,

Kipuk Cheung
Chief, Engineering Division

Enclosures

Incl. 1



EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
AO	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30*	Areas of 100-year flood, base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30*	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.
*	The numerals indicate the magnitude of difference between the 100-year and 10-year flood elevations. For numerals between 1-29, the difference is one half of the value; for values greater than 29, the difference is 10 less than the numerals shown. This information is used in establishing insurance rates.
—18—	100-year tsunami or riverine elevation line, with elevation in feet above mean sea level.
	Zone boundary line

Phillips Brandt Reddick

September 19, 1986

Mr. Kisuk Cheung
Chief Engineering Division
U.S. Army Corps of Engineers
Pacific Ocean Division
Building 230
Fort Shafter, Hawaii 96858-5440

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Cheung:

Thank you for your interest in the Makalawena Resort. Your comments and concerns regarding permit requirements for activities in ponds and shorelines and flood zone information will be helpful in preparing the Draft Environmental Impact Statement of which a copy will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
P. O. BOX 50004
HONOLULU, HAWAII
96850

September 10, 1986

Mr. Thomas S. Witten, ASLA
Principal, PDR-Hawaii
Phillips Brandt Reddick
130 Merchant Street - Suite 1111
Honolulu, HI 96813

Dear Mr. Witten:

Subject: Makalawena Resort, North Kona, Hawaii
Kamehameha Schools/Bishop Estate

We reviewed the subject notice for an environmental impact statement and offer the following comments:

The steps to be taken to reduce erosion and sediment during grading and construction should be discussed as well as control measures to reduce wind-blown soil.

Since it will be necessary to bring in soil material for landscaping purposes, erosion control measures will also be needed to protect both stockpiled and spread material until vegetation has been established.

A source and distribution system for irrigation water should be in place before any grading, stockpiling or landscaping is started.

The EIS should also describe potential impacts on the existing anchialine pools and what measures will be taken to protect endangered species habitat.

Thank you for the opportunity to review the document.

Sincerely,

RICHARD N. DUNCAN
State Conservationist

Phillips Brandt Reddick

September 19, 1986

Mr. Richard N. Duncan
State Conservationalist
U.S. Department of Agriculture
Soil Conservation Service
P.O. Box 50004
Honolulu, Hawaii 96850

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Duncan:

Thank you for your interest in the Makalawena Resort. Your comments and concerns regarding the reduction of erosion and wind blown soil, the irrigation water source and distribution system and the potential impacts on the existing anchialine pools, as well as protection measures for endangered species habitat will be helpful in preparing the Draft Environmental Impact Statement of which a copy will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region • Western Pacific Program Office
2570 Dole St. • Honolulu, Hawaii 96822-2396

September 10, 1986 F/SWR1:JJN

Thomas S. Witten
Phillips Brant Reddick
130 Merchant Street
Suite 1111
Honolulu, Hawaii 96813

RECEIVED
SEP 12 1986
PHILLIPS BRANDT

Dear Mr. Witten:

Subject: Makalawena Resort Draft EIS Preparation Notice.

The National Marine Fisheries Service (NMFS) has received the subject Draft EIS Preparation Notice for the proposed Makalawena Resort, North Kona, Island of Hawaii. An application for an amendment to the Hawaii General Plan has been submitted requesting a zoning change of the subject property from Conservation to Intermediate Resort. We understand that the EIS is being developed to address cumulative effects of developing the Makalawena Resort. The following comments are offered for your consideration in preparing the Draft EIS.

NMFS is greatly concerned with the recent ongoing and proposed development occurring along the Kona and Kohala coastlines of the Island of Hawaii. We feel the cumulative effects of these activities may have serious adverse impacts on the unique anchialine/tidal pond and nearshore coral reef habitats for which this region is noted. Consequently, we concur with the preparation of an EIS for the proposed action.

NMFS is pleased to note that the developer proposes to provide shoreline open space and park area along the entire property shoreline with public access to be incorporated into the hotel site development. In addition, Opaeula Pond, a seven-acre body of brackish water located near the northern boundary of Makalawena, is planned for designation as a wildlife refuge.

The EIS Preparation Notice does not indicate whether work is proposed on the beaches below the high-water line or in the immediate coastal waters. Any activity in this area would be of concern to NMFS and should be detailed in the Draft EIS. In addition to the above, we feel the following items should be addressed in the project EIS:

1. Existing use of coastal waters at Makalawena by subsistence, commercial and recreational fishing interests, including opihi and limu gatherers, divers and dive charter operators.

2. Baseline information on the conditions of the reef immediately offshore from the project area; i.e. live coral coverage and species diversity, reef fish and macro-invertebrate abundance.

3. Mapping of coastal habitat types (live reef, dead reef, boulder and sand substrates) and specific location, size, and condition of all anchialine ponds on the property.

4. Importance of coastal waters and beach areas to threatened and endangered species, including the seasonally occurring humpback whale and the green and hawksbill turtle.

5. Potential secondary impacts from the project; i.e. leaching of nutrients from the golf course into anchialine ponds and coastal waters, artificial lighting on nearshore waters, increased ocean recreation by resort guests, increased fishing pressure created by beach access.

NMFS appreciates the opportunity to comment on the proposed Makalawena Resort project at this early pre-EIS stage. Should you require additional information please contact Mr. John Naughton of my staff. We look forward to receiving a copy of the Draft EIS as soon as it becomes available.

Sincerely yours,

Doyle E. Gates
Administrator

cc: F/SWR, Terminal Is., CA
F/M4, Washington, D.C.
Corps of Engineers, Honolulu
FWS, Honolulu
EPA, Region 9 (P-5)
Hawaii State Div. of
Aquatic Resources
County of Hawaii
(Mr. Lono Lyman)

Phillips Brandt Reddick

September 19, 1986

Mr. Doyle E. Gates
Administrator
Department of Commerce
National Marine Fisheries Service
2570 Dole Street
Honolulu, Hawaii 96822

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Gates:

Thank you for your interest in the Makalawena Resort. Your comments and concerns regarding the existing uses of coastal waters at Makalawena, conditions of the reef immediately offshore of the project area, the on site anchialine ponds, threatened and endangered species and potential secondary impacts from the project will be helpful in preparing the Draft Environmental Impact Statement of which a copy will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

UNITED STATES
DEPARTMENT OF ENERGY

P.O. BOX 50168
HONOLULU, HAWAII 96850

PHILLIPS BRANDT

August 26, 1986

Mr. Thomas S. Whitten
Principal, PBR-Hawaii
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Subject: Makalawena Resort Draft EIS

Dear Mr. Whitten:

Thank you for sending an EIS preparation notice on the above development project to this office.

The U.S. Department of Energy is interested in what happens along the Kona Coast, due to its significant investment in the Natural Energy Laboratory of Hawaii (NELH), located at Ke-ahole Point. The continuing utility of this site as the national laboratory for ocean energy research is contingent upon the ocean waters in that vicinity remaining in a pristine state. I'm sure that the State Department of Planning and Economic Development, through which NELH is administered, will follow your development closely.

Best wishes for a successful project.

Sincerely yours,

John Shupe

John W. Shupe
Director

Phillips Brandt Reddick

September 19, 1986

Mr. John W. Shupe
Director
Department of Energy
P.O. Box 50168
Honolulu, Hawaii 96850

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Shupe:

Thank you for your interest regarding the Makalawena Resort. A copy of the Draft Environmental Impact Statement will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

U.S. Department of Housing and Urban Development
Honolulu Office Region IX
300 Ala Moana Blvd. Room 3318 Box 50007
Honolulu, Hawaii 96850-4991

86-283

September 11, 1986

Thomas S. Witten, ASLA
Principal, PBR-Hawaii
Financial Plaza of the Pacific
130 Merchant Street, Suite 1111
Honolulu, HI 96813

Dear Mr. Witten:

SUBJECT: Makalawena Resort Draft EIS Preparation Notice

We have reviewed the subject Preparation Notice for the proposed amendment to the General Plan for Hawaii. The proposed action will provide 900-1,200 hotel rooms, 900-1,350 multi-family residences, a golf course, a tennis center and open space along with a wildlife refuge.

In view of the number of jobs that will be created to service the project upon its completion, the housing requirements for those employees should be considered and coordinated with Hawaii County. This is particularly important on a regional level due to the large number of projects being proposed along the Kona Coast.

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

Sincerely,

Calvin Lew
Director
Community Planning and
Development Division, 9.2C

cc:
A. L. Lyman

Phillips Brandt Reddick

September 19, 1986

Mr. Calvin Lew, Director
Department of Housing and
Urban Development
P.O. Box 50007
Honolulu, Hawaii 96850

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Lew:

Thank you for your interest in the Makalawena Resort. Your comments and concern regarding the housing requirements for resort employees will be helpful in preparing the Draft Environmental Impact Statement of which a copy will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

GEORGE R. ARIYOSHI
Governor

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
DIVISION OF PUBLIC WORKS
P. O. BOX 119, HONOLULU, HAWAII 96810

HIDEO MURAKAMI
Comptroller

MIKE M. TOMINAGA
Deputy Comptroller

LETTER NO(P)1887.6

SEP 9 1986

Mr. Thomas S. Witten, ASLA
Principal
Phillips Brandt Reddick-Hawaii
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Dear Mr. Witten:

Subject: Makalawena Resort
Draft EIS Preparation Notice

We have reviewed the subject project's draft EIS Preparation Notice and have the following comments to offer:

1. Both the Natural Energy Laboratory of Hawaii (NELH) and Hawaii Ocean Science and Technology (HOST) Park development are located approximately 4.5 miles south of the subject development.

2. Maintenance of the high quality of near-shore ocean waters is critical to the successful operation of the NELH and HOST Park.

3. A description of the subject project's impact on the near-shore coastal waters should be included in the EIS.

Thank you for the opportunity to comment on this EIS Preparation Notice. If there are any questions, please have your staff call Mr. Ralph Yukumoto of the Planning Branch at 548-5703.

Very truly yours,

TEUANE TOMINAGA
State Public Works Engineer

RY:jnt
cc: Mr. Jack Huizingh
Mr. William Bass, Jr.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P.O. BOX 50167
HONOLULU, HAWAII 96850

IN REPLY REFER TO:
ES
Room 6307

SEP 24 1986

PHILLIPS BRANDT RE: SEP. 23 1986

Mr. Thomas S. Witten
Phillips, Brandt, Reddick and Associates, Inc.
130 Merchant Street, Suite 1111
Honolulu, HI 96813

Re: Environmental Impact Statement Preparation Notice for the Makalawena Resort, Hawaii

Dear Mr. Witten:

Thank you for forwarding a copy of the referenced Preparation Notice for our review. We offer the following comments on this proposal for your consideration.

Staff biologists Peter Stine, Steve Derendzen, and Andy Yuen met with Dr. Phil Bruner, biological consultant for this project, to discuss the proposed resort development on August 14, 1986. At this meeting we expressed concern that the proposed boundaries of the wildlife refuge around 'Opae Ula Pond did not provide an adequate buffer for endangered waterbirds from the hotel and golf course. The proposed boundaries are substantially smaller than those deemed appropriate by the Service during our negotiations with the Bishop Estate to acquire 'Opae Ula Pond as a National Wildlife Refuge (Land Acquisition I Step II. Biological Ascertainment Report for 'Opae Ula Pond, Island of Hawaii, 1972). At the request of Dr. Bruner, we drew in the boundaries as proposed by the Service in the Biological Ascertainment Report (Enclosure).

We also pointed out to Dr. Bruner that the location of anchialine ponds at Makalawena was not shown on the site map. We note that these ponds are still not illustrated on the site maps attached to the Preparation Notice. Based on descriptions of anchialine ponds in the area (Aquatic Survey of the Kona Coast Ponds, Hawaii Island. J.A. Maciolek and R.E. Brock, 1974), it appears that ponds are present in the area slated for hotel development and possibly along the edges of the golf course. We suggested to Dr. Bruner that he meet with the U.S. Army Corps of Engineers to discuss the project, particularly if filling of anchialine ponds was proposed.

The Service recommends that the Draft Environmental Impact Statement incorporate the following suggestions and information:

a. The proposed refuge boundaries around 'Opae Ula Pond should illustrate both the developer's concept (18 acres) and the Service's recommendation (36 acres).

b. The results of current detailed surveys and a summary of existing information on the use of 'Opae Ula Pond by endangered waterbirds and migratory birds should be provided. Surveys will need to be conducted during September to document the use of the pond by fall migrants (particularly shorebirds) and endemic waterbirds; in December, to determine use by migratory waterfowl, shorebirds, and endemic waterbirds; in March, to count spring migrants and resident endemic waterbirds; and in June, to evaluate stilt nesting and recruitment. In addition to bird surveys, assessments of wetland vegetation, invertebrate populations, and water quality of 'Opae Ula Pond would be necessary to determine baseline conditions of the wetland and identify management needs. State and Federal biologists would be pleased to assist with planning and conducting these surveys.

c. A management plan for the wildlife refuge at 'Opae Ula Pond should be developed through consultation with the Service and the State Department of Land and Natural Resources, Division of Forestry and Wildlife to complement the developer's protection program. This plan would outline management recommendations such as fencing, vegetation control, predator removal, interpretive displays, and management responsibilities.

d. The anchialine pond complex at Makalawena is one of the few remaining pond complexes along West Hawaii (Maciolek and Brock, 1974). A detailed map showing the location of all anchialine ponds on the property relative to the proposed development should be included. Surveys of all anchialine ponds within the project boundaries should be conducted, and the results of these studies should be included in the DEIS. Surveys should include water quality measurements, day and night sampling of the pond biota, and a description of pond algae and substrates.

e. We recommend that an anchialine pond management plan be developed through consultation with the Service and the State Department of Land and Natural Resources to insure the long-term protection and maintenance of these ponds.

f. Current descriptions of the nearshore marine habitats and fishery resources should be included in the DEIS. This information should include the distribution of corals, fishes, macro-invertebrates, and threatened and endangered species such as the humpback whale, green sea turtle, and the hawksbill turtle.

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

g. Finally, we recommend that the Draft EIS discuss the primary, secondary, and cumulative impacts of the proposed resort development upon these resources. Specifically, the Service believes that impacts to endangered waterbird habitat (e.g. reduced use of the 'Opae Ula Pond because of increased human disturbance), to anchialine ponds from modified groundwater conditions and filling, and to nearshore fishery resources from increased access and runoff from resort development, should be discussed.

The Service considers 'Opae Ula Pond and the surrounding anchialine pond habitats as Resource Category 1 (Federal Register Vol. 46, No. 15. January 23, 1981). Under this category, the habitat to be impacted is of high value for the evaluation species (migratory birds and anchialine pond animals like the 'opae ula) and is unique and irreplaceable both on a national basis and in the ecoregion. The mitigation goal for this category is no loss of existing habitat value. Under the Service's Wetland Protection Policy, we will recommend that no anchialine ponds be filled or modified.

We appreciate this opportunity to comment. My staff and I would be happy to meet with you to discuss our concerns and recommendations.

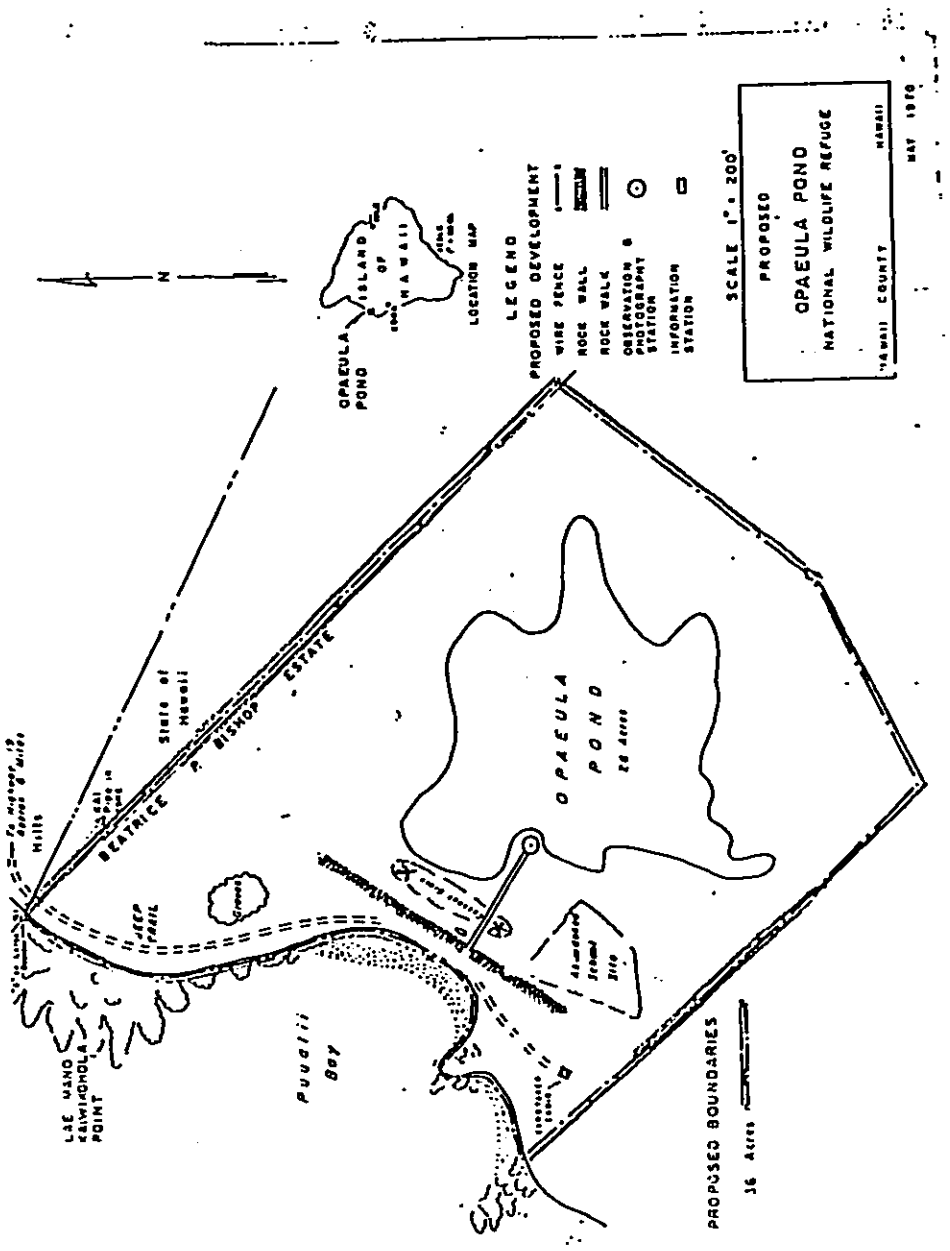
Sincerely,

for Ernest Kosaka
Project Leader
Office of Environmental Services

Enclosure

cc: NMFS - WPPO
EPA, San Francisco
DLNR
DOFW
DAR
DPED, Land Use Division (Attn: Joan Yim)
CE, Operations Branch
County of Hawaii, Planning Department
RD, Portland, OR

by PDR xc: P. Bruner
B. Brewer
H. Char



Phillips Brandt Reddick

September 24, 1986

Mr. Ernest Kosaka, Project Leader
Office of Environmental Services
U.S. Department of Interior
Fish and Wildlife Service
P.O. Box 50167
Honolulu, Hawaii 96850

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Kosaka:

Thank you for your interest in the Makalawena Resort. Your comments and concerns regarding Opaeula Pond, endangered waterbirds and migratory birds, and anchialine ponds will be helpful in preparing the Draft Environmental Impact Statement (DEIS) of which a copy will be distributed to you for further review and comment.

I spoke to Mr. Andy Yuen of your office and have scheduled a meeting with your department on October 22, 9:00 a.m. This should provide time for your review of the DEIS so that any additional concerns can be discussed at that time.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Mr. Albert Lono Lyman
Planning Director, County of Hawaii
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

Phillips Brandt Reddick

September 19, 1986

Mr. Tevane Tominaga
State Public Works Engineer
Department of Accounting and General Services
Division of Public Works
State of Hawaii
P.O. Box 119
Honolulu, Hawaii 96810

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Tominaga:

Thank you for your interest in the Makalawena Resort. Your comments and concerns regarding the Natural Energy Laboratory of Hawaii (NELH) and Hawaii Ocean Science and Technology (HOST) park development and the impact on the near-shore coastal waters will be helpful in preparing the Draft Environmental Impact Statement of which a copy will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

GEORGE R. ARIYOSHI
GOVERNOR

SEP - 5 1986

PHILLIPS BRANDT

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 So. King Street
Honolulu, Hawaii 96814-2512

September 5, 1986

JACK K. SUWA
CHAIRPERSON, BOARD OF AGRICULTURE

SUZANNE D. PETERSON
DEPUTY TO THE CHAIRPERSON

Mailing Address:
P. O. Box 22159
Honolulu, Hawaii 96822-0159

Mr. Thomas S. Witten, ASLA
Phillips Brandt Reddick
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Subject: Environmental Assessment and Notice of Preparation
for Makalawena Resort, North Kona, Hawaii
TMK: 7-2-04: 1; 353.00 acres

Dear Mr. Witten:

The Department of Agriculture has reviewed the Environmental Impact Statement (EIS) Notice of Preparation for Makalawena Resort and has the following comments to offer.

According to the subject document, the applicant is seeking a General Plan Amendment for the subject parcel in order to develop a proposed resort community.

The Soil Conservation Service Soil Survey information on page 3 is correct (except that a'a lava is rLV, not rLU). The applicable Land Study Bureau Overall Productivity Ratings are E287, EJ19, EJ20 and E327. By this method of classification, the parcel has poor productivity potential for most agricultural uses. The parcel is not classified according to the Agricultural Lands of Importance to the State of Hawaii (ALISH) system.

The Draft EIS should describe in detail the source of the potable water supply, the quantity required and any adverse impacts the water withdrawal may have on agricultural activities in the area. To develop the required water resources for the subject project and other projects in the North Kona area in a comprehensive fashion, it is essential that consideration be given to existing plans and programs for the development of water source and distribution facilities.

Sincerely,

JACK K. SUWA
Chairman, Board of Agriculture

cc: Mr. A. Lono Lyman
OEQC

Phillips Brandt Reddick

September 19, 1986

Mr. Jack K. Suwa
Chairman
Board of Agriculture
Department of Agriculture
State of Hawaii
P.O. Box 22159
Honolulu, Hawaii 96822-0159

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Suwa:

Thank you for your interest in the Makalawena Resort. Your comments and concerns regarding the potable water supply source and quantity required and adverse impacts the water withdrawal may have on agricultural activities in the area will be helpful in preparing the Draft Environmental Impact Statement of which a copy will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631
Honolulu • Irvine • San Francisco • Denver

GEORGE R. ARIYOSHI
GOVERNOR

HAWAII PUBLIC EMPLOYEES HEALTH FUND
EMPLOYEES' RETIREMENT SYSTEM
PUBLIC UTILITIES COMMISSION
OFFICE OF THE PUBLIC DEFENDER

STATE OF HAWAII
DEPARTMENT OF BUDGET AND FINANCE
STATE CAPITOL
P.O. BOX 150
HONOLULU, HAWAII 96810-0150

JENSEN S. L. HEE
DIRECTOR

DENNIS K. GODA
DEPUTY DIRECTOR

DIVISIONS:
BUDGET, PLANNING AND MANAGEMENT
ELECTRONIC DATA PROCESSING
FINANCE

September 2, 1986

SEP - 4 1986
PHILLIPS BRANDT

Mr. Thomas S. Witten, ASLA
Principal
Phillips Brandt Reddick-Hawaii
Financial Plaza of the Pacific
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Dear Mr. Witten:

This is in response to your letter of August 22, 1986 regarding the Draft Environmental Impact Statement Preparation Notice for the Makalawena Resort located in North Kona, Hawaii.

Thank you for the opportunity to comment on the proposal; however, we have no comments to make at this time.

Very truly yours,

JENSEN S. L. HEE

Phillips Brandt Reddick

September 19, 1986

Mr. Jensen S.L. Hee, Director
Department of Budget and Finance
State of Hawaii
P.O. Box 150
Honolulu, Hawaii 96810

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Hee:

Thank you for your interest regarding the Makalawena Resort. A copy of the Draft Environmental Impact Statement will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
3949 DIAMOND HEAD ROAD, HONOLULU, HAWAII 96816-4495

RECEIVED
SEP - 9 1986
PHILLIPS BRANDT

ALEXIS T. LUM
DEPUTY ADJUTANT GENERAL

PAUL K. NAKAHARA
DEPUTY ADJUTANT GENERAL

HIENG

SEP 5 1986

Thomas S. Witten, ASLA
Principal, PBR-Hawaii
130 Merchant Street, Suite 1111
Honolulu, HI 96813

Dear Mr. Witten:

Makalawena Resort Draft EIS Preparation Notice

Thank you for providing us the opportunity to review the above subject project.

We have no comments to offer at this time regarding this project.

Yours truly,

Jerry N. Matsuda
Major, Hawaii Air
National Guard
Contr & Engr Officer

Phillips Brandt Reddick

September 19, 1986

Mr. Jerry M. Matsuda, Major
Hawaii Air National Guard
Contractor and Engineer Officer
Department of Defense
Office of the Adjutant General
State of Hawaii
3949 Diamond Head Road
Honolulu, Hawaii 96816

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Matsuda:

Thank you for your interest regarding the Makalawena Resort. A copy of the Draft Environmental Impact Statement will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

GEORGE R. ARIYOSHI
GOVERNOR

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

OFFICE OF THE SUPERINTENDENT

FRANCIS M. HATANAKA
SUPERINTENDENT

RECEIVED
SEP - 4 1986
PHILLIPS BRANDT ...

September 2, 1986

Mr. Thomas S. Witten, ASLA
Principal, PBR-Hawaii
Phillips Brandt Reddick
Financial Plaza of the Pacific
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Dear Mr. Witten:

SUBJECT: Hakalawena Resort Draft EIS Preparation Notice

Our review of your proposed 900 - 1,350 multi-family units and 900 - 1,200 hotel rooms indicates that the following student enrollment may be generated.

SCHOOL	GRADE	APPROXIMATE ENROLLMENT
Kealakehe Elementary	K-5	10 - 30
Kealakehe Intermediate	6-8	4 - 8
Konawaena High	9-12	4 - 8

Schools in this area are at capacity but Kealakehe Intermediate and Konawaena High schools will be able to accommodate the small enrollment. Kealakehe Elementary will require monitoring since an additional classroom may be required.

Should you have any questions, please call Mr. Richard Inouye at 737-4743.

Sincerely,

Francis M. Hatanaka
Superintendent

FMH:jl

cc: OBS
K. Asato, Hawaii Dist.

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER

Phillips Brandt Reddick

September 19, 1986

Mr. Francis M. Hatanaka
Superintendant
Department of Education
State of Hawaii
P.O. Box 2360
Honolulu, Hawaii 96804

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Hatanaka:

Thank you for your interest in the Makalawena Resort. Your comments and concerns regarding student enrollment for Kealakehe Elementary and Intermediate Schools and Konawaena High School that may be generated will be helpful in preparing the Draft Environmental Impact Statement of which a copy will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631
Honolulu • Irvine • San Francisco • Denver

RECEIVED
SEP 19 1986
PHILLIPS BRANDT

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS

September 17, 1986

Mr. Thomas S. Witten, Principal
Phillips, Brandt, Reddick & Assoc. (Hawaii), Inc.
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Dear Mr. Witten:

Thank you for your letter of August 22 indicating the Department as a party to be consulted for the preparation of KS/BE's EIS for their proposed Makalawena Resort. We look forward to reviewing the Estate's plans.

In reviewing your listing of parties to be consulted, you may want to include the following community organizations on your list:

Alu Like -- Hawaii Island
32 Kinoole Street
Hilo, Hawaii 96720

Pa'a Pono Hiloli'i
1414 Keneki Place
Hilo, Hawaii 96720

The Nature Conservancy
1116 Smith Street, Suite 201
Honolulu, Hawaii 96817

If you have any further questions, please contact Mr. Robert Fletcher of our Planning Office at 548-8785.

Sincerely yours,

GEORGIANA K. PADEKEN, Chairman
Hawaiian Homes Commission

RF:HS:ed

Phillips Brandt Reddick

September 23, 1986

Ms. Georgiana K. Padeken, Chairman
Department of Hawaiian Home Lands
P.O. Box 1879
Honolulu, Hawaii 96805

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Ms. Padeken:

Thank you for your interest in the Makalawena Resort. Your suggestions on additional community organizations to be consulted are appreciated. A copy of the Draft Environmental Impact Statement will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Mr. Albert Lono Lyman
Planning Director, County of Hawaii
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

IN REPLY, PLEASE REFER TO
EPHSD

RECEIVED
SEP 18 1986
PHILLIPS BRANDT

ISSUE S. MATSUBARA
DIRECTOR OF HEALTH

September 15, 1986

Mr. Thomas S. Witten, ASLA
Principal, Phillips Brandt Reddick
130 Merchant St., Suite 1111
Honolulu, Hawaii 96813

Dear Mr. Witten:

Subject: Comments to Makalawena Resort Draft EIS Preparation Notice

Thank you for allowing us to review and comment on the subject Draft EIS Preparation Notice. We provide the following comments:

Air Pollution

Impacts on ambient air need to be discussed in the EIS.

Wastewater Disposal

The proposed project is not located within an approved facility plan planning area. The proposed project must comply with the requirements of Acts 282 (SLH 1985) and 302 (SLH 1986). Specifically, a sewage treatment plant should be utilized to handle the sewage generated by the project. Reuse of the effluent is recommended.

Drinking Water

Should the project obtain its potable water from an approved source the following comments do not apply. However, if the project plans to develop its own potable water source, the following is applicable.

The Department of Health is vested with the responsibility to assure that public water systems in the State are providing water which is in compliance with the State's drinking water regulations known as Chapter 20, Title 11, Administrative Rules, and are in compliance with all other applicable terms and conditions of Chapter 20. A public water system is defined as a system serving 25 or more individuals at least 60 days per year or having a minimum of 15 service connections. In the event that the new well is intended to serve these minimum numbers of persons or service connections, please be advised that the well and distribution system will be subject to the terms of Section 11-20-29 and Section 11-20-30 of Chapter 20 respectively.

Briefly, Section 11-20-29 of Chapter 20 requires all new sources of potable water serving public water systems to be approved by the Director of Health prior to their use to serve potable water. Such approval is based primarily upon the satisfactory submission

of an engineering report which adequately addresses all concerns as set down in Section 11-20-29. The engineering report must be prepared by a registered professional engineer and bear the person's seal upon submittal.

Section 11-20-30 requires that new or substantially modified distribution systems for public water systems be approved by the Director of Health. Such approval depends upon the submission of plans and specifications for the project prior to construction and the demonstration that the new or modified portions of the system are capable of delivering potable water in compliance to all maximum contaminant levels as set down in Chapter 20 once the distribution system or modification is completed.

In the event that the proposed well is solely intended to serve irrigation or other nondomestic purposes, or if the proposed well will not serve the minimum number to qualify as a public water system as defined earlier, then the new well and distribution system are not subject to Chapter 20 requirements. However, if at some point in the future, the decision is made to use the water for potable purposes, or if the system expands to meet the minimum service population or number of service connections, the source and distribution system will be subject to Section 11-20-29 and Section 11-20-30 respectively prior to their use to serve the new public water system.

Sincerely yours,

JAMES K. IKEDA
Deputy Director for
Environmental Health

KS:ao

Phillips Brandt Reddick

September 23, 1986

Mr. James K. Ikeda
Deputy Director for
Environmental Health
State of Hawaii
P.O. Box 3378
Honolulu, Hawaii 96801

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Ikeda:

Thank you for your interest in the Makalawena Resort. Your comments and concerns regarding air pollution, waste water disposal and drinking water will be helpful in preparing the Draft Environmental Impact Statement of which a copy will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Mr. Albert Lono Lyman
Planning Director, County of Hawaii
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

DEPARTMENT OF PLANNING
AND ECONOMIC DEVELOPMENT

GEORGE R. ARIYOSHI
Governor
KENT M. KEITH
Director
MURRAY E. TOWILL
Deputy Director

Roger A. Ulveling

Ref. No. P-5105

September 17, 1986

SEP 22 1986
PHILLIPS BRANDT

Mr. Thomas S. Witten
Phillips, Brandt, Reddick & Associates, Inc.
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Dear Mr. Witten:

Subject: Makalawena Resort, EIS Preparation Notice, North Kona, Hawaii

We have reviewed the subject EIS preparation notice and offer the following comments.

1. The draft EIS should describe potential impacts upon existing recreational resources. It should also include a description of the number and location of public accessways and associated facilities, such as comfort stations and parking spaces.

2. Impacts upon mauka-makai and lateral shoreline views should be discussed in the draft EIS.

3. The draft EIS should describe impacts upon Opaeula Pond and any other on-site wetland area, including anchialine ponds if present. A management plan for these areas should also be discussed in the draft document.

4. If the Department of the Army Permit from the Corps of Engineers should be required, a Federal Consistency Review will be required by the Department of Planning and Economic Development.

5. The draft 1983 Kona Regional Plan states that housing problems are perceived to be the most serious problem area for Kona. This is especially true in relation to the development of affordable housing stock. The draft EIS should discuss the impacts of the proposed project on housing needs.

6. The draft EIS should address how the proposed development will meet the appropriate objectives, policies and priority guidelines of the Hawaii State Plan and the policies and implementing actions of the applicable Functional Plans. Appropriate objectives and policies of the Hawaii Coastal Zone Management Program should also be addressed.

Thank you for the opportunity to review and comment on the subject document.

Very truly yours,

Murray E. Towill

Kent M. Keith

cc: Mr. Albert Lono Lyman,
Planning Director,
County of Hawaii
Office of Environmental Quality Control

Phillips Brandt Reddick

September 23, 1986

Mr. Kent M. Keith, Director
Department of Planning and
Economic Development
State of Hawaii
P.O. Box 2359
Honolulu, Hawaii 96804

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Keith:

Thank you for your interest in the Makalawena Resort. Your comments and concerns regarding the proposed resort development will be helpful in preparing the Draft Environmental Impact Statement of which a copy will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Mr. Albert Lono Lyman
Planning Director, County of Hawaii
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF SOCIAL SERVICES AND HOUSING
HAWAII HOUSING AUTHORITY
P. O. BOX 17907
HONOLULU, HAWAII 96817

SEP - 9 1986

PHILLIPS BRANDT

RUSSELL N. FUKUMOTO
EXECUTIVE DIRECTOR

IN REPLY REFER

TO

86:PLNG/5586

September 5, 1986

Mr. Thomas S. Witten, ASLA
Principal, PBR-Hawaii
Phillips Brandt Reddick
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Dear Mr. Witten:

Thank you for the opportunity to review and comment on the Draft Environmental Impact Statement Preparation Notice for Makalawena Resort.

We would like to recommend that the developer work closely with the Hawaii Housing Authority (HHA) or the County of Hawaii Housing Office to provide for development of affordable residential units which will be accessible to those who would be employed in jobs created by this development. We request that the developer keep the Authority apprised of the details of meeting the housing needs.

For any further questions, please contact Colette Sakoda of my staff at 848-3226.

Sincerely,

RUSSELL N. FUKUHOTO
Executive Director

Phillips Brandt Reddick

September 19, 1986

Mr. Russell N. Fukumoto
Executive Director
Department of Social Services and Housing
Hawaii Housing Authority
State of Hawaii
P.O. Box 17907
Honolulu, Hawaii 96817

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Fukumoto:

Thank you for your interest regarding the Makalawena Resort. A copy of the Draft Environmental Impact Statement will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

GEORGE R ARIYOSHI
GOVERNOR

SEP 2 2 1986

PHILLIPS BRANDT

WAYNE J YAMASAKI

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION

IN REPLY REFER TO:
STP 8.1577

September 16, 1986

Mr. Thomas S. Witten, Principal
Phillips Brandt Reddick
Financial Plaza of the Pacific
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Dear Mr. Witten:

Makalawena Resort Draft EIS Preparation Notice

While we expect no significant adverse impacts on our agency's facilities with the implementation of the subject resort development, the developer should prepare a traffic impact analysis report for our review. The design of the access road/ Queen Kaahumanu Highway intersection is of major interest to us and should have our approval.

The proximity of the Keahole Airport is such that a noise impact analysis should also be conducted by the developer to ascertain whether the noise factor from the airport's operations would be a factor or not.

We look forward to reviewing the EIS documents.

Very truly yours,

Wayne J. Yamasaki
Director of Transportation

Phillips Brandt Reddick

September 23, 1986

Mr. Wayne J. Yamasaki
Director of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, Hawaii 96813

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Yamasaki:

Thank you for your interest in the Makalawena Resort. Your comments and concerns regarding the proximity of the Keahole Airport to the project site and potential noise impacts will be addressed in the Draft Environmental Impact Statement of which a copy will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Mr. Albert Lono Lyman
Planning Director, County of Hawaii
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

DANIEL K. INOUYE
HAWAII

Federal Building
Suite 7325, 300 Ala Moana Boulevard
Honolulu, HI 96850
(808) 546-7550

United States Senate

ROOM 722, HART SENATE BUILDING
WASHINGTON, DC 20510
(202) 224-3934

SEP 15 1986

PHILLIPS BRANDT

September 3, 1986

Mr. Thomas S. Witten, ASLA
Principal,
Phillips Brandt Reddick-Hawaii
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Dear Mr. Witten:

On behalf of Senator Inouye, who is currently in Hawaii, I wish to acknowledge receipt of your recent communication of August 22, 1986, in which you so kindly shared the environmental assessment and notice of preparation for an Environmental Impact Statement for the Makalawena Resort sponsored by the Kamehameha Schools/Bishop Estate.

Within applicable rules and regulations, the Senator would deeply appreciate being kept informed as to the ongoing status of this project.

Thank you for sharing this report with us.

Aloha,

PHYLLISS M. MINN
Legislative Assistant

PMM:bhm

Phillips Brandt Reddick

September 19, 1986

The Honorable Daniel K. Inouye
Federal Building
P.O. Box 50123
Honolulu, Hawaii 96850

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Honorable Daniel K. Inouye:

Thank you for your interest regarding the Makalawena Resort. A copy of the Draft Environmental Impact Statement will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

SPARK M. MATSUNAGA
HAWAII

WASHINGTON OFFICE
[illegible]

HONOLULU OFFICE
[illegible]

United States Senate

WASHINGTON, D.C. 20510

CHIEF DEPUTY
DEMOCRATIC WHIP

MEMBER
COMMITTEE ON FINANCE
COMMITTEE ON ENERGY AND
NATURAL RESOURCES
COMMITTEE ON LABOR AND
HUMAN RESOURCES
COMMITTEE ON
VETERANS' AFFAIRS

August 28, 1986

Mr. Thomas S. Witten
Principal
Phillips Brandt Reddick
Suite 1111
130 Merchant Street
Honolulu, Hawaii 96813

SEP - 5 1986

PHILLIPS BRANDT

Dear Mr. Witten:

Re: Environmental Impact Statement

This is just to acknowledge receipt of your recent communication addressed to Senator Spark Matsunaga.

Please be assured that your communication will be brought to the Senator's attention at the earliest possible moment.

Yours truly,

Cherry Matano

Cherry Matano (Ms.)
Administrative Assistant
to Senator Matsunaga

Phillips Brandt Reddick

September 19, 1986

The Honorable Spark M. Matsunaga
Federal Building
P.O. Box 50124
Honolulu, Hawaii 96850

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Honorable Spark M. Matsunaga:

Thank you for your interest regarding the Makalawena Resort. A copy of the Draft Environmental Impact Statement will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631
Honolulu • Irvine • San Francisco • Denver

DEPARTMENT OF PUBLIC WORKS
COUNTY OF HAWAII 25 AUPUNI STREET - HILO HAWAII 96720 TELEPHONE (808) 961-8321

DANTE K CARPENTER
Mayor

HUGH Y. ONO
Chief Engineer

BRUCE C. McCLURE
Deputy Chief Engineer

SEP - 2 1986

August 28, 1986

MR THOMAS S WITTEN PRINCIPAL
PHILLIPS BRANDT REDDICK
FINANCIAL PLAZA OF THE PACIFIC
130 MERCHANT STREET SUITE 1111
HONOLULU HI 96813

SUBJECT: MAKALAWENA RESORT DRAFT EIS PREPARATION NOTICE

This is to acknowledge receipt of the subject document. Our comments will be transmitted to you through our Planning Department

HUGH Y. ONO
Chief Engineer

DIM:cso

cc: Planning Dept.
Engineering & Surveys Div.

DEPARTMENT OF PUBLIC WORKS
COUNTY OF HAWAII
HILO, HAWAII

Memorandum

DATE September 3, 1986

TO : Planning Department

FROM : Chief Engineer

SUBJECT: MAKALAWENA RESORT DRAFT EIS PREPARATION NOTICE

We would like the following discussed or described in the Draft EIS.

1. Show roadway network.
2. The development should be served by a single access road. Provide channelized intersection (with acceleration/deceleration lanes) at Queen Kaahumanu Highway for this road.
3. Solid waste generation and disposal and its impact on County facilities.
4. Sewage disposal.
5. Proposed typical road cross-sections.
6. Superimpose the coastal high hazard area of the FIRM on the development plan.
7. Drainage scheme.
8. Grading permit(s) is required.

HUGH Y. ONO
Chief Engineer

DIM:cso

cc: Engineering & Surveys Div.
Traffic Services Div.
Wastewater & Solid Waste Div.

Phillips Brandt Reddick

September 19, 1986

Mr. Hugh Y. Ono
Chief Engineer
Department of Public Works
Hawaii County
25 Aupuni Street
Hilo, Hawaii 96720

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Ono:

Thank you for your interest in the Makalawena Resort. Your comments and concerns regarding roadways, solid waste generation and disposal, sewage disposal, flood zone and drainage will be helpful in preparing the Draft Environmental Impact Statement of which a copy will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Mr. Albert Lono Lyman
Hawaii County Planning Department
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

Dante K. Carpenter
Mayor

Eugene N. Tiwanak
Managing Director

DEPARTMENT OF PARKS & RECREATION
COUNTY OF HAWAII

Patricia G. Engelhard
Director

Ronald Okamura
Deputy Director

August 28, 1986

Mr. Thomas S. Witten, ASLA
Principal, PBR-Hawaii
Financial Plaza of the Pacific
130 Merchant Street, Suite 1111
Honolulu, HI 96813

Subject: Hakalawena Resort Draft EIS Preparation Notice

Dear Mr. Witten:

The following comments were made by our staff in their review of your August 22, 1986 letter regarding Hakalawena Resort Draft EIS Preparation Notice:

1. The size of the wildlife refuge area appears to be rather small, although we don't profess to have any expertise in this area. Another question would be its proximity to the hotel, golf course and to the beach.

2. Public access to the beach is always a concern of ours. Specifically, access to the beach and along the shoreline should be expanded upon in the development of the EIS. The adjacent property (Awake'e Resort) is being developed also. Perhaps, access to the shoreline and beach should be coordinated with that development.

Thank you for allowing us the opportunity to comment on the EIS preparation.

Sincerely,

Pat Engelhard

Patricia Engelhard
Director

PE:ai

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

Phillips Brandt Reddick

September 19, 1986

Ms. Patricia Engelhard, Director
Department of Parks and Recreation
25 Aupuni Street
Hilo, Hawaii 96720

SUBJECT: HAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Ms. Engelhard:

Thank you for your interest in the Hakalawena Resort. Your comments and concerns regarding the wildlife refuge area and public access to the beach and along the shoreline will be helpful in preparing the Draft Environmental Impact Statement of which a copy will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631
Honolulu • Irvine • San Francisco • Denver

X-3

DANTE K. CARPENTER, MAYOR

DENNIS M. YAMAMOTO
Director

DEPARTMENT OF RESEARCH AND DEVELOPMENT
COUNTY OF HAWAII • 34 RAINBOW DRIVE • HILO, HAWAII 96720 • TELEPHONE (808) 961-8366

RECEIVED
SEP 16 1986
PHILLIPS BRANDT

September 8, 1986

Mr. Thomas S. Witten, ASLA
Principal, PBR-Hawaii
Financial Plaza of the Pacific
130 Merchant Street Suite 1111
Honolulu, HI 96813

Dear Mr. Witten:

We are definitely interested in your Makalawena Resort project and would like to receive a copy of the EIS when available.

We are generally in favor of development of the Kona-South Kohala coast and will make comments on your proposal after reviewing the EIS.

Thank you for informing us of your project.

Sincerely yours,

Dennis M. Yamamoto
Director

Phillips Brandt Reddick

September 19, 1986

Mr. Dennis M. Yamamoto, Director
Department of Research and Development
34 Rainbow Drive
Hilo, Hawaii 96720

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Yamamoto:

Thank you for your interest regarding the Makalawena Resort. A copy of the Draft Environmental Impact Statement will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

DANTE K. CARPENTER
MAYOR

HAWAII COUNTY FIRE DEPARTMENT
466 KINOOLE STREET, HILO, HAWAII 96720
PHONE (808) 961-2998

FRANCIS E. SMITH
FIRE CHIEF

DON COLOMA
DEPUTY FIRE CHIEF

August 25, 1986

Mr. Thomas S. Witten, ASLA, Principal
Phillips Brandt Reddick
Financial Plaza of the Pacific
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Dear Mr. Witten:

Subject: Makalawena Resort Draft EIS Preparation Notice

No objections to proposed development plans for Makalawena Resort. Developer shall provide adequate water supply and distribution system as required by AIA formulas and relative County Water Department regulations.

Automatic fire sprinkler systems are recommended for all commercial and residential structures because of expected delayed response from present 24-hour fire stations.

Very truly yours,

FRANCIS E. SMITH
FIRE CHIEF

FES/mo

Phillips Brandt Reddick

September 19, 1986

Mr. Francis Smith
Fire Chief
Hawaii County Fire Department
466 Kinoole Street
Hilo, Hawaii 96720

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Smith:

Thank you for your comments regarding the Makalawena Resort. The information provided will be helpful in preparing the Draft Environmental Impact Statement of which a copy will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631
Honolulu • Irvine • San Francisco • Denver

DANTE K. CARPENTER
MAYOR

A. SCOTT LEITHEAD
ADMINISTRATOR

COUNTY OF HAWAII
OFFICE OF HOUSING AND COMMUNITY DEVELOPMENT
50 WAILUKU DRIVE • HILO, HAWAII 96720
PHONE: (808) 961-8379

September 2, 1986

SEP – 4 1986
PHILLIPS BRANDT

Mr. Thomas S. Witten, ASLA
Phillips Brandt Reddick
Financial Plaza of the Pacific
130 Merchant Street, Suite 1111
Honolulu, HI 96813

SUBJECT: Makalawena Resort Draft EIS Preparation Notice

This is in response to your letter of August 22, 1986, regarding the Environmental Assessment and Notice of Prepration for an Environmental Impact Statement for the proposed Makalawena Resort located in North Kona, Hawaii.

Thank you for providing us with a copy of the Notice of Preparation. OEQC has advised our office that the formal review period will end on September 22, 1986. We will be forwarding our comments through the Hawaii County Planning Department.

Again, thank you for your courtesies in this matter.

A. Scott Leithead
Administrator

ASL:jlc/mab

EQUAL HOUSING OPPORTUNITY

DANTE K. CARPENTER
MAYOR

A. SCOTT LEITHEAD
ADMINISTRATOR

COUNTY OF HAWAII
OFFICE OF HOUSING AND COMMUNITY DEVELOPMENT
50 WAILUKU DRIVE • HILO, HAWAII 96720
PHONE: (808) 961-8379

September 2, 1986

MEMORANDUM

TO: Albert Lono Lyman
Planning Director

FROM: A. Scott Leithead
Administrator

SUBJECT: Draft Preparation Notice for the Proposed Makalawena Resort
Makalawena, North Kona, Hawaii (TMK: 7-2-04:01)

This memorandum is in response to a letter received from Thomas S. Witten of Phillips Brands Reddick advising us that the deadline for the 30-day review period for the draft EIS preparation notice is September 22, 1986. We will be taking this opportunity to comment on the proposed development and enumerate issues we would like to see addressed in the Draft EIS.

We understand that the proposed Makalawena Resort Development site encompasses approximately 353 acres 10 miles north of the town of Kailua-Kona. Further, that the proposed development will include up to 1,200 hotel rooms, 1,350 multi-family units, an 18-hole golf course, tennis center, wildlife refuge, and other support facilities.

There are several issues relating to employment and housing that should be addressed in the Draft EIS. These issues are primarily related to the cumulative impacts of the proposed Makalawena development along with the other permitted and proposed developments along the S. Kohala/N. Kona Coastline.

In particular, we would like to see discussion and analysis concerning the impact of rapid, slow, limited or full scale resort development on the ability of Makalawena to draw employees and for those employees to find adequate housng and community amenities. This analysis should include both construction and operational employment and housing impacts. The County needs to evaluate the individual projects on this coastline as a part of the development of the region. Only in this way can these impacts be effectively assessed.

Further, this analysis is necessary to allow the County to evaluate saturation levels and depletion points for housing (market and low income; rental and for-sale) as well as for the overall residents, in-migration figures,

projected resort destination region economics and demographics, and alternative growth rate scenarios need to be presented in order to adequately assess the proposed development's overall impacts on the Kona/Kohala community and the County as a whole.

We are especially concerned that there will be a significant impact to the residents and in-migrating workers looking for affordable housing during construction as well as at completion of these proposed projects.

Again, we thank you for this opportunity to make our concerns regarding this development known.

ASL:jlc/mab

Phillips Brandt Reddick

September 19, 1986

Mr. Scott Leithead
Director of Housing
Office of Housing and
Community Development
40 Wailuku Drive
Hilo, Hawaii 96720

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Leithead:

Thank you for your interest in the Makalawena Resort. Your comments and concerns regarding the impact of the resort development on the ability of Makalawena to draw employees, adequate housing for employees and community amenities will be helpful in preparing the Draft Environmental Impact Statement of which a copy will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Mr. Albert Lono Lyman
Hawaii County Planning Department
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

SEP - 5 1986

POLICE DEPARTMENT

COUNTY OF HAWAII
349 KAPIOLANI STREET
HILO, HAWAII 96720

OUR REFERENCE

YOUR REFERENCE

September 8, 1986

GUY A. PAUL
CHIEF OF POLICE

WARREN CARVALHO
DEPUTY CHIEF

Mr. Thomas S. Witten, ASLA
Principal, PBR-Hawaii
Financial Plaza of the Pacific
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

SUBJECT: MAKALAWENA RESORT DRAFT EIS PREPARATION NOTICE

We have reviewed the above EIS Preparation Notice and foresee no adverse effect from the requested land use.

GUY A. PAUL
CHIEF OF POLICE

cc: Kona Police

Phillips Brandt Reddick

September 19, 1986

Mr. Guy A. Paul
Chief of Police
Hawaii Police Department
349 Kapiolani Street
Hilo, Hawaii 96720

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Paul:

Thank you for your interest regarding the Makalawena Resort. A copy of the Draft Environmental Impact Statement will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631
Honolulu • Irvine • San Francisco • Denver

JAMES K. DAHLBERG
Councilman

COUNTY COUNCIL
County of Hawaii
Hawaii County Building
Hilo, Hawaii 96720

RECEIVED
SEP 28 986
PHILLIPS BRANDT

August 25, 1986

Mr. Thomas S. Witten, ASLA
Principal, PBR-Hawaii
Phillips Brandt Reddick
Financial Plaza of the Pacific
130 Merchant St, Suite 1111
Honolulu, Hawaii 96813

Dear Mr. Witten:

Thank you for your letter dated August 22, 1986, regarding the enclosed notice of preparation for an Environmental Impact Statement (EIS) for the Makalawena Resort located in North Kona, Island of Hawaii.

I found your communication of much interest and ask that you continue to keep me abreast as you progress.

Sincerely,

James K. Dahlberg
COUNCILMAN

Phillips Brandt Reddick

September 19, 1986

The Honorable Councilman James K. Dahlberg
Hawaii County Council
25 Aupuni Street
Hilo, Hawaii 96720

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Honorable Councilman Dahlberg:

Thank you for your interest regarding the Makalawena Resort. A copy of the Draft Environmental Impact Statement will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

KONA · KOHALA
CHAMBER OF COMMERCE

September 3, 1986

Mr. Thomas S. Witten
Principal - PBR Hawaii
Financial Plaza of the Pacific
130 Merchant Street - Suite 1111
Honolulu, Hawaii, 96813

Dear Mr. Witten:

Your August 22 letter to (Ms.) Alfie Fujitani, our immediate past president, has been routed to me, the Kona-Kohala Chamber's new president. Thank you for informing us about the Kamehameha Schools/Bernice Pauahi Bishop (KS/BE) proposed Makalawena Resort.

We also appreciate receiving the material related to KS/BE's Environmental Assessment and Notice of Preparation for an Environmental Impact Statement. As your project progresses, we would be pleased to receive additional status reports from your office.

Please continue to communicate with our Chamber. As I am sure you are aware, our members are very interested in supporting quality developments which enhance our economy and produce needed employment.

Very sincerely,

Wilton Wong
President

WW:jr

75-5737 KUAKINI HIGHWAY, KAILUA-KONA, HAWAII 96740 (808) 329-1758

Phillips Brandt Reddick

September 19, 1986

Mr. Wilton Wong, President
Kona/Kohala Chamber of Commerce
75-5737 Kuakini Highway
Suite 205
Kailua-Kona, Hawaii 96740

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Wong:

Thank you for your interest regarding the Makalawena Resort. A copy of the Draft Environmental Impact Statement will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

For the Protection of Hawaii's Native Wildlife

HAWAII AUDUBON SOCIETY

P.O. BOX 22833
HONOLULU, HAWAII 96822

P. O. Box 275
Volcano, HI 96785

September 20, 1986

SEP 23 1986

PHILLIPS BRANDT

Mr. Thomas S. Witten
Phillips Brandt Reddick – Hawaii
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Dear Mr. Witten:

Thank you for sending me a copy of the EIS preparation notice on the proposed Makalaweana Resort zoning, North Kona, sought by the Bishop Estate/Kamehameha Schools. The concerns of the Hawaii Audubon Society focus on the maintenance of Opaeula Pond and the adjacent coastal wetlands at Makalaweana as the single most important Big Island habitat for the endangered Hawaiian Stilt (Ae'o) and the endangered Hawaiian Coot ('Alae-ke'oke'o).

Many wetland habitats for native waterbirds on the Big Island have disappeared as wetlands have been converted to resort, recreational or agricultural uses. The only places where the endangered Hawaiian Stilt has been regularly observed in recent decades on the Big Island are at Opaeula Pond and Aimakapa (Honokahau Pond) in North Kona. Both habitats are essential to the continued viability of the stilt population on the Big Island.

Because of the significant importance of Opaeula Pond as endangered waterbird habitat, as well has for other native birds, migratory ducks and shorebirds, the Society recommends that the Protective Subzone-Conservation District land use designation be retained for Opaeula, the adjacent brackish water ponds and the coastal dunes.

In 1970 the US Bureau of Sport Fisheries and Wildlife (now the US Fish and Wildlife Service, USFWS) and the Hawaii State Division of Fish and Game (now the Division of Forestry and Wildlife) jointly issued Hawaii's Endangered Waterbirds . . . The Right to Exist. In the publication's summary, "Potential Refuges" on page 32, Opaeula Pond (35 acres) heads the list of "Key areas to be preserved and developed as wildlife refuges" on the island of Hawaii. Subsequently, the federal wildlife agency almost succeeded in purchasing the pond and a substantial buffer zone.

We are informed that the USFWS continues to give high priority to long-term protection of the Opaeula wetlands. For the Bishop Estate to propose only 18 acres for a "wildlife refuge" under Resort zoning, when the USFWS sees 32-35 acres as necessary for the integrity of the pond to be maintained, is a discouraging sign of how the landowner views its responsibilities to native wildlife protection for the benefit of its native Hawaiian students.

With plans underway for nine or ten other tourist resorts along the Kona coast, it appears timely to question whether there is a need for more Resort zoning, and whether resort development of up to 2550 living units on 353 acres would be economically feasible in light of the competition.

Would it not be premature to terminate the existing Conservation District land use when the financial investment for resort development in not yet in the offing?

As an alternative land use, we call upon the land owner to restore and maintain the integrity of Opaeula Pond, the adjacent wetlands and the coastal dunes as a wildlife refuge in perpetuity for the conservation education and natural history heritage of its beneficiaries — the Hawaiian students of the Kamehameha Schools.

In-depth surveys of terrestrial and aquatic plant and animal communities conducted by qualified field biologists and objective evaluations of probable negative environmental impacts are a necessity before informed decision-making on the proposal can take place.

Thank you for your consideration of the issues raised in this letter. Please send me a copy of the draft EIS.

Sincerely yours,

Mae E. Mull
Island of Hawaii Representative and
Member, Board of Directors

cc : Director, Hawaii County Planning Dept.
USFWS, Honolulu
Div. of Forestry & Wildlife, Honolulu
W. K. Tirrell, KS/BS

Phillips Brandt Reddick

September 23, 1986

Ms. Mae E. Mull
Island of Hawaii
Representative and Member
Board of Directors
Hawaii Audubon Society
P.O. Box 275
Volcano, Hawaii 96785

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Ms. Mull:

Thank you for your interest in the Makalawena Resort. Your comments and concerns regarding Opaeula Pond and associated endangered waterbird habitats will be helpful in preparing the Draft Environmental Impact Statement. An Avifaunal and Feral Mammal Survey has been completed for Makalawena and will be included in the Draft EIS of which a copy will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Mr. Albert Lono Lyman
Planning Director, County of Hawaii
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

ALU LIKE
WORKING TOGETHER

HAWAII ISLAND CENTER
P.O Box 606 Hilo, HI 96721

Telephone: (808) 961-2625
32 Kinoole St., Suite #102

RECEIVED
SEP 11 1986
PHILLIPS BRANDT

September 8, 1986

Thomas S. Witten, ASLA
Prinipal, PBR-Hawaii
Financial Plaza of the Pacific
130 Merchant St.,Suite 111
Honolulu, Hawaii 96813

Dear Mr. Witten,

Thank you for your letter of August 22 and the enclosed NOP for an EIS regarding the Makalawena Resort located in North Kona. Your notice provided us with an opportunity to examine the NOP statewide within the prospective of Alu Like's committment to the Native Hawaiian community in specfic and to the greater community in general.

We enjoy a direct mailing and voting membership of over 3,700 Native Hawaiian on the Big Island. Alu Like has a primary mission, that of assisting Native Hawaiian to develop and gain economic and social self-sufficiency. Alu Like office will be examing your EIS within the context of this mission as reflected in cultural, religious, recreational, meaningful employment, educational, archilogical and business impacts affecting this particular population.

We look forward to a warm and trustful relationship during the the period of this development. If you wish to call upon our resource pool for assistance with respect to the above concerns we would be happy to discuss such a possibility with you.

Aloha Kākou,

Everett Kinney
Island Center Administrator

A private non-profit, social change organization, striving toward Native Hawaiian economic and social self-sufficiency

E alu like mai kakou, E na 'oiwi o Hawai'i
Let us work together, natives of Hawai'i

Phillips Brandt Reddick

September 19, 1986

Mr. Everett Kinney
Island Center Administrator
Alu Like
32 Kinoole Street, Suite 102
Hilo, Hawaii 96720

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Kinney:

Thank you for your interest regarding the Makalawena Resort. A copy of the Draft Environmental Impact Statement will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

NA ALA HELE
P.O. BOX 1572
KEALAKEKUA, HI 96750

September 8, 1986

Mr. Thomas S. Witten, ASLA
Phillips, Brandt, Reddick & Assoc. (Hawaii) Inc.
Financial Plaza of the Pacific
130 Merchant St., Suite 1111
Honolulu, HI 96813

Re: Makalawena Resort Draft EIS Preparation Notice

Dear Mr. Witten:

Thank you for including our organization in the parties to be consulted in the EIS process for the Makalawena Resort.

Comments/concerns that we would like addressed in the Draft EIS include:

1. Impacts upon existing coastal and mauka-makai foot trails as a result of the proposed resort/residential development should be detailed. The State of Hawaii's ownership of trails in the area per the Highways Act of 1892 should also be examined.

2. Efforts to mitigate adverse impacts on anchialine resources surrounding the Opae'ula wildlife refuge area should be described.

3. Our organization would like to see the details of a wildlife refuge management program to be developed cooperatively between the owners and governmental agencies. We recommend buffer zones be established around the refuge.

4. How "comprehensive" will the archaeological "reconnaissance" survey be?

Thank you again for requesting our input.

Sincerely,

Deborah Chang Abreo
President, Na Ala Hele

cc: Mr. Albert L. Lyman
Mr. Wallace K. Tirrell
OEQC

Phillips Brandt Reddick

September 19, 1986

Ms. Deborah Chang Abreu
President
Na Ala Hele
P.O. Box 1572
Kealakekua, Hawaii 96750

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Ms. Abreu:

Thank you for your interest in the Makalawena Resort. Your comments and concerns regarding the existing foot trails, the Opae'ula wildlife refuge area and the wildlife refuge management program will be helpful in preparing the Draft Environmental Impact Statement of which a copy will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631
Honolulu • Irvine • San Francisco • Denver

September 4, 1986

Dear Mr. Thomas Witten,

It is difficult to express how saddened I feel at the possibility of losing Makalawena beach as a conservation area.

I have lived in Kona for twelve years and Makalawena has been my sanctuary. I live mauka Honaunau with my family and when we want to go to the beach, the ocean, the sunshine, the undeveloped, the quiet, the peaceful, the beautiful for swimming and camping and picnicing we go to Makalawena.

I would very much like to see Makalawena remain a conservation area. We, the endangered species of human beings who need a natural beach habitat to renew ourselves and thrive want Makalawena to remain undeveloped.

On the west side of the Big Island we have so few beaches. Makalawena is so precious to many of us as it is. If you develop it as planned we will lose it. Please don't take away our beach.

What would become of our beloved Queen's Bath? Would you leave it as it is? Would it be accessible to us, the public?

Would public access to the beach really be provided by you? How many parking places would be provided for the public? Who would supervise that hotel guests and employees didn't use the public parking stalls? And even if public access was provided and maintained, Makalawena would no longer have the magic undeveloped beauty that is now there. Would we be able to or want to camp on the beach with the hotel behind us?

My family has spent many treasured times together at Makalawena beach. We are thankful that we have had the opportunity to enjoy it in its natural beauty. We would like to continue to enjoy the beach. I ask for myself, for my family, for those who feel as I do but will not write their letters, and for those of the future who have not yet had the chance to experience Makalawena as it is.

Please consult me for the environmental impact statement preparation and for any other help I can be to maintain Makalawena as a conservation area. Mahalo for your time and attention.

RECEIVED
SEP - 8 1986
PHILLIPS BRANDT

Sincerely,
Sherry Berliner
PO Box 623
Kealakekua, HI.
96750

Sherry Berliner

Phillips Brandt Reddick

September 19, 1986

Ms. Sherry Berliner
P.O. Box 623
Kealakekua, Hawaii 96750

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Ms. Berliner:

Thank you for your interest regarding the Makalawena Resort. A copy of the Draft Environmental Impact Statement will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

Rick Gaffney & Associates Inc.
73 1083 Akkawa Street
Kailua-Kona, HI 96740
(808) 325-3000

9/9/86

RECEIVED
SEP 11 1986
PHILLIPS BRANDT

Mr. Thomas Witten
Phillips, Brandt, Reddick
130 Merchant Street
Honolulu, HI 96813

Sirs:

I would like to opportunity to comment on any and all plans concerning changes, development or re-zoning of the Bishop Estate lands at Makalawena, North Kona.

I further request to be a consulted party in the preparation of the Environmental Impact Statement regarding proposed changes for that area.

Sincerely yours,

Rick Gaffney

cc. Albert Lono Lyman
Hawaii County Planning Director

Phillips Brandt Reddick

September 19, 1986

Mr. Rick Gaffney
Rick Gaffney & Associates, Inc.
73-1062 Ahikawa Street
Kailua-Kona, Hawaii 96740

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Gaffney:

Thank you for your interest regarding the Makalawena Resort. A copy of the Draft Environmental Impact Statement will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

9/1/86

Dear Sir:

I would appreciate being contacted regarding the preparation of the environmental impact statement concerning Pu'u Ali'i Bay.

Thank you,

K.S. Mouskey
75-6002 Alii Dr.
Kailua-Kona, Hi. 96740
329-6087

Phillips Brandt Reddick

September 19, 1986

Mr. R.S. Marshall
75-6002 Alii Drive
Kailua-Kona, Hawaii 96740

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Marshall:

Thank you for your interest regarding the Makalawena Resort. A copy of the Draft Environmental Impact Statement will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

Phillips Brandt Reddick

September 3, 1986

Mr. R.S. Marshall
75-6002 Alii Drive
Kailua-Kona, Hawaii 96740

SUBJECT: MAKALAWENA RESORT DRAFT EIS PREPARATION NOTICE

Dear Mr. Marshall:

Enclosed for your review and comment is Kamehameha Schools/Bernice Pauahi Bishop Estate's (KS/BE) Environmental Assessment and Notice of Preparation for an Environmental Impact Statement (EIS) for the Makalawena Resort located in North Kona, Island of Hawaii.

In September 1984, a resource assessment, development strategy land use plan for the approximately 353 acres at Makalawena was submitted to the Hawaii County Planning Department for consideration in the update of the Hawaii County General Plan. Prepared for the Trustees of the KS/BE as part of their long-range planning for the coastal lands of Makalawena, the report concluded that these lands located 3.5 miles north of the airport with expansive stretches of white sand beaches, provide an outstanding setting for a quality low-density resort development.

Due to the uncertain time schedule of the current Hawaii General Plan Update process, an application for amendment has been submitted. The proposed General Plan Amendment requests an "Intermediate Resort" designation with various land uses including resort, medium density urban, open area, and conservation. The EIS will address cumulative effects of developing the proposed Makalawena Resort.

Should you have any comments or concerns that you would like to have addressed in the Draft EIS, please contact us.

Sincerely,

Thomas S. Witten, ASLA
Principal, PBR-Hawaii

Enclosure

cc: Mr. Albert L. Lyman, Director, Planning Department
Mr. Wallace K. Tirrell, KS/BE
OEQC

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

Sept. 2, 1986

Thomas Witten
Phillips, Brandt, Reddick
130 Merchant St
Honolulu, Hi. 96813

Dear Sir,
I would like a copy of the environmental impact statement and the names of the copany(s) who did the study.
Thank you

Sincerely,
Mary Lou Mowell

Mrs. Lou R. Mowell
P.O. Box 4071
Kailua-Kona, Hi 96740

9/5/86

Dear Mr. Witten

Thank you very kindly for your prompt response in your letter of September 3rd. after reading over the proposal E 15 el have several questions in my mind which would best answered by walking over the propsecty.

If you can make arraignments for a letter of permission to visit the site I would appriciate your continued cooperation in the matter.

Mahalo
K.E. Mowell

K-E-Mowell
75-6002 Alii Drive
Kailua-Kona, Hi.
96740

Phillips Brandt Reddick

September 19, 1986

Mrs. W.R. Glover
P.O. Box 4071
Kailua-Kona, Hawaii 96740

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mrs. Glover:

Thank you for your interest regarding the Makalawena Resort. A copy of the Draft Environmental Impact Statement will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

Phillips Brandt Reddick

September 3, 1986

Mrs. W.R. Glover
P.O. Box 4071
Kailua-Kona, Hawaii 96740

SUBJECT: MAKALAWENA RESORT DRAFT EIS PREPARATION NOTICE

Dear Mrs. Glover:

Enclosed for your review and comment is Kamehameha Schools/Bernice Pauahi Bishop Estate's (KS/BE) Environmental Assessment and Notice of Preparation for an Environmental Impact Statement (EIS) for the Makalawena Resort located in North Kona, Island of Hawaii.

In September 1984, a resource assessment, development strategy land use plan for the approximately 353 acres at Makalawena was submitted to the Hawaii County Planning Department for consideration in the update of the Hawaii County General Plan. Prepared for the Trustees of the KS/BE as part of their long-range planning for the coastal lands of Makalawena, the report concluded that these lands located 3.5 miles north of the airport with expansive stretches of white sand beaches, provide an outstanding setting for a quality low-density resort development.

Due to the uncertain time schedule of the current Hawaii General Plan Update process, an application for amendment has been submitted. The proposed General Plan Amendment requests an "Intermediate Resort" designation with various land uses including resort, medium density urban, open area, and conservation. The EIS will address cumulative effects of developing the proposed Makalawena Resort.

Should you have any comments or concerns that you would like to have addressed in the Draft EIS, please contact us.

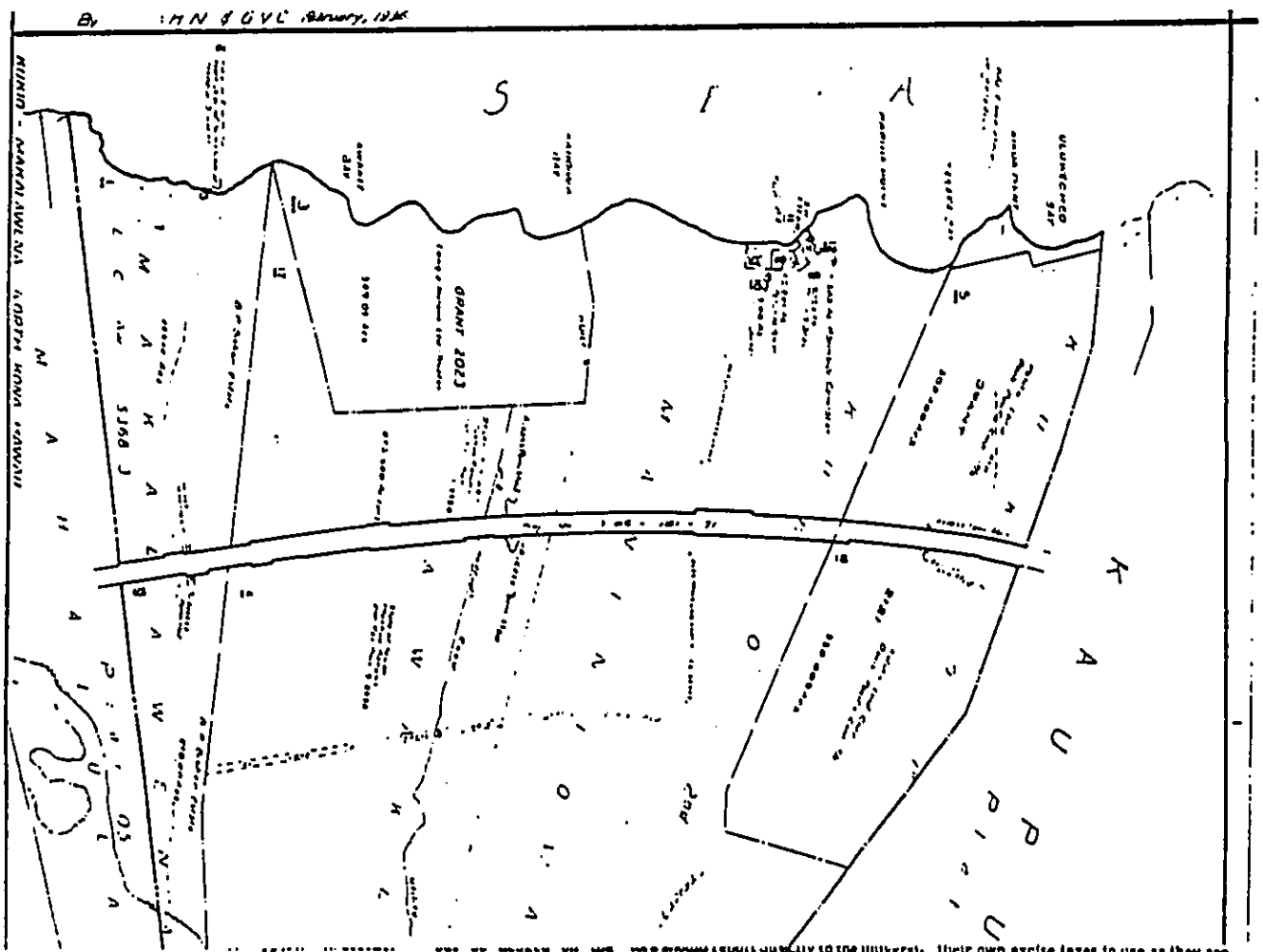
Sincerely,

Thomas S. Witten, ASLA
Principal, PBR-Hawaii

Enclosure

cc: Mr. Albert L. Lyman, Director, Planning Department
Mr. Wallace K. Tirrell, KS/BE
OEQC

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631



...t would do what I could to include funding for it," she said.

All three candidates said federal funding should be sought for such a project.

Improving the university's Hilo campus drew similar commitments. Waihee called UH-Hilo "a very important institution in the development of this island." And he said the state has been "dragging

question of a separate Board of Regents.

But Heftel went the extra step, calling for a local Board of Regents and a separate president. He suggested whole departments, including agriculture and astronomy, could be moved from the UH-Manoa campus in Honolulu to UH-Hilo.

Mink made a similar promise to chan-

...report directly to the university's Board of Regents, she said, rather than through the administration at Manoa as is done now.

The candidates echoed their promises of autonomy for UH-Hilo with a commitment to giving county governments more leeway in planning and taxation.

Heftel went so far as to propose the state Land Use Commission be abolished,

their own excise taxes to use as they see fit.

Mink agreed that development issues should be decided primarily in the counties, but she said she favors keeping the Land Use Commission. "The state LUC serves a very useful purpose," she said. "The state needs to have an entity that

See DEMOCRATS Page 2

Bishop moves on Makalawena resort plans

By REED FLICKINGER
West Hawaii Today

Bishop Estate is moving ahead with plans to develop a resort at Makalawena and has filed an environmental impact statement notice of preparation for the 353 acre North Kona project site.

Plans for the resort, as outlined by the State Office of Environmental Quality Control, include a 45-acre 900-1,200 room hotel site, between 900 and 1,350 multi-family residential units on 90 acres and an 18 hole golf course.

The Makalawena site is located approximately 10 miles north of Kailua-Kona, makai of Queen Kaahumanu Highway, extending to the coastline at Pu'u Ali'i Bay where the hotel would be situated. The ahupua'a immediately to the north of the project site is Awake'e, site of a proposed resort development by Kohala Capital Corp.

Kamehameha Schools Bernice Pauahi Bishop Estate will seek a Hawaii County General Plan amendment to change current Land Use Pattern Allocation Guide maps showing the project site as a conservation area. The developer is seeking reclassification to resort, medium density urban and open area designation to accommodate the proposed "high quality, low density resort community."

Plans outlined by the state for the project include a "shoreline open space and park area," that would be "provided along the entire shoreline with public access to be incorporated into the hotel site development." An area known as the "Opae'ula Pond" would be included within an 18-acre wildlife refuge, to be maintained and protected as such, the state reported. Additionally, 27 acres of the project area would be used for roads, a sewage treatment plant and open space.

Coordinating planning for the developer is Thomas Witten of Phillips, Brandt, Reddick and Assoc., 130 Merchant St., Honolulu, 96813. Persons wishing to comment on plans, or be consulted in the *environmental impact statement preparation* should contact Witten, with a copy to Hawaii County Planning Director Albert Lono Lyman, 25 Aupuni St., Hilo 96720. The deadline for comment on the notice of preparation is Sept. 22.

Holiday today

West Hawaii Today's offices will be closed today for the Labor Day holiday. The newspaper will publish as usual tomorrow.

County, state and federal offices, including the post offices, will be closed. Banks, savings and loans and public libraries will also observe the holiday.

The County Transit Agency says that all city and rural Hele-On bus routes and Dial-A-Ride services with the exception of the South Kohala system will not operate on Labor Day. The South Kohala system will operate as regularly scheduled

Planes collide, crash into homes; 70 dead

CERRITOS, Calif. (UPI) — An Aeromexico DC 9 jetliner and a single-engine plane collided in a clear sky yesterday and hurtled into a suburban Los Angeles residential area, killing all 67 people aboard the planes and at least five people on the ground.

A wall of flame and burning debris howled through the placid subdivision 20 miles southeast of downtown Los Angeles. The planes crashed just 8 miles from Disneyland and 3 miles from the Knott's Berry Farm amusement park.

One resident burned to death trying to save his $170,000 house with a garden hose. Parts of the two planes rained down for 10 minutes after the midday collision.

Authorities said the planes were between 6,000 and 7,000 feet high, and visibility extended 14 miles, when they collided. The Federal Aviation Administration would not comment on how they came to be in the same airspace but one airport official said he understood the small plane "had every right to be there."

Part of the fuselage of Aeromexico Flight 498 came to rest on Carmenita Avenue after hurtling through a concrete retaining wall. Another section protruded from the rubble of a house. They were the seen.

Parts of bodies littered the manicured lawns and emergency workers rushed about covering them with yellow plastic bags.

They did not begin gathering the dead until sundown.

"Our people are working in teams out there and it'll be sometime tomorrow afternoon before we finish our search and have everything collected," said Bill Guld, a spokesman for the coroner's office. "You might have a wallet near a man's body and a handbag near a woman's body. We're being careful about moving things until we've had a chance to examine the connections."

The death toll on the ground could rise. "We have numerous people unaccounted for," said Sheriff's Deputy Lynda Evans. Highway Patrol spokesman Lyle Whitten said five were known dead.

The airliner's flight recorder, which contains flight data and recordings of cockpit conversation, was recovered in a back yard on Holmes Street, authorities said. They also reported late yesterday night that they had arrested two people for looting — one they said was robbing a damaged house and another who was

An Aeromexico official said there were 58 passengers and six crew members aboard Flight 498 from Mexico City, but a passenger list released late yesterday night did not indicate how many were U.S. citizens.

An official of the Mexican pilot's union said the captain of Flight 498, Arturo Valdez Prom, had flown 10,000 hours, compiling an "excellent record."

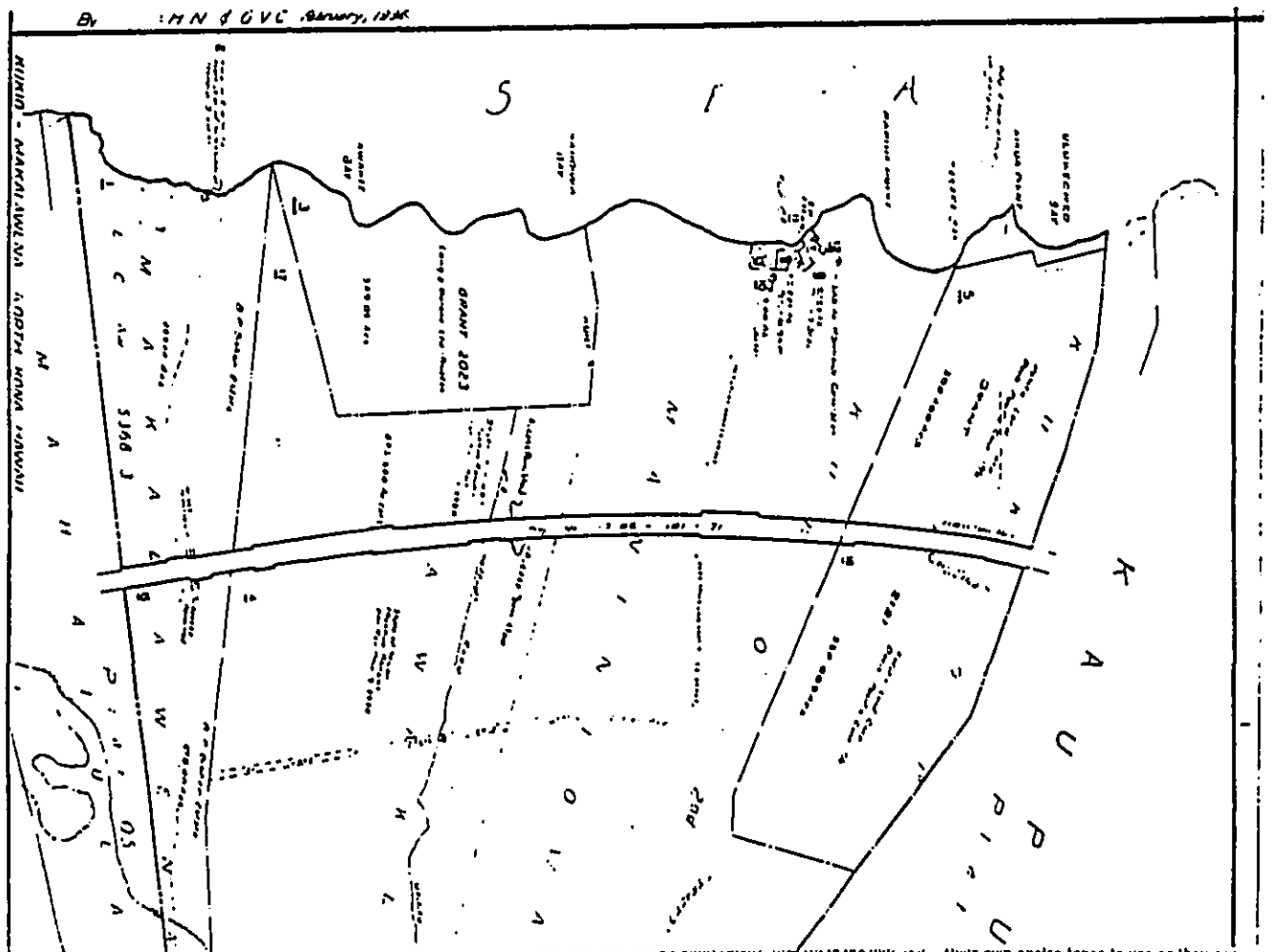
The airliner destroyed at least 10 houses and damaged 20 more. The Piper Tomahawk, with three people in it, fluttered to earth in a nearby schoolyard. A woman's legs protruded from a window.

"My neighbors are dead! My neighbors are dead!" screamed a hysterical woman roaming through the grisly wreckage. "My cat is dead! The planes, my God, they disintegrated. Look at the turtle over there. Oh my God."

Eric Himes said he was watching a tennis match on television when Flight 498 smashed into the ground a few hundred feet away.

"There was a wall of flame," Himes said. "It was unbelievable. It lies. Lots of bodies. Oh Christ. Have you ever been to Vietnam? That's the only thing I can compare it with."

See PLANES



X-67

...t would do what I could to include funding for it," she said.

All three candidates said federal funding should be sought for such a project.

Improving the university's Hilo campus drew similar commitments. Waihee called UH-Hilo "a very important institution in the development of this island." And he said the state has been "dragging

question of a separate Board of Regents.

But Heftel went the extra step, calling for a local Board of Regents and a separate president. He suggested whole departments, including agriculture and astronomy, could be moved from the UH-Manoa campus in Honolulu to UH-Hilo.

Mink made a similar promise to chan-

ty's Board of Regents, she said, rather than through the administration at Manoa as is done now.

The candidates echoed their promises of autonomy for UH-Hilo with a commitment to giving county governments more leeway in planning and taxation.

Heftel went so far as to propose the state Land Use Commission be abolished,

their own excise taxes to use as they see fit.

Mink agreed that development issues should be decided primarily in the counties, but she said she favors keeping the Land Use Commission. "The state LUC serves a very useful purpose," she said. "The state needs to have an entity that

See DEMOCRATS Page 2

Bishop moves on Makalawena resort plans

By REED FLICKINGER
West Hawaii Today

Bishop Estate is moving ahead with plans to develop a resort at Makalawena and has filed an environmental impact statement notice of preparation for the 353 acre North Kona project site.

Plans for the resort, as outlined by the State Office of Environmental Quality Control, include a 45-acre 900-1,200 room hotel site, between 900 and 1,150 multi-family residential units on 90 acres and an 18 hole golf course.

The Makalawena site is located approximately 10 miles north of Kailua-Kona, makai of Queen Kaahumanu Highway, extending to the coastline at Pu'u Ali'i Bay where the hotel would be situated. The ahupua'a immediately to the north of the project site is Awake'e, site of a proposed resort development by Kahala Capital Corp.

Kamehameha Schools Bernice Pauahi Bishop Estate will seek a Hawaii County General Plan amendment to change current Land Use Pattern Allocation Guide maps showing the project site as a conservation area. The developer is seeking reclassification to resort, medium density urban and open area designation to accommodate the proposed "high quality, low density resort community."

Plans outlined by the state for the project include a "shoreline open space and park area," that would be "provided along the entire shoreline with public access to be incorporated into the hotel site development." An area known as the "Opae'ula Pond" would be included within an 18-acre wildlife refuge, to be maintained and protected as such, the state reported. Additionally, 27 acres of the project area would be used for roads, a sewage treatment plant and open space.

Coordinating planning for the developer is Thomas Witten of Phillips, Brandt, Reddick and Assoc., 130 Merchant St., Honolulu, 96813. Persons wishing to comment on plans, or be consulted in the environmental impact statement preparation should contact Witten, with a copy to Hawaii County Planning Director Albert Lono Lyman, 25 Aupuni St., Hilo 96720. The deadline for comment on the notice of preparation is Sept. 22.

Holiday today

West Hawaii Today's offices will be closed today for the Labor Day holiday. The newspaper will publish as usual tomorrow.

County, state and federal offices, including the post offices, will be closed. Banks, savings and loans and public libraries will also observe the holiday.

The County Transit Agency says that all city and rural Hele-On bus routes and Dial-A-Ride services with the exception of the South Kohala systems will not operate on Labor Day. The South Kohala system will operate as regularly scheduled

Planes collide, crash into homes; 70 dead

CERRITOS, Calif. (UPI) — An Aeromexico DC 9 jetliner and a single-engine plane collided in a clear sky yesterday and hurtled into a suburban Los Angeles residential area, killing all 67 people aboard the planes and at least five people on the ground.

A wall of flame and burning debris bowled through the placid subdivision 20 miles southeast of downtown Los Angeles. The planes crashed just 8 miles from Disneyland and 3 miles from the Knott's Berry Farm amusement park.

One resident burned to death trying to save his $170,000 house with a garden hose. Parts of the two planes rained down for 10 minutes after the midday collision.

Authorities said the planes were between 6,000 and 7,000 feet high, and visibility extended 14 miles, when they collided. The Federal Aviation Administration would not comment on how they came to be in the same airspace but one airport official said he understood the small plane "had every right to be there."

Part of the fuselage of Aeromexico Flight 498 came to rest on Carmenita Avenue after hurtling through a concrete retaining wall. Another section protruded from the rubble of a house. They were the

seen.

Parts of bodies littered the manicured lawns and emergency workers rushed about covering them with yellow plastic bags.

They did not begin gathering the dead until sundown.

"Our people are working in teams out there and it'll be sometime tomorrow afternoon before we finish our search and have everything collected," said Bill Gold, a spokesman for the coroner's office. "You might have a wallet near a man's body and a handbag near a woman's body. We're being careful about moving things until we've had a chance to examine the connections."

The death toll on the ground could rise. "We have numerous people unaccounted for," said Sheriff's Deputy Lynda Evans. Highway Patrol spokesman Lyle Whitten said five were known dead.

The airliner's flight recorder, which contains flight data and recordings of cockpit conversation, was recovered in a back yard on Holmes Street, authorities said. They also reported late yesterday night that they had arrested two people for looting — one they said was robbing a damaged house and another who was

An Aeromexico official said there were 58 passengers and six crew members aboard Flight 498 from Mexico City, but a passenger list released late yesterday night did not indicate how many were U.S. citizens.

An official of the Mexican pilot's union said the captain of Flight 498, Arturo Valdez Prom, had flown 10,000 hours, compiling an "excellent record."

The airliner destroyed at least 10 houses and damaged 20 more. The Piper Tomahawk, with three people in it, fluttered to earth in a nearby schoolyard. A woman's legs protruded from a window.

"My neighbors are dead! My neighbors are dead!" screamed a hysterical woman roaming through the grisly wreckage. "My cat is dead! The planes, my God, they disintegrated. Look at the torso over there. Oh my God."

Eric Himes said he was watching a tennis match on television when Flight 498 smashed into the ground a few hundred feet away.

"There was a wall of flame," Himes said. "It was unbelievable. It lies. Lots of bodies. Oh Christ. Have you ever been to Vietnam? That's the only thing I can compare it with."

See PLANES

Phillips Brandt Reddick

September 19, 1986

Mr. Michael J. Matsukawa
Trustee, Hawaii Conference Foundation
75-5722 Kuakini Highway, Room 108
Kailua-Kona, Hawaii 96750

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Matsukawa:

Thank you for your comments regarding the Makalawena Resort. The information provided will be helpful in preparing the Draft Environmental Impact Statement of which a copy will be distributed to you for further review and comment.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten

Thomas S. Witten, ASLA
Principal

cc: Mr. Wallace K. Tirrell
Kamehameha Schools/Bernice Pauahi Bishop Estate
Office of Environmental Quality Control

Phillips, Brandt, Reddick & Assoc., Inc.
Planning and Landscape Architecture
130 Merchant Street Suite 1111
HONOLULU, HAWAII 96813

(808) 521-5631

FOR FILE

LETTER OF TRANSMITTAL

DATE 9.16.86 JOB NO.

ATTENTION MR. MATSUKAWA

RE MAKALAWENA RESORT DEIS

TO MR. MICHAEL J. MATSUKAWA
75-5722 KUAKINI HWY, RM. 108
KAILUA, KONA, HI. 96750

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
1	July '86		EIS Notice of Preparation

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval
☒ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution
☒ As requested ☐ Returned for corrections ☐ Return _____ corrected prints
☐ For review and comment ☐ _____
☐ FOR BIDS DUE _____ 19 _____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS Thank you for your letter. We are aware of the church property at Makalawena and apologize for our oversight of not contacting you sooner. With the proposed development, there are several opportunities for the subject project that should be explored further. Mr. Wallace Tirrell, Area Development Manager of Bishop Estate will be following up on this concern in the upcoming weeks. The Draft EIS should be available for review in October. Should you have further questions, pls. call.
cc: Mr. Jim Richards, Direct Executive Secretary
Hawaii Conference Foundation
15 Craigside Place, Hon. Hi. 96817

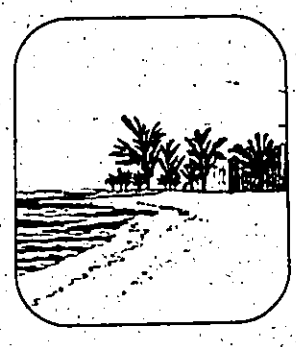
COPY TO Wallace Tirrell KS/BE

SIGNED: Tom Witten

If enclosures are not as noted, kindly notify us at once.

XI

AGENCIES, ORGANIZATIONS AND PERSONS WHO WERE SENT A COPY OF THE DEIS; WRITTEN COMMENTS RECEIVED DURING THE PUBLIC REVIEW PERIOD; AND RESPONSES



CHAPTER XI

AGENCIES, ORGANIZATIONS AND PERSONS WHO WERE SENT A COPY OF THE DRAFT EIS; WRITTEN COMMENTS RECEIVED DURING THE PUBLIC REVIEW PERIOD; AND RESPONSES

The Draft EIS (DEIS) was officially filed with the Hawaii County Planning Department and the Office of Environmental Quality Control (OEQC) on 6 October 1986 and was published in the OEQC Bulletin on 8 October 1986. The agencies, organizations and persons listed below received a copy(ies) of the DEIS. As of 7 November 1986, a total of 20 letters were received; of this total 14 provided substantive comments.

A thirty day extension to the sixty day public review period was requested by the applicant on November 13, 1986 in order that sufficient time would be available to respond to comments received late. The request was granted on November 21, 1986 by County of Hawaii Planning Department thus extending the response period to December 19, 1986 and Final EIS review and determination of acceptability to January 4, 1986.

Starred (*) individuals sent letters regarding the DEIS, but did not provide substantive comments. Double starred (**) respondents provided comments on the DEIS. Their letters and our replies are reproduced in this section.

Additionally, ten letters were received after the 7 November 1986 deadline for the review period. These respondents are indicated by a triple star (***) and their letters and our replies are also reproduced in this section.

Federal Agencies

** Department of Commerce - National Marine Fisheries Service
** U.S. Corps of Engineers - Engineering Division
** Department of the Interior - Fish and Wildlife Service
* Department of the Interior - Geological Survey, Water Resources Division
*** Department of Housing and Urban Development
* Department of Agriculture - Soil Conservation Service
* Department of Energy

State Agencies

** Department of Agriculture
** Department of Education

** University of Hawaii - Water Resources Research Center
** Natural Energy Laboratory of Hawaii
* Department of Budget and Finance
* Department of Accounting and General Services
* Department of Defense
* Department of Planning and Education Development - Energy Division
*** University of Hawaii - Environmental Center
*** Department of Transportation
*** Hawaii Housing Authority
*** Department of Planning and Education Development
*** Department of Health

County Agencies

*** Department of Planning
*** Office of Housing and Community Development
*** Department of Water Supply
** Department of Research and Development
** Department of Parks and Recreation
** Police Department
*** Department of Public Works

Community Organizations / Private Individuals

** Hawaii Electric Light Company, Inc.
** Na Ala Hele
*** Hawaii Audubon Society
** R.E. Marshall
** J. Prell

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
465 SOUTH KING STREET, ROOM 104
HONOLULU, HAWAII 96813

LETITIA N. UYEHARA
DIRECTOR

TELEPHONE NO.
548-6915

October 9, 1986

Mr. Guido Giacometti
Director, Land Division
Kamehameha Schools/Bernice
Pauahi Bishop Estate
567 South King Street, Suite 300
Honolulu, Hawaii 96813

Dear Mr. Giacometti:

Subject: Draft Environmental Impact Statement for the Makalawena Resort, Makalawena, North Kona, Hawaii

The Draft EIS was officially received by the Office of Environmental Quality Control on October 6, 1986 and will be published in the October 8, 1986 OEQC Bulletin. The deadline for comments and the end of the 30-day public review period is November 7, 1986. We have requested all written comments be directed to the County of Hawaii Planning Department with copies to you and Phillips, Brandt, Reddick and Associates (Hawaii), Inc.

Copies of the statement have been sent to the agencies, libraries, and organizations on the attached distribution list.

Should you have any questions regarding this EIS, please do not hesitate to contact Faith Miyamoto at 548-6915.

Sincerely,

Letitia N. Uyehara
Director

cc: Thomas S. Witten, PBR
County of Hawaii Planning Dept.

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
465 South King Street, Room 104
HONOLULU, HAWAII 96813

LETITIA N. UYEHARA
DIRECTOR

TELEPHONE NO.
548-6915

October 6, 1986

Dear Reviewer:

Attached for your review is an Environmental Impact Statement (EIS) that was prepared pursuant to Chapter 343, Hawaii Revised Statutes and Chapter 11-200, Administrative Rules, EIS Rules:

TITLE: Makalawena Resort

LOCATION: Makalawena, North Kona, Hawaii

CLASSIFICATION: Applicant Action

Your comments or acknowledgments of no comments on the EIS are welcomed. Please submit your reply to the accepting authority or approving agency:

Mr. Albert Lono Lyman, Director
County of Hawaii Planning Department
25 Aupuni Street
Hilo, Hawaii 96720

Please send a copy of your reply to the proposing party:

Mr. Guido Giacometti Director, Land Division Kamehameha Schools/Bernice Pauahi Bishop Estate 567 South King Street, Suite 300 Honolulu, Hawaii 96813	AND	Mr. Thomas S. Witten, Principal Phillips, Brandt, Reddick, & Assoc. (HI), Inc. 130 Merchant Street, Suite 111 Honolulu, Hawaii 96813

Your comments must be received or postmarked by: November 7, 1986.

If you have no further use for this EIS, please return it to the Office of Environmental Quality Control.

Thank you for your participation in the EIS process.

DISTRIBUTION LIST

( ) E.A.
( ) APPLICANT ACTION
( ) AGENCY ACTION

(x) EIS
(x) APPLICANT ACTION
( ) AGENCY ACTION

Title: Makalawena Resort

Location : Makalawena, North Kona, Hawaii

Proposing Agency/Applicant: Kamehameha Schools/Bernice Bishop Estate

Accepting Authority/Approving Agency: County of Hawaii Planning Department

Deadline for Comments: November 7, 1986

Date Sent/By: OCT -9 1986 li

STATE AGENCIES	NO. COPIES	REMARKS
OEQC	1	
Dept. of Agriculture	1	
Dept. of Accounting and General Services	1	
Dept. of Defense	1	
Dept. of Education (a)*	1	
Dept. of Hawaiian Home Lands (a)*	1	
Dept. of Health	1	
Dept. of Land and Natural Resources	3	
DLNR State Historic Preservation Officer	1	
Dept. of Planning and Economic Development	1	
DPED Library	1	
Dept. of Social Services and Housing	1	
Dept. of Transportation	3	
State Archives	1	
State Energy Office	1	
UNIVERSITY OF HAWAII		
Environmental Center	4	
Marine Programs (a)*	1	
Water Resources Research Center	1	
FEDERAL		
Army-DAFE (Facilities Eng.-USASCH)		
Environmental Protection Agency (a)*		
Navy		
Soil Conservation Service	1	
U.S. Army Corps of Engineers	1	
U.S. Coast Guard		
U.S. Fish and Wildlife Service	1	
U.S. Geological Survey (a)*	1	

Total Received: 71
Total Distributed: 70
File Copy: 1

Copy of Distribution List Sent to: Hawaii Planning Dept.;
Date: [illegible]
Phillips, Brandt, Reddi

Honolulu Star-Bulletin	1	
Honolulu Advertiser	1	
Sun Press		
Hawaii Tribune Herald (b)**	1	
West Hawaii Today - Kona (b)**	1	
The Garden Island Newspaper - Kauai (b)**		
Maui News (b)**		
Ka Molokai (b)**		
CITY AND COUNTY OF HONOLULU (b)**		
Board of Water Supply		
Building Dept.		
Dept. of Housing and Community Development		
Dept. of General Planning		
Dept. of Land Utilization		
Dept. of Parks and Recreation		
Dept. of Public Works		
Dept. of Transportation Services		
Fire Dept.		
Municipal Reference and Records Center (Oahu only)		
Police Dept.		
COUNTY OF HAWAII (b)**		
Planning Dept.		
Dept. of Parks and Recreation	1	
Dept. of Public Works	1	
Dept. of Research and Development	1	
Dept. of Water Supply	1	
University of Hawaii - Hilo Campus Library	1	
COUNTY OF MAUI (b)**		
Planning Dept.		
Dept. of Parks and Recreation		
Dept. of Public Works		
Dept. of Water Supply		
Economic Development Agency		
Maui Community College Library		
COUNTY OF KAUAI (b)**		
Planning Dept.		
Dept. of Public Works		
Dept. of Water Supply		
Kauai Community College Library		
NON-GOVERNMENTAL AGENCIES		
American Lung Association	1	
Hawaiian Electric Company	1	
Office of Hawaiian Affairs	1	
LIBRARIES		
U.H. Hamilton Library, Hawaiian Collection	1	
Legislative Reference Bureau	1	

(b)** Copy desired only if project is in respective county.

LIBRARIES	NO. COPIES	REMARKS
State Main Library	2	
REGIONALS:		
Kaimuki Regional Library	1	
Kaneohe Regional Library	1	
Pearl City Regional Library	1	
Hilo Regional Library	1	
Wailuku Regional Library	1	
Lihue Regional Library	1	
OAHU:		
Aiea Library		
Aina Haina Library		
Ewa Beach Community-School Library		
Hawaii Kai Library		
Kahuku Community-School Library		
Kailua Library		
Kalihi-Palama Library		
Lilina Library		
Manoa Library		
McCully-Moiliili Library		
Mililani Library		
Wahiawa Library		
Waialua Library		
Waianae Library		
Waikiki-Kapahulu Library		
Waimanalo Community-School Library		
Waipahu Library		
HAWAII		
Bond Memorial (Kohala) Library		
Holualoa Library	1	
Honokaa Library		
Kailua-Kona Library	1	
Keaau Community-School Library		
Kealakekua Library	1	
Laupahoehoe Community-School Library		
Mountain View Community-School Library		
Pahala Community-School Library		
Pahoa Community-School Library		
Thelma Parker Memorial Library/Waimea Area Library	1	
MAUI		
Kahului Library		
Lahaina Library		
Makawao Library		
MOLOKAI		
Molokai Library		
LANAI		
Lanai Community-School Library		
KAUAI		
Hanapepe Library		
Kapaa Library		
Koloa Community-School Library		

COUNTY OF HAWAII

PLANNING DEPARTMENT

25 ALIAPAI STREET • HILO, HAWAII 96720

DAVID A. CARPENTER
Mayor

ALBERT LONO LYMAN
Director

ILIMA A. PIHANAIA
Deputy Director

October 16, 1986

Mr. Thomas S. Witten, ASLA
Principal, PBR-Hawaii
Financial Plaza of the Pacific
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Dear Mr. Witten:

Draft EIS - Makalawena Resort Community

This is to acknowledge receipt of the original and four (4) copies of the draft environmental impact statement for the proposed resort community at Makalawena.

Sincerely,

A. Lono Lyman

Albert Lono Lyman
Director

AK:lv

IPP. FILE

Phillips Brandt Reddick

November 13, 1986

Mr. Albert Lono Lyman, Director
Planning Department
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

Dear Mr. Lyman:

The deadline for comments and the end of the 30-day public review period for this Draft EIS was November 7, 1986. Several comments have been received at this deadline that require additional response time prior to submitting the Final EIS.

So that we may adequately address the comments received at the end of review period, we request that the 60-day period be extended for thirty (30) days (Chapter 200 of Title 11, 11-200-23) as follows:

	Original	Extended Deadline
Official date of submittal - Draft EIS	October 6, 1986	
End of comment period	November 7, 1986	
End of response period (submit Final EIS)	November 20, 1986	December 19, 1986*
Final EIS review and determination of acceptability	December 5, 1986	January 6, 1987

* Should responses to comments be completed earlier, the Final EIS is likely to be submitted by December 5, 1986 with Final EIS determination of acceptability by December 22, 1986.

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

Please notify our office, Mr. Guido Giacometti, and OEQC in writing of your decision to grant or deny the requested time extension.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Office of Environmental Quality Control
Mr. Guido Giacometti KS/BE
Mr. Wallace Tirrell KS/BE
Mr. Sydney Kelliopuleole KS/BE

PLANNING DEPARTMENT

25 AUPUNI STREET • HILO, HAWAII 96720
(808) 961-8288

DANIEL K. CARPENTER
Mayor

ALBERT LONO LYMAN
Director

HIMA A. PHANAIA
Deputy Director

COUNTY OF HAWAII

NOV 25 1986

November 21, 1986

Mr. Thomas S. Witten, ASLA
Principal, PBR-Hawaii
Financial Plaza of the Pacific
130 Merchant Street, Suite 1111
Honolulu, HI 96813

Dear Mr. Witten:

Request for Extension
Makalawena Resort EIS

This is to acknowledge receipt of your November 13, 1986 letter, requesting thirty (30) days extension of the sixty-(60) day EIS acceptance period.

Based on your reason for the extension request, we hereby grant you the thirty days until January 4, 1987 at which time a determination of acceptance or non-acceptance of the final EIS shall be made. Please be advised that the sixty-day acceptance period may be extended for a period not to exceed thirty days (Chapter 200 of Title 11, 11-200-23f). Therefore, we recommend that the final EIS be submitted to our office by December 19, 1986.

Please be further advised that we are granting you the full thirty days; and as such, our determination shall be made by the January 4, 1987 deadline and not December 22, 1986.

Should you have any questions, please feel free to contact our office.

Sincerely,

ALBERT LONO LYMAN
Planning Director

AK:lkt
cc: OEQC w/copy of letter
Guido Giacometti w/copy of letter

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region • Western Pacific Program Office
2570 Dole St. • Honolulu, Hawaii 96822-2396

November 3, 1986 F/SWR1:JJN

Mr. Albert Lono Lyman
Director
County of Hawaii Planning Department
25 Aupuni Street
Hilo, Hawaii 96720

NOV 4 1986

Dear Mr. Lyman:

Subject: Draft Environmental Impact Statement Makalawena Resort, North Kona, Hawaii

The National Marine Fisheries Service (NMFS) has received and reviewed tha subject Draft Environmental Impact Statement (DEIS) for the Makalawena Resort, North Kona, Hawaii. The DEIS was prepared for Kamehameha Schools/Bishop Estate for submittal to the County of Hawaii. We offer the following comments for your consideration.

NMFS was consulted during development of the DEIS. Our letter dated September 10, 1986 commenting on the EIS Preparation Notice is included in Chapter X of the subject document. Generally speaking concerns raised in our September 10 letter about resources for which NMFS bears a responsibility, and alternatives to reduce adverse impacts on these resources, have been addressed to our satisfaction in the DEIS.

At this time the resort project developers apparently do not intend to directly modify the shoreline or coastal marine environment at Makalawena. In addition, the DEIS states that "no anchialine pond filling or alteration is proposed" and that "the developer intends to work with appropriate Federal, State and county agencies to create a wildlife refuge at Opae'ula Pond" (page IV-33).

NMFS continues to be concerned about secondary impacts to both the nearshore marine environment and coastal pond complexes from the proposed project. These include increased public access, increased fishing pressure, and changes in surface and sub-surface runoff patterns which may introduce nutrients, sediment and other pollutants into the marine and coastal pond environments. We feel the conservation measures detailed in the DEIS (under Mitigation Measures) include feasible methods to eliminate most of the major secondary impacts. We look forward to working with the developer to implement the appropriate measures.

We wish to point out that if the developer intends to modify in any way the marine environment, shoreline or coastal ponds,

an Army Corps of Engineers permit will be required. In addition, Section 7 consultation under the Endangered Species Act of 1973 must be initiated with NMFS should modification of the marine environment occur.

Sincerely yours,

Doyle E. Gates

Doyle E. Gates
Administrator

cc: F/SWR, Terminal Is., CA
Corps of Engineers, Honolulu District
FWS, Honolulu
EPA, Region 9
Hawaii State Div. of Aquatic Resources
Phillips, Brandt, Reddick, & Assoc., Inc.
Kamehameha Schools/Bishop Estate

Phillips Brandt Reddick
November 17, 1986

Mr. Doyle Gates, Administrator
National Marine Fisheries Service
Southwest Region, Western Pacific Program Office
2570 Dole Street
Honolulu, Hawaii 96822-2396

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT,
NORTH KONA, HAWAII

Dear Mr. Gates:

Thank you for the copy of your letter of 3 November 1986 to Mr. Albert Lono Lyman, Director, County of Hawaii Planning Department. We have reviewed your letter and offer the following response.

1. We are pleased the concerns noted in your letter regarding the EIS Preparation Notice were addressed to your satisfaction in the Draft EIS.

2. Your letter correctly states that the developer does not intend to modify the shoreline or coastal marine environment at Makalawena and that the developer intends to work with appropriate federal, state and county agencies to create a wildlife refuge at Opaeula Pond.

3. We appreciate and share your concerns regarding secondary impacts on the marine environment and look forward to working with your agency to minimize those impacts.

4. Please be assured that if the developer intends to modify the marine environment, shoreline or coastal ponds, all appropriate federal, state and county agencies will be consulted and appropriate permits, if required, obtained prior to those alterations. As noted in 2 above, the developer does not intend to modify the areas indicated above.

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director, County of Hawaii
Mr. G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel (808) 521-5631

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
BUILDING 230
FT. SHAFTER, HAWAII 96858-5440

[illegible]

Phillips Brandt Reddick

November 17, 1986

Mr. Kisuk Cheung, Chief
Engineering Division
U.S. Army Engineer District, Honolulu
Building 230
Ft. Shafter, hawaii 96858-5440

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT, NORTH KONA, HAWAII

Dear Mr. Cheung:

Thank you for the copy of your letter of 3 November 1986 to Mr. Albert Lono Lyman, Director, County of Hawaii Planning Department. We have reviewed your letter and offer the following response.

Filling of anchialine ponds and/or alteration of the beach areas of the project site are not planned at present. Should these plans change, appropriate permit applications and environmental assessments would be filed with your agency.

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director, County of Hawaii
Mr. G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies   Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P O BOX 50167
HONOLULU HAWAII 96850

NOV 7 1986

NOV 6 1986

Mr. Albert Lono Lyman, Director
County of Hawaii Planning Department
25 Aupuni Street
Hilo, Hawaii 96720

Re: Draft Environmental Impact Statement (DEIS) for the Makalawena Resort, North Kona, Hawaii, TMK: 7-2-04:01.

Dear Mr. Lyman:

The Service has completed its review of the subject DEIS. We believe that in general, the document adequately describes existing fish and wildlife resources and evaluates project construction impacts upon these resources. The specific issues raised in our letter of September 23, 1986 to Mr. Thomas S. Witten of Phillips, Brandt, Reddick & Associates, Inc. (PBR), have been addressed in the DEIS.

The Service's position with regard to the increasing number of proposed coastal developments in West Hawaii is one of serious concern over the cumulative loss of wetland and anchialine pond habitats caused by such development. The Service is obligated to review all such projects in that context. In light of this, a meeting was held on October 27, 1986 with Service biologists, representatives of Phillips, Brandt, Reddick & Associates, Inc., and the Kamehameha Schools/Bernice Pauahi Bishop Estate, to discuss the establishment of a wildlife refuge at 'Opae'ula and the preservation of anchialine ponds at Makalawena. At this meeting, the participants agreed to conduct a field trip to Makalawena (currently scheduled on December 2nd) for the purpose of defining the most appropriate boundaries and buffer areas for the proposed wildlife refuge at 'Opae'ula Pond. Service biologists will also be making additional observations of anchialine ponds and pond biota within the project area.

We offer the following specific comments regarding portions of the DEIS and its appendices which may require expansion or clarification.

1. Page IV 10. We recommend that the EIS address the potential cumulative impacts of resort water developments in South Kohala upon coastal groundwater hydrology, if possible.

2. Page IV 14. Table IV 1 should reference a specific map which illustrates the specific locations of the marine life sampling stations offshore.

3. Page IV-34. Kupipi (Abudefduf sordidus) are omnivorous and may account for the low numbers of certain shrimp in the anchialine ponds where these fish occur. However, we doubt that herbivorous mullet are responsible for shrimp predation as implied in the discussion on this page.

4. Page E-8. We recommend that the frequency of the water quality and biological monitoring of selected anchialine ponds be increased to at least two samples per month throughout project construction and for at least two years after the resort complex becomes operational. Since relatively rapid pond flushing by tidal flux and groundwaters is presumed to occur, discrete quarterly samples may not reveal important trends.

In general, the Service believes that the tentative pond and wetland management plan (Appendix E of the DEIS) is a good start toward the long-term protection of aquatic habitats at Makalawena. We feel that further discussion with the land owner regarding the management of 'Opae'ula Pond and adjacent anchialine ponds is appropriate, and look forward to working with the Kamehameha Schools/Bernice Pauahi Bishop Estate and PBR in the development of a wildlife refuge at 'Opae'ula Pond.

Thank you for providing this opportunity to comment.

Sincerely,

/s/ Ernest Kosaka
Project Leader
Office of Environmental Services

cc: Mr. Guido Giacometti
✓ Mr. Thomas S. Witten
DLNR
RD, FWS, Portland, OR (ARD-AFWR)

Save Energy and You Serve America!

Phillips Brandt Reddick

November 18, 1986

Mr. Ernest Kosaka, Project Leader
Office of Environmental Services
U.S. Fish and Wildlife Service
P. O. Box 50167
Honolulu, Hawaii 96850

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT.
NORTH KONA, HAWAII

Dear Mr. Kosaka:

Thank you for the copy of your letter of 6 November 1986 to Mr. Albert Lono Lyman, Director, County of Hawaii Planning Department. We have reviewed your letter and offer the following response.

We appreciate your cooperation in the establishment of meaningful and mutually acceptable boundaries for the proposed Opaeula Pond wildlife refuge. We look forward to our scheduled field trip on December 2, 1986.

Additional information will be included in the Final EIS regarding the cumulative impacts of groundwater development in the project area.

The following are provided in response to your specific comments.

(1) The specific locations of the marine/coastal survey areas will be included in the Final EIS.

(2) Based on discussions with our marine/coastal biology and chemical oceanography consultant, Mr. William A. Brewer, Kupipi [Abudefduf sordidus (and mosquito fish)] alone may be responsible for the low number of Halocaridina rubra observed in the Maciolek and Brock pond. Both Mugil cephalus and Neomyxus chaptalii are regarded as herbivores where they occur in their normal habitat. The sentence which implied that the mullets are at least in part responsible for the small population of shrimp was based on the observed apparent absence of any conventional food resources for either mullet. Macroalgae (both fleshy and filamentous) were not observed in the pond and detritus was minimal to non existant. Nor was there any overhanging terrestrial vegetation which could provide a source of vegetative matter (though wind deposition could presumably contribute leaf litter from adjacent Kiawe trees). Under these conditions perhaps alternative, non conventional foods are acceptable to mullet. These questions and considerations highlight the need for additional long term investigations on the ecology of disturbed and undisturbed anchialine ponds.

(3) The Tentative Pond and Wildlife Refuge Management Plan will be revised in the Final EIS to incorporate your suggestion regarding water quality and biological monitoring.

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director, County of Hawaii
Mr. G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

IPR FILE

Phillips Brandt Reddick

November 18, 1986

Mr. Wallace Tirrell
Kamehameha Schools/Bishop Estate
567 South King Street, Suite 200
Kawaihao Plaza
Honolulu, Hawaii 96813

SUBJECT: MAKALAWENA RESORT
OPAEULA POND FIELD TRIP - DECEMBER 2, 1986

Dear Mr. Tirrell:

As a follow up to our meeting with the U.S. Fish and Wildlife Service regarding the Draft EIS for the subject project, a field trip has been scheduled for December 2, 1986 to assist in delineating the appropriate area for establishing the proposed wildlife refuge. Attending from the U.S. Fish and Wildlife Service will be John Ford, Pete Stien, Stewart Fefer and Steve Berendzen. In addition, we will be contacting Mr. Albert Lono Lyman, Planning Director, County of Hawaii to see if he or someone from his office would be available to attend. To date, no correspondence has been received from the Department of Land and Natural Resources on the DEIS but if an interest is expressed in participating in this field survey, they may also have a representative in attendance.

The U.S. Fish and Wildlife Service has made their own travel and ground transportation arrangements and PBR Hawaii (myself and Frank Brandt) are scheduled to take Aloha Airlines Flight #80, departing 5:55 a.m. and return from Kona on Flight #281, departing at 2:35 p.m. If ground transportation is not available from Kona to Makalawena, please notify us so that arrangements can be made.

Should you have any questions on the proposed field trip, please contact myself or Frank Brandt.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: John Ford - U.S. Fish and Wildlife Service
Mr. Albert Lono Lyman, Planning Director
Mr. Guido Giacometti - KS/BE
Mr. Sidney Kellipuleole - KS/BE

Phillips Brandt Reddick

MEMORANDUM

TO: Sydney Kellipuleole - KS/BE
Ilima Piinaia - County of Hawaii
John Ford - USFWF
John Naughton - NMFS

SUBJECT: Field Survey of Opae'ula Pond - Makalawena
North Kona

DATE: December 3, 1986

FROM: Tom Witten

ATTENDING: County of Hawaii - Ilima Piianaia, Deputy Director; Rodney Nakano, Environmental Planner; and Brian Nishimura, Planner
US Fish & Wildlife Service - John Ford, Peter Stine, Steve Berendzen
National Marine Fisheries Service - John Naughton
Kamehameha Schools/Bishop Estate (KS/BE) - Sydney Kellipuleole, Bill Staton
Phillips, Brandt, Reddick - Frank Brandt, Tom Witten, Phil Bruner (Fauna Subconsultant)

In conjunction with preparation of the Final EIS, an onsite field inspection was made on December 2, 1986 with the above parties attending. The primary purpose was to inspect the onsite conditions of Opae'ula Pond to better estimate the appropriate boundaries and buffer areas for establishing a wildlife refuge in conjunction with the proposed resort development and provide the participants with a better overall understanding of this important wildlife habitat resource. The primary considerations discussed in establishing appropriate boundaries for a wildlife refuge at Opae'ula Pond were control of human access, visual barriers and sightline considerations, flight access, predator control (possible fencing and walls), light intrusion, noise, shoreline access, and adjacent land use activities.

A survey of the entire perimeter of the pond was completed. Surrounded primarily by a thicket of Kiawe, there were several areas where vistas were available of the pond. Measurements were taken at various points along the pond to establish a general sense of adequate setback and buffer areas to separate the wildlife refuge from adjacent uses. It was noted that at present there is little or no suitable nesting areas for the Hawaiian

Stilt, although the site has great potential if nesting areas (small isolated islands set within the pond) were created. Additionally, the clearing of introduced wetland vegetation would provide more feeding areas for the waterbirds.

After some discussion, the following understanding was reached as to the general principle of establishing a wildlife refuge at Opae'ula Pond and its boundaries. The boundaries as discussed are preliminary in nature in that, dependent upon more detailed planning of various adjacent uses, additional buffer areas may be required. The attached exhibit depicts the general wildlife refuge area and buffer determined by this field survey to accomplish a refuge at Opae'ula Pond. This includes a minimum 150-foot setback from the edge of the pond with the exception of the makai boundary where a 135-foot setback would be adequate with a barrier rock wall and landscape planting in a curvelinear form to separate the shoreline recreational use area from the refuge. There is a need for walls, fencing, vegetation barriers and/or a combination thereof to surround the entire refuge boundary refuge to control access and unwanted predators.

Based on the above described boundaries of the wildlife refuge, it is estimated that the refuge would include approximately 22 acres. A wildlife refuge management plan would be refined as more specific plans for the resort development are prepared and a wildlife manager or agency is selected to manage the refuge.

Possible view/interpretation points were also identified as the group hiked around the pond (see attached exhibit). These sites should be designed to provide cover for those viewing the area and located at vantage points that allow the viewer a good perspective of the pond and those areas that the birds would frequent without impacting nesting or breeding activities.

KS/BE indicated their interest in establishing a wildlife refuge at Opae'ula Pond in conjunction with the Makalawena Resort, although the actual means by which this is accomplished needs to be more clearly defined. The role of the Wildlife Refuge Manager and land owner, the details of a Wildlife Refuge Management Plan, and who would be most qualified to manage such a resource needs to be determined. The US Fish and Wildlife Service (USFWS), based on past efforts to acquire the pond as a National Wildlife Refuge and their current assessment of the value of Opae'ula Pond as a

waterbird refuge, is interested in working with the landowner to investigate the various alternative management arrangements by which the USFWS could manage the pond as a wildlife refuge.

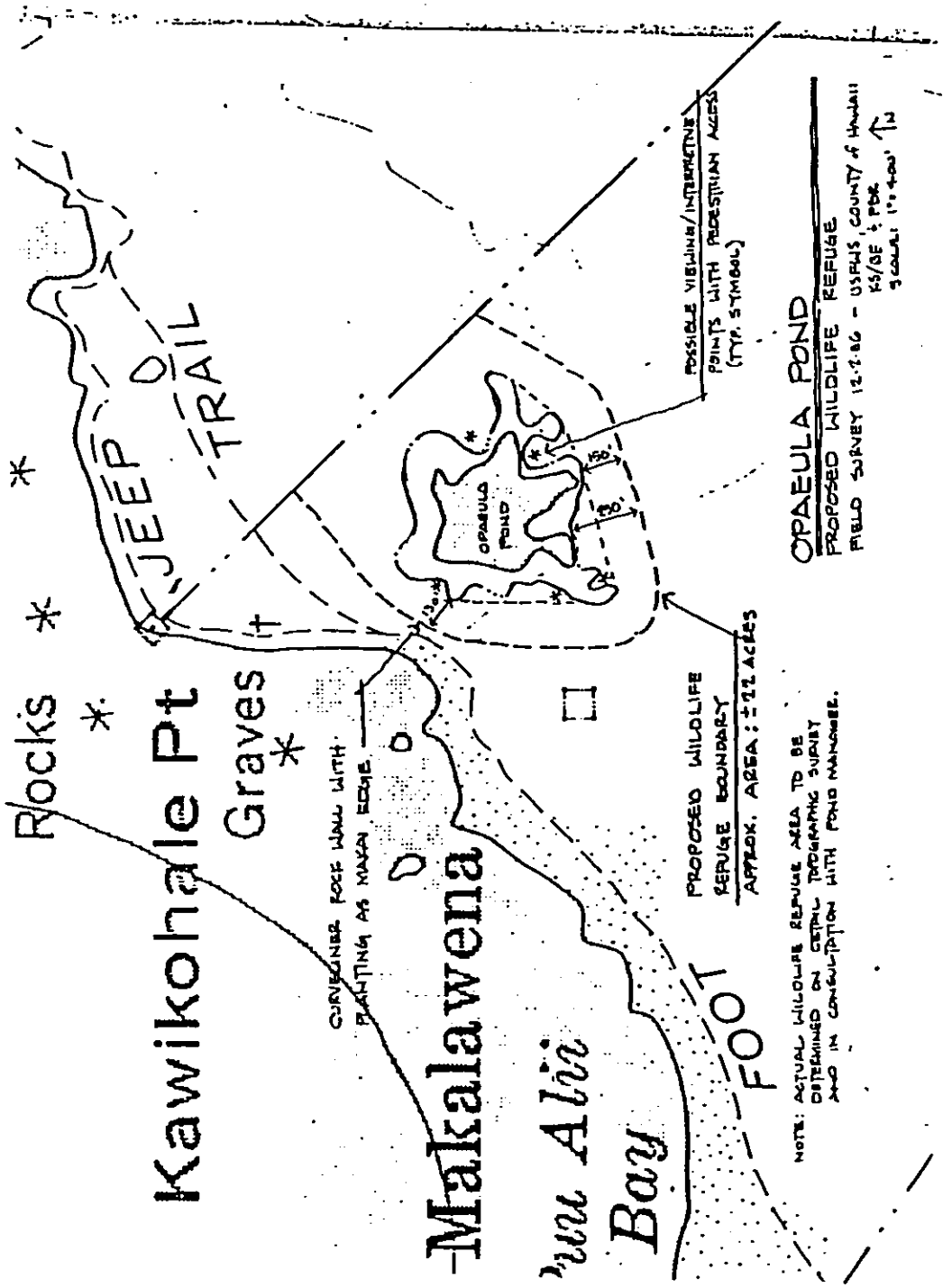
Although the State Department of Land and Natural Resources has not responded to the Draft EIS, they have expressed interest in Opae'ula Pond and should be consulted with regards to the establishment of a wildlife refuge. Additionally, organizations such as the Nature Conservancy and the Hawaii Audubon Society should be consulted.

As a follow-up to this field trip, PBR will include comments in the Final EIS to recognize the general conclusions reached at this field survey and to indicate the general boundary of the proposed wildlife refuge for the purposes of preliminary site development planning.

We appreciate the participation from the County Department of Planning, US Fish and Wildlife Service and National Marine Fisheries Service and are hopeful that further efforts will achieve a management plan for Opae'ula Pond that will improve and maintain this valuable wetland and migratory and waterbird refuge in conjunction with the proposed Makalawena Resort.

Thomas S. Witten, ASLA
Principal

cc: Ms. Mae Mull, Hawaii Audubon Society
Mr. Kevin Taketa, Nature Conservancy



United States Department of the Interior

GEOLOGICAL SURVEY

Water Resources Division
P.O. Box 50166
Honolulu, Hawaii 96850

3 NOV 86

October 20, 1986

Mr. Albert Lono Lyman, Director
County of Hawaii Planning Department
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Lyman:

The Hawaii District Office of the U.S. Geological Survey, Water Resources Division, has reviewed the Draft Environmental Impact Statement (DEIS) for the Makalawena Resort and has no comment at this time. As requested, we have returned the DEIS to the Office of Environmental Quality Control.

Thank you for allowing us to review the DEIS.

Sincerely,

Dan A. Davis
Acting District Chief

Copy to: Guido Giacometti,
Kamehameha Schools

/Thomas S. Witten,
Phillips, Brandt, Reddick &
Assoc. (HI), Inc.

Phillips Brandt Reddick

November 17, 1986

Mr. Dan Davis
Acting District Chief,
U.S. Department of the Interior
Geological Survey
Water Resources Division
P. O. Box 50166
Honolulu, Hawaii 96850

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT,
NORTH KONA, HAWAII

Dear Mr. Davis:

Thank you for the copy of your letter of 20 October 1986 to Mr. Albert Lono Lyman, Director, County of Hawaii Planning Department. We appreciate your review of the subject Draft EIS. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director,
County of Hawaii
Mr. G. Ginochetti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5831

U.S. Department of Housing and Urban Development
Honolulu Office, Region IX
300 Ala Moana Blvd., Room 3318, Box 50007
Honolulu, Hawaii 96850-4991

86-330

November 6, 1986

Mr. Albert Lono Lyman
Director, Planning Department
County of Hawaii
25 Aupuni Street
Hilo, HI 96720

Dear Mr. Lyman:

SUBJECT: Makalawena Resort
Draft Environmental Impact Statement

We have reviewed the Draft Environmental Impact Statement for the subject project that will provide 900-1200 hotel rooms, 900-1350 multi-family residences, a golf course, a tennis center and open space, along with a wildlife refuge.

In our response to the EIS Preparation Notice, we cited our concern for housing requirements for those employees who would be servicing the project upon its completion. Coordination with Hawaii County was also felt important due to the large number of projects being proposed along the Kona Coast.

In reviewing the Draft EIS, there appears to be an inconsistency between Chapter VI, Relationship of the Proposed Action to Land Use Plans, Policies and Controls for the Affected Area and anticipated sales prices of new condominium units. In responding to the project's relationship with part (3)(f) of the Hawaii State Plan "...Provision for housing opportunities for all income groups, particularly the low, low-moderate, and gap groups", the Draft EIS states "the project will provide affordable housing opportunities to mitigate demands that the resort may place on the existing housing supply." Review of Section 4.22.21.16 Housing Affordability indicates that households earning $30,000 per year would permit purchase of housing costing about $82,000 at an 11% interest rate and a 10% down payment. Table II-17 implies that condominiums in the Kona and Kohala area will be priced well over $100,000.

This observation is confirmed in Chapter IX, Unresolved Issues under item 5. Housing, where "Availability of adequate housing opportunities on site or in surrounding communities to meet project-generated needs will be determined prior to starting construction of the first hotel."

It would appear that a strategy for providing affordable housing should be discussed in greater detail with state and county agencies having housing responsibilities.

Sincerely,

Calvin Lew
Director
Community Planning and
Development Division, 9.2C

cc:
Guido Giacometti
Thomas S. Witten
A. Scott Leithead

Phillips Brandt Reddick

December 4, 1986

Mr. Calvin Lew, Director
Community Planning and
Development Division
U. S. Department of Housing and
Urban Development
Honolulu Office, Region IX
300 Ala Moana Boulevard
Room 3318, Box 50007
Honolulu, Hawaii 96850-4991

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT,
NORTH KONA, HAWAII

Dear Mr. Lew:

Thank you for the copy of your letter of 6 November 1986 to Mr. Albert Lono Lyman, Director, Planning Department, County of Hawaii.

The attached response from our market and economic consultant, Peat, Marwick, Mitchell & Co. addresses your concerns. Additional discussions will be held with appropriate county agencies to ensure that adequate housing is coordinated and planned at an early stage of the development process.

Thank you for your comments. Your letter and this response will be appended to the Final EIS

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director, County of Hawaii
Mr. G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Attachment: Peat, Marwick, Mitchell Letter

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel (808) 521-5631

PEAT MARWICK

Peat, Marwick, Mitchell & Co.
Internat'l Plaza Of The Pacific
PO Box 1140
Honolulu, Hawaii 96813
Tel: 531-7286

December 4, 1986

Mr. Thomas S. Witten
Phillips, Brandt, Reddick & Assoc., Inc.
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Re: Makalewena Resort - Draft Environmental Impact Statement

Dear Tom:

This letter presents our responses to the comments/questions raised by the U.S. Department of Housing and Urban Development regarding the Draft Environmental Impact Statement for the planned Makalewena Resort on the island of Hawaii.

a. Overall Housing Need

Section 4.22.2.1.16 discusses the need for affordable housing in the region and the need for Makalewena to directly provide affordable housing. The section concludes that there would be an overall affordable housing need generated by the resort of about 196 to 266 units, of which 64 to 108 units should be developed to meet the demand.

b. Condominium Prices

Table II-17 presents to prices for resort condominiums in the Kona and Kohala areas and not for all housing in the area. As resort condominiums tend to have a higher price than owner occupied housing, it could be expected that the average prices of the resort condominium developed at the resort would be in excess of $100,000. The pricing of single family homes is a better indication of the availability of affordable housing in the area. A pricing survey conducted by the Kona Board of Realtors indicated that only 8% of the homes are priced below $80,000.

c. Affordable Housing Need

The analysis indicates that about 60 to 110 affordable housing units would need to be developed to meet the employee housing needs of the resort. The strategy to providing this housing need should be discussed with state and county agencies.

We hope these comments address the questions and issues that have been raised regarding our market and economic impact analysis of the planned Makalewana Resort. Please let us know if we can be of any further support.

Very truly yours,

PEAT, MARWICK, MITCHELL & CO.

Malcolm J. Tom, Partner

MJT:lsa

cc: T. Whitten

UNITED STATES
DEPARTMENT OF
AGRICULTURE

SOIL
CONSERVATION
SERVICE

P. O. BOX 50004
HONOLULU, HAWAII
96850

November 4, 1986

NOV 5 1986

Mr. Albert Lono Lyman, Director
Planning Department
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Lyman:

Subject: Draft EIS for the Makalawena Resort, Makalawena, North Kona, Hawaii

We reviewed the draft environmental impact statement for the subject project and have no comments to make.

Thank you for the opportunity to review the document.

Sincerely,

Richard N. Duncan

RICHARD N. DUNCAN
State Conservationist

cc:
Mr. Guido Giacometti
Director, Land Division
Kamehameha Schools/Bernice Pauahi
Bishop Estate
567 South King Street, Suite 300
Honolulu, HI 96813

Mr. Thomas S. Witten, Principal
Phillips, Brandt, Reddick, & Assoc.
130 Merchant Street, Suite 1111
Honolulu, HI 96811

UNITED STATES
DEPARTMENT OF ENERGY

P.O. BOX 50168
HONOLULU, HAWAII 96850

NOV 4 1986

November 1, 1986

Mr. Thomas S. Whitten
Principal, PBR-Hawaii
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Subject: Makalawena Resort EIS

Dear Mr. Whitten:

I have no comments to add to my letter of August 26, 1986, which was sent to you in response to the Draft EIS Preparation Notice.

Sincerely yours,

John W. Shupe, Director
Pacific Site Office

GEORGE R. ARIYOSHI
GOVERNOR

JACK K. SUWA
CHAIRPERSON, BOARD OF AGRICULTURE

SUZANNE D. PETERSON
DEPUTY TO THE CHAIRPERSON

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 So. King Street
Honolulu, Hawaii 96814-2512

Mailing Address:
P. O. Box 22159
Honolulu, Hawaii 96822-0159

October 23, 1986

MEMORANDUM

To: Mr. A. Lono Lyman, Director
Hawaii County Planning Department

Subject: Draft Environmental Impact Statement (EIS) for
Makalawena Resort
Kamehameha Schools/Bernice Pauahi Bishop Estate
TMK: 7-2-04: 01 North Kona, Hawaii
Acres: 353

The Department of Agriculture has reviewed the Draft EIS for the Makalawena Resort and offers the following comments.

In our response to the Environmental Assessment and Notice of Preparation for the subject project (letter to Phillips, Brandt, Reddick, & Assoc. dated September 6, 1986), the Department of Agriculture recommended a detailed discussion in the Draft EIS on anticipated agricultural impacts resulting from the withdrawal of groundwater for domestic purposes. Reference to this concern is found on pages IV-71 and IV-72 of the Draft EIS which states, "... sources and transmission facilities to keep up with demand forecasts are preventing the Department of Water Supply from allowing the extension of the present Keahole Water System to projects north of Keahole Airport." From this statement, it appears that the existing domestic water supply system has reached capacity.

While no agricultural activities are present on the project site, the State Agricultural District exists mauka of the Makalawena area. WE note that of the proposed deep well sites referred to on page IV-72 of the EIS, one in the Agricultural District is nearby the Huehue Ranch. Both domestic and agricultural use of this resource depend on prudent management of the water source and availability of distribution facilities. If the Keahole Water System has reached maximum capacity for domestic uses, then mitigation measures to protect existing and future agricultural irrigation needs should be considered prior

to development. From the information provided in the hydrologic analysis, (pages IV-7 through IV-10) it appears that adequate groundwater is available for agriculture and domestic use, although no discussion relative to agricultural irrigation was provided in the Draft EIS.

Thank you for the opportunity to comment.

JACK K. SUWA
Chairperson, Board of Agriculture

cc: OEQC
Mr. Guido Giacometti
Mr. Thomas S. Witten

Phillips Brandt Reddick

November 17, 1986

Mr. Jack K. Suwa, Chairperson,
Board of Agriculture
1428 So. King Street
Honolulu, Hawaii 96814-2512

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT,
NORTH KONA, HAWAII

Dear Mr. Suwa:

Thank you for the copy of your letter of 23 October 1986 to Mr. Lono Lyman, Director, Hawaii County Planning Department. We have reviewed your comments and offer the following response.

Based on the hydrological studies that have been performed in the project area, it appears that there are sufficient developable ground water supplies to accommodate both the proposed resort development project as well as potential future agricultural activities that may occur in North Kona. The Final EIS Hydrology section will include information relative to agricultural irrigation and the availability of ground water for agricultural purposes.

Thank you for your comments. Your letter and this response will be appended to the final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr A. Lono Lyman, Planning Director,
County of Hawaii
Mr. G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

GEORGE R. ARIYOSHI
GOVERNOR

FRANCIS M. HATANAKA
SUPERINTENDENT

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

OFFICE OF THE SUPERINTENDENT

October 20, 1986

Mr. Albert Lono Lyman, Director
Planning Department
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Lyman:

Subject: Makalawena Resort

Our review of your proposed 900 - 1,350 multi-family units and 900 - 1,200 hotel rooms indicates that the following student enrollment may be generated:

SCHOOL	GRADE	APPROXIMATE ENROLLMENT
Kealakehe Elementary	K-5	10-30
Kealakehe Intermediate	6-8	4-8
Konawaena High	9-12	4-8

Schools in this area are at capacity but Kealakehe Intermediate and Konawaena High Schools will be able to accommodate the small enrollment. Kealakehe Elementary will require monitoring since an additional classroom may be required.

Should you have any questions, please call Mr. Richard Inouye at 737-4743.

Sincerely,

FRANCIS M. HATANAKA
Superintendent of Education

FMH:th (HO)

cc Mr. K. Asato, Haw. Dist.
Mr. G. Giacometti
Mr. T. Witten
OBS

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER

Phillips Brandt Reddick

November 17, 1986

Mr. Francis M. Hatanaka,
Superintendent of Education
Department of Education
P. O. Box 2360
Honolulu, Hawaii 96804

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT,
NORTH KONA, HAWAII

Dear Mr. Hatanaka:

Thank you for the copy of your letter of 20 October 1986 to Mr. Albert Lono Lyman, Director, Planning Department, County of Hawaii. We have reviewed your comments and offer the following response.

The information relative to the student enrollment that may be generated by the proposed project will be included in the Final EIS. Further, the Final EIS will note the classroom monitoring requirement for Kealakehe Elementary School, since an additional classroom may be required.

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director,
County of Hawaii
Mr. G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5831

NOV 3 1986

University of Hawaii at Manoa

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

29 October 1986

Mr. Albert Lono Lyman, Director
County of Hawaii Planning Department
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Lono:

Subject: Draft Environmental Impact Statement, Makalawena Resort, Makalawena, North Kona, Hawaii, October 1986

We have reviewed the subject DEIS and offer the following comments:

1. The water supply estimation should include water for fire protection.

2. It is surprising that the 1.772 mgd high wastewater generation (p. IV-74, Table IV-18) is greater than the 1.560 mgd high water consumption (p. IV-73, Table IV-15). This is very improbable.

Thank you for the opportunity to comment. This material was reviewed by WRRC personnel.

Sincerely,

Edwin T. Murabayashi

Edwin T. Murabayashi
EIS Coordinator

ETM:jm

cc: G. Giacometti, Bishop Estate
T.S. Witten, P.B.R. & Assoc.

AN EQUAL OPPORTUNITY EMPLOYER

Phillips Brandt Reddick

November 17, 1986

Mr. Edwin T. Murabayashi,
EIS Coordinator
University of Hawaii at Manoa
Water Resources Research Center
Holmes Hall 283
2540 Dole Street
Honolulu, Hawaii 96822

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT,
NORTH KONA, HAWAII

Dear Mr. Murabayashi:

Thank you for the copy of your 29 October 1986 letter to Mr. Albert Lono Lyman, Director, County of Hawaii Planning Department. We have reviewed your letter and offer the following response.

1. The water supply estimation provided in the Draft EIS includes fire protection requirements.

2. The wastewater generation estimate given in the Draft EIS should have read 0.772 mgd rather than 1.772 mgd and will be corrected in the Final EIS.

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director,
County of Hawaii
Mr. G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631
Honolulu • Irvine • San Francisco • Denver

The Natural Energy Laboratory of Hawaii

5 November 1986

NOV 6 1986

Mr. Thomas Witten
Phillips, Brandt, Reddick & Associates, Inc.
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Re: Draft Environmental Impact Statement for Makalawena Resort
North Kona, Hawaii

Dear Mr. Witten:

Thank you for the opportunity to comment on the subject dEIS. As you may know, our primary interest is to assure that the EIS addresses the preservation of the pure and pristine quality of the coastal waters upon which the future of our laboratory and its tenant users depend. In this respect, we offer the following comments for your consideration:

1. We note that you will be preparing a more detailed water supply, irrigation, and waste disposal plan (p. IV-12). However, we would like your evaluation and comments of how the fertilizers, agricultural chemicals, and biocides used on the golf course and landscaping might affect the quality of the coastal waters off NELH. We would like to know how the groundwaters might transport these nutrients, chemicals, herbicides and the like from the golf course to the receiving coastal waters, and their subsequent diffusion and advection in the coastal waters, and the potential of their transport by coastal currents to the vicinity of the intake pipelines at Keahole Point.

Future plans at NELH and the proposed Hawaii Ocean Science & Technology (HOST) park call for the installation of 4 new seawater intake pipelines with an additional 15 pipelines planned for the long term. How the aforementioned might affect the quality of the seawater to be pumped ashore by these pipelines is of great interest to our laboratory and its users.

2. We note that several other resort projects as well as the development of the HOST park and the expansion of NELH are in the planning stages. The potential cummulative effects of these developments is of concern to NELH. One resolution of these concerns suggests implementing a coastal water quality monitoring joint venture and notification procedure so that all affected and interested parties would be protected. We noted that Appendix I of the dEIS offers a tenative pond and wildlife refuge management plan with monitoring provisions and would be interested in your response and participation in a similar

(A 220 South King Street, Suite 1280 • Honolulu, HI 96813 • (808) 548-7017
(P.O. Box 1749 • Kailua Kona, HI 96745 • (808) 329-7741

The Natural Energy Laboratory of Hawaii

program for coastal water quality monitoring and notification.

Thank you for your consideration of these comments.

Best Regards...

Jack P. Huizingh
Executive Director

cc: Mr. A. L. Lyman
cc: Mr. G. Giacometti
cc: Mr. W. Bass

Phillips Brandt Reddick

December 4, 1986

Mr. Jack Huizingh, Executive Director
Natural Energy Laboratory of Hawaii
220 So. King Street, Suite 1280
Honolulu, Hawaii 96813

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT.
NORTH KONA, HAWAII

Dear Mr. Huizingh:

Thank you for your letter of 5 November 1986 regarding the subject project. We have reviewed your letter with our marine/coastal biology and chemical oceanography consultant, Mr. William A. Brewer, and offer the following response.

1. The use of secondarily treated domestic wastewater (followed by golf course ponding prior to irrigation) should have an inconsequential effect on nearshore water quality because of the existing high "baseline" level of nitrogen and phosphorus associated with natural, unpolluted, groundwaters. Nitrate nitrogen is typically high in Hawaiian groundwaters, principally as a result of nitrogen-fixing trees and shrubs such as Kiawe and Koa haole. For example, the average concentration of nitrogen at the Waiulua Bay spring is over 400 percent higher than that in the adjacent coastal waters. Similarly, phosphorus levels average about 100 percent higher than in adjacent coastal waters (Kay, et al., 1977).

Another significant factor influencing impact of groundwaters on nearshore water quality is the prevailing high coastal inflow of fresh and brackish water associated with the west Hawaii region. Kanehiro and Peterson (1977) calculated a coastal outflow of 6.3 million gallons per day per mile in the area immediately north of Keahole Point. Similarly, the ambient groundwater flow field for the region has been assigned a transmissive flux of 159.5 cubic feet per day per foot (Dames & Moore, 1985). Based on wastewater generation figures associated with the proposed development (0.545 to 0.772 mgd) and the existing natural coastal outflow of 6.3 mgd/mile, and assuming even mixing, a 11.6 to 8.2 fold dilution of wastewaters could occur prior to discharging into the ocean. The actual quantity of wastewater effluent that would enter the groundwater would be significantly less than that

Landscape Architecture • Planning • Environmental Studies
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631
Honolulu • Irvine • San Francisco • Denver

applied due to absorbtion by the soil, transpiration and evaporation (Mink, 1981). However, actual efficiencies of removal are undoubtedly significantly higher when one considers that effluents would also be subject to biological filtration and digestion during its residence time in the subsurface groundwater environment

The use of treated and untreated wastewater effluent for sugarcane and golf course irrigation purposes in Hawaii has been examined in detail over the past 20 years (Young, et al., 1967; Peterson and Hargis, 1971; Lau, 1972; Handley and Eckern, 1981). In general, it has been found that the controlled use of wastewater effluent for irrigation purposes is an environmentally sound and economical method for wastewater disposal. Handley and Eckern (1981) found that even with the highest effluent irrigation rates, nitrate nitrogen levels in the percolate from secondarily treated sewage remained less than the 10 mg/l recommended maximum for potable water. Similarly, mineralized phosphorus occuring in secondarily treated wastewater effluent could cause eutrophication of surface waters. However, studies have shown that although high concentrations of phosphorus are found in soil water samples of effluent irrigated sites as compared to control sites, those concentrations were less than 1 mg/l. Dugan, et al., (1975) reported that the phosphorus concentration in effluent applied to an Oxisol with Bermudagrass cover decreased to 0.03 mg/l or less regardless of applied concentration.

After discharged water is introduced into a coastal area, dispersion is governed by two processes - diffusion and advection. If the discharge were introduced into a stagnant water body, only diffusion due to concentration gradients would occur. In the case where there is motion and transport due to currents, the process of advection occurs. In the case of the west coast of Hawaii, both situations are operable and extremely difficult to predict. It is possible, however, to state that due to the temperature and density differences of waters discharged subtidally at Makalawena, there would be no possibility of nutrients from such diffuse discharges affecting the existing or proposed future deep water intake pipeline(s) at NELH.

A distance of approximately five miles separates Makalawena from the existing and future proposed NELH/HOST intake pipelines. Although in the absence of site-specific, long-term, shallow and deep water current data for Makalawena, it is impossible to be able to predict the fate of nutrient discharges, we believe that

the results of recent current modeling at NELH indicate that any effect of discharges at Makalawena on NELH intake waters should be so small (if even present) as to be undetectable with state of the art instrumentation, and could only influence NELH surface intake water when nearshore water currents demonstrate a southerly component. These studies (Oceanit Laboratories, Inc., 1986) indicated that disposal of up to 10,000 gpm of OTEC water via a canal at NELH "... would not affect the warm water intake system during most environmental conditions". Continuing, the report concluded that "... when there is no longshore current other than tidal, and currents flow in the ebb direction, i.e., towards the warm seawater intake, the materials discharged may compromise the water quality at the warm seawater intake by increasing nutrient levels and decreasing dissolved oxygen levels by a few percent from normal ambient levels". Furthermore, plume footprint calculations in the above study (Appendix B) suggested that concentrations would range between 1.8×10^{-5} and 5.1×10^{-13} of the original concentration within approximately a mile north or south of the intake site nine hours after the beginning of an ebb tidal cycle. Any effect on water quality resulting from development at Makalawena would be impossible to detect, assuming this worst case model is correct.

In summary, upland development at Makalawena will undoubtedly increase the baseline levels of nitrogen and phosphorus in nearshore waters fronting the project site. These are likely to be small and inconsequential. Dollar's (1986) model indicated that irrigating an 18-hole golf course with secondary treated sewage potentially could increase the nutrient content of offshore waters by only about 0.8 percent for nitrogen and 0.06 percent for phosphorus above present levels. A "worst case" scenario, produced results of 8.8 percent for nitrogen and 6.6 percent for phosphorus. These levels of nitrogen and phosphorus would appear if half of the treated wastewater used to irrigate the golf course were to reach the ocean directly (without the mitigating effect of any filtering through the lava strata) and if offshore water circulation were slowed by five times. For these reasons and considering the distance between the proposed project site and NELH, we anticipate that Makalawena discharges would pose no short- or long-term risk to the water quality at NELH.

2. We are supportive of your idea regarding implementing a regional coastal water quality monitoring program. It appears that NELH has the existing facilities and personnel to coordinate and manage such a program. Such a program would appear to be consistent with our desire to maintain an optimum environment for preservation and management of the proposed Makalawena wildlife refuge and the anchialine ponds and coastal waters off Makalawena.

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director,
County of Hawaii
Mr. G. Gincometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

References Cited:

Dames & Moore. 1985. Technical Evaluation of Seawater Return Flow and Wastewater Disposal Systems at NELH/HOST Park (Appendix C) in: Final Environmental Impact Statement - Development Plan for the Hawaii Ocean Science and Technology Park and Expansion of the Natural Energy Laboratory of Hawaii. High Technology Development Corporation.

Dollar, S. 1986. Letter to William Bass from Helber, Hastert, Van Horn & Kimura dated September 29, 1986.

Dugan, G. L., R. H. F. Young, L. S. Lau, P. C. Eckern and P. C. S. Loh. 1975. Land disposal of sewage in Hawaii, a reality? Jour. Water Poll. Cont. Fed. Vol. 47, No. 8.

Handley, L. L. and P. C. Eckern. 1981. Irrigation of California grass with domestic sewage effluent: water and nitrogen budgets and crop productivity. Univ. of Hawaii Water Resources Research Center Tech. Rept. No 141.

Kanehiro, B. Y. and P. L. Peterson. 1977. Groundwater recharge and coastal discharge for the northwest coast of the island of Hawaii, a computerized water budget approach. Univ. of Hawaii Water Resources Research Center Tech Rept. No. 110.

Kay, E. A., L. S. Lau, E. D. Stroup, S. J. Dollar, D. P. Fellows, and R. H. F. Young. 1977. Hydrologic and ecologic inventories of the coastal waters of west Hawaii. Univ. of Hawaii Water Resources Research Center Tech Rept. No 105.

Lau, L. S. 1972. Water recycling of sewage effluent by irrigation: a field study on Oahu. Univ. of Hawaii Water Resources Research Center Tech. Rept. No. 62.

Mink, J. F. 1981. Overview of water resources, Pahala - Naalehu region. Report prep. for C. Brewer, Inc.

Peterson, F. F. and D. R. Nargis. 1971. Effect of storm runoff disposal and other artificial recharge to Hawaiian Ghyben-Herzberg aquifers. Univ. of Hawaii Water Resources Research Center Tech. Rept. No. 64.

Young, R. H. F., L. S. Lau and N. C. Burbank. 1967. Travel of ABS and ammonia nitrogen with percolating water through saturated Oahu soils. Univ. of Hawaii Water Resources Research Center, Tech. Rept. No. 1.

GEORGE R. ARIYOSHI
Governor

JENSEN S. L. HEE
Director

DENNIS R. KOYA
Deputy Director

STATE OF HAWAII
DEPARTMENT OF BUDGET AND FINANCE
STATE CAPITOL
P.O. BOX 150
HONOLULU, HAWAII 96810-0150

DIVISIONS
Budget, Planning, and Management
Electronic Data Processing
Finance

October 16, 1986

Mr. Albert Lono Lyman, Director
County of Hawaii Planning Department
25 Aupuni Street
Hilo, Hawaii, 96720

Dear Mr. Lyman:

This is in response to the draft environmental impact statement (EIS) for the Makalawena Resort, North Kona, Hawaii. The EIS has been forwarded to this office for review by the Office of Environmental Quality Control.

Thank you for the opportunity to comment on the proposal; however, I have no comment to make at this time.

Very truly yours,

Jensen S. L. Hee

JENSEN S. L. HEE

cc: Mr. Guido Giacometti
Mr. Thomas S. Witten

Phillips Brandt Reddick

November 17, 1986

Mr. Jensen S. L. Hee, Director
Department of Budget and Finance
State Capitol
P. O. Box 150
Honolulu, Hawaii 96810-0150

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT,
NORTH KONA, HAWAII

Dear Mr. Hee:

Thank you for the copy of your letter of 16 October 1986 to Mr. Albert Lono Lyman, Director, County of Hawaii Planning Department We appreciate your review of the subject Draft EIS. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director,
County of Hawaii
Mr. G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

(P)1979.6

Mr. Albert Lono Lyman
Director
Planning Department
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Lyman:

Subject: Draft Environmental Impact Statement
Makalawena Resort

We have reviewed the subject document and have no comments to offer.

Very truly yours,

TEUANE TOMINAGA
State Public Works Engineer

EH:jnf
cc: Mr. Guido Giacometti
Mr. Thomas Witten

Phillips Brandt Reddick

November 17, 1986

Mr. Teuane Tominaga
State Public Works Engineer
Department of Accounting and
General Services
Division of Public Works
P. O. Box 119
Honolulu, Hawaii 96810

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT,
NORTH KONA, HAWAII

Dear Mr. Tominaga:

Thank you for the copy of your letter of 16 October 1986 to Mr. Albert Lono Lyman, Director, Planning Department, County of Hawaii. We appreciate your review of the subject Draft EIS. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director,
County of Hawaii
Mr. G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5831

[illegible]

[illegible]

Dear Mr. Lyman:

Pakalawena Resort
Pakalawena, North Kona, Hawaii

Thank you for providing us the opportunity to review the above subject project.

We have no comments to offer at this time regarding this project.

Yours truly,

Jerry M. Matsuda
Major, Hawaii Air
National Guard
Contr & Engr Officer

cc: Director, Land Dvsn., Kamehameha Schools
Phillips, Brandt, Reddick, & Assoc. Inc.

Phillips Brandt Reddick

November 17, 1986

Major Jerry M. Matsuda
Department of Defense
Office of the Adjutant General
3949 Diamond Head Road
Honolulu, Hawaii 96816-4495

SUBJECT: DRAFT EIS FOR NAKALAWENA RESORT,
NORTH KONA, HAWAII

Dear Major Matsuda:

Thank you for the copy of your letter of 16 October 1986 to Mr Albert Lono Lyman, Director, County of Hawaii Planning Department We appreciate your review of the subject Draft EIS. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director
County of Hawaii
Mr. G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

GEORGE R. ARIYOSHI
GOVERNOR

DPED-
ENERGY DIVISION

LEIILANI M. MIYAMURA
DIRECTOR

TELEPHONE NO.
548-4915

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
465 South King Street, Room 104
HONOLULU, HAWAII 96813

October 6, 1986

Dear Reviewer:

Attached for your review is an Environmental Impact Statement (EIS) that was prepared pursuant to Chapter 343, Hawaii Revised Statutes and Chapter 11-200, Administrative Rules, EIS Rules:

TITLE: Makalawena Resort

LOCATION: Makalawena, North Kona, Hawaii

CLASSIFICATION: Applicant Action

Your comments or acknowledgments of no comments on the EIS are welcomed. Please submit your reply to the accepting authority or approving agency:

Mr. Albert Lono Lyman, Director
County of Hawaii Planning Department
25 Aupuni Street
Hilo, Hawaii 96720

Please send a copy of your reply to the proposing party:

Mr. Guido Giacometti
Director, Land Division
Kamehameha Schools/Bernice Pauahi Bishop Estate
567 South King Street, Suite 300
Honolulu, Hawaii 96813

AND

Mr. Thomas S. Witten, Principal
Phillips, Brandt, Reddick, & Assoc. (HI), Inc.
130 Merchant Street, Suite 111
Honolulu, Hawaii 96813

Your comments must be received or postmarked by: November 7, 1986.

If you have no further use for this EIS, please return it to the Office of Environmental Quality Control.

Thank you for your participation in the EIS process.

University of Hawaii at Manoa

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

November 7, 1986

Mr. Albert Lono Lyman, Director
County of Hawaii Planning Department
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Lyman:

Draft Environmental Impact Statement
Makalawena Resort
Makalawena, North Kona, Hawaii

The above cited document addresses the environmental impacts relative to the development of a new resort in Makalawena, North Kona, Hawaii. This review was prepared with the assistance of Michael Graves, Archaeology; Jon Matsuoka, Sociology; Richard Brock, Sea Grant; Sheila Conant, General Science; Frank Peterson, Geology and Geophysics; Chuck Gee, Travel Industry Management; and Michael Tokushige, Environmental Center.

Hydrology and Geology

The background information on groundwater and geology were quite adequately covered in this document. The discussion was comprehensive and accurate. However, the availability of an adequate supply of drinking water remains unresolved. The project will take place in a water-poor area and as recognized in the DEIS, given the location and elevation of the subject property, no drinking water source is available on the project site. There is mention of ground-water availability at the 1200 foot elevation (other side of the highway) but no information is provided as to ownership and accessibility of that land for water development. In view of the water needs for this development and others in this area, the supply of drinking water is an issue that needs extensive consideration. Although groundwater is presumably available in the higher elevations, lack of research and development precludes any immediate answers as to the sustainable yield and accessibility of the resource. In addition, there are no estimates of the cost associated with its development. Coordination between the developer and the county is essential to ensure that sufficient water will be available to suport this and the many other proposed developments on the Kona coast, and that the present residents' water supply will not be jeopardized. The cumulative impacts of multiple developments, including Makalawena, on the water supplies of the Kona coast, should be fully discussed in the final EIS.

Anchialine Ponds

Although the anchialine pond biota are euryhaline (salinity tolerant), increased brackish water irrigation and the accumulation of fertilizers and agricultural chemicals may have a cummulative effect on the salinity and nutrient content of the ponds and thereby jeopardize the biota.

A major flaw exists in the survey of the Opae'ula shrimp (Halocaridina rubra) in that the surveys were conducted only during daylight hours. It is our understanding that most of the ponds in this area have been invaded by exotic fishes, (ie. guppies and tilapia) that are predators of the Opae'ula shrimp. To avoid predators, the shrimp occupy subsurface niches of the pond and only emerge in the late evening hours to feed. A survey of the Opae'ula shrimp should be conducted in the evening hours if an accurate account of their population is to be made.

The U.S. Fish and Wildlife Service has given the Opae'ula pond a very high rating and they regard it as a prime preservation area. Furthermore they recommended that 36 acres be set aside for wildlife preservation around this pond. We note that present development plans call for only 18 acres to be set aside for wildlife preservation. Given the recommendations and expertise of the U.S Fish and Wildlife Service, our University ecosystem specialists, and the continuing cummulative pressures on the non-renewable and endangered anchialine pond resources on the Big Island and the ecosystems they support, the justification for the reduced size of the preservation area should be clarified in the EIS.

With regard to the Pond and Wildlife Refuge Management Plan, the final EIS should clarify what provisions will be taken to assure that the Refuge Management will be carried out by qualified individuals with experience in ecosystems management. In addition to the Conservation Manager's written consent for removal of any pond organisms, there are likely to be other state and federal permits required to assure that endangered species are adequately protected. When construction is in progress, attempts should be taken to minimize impacts to birds near the ponds particularly during the breeding season. Cooperation with both the U.S. Fish and Wildlife Service and the Hawaii State Division of Forestry and Wildlife should be required. This would assure that site development, implementation and monitoring of the ponds and wetlands would be comparable to that being carried out at other developments so that cummulative impacts can be assessed.

Transportation/Traffic Considerations

The need for assessing the potential widening of Queen Kaahumanu Highway in response to increasing cummulative traffic volumes is listed under "Unresolved Issues". This will indeed require extensive study, however there is no mention of who will fund the study or when it will be performed. Such a study should be undertaken at the earliest possible time to assure adequate planning and safety.

The EIS mentions another traffic study which will be prepared for addressing this projects's related traffic generation, intersection requirements, financial responsibility of road improvements, etc. This study should be undertaken relatively early in order to obtain a more comprehensive understanding of the proposed resort's impact and requirements.

The table on Project Trip Generation includes estimates of vehicle trips generated, based on hotel and multi-family units and the golf course. It is not clear whether these figures account for 1) vehicle trips made by off-site employees commuting to work, 2) additional traffic caused because beach access is provided for the first time, and 3) commercial activities at the resort used by non-guests and non-residents. The basis for these figures should be included in the final EIS.

Land Use Considerations

Several alternative land use considerations have come to our attention. For example, section II 2.6 includes a map of the proposed conceptual development plan. Judging from this illustration, improvements could be made to give the multi-family housing units better access to the beach.

Since there are already several "standard" golf courses in this area perhaps the incorporation of a botanical park or exotic landscaping would enhance recreational opportunities for visitors and residents alike.

Archaeology

The field work surveys, represent an adequate level and intensity of work. However, we find the discussion and interpretation of the archaeological sites located within the project area lacking in both substance and methodology.

Most of the sites are grouped into either functional or temporal catagories without providing the rationale for such actions. This rationale should be included in the final EIS. Although the archaeologists may have done it intuitively, there should be some description in the document so that an impartial review is possible.

There is little information provided on archaeological assemblages associated with each site. It would appear that sites were assigned levels of importance on the basis of their features and architectural remains. In addition to this criteria, measurements of artifacts, abundance, density and diversity should also be included.

In order to understand a sites research potential, the remains have to be placed in some sort of historical context. The archaeological report is deficient in this respect. The discussion of cultural historical issues that are important to Hawaii are not adequately addressed except for the brief mention of early human settlement in the islands. A discussion of the analytical procedures, the theoretical and methodological approach used, and the linkage between the remains and potential problems of cultural/historical interest, should be provided in the final EIS.

Social Impacts

We find this draft EIS has inadequately covered the area of social impact analysis to the north Kona area. For example, the DEIS lists individuals that were interviewed (p.VI 123-124), however there is only a generalized summary of the responses to these interviews. No indication is given as to the questions that were asked, the specific responses received, nor any efforts to quantify the information gained. The EIS should provide more substantive data with regard to these interviews and the basis for any conclusions that are drawn from them. In addition to interviews with individuals in government agencies and the visitor industry, it is also essential to include the interviews and opinions of local residents.

Another area of concern involves the need for long-term housing to service the personnel employed at this development. It is mentioned on page IV-110 that there is limited availability of homes priced below $80,000. Furthermore, the DEIS notes that employees with an annual income of $27,000 would not find affordable housing and those with an annual income of $30,000 would have great difficulty finding a home. The discussion of Social Cohesion (page IV-126-127) concludes that crime, family problems, and individual stress are a result of rapid population growth and lack of affordable housing. What procedures are planned to mitigate this serious issue?

Socioeconomic Considerations

In general, the section on socioeconomic impacts is somewhat sketchy and does not address several relevant issues. For example, no attempt is made to analyze the proposed resort's effect on the social fabric of the existing community or its composition. There is no mention of management's commitment to purchase local products or to hire local labor, especially for mid and upper level management positions. The possibility of establishing programs to train local residents should be considered.

Several references are made to an analysis in Section IV 4.22 which indicates that recurring revenues for the state and county via sales tax and other tax resources will significantly exceed recurring public costs. Public revenue/cost ratios are given as ranging between 2.5 - 2.7. Section IV 4.22, however, contains no such analysis or derivation of this ratio. Public costs such as police and fire protection, medical facilities, schools for resort-based families and employees' children, etc. should be analyzed in comparison to projected revenues generated for the state and county and the basis and results of these analyses included in the final EIS.

As proposed, Makalawena Resort will be a "first class" property. It should be noted that first class or luxury properties generally tend to have lower income multipliers, due to higher leakages. That is for every dollar taken in by a luxury resort a significant fraction is spent for imported items, ie. "French Champagne". Thus proportionally less money accrues to the state and county. A smaller fraction is left to be channeled into the local economy and down through the economic chain, ie. income, housing, retailers, farmers, etc.

As identified in the report, hospital resources in this area of the Big Island are already inadequate for meeting the needs of the existing regional population. This issue needs to be addressed more thoroughly, both for the needs of the employees of the resort and also to accomodate the needs of the projected guests, particularly if a significant portion of the latter will be retirees.

Other Comments

Figures IV-6 and IV-7 indicate that the proposed resort lies outside the 60 LDN noise curves for flight paths at Keahole Airport. There is no indication that this would still be the case if the airport were to be expanded or larger aircraft were to begin serving the area. There is also no mention made of the additional noise for residents living near the airport.

We appreciate the opportunity to comment on this DEIS.

Yours truly,

Jacquelin H. Miller
Acting Associate Director

cc. Patrick Takahashi
Guido Giacometti
Thomas Witten
OEQC
Michael Graves
Jon Matsuoka
Richard Brock
Sheila Conant
Frank Peterson
Chuck Gee
Michael Tokushige

Phillips Brandt Reddick

November 19, 1986

University of Hawaii at Manoa
Environmental Center
Crawford Hall, Room 317
2550 Campus Road
Honolulu, Hawaii 96822

Attention: Ms. Jacquelin Miller,
Acting Associate Director

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT,
NORTH KONA, HAWAII

Dear Ms. Miller:

Thank you for the copy of your letter of 7 November 1986 to Mr. Albert Lono Lyman, Director, County of Hawaii Planning Department. We have reviewed your letter and offer the following response.

Hydrology and Geology

As indicated in the Draft EIS, a thin basal lens of fresh brackish groundwater underlies Makalawena and continues many miles to the north and south of the proposed project site. At the inland boundary of the project area, the lens is brackish, but usable for irrigation purposes. At the 1,200 foot level, the lens is most likely to be fresh and developable for a domestic water supply. Present groundwater development in the area has indicated that fresh water is present and developable. Also, as noted in the Draft EIS (See Chapter IV, Section 4.12), four alternatives to obtain potable water in a timely manner have been and will continue to be investigated. These alternatives range from buying into an existing water agreement to development of low elevation brackish wells for irrigation purposes coupled with desalination for potable supplies.

It is estimated that basal groundwater flows toward the coast down a regional gradient of about 1.5 feet per mile and freely discharges along the shore at an average of about 6.38 mgd/mile of coastline. Groundwater withdrawals from the lens will diminish seaward flow. If the development of upper level wells is the alternative selected to provide potable water for the proposed

project, but the effect would be neither locally specific nor directly observable. The consequences of extracting several million gallons per day from deep wells along a line parallel to the coast over a distance of one mile probably would not be measurable in the anchialine ponds or the coastal seepages. It is estimated that the proposed project would require approximately 1.560 mgd of potable water. Based on the preliminary studies performed to date, in addition to the experience of the wells that have been drilled and are in operation, it would appear that the water resources of the area are sufficient to provide potable water for the proposed project without adverse effects on other proposed or potential resort, residential or agricultural projects in the area. As noted in the Draft EIS, a water study to identify the most feasible potable water system (well, desalination, etc.) will be prepared in conjunction with detailed water supply, irrigation and wastewater disposal planning. All applicable State Department of Health and County standards will be met.

Should deep wells be selected as the source of the water supply, those wells would be located on Kamehameha Schools/Bishop Estate property mauka of the highway. The costs of developing wells and/or other possible sources, will be estimated at the time the detailed water supply plans are prepared. Those plans will be coordinated with appropriate state and county agencies to ensure that present resident's, as well as possible future development's, water supplies are protected.

Anchialine Ponds

The possibility of brackish water irrigation and the accumulation of fertilizers and agricultural chemicals having a cumulative effect on the salinity and nutrient content of the anchialine ponds is recognized in the Draft EIS. As noted, it is estimated that the use of secondary treated sewage for irrigation purposes is not expected to have an adverse effect on the ponds, based on studies performed on Oahu and the Big Island. The continuing studies being performed by the U.S. Army Corps of Engineers at Waiakoa will greatly aid the planning of the proposed Makalawena project planning. As noted in the Draft EIS, it is the intention of the developer to protect and preserve the natural resources of the project site. As such, appropriate measures, based on the latest available information at the time specific development plans are developed, will be formulated and implemented.

We are cognizant of the fact that the Opae'ula shrimp emerge in the late evening hours to feed and will be conducting additional daytime as well as nighttime surveys of the project site anchia line ponds at the time the final Pond and Wildlife Refuge Manage-ment Plan is prepared.

The developer is continuing to work with the U.S. Fish and Wildlife Service to define the boundaries of the Opaeula Wildlife Refuge. To date several meetings have taken place and a field trip to the site is planned for early December 1986 to field check the site and discuss preliminary refuge boundaries. The land owner is aware of the importance of this wetland resource and the need to protect valuable wildlife habitats.

As noted in the Tentative Pond and Wildlife Management Plan (Appendix E), the Conservation Manager will be an individual, organization or governmental agency with a record of experience in wildlife conservation, management, environmental awareness, educa-tion and public relations. Appropriate measures will be employed during and after construction to protect and minimize impacts to the wildlife of the project site.

Transportation/Traffic Considerations

We agree that the need for assessing the potential widening of Queen Kaahumanu Highway will require extensive study and coor-dination with other proposed projects along the North Kona/South Kohala coast. One purpose of the EIS is to inform appropriate State Department of Transportation Divisions of the developer's plans so that those plans can be considered during the State's planning processes. The traffic projections presented in the Draft EIS are considered to be a "worst case" situation and, as such, provide the State's highway planners with the information they require for their studies.

As specific resort development plans are prepared, the developer will prepare the necessary traffic generation studies to deter-mine intersection requirements and costs. The traffic generation estimate included in the Draft EIS includes all traffic that is expected to be generated by the resort, including off site employees, delivery vehicles, visitors and guests to the resort. This information will be included in the Final EIS.

Land Use Considerations

In general, with any proposed project there are alternative development plans that could be formulated, including the alterna-tive of "no action". It is the land owner's responsibility to present the plan that best meets their needs and objectives along the community in which the proposed project is to be located. In this case, it is the land owner's responsibility to develop a project that will provide the financial return required to ensure long-term financial support of the Kamehameha Schools for the bet-terment of the students. While alternative layouts of the project site may be possible and/or alternative amenities provided, it is the developer's belief that the conceptual plan presented in the Draft EIS offers a plan that is sensitive to resources and natural amenities of the site and provides the greatest potential to generate the income required for the long-term financial support of Kamehameha Schools.

Archaeology

See attached response from Dr. Paul H. Rosendahl

Social Impacts

See attached response from Dr. John Knox, Community Resources, Inc.

Socioeconomic Considerations

The existing regional economic setting and social characteristics are described in the Draft EIS as are qualitative social impacts, indicators of social cohesion and the proposed mitigation measures to mitigate increased employment competition from new residents. Resident oriented job training could reduce undesirable levels of immigration and consequent exacerbation of housing shortages and associated social impacts. In general, resort operators would prefer to hire local residents to the greatest extent possible for all job levels and to purchase locally produced products However, both qualified personnel and competitively priced com modities must be available. Possible job training programs are noted in the Draft EIS (See pages IV 128 through IV 133).

With regard to the derivation of the benefit/cost ratios, see attached response from Peat, Marwick, Mitchell & Co

As noted in the Draft EIS, hospital resources in the Kona area appear to be inadequate to serve the existing population. However, existing hospital facilities are privately operated and it would seem that if a market for additional facilities were required, the private sector would provide those facilities. In addition, the State Department of Health has the responsibility to ensure that adequate health care facilities are available to residents and visitors. Based on discussions with Department of Health personnel, it is their belief that adequate services will be provided by the private sector when the need for those services is demonstrated.

Other Comments

Based on discussions with the State Department of Transportation, Airports Division personnel, a Master Plan for Keahole Airport is currently being prepared. It is believed that expansion of the airport and/or the introduction of larger aircraft operations at the airport, will not cause future aircraft generated noise levels to increase above the 55LDN level at the project site. The latest available noise contours will be included in the Final EIS. Aircraft noise levels will be controlled through the imposition of appropriate FAA aircraft noise regulations and the operations procedures of the airport. Aircraft noise levels for residents living near the airport are under the jurisdiction of the State Department of Transportation and the FAA.

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witton, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director, County of Hawaii
Mr. G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Attachments: Peat, Marwick, Mitchell Letter
Community Resources Letter
P. Rosendahl Letter

PEAT MARWICK

Peat Marwick Mitchell & Co.
[illegible]
P.O. Box [illegible]
Honolulu, HI [illegible]

November 26, 1986

Mr. Thomas S. Whitton
Phillips, Brandt, Reddick & Assoc., Inc.
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Re: Makalewena Resort - Draft Environmental Impact Statement

Dear Tom:

This letter presents our responses to the comments/questions raised by the various governmental agencies of the Draft Environmental Impact Statement for the planned Makalewena Resort on the Island of Hawaii.

A. U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

1. Availability of Affordable Housing (Page 1)

Section 4.22.2.1.16 discusses the need for affordable housing in the region and the need for Makalewena to directly provide affordable housing. The section concludes that there would be an overall affordable housing need generated by the resort of about 196 to 266 units, of which 64 to 108 units would need to be developed to meet the demand.

Table II-17 relates to the prices for resort condominiums in the Kona and Kohala areas and not for all housing in the area. As resort condominiums tend to have a higher price than owner occupied housing, it could be expected that the average prices would be in excess of $100,000. The pricing of single family homes is a better indication of the availability of affordable housing in the area. A pricing survey conducted by the Kona Board of Realtors indicated that only 8% of the homes are priced below $80,000.

Thus, the analysis indicates that about 60 to 110 affordable housing units would need to be developed to meet the employee housing needs of the resort. The strategy to providing this housing need should be discussed with state and county agencies.

B. COUNTY OF HAWAII, PLANNING DEPARTMENT

1. Visitor Industry Projections (Page 2)

A preliminary draft of the Hawaii County General Plan presents three sets of projects of westbound visitor arrivals to Hawaii County. The three sets are as follows:

Year	Series A	Series B	Series C
1985	837,000	837,000	837,000
1990	1,096,000	1,096,000	1,242,000
1995	1,337,000	1,396,000	1,500,000
2000	1,485,000	1,713,000	1,664,000
2005	1,553,000	1,800,000	1,973,000

Each set of projection is based on an alternative economic scenario as to the employment growth by industry sector and the relative dependency on tourism.

Under "Planned Hotel Development", the "Unnamed" hotel for Hauna Lani Resort should be the Ritz Carlton Hotel. The Marriot Hotel has not been listed as the discussions are still preliminary.

The projected increase in westbound and eastbound visitor arrivals to the island of Hawaii in Table II-11 is based on the historical and projected visitor arrivals to the island as developed by the State Department of Planning and Economic Development and presented in Table II-7. The projection of westbound visitors utilized is the same projection as presented in Series B of the Draft Hawaii County General Plan.

The increase in resident arrivals is based on the overall population growth of the state and the increasing attractiveness of the island as a visitor destination area.

The increase in the average length of stay by both the westbound and eastbound visitors is based on the following factors.

- Historical growth of the average length of stay from 7.9 days in 1970 to 8.7 days in 1985 for westbound visitors, as shown in Table II-4.

- The emergence of the island of Hawaii, particularly the Kohala Coast, as a visitor destination area, rather than as a stop over point.
- As a result, the expectation that the average length of stay for the island of Hawaii will become similar to that of Maui, which currently is 6.4 days.

The decline in the utilization of hotel accommodations from 80% to 70% reflects the anticipation that as more visitors to the island are repeat visitors and tend to stay longer in the area, the visitors would tend to utilize condominiums for visitor accommodations. This trend is similar to that experienced on Maui.

The anticipated market share for Makalewena has been based on the relative market share of other resorts in the state and on the island of Hawaii. Specifically, it was concluded that the potential market share of Makalewena would be similar to that of Wailea on Maui, due to the similarity in development plans and competitive resorts. Thus, it was concluded that the market share could be about 7% to 9% of the hotel unit demand in West Hawaii.

C. DEPARTMENT OF PLANNING AND ECONOMIC DEVELOPMENT

1. Market Demand Targets (Page 3)

The target markets for the resort are the upper income visitors to the state that tend to visit the resort destination areas on the neighbor islands. These visitors tend to be from the mainland, to be on a vacation, to stay in a hotel or condominium and to seek a recreation oriented resort that has a full range of guest amenities.

D. UNIVERSITY OF HAWAII AT MANOA, ENVIRONMENTAL CENTER

1. Public Revenue/Cost Ratios (Page 4)

Section 4.22.2.2, Fiscal Impacts, presents the detailed methodology and analysis used in estimating the cost/benefit ratios.

2. Income Multipliers (Page 4)

To our knowledge, there are no studies that have determined the income multipliers by category of resort. However, it could be expected that the resorts that cater to the upscale visitors could be expected to have income multipliers higher, if not at least, the same level for the state as a whole, for a number of reasons. Hawaii, as a whole, imports a good proportion almost all of its foodstuffs, particularly alcoholic beverages, and thus the leakage factor for upscale visitors and middle income visitors could be expected to be about the same. As Hawaii imports a significant portion of its products, the income multipliers primarily reflect the value added by the local economy in the marketing and packaging of the items.

E. COUNTY OF HAWAII, OFFICE OF HOUSING AND COMMUNITY DEVELOPMENT

1. Socio Economic Impact (Page 1)

Section 4.22.2.1.14 discusses construction employment. The section concludes that construction employment is temporary and therefore does not generate long term housing needs.

Section 4.22.2.1.15 discusses operational employment. The projected operational employment is estimated to range from 1,028 to 1,393 employees at the completion of the resort.

2. Hawaii County General Plan (Page 1)

An analysis of the cumulative housing demand from the development of the proposed resorts and related developments indicates a cumulative demand of about 35,000 housing units.

The housing demand associated with the direct operational employees of the resort for the island of Hawaii is estimated to be 196 to 766 units. Thus, the resort could be expected to have a negligible impact on the overall housing requirements of the island.

* * * * * * *

We hope these comments address the questions and issues that have been raised regarding our market and economic impact analysis of the planned Makalewana Resort. Please let us know if we can be of any further support.

Very truly yours,

PEAT, MARWICK, MITCHELL & CO.

Malcolm J. Tom, Partner

MJT:egj

NOV 18 1986

COMMUNITY RESOURCES, INC.

November 13, 1986

Mr. Tom Witten, Principal
Phillips Brandt Reddick
130 Merchant St., Suite 1111
Honolulu, HI 96813

RE: Makaluwena Draft EIS -- Response to Environmental Center Comments on Social Impact Sections

Dear Mr. Witten:

As per your request, this letter represents Community Resources' response to the University of Hawaii at Manoa, Environmental Center's comments on the Makaluwena Resort Draft EIS. The following portions of the Center comments pertain to work done by Community Resources and are addressed in this letter:

(1) On page 4 of Center's letter, the first paragraph under the heading "Social Impacts" (NOTE: the second paragraph relates to housing, which was addressed by another consultant);

(2) Also on page 4, the first paragraph under the heading "Socioeconomic Considerations."

Social Impacts (First Paragraph)

In regard to interviews for the report, the Center comments: "...there is only a generalized summary of the responses to these interviews. No indication is given as to the questions that were asked, the specific responses received, nor any efforts to quantify the information gained. The EIS should provide more substantive data with regard to these interviews and the basis for any conclusions that are drawn from them. In addition to interviews with individuals in government agencies and the visitor industry, it is also essential to include the interviews and opinions of local residents."

Our responses would include the following points:

(1) The Environmental Center comments indicate confusion over the differences between the key informant methodology versus a formal survey research approach. It would not have been appropriate for impact assessment purposes to have standardized questionnaires or to quantify results. Different individuals were asked different questions, depending on the nature of their expertise.

(2) The Center seems to be requesting a detailed methodological appendix more appropriate to a formal academic survey research project than to social impact sections of an EIS. It is conventional in EIS's not to provide such elaborate detail in the body of the text, in order to keep the EIS to a manageable length.

1188 Bishop Street • Suite 909 • Honolulu, Hawaii 96813 • Phone (808) 528 2211

(3) On the other hand, some supporting detail may typically be included in an expanded social impact report appended to the main text. Such a report was not prepared for the Makaluwena EIS because -- as explicitly stated at the beginning of the social impact section on p. IV-122 -- Community Resources had very recently completed such a report for another nearby proposed Kona resort (at Kukio). The Makaluwena EIS text summarized both this Kukio report and some less intensive supplementary work for the present project.

(4) Community Resources would strongly concur that resident perspectives are vital to social impact assessment. That is why we prepared the section on "Community Issues and Concerns" (p. IV-122). This section presents survey evidence on general social issues and attitudes. No original survey was conducted on project-specific concerns, for several reasons:

- No such survey has ever (to our knowledge) been requested after the Notice of Preparation for this or any other Hawaii project.
- A survey asking about a proposed project about which the public is little-informed would be of dubious value.
- The entire purpose of the EIS process is, in fact, to inform the public and then to obtain public response through written comments and public hearings.

Socioeconomic Considerations (First Paragraph)

The first paragraph of this section in the Center's letter addresses three points relative to EIS sections prepared by Community Resources:

(1) "...no attempt is made to analyze the proposed resort's effect on the social fabric of the community or its composition."

The sections on "Social Structure" and "Indicators of Social Cohesion" (Draft EIS pp. IV-122, 125-128) address precisely these issues. However, it should be noted that it is difficult to come to definite conclusions because the number of approved and proposed resort projects in West Hawaii is very large. The proposed Makaluwena project by itself would have relatively little impact. The cumulative impact of all projects could be substantial, but it is unknown at present how many of the proposed projects will be approved and/or actually constructed due to market conditions.

(2) "There is no mention of management's commitment to purchase local products or to hire local labor, especially for mid and upper level management positions."

The applicant is a landowner. If the project is approved, one or more developers will be sought. Following development, there will be numerous managers of various hotel and retail operations. The identity, much less the policies, of these managers is currently unknown.

(3) "The possibility of establishing programs to train local residents should be considered."

In Section 4.22.4 -- "Mitigation Measures" -- four pages of the Draft EIS (pp. IV-128 to IV-132) are devoted to discussions of "Resident-Oriented Job Training" and "Support Services to Increase Resident Employment."

In closing, Community Resources would like to state that we do value the Environmental Center's underlying objective of improving social impact content in all EIS's. We are hopeful that Center reviewers will in future distinguish between the objectives of impact assessment (disclosure of available information about a specific project; furthering the process of public involvement; and suggesting management actions) and those of social science research (drawing definitive conclusions about universal social principles).

Sincerely,

John H. Knox, Ph.D., President

PAUL H. ROSENDAHL, Ph.D., Inc.
Consulting Archaeologist

November 14, 1986

Mr. Thomas S. Witten
Phillips, Brandt, Reddick & Associates
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Subject: Archaeology Review Comments by the University of Hawaii-Manoa Environmental Center on the Draft Environmental Impact Statement (DEIS) for Makalawena Resort, Makalawena, North Kona, Hawaii

Dear Mr. Witten:

At your request, Paul H. Rosendahl, Ph.D., Inc. (PHRI) has reviewed the Environmental Center's response to the DEIS for Makalawena. The above subject review comments indicate that the reviewer (Dr. M. Graves) found several deficiencies in the archaeological section of the DEIS and/or the report included as Appendix C of the DEIS ("Preliminary Report Upon Completion of Field Work: Archaeological Reconnaissance Survey, Makalawena Coastal Development Area;" PHRI Report 245-071486, by T.F. Denham 1986). The reviewer's comments are perplexing, given the preliminary acceptance of the report by the State Historic Preservation Office/Department of Land and Natural Resources, and the Hawaii County Planning Department. The review comments indicate that Dr. Graves is:

1. not using the Society for Hawaiian Archaeology's "Minimum Requirements For Reconnaissance Survey Reports", which previously have been used by the Environmental Center in reviewing such reports;

2. not aware that he is reviewing a Preliminary Report, which is to be followed by a much more detailed Final Report;

3. unfamiliar with the State Historic Preservation Office's requirements in connection with, general land use planning decisions;

4. confused over the differences in theoretical, methodological, and substantive content requirements for reconnaissance, versus subsequent data recovery, reports; and

5. unaware of the general nature, and commonly accepted interpretations, of archaeological remains in Hawaii.

The reviewer claims the archaeological report contains the following substantive and methodological deficiencies:

1. There is no rationale given for grouping "most" of the sites "into either functional or temporal categories," thus rendering an impartial review impossible;

305 Mahouli Street • Hilo, Hawaii 96720 • (808) 969 1761 or 966 8018

7. There is "little information provided on archaeological assemblages associated with each site" (i.e., artifact measurements, diversity, density);

1. Sites "appear" to have been "assigned levels of importance [solely] on the basis of their features and architectural remains;"

4. The report is "deficient" in the extent to which it places the archaeological remains in "some sort of historical context;"

5. "[C]ultural historical issues that are important to Hawaii are not adequately addressed;" and

6. A discussion of the analytical procedures, the theoretical and methodological approach used, and the linkage between the remains and potential problems of cultural/historical interest," is lacking.

Purported substantive deficiencies include inadequate description of field data (No.7, above), insufficient discussion of the historical context of the remains (No.4), and inadequate treatment of important Hawaiian cultural historical issues (No.5). The first supposed substantive deficiency--insufficient information on artifacts--is simply due to the preliminary nature of the report. Paragraph three on page ten of the preliminary report lists a total of nine artifacts collected from four sites, and states that the artifacts "will be further discussed and illustrated in the final report." Table 1 in the preliminary report notes the presence of uncollected artifacts at other sites. These are also further described in the final report.

The second and third purported substantive deficiencies are unjustified. The preliminary report discusses the probable historic age of most sites (Donham 1986:13-14). Donham (1986:15-18) goes on to discuss a range of topics dealing with the historic context of the Makalawena sites, and the sites' potential to contribute to furthering our knowledge of local and regional prehistory and history. Furthermore, it is not necessary for a reconnaissance survey report of this type to recapitulate Hawaiian culture history, unless it is intended that the report be reviewed by parties totally unfamiliar with the Hawaiian sequence, which should not be the case for reports submitted in connection with general land use planning in Hawaii.

The remaining purported deficiencies in the preliminary report relate to its methodological adequacy. The first (No.1 on page two, above) concerns the supposed lack of a rationale for grouping sites into "either functional or temporal categories." To begin with, functional and temporal categories are not mutually exclusive ones, as the reviewer implies, but this is moot because the report does not do this. Sites, specifically architectural features, are categorized in terms of formal type (Donham

1986:12-13), and inferred or tentative functional type (1986:13-14). The use of formal and functional types is accepted standard practice in American archaeology.

The second supposed methodological flaw in the report concerns the inadequate basis used for determining "levels of importance" (No.3, above). Specifically, the reviewer implies that importance (more commonly referred to as significance) is assigned on the basis of architectural remains, and that artifacts and other associated remains are not considered in the assessment. The categories used for assessing site significance are defined on page 15 in the preliminary report, and applied on a site-by-site basis in Table 1. A thorough reading of the table, as well as the preliminary report section entitled EVALUATIONS (Donham 1986: 15-19), should leave no question as to how sites were assigned various categories and degrees of significance. In fact, the present report goes much further in discussing site significance than is required by the accepted standards for a reconnaissance report in Hawaii. The guidelines only require preliminary, or general, evaluation of a site's probable significance be made. It should be emphasized here that the significance assessments made in the preliminary report have been tentatively agreed to by staff archaeologists reviewing this report for the State and County, and who are intimately familiar with the local archaeology.

The final supposed defect in the preliminary report concerns the lack of a "discussion of the analytical procedures, the theoretical and methodological approach used, and the linkage between the remains and potential problems of cultural/historical interest." Such a discussion may well be appropriate to subsequent data recovery reports, research designs, and so on; however, for purposes of a reconnaissance survey of this type, such discussions are neither warranted nor appropriate. A reconnaissance survey report is not a doctoral dissertation; it is a report intended to describe the presence or absence, and general nature, of archaeological resources with in a given area in order to make preliminary evaluations and facilitate formulation of realistic recommendations for further work.

If you have any questions, please contact us at our Hilo office 969-1763.

Sincerely yours,

Paul H. Rosendahl, Ph.D.
President and Principal
Archaeologist

Alan E. Haun, Ph.D.
Senior Archaeologist

RECEIVED AS FOLLOWS

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION

STP 8.1682

November 13, 1986

Mr. Albert Lono Lyman, Director
Planning Department
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Lyman:

Makalawena Draft EIS

The Department of Transportation has reviewed the draft EIS for the proposed Makalawena Resort at North Kona, Hawaii and has the following comments to offer.

Vehicular Trip Generation Estimates

Page I-6 of the DEIS estimates that the proposed development will generate approximately 8,620 total vehicular trips per day. Table IV-10 on page IV-63 displays the derivation of estimated daily trips based upon rates obtained from the Punalu'u Resort DEIS which in turn claims to have obtained these rates from the Institute of Transportation Engineers, Trip Generation 3rd Edition. The rates used in Table IV-10 based rates of 3.5 trips/room for the hotel and 3.2 trips per unit for the multi-family dwelling units. May we point out the 3rd edition of the ITE Trip Generation has rates of 10.5 trips/hotel room and 5.2 trips/residential condominium unit. Based on potential development of 900-1200 hotel rooms and 900-1350 condominium units, the estimate translates to a range of 13,860-19,260 daily trips not including the golf course. The result is a substantial difference in estimated trip ends of 8,620 as stated in the DEIS.

Traffic Study

The DEIS on page IV-64 par. 4-9-4 states, "...a traffic study will be prepared..." addressing "...traffic assignment and distribution, turning movements, intersection requirements and control and financial responsibility of road improvements." Page VI-11 contains a statement that, "A number of operational measures could be considered to facilitate effective transportation [illegible] the resort and the airport."

Mr. Albert Lono Lyman
Page 2

STP 8.1682

The Department of Transportation reserves its comments on these traffic related matters until such time as more information is supplied to conduct a thorough evaluation.

Public Access to Shoreline

The DEIS on numerous occasions states that public access to the shoreline will be incorporated in the development. The statement should contain an estimate of public usage of the access and sufficient off-street parking stalls that should be provided to accommodate these users. An inadequate parking facility may result in vehicular parking along Queen Kaahumanu Highway, thus creating potentially hazardous conditions along the highway.

Thank you for this opportunity to provide comments on this draft EIS.

Very truly yours,

Wayne D. Yamasaki
Director of Transportation

Phillips Brandt Reddick

December 4, 1986

Mr. Wayne J. Yamasaki
Director of Transportation
Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT,
NORTH KONA, HAWAII

Dear Mr. Yamasaki:

Thank you for the copy of your letter of 13 November 1986 to Mr. Albert Lono Lyman, Director, Planning Department, County of Hawaii. We have reviewed your letter and offer the following response.

Vehicular Trip Generation Estimates

We agree that the Institute of Transportation Engineers, Trip Generation 3rd Edition has rates of 10.5 trips per hotel room and 5.2 trips per residential condominium unit. However, our rationale for using 3.5 trips per hotel room and 3.2 trips per residential condominium unit is that the proposed resort will be essentially self sufficient in that recreational facilities, dining opportunities and shopping services will be provided on-site, thereby generating fewer trips than otherwise might be the case with the "typical" hotel or residential condominium unit. As noted in the Draft EIS and your letter, a traffic study will be performed following preparation of a specific site development program for the proposed project. Please be assured that the landowner will keep your department, as well as all other applicable governmental agencies, informed of their plans so that coordinated traffic/highway planning actions can be accomplished.

Traffic Study

As noted above, it is the landowner's intention to keep your department informed of the traffic/highway planning and study such that coordinated planning is accomplished.

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

Public Access to Shoreline

The estimate of public usage and number of public parking facilities to be provided will be determined following preparation of a specific development plan for the proposed resort. It is the landowner's intention to comply with all applicable state and county rules, regulations and ordinances regarding the provision of public facilities at the proposed resort. We believe that it is unlikely that vehicular parking would occur on Queen Kaahumanu Highway due to the distance (over 6,000 feet) from the highway to the beach.

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director,
County of Hawaii
Mr. O. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

STATE OF HAWAII
DEPARTMENT OF SOCIAL SERVICES AND HOUSING
HAWAII HOUSING AUTHORITY
P O BOX 17907
HONOLULU HAWAII 96817

86:PLNG/6697

November 7, 1986

Mr. Albert Lono Lyman, Director
County of Hawaii Planning Department
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Lyman:

Re: Draft Environmental Impact State (EIS) for the Proposed Makalawena Resort

The Hawaii Housing Authority has reviewed the draft EIS for the proposed development and offers the following comments:

As shown in Table IV-36 of the draft EIS, direct operational hotel and resort employees will create a demand for approximately 196 to 266 new housing units. Indirect or induced employment will also increase the demand for new housing (although that estimate is not provided in the EIS). Therefore, it appears that the proposed Makalawena Resort will have a significant impact on the housing market in the Kona area.

In view of this impact, the Authority suggests that the provision of affordable housing be an integral part of the applicants master plan. Moreover, close cooperation between the developer and County housing officials should be maintained to insure that employee housing needs are met.

Should you have any questions, please contact Colette Sakoda of my staff at 848-3226.

Sincerely,

RUSSELL N. FUKUMOTO
Executive Director

cc: Mr. Guido Giacometti
Mr. Thomas S. Witten, Principal

Phillips Brandt Reddick

December 4, 1986

Mr. Russell N. Fukumoto,
Executive Director
Hawaii Housing Authority
State of Hawaii
P O. Box 17907
Honolulu, Hawaii 96817

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT,
NORTH KONA, HAWAII

Dear Mr. Fukumoto:

Thank you for the copy of your letter of 7 November 1986 to Mr. Albert Lono Lyman, Director, County of Hawaii Planning Department. We have reviewed your letter and offer the following response.

Pleased be assured that the developer will continue to work closely with appropriate county agencies to insure that employee housing needs are met. As you are aware, your Authority and the county are planning a new 1,500 acre community at Kealakehe and as conceptualized it is possible that employee housing could be provided in that community. We would appreciate being kept informed of your plans so that we may integrate those plans with the proposed resort development.

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director,
County of Hawaii
Mr G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel (808) 521-5631

DEPARTMENT OF PLANNING
AND ECONOMIC DEVELOPMENT

Ref. No. P-5401

November 7, 1986

NOV 1 1 1986

The Honorable Albert Lono Lyman
Planning Director
Planning Department
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Lyman:

Subject: Makalawena Resort DEIS, North Kona, Hawaii

We have reviewed the subject draft environmental impact statement (DEIS) and have the following comments on coastal recreational resources, scenic and open space resources, coastal ecosystems, historic resources, and other concerns.

1. Recreational Resources

The project area offers significant recreational resources along the shoreline. The site's extensive beach areas, sand dunes and offshore waters are known to be used by snorkelers, scuba divers, swimmers, sunbathers, shoreline fishermen and surfers. The EIS should further describe existing coastal recreation resources, uses and activities in the area and anticipated impacts on these. A recreation resources inventory would assist in gathering accurate information on the value of the coastal recreational resources.

Future offshore and onshore recreational activities and uses, particularly those of a commercial nature, proposed in connection with the development should be identified.

The development proposal indicates that a public shoreline promenade, park space and access will be provided, but specific spatial and facility improvements are not adequately described. The EIS should indicate whether public parking (non-fee) and restrooms will be provided to facilitate beach access and whether a wildlife refuge interpretive center is proposed. The inland extent of the shoreline park area and proposed public facilities should be identified clearly on a map.

As recent growth and anticipated increases in the North Kona/South Kohala population will result in increasing demands for public shoreline recreational opportunities, the EIS should also describe existing and planned park and recreational facilities in the region.

2. Scenic and Open Space Resources

Although the project's design details have yet to be prepared, the EIS should discuss, at least conceptually, how shoreline structures will be designed (height and bulk) and located to minimize alteration of natural landforms and views to and along the shoreline. Any shoreline/beach alteration or landfill should be described in the EIS.

3. Historic Resources

The EIS should indicate whether the Old Kings Trail will be affected by the project and, if so, identify measures that would be taken to preserve the trail. Also, the feasibility of preserving and protecting the cemetery should be discussed in the EIS.

4. Coastal Ecosystems

The project area includes many anchialine ponds and Opae'ula Pond which supports endangered species. As proposed, the development would reserve 18 acres for a wildlife refuge surrounding Opae'ula Pond and provide a management plan and buffer zone to protect the resource. It appears that the rest of the anchialine ponds would be incorporated into the project design as much as possible, but some ponds may be filled. The EIS should provide a more detailed and specific discussion of project impacts on each pond basin to assure that significant ponds are treated in an environmentally sensitive manner. In addition, Figure IV-2 should indicate the location of the mauka ponds.

Notwithstanding the absence of site-specific designs, the EIS should discuss anticipated impacts which might occur from the filling of anchialine ponds, including the significance of the ponds in providing habitat for the endangered birds and their tolerance of water quality degradation. For example, the anticipated changes in water quality parameters should be discussed in terms of the significance of these effects upon the avifauna. The buffer area around the refuge should be justified. In particular its adequacy as protection for endangered wildlife from human impacts should be addressed.

5. Other Concerns

A Federal permit or license will be necessary for dredge and fill activities, particularly with respect to the anchialine ponds. If this is the case, a statement of consistency with the Hawaii CZM Program will have to be filed for our certification to satisfy the requirements of the National CZM Act. We will, of course, be available to help assure that the requirements of this review process are satisfied.

With regard to demand for the project, the DEIS does not clearly identify the market segment to which the proposed project will be oriented. In addition, the higher estimates of proposed hotel (1,200) and multi-family (1,350) units exceed the estimated market share for Makalawena in the year 2005 (970 hotel and 1,200 condo units). These estimates should be clarified in the EIS.

Page I-10 states that the project fulfills State economic goals and that this offsets any adverse impacts of the project. While the project may fulfill economic goals, it has other less favorable impacts on physical environment, recreational and other goals and these impacts should continue to be considered.

An explanation of the derivation for the overall rankings on p. III-5 should be provided in the EIS. The ratings of low cost for public infrastructure and low risk of damage for coastal resources under the proposed development should be explained.

With reference to natural hazards, the EIS should clarify an apparent discrepancy between statements on the area's risk from volcanic hazards, moderate to high (p. IV-6) and the statement on p. VI-10 that the threat from lava flow is minimal. We also note that John Clark's Beaches of Hawaii quotes "Na Ala Hele" by DLNR, indicates that eight houses were destroyed by tsunami at Makalawena in 1946.

Since the DEIS (p. IV-110) states that 60 to 110 affordable housing units will be demanded in the County by project completion, the EIS should include specific information on actions the developer will take to address the provision of affordable housing.

Several options relating to water development are discussed in the EIS but the selection of a course of action is dependent on several factors. Thus, water supply for the proposed project should be included as an unresolved issue in Chapter IX. Water quality is a related concern. High quality water should be maintained due to its importance to NELH and the HNST Park.

Finally, the DEIS presents several alternatives to the proposed project including a "No Build" alternative which is not favorably discussed.

We find that the project is valuable as a coastal recreational area, an environmental resource and a natural wildlife area. It has one of the few outstanding sand beaches and swimming areas on the island. Moreover, the coastal area is of extremely high quality. The project area includes five anchialine pond complexes containing numerous ponds and pools, and Opae'ula Pond which supports endangered species. It also has environmental, aesthetic and scenic value. The value of the project area for coastal recreation, natural wildlife habitat and aesthetic and scenic considerations should be fully described in the chapter dealing with alternatives in the EIS. In addition, this chapter should recognize the consistency of the present conservation district classification of the property with these natural resource values.

Thank you for allowing us the opportunity to comment.

Very truly yours,

Kent M. Keith

cc: Mr. Guido Giacometti
Kamehameha Schools/Bernice Pauahi
Bishop Estates
Mr. Thomas S. Witten
Phillips, Brandt, Reddick & Assoc., Inc.
Office of Environmental Quality Control

Phillips Brandt Reddick

December 4, 1986

Mr. Kent M. Keith, Director
Department of Planning and
Economic Development
P. O. Box 2359
Honolulu, Hawaii 96804

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT,
NORTH KONA, HAWAII

Dear Mr. Keith:

Thank you for the copy of your letter of 7 November 1986 to Mr. Albert Lono Lyman, Planning Director, Planning Department, County of Hawaii. We have reviewed your letter and offer the following response.

1. Recreational Resources

The proposed project will increase public access to the recreational amenities of the project site. Public facilities will be provided in compliance with applicable county ordinances. The exact locations of various facilities on the site are to be determined and these facilities will be clearly shown on future drawings as required by the county. Existing county park facilities in the vicinity of the proposed project will be described in the Final EIS.

2. Scenic and Open Space Resources

Structures within the shoreline area are not planned at this time. Similarly, alterations to the existing beach areas are not planned.

3. Historic Resources

The Old Kings Trail is not located within the subject project area. There is a coastal trail that is evident to the north and south of the property and it is assumed that this trail follows the sandy shoreline along the property. As such, lateral shoreline access along the entire site will be maintained. The cemetery and other significant archaeological sites will be preserved as specified in the Archaeological Reconnaissance Survey that will be included in the Final EIS.

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

4. Coastal Ecosystems

The filling of on-site anchialine ponds is not planned at present. Should these plans change, appropriate environmental assessments will be conducted and permits filed.

Your mention that Figure IV-2 should indicate the location of mauka ponds is unclear. There was no pond basin identified as "mauka". Mauka was used in the generic sense to distinguish physical/chemical features of upland "mauka" ponds and pools from makai pond/pool complexes. In these instances, mauka pools were generally younger in terms of ecological succession than older makai ponds. The format and figures of the Final EIS will be revised to provide a clearer description of the project site coastal resources.

Because there are no plans at present to fill the anchialine ponds, no impacts to the ponds are expected. However, should those plans change, as noted above, appropriate environmental assessments and permits will be filed with federal, state and county agencies. Additionally, should the site developer determine that pond filling is required to develop an economically viable resort, the water quality of those ponds would obviously be degraded. However, in no case would Opaeula Pond or the immediately adjacent anchialine ponds be filled. Opaeula Pond, and some of the adjacent anchialine ponds will be inside the proposed wildlife refuge and protected from resort construction and operation activities. The size of the refuge, location and type of buffers, management requirements and other factors relating to the refuge are under discussion with the U.S. Fish and Wildlife Service County Planning Department. A field inspection of Opaeula Pond was completed on December 2, 1986 with representatives from both agencies and a preliminary determination was made as to appropriate boundaries of the proposed wildlife refuge. Refer to attached Memorandum 12/4/86.

5. Other Concerns

As noted above, should present plans change such that anchialine pond filling is necessary, appropriate permit applications will be filed and procedures followed. Our market and economic consultant, Peat, Marwick, Mitchell & Co. has developed the attached response to your concerns regarding the market segment to which the proposed project will be oriented.

We believe that the proposed project not only fulfills State economic goals, but that it also fulfills other goals as well. For example, improved public access to recreational facilities and amenities will be provided; the present xeric vegetation will be replaced by landscaping utilizing indigenous and introduced plant species compatible with North Kona's climate and soil, thereby providing improved habitat for resident and migratory birds; and the site's archaeological resources will be properly recorded and preserved as required.

An explanation of the derivation and rationale for the ranking of the alternatives investigated will be provided in the Final EIS.

The apparent discrepancy between statements on the area's risk from volcanic hazards will be clarified in the Final EIS.

With regard to affordable housing, the developer of the resort will work with State and County agencies to satisfy the affordable housing needs generated by this project (estimated at 60 to 110 units). Specific actions the developer may take would include independent off-site development of housing, joint-venture development of off-site housing and/or financial assistance towards State, County or Federal programs targeted at supplying affordable housing.

The source of potable water for the resort will be included in the Unresolved Issues section of the Final EIS. The water quality of the offshore areas is not expected to be degraded by the proposed project as is noted in the Draft EIS. The land owner is cognizant of the work being performed and planned at NELH and the HOST Park and is aware of the need to protect the water quality of the Kona coast.

The "No-Build" alternative discussion will be expanded in the Final EIS to include the points you have raised.

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director,
County of Hawaii
Mr. G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Attachments: P. Rosendahl Letter
Peat, Marwick, Mitchell Letter
PBR Memorandum 12/4/86

PAUL H. ROSENDAHL, Ph.D., Inc.
Consulting Archaeologist

November 14, 1986

Mr. Thomas S. Witten
Phillips, Brandt, Reddick & Associates
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Subject: Archaeology Review Comments by the University of Hawaii-Manoa Environmental Center on the Draft Environmental Impact Statement (DEIS) for Makalawena Resort, Makalawena, North Kona, Hawaii

Dear Mr. Witten:

At your request, Paul H. Rosendahl, Ph.D., Inc. (PHRI) has reviewed the Environmental Center's response to the DEIS for Makalawena. The above subject review comments indicate that the reviewer (Dr. M. Graves) found several deficiencies in the archaeological section of the DEIS and/or the report included as Appendix C of the DEIS ("Preliminary Report Upon Completion of Field Work: Archaeological Reconnaissance Survey, Makalawena Coastal Development Area;" PHRI Report 245-071486, by T.K. Donham 1986). The reviewer's comments are perplexing, given the preliminary acceptance of the report by the State Historic Preservation Office/Department of Land and Natural Resources, and the Hawaii County Planning Department. The review comments indicate that Dr. Graves is:

1. not using the Society for Hawaiian Archaeology's "Minimum Requirements For Reconnaissance Survey Reports", which previously have been used by the Environmental Center in reviewing such reports;

2. not aware that he is reviewing a Preliminary Report, which is to be followed by a much more detailed Final Report;

3. unfamiliar with the State Historic Preservation Office's requirements in connection with, general land use planning decisions;

4. confused over the differences in theoretical, methodological, and substantive content requirements for reconnaissance, versus subsequent data recovery, reports; and

5. unaware of the general nature, and commonly accepted interpretations, of archaeological remains in Hawaii.

The reviewer claims the archaeological report contains the following substantive and methodological deficiencies:

1. There is no rationale given for grouping "most" of the sites "into either functional or temporal categories," thus rendering an impartial review impossible;

305 Mahouli Street • Hilo, Hawaii 96720 • (808) 969-1763 or 966-8038

2. There is "little information provided on archaeological assemblages associated with each site" (i.e., artifact measurements, diversity, density);

3. Sites "appear" to have been "assigned levels of importance [solely] on the basis of their features and architectural remains;"

4. The report is "deficient" in the extent to which it places the archaeological remains in "some sort of historical context;"

5. "[C]ultural historical issues that are important to Hawaii are not adequately addressed;" and

6. A discussion of the analytical proceedures, the theoretical and methodological approach used, and the linkage between the remains and potential problems of cultural/historical interest," is lacking.

Purported substantive deficiencies include inadequate description of field data (No.2, above), insufficient discussion of the historical context of the remains (No.4), and inadequate treatment of important Hawaiian cultural historical issues (No.5). The first supposed substantive deficiency--insufficent information on artifacts--is simply due to the preliminary nature of the report. Paragraph three on page ten of the preliminary report lists a total of nine artifacts collected from four sites, and states that the artifacts "will be further discussed and illustrated in the final report." Table 1 in the preliminary report notes the presence of uncollected artifacts at other sites. These are also further described in the final report.

The second and third purported substantive deficiencies are unjustified. The preliminary report discusses the probable historic age of most sites (Donham 1986:13-14). Donham (1986:15-18) goes on to discuss a range of topics dealing with the historic context of the Makalawena sites, and the sites' potential to contribute to furthering our knowledge of local and regional prehistory and history. Furthermore, it is not necessary for a reconnaissance survey report of this type to recapitulate Hawaiian culture history, unless it is intended that the report be reviewed by parties totally unfamiliar with the Hawaiian sequence, which should not be the case for reports submitted in connection with general land use planning in Hawaii.

The remaining purported deficiencies in the preliminary report relate to its methodological adequacy. The first (No.1 on page two, above) concerns the supposed lack of a rationale for grouping sites into "either functional or temporal categories." To begin with, functional and temporal categories are not mutually exclusive ones, as the reviewer implies, but this is most because the report does not do this. Sites, specifically architectural features, are categorized in terms of formal type (Donham

1986:12-13), and inferred or tentative functional type (1986:13-14). The use of formal and functional types is accepted standard practice in American archaeology.

The second supposed methodological flaw in the report concerns the inadequate basis used for determining "levels of importance" (No.3, above). Specifically, the reviewer implies that importance (more commonly referred to as significance) is assigned on the basis of architectural remains, and that artifacts and other associated remains are not considered in the assessment. The categories used for assessing site significance are defined on page 15 in the preliminary report, and applied on a site-by-site basis in Table 1. A thorough reading of the table, as well as the preliminary report section entitled EVALUATIONS (Donham 1986: 15-19), should leave no question as to how sites were assigned various categories and degrees of significance. In fact, the present report goes much further in discussing site significance than is required by the accepted standards for a reconnaissance report in Hawaii. The guidelines only require preliminary, or general, evaluation of a site's probable significance be made. It should be emphasized here that the significance assessments made in the preliminary report have been tentatively agreed to by staff archaeologists reviewing this report for the State and County, and who are intimately familiar with the local archaeology.

The final supposed defect in the preliminary report concerns the lack of a "discussion of the analytical procedures, the theoretical and methodological approach used, and the linkage between the remains and potential problems of cultural/historical interest." Such a discussion may well be appropriate to subsequent data recovery reports, research designs, and so on; however, for purposes of a reconnaissance survey of this type, such discussions are neither warranted nor appropriate. A reconnaissance survey report is not a doctoral dissertation; it is a report intended to describe the presence or absence, and general nature, of archaeological resources with in a given area in order to make preliminary evaluations and facilitate formulation of realistic recommendations for further work.

If you have any questions, please contact us at our Hilo office 969-1761.

Sincerely yours,

Paul H. Rosendahl, Ph.D.
President and Principal Archaeologist

Alan E. Haun, Ph.D.
Senior Archaeologist

PEAT MARWICK

Peat Marwick Mitchell & Co.
[illegible]
P.O. Box [illegible]
Honolulu, Hawaii
[illegible]

December 4, 1986

Mr. Thomas S. Witten
Phillips, Brandt, Reddick & Assoc., Inc.
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Re: Makalewena Resort - Draft Environmental Impact Statement

Dear Tom:

This letter presents our responses to the comments/questions raised by the State Department of Planning and Economic Development the Draft Environmental Impact Statement for the planned Makalewena Resort on the island of Hawaii.

> The target markets for the resort are the upper income visitors to the state that tend to visit the resort destination areas on the neighbor islands. These visitors tend to be from the mainland, to be on a vacation, to stay in a hotel or condominium and to seek a recreation oriented resort that has a full range of guest amenities.

By category, these markets could be expected to include:

- Individual and family vacation travelors seeking a beach environment.
- Corporate meeting groups seeking a resort retreat.
- Incentive meeting groups seeking a self contained recreation resort area
- Pre- and post convention groups visiting a neighbor island
- Hawaii residents seeking a beach resort vacation area

* * * * * * *

We hope these comments address the questions and issues that have been raised regarding our market and economic impact analysis of the planned Makalewena Resort. Please let us know if we can be of any further support.

Very truly yours,

PEAT, MARWICK, MITCHELL & CO.

Malcolm J. Tom, Partner

MJT:lsa

Phillips Brandt Reddick

M E M O R A N D U M

TO: Sydney Kelipuleole - KS/BE
Ilima Pilnaia - County of Hawaii
John Ford - USFWF
John Naughton - NMFS

SUBJECT: Field Survey of Opae'ula Pond - Makalawena
North Kona

DATE: December 3, 1986

FROM: Tom Witten

ATTENDING: County of Hawaii - Ilima Pilanaia, Deputy Director; Rodney Nakano, Environmental Planner; and Brian Nishimura, Planner
US Fish & Wildlife Service - John Ford, Peter Stine, Steve Berendzen
National Marine Fisheries Service - John Naughton
Kamehameha Schools/Bishop Estate (KS/BE) - Sydney Kelipuleole, Bill Staton
Phillips, Brandt, Reddick - Frank Brandt, Tom Witten, Phil Bruner (Fauna Subconsultant)

In conjunction with preparation of the Final EIS, an onsite field inspection was made on December 2, 1986 with the above parties attending. The primary purpose was to inspect the onsite conditions of Opae'ula Pond to better estimate the appropriate boundaries and buffer areas for establishing a wildlife refuge in conjunction with the proposed resort development and provide the participants with a better overall understanding of this important wildlife habitat resource. The primary considerations discussed in establishing appropriate boundaries for a wildlife refuge at Opae'ula Pond were control of human access, visual barriers and sightline considerations, flight access, predator control (possible fencing and walls), light intrusion, noise, shoreline access, and adjacent land use activities.

A survey of the entire perimeter of the pond was completed. Surrounded primarily by a thicket of Kiawe, there were several areas where vistas were available of the pond. Measurements were taken at various points along the pond to establish a general sense of adequate setback and buffer areas to separate the wildlife refuge from adjacent uses. It was noted that at present there is little or no suitable nesting areas for the Hawaiian

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

Stilt, although the site has great potential if nesting areas (small isolated islands set within the pond) were created. Additionally, the clearing of introduced wetland vegetation would provide more feeding areas for the waterbirds.

After some discussion, the following understanding was reached as to the general principle of establishing a wildlife refuge at Opae'ula Pond and its boundaries. The boundaries as discussed are preliminary in nature in that, dependent upon more detailed planning of various adjacent uses, additional buffer areas may be required. The attached exhibit depicts the general wildlife refuge area and buffer determined by this field survey to accomplish a refuge at Opae'ula Pond. This includes a minimum 150-foot setback from the edge of the pond with the exception of the makai boundary where a 136-foot setback would be adequate with a barrier rock wall and landscape planting in a curvelinear form to separate the shoreline recreational use area from the refuge. There is a need for walls, fencing, vegetation barriers and/or a combination thereof to surround the entire refuge boundary refuge to control access and unwanted predators.

Based on the above described boundaries of the wildlife refuge, it is estimated that the refuge would include approximately 22 acres. A wildlife refuge management plan would be refined as more specific plans for the resort development are prepared and a wildlife manager or agency is selected to manage the refuge.

Possible view/interpretation points were also identified as the group hiked around the pond (see attached exhibit). These sites should be designed to provide cover for those viewing the area and located at vantage points that allow the viewer a good perspective of the pond and those areas that the birds would frequent without impacting nesting or breeding activities.

KS/BE indicated their interest in establishing a wildlife refuge at Opae'ula Pond in conjunction with the Makalawena Resort, although the actual means by which this is accomplished needs to be more clearly defined. The role of the Wildlife Refuge Manager and land owner, the details of a Wildlife Refuge Management Plan, and who would be most qualified to manage such a resouce needs to be determined. The US Fish and Wildlife Service (USFWS), based on past efforts to acquire the pond as a National Wildlife Refuge and their current assessment of the value of Opae'ula Pond as a

Memorandum
Field Survey of Opae'ula Pond
December 3, 1986
Page 3

waterbird refuge, is interested in working with the landowner to investigate the various alternative management arrangements by which the USFWS could manage the pond as a wildlife refuge.

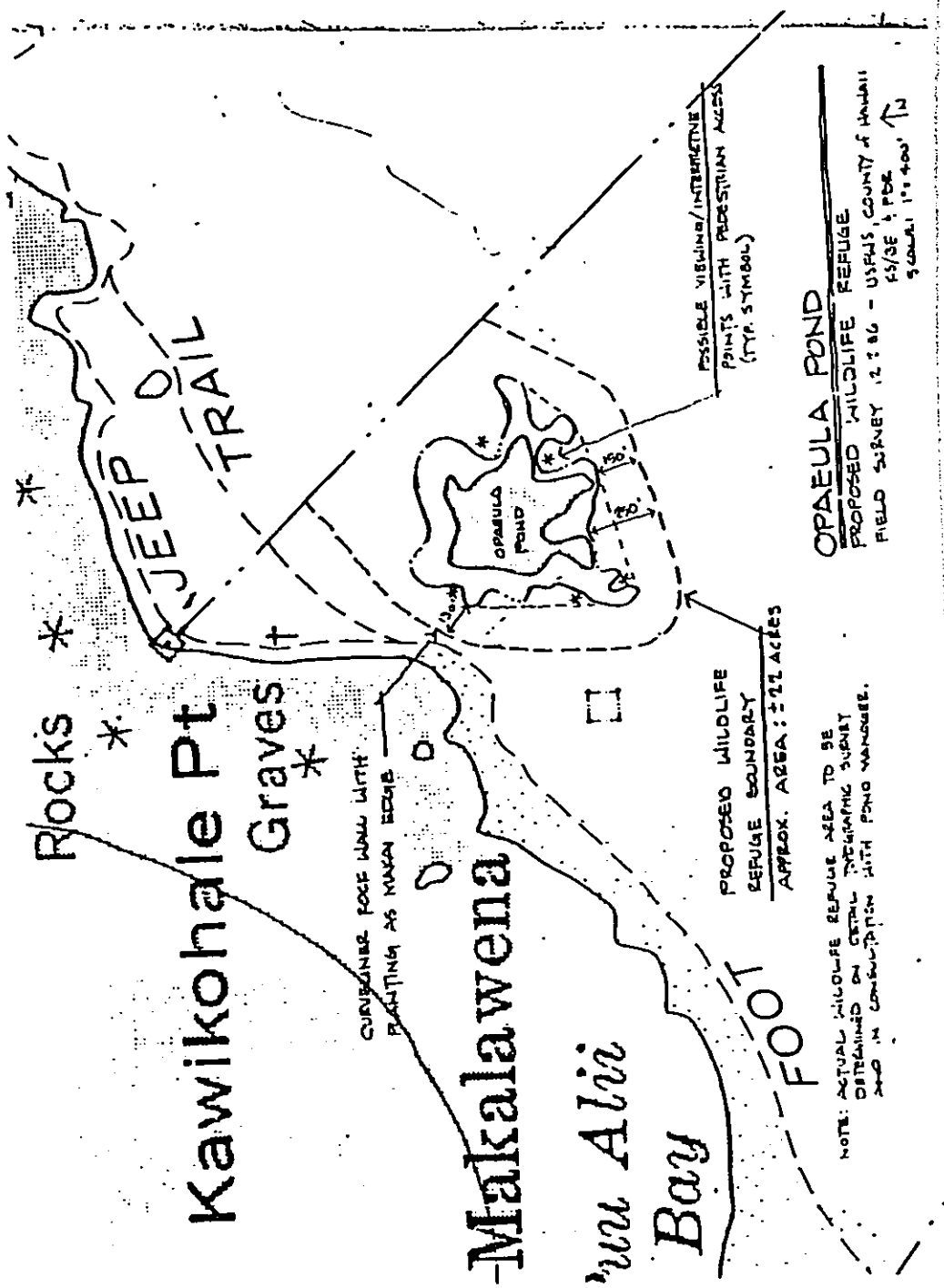
Although the State Department of Land and Natural Resources has not responded to the Draft EIS, they have expressed interest in Opae'ula Pond and should be consulted with regards to the establishment of a wildlife refuge. Additionally, organizations such as the Nature Conservancy and the Hawaii Audubon Society should be consulted.

As a follow-up to this field trip, PBR will include comments in the Final EIS to recognize the general conclusions reached at this field survey and to indicate the general boundary of the proposed wildlife refuge for the purposes of preliminary site development planning.

We appreciate the participation from the County Department of Planning, US Fish and Wildlife Service and National Marine Fisheries Service and are hopeful that further efforts will achieve a management plan for Opae'ula Pond that will improve and maintain this valuable wetland and migratory and waterbird refuge in conjunction with the proposed Makalawena Resort.

Thomas S. Witten, ASLA
Principal

cc: Ms. Mae Mull, Hawaii Audubon Society
Mr. Kelvin Taketa, Nature Conservancy



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

NOV 13 1986

November 5, 1986

Mr. Albert Lono Lyman, Director
Planning Department
County of Hawaii
25 Aupuni St.
Hilo, Hawaii 96720

Dear Mr. Lyman:

Subject: Comments on Draft EIS for Makalawena Resort, North Kona, Hawaii

Thank you for allowing us to review and comment on the subject draft EIS. We provide the following comments:

Wastewater Disposal

The proposed project is not located within the planning area of an approved 201 Facility Plan. Therefore, the proposed project must utilize a wastewater treatment works built in accordance with Acts 282 and 302.

Air Pollution

The draft environmental impact statement (EIS) has indicated that the State ambient air quality standards may be exceeded as a result of vehicular activity. Proposed mitigative measures include the widening of the Queen Kaahumanu Highway and intersectional improvements. The project should not be allowed to proceed unless the mitigative measures are implemented and only if an air quality assessment determines the mitigative measures as adequate.

Drinking Water

As stated in the draft EIS, the project has not finally determined which of several options for water supply will be pursued. The fact that additional water supply will be necessary to support the project has already been established. The options include participation with the Hawaii Department of Water Supply in the expansion of the municipal system, in the development of new sources and the operation and maintenance of a privately owned water system. Our comments of September 15, 1986 on the EIS preparation notice identified the Drinking Water Program requirements pertaining to new sources serving public water systems and the development of new distribution systems (Sections 11-20-29 and 11-20-51 respectively). This subject document does not indicate

recognition of these requirements as part of the development, operation and maintenance of a privately owned water system. In view of the significance of water supply to the project, failure to meet the water system requirements will have a major impact on the project.

Sincerely yours,

JAMES K. IKEDA
Deputy Director for
Environmental Health

KS:ao

cc: Mr. Guido Giacometti
Mr. Thomas Witten
DHO, Hawaii

Phillips Brandt Reddick

November 18, 1986

Mr. James Ikeda, Deputy Director,
for Environmental Health
Department of Health
P. O. Box 3378
Honolulu, Hawaii 96801

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT,
NORTH KONA, HAWAII

Dear Mr Ikeda:

Thank you for the copy of your letter of 5 November 1986 to Mr. Albert Lono Lyman, Director, Planning Department, County of Hawaii. We have reviewed your letter and offer the following response.

Wastewater Disposal

The proposed project wastewater treatment works will be constructed in compliance with Acts 282 and 302. This information will be included in the Final EIS.

Air Pollution

As noted in the Draft EIS, pursuant to detailed development plans, an air quality assessment would be prepared to address pollutant concentrations during peak hour traffic conditions at primary project intersections. The assessment would address any measures required to comply with Federal and State air quality standards.

Drinking Water

The drinking water standards noted in your letter of 15 September 1986, which was included in Chapter X of the Draft EIS, will be included in the Final EIS.

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director, County of Hawaii
Mr. G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

NOV 12 1986

COUNTY OF HAWAII

PLANNING DEPARTMENT

25 AUPUNI STREET • HILO, HAWAII 96720

November 7, 1986

Phillips Brandt Reddick and Assoc.
110 Merchant Street, Suite 1111
Honolulu, HI 96813

Gentlemen:

Draft Environmental Impact Statement
Hakalawena Resort
Hakalawena, North Kona, Island of Hawaii

We have reviewed the subject draft EIS for the proposed Hakalawena Resort project in North Kona, Island of Hawaii, and submit the following comments.

1. Project description: The description of the project and development plans do not acknowledge the separate ownership of the approximately 10,000 square foot parcel owned by the Congregational Church. There is no indication in the text that the plans have been discussed with the Trustees of the church. The archaeological survey report suggests the preservation of the church ruins. However, it is not clear whether the Trustees of the church agree with the recommendation or whether there are other plans for the parcel. The parcel is situated in an area which is shown as hotel site(s), thus a discussion of the integration/non-integration of this parcel with the overall development plans ought to be discussed in terms of its separate ownership as well as archaeological considerations.

2. With respect to the phasing and timing of the project (2.7), other than the expected start date in 1989, there is no indication of yearly increments. The timing should be indicated in terms of five year increments. It would also be appropriate to discuss the implications and possible impacts to the development, if any, of incremental land use approvals.

3. Visitor industry projections: The County of Hawaii Planning Department's preliminary projections should be included in the sections relating to visitor counts (2.9.2.4) and the assessment of hotel unit demand in West Hawaii (2.9.3.3). These projections are presented in the preliminary draft of the Revised General Plan dated May 1986.

Also, projects included in the "planned development" sub-section should include the Ritz Carlton proposed at Mauna Lani Resort and the Marriot Hotel proposed at the Waikoloa Resort.

There are a number of assumptions which have been used and which need to be explained and justified, these include:

a. Table II-1l, the average length of stay for both west and eastbound visitors, the increase in volume of eastbound visitors, and the increase in the number of Hawaii residents.

b. The basis for assuming that the visitor demand served by hotel units decreasing from 80% to 70%.

c. The basis for assuming that 7% to 9% of the hotel units demanded in West Hawaii can be attracted to Hakalawena.

4. Alternatives to the proposed project: The alternative of no-development and/or development at a smaller scale should be discussed from the standpoint of the natural resources of the site.

5. Description of the environment and probable impacts:

Opaeula pond: The U.S. Fish and Wildlife Service indicated that the proposed wildlife refuge encompassed 16 acres rather than 15 acres as is being proposed through the draft EIS. Please provide as an appendix all federal and/or state reports describing the proposed National Wildlife Refuge including that mentioned in the U.S. Fish and Wildlife Survey letter of September 23, 1986.

What are the impacts to the endangered waterbird habitat from the establishment of a management area of 15 acres rather than 16 acres. What are the impacts of the 16 acre wildlife management area on the feasibility of the resort proposal.

Anchialine ponds and coastal waters: The draft EIS indicates that there is substantial movement of subsurface waters through the anchialine ponds and to coastal waters. The draft EIS should discuss and consider as a mitigation measure, a coastal and anchialine pond water quality monitoring program. An outline of such a program should include physical, biological, chemical, and scheduling parameters.

Marine survey: The statement is made on page IV-13, "The relatively low diversity and low population levels of fishes in the nearshore waters of Pu'u Ali'i Bay probably reflects the absence of suitable coral habitat, heavy fishing pressure and the impact of tropical fish collectors." We note that there may be other physical/chemical parameters which may limit both diversity and population levels, including the presence of large quantities of groundwater discharge.

Some of the statements made on pages IV-14 and 15 relating to the physical and chemical conditions of the area should be discussed and justified further as the sample taken constitutes one day sampling at high and low tide. References to other surveys taken in the area or along the Kona coast should be included if data from these other surveys were utilized.

Air quality: Since no air quality measurements have been taken at the site or surrounding areas, some of the statements made in this section is speculative and warrants some justification or deletion.

Noise impacts: The source for 1985 noise contour map should be indicated within the text. Also, noise projection contours for the years beyond 1985 should be included. We suggest that the Department of Transportation, Airports Division, be contacted for information relating to both projected contours as well as acceptable noise standards.

6. Public Facilities and Utilities:

Public Access and Other Recreational Facilities: The draft EIS does not indicate whether the public access or other facilities will be dedicated to the County or will be privately maintained. Maintenance and other operating costs should be discussed for both alternatives.

Protective Services: The discussion on the fire station which is being jointly developed by the Kohala Coast Resort Association is not current and should be updated.

Water: One of the alternatives for the provision of water is drilling on mauka lands owned by the applicant. According to data provided, three wells will be needed to provide enough water for the development. Since the mauka parcel is narrow, it may not be possible to locate all three wells on this parcel. What other private sources have been considered?

7. State and County Plans: The section relating to County zoning (6.6) should note that the zoning ordinance will need to be amended in order to allow the proposed mix of resort, residential and commercial uses.

8. Appendices: Appendix E, the draft pond management plan should include water quality monitoring which includes sampling for herbicides, pesticides, and other agricultural chemicals.

Additionally, since the County of Hawaii is conducting its own analysis of the cumulative impacts of resort development in West Hawaii, the consultant should review these sections with the County Planning Department.

Should you have any questions or wish to discuss any of these comments in detail, please do not hesitate to contact us.

Sincerely,

ALBERT LONO LYMAN
Planning Director

VKG:aeb

Phillips Brandt Reddick

December 4, 1986

Mr. Albert Lono Lyman
Planning Director
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT,
NORTH KONA, HAWAII

Dear Mr. Lyman:

Thank you for your letter of 7 November 1986 regarding the subject project. We have reviewed your letter and offer the following response.

1. Project Description

The separate ownership of the Kalawina Church site will be added to the Final EIS. The proposed project is being discussed with the church and they are in the process of determining their options of moving or staying on site. The conceptual development areas shown on Figure II-6 (Conceptual Development Plan) indicate those areas that are planned for various resort facilities. Final development plans and the specific locations of building envelopes will be shown on future drawings once specific development plans are determined. The relationship and/or disposition of the church, archaeological sites of significance and the proposed wildlife refuge will be considered at the time specific development plans are prepared.

2. Phasing and Timing of Project

Section 2.7 of the Final EIS will be revised to include the projected development schedule, including regulatory approvals required and anticipated construction schedule projections. Due to the relatively limited scale of this project, extensive open space development (shoreline and 18-hole golf course) and initial phase investment for infrastructure improvements (primarily water and sewage treatment), incremental land use approvals, if applied, could discourage or totally eliminate the capital investment required to proceed with this type of project. Incremental land use approvals that would remove the land owner's certainty on the ultimate development plan for the site would have a negative impact on the project's feasibility.

3. Visitor Industry Projections

See attached response from Peat, Marwick, Mitchell & Co.

4. Alternatives to the Proposed Project

The Final EIS discussion of the alternative of no development and/or development at a smaller scale will include additional information relative to the effects of the alternative on the natural resources of the site.

5. Description of the Environment and Probable Impacts

Opae'ula Pond: The requested information will be included in the Final EIS. As noted in the Draft EIS, the landowner is continuing talks with appropriate federal and state agencies regarding the boundaries of the proposed wildlife refuge. A field trip to examine the specific site conditions and possible wildlife refuge boundaries was held on December 2 with the U.S. Fish and Wildlife Service and several of your staff. The general wildlife boundaries determined at this on-site survey are shown on the attached Memorandum (12/4/86). Additional information regarding the impacts of a smaller or larger refuge on the wildlife and feasibility of the proposed resort will be included in the Final EIS.

Anchialine Ponds and Coastal Waters: The movement of sub surface waters through the anchialine ponds is a natural occurrence that is experienced all along the west coast of the Big Island. As noted in the Draft EIS, the proposed project is not expected, based on analyses conducted at North Kohala resorts, to have an adverse effect on the coastal waters or anchialine ponds on site. A suggested water quality monitoring program will be included in the Tentative Pond and Wildlife Management Plan included in the Final EIS.

Marine Survey: There may be other factors contributing to the low biological diversity of the nearshore waters off the project site. For example, the project site coastline is relatively unprotected and subjected to heavy surf conditions and wave scouring. The presence of large quantities of groundwater discharge may affect biological diversity and density. However, this does not appear to be the case at other sites along the

coast where groundwater discharge is similar to Makalawena. Additional information relative to the probable causes of low biological diversity and density will be included in the Final EIS.

Information relative to previous marine biological surveys made in the Makalawena area will be included in the Final EIS as appropriate.

Air Quality: The air quality statements included in the Draft EIS have been discussed with appropriate State Department of Health personnel and are believed to accurately describe existing conditions.

Noise Impacts: The source of the noise contour maps to be included in the Final EIS will be identified. We have contacted the Department of Transportation, Airports Division regarding projected aircraft noise contours and accepted noise standards. These standards will be included in the Final EIS.

6. Public Facilities and Utilities

Public Access and Other Recreational Facilities: With regard to public access to recreational facilities, it is the land owner's intention to follow appropriate county rules, regulations and ordinances regarding public access and to provide the required amenities. The public access right-of-way to and along the shoreline and related recreational facilities will be privately owned with all costs of development and maintenance to be the responsibility of the land owner or hotel operator.

Protective Services: Information relative to the jointly developed fire station on the Kohala coast will be included in the Final EIS.

Water: Based on discussions with our project hydrologists, it appears that there is sufficient land mauka of the proposed site to develop the potable and irrigation water supplies that will be required by the resort.

7. State and County Plans

Section 6.6 of the Final EIS will be revised to clearly state the desired zoning for the project site once the State Land Use district is amended. As proposed, a zoning ordinance amendment would not be required to accommodate the proposed land uses.

8. Appendices

The Draft Pond and Wildlife Management Plan to be included in the Final EIS will include a suggested water quality monitoring program.

Per your request, we have reviewed the information provided regarding the County of Hawaii's analysis of the cumulative impacts of resort development in West Hawaii. Our market and economic consultant, Peat Marwick Mitchell, has analyzed the cumulative assessment and their responses is attached.

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director,
County of Hawaii
Mr. G Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Attachment: Peat, Marwick, Mitchell Letter

PEAT MARWICK

Peat, Marwick, Mitchell & Co.
Financial Plaza Of The Pacific
P.O. Box 1190
Honolulu, Hawaii 96813
808 531 7286

December 4, 1986

Mr. Thomas S. Witten
Phillips, Brandt, Reddick & Assoc., Inc.
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Re: Makalewena Resort - Draft Environmental Impact Statement

Dear Tom:

This letter presents our responses to the comments/questions raised by the County of Hawaii Planning Department in respect to the Draft Environmental Impact Statement for the planned Makalewena Resort on the island of Hawaii.

a. Visitor Industry Projections (Page 2)

A preliminary draft of the Hawaii County General Plan presents three sets of projects of westbound visitor arrivals to Hawaii County. The three sets are as follows:

Year	Series A	Series B	Series C
1985	837,000	837,000	837,000
1990	1,096,000	1,096,000	1,242,000
1995	1,337,000	1,396,000	1,500,000
2000	1,485,000	1,713,000	1,664,000
2005	1,553,000	1,800,000	1,973,000

Each set of projection is based on an alternative economic scenario as to the employment growth by industry sector and the relative dependency on tourism.

The projected increase in westbound and eastbound visitor arrivals to the island of Hawaii in Table II-11 is based on the historical and projected visitor arrivals to the island as developed by the State Department of Planning and Economic Development and presented in Table II-7. The projection of westbound visitors utilized is the same projection as presented in Series B of the Draft Hawaii County General Plan.

b. Hawaii Resident Visitors

The increase in Hawaii resident visitor arrivals to the island is based on the overall population growth of the state and the increasing attractiveness of the island as a visitor destination area.

c. Average Length of Stay

The increase in the average length of stay by both the westbound and eastbound visitors is based on the following factors.

- Historical growth of the average length of stay from 3.9 days in 1970 to 4.2 days in 1985 for westbound visitors, as shown in Table II-4.
- The emergence of the island of Hawaii, particularly the Kohala Coast, as a visitor destination area, rather than as a stop over point.
- As a result, the expectation that the average length of stay for the island of Hawaii will become similar to that of Maui, which currently is 6.4 days.

d. Hotel Accommodations Utilized

The decline in the utilization of hotel accommodations from 80% to 70% reflects the anticipation that as more visitors to the island are repeat visitors and tend to stay longer in the area, the visitors would tend to utilize condominiums for visitor accommodations. This trend is similar to that experienced on Maui.

e. Supportable Visitor Units

The Hawaii County General Plan also presents an estimate of supportable rooms or visitor units for the County for the period 1985 to 2005, as shown below:

County of Hawaii
Projected Supportable Visitor Units

Year	Series A	Series B	Series C
1985	6,100	6,100	6,100
1990	7,700	8,200	12,600
1995	9,400	12,600	18,000
2000	10,500	17,500	27,000
2005	11,200	20,100	26,700

Series A is the most conservative projection and includes a moderate expansion in visitor units for 6,100 units in 1985 to 11,200 units in 2005. Series C is the most optimistic projection and indicates a more significant expansion for 6,100 units to 26,700 units in 2005.

f. Resort Market Share

The anticipated market share for Makalawena has been based on the relative market share of other resorts in the state and on the island of Hawaii. Specifically, it was concluded that the potential market share of Makalawena would be similar to that of Wailea on Maui, due to the similarity in development plans and competitive resorts. Thus, it was concluded that the market share could be about 7% to 9% of the hotel unit demand in West Hawaii.

g. Planned Hotels

Under "Planned Hotel Development", the "Unnamed" hotel for Hauna Lani Resort should be the Ritz Carlton Hotel. The Marriott Hotel has not been listed as the discussions are still preliminary.

h. Cummulative Impacts

The County of Hawaii recently conducted an evaluation of the cummulative impacts of planned and proposed resort developments for West Hawaii, County of Hawaii. The analysis generally utilizes the same methodology and assumptions presented in the draft environmental statement, with some exceptions.

The County of Hawaii cummulative impact analysis presents the maximum impact and, thus, tends to overstate the actual impact of the developments for a number of reasons. First, the analysis assumes that all proposed developments requiring land use redesignation or zoning changes would receive the necessary approvals for development. Secondly, the analysis assumes that all the planned developments would be actually developed. Thirdly, the analysis assumes that the developments would be built to the full extent of the permitted uses. Finally, the analysis assumes that the projects would all be completed. Thus, the analysis presents more of a long-term perspective of possible impacts if every project was actually built to the extent permitted. The analysis does not take into consideration the possibility that some projects may not obtain the necessary financing to commence development or that some projects may be built at lower than allowed densities and sizes.

However, in comparison to the cummulative impacts developed by the County, the planned Makalawena Resort would have a negligible impact on West Hawaii in terms of population, employment housing needs as shown in the following table.

Potential Impacts

Area	Makalawena Resort Impact	West Hawaii cummulative impact	Percent of impact
Total population	3,910	47,653	8.2%
Total operational employment	2,647	49,170	5.4
Housing demand	266	14,643	1.7

Thus, the West Hawaii area is expected to grow substantially, but the impact of the proposed Makalawena resort is expected to be marginal. This is because the other planned resorts are proposed to be much larger in size and scope than Makalawena.

* * * * * * * *

We hope these comments address the questions and issues that have been raised regarding our market and economic impact analysis of the planned Makalawana Resort. Please let us know if we can be of any further support.

Very truly yours,

PEAT, MARWICK, MITCHELL & CO.

Malcolm J. Tom, Partner

MJT:lsa

DANTE K CARPENTER
MAYOR

A SCOTT LEITHEAD
ADMINISTRATOR

COUNTY OF HAWAII
OFFICE OF HOUSING AND COMMUNITY DEVELOPMENT
50 WAILUKU DRIVE • HILO, HAWAII 96720
PHONE: (808) 961-8379

November 12, 1986

MEMORANDUM

TO: A. Lono Lyman, Director
Planning Department

FROM: A. Scott Leithead
Housing Administrator

SUBJECT: Makalawena Resort Draft Environmental Impact Statement

The following are comments on the draft Environment Impact Statement (EIS) for the Makalawena Resort Project.

1. Socio-Economic Impact

The Draft EIS does not provide any analysis of the construction or operational employment which will be generated by the proposed development, nor does the Draft EIS provide any information with respect to housing impacts which will be generated by this additional employment in West Hawaii.

Furthermore, these employment and housing impacts should be discussed in the context of the potential cumulative impacts of the existing and proposed developments within the West Hawaii Region.

2. Hawaii County General Plan

The County General Plan's Housing Element states as a Policy, that:

Large industries which create a demand for housing shall provide employee housing based upon a ratio to be determined by analysis of the localities needs.

The Resort Element further requires that:

Employee housing shall be provided at a maximum ratio of one employee unit to every four hotel units built. The required ratio shall be determined by an analysis of housing needs of each district or relative area.

EQUAL HOUSING OPPORTUNITY

The DRAFT EIS should address this specific policy and course of action.

Thank you for the opportunity to provide you with our comments on this matter.

Phillips Brandt Reddick

December 4, 1986

Mr. A. Scott Leithead,
Housing Administrator
Office of Housing and Community
Development
County of Hawaii
50 Wailuku Drive
Hilo, Hawaii 96720

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT,
NORTH KONA, HAWAII

Dear Mr. Leithead:

The following is provided in response to your Memorandum of 132 November 1986 to Mr. A. Lono Lyman, Director, Planning Department, County of Hawaii.

1 Socio Economic Impact

The attached letter from our marketing and economic consultants, Peat, Marwick, Mitchell & Company, is provided in response to your comments regarding construction and operational employment and housing impacts to be generated by the proposed project. This information will be included in the Final EIS.

2 Hawaii County General Plan

The number of employee housing units to be required as a result of the proposed project will be determined following the development of a specific development plan for the proposed project. The specific course of action to be taken to comply with appropriate county regulations will be prepared at that time.

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director, County of Hawaii
Mr. G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Attachment Peat, Marwick, Mitchell Letter

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel (808) 521-5631

PEAT MARWICK

Peat Marwick Mitchell & Co.
Financial Plaza Of The Pacific
P.O. Box 1949
Honolulu, Hawaii 96805
Tel: (808) 531-7282

December 4, 1986

Mr. Thomas S. Witten
Phillips, Brandt, Reddick & Assoc., Inc.
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Re: Makalewena Resort - Draft Environmental Impact Statement

Dear Tom:

This letter presents our responses to the comments/questions raised by the County of Hawaii Office of Housing and Community Development of the Draft Environmental Impact Statement for the planned Makalewena Resort on the island of Hawaii.

1. Socio Economic Impact (Page 1)

Section 4.22.2.1.14 discusses construction employment. It concludes that the project would create 2,080 to 2,853 construction jobs or about 139 to 190 jobs per year.

The above section concludes that construction employment is temporary and therefore does not generate long term housing needs.

Section 4.22.2.1.15 discusses operational employment. The projected operational employment is estimated to range from 1,028 to 1,393 employees at the completion of the resort.

An analysis of the cumulative housing demand from the development of the proposed resorts and related developments indicates a cumulative demand of about 35,000 housing units.

The housing demand associated with the direct operational employees of the resort for the island of Hawaii is estimated to be 196 to 266 units. Thus, the resort could be expected to have a negligible impact on the overall housing requirements of the island.

2. Hawaii County General Plan

The analysis of the planned resort indicates that the housing generated by the people would be 196 to 266 units, of which the project would need to directly or indirectly address.

Mr. Thomas S. Witten
December 4, 1986
2

Based on 900 to 1,200 hotel rooms, the resort would be generating a housing demand of about one housing unit per 4.5 hotel units; or slightly lower than the required ratio of one unit per four hotel units.

* * * * * * *

We hope these comments address the questions and issues that have been raised regarding our market and economic impact analysis of the planned Makalewana Resort. Please let us know if we can be of any further support.

Very truly yours,

PEAT, MARWICK, MITCHELL & CO.

Malcolm J. Tom, Partner

MJT:lsa

COPY

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAII

[illegible]

[illegible]

JUL 19 1986

TO: Planning Department

FROM: H. William Sewake, Manager

SUBJECT: MAKALAWENA RESORT
ENVIRONMENTAL IMPACT STATEMENT
TAX MAP KEY 7-2-04:1

The water conditions addressed in Section 4.12 of the document are generally correct; however, in reference to paragraph 3 of Section 4.12.1, our department generally does not fund extensions of mains, especially in undeveloped areas.

H. William Sewake
Manager

cc - Mr. Guido Giacometti
Mr. Thomas S. Witten

...Water hings page...

Phillips Brandt Reddick

December 4, 1986

Mr. H. William Sewake
Manager
Department of Water Supply
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT,
NORTH KONA, HAWAII

Dear Mr. Sewake:

Thank you for the copy of your letter of 14 November 1986 to the Planning Department, County of Hawaii regarding the subject project. We have reviewed your letter and offer the following response.

The information provided regarding the Department of Water Supply's policy towards funding extensions of mains in undeveloped areas will be included in the Final EIS.

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director,
County of Hawaii
Mr. G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel (808) 521-5631

DANIEL P. CARPENTER, MAYOR
DENNIS M. YAMAMOTO
Director

DEPARTMENT OF RESEARCH AND DEVELOPMENT
COUNTY OF HAWAII • 34 RAILROAD AVENUE • HILO, HAWAII 96720 • TELEPHONE 961-8366

October 29, 1986

Mr. Albert Lyman, Director
Planning Department
25 Aupuni Street
Hilo, Hawaii 96720

We wish to express support for the proposed Makalawena resort described in the draft environmental impact statement dated October, 1986.

From the economic standpoint, the proposed resort would contribute to the achievement of several of the County of Hawaii's objectives.

First, resort construction would contribute to employment in the construction industry, a sector of the Big Island economy which had been depressed for several years and has begun to revive with the advent of lower interest rates and resort development in West Hawaii.

Second, resort employment would increase the employment base of the Big Island, not only reducing unemployment, but having stability to jobs in the visitor industry. Makalawena's clientele which will consist primarily of first-class visitors will tend to be less affected by the economic conditions of the areas they come from than the average tourist. This should help maintain an occupancy rate which would provide stable employment for the employees at the resort.

Third, having a stable labor force will allow the economy to diversify as the resident population increases, and demand for services grows. An increase in the de facto population will give rise to opportunities in the production of consumer goods and services, and to tourist-oriented activities.

We feel that the Makalawena development will provide a considerably greater benefit than the cost it imposes upon the people of Hawaii county. There are some considerations which should be provided for upstream prior to development of the resort and eventually, the entire Kona-Kohala coastline.

Coastline access should be made available to persons who wish to utilize the coastline for recreational purposes. The resort should be planned to minimize the cost and inconvenience to the developer and the resort while keeping the difficulty of access to a minimum.

Mr. Albert Lyman
October 29, 1986
Page 2

because of the number of planned developments in the area and the anticipated growth of the population, affordable housing will be a major problem downstream. Provisions for this situation should be made early in the developmental stages of the resort-destination areas.

Although individual resorts show good cost-benefit relationships regarding the use of public services, the cumulative development of the area may incur costs which should be anticipated. As the area becomes more fully developed, it may be more feasible to locate public safety facilities in the vicinity instead of relying on Waimea or Kailua for such services. Failure to consider and plan for such services may eventually impose an external cost upon the County.

Dennis H. Yamamoto
DIRECTOR

Phillips Brandt Reddick

November 17, 1986

Mr. Dennis Yamamoto, Director
Department of Research and
Development
County of Hawaii
34 Rainbow Drive
Hilo, Hawaii 96720

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT,
NORTH KONA, HAWAII

Dear Mr. Yamamoto:

Thank you for the copy of your letter of 29 October 1986 to Mr. Albert Lyman, Director, Planning Department, County of Hawaii.

We appreciate your support for the subject project and agree that the proposed project will contribute to the employment base of the Big Island, add to the stability of the labor force, provide greater benefits than costs to the people of Hawaii County and provide increased access to the recreation areas of the Big Island. We also agree that planning for housing and public services should begin early in the planning process.

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director,
County of Hawaii
Mr. G. Gincometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel (808) 521-5631

RECEIVED AS FOLLOWS

DEPARTMENT OF PARKS & RECREATION

October 20, 1986

TO: Albert Lyman, Planning Director

FROM: Pat Engelhard, Director

SUBJECT: Makalawena Resort, North Kona, Hawaii - EIS

We have reviewed the project EIS and have no adverse comments to offer.

As a point of information, the County maintains the Kahalau Beach Park, in addition to Palaschoe and Disappearing Sands Beach Parks.

Thank you for the opportunity to review the report and we look forward to the opportunity to provide input during the Special Management Area permit review process.

Pi'ai

cc: Mr. Guido Giacometti
Mr. Homer Witten

Phillips Brandt Reddick

November 17, 1986

Ms. Patricia Engelhard, Director
Department of Parks and Recreation
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT,
NORTH KONA, HAWAII

Dear Ms. Engelhard:

Thank you for the copy of your letter of 20 October 1986 to Mr Albert Lono Lyman, Planning Director, County of Hawaii. We have reviewed your letter and offer the following response

The information relative to the county maintained parks in the subject project area will be included in the Final EIS

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten

Thomas S. Witten, ASLA
Principal

cc: Mr Albert Lono Lyman, Planning Director,
County of Hawaii
Mr G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel (808) 521-5631

POLICE DEPARTMENT

COUNTY OF HAWAII
349 KAPIOLANI STREET
HILO, HAWAII 96720

October 15, 1986

TO : ALBERT LONO LYMAN, PLANNING DIRECTOR

FROM : WAYNE G. CARVALHO, DEPUTY CHIEF OF POLICE

SUBJECT: MAKALAWENA RESORT DRAFT EIS
NORTH KONA, HAWAII

The above application has been reviewed and from the police standpoint, we foresee no adverse effect from the requested land use.

We agree with the statements in 4.16.2 Impacts.

GUY A. PAUL
CHIEF OF POLICE

WAYNE G. CARVALHO
DEPUTY CHIEF OF POLICE

cc: Kona

Phillips Brandt Reddick

November 17, 1986

Mr. Guy Paul, Chief
Police Department
County of Hawaii
349 Kapiolani Street
Hilo, Hawaii 96720

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT.
NORTH KONA, HAWAII

Dear Chief Paul:

Thank you for the copy of your letter of 15 October 1986 to Mr. Albert Lono Lyman, Planning Director, County of Hawaii. We have reviewed your letter and offer the following response.

We appreciate your confirmation of the impacts of the proposed project on County Police facilities.

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director,
County of Hawaii
Mr. G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel (808) 521-5631
Honolulu • Irvine • San Francisco • Denver

DEPARTMENT OF PUBLIC WORKS

[illegible]

DAVID K. CARPENTER
Mayor

HUGH Y. ORO
Chief Engineer

BRUCE C. McCLURE
Deputy Chief Engineer

November 20, 1986

MR THOMAS S MEYER PRINCIPAL
PHILLIPS BRANDT REDDICK & ASSOC INC
130 MERCHANT STREET SUITE 111
HONOLULU HI 96811

SUBJECT: DRAFT EIS - HAKALAWENA RESORT
HAKALAWENA, N. KONA, HAWAII
TMK: 7-2-04:01

This is to acknowledge receipt of the subject document. Our comments will be transmitted to you through our Planning Department.

HUGH Y. ORO
Chief Engineer

DHY:cso

cc: Planning Dept.
Engineering Div.

DEPARTMENT OF PUBLIC WORKS
COUNTY OF HAWAII
HILO, HAWAII

DATE November 20, 1986

Memorandum

TO Planning Department

FROM Chief Engineer

SUBJECT DRAFT EIS - HAKALAWENA RESORT
North Kona, Hawaii

1. Figure IV-5 is not a County standard road. The County standard 50 ft. right-of-way road is fully graded with the fill slope outside of the right-of-way.

2. Are roads to be kept in private ownership?

3. Provide channelized intersection, i.e. a separate left turn lane and acceleration/deceleration lanes at Queen Kaahumanu.

HUGH Y. ORO
Chief Engineer

DHY:cso

Phillips Brandt Reddick

December 4, 1986

Mr. Hugh Y. Ono,
Chief Engineer
Department of Public Works
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT
NORTH KONA, HAWAII

Dear Mr. Ono:

The following is provided in response to your memorandum of 20 November 1986 to the Planning Department regarding the subject project.

1. As noted in the Draft EIS, all interior roads would be built to County standards as modified for resort usage. Figure IV-5 indicates the modifications planned at this time.

2. At this time it is planned that resort interior roads would be kept in private ownership. However, it is possible that the proposed mauka-makai road would be dedicated to the county as the primary public access road to the coastal recreation and resources of the project site.

3. As noted in the Draft EIS, prior to detailed development plans, a traffic study will be prepared to address project related traffic generation, traffic assignment and distribution, turning movements, intersection requirements and phasing and financial responsibility of road improvements. The results of this study are expected to define roadway design criteria, including the need for acceleration/deceleration lanes. This study will be performed in consultation with appropriate county and state traffic planning agencies.

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director, County of Hawaii
Mr. G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

HEI

October 9, 1986

Phillips, Brandt, Reddick
Financial Plaza of the Pacific
130 Merchant Street, Suite 1111
Honolulu, Hawaii 96813

Attention: Mr. Thomas S. Witten, ASLA

Dear Mr. Witten:

Subject: Makalawena Resort Draft EIS Preparation Notice

This is our response to the existing conditions and the proposed development as related the the above project.

A. Existing Conditions:

There is no transmission or distribution lines available in the immediate area of the proposed development. The nearest 69KV transmission line is approximately one mile above Queen Kaahumanu Highway and the project.

B. Proposed Development:

1. The estimated power demand based on the information provided is 6,180 KVA.
2. A 7,500 KVA 69-12KV substation transformer is required to serve the proposed development.
3. A 120' X 120' minimum lot near the development must be deeded over to HELCO above Queen Kaahumanu Highway. A contribution to the construction of a distribution system is required from the developer. The substation cost is estimated to be $650,000 minimum in 1986 dollars.
4. The 69KV overhead transmission line off site costs and 12KV underground distribution line on-site costs are not included. These costs will be given after electrical plans are submitted and a request is opened with the Engineering Department. The electrical plans should include service equipment locations, demand KVA load and service voltages.

If you have any questions on this, please contact Melvin Yamaki at 969-0323.

Very truly yours,

Clyde H. Nagata
Sr. Electrical Engineer
Planning Division

CHN:MY:ls

cc: M Yamaki

Phillips Brandt Reddick

November 17, 1986

Mr. Clyde Nagata,
Senior Electrical Engineer,
Planning Division
Hawaii Electric Light Company, Inc.
P. O. Box 1027
Hilo, Hawaii 96721-1027

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT,
NORTH KONA, HAWAII

Dear Mr. Nagata:

Thank you for your letter of 9 October 1986 regarding the subject project. We have reviewed your letter and offer the following response.

A. The information relative to existing transmission and distribution lines in the vicinity of the project will be included in the Final EIS.

B. The information regarding the required transformer, lot size, substation, transmission and distribution line costs will also be included in the Final EIS.

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director,
County of Hawaii
Mr. G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

HEI

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel (808) 521-5631

NA ALA HELE
P.O. BOX 1572
KEALAKEKUA, HI 96750

September 18, 1986

Mr. Thomas S. Witten, ASLA
Phillips, Brandt, Reddick & Assoc. (Hawaii) Inc.
Financial Plaza of the Pacific
130 Merchant St., Suite 1111
Honolulu, HI 96813

Re: Makalawena Resort Draft EIS Preparation Notice

Dear Mr. Witten:

Thank you for including our organization in the parties to be consulted in the EIS process for the Makalawena Resort.

Additional comments/concerns that we would like addressed in the Draft EIS include:

1. Archaeology
   Where will artifacts be repositied? Will kama'aina of Kekaha, particularly those with ancestral connections to Makalawena, have the opportunity to view and learn from such finds?

2. Ethnography
   The post-contact history of Makalawena is rich. There are individuals living who have memories of the last permanent residents of the area. Will ethnographic information be recorded and made available to the kama'aina of Kekaha, particularly those with ancestral connections to Makalawena?

3. Education
   As the applicant is the Kamehameha Schools/ Bernice Pauahi Bishop Estate, will students/ beneficiaries with an interest in Anthropology have any work/study opportunities in data gathering and information processing?

Thank you again for requesting our input.

Sincerely,

Hannah Kihalani Springer
Director of Hawaiian
Historic/Cultural Affairs,
Na Ala Hele

cc: Mr. Albert L. Lyman
Mr. Wallace K. Tirrell
OEQC

Phillips Brandt Reddick
November 18, 1986

Ms Hannah Kihalani Springer
Director of Hawaiian
Historic/Cultural Affairs,
Na Ala Hele
P. O. Box 1572
Kealakekua, Hawaii 96750

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT,
NORTH KONA, HAWAII

Dear Ms. Springer:

Thank you for your letter of 16 September 1986 regarding the subject project. We regret that your letter did not arrive in time for inclusion in the Draft EIS. We have reviewed your letter and offer the following response.

1. Archaeology

Artifacts of significance collected during archaeological recordation and preservation as well as construction will be evaluated for disposition by the Hawaiian Studies Institute of the Kamehameha Schools. Institute staff, which includes a qualified archaeologist will recommend to the Board of Trustees alternatives fo. disposition. This may entail further evaluation by the Bishop Museum or other consulting archaeologist, restoration for display, or safekeeping for later study.

2. Ethnography

The preparation of the Draft EIS has allowed Kamehameha Schools/Bishop Estate to complete a detailed literature search and develop background information relative to the ethnography of the Makalawena site. This information will be included in the text and appendices of the Final EIS which will be available to the general public through regional libraries and governmental agencies.

3. Education

In general, it is Kamehameha Schools/Bishop Estate's philosophy to provide students with the opportunity to participate in work/study projects that will further the student's education and knowledge. This philosophy has been followed for projects both on

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

Oahu and the Big Island. Where feasible estate lands are utilized, when not practical, other estate resources are brought to bear on the problem. Three programs that utilize estate lands are the koa reforestation project, Kapapa Honua O Keawanui, and the Kapalama campus archaeological project. For almost 10 years, the trustees have operated a reforestation project on the upper elevations of its Keauhou Ranch lands in the Volcano area of the Big Island. Kamehameha Schools and other students participate in this project; planting thousands of young Koa acacia seedlings and experiencing the natural environment that will someday be a native forest home for indigenous plant and wildlife species. On the island of Molokai, Kapapa Honua O Keawanui, a joint project of the DOE and the trustees utilize the estate's lands of Keawanui. Students are exposed to ancient aquacultural practices using the still intact Keawanui fishpond. On the Kapalama campus, Kamehameha Schools students were involved in an archaeological project of both educational and practical value. In preparation for new construction, students gain hands-on experience in plotting sites and collecting hundreds of artifacts. Other examples of the trustees' dedication to nature studies are the Hale O Ho'oponopono program in South Kona and the summer Explorations programs.

To the extent practical, students may be employed in Hawaiiana data gathering and information processing as it relates to the proposed project and site. The details of archaeological/anthropological data gathering from the Makalawena site have not been finalized but due consideration will be given to the use of Kamehameha Schools students for data gathering and information processing.

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr Albert Lono Lyman, Planning Director, County of Hawaii
Mr. G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

For the Protection of Hawaii's Native Wildlife

HAWAII AUDUBON SOCIETY

November 5, 1986

P O BOX 22433
HONOLULU, HAWAII 96822

P. O. Box 275
Volcano, HI 96785

NOV 10 1986

Mr. Albert Lono Lyman, Director
County of Hawaii Planning Department
25 Aupuni Street
Hilo, Hawaii 96720

Re: Draft Environmental Impact Statement (EIS) for the proposed Makala-wena Resort zoning sought by the Bishop Estate/Kamahameha Schools

Dear Mr. Lyman:

The concerns of the Hawaii Audubon Society focus on the Makala-wena wetlands and 'Opae-'ula Pond as viable habitats for endangered waterbirds, migratory birds, and other native animals and plants. The existing land use zoning of Conservation provides the best long-term protection to this extremely valuable habitat for the endangered Hawaiian Stilt (Ae'o), the endangered Hawaiian Coot ('Alae-ke'oke'o) and other native wildlife. There are no Big Island wetlands of greater significance to the survival of endangered waterbirds than 'Opae-'ula. It is for this reason that the Society recommends the retention of Conservation zoning. We are opposed to changing the land use of the coastal wetlands to Urban-Resort zoning. The land owner or developer will lose the legal incentive to properly protect and maintain essential habitats for wildlife if urban land use is permitted.

We provide these comments on the draft EIS:

1) 'Opae-'ula. The EIS does not adequately inform decision-makers of the key importance of 'Opae-'ula Pond to endangered waterbirds on the Big Island. They need to know that the continued existence in the wild of the Hawaiian Stilt and Hawaiian Coot may depend upon the maintenance of 'Opae-'ula as viable breeding habitat. The singular value of the Makala-wena wetlands should be discussed in the context of vanishing Big Island waterbird habitats (pp. IV-49-50). Hidden in Appendix A, Floral Survey, is this useful information: "'Opae-'ula Pond is considered the premier stilt habitat on Hawaii Island (Maciolek and Brock 1974)" (p. App. A-7). It belongs up front in the text.

2) Unresolved Issue. In the section on Unresolved Issues (pp. I-9; IX-1), 'Opae-'ula Pond is not listed, but there is a heading for "Anchialine Ponds." 'Opae-'ula should be distinguished separately by itself as an unresolved issue since it is not an anchialine pond and development nearby will impact endangered species. This biological distinction is clearly made elsewhere in the text (p. IV-21): "With the exception of Opae'ula pond, which is essentially a brackish water marsh and excellent water-bird habitat, the majority of the remaining 57 ponds displayed the physical and biological features characteristic of anchialine ponds . . . ."

3) Endangered Bat. The endemic Hawaiian Hoary Bat is discussed in the same paragraph as feral goats under the heading of Feral Mammals (pp. IV-46-47). The native bat should be treated separately as an Endangered Mammal, not a feral one. An assessment of the impact of development on this endangered species should be included in the final EIS.

4) Alternatives. In the section on alternatives to the proposed resort (pp. I-7;III-1-5), another feasible land use could be considered by the Bishop Estate where the land use would remain Conservation and the capital outlay small. That alternative would be the establishment of a wildlife refuge and Hawaiian nature study camp for the use and benefit of the students of the Kamehameha Schools. The refuge would include 'Opae-'ula Pond, anchialine ponds, sand dunes, beaches and inshore marine resources. Significant archeological sites would gain equal protection.

Here Hawaiian students could experience their natural and cultural heritage, learning how their ancestors both used and conserved the natural resources of Makala-wena. Restoration of the anchialine ponds, fence building, wildlife monitoring, removal of feral mammals and noxious alien plants, and planting appropriate native vegetation would be constructive student work-study projects. The educational and cultural value of a Makala-wena Wildlife Refuge and Nature Center for Kamehameha students warrants consideration when compared with a financially risky resort that will be in competition with a dozen others up and down the West Hawaii coast.

5) Management Areas. In the draft Pond and Wildlife Refuge Management Plan for Makala-wena Resort (App. E), several different names are used for the areas to be protected: "Wildlife Refuge Management Area," "Pond and Wildlife Refuge Management Area," "Anchialine Pond Management Area," and "Management Area." Since there is no map of proposed boundaries for these areas, the reader is in the dark as to what ponds are included in what management areas.

6) Wildlife Refuge. If the intent is to set aside a wildlife refuge for 'Opae-'ula Pond and the anchialine ponds adjacent to it — the "north complex" and the "makai complex" as drawn on the Coastal Pond Location Map (Fig. IV-2)-- then it should be clearly spelled out in the text, in the management plan and on a map in the final EIS.

7) Anchialine Ponds. Is it the land owner's intent to protect and maintain the other two groups of anchialine ponds also — the "south complex" and the "dune complex" (Map, Fig. IV-2)? Decision-makers should be informed in the final EIS. Will these ponds be excluded from the wildlife refuge?

8) Maps. In comparing the two maps of differing scales — Coastal Pond Location Map (Fig. IV-2) and the Proposed Phasing Plan map (Fig. II-7), it appears there may be a conflict in the siting of the hotel and the location of the "dune complex" and "south complex" anchialine ponds. Definitive maps are needed in the final EIS to resolve this question.

9) Destructive Aliens. In the draft management plan a major objective should be added to the three listed on page E-5: Removal of feral mammals (goats, dogs and cats) and aggressive alien plants that degrade native wildlife habitats.

10) Stilt. Adequate nesting habitat for the endangered Hawaiian Stilt is of key importance at 'Opae-'ula. The EIS points out that "the creation of bare islands which would isolate predators from nesting stilt could markedly increase stilt breeding success" (p. IV-45). This recommendation should be added to the wildlife refuge management plan in Appendix E.

Now is the time for the land owner to demonstrate responsible stewardship of Makala-wena lands by taking these protective actions:

a) Remove feral goats, dogs and cats from the land parcel because of their destructive impact on wildlife habitats.

b) Make a firm written commitment to county, state and federal officers to set aside 36 acres — as recommended by the US Fish and Wildlife Service — in perpetuity for a wildlife refuge with an adequate buffer zone and sufficient funds for maintenance.

c) Make a firm written commitment to the Army Corps of Engineers that none of the anchialine ponds or 'Opae-'ula will be filled in or degraded by resort construction.

Thank you for the opportunity to present these comments. We will appreciate the applicant's reply to the points raised in this letter.

Sincerely yours,

Mae E. Mull

Mae E. Mull
Island of Hawaii Representative and
Member, Board of Directors

cc. Guido Giacometti, Bishop Estate
Thomas Witten, Consultant
US Fish & Wildlife Service, Honolulu
Div. Forestry & Wildlife, Honolulu
OEQC, Honolulu

Phillips Brandt Reddick

November 18, 1986

Ms. Mae Mull
Hawaii Audubon Society
P. O. Box 275
Volcano, Hawaii 96785

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT,
NORTH KONA, HAWAII

Dear Ms. Mull:

Thank you for the copy of your letter of 5 November 1986 to Mr. Albert Lono Lyman, Director, County of Hawaii Planning Department We have reviewed your letter and offer the following response.

The subject EIS is for a General Plan Amendment to change a signi ficant portion of the present land use designation from Conser vation to Intermediate Resort, Medium Density and Open Area The critical habitat area of Opaeula Pond will remain in the Conser vation District. The boundaries of the area to remain in Conser vation are being discussed with appropriate federal, state and county agencies. These boundaries will be established prior to development occurring on the project site.

The following are in response to your numbered items and follow your listing.

1. Opaeula

The land owner fully agrees that Opaeula Pond is a valuable habitat for the endangered Hawaiian Stilt and Hawaiian Coot and, as noted above, fully intends to keep the area in Conservation and establish a professionally managed wildlife habitat at the pond Also as noted above, the land owner is continuing to work with appropriate federal, state and county agencies (U S Fish and Wildlife Service, Department of Land and Natural Resources and Planning Department) to establish the appropriate boundaries of the refuge. As noted on page IV 35 of the Draft EIS, the U S Fish and Wildlife Service category designation of the pond is listed and described in detail.

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel (808) 521-5631

2. Unresolved Issues

Opaeula Pond will be listed in the Unresolved Issues of the Final EIS as a separate issue.

3. Endangered Bat

The endemic Hawaiian Hoary Bat will be listed in the Final EIS under the heading of Endangered Mammals. As noted on page IV-50 of the Draft EIS, "The Hawaiian Hoary Bat occurs in small numbers along the Kona coast. This species nests solitarily. Many areas regarding the natural history of this species remain to be studied. Questions such as how site faithful are local populations, as well as what habitat characteristics are likely to attract them are presently unknown. Whether bats will become more common at Makalawena or be displaced by changes in the habitat brought about by the development remains to be seed. Too little is known about the natural history of this species to accurately predict the effect the proposed development might have on this species' abundance. However, the fact that the Hoary Bat occurs on developed property elsewhere on the Kona coast (Brunner, 1984c) might indicate that it is not restricted from foraging in an area simply because of urbanization".

4. Alternatives

We agree that there may be several other alternatives that could be investigated by the land owner. However, we believe that the alternatives listed encompass the alternatives that could feasibly attain the objectives of the proposed action. It is the land owner's charge to manage its resources to provide long-term financial stability to the support of the Kamehameha Schools for the betterment of the students attending the Schools. The trustees are constantly aware of opportunities to provide nature study experiences for beneficiaries of the Bernice Pauahi Bishop Estate. Where feasible estate lands are utilized, when not practical, other estate resources are brought to bear on the problem. Three programs that utilize estate lands are the koa reforestation project, Kapapa Honua O Keawanui, and the Kapalaoa campus archaeological project. For almost 10 years, the trustees have operated a reforestation project on the upper elevations of its Keauhou Ranch lands in the Volcano area of the Big Island. Kamehameha Schools and other students participate in this project: planting thousands of Koa acacia seedlings and experiencing the

natural environment that will someday be a native forest home for indigenous plant and wildlife species. On the island of Molokai, Kapapa Honua O Keawanui, a joint project of the DOE and the trustees utilizes the estate's lands of Keawanui Students are exposed to ancient aquaculture practices using the still intact Keawanui fishpond. On the Kapalaoa campus, Kamehameha Schools students were involved in an archaeological project of both educational and practical value. In preparation for new construction, students gained hands-on experience in plotting sites and collecting hundreds of artifacts. Other examples of the trustees' dedication to nature studies are the Hale o Ho'oponopono program in South Kona and the summer Explorations programs. The wildlife refuge to be established at Opaeula Pond will be available to the students of Kamehameha Schools, as well as other serious researchers. Similarly, as stated in the Draft EIS, there are no present plans to alter the anchialine ponds or sand dunes found on the project site, and significant archaeological sites will be preserved as recommended by the archaeologist as is noted in Appendix C.

5. Management Areas

The text of the EIS and the Tentative Pond and Wildlife Refuge Management Plan will be reviewed and the nomenclature of the areas standardized. The boundaries of the the areas to be included in the wildlife refuge are under discussion with appropriate agencies (See U. S. Fish and Wildlife Service letter in this Chapter), and will be established prior to development of the site.

6. Wildlife Refuge

See response to 5 above.

7. Anchialine Ponds

See response to 5 above.

8. Maps

The Conceptual Development Plan (Figure II 6 and Proposed Phasing Plan (Figure II-7) indicate general development areas only at this time. Specific envelopes for buildings and other resort facilities have not been determined at this time As noted pre-

viously, the boundaries of those areas to be protected and included in the wildlife refuge will be determined prior to development occurring on the site.

9. Destructive Aliens

Your suggested major objective addition to the Tentative Pond and Wildlife Refuge Management Plan will be included in the Final EIS.

10. Still

The final configuration and characteristics of the wildlife refuge will be the responsibility of the refuge manager. Your recommendation regarding the creation of bare islands is included in the Draft EIS and will be in the Final EIS.

11. Other

The following are provided in response to your final comments.

a. The land owner is in the process of licensing a qualified person to trap and remove the feral goats from the property. Dogs and cats will also be removed from the property.

b. As noted previously, the land owner is working with appropriate federal, state and county agencies to establish the wildlife refuge boundaries.

c. As indicated in the Draft EIS, there are no plans to alter the anchialine ponds. Should these plans change, appropriate permit applications will be filed and appropriate environmental assessments made by the developer and federal, state and county agencies.

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director,
County of Hawaii
Mr. G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

10/24/84

R. E. Marshall
P. O. Box 3237
Kailua-Kona, Hi 96745

Dear Mr. Witten:

I would like to thank you for your kind consideration of past requests. I have had the opportunity to read the entire draft environmental impact statement and also to visit Mokalawena last Sunday. The site is beautiful beyond description. Therefore we would appreciate it if you would include the following concerns in the final environmental impact statement and please send me 20 copys of the same.

1. Would public access include adquate (more than 10 parking places) parking, showers, bathrooms, and easy access?

2. How valid are the projections of public services ie Police - Fire - ROADS - HOSPITAL (allready inadquate by your own report)?

3. Since the master plan for Keahole airport is adopted can we be assured that the that the 55 LDN will not be expanded in the development?

4. Why has the Kamehameha schools not chosen to place a small area of space where Hawaiian crafts could be taught to those visitors who choose to become knowledgable about the Hawaiian culture?

5. Who are the members of the proposed co ordination council? Pg 1-4

6. Also Appendix E item 5. Why not have a neutral third party appoint or name the conservation Manager?

7. How many feet in D. I page E.4?

8. What about visitor liability in I-3 page E 9-10?

9. What is "suitable" in H-2-a on page E-10.

10. What is the proposed funding in Section H-a + b. on page E-10?

11. How many square inches will each visitor have for beach useage once the Total development is completed?

Figure IV-2

12. What were the results of your conference with the U.S. Fish & Wildlife Services regarding pond boundaries?
13. Why is the Shoreline Open Space only 4.24% of the total development?
14. Why is the Wildlife Refuge only 5% of the total development?
15. Cut and fill activities will be balanced by whom? See page IV-2 top.
16 What do the "present" geologic studies of HUALALAI show regarding volcanic activity? (present meaning within the last 3 months?)
17. Could warning of an impending eruption on HUALALAI be as short as one hour or less? "D-E" scale IV-6
18. What risk factor exists on the project regarding flooding, tsunami, earthquake and volcanic eruption?
19. Is the Brook study of the anchialine ponds at Puuanahulu in 1965 still valid?
20. What were the extent of storm damage in February of 1956?

21. How many anchialine ponds will be destroyed during the construction of the entire project?
22. Has any further studies been completed on the Hawaiian Hoary Bat?
23. What "Limited habitat and wildlife resources will be removed or displaced" from site? See IV page 30 (4,7,37).
24. What is the entire location of the Makalawena - Akahipuu trail?
25. Could large remnant of the trail be incorporated in the golf course and other open spaces?
26. What is the present length of the trail in meters?
27. Which archaeological sites will be preserved? see figure IV-4
28. Will members of the Church of Christ still have public access to the Kalawina Church Site?
29. Has a topographic survey of the site been prepared?
30. Has the proposed deep well 1400' been accepted as the water source?

31. When will HELCO complete the upgrade of the 69kV line to 138kV?
32. Are police and fire services adequate to handle growth posed in question #18?
33. When will the proposed bikeways in the district be completed?
34. What is the estimated cost of increased educational ~~demand~~ demands upon public educational institutions?
35. What specific job training programs are being proposed by the developer?
36. Will currently unemployed people be recruited for site jobs or will immigrant labor be encouraged?

I still have many questions but I am sure that you are suffering from sore strain by this time. I would appreciate your response to the above questions at your earliest possible convenience.

Mahalo Nui Loa
R.E. Marshall

Phillips Brandt Reddick

November 17, 1986

Mr. R. E. Marshall
75-6002 Alii Drive
Kailua-Kona, Hawaii 96740

SUBJECT: DRAFT EIS FOR MAKALAWENA RESORT, NORTH KONA, HAWAII

Dear Mr. Marshall:

Thank you for your letter of 24 October 1986 regarding the subject project. We have reviewed your letter and offer the following responses.

1. Public access to the beach fronting Makalawena would be increased as a result of the proposed project. A public access way to the shoreline would be provided to give residents and visitors additional shoreline access. Improved access is likely to lead to increased ocean and other recreational activities. The locations of public parking, showers, comfort stations, etc. will be determined at the time detailed resort development plans are developed. These plans will be developed in consultation with county parks and recreation and planning personnel to ensure that adequate public access to the recreational and cultural amenities of the site is provided while protecting those areas that are ecologically sensitive.

2. Based on reviews of the Draft EIS by county agencies, the statements in the Draft EIS regarding police, fire and other public services appear to be valid. Also as noted in the Draft EIS, public revenues resulting from the proposed project are expected to exceed possible public expenditures that may be required as a result of the project.

3. FAA aircraft noise regulations ensure that future aircraft will meet the 55 LDN level at the project site. Aircraft noise levels in the project site are dependent upon airport operations procedures and flight paths, which, at present, direct aircraft out to sea shortly after takeoff. These procedures and operations are not expected to change.

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel (808) 521-5631

4. The locations of future resort activity areas, other than the golf course, tennis center and general location of the hotel and condos, have not been determined at this time. Future activity areas will be determined when final resort plans are developed. A Hawaiian crafts teaching area could be integrated into those plans.

5. A formal coordinating council is not mentioned on page I-4. The adjacent property owners are the State and Long and Melone, Ltd., Trustee. Coordination is being accomplished, in part, through review of this EIS. Additional coordination will occur at the time specific development plans are submitted to appropriate governmental agencies.

6. The Tentative Pond and Wildlife Refuge Management Plan included in Appendix E will be finalized and definitized following future discussions with federal, state and county wildlife management personnel and agencies. A field trip to Makalawena is scheduled with the U.S. Fish and Wildlife Service for early December 1986 for the purpose of defining the most appropriate boundaries and buffer areas for the proposed wildlife refuge at Opaeula Pond (See U.S. Fish and Wildlife Service Letter in this Chapter). The Tentative Pond and Wildlife Refuge Management Plan is presented in the Draft EIS to indicate the property owner's intent to establish and manage the wildlife resources of the project area to the benefit of the wildlife. As noted in the Tentative Pond and Wildlife Refuge Management Plan, The Conservation Manager will be an individual, organization or governmental agency with a record of experience in wildlife conservation, management, environmental awareness, education and public relations. It is likely that the land owner will solicit the advice and guidance of appropriate governmental agencies in the selection of the Conservation Manager.

7. The specific size, buffer areas and other factors of the wildlife refuge will be determined during the discussions noted in 6 above.

8. The wildlife refuge will include observation areas for public viewing. As noted in the Tentative Pond and Wildlife Refuge Management Plan, the Conservation Manager will determine the need for remedial and corrective actions due to the degradation of the refuge from resort operations, including those caused by visitors to the resort. As a wildlife refuge in which federally and state

protected birds may be found, civil and criminal penalties may be levied against persons causing harm to the endangered wildlife inhabiting the refuge.

9. See response to 7 above.

10. The amount of funding required from the property owner will be determined following the discussions noted in 7 above. Funding levels will be adequate to perform the services required

11. Although the proposed project does not include alteration of the beach, increased numbers of residents and visitors can be expected to use the beach following development of the resort Based on studies conducted for North Kohala beach parks, it is estimated that the sizes of the Makalawena and adjacent beaches are sufficient to handle the expected number of visitors and residents. The amount of beach area any one beachgoer may have on any given day will be dependent upon the number of others using the beach that day. Access to neighboring beaches will be increased by development of the proposed project.

12. See response to U.S. Fish and Wildlife Letter. The exact boundaries of the wildlife refuge will be determined following further discussions with federal, state and county wildlife management and protection personnel and agencies as is noted in 6 above.

13. Resort activity area space requirements are based on several factors, including the requirement to provide sufficient income generating areas to enable the resort to be economically viable Presently defined activity area space designations appear to be sufficient to accommodate proposed activities

14. See response to 13. above

15. Future detailed engineering plans by registered civil engineers will define cut and fill quantities and requirements The general objective to minimize costs will be to balance these quantities on site.

16. Existing geological information and studies have been used to describe the geologic character of the project area As noted in the Draft EIS, the references cited regarding the geological character of the area are the latest available publications The

developer is unaware of more recent scientific studies that may have been performed regarding Hualalai volcano.

17. Based on the character of Hualalai and the lack of recent activity, it is doubtful that eruption warning time would be less than the week or several weeks noted in the DEIS. As noted, Hawaii Volcano Observatory monitoring instruments would permit advance warning of significant seismic activity which could indicate impending volcanic activity.

18. As noted in the DEIS, Makalawena is located in an area of moderate to high volcanic risk. Earthquakes and tsunamis cannot be predicted and, therefore, design standards are invoked to reduce and minimize hazards to persons and property. These design standards will be followed during the development of the final resort construction drawings and specifications.

19. The scientific studies performed by Dr. R. E. Brock and others, as well as those currently being performed under the direction of the U.S. Army Corps of Engineers, are still valid and have been confirmed by field investigations conducted for this EIS.

20. The extent of storm damage due to the passing of Hurricane Estelle and other 1986 winter storms is described to the extent possible in the DEIS. It appears that the majority of damage was to the limited coral habitat found offshore of the resort area. No significant damage was experienced onshore.

21. The anchialine ponds found on the resort property are considered to be a valuable resource and will be protected to the maximum extent possible. At this time, there are no plans to fill any of the anchialine ponds, as stated in the DEIS.

22. The developer is not aware of any further studies on the Hawaiian Hoary Bat, other than those noted in the DEIS.

23. The limited habitat and wildlife resources to be lost as a result of the proposed project is limited to the dry grasslands of the site. As noted in the DEIS, the loss of sparce, xeric vegetation would be offset by a major landscaping program using indigenous and introduced species compatible with North Kona's climate and soil.

24. The location of the Makalawena-Akahipuu Trail on the project property is shown on Figure IV-4 in the DEIS (following Page IV-52). The mauka extension of the trail leads upward towards Akahipuu.

25. Remnants of the trail will be incorporated into the overall resort development to the maximum extent possible. As with the coastal resources of the project area, the archaeological resources will be protected in accordance with the archaeologist's recommendations as included in Appendix C of the Final EIS.

26. The length of the trail within the proposed project property is approximately 6,000 feet or approximately 1,800 meters.

27. As noted above in 25, the recommendations of the archaeologist, as contained in Appendix C, will be followed and those sites recommended for preservation will be retained as cultural resources for and of the proposed resort. At this time, 13 sites will be preserved with some level of interpretive development or "as is" with no further work.

28. The land owner is currently holding discussions with the church regarding their plans for the property. Should the church choose to remain at Makalawena, access to the Kalawina Church site will be retained and improved by the proposed project. Members of the Church of Christ, as well as others, will have access to the site.

29. USGS topographic maps of the site have been used for concept planning purposes. At the time detailed resort development plans are prepared, a detailed topographic map will also be prepared by registered land surveyors.

30. As noted in the Draft EIS, the proposed deep well is one possible source of potable water for the proposed resort. This source, as well as others, will be examined in more detail in the future. The source of potable water will require state and county approval and, as such, will be required to meet all health and safety standards of appropriate governmental agencies.

31. The upgrading of HELCO transmission and distribution lines is dependent upon the total growth of the West Hawaii area and is under discussion. The extent of any upgrading is not known at this time. However, the electrical demand of the resort and the

facilities required to meet that demand will be given in Chapter IV, Section 4.15 of the Final EIS.

32. Based on comments received from appropriate county agencies, existing or planned public service facilities are adequate to accommodate the proposed project.

33 According to state Department of Transportation, Highways Division planning personnel, a bikeway along Queen Kaahumanu Highway has been master planned. However funding for the bikeway is not available at present and may not be available in the next six-year period

34. Based on comments from the State Department of Education, Kealakehe Elementary School may require another classroom to handle forecast increases in enrollment due to the proposed project. The cost of this classroom, and any other services that may be required, will be dependent upon the time they are required. As noted in the fiscal impacts section of the DEIS, the expected state and county revenues to be generated by the proposed resort will more than offset any public expenditures that may be required as a result of the proposed project.

35. Specific job training programs will be determined at the time the resort is developed and will depend on the characteristics of the labor pool at that time. It is likely that the resort developer and/or operator will have in-house resort operations training for employees of the resort.

36. To the extent possible, local residents of the area will be encouraged to seek employment at the resort. Because of the time required to accomplish the resort development, it is not possible to speculate on the characteristics of future employment resources and/or the qualifications of those resources. Appropriate private, state and county agencies will monitor the labor resource characteristics to ensure maximum employment of local residents.

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director,
County of Hawaii
Mr. G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Oct 27, '86

Mr. Thomas Witten
1164 Nuuanu Ave. Suite 111
Honolulu, Hi. 96813

Dear Mr. Witten:

In regards to the resort proposed for Makalawena, I wish to express concern in three areas:

1) Shoreline access (mauka to makai) should be specified with parking close to the beach for the public.

2) Endangered species - the endangered Hawaiian Stilt and endangered Hawaiian Coot have been observed regularly at Makalawena during the past decade.

3) Will another resort on the So. Kohala coast be economically feasible? When will the market for resort destination hotels and luxury/condo developments become saturated? Right now, the average hotel occupancy rate is only 50%.

Thank you,
Ms. Jacque Prell
Box 888
Capt. Cook, Hi.
96704

cc: Albert Lono Lyman
Mr. Guido Giacometti

Phillips Brandt Reddick

November 17, 1986

Ms. Jacque Prell
P. O. Box 888
Captain Cook, Hawaii 96704

SUBJECT: DRAFT EIS FOR MAKALAWENA EIS.
NORTH KONA, HAWAII

Dear Ms. Prell:

Thank you for your letter of 27 October 1986 regarding the subject project. We have reviewed your letter and offer the following response.

1. Makalawena Resort development would increase access to the recreational amenities located on the site. A public access way to the shoreline would be provided to give residents and visitors additional shoreline access. The exact location of roadways, parking areas, etc. will be determined at the time detailed plans for the resort are developed.

2. The endangered Hawaiian Stilt and Hawaiian Coot are noted in the Draft EIS as occurring at Opaeula Pond, which will become a wildlife refuge.

3. Based on the market assessment performed for the proposed project, as included in the Draft EIS, the proposed project is expected to be economically viable.

Thank you for your comments. Your letter and this response will be appended to the Final EIS.

Sincerely,

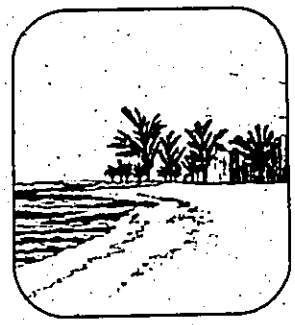
PHILLIPS BRANDT REDDICK

Thomas S. Witten, ASLA
Principal

cc: Mr. Albert Lono Lyman, Planning Director,
County of Hawaii
Mr. G. Giacometti, Kamehameha Schools/Bishop Estate
Office of Environmental Quality Control

Landscape Architecture • Planning • Environmental Studies Honolulu • Irvine • San Francisco • Denver
Financial Plaza of the Pacific • 130 Merchant Street, Suite 1111 • Honolulu, Hawaii 96813 • Tel. (808) 521-5631

XII
REFERENCES



APPENDIX A
FLORA SURVEY

CHAR & ASSOCIATES
Botanical/Environmental Consultants
4471 Puu Panini Ave
Honolulu, Hawaii 96816
(808) 734-7828

FLORA SURVEY
MAKALA-KENA RESORT DEVELOPMENT PROJECT
NORTH KONA, ISLAND OF HAWAI'I

BY

WINONA P. CHAR

CHAR & ASSOCIATES

BOTANICAL/ENVIRONMENTAL CONSULTANTS

HONOLULU, HAWAII

PREPARED FOR: PHILIPPS, BRANDT, REDDICK & ASSOCIATES, INC.

JULY 1986

Table of Contents

FLORA SURVEY
MAKALA-WENA RESORT DEVELOPMENT PROJECT
NORTH KONA, ISLAND OF HAWAI'I

INTRODUCTION

The subject property lies within the Makala-wena Ahupua'a, North Kona District, on the dry leeward coast of the island of Hawai'i. It is located below (makai of) the Queen Ka-'ahu-manu Highway, about 4 miles north of the Ke-ahole Airport. The Makala-wena project area is composed of approximately 350 acres. Prehistoric lava flows of different ages, largely pahoehoe, dominate most of the landscape. Along the coast a fairly well-developed sandy beach is found. 'Opae-'ula (or Kapoikai) Pond as well as a number of smaller anchialine ponds are found in the areas back of the beach. Elevation ranges from sea-level to approximately 240 feet near the Queen Ka-'ahu-manu Highway boundary.

The subject property is zoned "Conservation." It is presently vacant except for a small caretaker's residence and is unimproved. A resort development is proposed for the project area. A reclassification from the current Conservation District to Urban District status will be requied.

A botanical survey to inventory the flora, describe the major vegetation types, search for rare, threatened, or endangered species, and identify areas of potential environmental problems or concerns was conducted on 19 July 1986. The technical data gathered during the survey will be incorporated into the Environmental Impact Statement (EIS) to be prepared for the land use change.

METHODS

Prior to undertaking the survey, a search was made of the pertinent literature to familiarize the principal investigator with previous biological studies conducted in the general area.

A four-wheel drive road through the adjacent Awa-ke'e Ahupua'a provides access onto the makai portion of the Makala-wena project area, while the Queen Ka-'ahu-manu Highway provides access to the mauka portion.

A walk-through survey method was used. Criteria such as structure, composition, and associated species were used in identifying and describing each vegetation type. Notes were made of the species present in each vegetation type. Species which could not be positively identified were collected for later determination in the herbarium and laboratory.

The species recorded and their relative abundance on the project site are indicative of the season and environmental conditions at the time of the survey. A survey taken at a different time and under varying environmental conditions would no doubt yield slight variations in the abundance and kinds of species present, especially of the annual species.

DESCRIPTION OF VEGETATION

To our knowledge, there have been no floristic studies which have dealt specifically with the entire Makala-wena project area. However, there have been a few studies which have focused on the ponds on the project site. Maciolek and Brock (1974), in their survey of the Kona coast ponds, inventoried

an array of smaller anchialine ponds in the vicinity of 'Opae-'ula Pond. 'Opae-'ula Pond is a relatively young wetland with shallow, brackish, sediment-laden water. The wetland vegetation around the pond was surveyed in 1977 by Elliott and Hall. No rare, threatened, or endangered species were found during the later survey.

During this survey, four major vegetation types were recognized and are discussed below. A large herd of goats was kept by the past caretaker, and goat-damage to the vegetation is evident on all portions of the project site. The number of goats has since been reduced considerably by the landowner and present caretaker. A total of 39 species of plants were found during this survey--a rather depauperate flora. In similar botanical surveys conducted on the nearby Ka-'u-pulehu (Char 1985) and Ku-ki'o (Char 1984) lands, twice as many species were inventoried.

1. Grass-scrub association

Of the four vegetation types, the grass-scrub association covers the largest area. It occurs primarily on pahoehoe lava flows.

Pahoehoe flows of various ages cover most of the project area. A few rough, scoriaceous 'a'a flows are occasionally encountered, especially on the makai portion of the project area near the adjacent Hahai'ula Ahupua'a. A "slump scarp" (Macdonald and Abbott 1979), about 18 to 20 feet high, is found in the middle of the project area (near the 80-foot contour line). Here, the front of a prehistoric pahoehoe flow had stopped, and the resultant lava is angular and almost 'a'a-like.

Vegetation cover on the pahoehoe flows varies generally from 40 to 50 percent. On the upper mauka portions of the project area (above 120 feet in elevation), however, the cover becomes denser--75 to 100 percent.

The 'a'a flows support only a very few plants and, generally are largely devoid of vegetation.

Fountaingrass (Pennisetum setaceum) is the most abundant species in this vegetation type. Scattered among the bunches of fountaingrass are small shrubs of 'uhaloa (Waltheria indica var. americana), indigo (Indigofera suffruticosa), and 'ilima (Sida fallax). Kiave trees (Prosopis pallida) are occasionally observed. They occur as widely scattered, low-statured (6 to 9 feet tall) individuals; many have died back and only standing snags remain. Other species which may be found in this association include noni (Morinda citrifolia), pili (Heteropogon contortus), panini (Opuntia ficus-indica) hairy spurge (Euphorbia hirta), lovegrass (Eragrostis tenella), and 'ihi (Portulaca cyanosperma).

Most of the plants showed some signs of browsing by goats or occurred only in very low numbers.

2. Kiave forest

A large kiave forest (Prosopis pallida) is found around 'Opae-'ula Pond. It also extends from back of the pond to near the base of the "slump scarp," close to the 80-foot contour line. Along the seaward (makai) edge of the pond, the forest occurs on coralline sand; inland (mauka) of the pond it occurs on a very weathered pahoehoe flow. Smaller kiave forests are found

along the makai portion of the project area in the interface between sand and lava substrates.

The canopy cover of these forests varies from open (crowns of trees not touching, cover less than 60 percent) to closed (crowns of trees touching, cover greater than 60 percent).

Along the shore and around 'Opae-'ula Pond, the kiawe forests are generally closed and trees may reach 25 feet in height. Ground cover is usually sparse in these forests. Scattered plants of fountaingrass (Pennisetum setaceum), lovegrass (Eragrostis tenella), keeled goosefoot (Chenopodium carinatum), and hairy abutilon (Abutilon grandifolium) may occasionally be encountered. The kiawe forest immediately mauka of 'Opae-'ula Pond is very dense with many smaller kiawe trees forming a subcanopy layer with interlocking, low branches. Surveying is difficult, as the kiawe plants form an almost impenetrable tangle of branches and thorns.

The forest on the weathered pahoehoe, near the base of the "slump scarp," is open with the trees 9 to 15 feet tall. Ground cover is dense and consists almost exclusively of fountaingrass.

3. Strand vegetation

The majority of the coastal area on the project site consists of a sandy beach. Barren 'a'a lava flows occupy small areas near the Hahai'ula boundary and Kawikohale Point.

The vegetation on the sandy beach consists almost entirely of the low, mat-forming beach morning glory vine or pohuehue (Ipomoea brasiliensis). Orange-colored patches of the native dodder vine or kauna'oa (Cuscuta sandwichiana) can occasionally be found on the pohuehue mats. A few scattered plants of cocklebur (Xanthium saccharatum), fountaingrass (Pennisetum setaceum), 'aki'aki (Sporobolus virginicus), and kiawe (Prosopis pallida) may be observed in the strand. Also included in the strand vegetation are a large grove of ironwood trees (Casuarina spp.), 50 to 60 feet tall, near Kawikohale Point and a few smaller scattered clumps of trees along Pu'u Ali'i Bay.

Typically, the strand vegetation on sandy beaches along the Kona coast is composed of an assortment of other species such as beach naupaka (Scaevola taccada), tree heliotrope (Messerschmidia argentea), maiapilo (Capparis sandwichiana var. zoharyi), 'ilima (Sida fallax), pa'u-o-Hi'iaka (Jacquemontia sandwicensis), hinahina (Heliotropium anomalum var. argenteum), alena (Boerhavia diffusa), kou (Cordia subcordata), etc. The absence or very low numbers of these species on the project area is probably due to the large number of goats which were once kept on the site. The beach morning glory was not eaten as it is toxic.

4. Pond vegetation

A number of anchialine ponds are found on the project area. These ponds are features which undergo a natural process of aging from barren lava pools to organic and sediment-laden, vegetated wetlands.

'Opae-'ula (or Kapoikai) Pond represents a somewhat later stage in this aging process. Elliott and Hall (1977), in their wetland survey of the Hawaiian Islands, describe the 'Opae-'ula marsh soil as

> ". . . a brownish-beige mixture of sand, silt, organic matter and water. Where water has evaporated, the soil appears as spongy flats with occasional crusts of salt crystals. In some places the soil appears much like quicksand."

The vegetation cover is dense and composed primarily of a mixture of medium to very large clumps of sedges--makai (Scirpus maritimus var. paludosus), 'aka'akai (Scirpus lacustris ssp. validus), great bulrush (Scirpus californicus), and makaloa (Cyperus laevigatus)--and large to very large patches of the low, mat-forming water hyssop (Bacopa monnieria).

A dense growth of kiawe (Prosopis pallida) forms a closed forest around the mauka (east) perimter of the pond. Along the remainder of the pond perimeter, an open kiawe forest or, in a few places, only a very few kiawe trees are found. Scattered ironwood trees (Casuarina equisetifolia) are occasionally encountered around the pond area.

A number of Hawaiian stilt or ae'o (Himantopus mexicanus knudseni) and coot or 'alae-ke'oke'o (Fulica americana alai) were observed utilizing this pond area. 'Opae-'ula Pond is considered the premier stilt habitat on Hawai'i Island (Maciolek and Brock 1974).

Several smaller ponds are scattered along the coast in the lava flows. These are relatively "younger," as they have not developed a substantial accumulation

of organic and mineral deposits. Vegetation around these ponds may be moderate to sparse and consists largely of low, mat-forming species such as pohuehue (Ipomoea brasiliensis), 'aki'aki (Sporobolus virginicus), makaloa, and water hyssop. The aquatic flowering plant, Ruppia maritima or widgeon grass, may be observed growing in some of these ponds.

A few of the smaller ponds north of 'Opae-'ula Pond have been modified. Rock walls and other stone structures are found in this area.

DISCUSSION AND RECOMMENDATIONS

A total of 39 vascular plant species were inventoried on the project area. Of these, 20 (51.2%) are introduced (or exotic), 18 (46.2%) are native, and 1 (2.6%) is of Polynesian origin. Among the 18 native species, 15 are indigenous, i.e., found in the Hawaiian Islands and one or more other geographical area(s), and 3 are endemic, i.e., found only in the Hawaiian Islands. None of these species is considered threatened or endangered (U. S. Fish and Wildlife Service 1980).

Four vegetation types are recognized on the Hakala-vena project area. The grass-scrub association occupies the largest number of acres on the project site. This vegetation type is dominated by the introduced fountaingrass (Pennisetum setaceum). The other vegetation types found on the project area are the kiawe (Prosopis pallida) forest, strand vegetation, and pond vegetation. All vegetation types showed signs of goat-damage. The small number of plant species recorded, as well as the low abundance of some of these species, is due to the presence of large numbers of goats which were once kept on the site.

Development of a large portion of the project area will not have a significant impact on the total island populations of the plant species involved. These same species occur in similar environmental habitats throughout leeward Hawaii. The anchialine pond areas, however, represent a unique type of aquatic ecosystem and should not be altered if possible. These pond areas also provide feeding and nesting sites for endangered Hawaiian waterbirds as well as a number of migratory bird species.

Development plans call for setting 'Opae-'ula Pond aside as a wildlife refuge. The developer will be working in close consultation with the U. S. Fish and Wildlife Service. Three alternative refuge boundaries--encompassing 19 acres, 25 acres, and 36 acres, respectively--are proposed. The 36-acre refuge is the best alternative, as it provides the greatest buffer zone around the pond and also includes a number of smaller anchialine ponds as well as several archeological sites.

Vegetation on the proposed wildlife refuge site should not be altered. Additional plantings of shrubs such as beach naupaka (Scaevola taccada) should be made along the seaward portion of the refuge to screen the area. Pedestrian traffic around the refuge should be limited and controlled. The anchialine ponds remaining outside the refuge site should be preserved and incorporated into the landscape design.

PLANT SPECIES CHECKLIST--HAKALA-WENA, NORTH KONA, HAWAI'I

In the plant species checklist which follows, families are arranged alphabetically within each of three groups: Pteridophytes (Ferns and Fern Allies), Monocotyledons, and Dicotyledons. Taxonomy and nomenclature of the Pteridophytes follow C. H. Lamoureux's unpublished checklist (1984); taxonomy and nomenclature of the Flowering Plants (Monocotyledons and Dicotyledons) follow St. John (1973) except where more recently accepted names are used. Hawaiian names used are in accordance with Porter (1972) or St. John (1973). The following information is given:

1. Scientific name with author citation.
2. Common English or Hawaiian name, when known.
3. Biogeographic status of the species. The following symbols are used:

   E = endemic = native only to the Hawaiian Islands

   I = indigenous = native to the Hawaiian Islands and also to one or more other geographic areas

   P = Polynesian = plants of Polynesian introduction; all those plants brought by the Polynesian immigrants prior to contact with the Western world

   X = introduced or exotic = not native to the Hawaiian Islands; brought here intentionally or accidentally after Western contact

4. Vegetation types. Four vegetation types are recognized on the project area and are discussed in detail in the text. The number heading each of the columns refers to the following vegetation types:

   1 = Grass-scrub association

   2 = Kiawe forest

   3 = Strand vegetation

   4 = Pond vegetation

5. The relative abundance of each species or its absence (-) within each of the vegetation types is given. These ratings reflect the abundance of a particular species within the project area and are not applicable to areas outside the project. The following symbols are used:

A = abundant = the major or dominant species in a given vegetation type

C = common = distributed throughout a given vegetation type in large numbers

Lc = locally common = found in localized patches where it may occur in large numbers in a given vegetation type

O = occasional = distributed throughout a given vegetation type in moderate numbers

U = uncommon = observed infrequently but not more than 10 times in a given vegetation type

R = rare = observed less than 10 times in a given vegetation type

MAKALA-WENA, NORTH KONA, HAWAI'I

Scientific name	Common name	Status	Vegetation types 1	2	3	4
FERNS AND FERN ALLIES--PTERIDOPHYTES						
NEPHROLEPIADACEAE (Sword Fern Family)						
Nephrolepis multiflora (Roxb.) Jarrett ex Morton	hairy sword fern	X	R	-	-	-
PSILOTACEAE (Psilotum Family)						
Psilotum nudum (L.) Beauv.	moa, pipi	I	R	-	-	-
FLOWERING PLANTS--MONOCOTYLEDONS						
CYPERACEAE (Sedge Family)						
Cyperus laevigatus L.	makaloa sedge, makaloa	I	-	-	-	Lc
Fimbristylis sp.		E(?)	O	-	-	-
Scirpus californicus (C. A. Meyer) Steud.	great bulrush	X	-	-	-	C
Scirpus maritimus var. paludosus (A. Nels.) Kuk.	makai	I	-	-	-	A
Scirpus lacustris ssp. validus (Vahl) Koyama	great bulrush, 'aka'akai	I	-	-	-	A
GRAMINEAE (Grass Family)						
Eragrostis tenella (L.) Beauv. ex R. & S.	Japanese lovegrass	X	O	O	-	-
Heteropogon contortus (L.) Beauv. ex R. & S.	pili, pili grass	I	U	-	-	-
Pennisetum setaceum (Forsk.) Chiov.	fountaingrass	X	A	A/O	U	R
Sporobolus virginicus (L.) Kunth	seashore rushgrass, 'aki'aki	I	-	-	U	O
RUPPIACEAE (Ruppia Family)						
Ruppia maritima var. pacifica St. John & Fosb.	ruppia, widgeon grass	I	-	-	-	Lc
FLOWERING PLANTS--DICOTYLEDONS						
AIZOACEAE (Carpetweed Family)						
Sesuvium portulacastrum (L.) L.	'akulikuli	I	-	-	-	O

A = abundant = the major or dominant species in a given vegetation type

C = common = distributed throughout a given vegetation type in large numbers

Lc = locally common = found in localized patches where it may occur in large numbers in a given vegetation type

O = occasional = distributed throughout a given vegetation type in moderate numbers

U = uncommon = observed infrequently but not more than 10 times in a given vegetation type

R = rare = observed less than 10 times in a given vegetation type

MAKALA-WENA, NORTH KONA, HAWAI'I

Scientific name	Common name	Status	Vegetation types 1	2	3	4
FERNS AND FERN ALLIES--PTERIDOPHYTES						
NEPHROLEPIADACEAE (Sword Fern Family)						
Nephrolepis multiflora (Roxb.) Jarrett ex Morton	hairy sword fern	X	R	-	-	-
PSILOTACEAE (Psilotum Family)						
Psilotum nudum (L.) Beauv.	moa, pipi	I	R	-	-	-
FLOWERING PLANTS--MONOCOTYLEDONS						
CYPERACEAE (Sedge Family)						
Cyperus laevigatus L.	makaloa sedge, makaloa	I	-	-	-	Lc
Fimbristylis sp.		E(?)	O	-	-	-
Scirpus californicus (C. A. Meyer) Steud.	great bulrush	X	-	-	-	C
Scirpus maritimus var. paludosus (A. Nels.) Kuk.	makai	I	-	-	-	A
Scirpus lacustris ssp. validus (Vahl) Koyama	great bulrush, 'aka'akai	I	-	-	-	A
GRAMINEAE (Grass Family)						
Eragrostis tenella (L.) Beauv. ex R. & S.	Japanese lovegrass	X	O	O	-	-
Heteropogon contortus (L.) Beauv. ex R. & S.	pili, pili grass	I	U	-	-	-
Pennisetum setaceum (Forsk.) Chiov.	fountaingrass	X	A	A/O	U	R
Sporobolus virginicus (L.) Kunth	seashore rushgrass, 'aki'aki	I	-	-	U	O
RUPPIACEAE (Ruppia Family)						
Ruppia maritima var. pacifica St. John & Fosb.	ruppia, widgeon grass	I	-	-	-	Lc
FLOWERING PLANTS--DICOTYLEDONS						
AIZOACEAE (Carpetweed Family)						
Sesuvium portulacastrum (L.) L.	'akulikuli	I	-	-	-	O

Scientific name	Common name	Status	Vegetation types 1	2	3	4
BORAGINACEAE (Heliotrope Family)						
Heliotropium curassavicum L.	nena, kipukai	I	-	-	-	R
Messerschmidia argentea (L. f.) Johnston	tree heliotrope	X	-	-	R	-
CACTACEAE (Cactus Family)						
Opuntia ficus-indica (L.) P. Mill.	prickly-pear, panini	X	U	U	-	-
CASUARINACEAE (Ironwood Family)						
Casuarina equisetifolia Stickm.	common ironwood	X	-	O	C	-
Casuarina littoralis Salisb.	black she oak casuarina	X	-	-	O	-
CHENOPODIACEAE (Goosefoot Family)						
Chenopodium carinatum R. Br.	keeled goosefoot	X	U	U	-	-
COMPOSITAE (Daisy Family)						
Erigeron bonariensis L.	hairy horseweed, ilioha	X	R	-	-	-
Pluchea odorata (L.) Cass.	pluchea	X	R	-	-	-
Xanthium saccaratum Wallr.	cocklebur, kikania	X	-	-	U	-
CONVOLVULACEAE (Morning-glory Family)						
Cuscuta sandwichiana Choisy	kauna'oa	E	-	-	O	-
Ipomoea brasiliensis (L.) Sweet	beach morning glory, pohuehue	I	-	-	A	O
Ipomoea congesta R. Br.	koali-'awania	I	R	-	-	-
CUCURBITACEAE (Squash Family)						
Cucumis dipsaceus Ehrenb. ex Spach	wild cucumber	X	R	R	R	-
EUPHORBIACEAE (Spurge Family)						
Euphorbia hirta L.	garden spurge, koko-kahiki	X	O	U	-	-
LABIATAE (Mint Family)						
Ocimum gratissimum L.	wild basil	X	-	R	-	-
LEGUMINOSAE (Pea Family)						
Indigofera suffruticosa Mill.	indigo, 'iniko	X	O	-	-	-
Prosopis pallida (Humb. & Bonpl. ex Willd.) HBK.	kiawa, algaroba	X	O	A	O	O

Scientific name	Common name	Status	Vegetation types 1	2	3	4
MALVACEAE (Mallow Family)						
Abutilon grandifolium (Willd.) Sweet	hairy abutilon	X	-	U	-	-
Sida fallax Walp.	'ilima	I	O	U	-	-
NYCTAGINACEAE (Four O'clock Family)						
Boerhavia diffusa L.	alena	I	-	-	R	-
PORTULACACEAE (Purslane Family)						
Portulaca cyanosperma Egler	'ihi	E	U	U	-	-
Portulaca oleracea L.	common purslane, 'ihi	X	-	R	-	-
RUBIACEAE (Coffee Family)						
Morinda citrifolia L.	noni	P	R	-	-	-
SCROPHULARIACEAE (Snapdragon Family)						
Bacopa monnieria (L.) Wettst.	water hyssop, herpestis	I	-	-	-	A
STERCULIACEAE (Cocoa Family)						
Waltheria indica var. americana .) R. Brown ex Hosaka	'uhaloa, hi'aloa	I	O	-	-	-
VERBENACEAE (Verbena Family)						
Lantana camara L.	lantana, lakana	X	-	U	-	-

LITERATURE CITED

Char, W. P. 1984. Assessment of flora, Kuki'o I, North Kona, Hawai'i. Prepared for Phillips, Brandt, Reddick & Associates, Inc., Honolulu. November 1984. 18 pp.

Char, W. P. 1985. Botanical survey for Ka'upulehu Developments, Ka'upulehu, North Kona, Hawai'i. Prepared for Belt, Collins & Associates, Inc., Honolulu. May 1985. 14 pp.

Elliott, H. E. and E. H. Hall. 1977. Wetlands and wetland vegetation of Hawaii. Prepared for the U. S. Army Corps of Engineers, Pacific Ocean Division. Contract #DACW 84-77-C-0014. 344 pp.

Lamoureux, C. H. 1984. Draft checklist of Hawaiian Pteridophytes. Ms. 11 pp.

Macdonald, G. A. and A. T. Abbott. 1979. Volcanoes in the sea. 5th printing. Univ. Press of Hawaii, Honolulu. 441 pp.

Maciolek, J. A. and R. E. Brock. 1974. Aquatic survey of the Kona coast ponds, Hawaii Island. Univ. of Hawaii Sea Grant Program, Honolulu. UNIHI-SEAGRANT-AR-74-04. 73 pp.

Porter, J. R. 1972. Hawaiian names for vascular plants. Coll. of Trop. Agr., Univ. of Hawaii, Dept. Paper No. 1, Honolulu. 64 pp.

St. John, H. 1973. List and summary of the flowering plants in the Hawaiian Islands. Pacific Tropical Botanical Garden Mem. 1, Lawai, Kauai, Hawaii. 519 pp.

U. S. Fish and Wildlife Service. 1980. Endangered and threatened wildlife and plants. Review of plant taxa for listing as Endangered or Threatened species. Federal Register 45(242):82480-82569.

APPENDIX B

AVIFAUNAL AND FERAL MAMMAL SURVEY

AN AVIFAUNAL AND FERAL MAMMAL SURVEY OF PROPERTY PROPOSED FOR DEVELOPMENT AT MAKALAWENA, NORTH KONA, HAWAII

Prepared for

Phillips Brandt Reddick and Associates

By

Phillip L. Bruner M.S.
Assistant Professor of Biology
Director, Museum of Natural History
BYU-HC
Laie, Hawaii 96762

8 September 1986

AN AVIFAUNAL AND FERAL MAMMAL SURVEY OF PROPERTY PROPOSED FOR DEVELOPMENT AT MAKALAWENA, NORTH KONA, HAWAII

INTRODUCTION

The purpose of this report is to summarize the results of a three day (19-21 August 1986) field survey of birds and feral mammals found on 353 acres at Makalawena, North Kona, Hawaii. References to pertinant published literature as well as unpublished reports are also included.

The objectives of the field survey were to document what bird and feral mammal species occur on the site and at what relative densities. In addition a limited assessment of habitat preferences of these species would be undertaken using knowledge gained from previous field work in similar habitat elsewhere in Hawaii and from observations acquired on this survey. In the event "endangered" species were found on the site a special effort was to be made to assess their use of the habitat and the importance of this area for these species. References to former studies and counts of the Makalawena area and in particular Opaeula Pond are also noted in

order to get an historical perspective of the fauna and to provide a more complete picture than would otherwise be possible from a single three day field survey.

STUDY METHODS AND GENERAL SITE DESCRIPTION

METHODS:

Field observations were taken with the aid of binoculars and by listening for vocalizations while walking along existing trails and along transects in all accessable areas. At 14 separate stations, located in all types of available habitat eight minute counts of all birds seen or heard were made (Fig. 1). These counts were confined to early morning and late afternoon hours (peak bird activity periods). Information acquired through these methods form the basis for population estimatesgiven in this report and additionally were helpful in determining general distribution patterns at the project site and habitat preferences.

Observations of feral mammals were limited to visual sightings and evidence in the form of tracks and scats. Attempts to trap mammals in order to obtain data on density and distribution were not made.

GENERAL SITE DESCRIPTION:

Weather during the three day survey was clear and warm with light winds. Six general habitats occur within the project site; 1- Sandy beach and rocky shoreline. 2- Open barren lava flows. 3- Older lava flows covered in grasses and scattered brush. 4- Dense thickets of Kiawe (Prosopis sp.). 5- Shoreline stands of large Ironwood (Casuarina sp.). 6- Wetland habitat, Opaeula Pond and emergent vegetation primarily bullrush (Scirpus sp.), Water hyssop (Bacopa sp.), Fleabane (Pluchea sp.)(Woodside 1979). In addition a number of small anchialine ponds are scattered about the property, some surrounded by Kiawe others in open barren lava flows.

RESULTS AND DISCUSSION

Resident Indigenous (native) Birds:

American Coot (Fulica americana alai) -

(Endangered species)

Recent (1982-86) waterbird surveys conducted by personnel of the Division of Forestry and Wildlife, State of Hawaii, have averaged 24.4 coot on counts taken in summer months and 17.8 during surveys in winter months (Table 1). These data also reveal a considerable amount of fluctuation

in the coot population at Opaeula Pond which suggests that changes in pond size and food availability may influence the size of the resident coot population. Alternatively population increases and decreases might be due to transient birds which move regularly between ponds along the Kona coast. The results of this August 1986 survey revealed an average of 20.0 coot over the three days that Opaeula Pond was censused. At least ten of these coot were juveniles. One coot was observed carrying nesting material. Aggressive encounters (chases) between adults were seen which is indicative of breeding activity (Shallenberger 1977, Byrd et al. 1985). Emergent vegetation suitable for anchoring nest platforms is readily available at Opaeula Pond.

Black-necked Stilt (Himantopus mexicanus knudseni) - (Endangered Species)

Data from Division of Forestry and Wildlife, State of Hawaii, (1982-1986) for Opaeula Pond reveal an average of 7.4 stilt utilizing the pond in winter months and 5.6 in summer months. These data show little variation in the population. This present survey averaged 6.6 stilt over the three days censused. All stilt seen were adults. The relatively shallow nature of Opaeula Pond with its exposed mud/sand flats makes it ideal for foraging stilt. However, the accessibility of the site

to feral goats which could trample nests, and predators such as dogs and mongoose, severely limits the present usefulness of the pond for stilts. The creation of bare islands which would isolate predators from nesting stilt could markedly increase stilt breeding success.

Hawaiian Duck (Koloa) (Anas wyvilliana) - (Endangered species).

Waterbird surveys by the Division of Forestry and Wildlife, State of Hawaii, at Opaeula Pond (1982-1986) do not record this species. These data do, however, record a number of migratory duck of several species (Table 1). One Koloa was observed on all three days of this present survey. This bird was seen following coots about the pond. The dark head of this individual probably indicated it was a male (Hawaii Audubon Society, 1984, Pratt et al. 1986). The absence of other ducks at Opaeula was not unexpected since migratory ducks do not normally begin to arrive until November. Occasionally some migrant ducks remain through the summer but do not breed (see Table 1). The abundance of emergent vegetation around the southern and eastern boundry of Opaeula Pond provide ideal nesting habitat for Kolon.

Black-crowned Night Heron (Nycticorax nycticorax) -
No night heron were observed during the survey. Data from Division of Forestry and Wildlife, State of Hawaii, reveal night heron do occasionally use this site for foraging on small fish, crustaceans, mice and even the eggs and young of other birds (Andrews 1981, Hawaii Audubon Society 1984).

Migratory Indigenous Birds:

Wandering Tattler (Heteroscelus incanus) -
A total of three tattler were seen during the three days of the field survey. This species usually forages alone rather than in flocks. The exposed rocky intertidal zone is their preferred habitat. Two of the tattler observed still had traces of breeding plumage indicating that they likely had just returned from their artic breeding grounds. Tattler may exhibit some site-faithfulness based on limited data acquired by S. Conant (pers. comm.) in the leeward Hawaiian Islands. Thus it is possible that the same individuals return each year to a particular locality.

Sanderling (Calidris alba) -
This migrant shorebird likewise breeds in the artic and winters in the Pacific. Sanderling prefer to forage on small invertebrates along sandy wave swept beaches or on exposed intertidal zones and mud flats. They are non-

territorial under most situations (Myers et al. 1981). A total of three Sanderling were observed during the field survey. All of these individuals were foraging on the exposed mud flats at Opaeula Pond. The sandy beach which fronts the project site did not have any Sanderling during the times it was censused but is nevertheless an ideal habitat for this species.

Ruddy Turnstone (Arenaria interpres) -
Turnstone tend to forage in flocks and are not known to exhibit territoriality or long term site-faithfulness. They often are seen in open short grass habitats as well as along the intertidal zone and on exposed mud flats around wetlands. This species was not recorded during State of Hawaii, Division of Forestry and Wildlife waterbirds surveys from 1982-1986. A total of 6 turnstones were seen on this August 1986 survey.

Pacific Golden Plover (Pluvialis fulva) -
An average of seven plover were seen each day of the survey. These data are normal for this time of year as plover return to Hawaii from their artic breeding grounds beginning the first week of August (Johnson et al. 1981, Bruner 1983). While on the wintering grounds here in Hawaii some individuals establish foraging territories

that they defend throughout the day. This behavior is apparently imprinted during the first or second year of their life. Each fall as they return from their breeding grounds they reoccupy the exact same territories held in previous years (Johnson et al. 1981, Bruner 1983). Several plover at Opaeula Pond were observed chasing and acting aggressively towards other plover which usually is a sign of territoriality. Given the amount of suitable space probably fewer than 10 plover hold territories at Opaeula Pond. Several plover were also seen around anchialine ponds and along the exposed intertidal at Makalawena.

Exotic (Introduced) Birds:

A total of 11 species of exotic birds was recorded during the three day field survey at Makalawena. Table 2 show the relative abundance and habitat preferences of these species. The most unusual sighting of the survey was the discovery of a sizeable flock of Yellow-fronted Canaries (Serinus mozambicus). Previous surveys in areas adjacent to Makalawena did not find this species (Bruner 1984a, 1984b, 1984c, 1985). The localized flock of canaries at Makalawena might be due to the presence of Ironwood trees which they seemed to prefer. It is possible also that a small flock was released here and has yet to establish itself further along the coast.

Population densities of each exotic species was typical for habitat of this nature along the Kona coast. The most abundant species were Japanese White-eye (Zosterops japonicus), Nutmeg Mannikin (Lonchura punctulata) and Yellow-billed Cardinal (Paroaria capitata) (Table 2).
A number of game birds have been introduced to the island of Hawaii (Schwartz and Schwartz 1949, Berger 1972). Populations of these species tend to be localized. Field surveys by Bruner (1984a, 1984b, 1985) have consistently shown Gray Francolin (Francolinus pondicerianus) to be the most common of the larger game birds along the Kona Coast. On this 1986 survey of Makalawena Gray Francolin were also found to be common (Table 2). A number of individuals were seen and heard on each day of the survey particularly in and around the Kiawe groves at the edge of Opaeula Pond. Other species which, although not recorded, might potentially occur in the area are: Erkel's Francolin (Francolinus erckelii) and Japanese Quail (Coturnix japonica). These two species are unevenly distributed in the Kona area. The latter species (Japanese Quail) is particularly hard to find due to its retiring nature and thus could easily escape detection on a short term survey. Also not recorded but known from the Kona coast in habitat similar to that at Makalawena were Northern Mockinbird (Mimus polyglottos), Warbling Silverbill (Lonchura malabarica) and House

Sparrow (Passer domesticus).

Feral Mammals:

Mongoose were seen on all three survey days. They were especially common in kiawe thickets and around Opaeula Pond. Feral cats also occur on the property as evidenced by tracks and one visual sighting. The caretaker presently has guard dogs which roam freely during the night. Dog tracks were seen around the pond which might indicate a potential for disturbance and harassment of the endangered waterbirds, a situation that should be corrected by confining the dogs. Feral goat (Capra hircus) were seen foraging on the emergent vegetation at Opaeula Pond and in the grasslands east of the pond. As many as 30 goats were seen at one time. Goats have been a problem for a long time in Hawaii and have proven difficult to eradicate (van Riper and van Riper III 1982). The native Hawaiian Hoary Bat (Lasiurus cinereus) occurs sporadically along the Kona coast as evidenced by the sightings reported by Tomich (1969, 1974) and Bruner (1984c, 1985). Two bats were observed foraging over Opaeula Pond at dusk on 20 August 1986. The present caretaker also reported seeing bats occasionally at Makalawena.

CONCLUSIONS AND RECOMMENDATIONS

Makalawena contains habitat similar to many sites along the North Kona coast with barren lava flows, dry grassland with scattered Kiawe trees and a coastal strip of larger and denser vegetation. It is also distinct in that it has a sizeable coastal pond and white sand beach with well developed sand dunes. A number of anchialine ponds also occur on the property. As can be seen from Table 2 many of the birds rely extensively on the coastal forested area. The much drier and more open uplands support many fewer birds. Opaeula Pond and its surrounding wetlands is an extremely important habitat for wildlife. Reports by Federal ans State wildlife personnel suggest that Opaeula Pond is one of the most important wetlands on the island of Hawaii (Kridler 1965; Swedberg 1969; Van den Akker 1972; Woodside 1979). Not only does it provide essential resources for endangered Hawaiian waterbirds (coot, stilt, Koloa) but also is utilized by migratory ducks and shorebirds. Despite its importance Opaeula Pond is in need of management. Large areas are overgrown with bullrush and need to be channelized. A number of small islands need to be created to provide nesting sites free of predators. Presently dogs and goats invade the shallow portions of the wetland and further degrade the habitat.

The bird survey revealed the typical mix of exotic species that occur along the Kona coast. The most interesting discovery in terms of exotic species was the Yellow-fronted Canary. This species was first reported on the slopes of Mauna Kea, Hawaii, by van Riper (1978). Pyle (1979) also records Yellow-fronted Canaries from Hualalai. Recent unpublished sightings (Pyle pers. comm.) in the town of Kailua-Kona would seem to imply that this species is in the process of expanding its range on the island of Hawaii.

All of the shorebird species that commonly occur in Hawaii were recorded on the project site. With the development of a golf course and residential lawns Pacific Golden Plover and Ruddy Turnstone should become even more abundant. Presently they are confined to the limited wetland habitat at Opaeula Pond, around the anchialine ponds and along the shoreline. The inland dry grasslands are not being utilized by these species. Counts from this August 1986 survey of the waterbirds at Opaeula Pond agree with data acquired by State of Hawaii, wildlife personnel (Table 1). The only noticeable differences were the lack of Black-crowned Night Heron and migratory ducks. The latter can be easily explained by the fact that migratory ducks do not normally arrive in Hawaii until November. Black-crowned Night Heron are not abundant along the Kona coast and the few birds that do occur in the area

move around a good deal which perhaps accounts for their absence during the survey.

Mongoose were common particularly in and around the coastal forest and ponds. Feral goats pose a problem for the wetland and should be removed from Makalawena. The Hawaiian Hoary Bat occurs in small numbers along the Kona coast. This species nests solitarily. Many areas regarding the natural history of this species remain to be studied. Questions such as how site-faithful are local populations, as well as what habitat characteristics are likely to attract them are presently unknown. Whether bats will become more common at Makalawena or will decrease in number as a result of changes in habitat brought about by development remains to be seen. Too little is known about the natural history of this species to accurately predict the effect the proposed development might have on this species abundance. However, the fact that the Hoary Bat occurs on developed property elsewhere on the Kona coast (Bruner 1984c) might indicate that it is not restricted from foraging in an area simply because of urbanization.

Possible Impacts of Development

Any major change in a habitat such as converting dry grassland lava flows into a golf course and residential area will result in not only the kind of species present

but their relative abundance as well. Common Myna and Zebra Dove populations should increase following development. House Sparrows will undoubtedly find their way to this area. As noted earlier Pacific Golden Plover and Ruddy Turnstone should also become more abundant.

The most pressing concern is the management and protection of Opaeula Pond and surrounding wetlands. Development plans should make every effort to protect and enhance this important and attractive resource. The anchialine ponds are likewise unique habitats and should be protected and where possible incorporated into the design of the resort grounds.

Recommendations

1- Protect and manage Opaeula Pond and surrounding wetlands.

a- This should be viewed as a positive resource for the resort rather than a problem to be hidden behind a wall and forgotten. The following suggestions are offered as a guide to this effort.

1- Fence the wetland to restrict access to dogs. This fence ought to be outside of the existing trees which currently surround the site. Exact boundries can be worked out by consultation with the Federal Fish and Wildlife personnel.

2- Plant a buffer of vegetation on the outside of the fence and restrict highrise development

to an area well outside of this buffer zone.

3- Manage the pond by creating small islands and channelizing some of the bullrush patches.

4- Avoid contamination of the pond by pesticides or herbacides that might be used on the surrounding landscaped areas.

5- Create public viewing stations on the west and east side of the pond. These stations could be enhanced with signs depicting the birds seen and something of their natural history and importance as a native and endangered species. How well this portion of the project is handled will determine the value that the pond/refuge will have to the overall resort complex. Every effort should be made to maximize the ponds value both to the birds and to those who come to see them. No other resort along the Kona coast would have such an attraction. The natural beauty of Opaeula Pond could be a major plus for those visiting or living at Makalawena. I would recommend that the advice of Federal Fish and Wildlife personnel be sought in order to maximize the development and management of Opaeula Pond to the benefit of the birds and the resort.

2- Protect the unique anchialine ponds that occur on the property.

a- These ponds represent a unique resource that support birds as well as aquatic life. At low tide these ponds are relatively fresh and are utilized by birds for drinking and bathing. Where possible these ponds should be preserved in as natural a state as possible. Their beauty can add rather than detract from the design of the landscape.

Phillip L. Bruner M.S.
Assistant Professor of Biology
Director, Museum of Natural History
BYU-HC
Laie, Hawaii 96762

Revised
8 September 1986

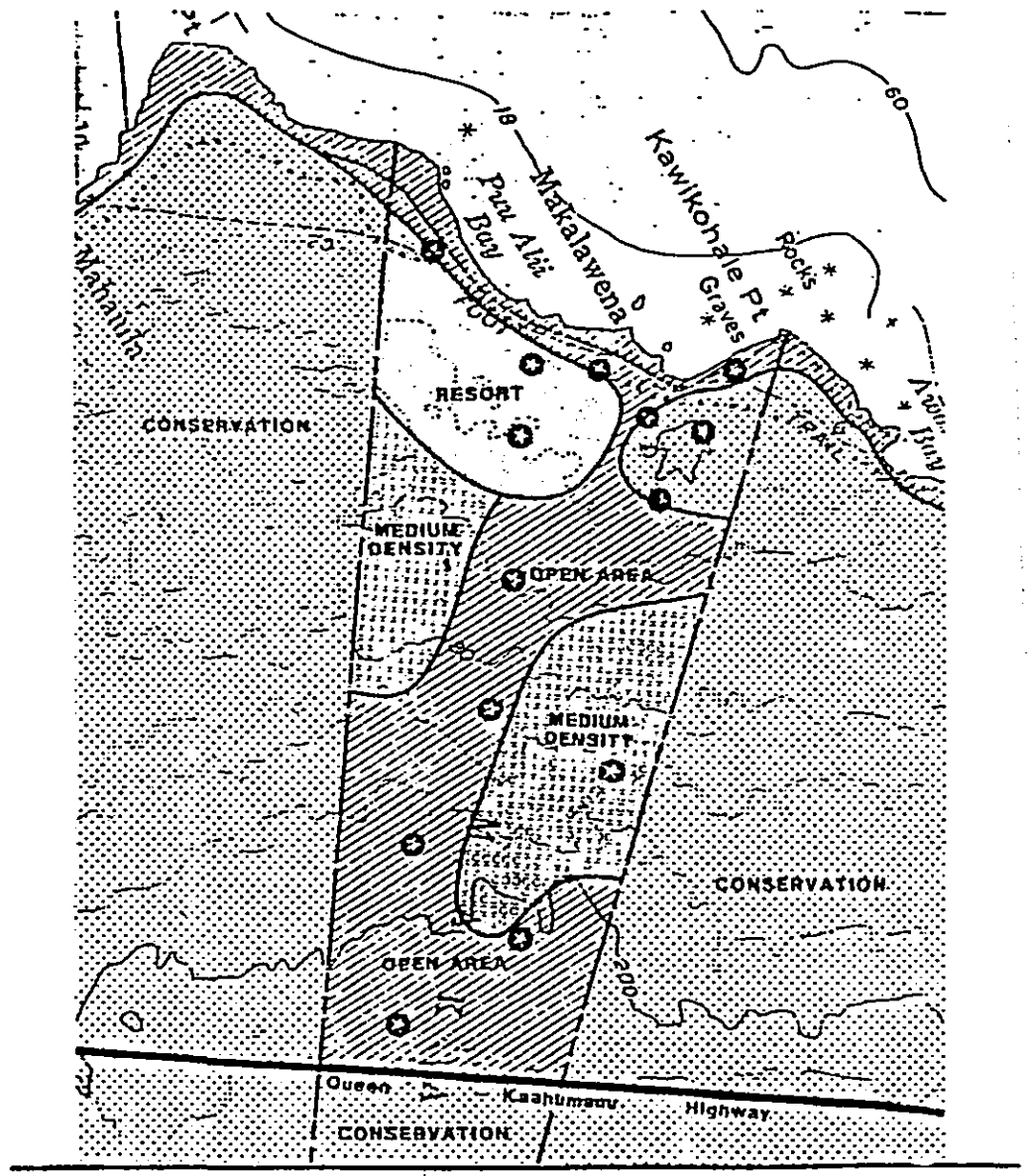


Fig. 1 Project area Makalawena, North Kona, Hawaii.

= 8 min. count sites

TABLE 1

Summary of surveys and inventories of waterbirds in the State of Hawaii. Division of Forestry and Wildlife, State of Hawaii. Job progress Report data from Opaeula Pond, Makalawena, North Kona, Hawaii. 1982-1986.

SEASON/YEAR W = winter S = summer	Species American Coot	Black-necked Stilt	Black-crowned Night Heron	*Migratory ducks	*Migratory shorebirds
W-1982	17	20	--	47	11
S-1982	13	6	1	1	--
W-1983	29	8	3	12	10
S-1983	49	6	--	1	--
W-1984	20	3	--	38	1
S-1984	31	--	--	--	1
W-1985	12	5	--	48	--
S-1985	10	6	--	--	1
W-1986	11	5	--	4	1
S-1986	19	10	--	1	--

* All species are lumped in these data.

TABLE 2

Relative abundance and general habitat preferences of exotic birds recorded at Makalawena, North Kona, Hawaii. 19-21 August 1986.

COMMON NAME	SCIENTIFIC NAME	RELATIVE ABUNDANCE*	HABITAT*
Gray Francolin	Francolinus pondicerianus	C = 8.8	K,G
Black Francolin	Francolinus francolinus	U = 2	K,G,W
Spotted Dove	Streptopelia chinensis	U = 1	K,I
Zebra Dove	Geopelia striata	C = 8.9	K,I,G,W
Common Myna	Acridotheres tristis	C = 7.6	I,K,W
Japanese White-eye	Zosterops japonica	A = 12.4	K,W,I
Northern Cardinal	Cardinalis cardinalis	U = 4.7	K
Yellow-billed Cardinal	Paroaria capitata	A = 17.6	K
House Finch	Carpodacus mexicanus	C = 9.1	I,K,G
Nutmeg Mannikin	Lonchura punctulata	A = 18.9	I,K,G
Yellow-fronted Canary	Serinus mozambicus	C = 9.5	I,K,G

* (See page 20 for key to symbols)

KEY TO TABLE 2

RELATIVE ABUNDANCE = Number of times observed during walking survey or frequency on eight-minute counts in appropriate habitat.

A = Abundant (ave. 10+) (number which follows is an average of all survey days)

C = Common (ave. 5-10) " "

U = Uncommon (ave. less than 5) " "

HABITAT = Area most frequented. Order of most preferred or utilized begins at left.

G = Grassland with scattered brush

K = Kiawe thickets

I = Ironwood groves

W = Wetland habitat

Note:

Barren lava flows and sandy beach/rocky shoreline are two habitats which also exist on the project site but are not utilized by exotic birds and hence do not appear as habitat preferences in Table 2.

SOURCES CITED

Andrews, S. 1981. Black-crowned Night Heron Predation on Black-necked Stilt. 'Elepaio 41 (9): 86.

Berger, A.J. 1972. Hawaiian Birdlife. The Univ. Press of Hawaii, Honolulu. 270pp.

Bruner, P.L. 1983. Territorial behavior of wintering Pacific Golden Plover in Hawaii. ms. (paper presented at the 100th meeting of the Amer. Ornith. Union).

—— 1984a. An avifaunal and feral mammal survey of Hauna Kea Properties, Inc. Hawaii. Unpubl. ms.

—— 1984b. An avifaunal and feral mammal survey of Waikoloa Beach Resort Property, Hawaii. Unpubl. ms.

—— 1984c. Letter to A. Yoklavich of Belt, Collins and Associates concerning the recovery of a specimen of the Hawaiian Hoary Bat at Sheraton Royal Waikoloa, Hawaii. Date: 10 Oct.84.

—— 1985. An Avifaunal and feral mammal survey of Waikoloa Beach Resort Property, coastal area between south property boundary and proposed Hyatt site, Hawaii. Unpubl. ms.

Byrd, V. R.A. Coleman, R.J. Shallenberger, and C.S. Arume. 1985. Notes on the breeding biology of the Hawaiian Race of the American Coot. 'Elepaio 45 (7): 57-63.

Conant, S. Ornithologist and Chairperson of Gen. Sci. Dept. Univ. of Hawaii, Manoa.

Div. of Forestry and Wildlife, State of Hawaii. P-R Project No: W-18-R Job. R-III-A. Unpubl. documents.

Hawaii Audubon Society. 1984. Hawaii's Birds. Third Edition. Hawaii Audubon Society, Honolulu. 96pp.

Johnson, O.W., P.M. Johnson, and P.L. Bruner, 1981. Wintering behavior and site-faithfulness of Golden Plovers on Oahu. 'Elepaio 41 (12): 123-130.

Kridler, E. 1965. A preliminary report on Makalawena Pond. Unpubl. document. USFWS. 2pp.

Myers, J.P., P.C. Connors. F.A. Pitelka. 1981. Optimal Territory size and the Sanderling compromises in a variable environment. in Foraging Behavior: Ecological, Ethological, and Psychological Approaches (A.C. Kamil and T.A. Sargent, Eds.), Garland STPM Press, N.Y. 135-158pp.

Pratt, H.P., P.L. Bruner, and D.G. Berret. 1986. A field guide to the birds of Hawaii and the tropical Pacific. Princeton Univ. Press. 640pp.

Pyle, R.L. Ornithologist B.P. Bishop Museum, Honolulu.

—— 1979. Hawaii bird observations March through July 1978. 'Elepaio 39 (7): 75-76.

Shallenberger, R.J. 1977. An ornithological survey of Hawaiian wetlands. Ahuimanu Productions.

Swedberg, G.E. 1969. Staff report on Opaeula Pond. Hawaii. Unpubl. document. State of Hawaii Div. of Forestry and Wildlife. 3pp.

Tomich,P.Q. 1969. Mammals in Hawaii. B.P. Bishop Museum Special Publication 57. Bishop Museum Press, Honolulu. 238pp.

—— 1974. The Hawaiian Hoary Bat. National Parks Conservation Magazine. 48: 10-13.

Van den Akker, J.B. 1972. Biological ascertainment report Opaeula Pond island of Hawaii. Unpubl. document. USFWS. 13pp.

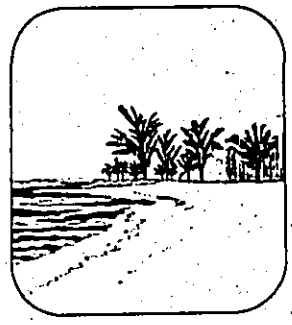
van Riper III, C. 1978. Discovery of the Yellow-fronted Canary on Mauna Kea, Hawaii. 'Elepaio 38 (9): 99-100.

van Riper, S.G., and C. van Riper III 1982. A field guide to the mammals of Hawaii. The Oriental Publishing Company. Honolulu, Hawaii. 68pp.

Woodside, D.H. 1979. Staff report on Opaeula Pond, island of Hawaii, as a wildlife sanctuary. Unpubl. document. State of Hawaii Div. of Forestry and Wildlife. 6pp.

APPENDIX C

FULL ARCHAEOLOGICAL RECONNAISSANCE SURVEY



PAUL H. ROSENDAHL, Ph.D., Inc.
Consulting Archaeologist

Report 245-091886

ARCHAEOLOGICAL RECONNAISSANCE SURVEY MAKALAWENA COASTAL DEVELOPMENT AREA

Land of Makalawena
North Kona, Island of Hawaii

October 1986

305 Mohouli Street • Hilo, Hawaii 96720 • (808) 969-1763 or 966-8038

SUMMARY

An archaeological reconnaissance survey of the Makalawena Coastal Development Area was conducted by Paul H. Rosendahl, Ph.D., Inc., during the period July 24-August 4, 1986, under agreement with Phillips, Brandt, Reddick & Associates, Inc. for their client The Kamehameha Schools/Bernice P. Bishop Estate. The area surveyed consists of a 353 acre parcel owned by Bishop Estate and located within the Land of Makalawena, North Kona District, Island of Hawaii (TMK:3-7-2-04:1).

The project area includes a coastal sand beach and dune zone, coastal anchialine ponds, weathered pahoehoe rocklands, and recent and prehistoric aa flows. All portions of the project area were surveyed by aerial and pedestrian reconnaissance. A total of 49 sites were identified within the project area; this number includes nine sites previously identified by Soehren (1963), and three sites previously identified by Reinecke in 1930 (Ms.).

Nearly half (N=22) of the identified sites are spatially associated with the former village of Makalawena, which was situated on the coast, adjacent to the shoreline of Opaeula Pond. These sites include four permanent historic habitation complexes, three high-walled enclosures, three footpaths, a cemetery, a church/and school, and numerous modified anchialine ponds. Of the remaining 27 sites, 14 are temporary habitation shelters situated in the inland portion of the project area. Other identified sites include the historic Makalawena-Akahipu'u trail and isolated or grouped cairns.

Additional archaeological work is recommended at this time for 24 of the 49 identified sites. Thirteen sites are significant soley for their research value, the loss of which can be mitigated by further data collection at the sites. Eleven other sites have research value, but are also significant as excellent examples of a site type or as culturally valuable resources. Further archaeological work in the form of additional data collection at three sites, and preservation with interpretive development of all 11 sites, is recommended. Two sites, the Makalawena Cemetery and the Kaikalaia (Kalawina) Church site, have cultural values, and are recommended for preservation and protection "as is," with no interpretive development. For the remaining 23 sites--which were significant soley for their research value, sufficient data have already been collected, and no further archaeological work of any kind is necessary.

Cover: The Beach at Makalawena, c. 1910. (Photograph courtesy of the Kukui'ohiwai Collection.)

CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

INTRODUCTION

BACKGROUND

An archaeological reconnaissance survey of the Makalawena Coastal Development Area was conducted by Paul H. Rosendahl, Ph.D., Inc. (PHRI) under agreement with Phillips, Brandt, Reddick & Assoc., Inc. for their client The Kamehameha Schools/Bernice P. Bishop Estate. A full-scale reconnaissance was conducted, in compliance with the requirements of a Special Management Area permit application and Environmental Impact Statement, as requested by the Hawaii County Planning Department. The 353 acre area surveyed includes the entire seaward portion of the Land of Makalawena, District of North Kona, Island of Hawaii. Field investigations were conducted July 24-August 4, 1986, by a crew of six persons, under the direction of Principal Investigator Dr. Paul H. Rosendahl, PHRI Supervisory Archaeologist and Project Director Theresa K. Donham and PHRI Field Archaeologist Alan T. Walker.

A total of 49 sites were identified within the project area during the reconnaissance. This total includes nine sites that were previously identified by Soehren (1963), and several features within three sites previously identified by Reinecke in 1930 (Ms.). Complete verbal descriptions, locational data, and significance assessments of these sites are presented in this report. Also included is background information pertaining to the environmental and cultural-historical setting of the project area, a summary of previous archaeological investigations, discussion of research problems, and a description of field procedures. The report Conclusion presents site significance evaluation criteria and specific research, interpretive, and cultural values that are reflected in the cultural resources of Makalawena. Recommended general treatment is offered for each site. Appended to this report are findings of the preliminary historical documentary research (Silva, Appendix A), and an ethnographic background and local informant interviews report (Springer, Appendix B) concerning the project area. These reports are summarized in the introductory section, and their findings have been synthesized with the archaeological data.

SCOPE OF WORK

The basic purpose of an archaeological reconnaissance survey is to identify and accurately locate sites or features of archaeological or historical significance. A reconnaissance survey is a pedestrian survey designed to determine the presence or absence of surface features within a designated area, and to determine both the range of variability and distribution of cultural resources. A reconnaissance survey permits a preliminary evaluation of cultural resources and facilitates formulation of realistic recommendations for additional work which might be necessary or appropriate. Such further work could include intensive survey detailed

recording of sites and features, with selected test excavations; and possibly subsequent mitigation--data recovery research excavations, interpretive planning and development, and/or preservation of sites with significant scientific research, interpretive, or cultural values.

A detailed outline of reconnaissance survey activities was prepared by PHRI prior to the initiation of field work (PHRI Proposal No.245-060886). This scope of work was based on a review of available background literature and discussions with Ms. Virginia Goldstein--staff planner and historic sites specialist in the Hawaii County Planning Department, and with Dr. Ross Cordy--staff archaeologist with the Hawaii State Historic Preservation Office. The following specific tasks were determined to constitute an adequate scope of work for the reconnaissance survey:

1. Review available archaeological and historical literature relevant to the immediate project area;

2. Conduct 100% coverage low-level aerial reconnaissance (c. 30-50 ft altitude) of the entire 353 acre project area, with special emphasis upon (a) following out any foot trails present and plotting them onto available aerial photographs and/or maps, (b) identifying all sites observed, and (c) identifying areas which are devoid of sites (e.g., recent lava lands);

3. Conduct 100% coverage high intensity ground reconnaissance (10.0 m field crew intervals) of the immediate coastal zone--extending to approximately 1,000 ft inland, or to beyond the inland edge of the anchialine pond zone, whichever distance is greater;

4. Conduct 100% coverage variable intensity ground reconnaissance (10.0 to 30.0 m intervals) of the remainder of the project area (c. 240 ac), with relatively higher intensity coverage given to the older pahoehoe lava lands and relatively lower intensity coverage to the more recent aa lava lands (unless otherwise indicated by aerial survey);

5. Conduct limited historical documentary research (emphasis on readily available literature and documentary sources) and interviews with local informants; and

6. Analyze field and historical research data, and prepare appropriate reports, including Preliminary and Final Reports on findings and recommendations.

The principal goals of the reconnaissance survey of the Makalawena Coastal Development Area were the following: (a) to locate all surface remains of past human activities within the project area; (b) to evaluate the potential general significance of each archaeological site, within relevant contexts of research, interpretive, or cultural values; (c) to determine the possible impacts of any proposed development upon the identified remains; and (d) to de ine the general scope of any subsequent archaeological mitigation work that might be necessary or appropriate.

The reconnaissance survey was to be conducted in accordance with the recommended standards of the Society for Hawaiian Archaeology (SHA). These standards are currently being used by the Hawaii County Planning Department as guidelines for the review and evaluation of archaeological reconnaissance survey reports submitted in conjunction with various development permit applications. A copy of the SHA minimum requirements for reconnaissance level survey has been provided previously to Phillips, Brandt, Reddick & Assoc., Inc.

PROJECT AREA DESCRIPTION

The Makalawena Coastal Development project area consists of approximately 353 acres located within the Land of Makalawena, North Kona, Island of Hawaii (TMK:3-7-2-04:1) (Figure 1). The Makalawena Coastal Development project area is a single parcel which includes the entire seaward portion of Makalawena, a relatively small land division (ahupua'a) located in central North Kona. This ahupua'a is situated between Mahaiula to the south, Awakee to the north, and the upland portion of Kaupulehu to the east. The inland (mauka) end of Makalawena is at Akahipu'u (2,232 ft elevation), just above the Huehue Ranch cemetery, c. 7.7 km from the coast. As a land division, Makalawena is extremely narrow (c. 300 m) above 600 ft elevation. It is possible that the existing boundaries are historical, and were delineated sometime after the land was awarded to Akahi, a cousin of Bernice Pauahi Bishop, in 1851 (LCA 5368, RP 7731).

The general climatological patterns affecting Makalawena are those characteristic of Kekaha, the dry, barren portion of North Kona noted for its harsh lava covered terrain and excellent offshore marine resources (Kelly 1973, Springer 1985). Rainfall along the coastal areas of Kekaha rarely exceeds 20 inches per year, due to the blockage of moisture laden northeast trade winds by the mountains (Armstrong 1973:57). Upland portions of Makalawena receive an average of 39 inches of rainfall annually, with monthly averages as low as 2.2 inches (July) and occasional monthly highs of 18 to 22 inches in January and December (Hawaii Department of Land and Natural Resources [DLNR] 1970:58 59). Mean temperatures along the coast range from 70 to 76 degrees F (DLNR 1970:81).

Makalawena is situated on the lower western slope of Hualalai Volcano, which is the source of the prehistoric pahoehoe and historic aa lava flows which form the present land surface. Prehistoric pahoehoe covers most of the coastal zone and forms the barren rocklands within the project area. An lava from the Puhipele Flow of 1801 covers Makalawena above the project area, between 600 and 1,200 ft elevations. This flow originated from the Puhia Pele (also Puhipele) vent at 1,637 ft, 0.6 km north of Makalawena, and reached the coast at the southern border of Mahaiula, 1.7 km south of Opaeula Pond (Macdonald, Abbott and Peterson 1983:60). As from a prehistoric Hualalai flow covers a narrow band along the northern border of Makalawena; this aa flow contains a number of anchialine ponds.

Due to the porosity of lava, surface runoff streams do not occur in this region; groundwater flows directly into the ocean below sea level,

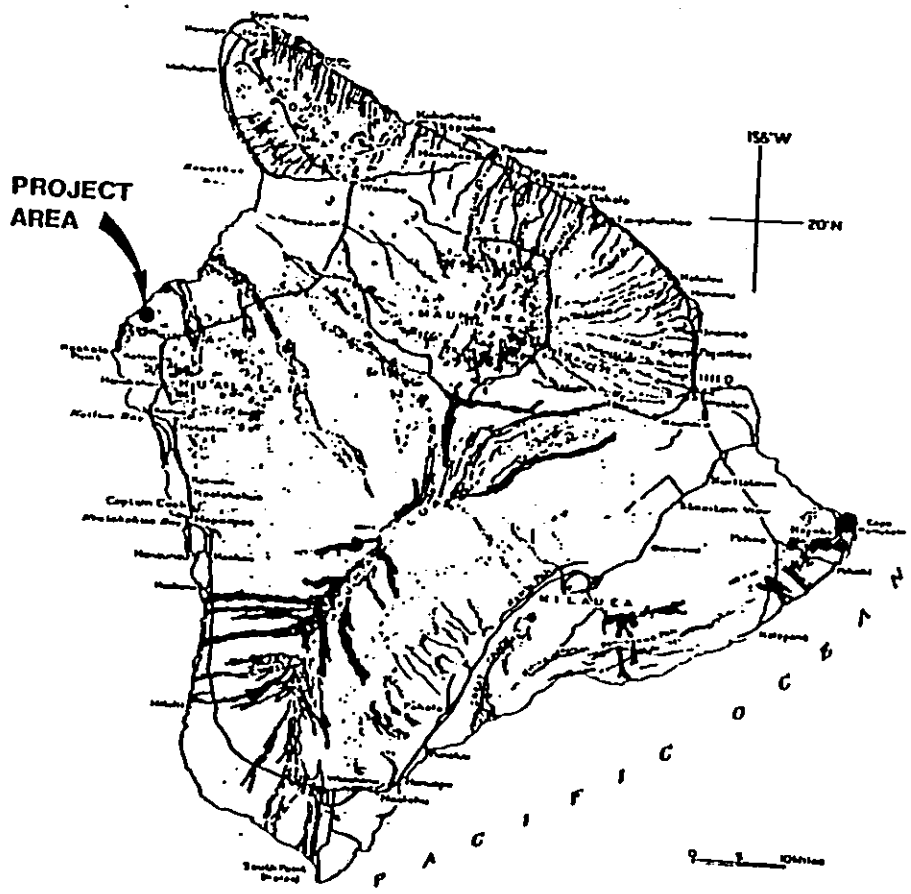


Figure 1. PROJECT LOCATION MAP

Archaeological Reconnaissance Survey
Nakalawena Coastal Development Area
Land of Nakalawena, North Kona
Island of Hawaii (TMK:3 7 2 04:1)

PUKI Project 86 245 October 1986

(Map taken from Macdonald and Abbott 1970:288)

and into depressions in lava near the coast, forming anchialine ponds. When freshwater runoff is sufficiently high and ocean tides sufficiently low, the water of some anchialine ponds may be potable. Salinity proportions as low as 3 to 4 parts per thousand (considered potable) have been recorded for four anchialine ponds at Nakalawena; other ponds range in salinity from 6 to 8 parts per thousand, and one was measured at 8-12 parts per thousand (Maciolek and Brock 1974:32).

A very small portion of Nakalawena has shallow soil deposits over prehistoric lava: these deposits are all located upslope from the Puhia pele Flow, and are outside of the project area. These soils are of the Kekake Keei-Kilon Association, and probably supported ohi'a lehua (Metrosiderous collina [Forst] Gray subsp olymorpha (Gaud.] Rock), tree fern (hapu'u, Cibotium splendens Gaud.), koa haole (Leucaena leucocephala [Lam.] de Wit), and Christmas-berry (Schinus terebinthifolius Raddi) prior to conversion to pasture land (Sato et al. 1973).

Vegetation is relatively sparse in the barren rocklands portion of the project area, and is absent on the bend of an which parallels the northern boundary. Char (1986) identified two vegetation zones for the Nakalawena rocklands, the more extensive of which is the grass scrub association dominated by fountain grass (Pennisetum setaceum (Forsk.] Chiov.). Scattered shrubs such as 'ilima (Sida fallax Walp.), indigo (Indigofera suffruticosa), and noni (Morinda citrifolia) were observed in the grasslands during the reconnaissance survey, along with isolated occurrences of Christmas-berry and scattered kiawe (Prosopis pallida [Humb. and Bonp.]).

The second inland zone identified by Char (1986) is the kiawe forest, which is located in the northwestern corner of the project area (see Figure 2). This forest is very dense and difficult to penetrate. Kiawe is by far the predominant tree species, and is concentrated primarily in the northwestern portion of the project area.

The coastline of Nakalawena is 1.2 km long and consists of two broad, gentle bays, the larger of which is Puu Alii Bay, with 620 m of shoreline. The smaller, northern bay extends inland to within 100 m of the eastern edge of Opaeula Pond. Beach sand deposits occur in a narrow band along Puu Alii Bay, where a low dune has developed.

The immediate coastal zone consists of distinguishable northern and southern subzones. The northern subzone is comprised of a rocky shoreline and approximately 28 anchialine ponds located inshore to a distance of c. 350 m from the coast. This subzone includes Opaeula Fishpond, which is the largest existing fishpond between Kiholo and Kaloko along the West Hawaii coast. Opaeula Pond (also referred to as Kapoikai Pond) is naturally close to the ocean and is currently shallow and turbid. According to Maciolack and Brock (1974), who conducted an intensive survey of anchialine ponds in North Kona, Opaeula Pond "...is the premier [Hawaiian] stilt habitat of Hawaii Island". (1974:18).

During Maciolack and Brock's anchialine pond study, the floral and faunal resources of 14 Nakalawena ponds were examined. The most common

animal species found was red shrimp (Opae'ula, Halocaridina rubra), which occurred in 11 of the ponds. According to local residents interviewed by Kelly (1973), 'opae'ula were raised in these ponds for use as fishbait (1973:78). Other animals commonly found in the Makalawena ponds were molluscs, particularly Melania spp., which occurred in nine of 14 ponds examined. Nine of the ponds also had some form of vegetation, primarily algae crusts and vascular plants such as Ruppia maritima (Macioleck and Brock 1974:56). A more recent inventory of the Makalawena ponds by Brewer inventoried 58 ponds within four major clusters along the coastline (1986:3). Terrestrial vegetation occurring within the anchialine ponds coastal subzone includes kiawe, milo (Thespesia populnea L.), and ironwood (Casuarina equisetifolia L.).

The southern coastal subzone is characterized by a sandy beach and sand dunes which support ironwood, milo, kiawe, beach morning glory (pohuehue, Ipomoea pes-caprae [L.]), and beach naupaka (naupaka kahakai, Scaevola sericea Vahl). A recent study by Char (1986) indicates that the strand and kiawe forest biomes at Makalawena are relatively depauperate when compared with other sections of the North Kona Coast. The low variability of species present is attributed by Char to goat damage (1986:3).

Two distinguishable marine habitats have been identified for the offshore coastal waters of Makalawena (Brock and Brock 1974). Along the northern coastline there is well developed limestone beach rock which supports coral growth at depths of 2.0 m or greater (Brock and Brock 1974:17). Invertebrates are most common along this portion of the Makalawena coast, and a number of crustacea, gastropod, bivalve, and echinoid species were observed by Brock and Brock during their survey of the North Kona coastline. Important subsistence species found in the intertidal zone include molluscs such as Hipponix sp., Littorina pintado, Nodilittorina picta, Nerita picea, Theodoxus cariosa, Isognomon californicum, and I. perna; echinoids such as Echinothrix calamaris, E. diadema, Tripneustes gratilla, Echinometra mathaei and E. oblonga; and crustacea such as Calcinus laevimanus and Grapsus grapsus (Brock and Brock 1974).

Due to the presence of freshwater admixture with saline water in the northern coastal subzone, a subtidal habitat occurs which is limited to species tolerant of freshwater dilution. Among the molluscs, Nerita picea, Isognomon californicum and I. perna occur in this habitat. The echinoderms are the least tolerant of freshwater, and are uncommon in waters with relatively low salinity; however, they do proliferate at deeper water levels along the northern coastline. Species such as Echinometra mathaei and Echinostrephus aciculatus are very common in this area (Brock and Brock 1974:7).

The southern coastal zone has a shallow, gently sloping, sandy offshore area, and prolific coral growth does not occur until a 6.0 m depth is reached. An offshore ledge parallels the entire coastline of Makalawena at a depth of c. 8.0 to 9 m (Brock and Brock 1974:17).

Brock and Brock observed 79 fish species in the intertidal and subtidal waters of Makalawena; eight of these species were characterized as abundant, including squirrel fish (Myripristis amaenus amaenus), cardinal fish (Apon snyderi), damsel fish (Abudefduf abdominalis, A. imparipennis), wrass (Thalassoma duperreyi), surgeon fish (Acanthurus triostegus sandvicensis, A. nigrofuscus, A. dussumieri), trigger fish (Rhinecanthus rectangulus), and parrot fish (Scaridae spp.) (Brock and Brock 1974).

Brewer's more recent survey of the nearshore marine environment concluded that the area was low in diversity and numbers of coral, invertebrates, fish, and algae. This condition is attributed to major storm wave attack which occurred recently, to heavy fishing pressure, and to tropical fish collecting (Brewer 1986:4.1, 2).

PREVIOUS ARCHAEOLOGICAL WORK

The earliest archaeological field work at Makalawena and within the project area was conducted in 1930 by John E. Reinecke, who identified coastal sites in the Districts of North and South Kona for the Bernice P. Bishop Museum. Reinecke recorded three sites within Makalawena; however, several additional sites that were not assigned numbers are mentioned in his manuscript. Reinecke walked along the coast from south to north, and recorded the following sites and associated features at Makalawena:

> Site 97. A pen; then a series of little ponds and waterholes behind the great dunes. Reaching Makalawena hamlet, one finds a house by the southernmost house; another house site by the trail; a third just north of the house; a fourth by the row of houses.
>
> Site 98. Makalawena Pond. The pools and springs feeding the pond are walled up in numbers, especially on the north end. At this end too are a few small pens. The water at the south end is very good and fresh.
>
> Site 99. Graveyard at north end of the hamlet (Ms.:19)

At the time of Reinecke's survey, there were apparently four to six houses occupied at Makalawena. The location of these structures could not be precisely determined in the field; however, it is likely that the present caretaker's house was one of the occupied houses. All four of the archaeological house sites described by Reinecke were located during the PHRI survey; however, no traces of Reinecke's "row of houses" could be relocated. It is assumed that these houses were frame structures built on the beach, possibly with no stone platforms beneath them. Table 1 correlates site numbers assigned during the PHRI survey with those assigned earlier by Reinecke.

In 1963, Lloyd J. Soehren of Bishop Museum conducted an archaeological survey and historical research on Kaupulehu and Makalawena for Bishop Estate. He identified nine sites at Makalawena. Site 1 was described as

a large goat pen, and corresponds with Reinecke's Site 97. Sites 2, 5, and 8 were walled ponds probably included within Reinecke's Site 98. Site 4 the Makalawena graveyard, is Reinecke's Site 99. Soehren also observed a number of human bones scattered on the surface of the graveyard, along with structural debris deposited by the 1946 tsunami (1963:38). The remaining four sites recorded by Soehren incorporated two house sites, a second goat pen, the Kaikalaia church site, and additional walled ponds.

Table 1.

CORRELATION OF SITE NUMBERS FOR PHRI (1986), SOEHREN (1963), AND REINECKE (1930) SURVEYS

PHRI (1986) Site Number	Soehren (1963) Site Number	Reinecke (1930) Site Number
T-3	5	98
T-5	5	98
T-7	5	98
T-8	6	98
T-9	4	99
T-10	5	98
T-12	3	--
T-13	9	--
T-14	3	97
T-16	2	97
T-17	1	97
T-18	3	97
T-20	8	97
T-21	8	97
T-27	7	97
T-28	7	97

In 1968-69, an archaeological survey of the Queen Kaahumanu Highway corridor was conducted through North Kona, and included a portion of Makalawena within the construction corridor of the proposed highway (Ching 1971). Five sites were recorded within Makalawena, three of which were small C- or U-shaped shelters (Sites 1176, 1177, 1178). Other sites recorded include a rectangular walled shelter (Site 1181), and the Makalawena-Akahipu'u Trail (Site 1179), which was subsequently given Bishop Museum Site No. 50-Ha-D20-12.*

*B.P. Bishop Museum (BPBM) site designation system: all site numbers prefixed by 50-Ha-D20- (50=State of Hawaii, Ha=Island of Hawaii, D=District of North Kona, 20=Land of Makalawena).

A brief description of the Opaeula Fishpond was included in an appendix to Ching's report which focused on the fishponds of Kekaha. The pond at Makalawena was described as follows:

> The Fishpond of Opaeula is located in Makalawena ahupua'a. It is one of the larger ponds in the region today. Many archaeological features are noted here and there is no doubt that this was an important settlement in its time (Ching 1971:245).

No excavations were conducted within Makalawena in connection with the archaeological salvage of sites within the highway corridor; however, a number of references to Makalawena are included in the historical research conducted by Kelly (1973) as part of the highway salvage research project (Rosendahl 1973). Kelly described the village of Makalawena as follows:

> A beautiful set of small bays with many legends, Makalawena was the most prominent town of this area in the first decade of this century. Essentially a fishing village, it boasted a church, school, store, and at least seven or eight houses at one time. All houses were wiped out in the 1946 tsunami. Only one house was rebuilt, that of Annie Una. Her last husband, Porto Almodober, still lives at Makalawena. In the late 1800s in areas such as Kukio and Makalawena residents raised goats for market. Today raising goats and chickens, and going fishing are Porto's principal occupations (1973:103).

SUMMARY OF PRELIMINARY HISTORICAL DOCUMENTARY AND INFORMANT RESEARCH

Preliminary historical documentary research was conducted in Honolulu by historical researcher Carol L. Silva for the Makalawena project area (Appendix A). A review of archival material available in Kona was made by Hannah Kihalani Springer, who also conducted interviews of knowledgeable local informants and compiled brief biographical sketches of past and present residents of the area (Appendix B). These reports are briefly summarized here.

Both Silva and Springer's reports contain introductory notes on the region of Kekaha, the traditional Hawaiian region of lava lands, anchialine ponds, and exceptional offshore marine resources. Silva summarizes two oral tradional legends involving Makalawena. These legends were previously recorded by Maguire and Pukui. The first of these recounts the capture of water spirits off the coast of Makalawena by Punialki, a champion spirit catcher of Kohala. The villagers of Makalawena requested the assistance of Punialki, after repeated thievery of the fish from their nets by the water spirits. Two place names along the coast, Kalepenmoa and Kaunaakeakua (the sand beach), are related to the events of this legend. The second legend mentioned by Silva involves spirit capturing as well, and likewise occurred at Kaunaakeakua (net let down for ghosts).

Silva's investigations at the Bureau of Land Conveyances indicate that the earliest legal owner of Makalawena was the Chiefess Akahi, who was awarded the entire ahupua'a (656 acres) in 1851 (LCA 5368). No records or claims of kuleana lots were located within this parcel. Akahi placed a restriction on the removal of squid and silverside fish from the waters of Makalawena in 1852, but apparently placed no restrictions on settlement within the area. Chiefess Akahi was the cousin of Bernice P. Bishop's mother, Konia, and when Akahi died in 1877, Makalawena ahupua'a was passed to the Bishop estate, as reqested in her will.

Additional archival information located by Silva includes notes and drawings by land surveyors Emerson and Perryman, who conducted a formal survey of the ahupua'a in 1882. Maps compiled by these surveyors are reproduced in Appendix A; both indicate the Makalawena-Akahipu'u Trail and the Makalawena school/church. Perryman's map depicts five additional structures on the beach at Makalawena, the locations of two of which correspond with those of permanent house Sites T-11 and T-14.

Silva could locate no specific date for the establishment of the school at Makalawena. Included in her report are quotations from a number of sources concerning the conditions of various Kekaha schools. A report by the Department of Public Instruction in 1898 states that Makalawena consisted of nine houses with 32 children (3 to 4 children per household). A similar type of report by the Reverend Baker in 1909 enumerated 15 houses with 50 children (Kelly 1973:104). These figures suggest a 60% increase in village population within an eleven year period; however, it is not clear if the enumerated children in these reports include those not in school.

Additional historic background on the Makalawena school is presented in Springer's ethnographic and literature review. According to records located at the Kona office of the Office of Hawaiian Affairs, the Makalawena school was in service as early as 1848, when 21 students were reported. A detailed summary of the construction, use, and recycling of the structure which housed the school and church is presented by Springer, as well as a photograph of the newly built Kaikalaia Church.

Springer's report discusses the role and relative importance of the floral, faunal, and water resources within the project area, in the context of early to middle twentieth century Hawaiian lifeways. Information compiled by Springer is based on interviews with elderly informants who formerly resided in or frequently visited Makalawena.

The observations of Springer and her informants include information that is directly applicable to the analysis of historic sites within the project area. For example, one of Springer's informants (N. Keana'aina) indicates that the area around Opaeula Pond was cultivated by Makalawena residents. Other economic activities of the community included the drying of 'opelu for exchange and sale, and breeding of goats for personal use and sale. The Makalawena goatherds apparently produced a quality stock that was recognized as such throughout the region.

Springer's notes on the more recent uses of the cultural and natural resources of the project area provide additional bases for the assessment of cultural significance. This is especially true for the anchialine pond complexes, Kaikalaia Church, and the Makalawena-Akahipu'u Trail. The perspective presented by Springer is that of Hawaiians who were and are most intimately knowledgeable of the land and its resources.

Included in the ethnographic study are brief biographical sketches of Makalawena residents and persons familiar with the Makalawena coastal area. Significant among this information is the extent of coastal/upland travel that occurred, and the degree of mobility exhibited even by older members of the local community. As indicated by Springer, pedestrian travel between the coast and the uplands is still a part of life in Kekaha for more than one resident of the area.

RESEARCH PROBLEMS AND APPROACH

A number of research issues of importance to further archaeological investigations at Makalawena are discussed here, in order to provide an explicit context for the assessment of research significance. These issues cannot be substantively addressed with information obtained from a reconnaissance level investigation. However, the information generated by this survey should aid in determining which research issues can be most productively addressed by future work, given the archaeological resources present at Makalawena. The various approaches to archaeological interpretation, such as human ecology, culture history, settlement pattern analysis, culture process, and the reconstruction of past lifeways, are briefly discussed, with considerations of specific research questions. The general data requirements of these approaches are given, since they are an integral aspect of field observation and site assessment.

An ecological approach to archaeological interpretation attempts to identify and account for various aspects of the interrelationships between human populations and their environment. Within the context of this approach, the environmental features of Makalawena are expected both to have an effect on and be affected by human occupants of the area. In order to examine specific issues in human ecology, reconstruction of the local environment for specific historic periods is required, as is the reconstruction of extant resource exploitation patterns for that period. A considerable amount of data is available for the current environment of Makalawena; however, it is obvious from information collected by Springer (Appendix B) and Char (1986) that environmental conditions at Makalawena were different during the early twentieth century, and can be expected vary for the prehistoric period as well.

Environmental reconstruction has been considerably aided by archaeological data, particularly subsistence remains. If properly controlled, these data reflect not only subsistence strategies, but also the effective environment of a given period. In this context, ecofactual remains are significant, particularly if they occur in an undisturbed depositional

context. One of the goals of the reconnaissance survey, therefore, was to identify sites which contain or potentially contain ecofactual remains.

An additional research concern for archaeological studies is the development of local culture histories which can be synthesized with data from other localities to derive regional and interregional patterns of culture and culture change. Culture histories also form the basis for control in studies of human adaption and environmental change. In order to address problems in culture history and to develop a reliable temporal framework for a given area, materials must be present which can be dated through absolute or relative dating procedures. One of the goals of reconnaissance level field investigations, therefore, is to identify archaeological sites which contain or potentially contain datable materials, such as volcanic glass and wood charcoal, or temporally diagnostic architectural features and artifacts. An attempt is also made to predict the extent of disturbance that has occurred to specific deposits.

Once a sequence of area occupation and abandonment is established, comparative data from adjacent areas can be used to formulate more complex research problems. Local chronologies have been proposed by Cordy (1981) for a number of North Kona ahupua'a, and a regional settlement pattern has been offered. Cordy's model provides sufficient comparative data for the synthetic treatment of a local Makalawena chronology, which has not been developed to date.

Settlement pattern analysis is generally an integral component of archaeological studies, and is interrelated with culture history, human ecology, and culture process. Settlement pattern analysis requires the development and application of an accurate functional typology of sites and features, as well as reliable temporal control. All functional categories must be identified and accounted for in order to obtain an accurate settlement model. Field investigations were therefore oriented toward documenting all evidence of human activity or presence, not just the "major" sites.

A principal concern of settlement pattern analysis is the identification of permanency, as reflected by single residencies or groups of residencies. Cordy's review of historic resources suggested to him that nearly all permanent prehistoric habitation in North Kona could be expected to occur along the coast, and that residencies were generally aggregated into small communities (Cordy 1976:5). Permanent settlement in the uplands of North Kona is, however, documented for the nineteenth and twentieth centuries. A greater degree of coastal/upland mobility might therefore be expected for the historic period, as well as an increase in the range of available resources for coastal residents. These implications do not concur with Cordy's observation that "communities in the areas of leeward Kohala, North Kona (north of Kailua) ...were often noted to subsist on fishing alone" (Cordy 1976:5). The extent to which historic settlement patterns reflect prehistoric patterns has not been thoroughly examined. The Makalawena area may provide insight into this issue, if the archaeological record can be determined to be an accurate representation of actual settlement during the prehistoric and historic periods.

Perhaps one of the more striking aspects of the Makalawena coastal area is its unstable nature. The strand and offshore zones exhibit the effects of severe storm wave action (Brewer 1988), and few of the cultural features of the strand zone have survived to the present time. This factor could have affected the settlement pattern at Makalawena in two ways: permanent settlement could have been curtailed during specific periods due to limitations of marine resources; or settlement may have occurred along the coast, with all, or nearly all evidence being removed by subsequent wave action. Given these factors, the inland and generally more temporary sites must be examined in order to determine if coastal/upland travel was perhaps increased or decreased during specific periods.

The culture process approach examines the mechanisms and causes of change in cultural systems. This approach is largely synthetic, and requires a reliable culture history, an understanding of environmental and social constraints, and a conjunctive use of ethnohistorical sources. The early historic period in Hawaii is particularly amenable to culture process studies, since during this period the traditional Hawaiian culture system was exposed to numerous change-inducing stimuli. The character and contexts of these stimuli and the effected changes are understood primarily through the written observations of foreign visitors, few of which have been supplemented or substantiated with material evidence from archaeological contexts. Historic period studies which utilize both documentary and archaeological data are particularly appropriate for addressing culture process problems. Based on the review of past work at Makalawena and on historic background studies, it appears that this area may have a number of resources relevant to the study of culture contact and change.

Of particular interest in the study of the Makalawena community during the nineteenth century is the determination of its actual role in the social and economic system of the Kekaha region. Kelly has characterized this village as being quite important (see above), and it was the site of a church as early as 1848 (Springer, Appendix B). Was the village a "central place" prior to the establishment of a religious center at the town? If so, what natural and/or social features of the locale contributed to this status? Was the growth of the settlement dependent upon market systems or transportation systems that were introduced with the Euroamericans? How unique was the village in the context of the region of Kekaha and the Kona coast north of Kailua?

These questions require the use of both archival and archaeological data. During field investigations, an attempt was made to correlate archaeological features with specific sites referenced in historic sources. Likewise, all transportation corridors were identified, and an attempt was made to identify features that were part of the material culture of Makalawena Village. The presence of historic materials was also noted, and preliminary temporal assignments determined

A final approach to data analysis and research problem formulation considered here is the reconstruction of past lifeways, based on material culture remains and other information. Research problems that can be addressed in reconstructing past lifeways include the determination of

domestic space use patterns, the identification of source areas of raw materials used in the manufacture of tools or of purchased artifacts (i e., European, Oriental, American), the role of traditional Hawaiian tools and materials in historic period households, and locally important home industries. These data are amenable to comparative analyses both at the local and regional level. I provide important clues in understanding early trade systems, local variation in commodity demands, and in the rates of replacement of specific Hawaiian tool forms and materials. In the context of this approach, sites which contain undisturbed deposits with artifacts are of relatively high research value. Likewise, sites with material processing debris are also significant. The identification of these sites was one of the goals of the reconnaissance survey.

The above research problems and approaches are discussed in the Conclusion section and are used as an aid to site evaluations. The brief and generally undeveloped framework presented here for these questions is not considered to be exhaustive in scope; there are additional research applications which can be effectively used with available archaeological data.

FIELD METHODS AND PROCEDURES

A 100% coverage low-level aerial reconnaissance of the project area was conducted July 23, 1986 by Theresa K. Donham and Alan T. Walker by means of a helicopter piloted by Mr. Jim Cardin of Kona Helicopters. Mr. Gordon Chapman, representing Phillips, Brandt, Reddick & Assoc., was present during the aerial reconnaissance. A series of overlapping north-south transects were flown at an average altitude of 30 ft, which enabled recognition of archaeological features in areas of sparse ground cover. Identified features were photographed from the air. Wherever possible, the helicopter was set down, and the features were tagged to facilitate location during pedestrian reconnaissance. All identified sites and features were plotted on an aerial photograph, approximate scale 1 inch-400 ft (R.M Towill Corp., Photo No. 4414-4415, 1967). Sites located from the air included all of the previously recorded walled ponds and enclosures, two cave shelters, two cairns, three footpaths, and the Makalawena-Akahipo'u Trail.

Pedestrian reconnaissance field work began July 24, 1986 and was concluded August 4, 1986. The five person field crew was supervised by Alan T. Walker from July 24 through July 29, and by Theresa K. Donham from July 30 through August 4. The project was conducted under the overall supervision of Principal Investigator Dr. Paul H. Rosendahl.

The 100% ground coverage of the project area was accomplished using two survey intensity levels, as specified in the scope of work. The coastal zone (shoreline to c. 1,000 ft inland, c. 90 acres) was surveyed at a high intensity level, with crew members spaced at 10.0 m intervals. A small portion (c. 5 acres) of the coastal zone at the southern boundary of the project area was covered with recent aa (1801 Flow), and was surveyed at 30.0 m intervals.

A 20 acre area within the inland survey zone was also surveyed at the high intensity survey level. The area located at the northern edge of the project area was covered with relatively dense kiawe growth which hindered visibility; therefore, crew members were spaced at a maximum of 10.0 m apart in this area. The remaining 238 acres were surveyed at a medium level of intensity, using 30.0 m intervals between crew members. Areas of older pahoehoe which contained collapsed blisters and more frequent caves were surveyed with 15.0-20.0 m intervals. All survey transects were oriented north-south, parallel to the coastline, and progressed eastward (inland) from the coast. The easternmost transect of each sweep was well marked with plastic flagging tape, and used to guide subsequent sweeps.

Sites located during reconnaissance were plotted on a large scale (1 inch-200 ft) aerial photograph (R.M. Towill Corp. Photo No. 4414 4415, 1967). A standard PHRI site survey form was completed for each site, with descriptive data and feature dimensions recorded on site at the time of location. The principal features of each site were photographed in 35 mm black-and-white (PHRI Rolls No. 498, 500-502). Each site was marked with pink and blue flagging tape and an aluminum tag denoting temporary site number, PHRI project number (86-245), and date. Site identification data was also written on a separate piece of flagging tape that was wrapped around a cobble-sized stone and placed in a protected, but conspicuous, location at the site as an aid to future site reidentification.

After completion of the site location sweeps, 25 of the 49 identified sites were returned to for additional data collection. This included compilation of a scaled plan map, a listing of shellfish and crustacean species represented in surface scatters, collection of significant artifacts, and further written and/or metric descriptions.

Additional investigations were conducted along the white sand dune along the southern beach within the project are. This natural feature was walked on two occasions, with a focus on locating any cultural, skeletal, or organic material that might be eroding from a buried context within the dune. Five vertical faces were shovel-shaved along the west facing dune slope in areas suspected of containing buried organic horizons. Two organic lenses were located and mapped along the dune; both of these lenses appeared to be former dune surfaces of relatively recent age. Carbonized wood was collected from both deposits; one is suspected to represent a recent camp fire and was associated with aluminum can fragments. The second carbonized wood sample was clearly from a former dune surface, but no cultural material could be located within the deposit, which varied in depth from 0.40 to zero meters below ground surface.

Artifacts were surface collected at four sites. These include an adze shaped item of cut pearl shell (Site T 11), a coffee bean shaped octopus lure sinker (Site T 18), a basalt abrader and three volcanic glass flakes (Site T 22), and a spatulate wooden tool and a wooden bowl containing a fishing net (Site T 42). The two charcoal samples collected from the buried sand dune deposits have been curated for possible age determination at a later time. At present, there is no evidence to suggest that these samples are more than 20 years old.

FINDINGS

A total of 19 archaeological sites with 121 component features have been identified within the Nakalawena Coastal Development project area. These sites and their component features are summarized in Table 2 (at end), and their appropriate locations indicated on Figure 2.

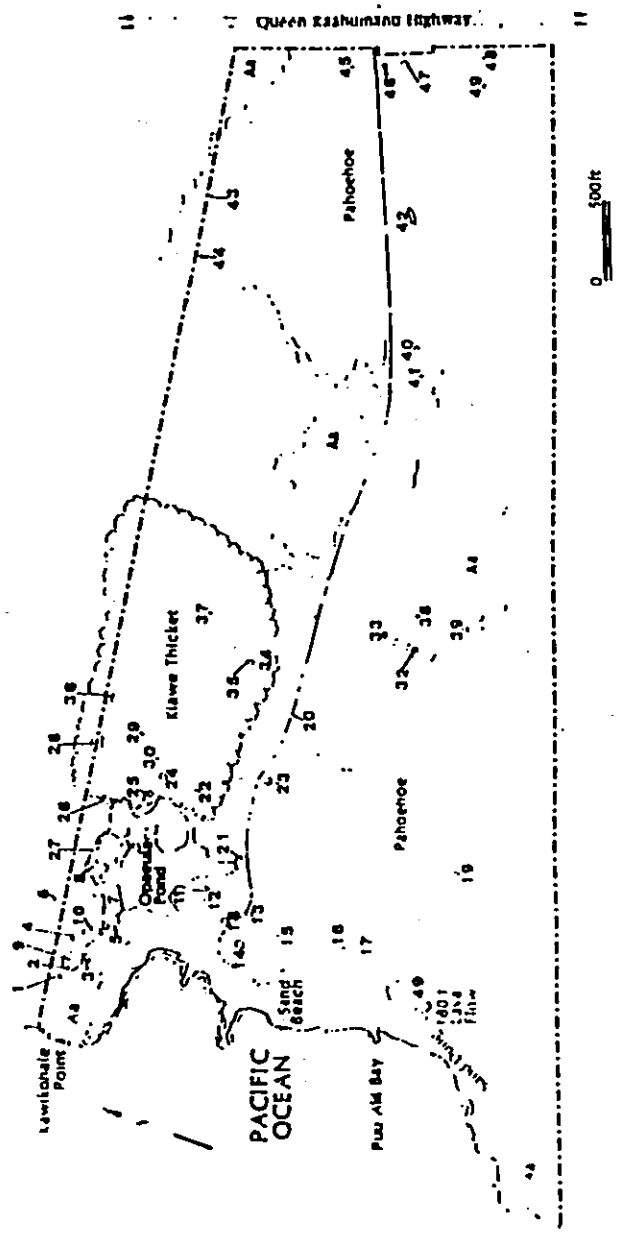
A total of 24 formal types are represented among the 121 features recorded (Table 3). Over half of these features (N=71, 59%) are accounted for by six formal categories; cairns, overhang shelters, single walls, terraces, cave shelters, and cleared ponds/pools. These frequencies reflect the relatively low degree of variability between the sites identified. Several of the formal feature categories are represented by one example only. Of noticable absence are raised stone platforms, pavements of basalt and/or coral pebbles, rock mounds, petroglyphs, and other formal types which generally occur in areas that were more intensively utilized during the prehistoric period.

Table 3.

FREQUENCIES OF FORMAL FEATURE TYPES

Formal Type	Number	Formal Type	Number
Cairn	16	Well	3
Overhang shelter	15	Rock alignment	3
Single wall	13	C shape wall	2
Terrace	9	Surface midden	2
Cave shelter	9	Refuse pit	2
Cleared pond/pool	9	Platform	1
Grave	7	Kerbstone trail	1
Walled pond	7	Aa excavation	1
Enclosure	6	Leveled aa area	1
Walled shelter	4	Mortared wall	1
Footpath	5	Filled crevice	1
Rubble pile	4	Mortared floor	1

Each site is described below, in numerical order. The findings are summarized and evaluated in the subsequent Conclusion section.



SITE LOCATION MAP

SITE DESCRIPTIONS

T-1 C-Shape Wall

Site T 1 is located at the northeastern corner of the project area, along the coral beach and aa flow interface. It consists of a C-shape wall, constructed from rough aa boulders and cobbles, which partially encloses a leveled floor of crushed aa pebbles (Figure 3). The structure is situated on a low natural rise that is 0.9 m above the surface of the adjacent beach. Portions of the rise may have been artificially terraced in order to level the floor; however, these areas were not observable beneath the current storm disturbed deposit of aa. The site is 108.0 m from the shoreline and has been affected by wave action; it is possible that the wall was originally built as an enclosure, and that the western portion has been washed out, creating the C-shaped form.

The structure has an overall length of 6.6 m and an overall width of 5.0 m. The current opening in the wall is 2.25 m long and is oriented toward the shoreline (262 degrees Az). The wall is widest at the base, which varies in width from 1.3 to 1.5 m. The upper two courses of the four to five course wall average 1.0 m in width. Exterior wall height varies from 1.5 m at the eastern end to 0.85 m at the southern end of the structure. Interior wall height is an average of 0.68 m above the floor surface. The 7.5 sq m interior space is roughly rectangular in shape, and is paved with crushed aa and small waterworn beach pebbles ('III'III). This leveled surface extends 0.8 m westward beyond the wall opening.

A wide range of shellfish remains was observed among the aa gravel within the wall. Families present include Conidae, Cypraeidae, Isognomonidae, Neritidae, Thaiidae, and Veneridae. Echinoidea remains were also observed; these and the shellfish remains had filtered down through the aa and were observable only in small gaps between the loose surface stones. It is suspected that a considerable quantity of subsistence remains is present in lower levels of the aa floor fill.

No recent or historic materials were observed within the wall, which is tentatively identifed as a prehistoric structure. The wall and leveled floor are considerably more substantial than other C shapes located within the project area, and may represent a permanent habitation site. This site may represent one of very few prehistoric structures located along the coast within the project area.

T-2 Overhang Shelter

Site T 2 is located 15.5 m south from Site T 1, just east of the coral beach, on rough aa. It consists of a naturally uplifted aa shelf that has created a small, shallow shelter. The 1.75 m high uplifted rock covers an area 5.7 by 3.0 m, with the major axis oriented northeast-southwest. The 2.1 sq m sheltered area has a ceiling height of 1.35 m, and a maximum depth of 0.9 m from dripline. The floor is depressed

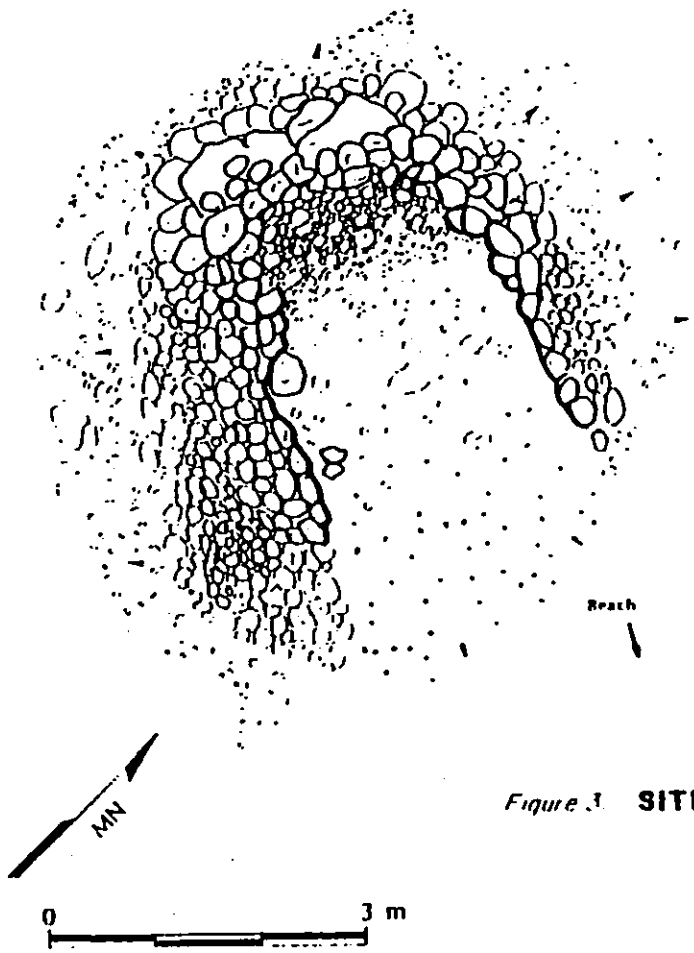


Figure 3. **SITE T-1**

and appears to have been filled with aa pebbles and cobbles. A few aa boulders have been piled on top of the upthrusted rock, forming a small cairn. No walls or other modifications have been made to create a more effective shelter.

Portable remains observed within the shelter include milled lumber and recently deposited metal fragments. No subsistence remains were observed. This site is located within the boundaries of the Makalawena cemetery (Site T-2, see Figure 8), and may have been used as a burial or shrine site prior to its more recent use as a shelter.

T-3 Complex

The Site T-3 complex consists of an L shape wall remnant, a footpath, and a modified anchialine pool. It is located 30.0 m south of the Makalawena cemetery and 76.2 m northeast from the shoreline. The wall remnant (Feature A) was described by Soehren in his discussion of the cemetery; however, it was not functionally associated with the cemetery. Soehren suggested that the wall "...may have been the site of another goat pen, but [that] the rest of the structure has been demolished" (1963:38).

The long section of the wall is oriented east-west (275 degrees Az), and has an overall length of 8.9 m. The short section extends 4.6 m south from the east end of the long section. The wall is constructed from aa boulders, and intact sections are faced on both interior and exterior sides. Average width is 1.3 m and average height is 1.45 m. No surface modifications were observed on the south side (interior side) of the wall; however, a leveled surface of aa pebbles occurs along the northern face of the longer wall section.

A narrow footpath (Feature B) of leveled and crushed aa passes adjacent to the southern end of the short wall section, connecting the beach and the nearby modified pool with additional pools and structures to the east. The southern portion of the footpath apparently postdates the destruction of the wall; it is 0.5 m wide.

Feature C is a modified anchialine pool located 5.7 m northeast from the eastern end of the wall section (Feature A). This feature was probably included in Reinecke's Site 98, which included an unspecified number of pools (MS-19), and in Soehren's Site 5, which included "...several small, roughly cleared pools" (1963:38).

The pool has an overall length of 7.5 m and has been divided into two smaller sections that are cleared of loose rocks and deepened. The pool is roughly hourglass shaped, with maximum widths of 2.5 m at the north and south ends and 0.8 m in the center. The cleared portions are located in the wider portions at each end of the pool. The northern cleared area is 1.0 sq m and has a maximum depth of 0.74 m. The southern cleared area is similar in size and only slightly deeper (0.8 m). A small platform (1.7 by 0.65 m) constructed from stacked aa boulders and cobbles occurs near the center of the pool. The surface of the platform is 0.65 m above normal water level.

No portable remains were found either along the footpath or near the cleared pool, but small metal fragments were observed near the wall segment. There were no indications of additional subsurface wall remnants or of any deposits which would suggest former wall configuration or function. The wall appears to represent a remnant of an enclosure, which would have extended onto the beach to the north and east.

T-4 Footpath

Site T-4 is a narrow footpath across rough aa which connects the modified pond complexes around Opaeula Pond with points north of the project area. The path enters the project area 168.0 m from the shoreline, and passes east of the cemetery to connect with the path from Site T-3. Its total length within the project area is 60.6 m. Width of the path varies from 0.6 to 0.8 m, and it is generally oriented 45 degrees Az. It is constructed of crushed aa pebbles and has a worn, leveled surface. No portable remains were observed along the path, which is easily distinguishable in the aa.

T-5 Complex

This site consists of five features, all located in or around a shallow anchialine pond at the northeastern edge of Opaeula Pond (Figure 4). The extensively modified pond within this site appears to have been formerly connected with Opaeula Pond, but is now disconnected by a series of low stone wall dams. A narrow water channel at the south end of the pond connects this small body of water with the ponds in the adjacent complex, Site T-7. This site appears to have been previously identified by Soehren (Site 5) and Reinecke (Site 98).

The focal pond of this site has a long axis of 46.0 m and a short axis (north-south) of 24.0 m. Average depth of the water at high tide is 0.35 to 0.40 m. At low tide, the pond surface area is much smaller, and the perimeter wall features are completely exposed.

The major feature (A) is a rectangular enclosure, or small structure foundation, located in the center of the pond. The enclosure is 13.4 m long and 6.0 to 8.0 m wide from the outer sides of the walls. Interior space is rectangular (9.40 by 3.25 m), and has an average water level of 0.3 m. The enclosure walls vary in width (2.4 to 1.2 m) and height (0.43 to 0.65 m), and portions of the interior sides are faced. The entire wall was probably faced on the interior side at the time of construction; major sections of the wall are currently slumping and stones are somewhat scattered. A well defined circular hole is present at the southwestern corner of the wall, where it is widest. It is 0.4 m in diameter and extends to the base of the wall; it may represent a post hole.

Feature B is a faced retaining wall, 0.5 m high, built around a 9.0 m long section of the pond shoreline. It defines the western side of a cleared and deepened portion of the pond, which is partially separated

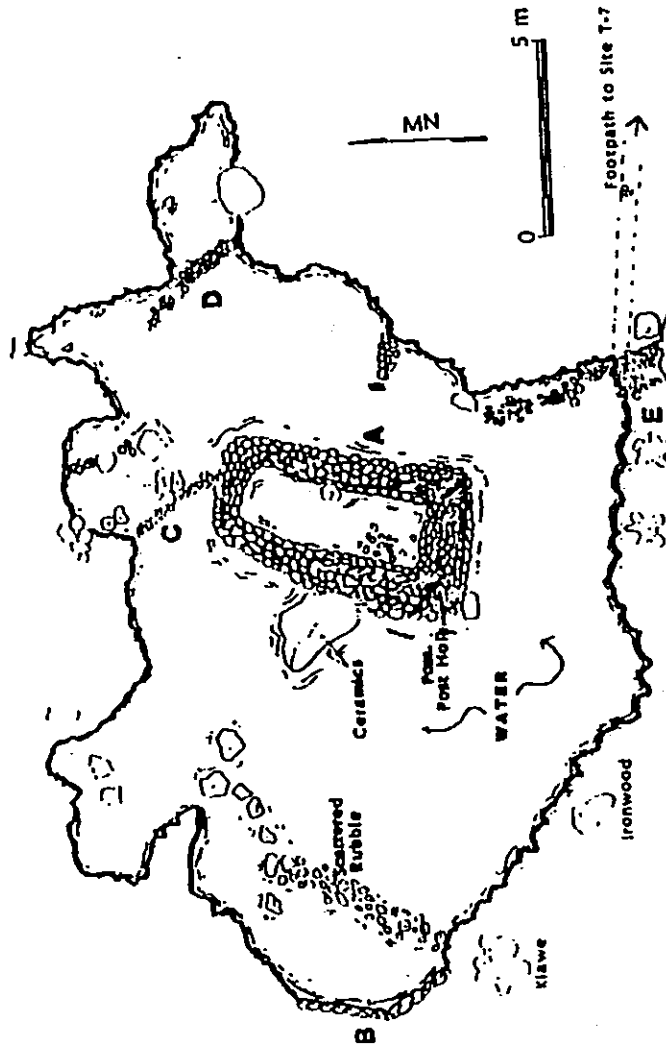


Figure 4. SITE T-5, FEATURES A-E

from the main pond by a now scattered rubble wall. Depth of this section is 0.05 to 0.1 m below the level of the main pond; it is 14.0 m long and 5.0 m wide.

Feature C is a narrow stacked stone wall which connects the northern shoreline with the northern end of Feature A. It is exposed during low tide, and almost completely submerged at high tide. The wall is 6.0 m long and 0.8 m wide, and is built in a more shallow section of the pond. A linear scatter of stone, which may represent the remnants of a bridge or walkway footing, occurs 2.0 m to the east of this wall.

Feature D is a 6.8 m long stacked wall which separates a small section of the pond along the eastern shoreline. The wall is 1.0 m wide and has an average height of 0.6 m. It is only partially submerged during high tide, and can be used as a walkway across the mouth of the small inlet. The section separated from the main pond by the wall is 8.0 m long and 4.0 m wide; it has not been deepened or cleared of loose surface ma

Feature E is a rubble filled bridge/dam that is located in a narrow channel which connects the Site T-5 and Site T-7 ponds. The filled chan nel section is 2.6 m long and 2.0 m wide, and is totally exposed during low tide. During high tide, the rubble is covered with c 0.10 m deep water, and does not completely stop the flow of water between the two ponds. A footpath leads directly to the rubble fill from the east, indi cating its use as a bridge.

A few historic ceramic sherds were observed in the pond, along the shoreline, and adjacent to the Feature A wall. These include a hand painted stoneware bowl sherd with cobalt designs under salt glaze, a salt glazed slip cast stoneware crock sherd, and an undecorated whiteware plate rim sherd. Other portable remains observed in the pond include beer bottle sherds, medicine bottle sherds, Patellidae (opihi) shells, and modern beverage cans. The ma surface around the entire perimeter of the pond has been crushed and leveled for a distance of 2.0 to 3.0 m back from the shoreline. A footpath surfaced with crushed ma (Site f 27) transects this site north-south, and connects it with Site T-7 and Opaeula Pond

T-6 Footpath

Site T-6 is a major branch of the coastal footpath between Makalawena and Awakee to the north. It enters Makalawena 250.0 m from the shoreline, and continues south from the border for a distance of 61 0 m, where it con nects with the east west path around Sites T 5, T 7, T 8, and T 10 The path is visible on the project area aerial photograph, and connects with another footpath, Site T-4, 58.0 m north of the Makalawena border

The path has an average width of 0.9 m and is surfaced with crushed and worn ma gravel A few waterworn basalt boulders were observed along the path, and a single piece of coral was observed along the side of the path. A few pieces of Cypraeidae shell fragments were observed on bedrock adjacent to the trail in one location along its course

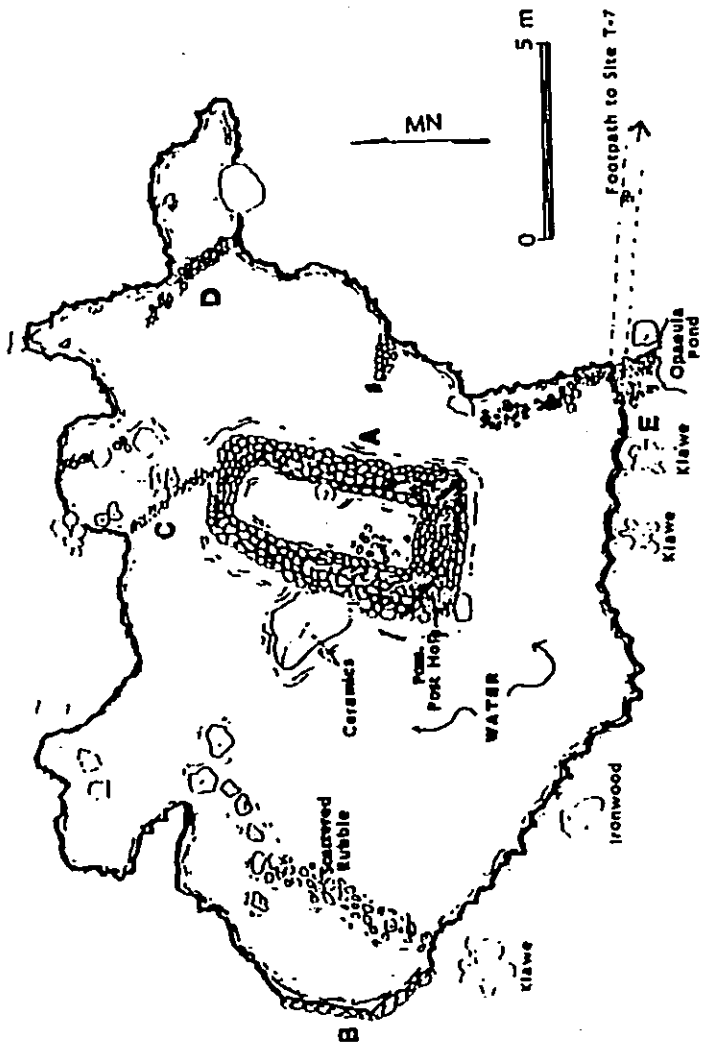


Figure 4. SITE T-5, FEATURES A-E

from the main pond by a now scattered rubble wall. Depth of this section is 0.05 to 0.1 m below the level of the main pond; it is 14.0 m long and 5.0 m wide.

Feature C is a narrow stacked stone wall which connects the northern shoreline with the northern end of Feature A. It is exposed during low tide, and almost completely submerged at high tide. The wall is 6.0 m long and 0.8 m wide, and is built in a more shallow section of the pond. A linear scatter of stone, which may represent the remnants of a bridge or walkway footing, occurs 2.0 m to the east of this wall.

Feature D is a 6.8 m long stacked wall which separates a small section of the pond along the eastern shoreline. The wall is 1.0 m wide and has an average height of 0.6 m. It is only partially submerged during high tide, and can be used as a walkway across the mouth of the small inlet. The section separated from the main pond by the wall is 8.0 m long and 4.0 m wide; it has not been deepened or cleared of loose surface as

Feature E is a rubble filled bridge/dam that is located in a narrow channel which connects the Site T-5 and Site T-7 ponds. The filled channel section is 2.6 m long and 2.0 m wide, and is totally exposed during low tide. During high tide, the rubble is covered with c. 0.10 m deep water, and does not completely stop the flow of water between the two ponds. A footpath leads directly to the rubble fill from the east, indicating its use as a bridge.

A few historic ceramic sherds were observed in the pond, along the shoreline, and adjacent to the Feature A wall. These include a hand painted stoneware bowl sherd with cobalt designs under salt glaze, a salt glazed slip cast stoneware crock sherd, and an undecorated whiteware plate rim sherd. Other portable remains observed in the pond include beer bottle sherds, medicine bottle sherds, Patellidae (*'opihi*) shells, and modern beverage cans. The aa surface around the entire perimeter of the pond has been crushed and leveled for a distance of 2.0 to 3.0 m back from the shoreline. A footpath surfaced with crushed aa (Site F 27) transects this site north-south, and connects it with Site T-7 and Opaeula Pond

T-6 Footpath

Site T-6 is a major branch of the coastal footpath between Makalawena and Awakee to the north. It enters Makalawena 250 0 m from the shoreline, and continues south from the border for a distance of 61 0 m, where it connects with the east west path around Sites T 5, T 7, T 8, and T 10 The path is visible on the project area aerial photograph, and connects with another footpath, Site T-4, 58.0 m north of the Makalawena border

The path has an average width of 0.9 m and is surfaced with crushed and worn aa gravel A few waterworn basalt boulders were observed along the path, and a single piece of coral was observed along the side of the path. A few pieces of Cypraeidae shell fragments were observed on bedrock adjacent to the trail in one location along its course

T-7 Complex

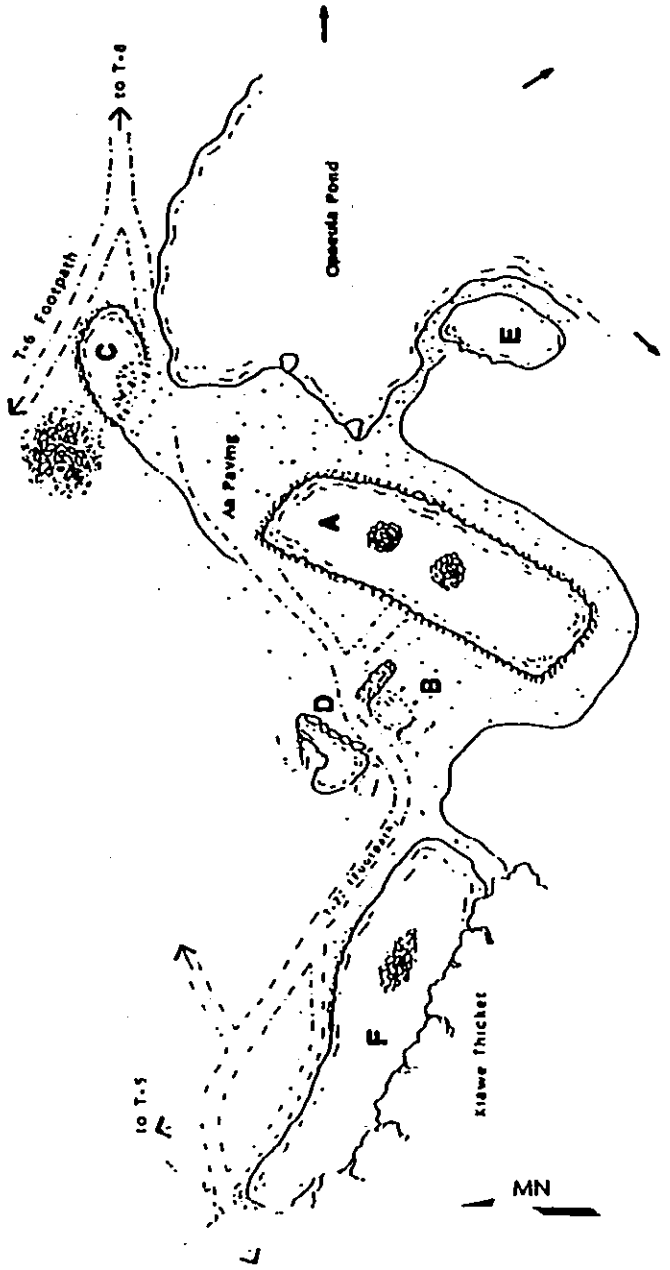
This large complex of modified anchialine ponds encompasses an area 58.0 m long and 36.5 m wide, and includes six ponds, two of which are relatively large (Figure 5). The complex is located directly to the north shore of Opaeula Pond, and is adjacent to Site T-5 to the west and Site T 8 to the east. These three complexes are essentially continuous, and were previously identified by Reinecke (Site 98) and Soehren (Site 5).

The principal feature at the site is a rectangular pond (Feature A) that has been completely enclosed with a faced retaining wall (Figure 6). The pond is 20.0 m long and 6.6 m wide, and has a very regular (artificial) shoreline. The retaining wall is constructed from aa slabs, and varies in height from 1.1 to 1.6 m. A single breach in the wall occurs at the northeastern corner, where the wall has fallen inward due to bank erosion.

Two large pier like rubble constructions occur in the center of the pond; these may have functioned as supports for a bridge, or are simply clearing piles. These piles are 2.0 m in diameter, and vary in present height from 0.9 to 0.57 m. They are 2.6 m apart and 2.25 m from the nearest shorelines (equal distance from east and west sides of pond). The pond has an average depth of 0.5 m at high tide, and has a limited amount of algae growth. The aa surface around the pond has been crushed and packed for a distance of 4.0 to 5.0 m back from the shoreline.

Feature B is a small depression in the aa that contains standing water only during high tide, when it averages 0.05 m deep. The northwest perimeter of the depression is defined by a naturally upthrust segment of aa 3.25 m long and 0.4 m wide. The southwestern portion of the depression is likewise defined by a natural aa upthrust 2.6 m long and 1.0 m wide. These two wall-like bedrock features are complemented by a bifacial stacked wall built along the eastern perimeter of the depression. The constructed wall abuts one outcrop and parallels the southwestern outcrop to form a C shaped structure around the depression. The constructed wall is 3.0 m long and 1.0 m wide, and has an average height of 0.75 m. The Site T 27 footpath from Site T 5 passes immediately around this feature to the north, and continues eastward around Feature A.

Feature C is located 11.0 m northeast from the northern edge of Feature A. It is an oval pond with a long axis of 7.2 m and short axis of 4.6 m. Three sides of the pond have been defined with a faced retaining wall similar to that constructed around Feature A. The ground surface around the pond is sloping, and height of the retaining wall varies from 1.45 m at the north end to 0.6 m at the south end. The south border of the pond is unwalled and a leveled, crushed aa surface provides access to the water. This pond is quite clear, and has a high tide depth of about 0.4 m, with the deepest portion against the retaining wall. A pile of small aa stones occurs adjacent to the pond on the northwest side. This pile is 6.0 m in diameter and 0.5 m high, and appears to be a result of pond clearing and deepening.



FEATURES A-F

Figure 5. SITE T-7,

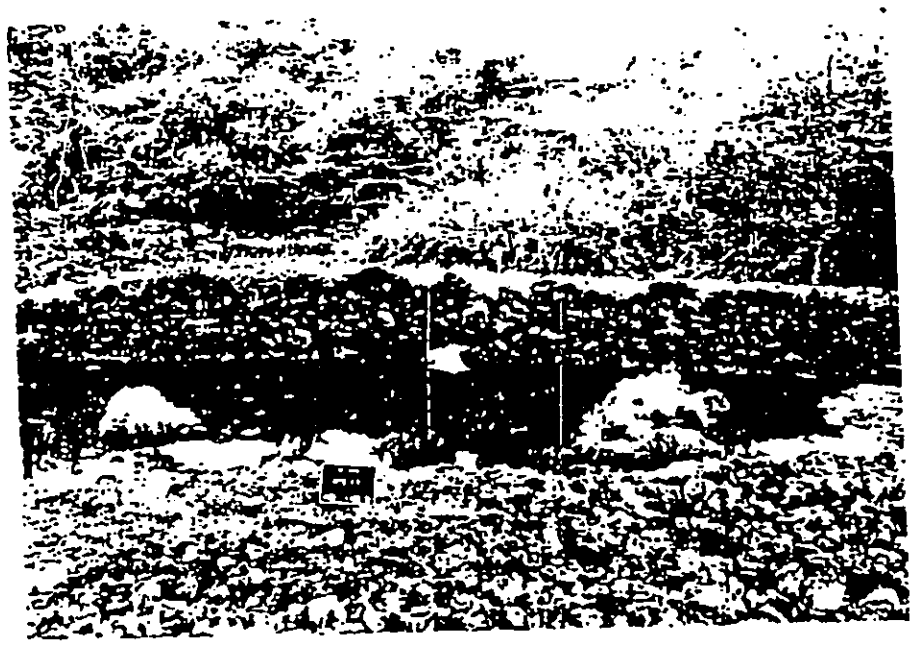


Figure 6 SITE T-7, FEATURE A, FACED RETAINING WALL. View to South. (PHRI neg.501-8)

Feature D is 2.0 m northeast from Feature B, and consists of a cleared and deepened pool that has been partially outlined with an alignment of large stones. The pool contains water only during high tide.

Feature E is a minimally modified pool located 9.0 m west of Feature A and a few meters east of Opaeula Pond. It has been cleared and deepened, but no other structural features are present. A path of crushed an connects this small pool (7.5 by 2.9 m) with Feature A.

Feature F is a linear pond, 24.8 m long and 3.0 to 6.2 m wide, oriented northwest-southeast. A 6.0 m section of the north shoreline has been built up with a faced retaining wall; all other sections of the shoreline appear to be natural. A single artificial island occurs in the center of the eastern portion of the pond. This island is constructed from stacked an boulders, and is irregular in shape and surface. It was inaccessible for measuring, but appears to be c. 4.0 m long and 1.0 m wide; it extends c. 0.5 m above the water level at high tide.

Portable remains observed at Site T-7 are limited to a few scattered fragments of Cypraeidae, Neritidae, and brackish water gastropods.

T-8 Complex

Site T-8 consists of a high-walled enclosure and two terraces situated directly on the northern shore of Opaeula Pond (Figure 7). The enclosure was previously recorded by Soehren (Site 8) and is part of Reinecke's Site 98 complex.

Feature A is described by Soehren as a goat pen (1963:39). It is constructed from large an boulders (primarily basal stones) and smaller cobbles, and is trapezoidal in plan view. Maximum interior wall length is along the south wall, which is 12.0 m long. The north wall is 11.0 m long, and the east and west walls have interior lengths of 9.6 and 7.2 m respectively. Wall width varies from 0.5 to 0.8 m, with some sections truncated at the base of the wall. Both sides are faced, but portions of the interior walls are uneven and slope outward toward the base. The southern sections of the wall have faced sides with cobble core fill, whereas the northern sections are of stacked slabs with no core fill. Exterior wall height is greater than interior height, and varies from 2.35 m along the west wall to 1.10 m at the south entrance gate. Interior wall heights vary from 1.6 m along the east wall, to 0.7 m along the west wall, where a section has fallen. The 0.8 m wide entrance faces south, and is within 5.0 m from the Opaeula Pond shoreline.

Feature B is a small terrace constructed of large basalt boulders and smaller cobble fill. It is located 6.0 m directly south from the entrance to Feature A, on a narrow land projection into Opaeula Pond. The pond shoreline is within 1.5 m from three sides of the terrace, which is oriented east-west, and is 3.0 m long and 1.0 m wide. The south side is raised 0.5 to 0.85 m above ground surface, and is outlined with a single course of large basalt boulders. The north side is essentially level with ground surface. No portable remains or soil deposit was observed on or near this terrace.

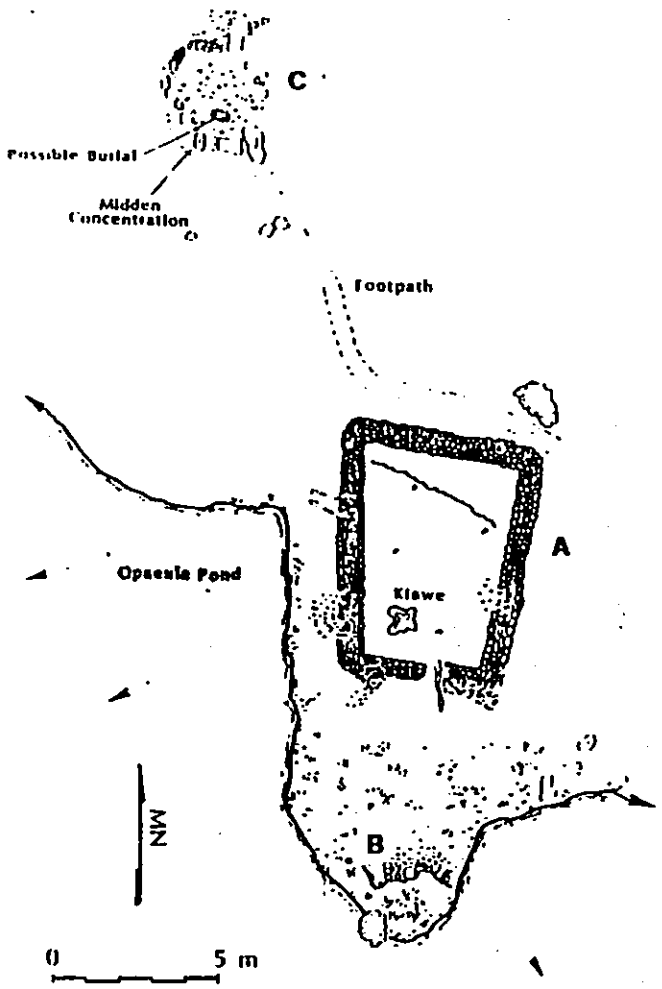


Figure 4. **SITE T-8, FEATURES A-C**

Feature C is located 9.0 m north from the enclosure. It is a roughly defined terrace, which may have been constructed as a platform, located on a raised section of an. The terrace is outlined with large an boulders, and is filled with an boulders and cobbles. It is generally square in plan (6.0 by 6.0 m), and varies in height from 0.2 to 1.22 m above ground surface. A small rectangular depression 0.5 by 0.3 m occurs in the south end of the terrace. The depression contains wooden plank fragments, a square nail, and bone fragments (ribs) that may be from a subadult human.

An area of surface midden occurs along and just off of the eastern edge of the Feature C terrace, with Cypraeidae, Neritidae, Patellidae, and Thaididae shell fragements present. Feature C is 385.0 m east from the currently identified boundary of the Makalawena cemetery, and appears to represent an isolated grave, rather than an extension of the cemetery

T-9 Makalawena Cemetery

The Makalawena cemetery was observed and briefly mentioned by Reinecke (Site 99), who offered no estimate of numbers or types of graves present (Ms:19). Unfortunately, Soehren's observations (Site 4) were made after the damaging 1946 tsunami, and no estimate of grave number was attempted (1963:38). At the time of his survey, Soehren observed a number of scattered bones and debris which he interpreted as grave covers or enclosures. This material included lumber and sheet iron roofing, which is still present at the site and visible in a number of grave depressions.

A minimum of seven burial features were identified during this study, some of which may contain two interments (Figure 8). These features occur within a 705.0 sq m area, which contains at least three additional possible grave locations and surface occurrences of human bone. As noted above, Site T-2 is within the boundaries of the cemetery, and may also contain a burial.

Site T-9 is situated in an, at the western edge of the coral beach, 122.0 m from the shoreline. A low, coral covered natural berm appears to define the western edge of the cemetery, and a single grave feature (F) is located on the berm. All other features are to the east of the berm

Feature A is a 1.6 m sq grave located near the center of the cemetery, adjacent to a large an upthrust. It is a low platform, outlined with large an boulders and filled with smaller an cobbles to form a level surface. A concentration of coral 1.0 m in diameter occurs in the north eastern corner of the grave.

Feature B is located 1.0 m to the west of Feature A, and the northern sides of both graves are aligned. This grave is a low rectangular platform (2.3 by 2.1 m), with the long axis oriented northeast to southwest. The center of this feature is depressed 0.55 m below the top of the perimeter stones. Partially buried lumber and corrugated metal sheet roofing is visible beneath a layer of jumbled an cobbles. The northern interior side of the perimeter alignment is faced, and it appears that the grave

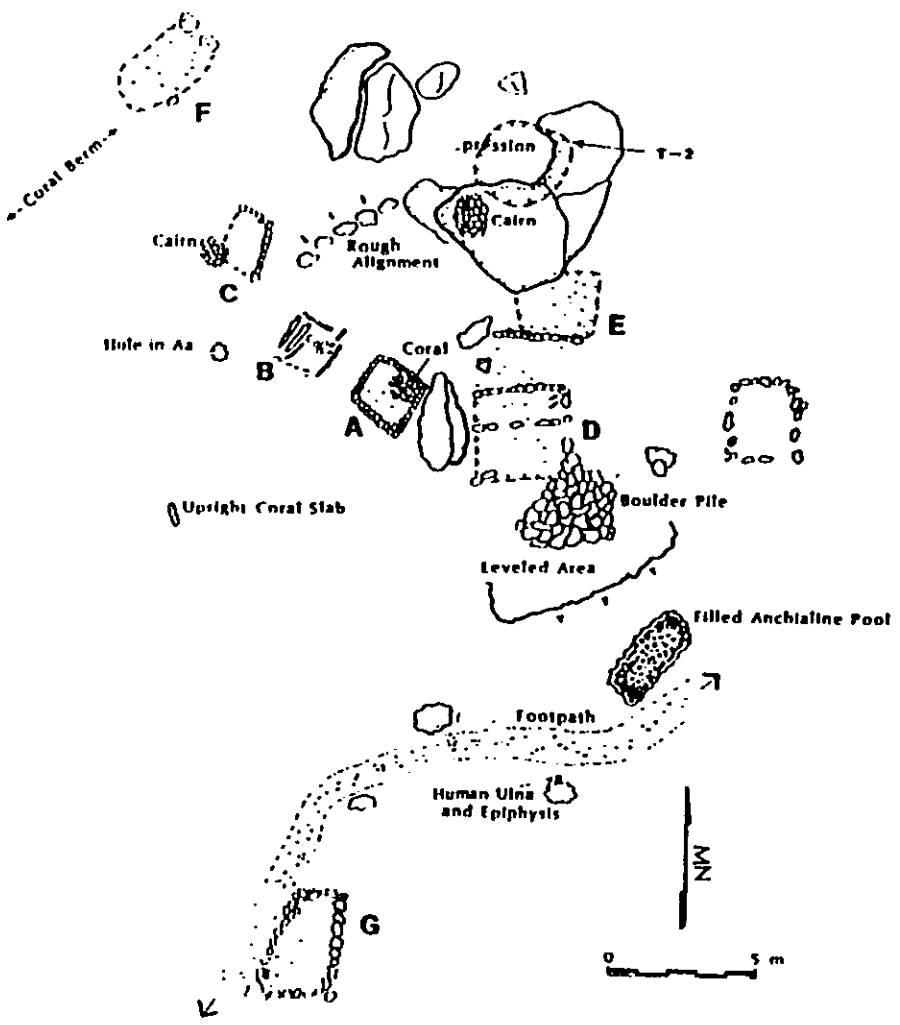


Figure 8. **SITE T-9, FEATURES A-G**

cyst was lined with stone for an indeterminate depth below ground surface. Depressed surfaces occur at additional burial features, suggesting that the common burial mode was excavation into the an, rather than construction of platforms over shallow graves.

Feature C is a low platform located 2.0 m northwest from Feature B. The southern side is aligned with the northern side of Feature B. The interior of Feature C is depressed 0.5 m, and wood fragments are visible among the loose aa cobbles. The north and eastern sides of the grave are outlined with larger boulders, and the western side is cut into the lower slope of the coral berm. Interior wall facings are observable to an indeterminate depth along the north and eastern walls. A small cairn 1.0 m wide at the base and 0.35 m high occurs at the southwestern corner of the grave. This cairn encases human skeletal remains, which were apparently collected from the surface and redeposited in the cairn.

Feature D is the largest of the identified graves; it is a low platform located 1.5 m east of Feature A, on the east side of the large aa outcrop. The grave is 3.2 sq m and probably contains two interments, since it is divided by a central east-west alignment of boulders. Most of the grave perimeter is defined with large boulders, and the surface is filled with small cobbles and pebble to cobble size coral. The northern half of the grave is depressed to 0.25 m below the top of the perimeter stones, and the southern half is depressed to 0.7 m below the perimeter. Partially buried wood is observable in the northern half of the grave. This feature is not aligned with Features A through C; however, it is aligned with Feature E, which is located 1.7 m to the north.

Feature E is situated at the base of the Site T-2 shelter outcrop, on the eastern (back) side. It consists of a 2.5 by 3.0 m depression in an that is defined on the south side and at the corners with larger aa boulders. The long axis of the feature is oriented east west. Immediately to the south, between Features E and D, is a rectangular area (3.0 by 2.0 m) of leveled aa, which may represent an additional grave. This area is defined on the north and south sides by perimeter stones of Features D and E, and has a single large boulder along the western side.

Feature F is located at the northwestern end of the cemetery, on the low coral covered berm. The nearest adjacent identified grave is Feature C, located 4.5 m to the southeast. Feature F is a rectangular depression 3.5 m long and 2.0 m wide, oriented with the major axis of the berm. It is defined along the north side by two large boulders, and along other sides by a few boulders that are still in place. This grave is more severely disturbed than the other features.

Feature G is a low platform located at the far southern end of the cemetery, 15.0 m south from Feature D. It is adjacent to a footpath from the beach, and appears to have been somewhat affected by pedestrian traffic. The south and east sides of the feature are straight, whereas the north and west sides are curved to conform with the footpath. Major axis is 3.5 m long and is oriented north south. The south side is 2.5 m long and the north side is 1.5 m long. The entire grave is defined with

large as boulders and it is filled with smaller cobbles and coral. The surface of this feature is mounded rather than depressed, and it appears to have escaped some of the strong wave damage exhibited in the northern portion of the cemetery.

It is likely that additional graves occur between Feature G and the remaining features; however, surface indications of such are not evident. A few weathered pieces of human bone were observed in the area between these features, and additional areas of leveled aa are present.

T-10 Complex

Seven features were identified within this complex, which is located between the cemetery (Site T-9) and the pond complex (Site T-5). This site appears to have been previously identified by Soehren (Site 5) and Reinecke (Site 98). Feature A is a small cairn located at the crest of an aa ridge, along the coastal footpath (Site T-6) which transects the complex north south. The cairn is 1.0 m in diameter at the base and 0.75 m high.

Feature B is a linear anchialine pond, 20.0 m long, that has a variable width of 1.7 to 8.0 m. The pond has no faced walls; however, all surrounding banks have been leveled with packed aa gravel. A crushed aa footpath 1.4 m wide parallels the pond along the east side, 3.0 m from the shoreline. Along the west side of the pond, a filled and leveled aa surface occurs on which is located a platform-like area of raised aa fill 3.5 m long and 2.5 m wide. This pond is 20.0 m south of the Feature A cairn

Feature C is the poorly defined remnants of a shelter or wall, located on the crest of a linear aa rise between Feature B and the Site T-3 pond (15.0 m east of Feature A). The feature consists of a jumbled pile of boulders, 1.5 m east-west by 1.3 m north-south, and 0.64 to 0.55 m high. A cleared area 2.0 by 1.5 m occurs adjacent to the remnant to the east side. This area appears to have been the interior space of some type of structure. Five meters to the west of Feature C is a second pile of boulders (Feature D) which appears to be remnants of the same structure. This pile is 1.0 by 0.8 m at the base and 0.55 m high. These two rubble piles are c. 4.0 m above the water level in the Feature B pond.

Feature E is a stone lined excavation in aa, located 13.7 m east (145 degrees Az) from Feature A. The excavation is roughly circular in plan (1 4 by 1.2 m) and 0.9 m deep. It is situated against a bedrock outcrop, and appears to represent a cupboard or storage feature. A similar storage facility (Feature F) occurs against the same bedrock outcrop, along the west side This latter feature is under a small overhang with a ceiling height of 0.9 m. It has an interior space 1.7 m long (north south) and 1 2 m wide This cupboard is defined by both excavated aa and small walls around the edges of the overhang dripline. The walls open to the north and are 0 75 m high.

Features E and F occur in association with a leveled aa surface, 2.0 by 2.8 m, that is situated on the south side of the bedrock outcrop which forms the cupboards. No portable remains were observed on this surface or in the two cupboards.

Feature G is a long, narrow pond with the major axis (55.0 m) oriented east-west. No major modifications were observed around the pond; however, some leveling with small aa pebbles occurs around the shoreline. Two cleared and deepened areas occur within the pond, and footpaths encircle the perimeter. Portable remains around the pond are limited to Patellidae shells and a panel bottle base.

T-11 Residential Complex

This site is located along the south shore of Opaeula Pond, 76.0 m from the coastline. It covers a 625.0 sq m area along a low paleodune ridge, just east of the inland extent of the sand beach. Eight features have been identified at this complex, which represents the best preserved and most complicated habitation site located within the project area (Figure 9).

Feature A is the central terrace, and probably represents the main house location at the site. This structure is faced along the north and west walls; the north wall forms the long axis, which is 4.5 m, and the west wall is 3.2 m long. A number of larger basalt boulders from the walls have been washed onto the terrace surface, which is paved with small waterworn pebbles ('ili'ili). The north terrace wall is disturbed, but is still the highest wall of the feature, with an average height of 0.5 m. Directly to the north of this wall is a natural slope that has been terraced with two narrow stepped terraces, and filled at the base with larger rock rubble. The rubble fill at the base of the slope extends to the shoreline of a small walled pond (Feature C). The top of the Feature A terrace surface is c. 1.5 m above the surface of the walled pond. The southern side of Feature A consists of rock fill that is outlined with an alignment of larger boulders. This alignment is somewhat irregular in shape and does not conform strictly with the rectangular shape of the front walls of the terrace.

Feature B is a nearly square terrace, located 4.5 m west of Feature A, at a slightly higher elevation. The east west axis of the terrace is 4.8 m, and north south axes vary from 5.3 m along the west side to 4.0 m along the east side. The terrace is outlined with a partially buried, faced wall of basalt boulders and cobbles along the south side, and aligned surface stones along the north side. The north and east sides of the terrace have been disturbed, as has the general surface of the feature. Relatively large stones were apparently used as terrace fill, and the surface is scattered with cobble to pebble size pieces of coral Small waterworn pebbles occur under a surface layer of larger boulders, which are probably storm deposited.

Feature C is a small modified pond located at the base of the terraced north facing slope of the site The south shore of the pond varies from

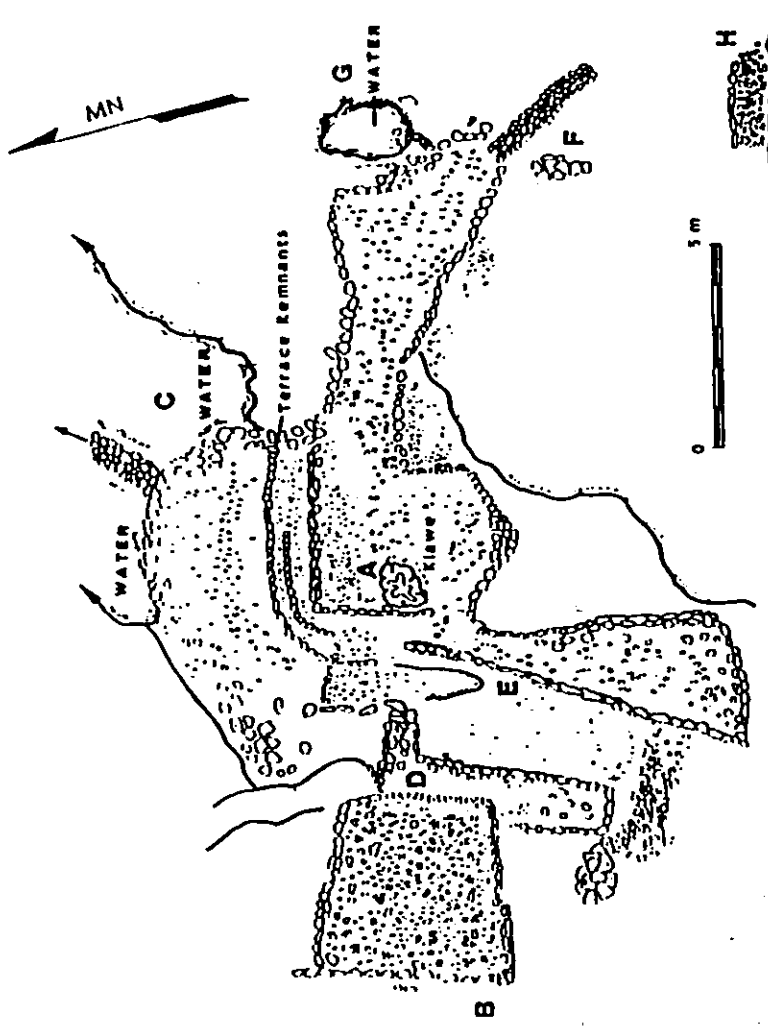


Figure 9. SITE T-11, FEATURES A-H

2.0 to 4.0 m north from Feature A. The southern shoreline of the pond has been walled, and a free-standing wall of stacked boulders occurs down the center of the pond, from southwest to northeast shore. The wall remains exposed during high tide, and has an average width of 0.9 m.

Feature B is a partially buried wall remnant located under the south eastern corner of Feature B. It is the most substantial wall remnant on the site, and it appears to be associated with a prior structure. It is oriented northeast-southwest (25 degrees Az) and is L shaped, with the corner and extension at the northern end of the wall. The main section of the wall is 6.2 m long, 1.2 to 1.5 m wide, and has an average height of 0.44 m. Both sides are faced, and construction is stacked rather than core filled. The extension is less substantial and appears to have been disturbed; it is currently 2.5 m long and 1.0 m wide.

A second wall remnant occurs immediately south of Feature D, oriented east-west (305 degrees Az). This wall is within 0.4 m from Feature D, and is similarly constructed, with an average width of 1.4 m. Current length is 3.6 m. The eastern portion of the wall may be either buried or disturbed by the Feature E alignment, which appears to be a later addition.

Feature E is a surface alignment of basalt boulders which defines the southern extent of rock fill to the south of Feature A. The western side of the alignment is 9.2 m long and straight, oriented 30 degrees Az. Other sections of the alignment are curved and oriented at various angles, forming a rather irregularly shaped area of fill. Major portions of the alignment are partially buried in soil, and may actually represent the top of a low wall. The alignment is a single stone wide (0.2 to 0.3 m).

Feature F is a free-standing wall, located 9.0 m southeast from the eastern corner of Feature A. The wall is bifacial and oriented northwest southeast (330 degrees Az). It is 3.8 m long and 0.5 to 0.6 m wide, with a varied height of 0.4 to 0.6 m. The wall is located at the southeastern end of the filled area, and it may represent the remnant of a former enclosure wall.

Feature G is a small modified pool located 8.0 m east from Feature A. The pool has a surface area of 3.20 sq m, and apparently contains water during low tide. It has been cleared and deepened, and a small rubble platform is located at the southern shore.

Feature H is a third nearby modified pond and associated wall remnant, located 4.0 m south from Feature F. The wall is in extremely poor condition, with a 3.0 m section only partially intact. Wall fall extends from this segment to the shoreline of the pond, 1.0 m to the south.

Historic artifacts observed on the site surface include ceramics, bottle glass, and saw cut marine shell. The ceramic and bottle glass sherds indicate a period of manufacture between 1880 and 1920. They include a banded whiteware cup sherd (not annular ware), a machine molded bottle neck with hand applied lip, a whiteware plate rim sherd, and a stoneware vessel body sherd. The cut shell tool (scraper or small hoe?) is made from an extremely large Pinctada margaritifera (pearl shell) valve.

Subsistence remains present on the site consist of fish bone and shell fragments. Shellfish families observed include Cypraeidae, Isognomonidae, and Neritidae.

At least two, and possibly three, construction phases appear to be present at Site T-11. Artifacts observed during survey suggest that the site was not occupied after c. 1930. This interpretation is tentative and subject to change with the acquisition of additional data. Due to its relatively good preservation and the possible absence of a late twentieth century component, this site has significant research value.

T-12 Complex

Site T 12 is located at the eastern edge of the sand beach, at the base of a pahoehoe ridge, 45.7 m south from Site T-11. It is in an extremely eroded condition, and the three features recorded are partial. Feature A consists of a concentration of structural boulders and small waterworn pebbles ('ili'ili), with intermixed shell midden. These materials occur within the roots of two adjacent overturned kiawe trees, which have preserved what appears to be the portion of a platform. Feature A is 2.3 m north south by 2.2 m east-west, and has a height of 0.7 m. Adjacent to Feature A, to the south, is an oval depression that has been ground into the smooth pahoehoe bedrock. This depression is 0.13 m deep, and has a major axis of 0.45 m. Minor axis is 0.35 m.

Feature B is a thin pad of soft mortar, positioned on a bed of loose pahoehoe cobbles and bedrock. It is located 6.0 m west from Feature A, and is incomplete, with the mortar in an advanced state of decomposition. The mortar is 3.0 cm thick and has a white, sandy matrix. The pad is roughly rectangular, with a long axis of 6.0 m and a short axis of 3.8 m (north south). The surface of the pad is not level, suggesting that it was a substructural feature rather than an interior structural floor.

Feature C is a 1.4 m long, 0.9 m wide crack that has been filled with waterworn basalt cobbles and boulders, and weathered and unweathered coral. This feature is located 17.5 m south from Feature A, and is beyond the level, sand covered area where the two former features occur. The surface of the fill is currently 0.5 m below the surface of the adjacent bedrock, and bottom depth of the crevice is not determinable. This feature may represent either storm wave deposited material or a possible burial.

A rather large (c. 4.0 m in diameter) concentration of modern bottle glass (one gallon bottles) occurs on the site, 3.0 m south from Feature A. This deposit and additional modern refuse does not appear to be functionally related with the Features. Other portable remains include Cypraeidae and Patellidae shellfish remains, and unweathered branch coral.

This historic site could not be definitely correlated with sites described by Reinecke or Soehren. It is the only structural remains in the vicinity of the "row of houses" described by Reinecke (Ms-19).

T-13 Kaikalaia Church and School

The Kaikalaia (Kalawina) Church site is situated on property that is currently under the jurisdiction of the Church of Christ, and will not be directly impacted by the Makalawena Coastal Development unless the property is sold to Bishop Estate. This church site was recorded as Site 9 by Soehren, who reported that the church superstructure had been dismantled and moved to Kaloa (1983:39). Springer details this removal in Appendix B. The site is situated on a level pahoehoe rise along the seaward portion of the Makalawena-Akahipu'u Trail, 106.0 m from the sand beach. Three major features were recorded, including the main structure foundation terrace, a mortared crypt foundation, and a well (Figure 10).

Feature A is a faced terrace located along the western slope of the pahoehoe rise. The west and south walls of the terrace are raised an average of 0.53 m above the bedrock slope in order to level the surface of the feature with the eastern side, which is at ground level. The walls are of stacked and faced pahoehoe chunks, and the terrace surface is filled with smaller pahoehoe cobbles. Major axis of the feature is oriented north south, and the western wall is 5.5 m long. Width of the filled area varies from 3.2 to 4.5 m, depending upon bedrock surface. A light scattering of small waterworn pebbles occurs adjacent to the terrace to the north; these pebbles probably represent a former pathway to the front door.

A 1909 photograph of the Kaikalaia Church, with about 100 parishioners standing on the south side, is reproduced here in Appendix B (Figure 29). The photo depicts a frame structure with north facade, a small portico, and a pyramidal steeple on a short, squarish tower. There are two windows on the east side, each with six upper lights and six lower lights. The roof is corrugated sheet metal, and the portico is supported by square posts.

Feature B is a rectangular structure foundation, constructed from pahoehoe chunks and mortar (Figure 11). It is located 4.5 m northeast from Feature A, at the northern edge of the level area of the rise. Major axis of the foundation is oriented east-west, with the access at the western end. The foundation is 4.5 m long and 3.5 m wide; walls are 0.8 to 1.0 m wide, and the opening in the west wall is 1.0 m wide. Exterior wall height varies from 0.4 m at the southwest corner to 0.71 m at the northwest corner (six courses of stone). Interior wall height varies from 0.09 m at the west end to 0.99 m at the east end. Original floor depth was probably slightly above present floor depth. The eastern portion of the interior has been filled with rubble in order to better level the floor surface.

The impressions of 4 inch milled boards are clearly distinguishable in the surface mortar of the foundation. Two boards 3.5 m long were positioned along each long wall, and a single board 2.2 m long was positioned along the east wall. The impressions from the boards are an average depth of 6.0 cm into the mortar.

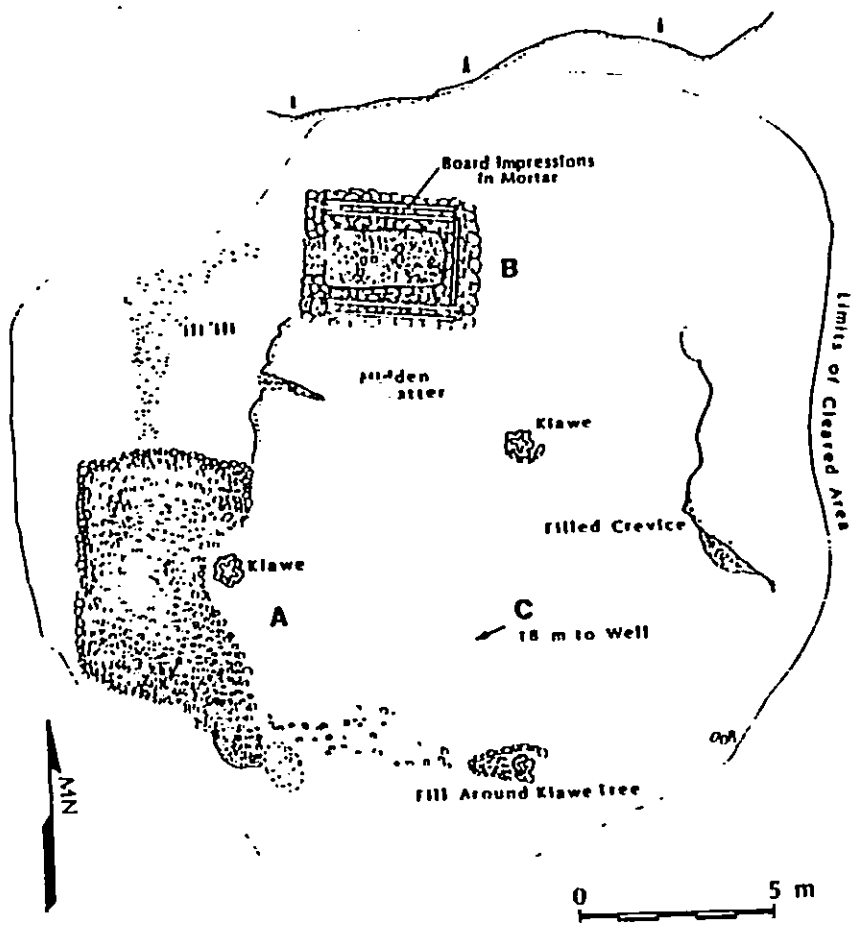


Figure 10. **SITE T-13, FEATURES A-C**

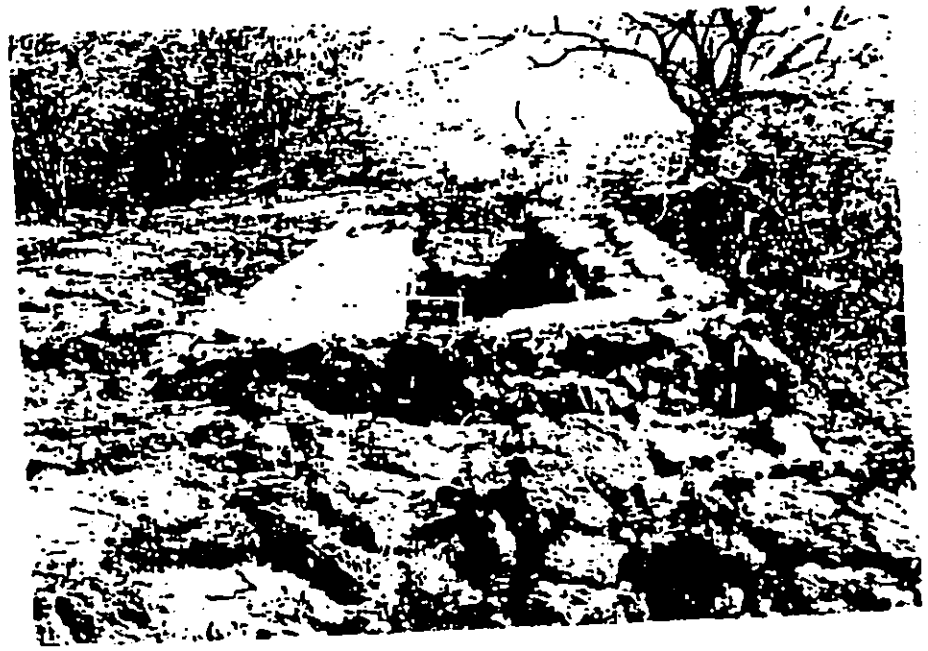


Figure 11. SITE T-13, FEATURE B. View to northwest (PHRI Neg.501-19)

Feature C is a freshwater well, located 18.0 m west (300 degress Az) from the center of the main church site. The well is located in a small natural overhang formed in a deep crevice, at the base of the pahoehoe rise. The overhang opening is nearly vertical, with a major axis of 1.6 m and minor axis of 1.5 m. Water level in the feature was 1.32 m below ground surface and 0.43 m deep at the time of survey. A portion of the crevice has been filled with rubble in order to aid access to the water. Plumbing pipes, pump parts, wooden planks, and enamelware pans are scattered around the well.

The site of the church has been maintained by its membership who, according to the current Bishop Estate caretaker, hold annual meetings at the site. An area of 530.0 sq m on the crest of the rise is kept cleared of underbrush and small trees, and several small crevices on the rise have been filled with rubble. Shellfish fragments representing Conidae, Cypraeidae, Isognomonidae, and Neritidae are scattered on the surface, in addition to small pieces of flat glass, slate, and small waterworn pebbles. A single square nail and a small piece of cut pearl shell were also noted.

T-14 Complex

This site correlates with features of Reinecke's Site 97, which includes all sites in and around the "hamlet" of Nakalawena. Feature A of this site may correlate with Soehren's Site 3, which he describes as "the barely discernable remains of an old house foundation" (1963:37). It also includes the remnants of the former caretaker's residence (Feature B), the latter frame structure is still standing, as are a number of other features within the Site T-14 limits. The site includes an intensively used yard area associated with the current caretaker's residence, which is located directly across the jeep road to the north, situated on a low pahoehoe ridge bordering the sand beach.

Feature A is a foundation remnant of pahoehoe boulders and an associated terrace, situated along the south-facing upper slope of the pahoehoe ridge. The 6.5 m long wall consists of a single row of blocky boulders; stones are stacked two courses high in places, and remnants of corners are discernable. The feature is extremely disturbed by a large kiawe tree. A scattering of 'ili'ili paving occurs to the north of the alignment, and organic sandy soil deposits occur in bedrock crevices downslope to the south.

Feature B is located c. 35.0 m to the northeast, on the north facing extension of the ridge. It is a two room board and batten frame structure with a narrow front porch along the west side. The facade is 8.7 m (28.5 ft) long and sides are 4.3 m (14 ft). The main structure is supported by eleven posts (nine boards, 4 by 4 in, and two round sapling posts) that are positioned on pahoehoe block piers. The larger room is 4.7 by 4.25 m (15.5 by 14.0 ft), with windows on the west and south sides, and the front doorway at the northwest corner. The second room is to the north of the main room, and is accessed through a 0.76 m (2.5 ft) wide interior doorway. This room is is 3.95 by 4.25 m (13 by 14 ft), with

windows on the north and east sides. The porch is 1.67 m (5.5 ft) wide, and spans the facade of the structure. Interior and exterior walls are of 1 by 10 inch boards and 1/2 by 2 inch battens. The floor is completely absent inside the structure, and a small portion of tongue and groove flooring is present at the northern end of the porch. The corrugated sheet metal roof is still intact, and the structure is currently used as a shelter for chickens; it was used as a goat shelter during the past caretaker's residency.

The Feature B structure is located on a natural pahoehoe rise that has been artificially terraced on the north and east sides. The east face of the terrace is 4.5 m east from the back of the building, and is defined by a 0.9 m high retaining wall. The north face of the terrace is stepped, with three levels of retaining walls and rock fill.

Feature C is a well, located in a small deep sinkhole at the base of the southern slope of the pahoehoe ridge, 8.0 m east from Feature A. The well is a natural feature with no side wall construction or facing. At the time of survey, water was 0.9 m deep in the pool, which is c. 2.0 m in diameter. A wooden platform, hand crank pump, hoses, and wooden bathtub are located immediately above the well, which is used by the current caretaker.

Feature D is a recently abandoned privy which has a pahoehoe boulder foundation and wooden superstructure. The foundation is situated over a bedrock crevice at the base of the eastern slope of the pahoehoe ridge, 10.0 m east from Feature C. Remnants of an additional privy foundation are nearby.

Additional dependencies are present on the site, including a small shack of corrugated tin and a frame animal shed, probably for chickens. A wire fence goat pen that was used by the former caretaker is also extant.

The entire site is littered with recent and historic debris, with concentrations around the base of the ridge in crevices and shallow sinkholes. Nineteenth and early twentieth century artifacts were observed in association with Feature A, and probably occur below recent refuse deposits at the base of the ridge. Items observed on the surface near the foundation alignment include a brown bottle neck sherd with hand applied lip, stoneware sherds, cut marine (pearl) shell, and a whiteware bowl base of indeterminate age. Shellfish remains (Cypraeidae, Isognomonidae, Patellidae) were also observed near Feature A.

T-15 C-Shape Wall

This feature is located over a small collapsed pahoehoe blister, 123.0 m inland from the shoreline and 69.0 m from the edge of the beach. It consists of a crudely stacked and faced wall, two to three courses high (0.55 m), which outlines the western half of the blister opening (1.6 by 1.2 m). Recently deposited tissue paper is littered on the interior of the wall, which has been used as a privy. No other portable remains were observed.

T-16 Walled Pond

Site T 16 is located 76.0 m inland from the northern edge of the sand dune, at the sand beach/pahoehoe interface, where pockets of aa lava also occur. It was previously described by Reinecke (Site 97) and Soehren (Site 2), who provided measurements consistent with those given here (1963:37). The pond is rectangular to oval in shape, with the long axis (12.4 m) oriented north-south (14 degrees Az). The northern end is rounded and has an internal width of 2.0 to 3.3 m. The southern end is straight with corners and has an internal width of 4.6 m.

The perimeter wall is constructed from large aa boulders stacked two to three courses high, and topped with smaller aa and basalt cobbles to a variable height of 0.55 to 1.25 m. Wall height is greatest at the south end. The top of the wall is leveled with the surrounding ground surface, which has been paved with crushed aa gravel.

T-17 Complex

A large, high walled enclosure and three modified anchialine pools are included in this complex. It is located on a pahoehoe and aa area, just inland of the sand dune. The enclosure was previously recorded by Soehren (Site 1), who interpreted it as a "large pen, probably for goats" (1963: 37). At the time of Soehren's survey, sand had encroached into the enclosure, and the dune had almost reached the base of the western wall. No significant change in sand deposition has occurred since the time of Soehren's survey. This site was also previously identified by Reinecke (Site 97).

Feature A is a rectangular enclosure located in a natural depression at the western edge of a pahoehoe outcrop. It is constructed of very large to large aa boulders, and incorporates sections of natural pahoehoe and aa bedrock into the walls. The walls are of varying lengths, giving the structure an irregular plan. The longest wall is along the east side, and measures 17.2 m along the interior. Interior lengths of the other walls are 15.2 m (north), 14.1 m (west), and 13.1 m (south). The corners of the enclosure are slightly rounded or obtuse, and sections of the walls are bowed and fallen, due primarily to kiawe tree incursion.

Wall height is consistantly greater on the interior side than on the exterior. Interior height varies from 2.3 m at the southwest corner to 1.6 m at the entrance gate, which is located at the western end of the north wall. Exterior wall height varies from 2.0 m at the center of the north wall to 1.3 m at the southwest corner. The east wall has greatest average width, which is 1.9 m. Other wall widths vary from 0.9 to 1.4 m.

The sand deposit inside the enclosure is darkened from organic material and is up to 0.1 m deep in crevices. Sand occurs mainly in the western half, which is lower and has less prominent pahoehoe outcropping than the eastern half. No portable remains other than recent refuse were observed inside the enclosure.

Features B, C, and D are modified anchialine pools located southeast from the enclosure. The water in the three features is clear, cool, and contains no plant growth. The features are interconnected by a footpath which consists of crushed and leveled aa gravel. Feature B is located 15.2 m from the northeast corner of the enclosure, at 125 degrees Az. It is a cleared and deepened pool, with low tide dimensions of 1.57 by 0.95 m and high tide dimensions of 2.43 by 1.65 m. Aa boulders, apparently removed from the pool, are stacked on three sides to a maximum height of 0.72 m above the base of the pool. Low tide water level is 0.24 m.

Feature C is located 13.5 m southeast (158 degrees Az) from Feature B. It consists of a cleared and deepened pond which has stones piled around the perimeter in no particular stuctural form. Low tide dimensions are 4.5 by 1.7 m; high tide dimensions are 5.2 by 2.5 m. Two smaller areas within the pond have been deepened to 0.8 m below normal pond base. These two areas are 1.15 by 0.7 m and 0.93 by 0.7 m respectively, and have an average low tide water depth of 0.75 m.

Feature D is the largest and most extensively modified of the three features. It is located 17.3 m southeast (130 degrees Az) of Feature C. Maximum length of the pond at low tide is 5.5 m; high tide length is 6.7 m. Width is constant at 2.6 m, and is defined by vertical bedrock shelves that have been cleared of aa pebbles. Two cleared and deepened sections occur at the north and south ends of the pond. The northern cleared area is 1.05 by 0.7 m, and has an average water level of 0.7 m. The southern section is 1.03 by 0.37 m, and has an average water level of 0.64 m.

T-18 Complex

Site T-18 has been correlated with a feature of Soehren's Site 3, which also includes Site T-14. Site 3 is described as follows:

> The line of ironwood trees marking the western boundary of the abandoned school site is continued by a stone fence running south to the summit of another pahoehoe knoll, on which are traces of a destroyed house site. This site is about 200' east of the frame house (1963:38).

Structural remains present at Site T-18 (Figure 12) do not provide unquestionable evidence of a residency; however, it is possible that features were more intact at the time of Soehren's survey. The stone fence described by Soehren is partially intact along the pahoehoe slope, and almost totally buried in sand along the lower section where it meets the ironwood trees. This site was also previously recorded as Reinecke's Site 97.

Feature A is a bifacial, core filled wall that was apparently interpreted by Soehren as a foundation. It is oriented east west (77 degrees Az), along the north facing edge of the pahoehoe slope. A shallow sink hole 1.1 m deep occurs at the base of this slope. The wall is 4.2 m long

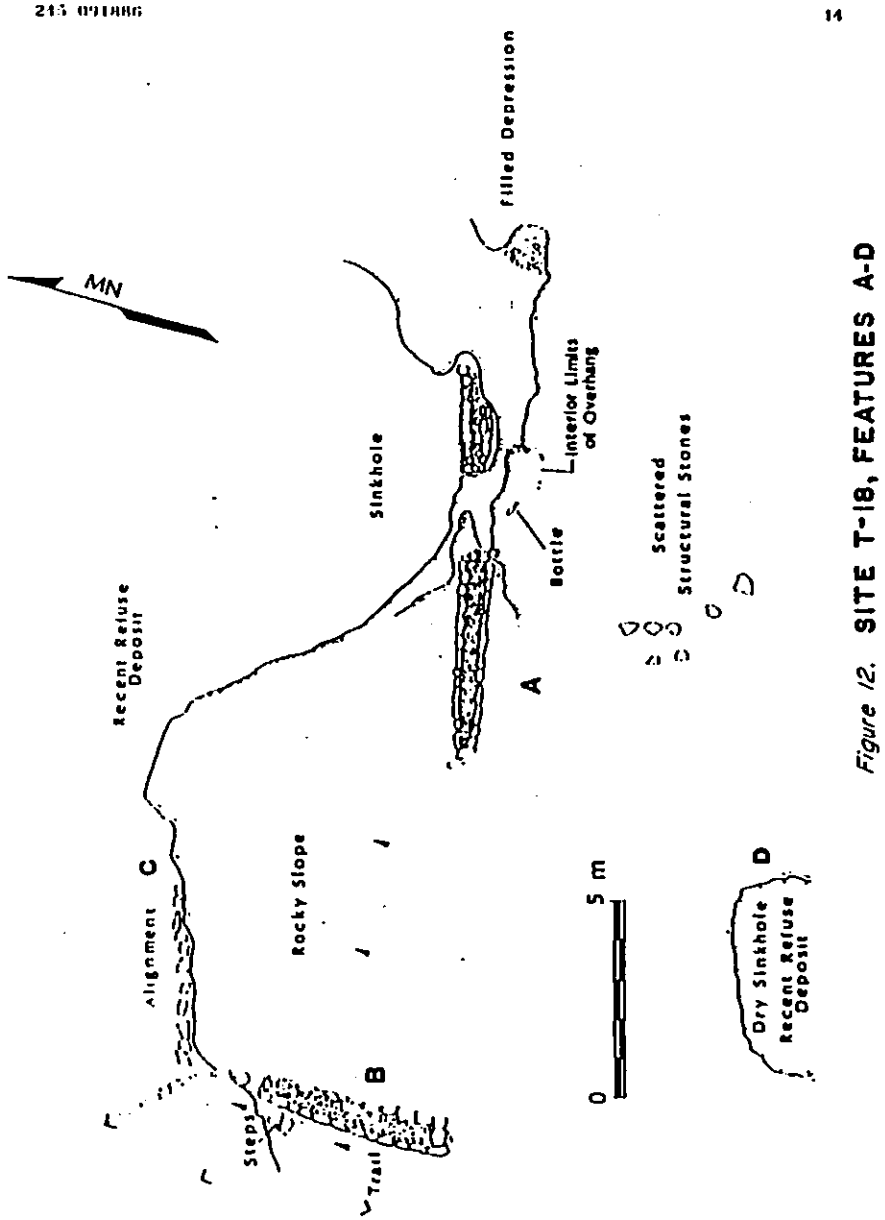


Figure 12. SITE T-18, FEATURES A-D

and 0.8 m wide, with an average height of 0.55 m. There are no indications of connecting perpendicular or parallel walls associated with this feature. A second wall section directly aligned with the main wall section occurs along the lower slope, on a small natural terrace. This section is 2.7 m long and 2.0 m east from the main section. The two walls are separated by exposed bedrock, and may have been originally connected with an alignment. The tops of these walls vary in elevation by c. 0.6 m.

A small overhang occurs along the ridge slope, in the area between the two wall sections. This small shelter is 3.0 m long, 1.0 m wide, and has a ceiling height of 0.45 m. A shallow soil deposit was observed in the overhang, as well as a twentieth century beverage bottle. A coffee bean shaped octopus lure sinker was located just outside the entrance to the overhang. This artifact had been reused as a hammerstone and as a small anvil; it is further described below.

Feature B is a bifacial core filled wall located 9.2 m west from feature A. This wall is oriented north-south (360 degrees Az), and defines the eastern side of the trail which connects the beach with the Kalawina Church and the Hakalawena-Akahipu'u Trail. The intact section of the wall is 5.2 m long and 0.6 to 1.0 m wide. Two courses of stone are present (0.4 m) and represent the base of the wall. The northern end is abutted with kerbstones which appear to have been more recently positioned. These stones direct the trail to the northwest, away from its original course as indicated by the sand covered wall remants on the beach.

A second stone alignment (Feature C) extends east west from the trail kerbstones, at the foot of the pahoehoe slope. The alignment is 4.7 m long and constructed from waterworn basalt boulders. The area immediately adjacent to the alignment is covered with a heavy deposit of recent refuse, and it is uncertain whether there are additional alignments or other associated features in this area of the site.

Feature D is a dry sinkhole located 8.0 m south from Feature A. It has an average depth of 0.9 m below ground surface and is circular in plan, with a diameter of 4.8 m. This natural feature has been utilized as a refuse pit; it contains an assortment of household artifacts, primarily kitchen equipment and dishes. The artifacts are of middle twentieth century manufacture, and are probably associated with the period of the former caretaker's residency, rather than with occupation of Site T-18.

T-19 Overhang Shelter

This isolated shelter site is located 320.0 m inland from the coast, in an area of disturbed pahoehoe. The nearest located site (T-17) is 229.0 m to the north. The overhang is situated on the northwest side of a pahoehoe rise, and has an opening 3.6 m long which overlooks a shallow sinkhole. Maximum depth of the overhang is 3.3 m and maximum ceiling height is 1.7 m. Ceiling height at dripline varies from 1.7 to 0.8 m. A crudely stacked wall of ceiling collapse occurs along the dripline and partially blocks the entrance. The rubble wall is 2.7 m long, and ranges in width from 1.7 to 1.0 m; height is 0.8 m.

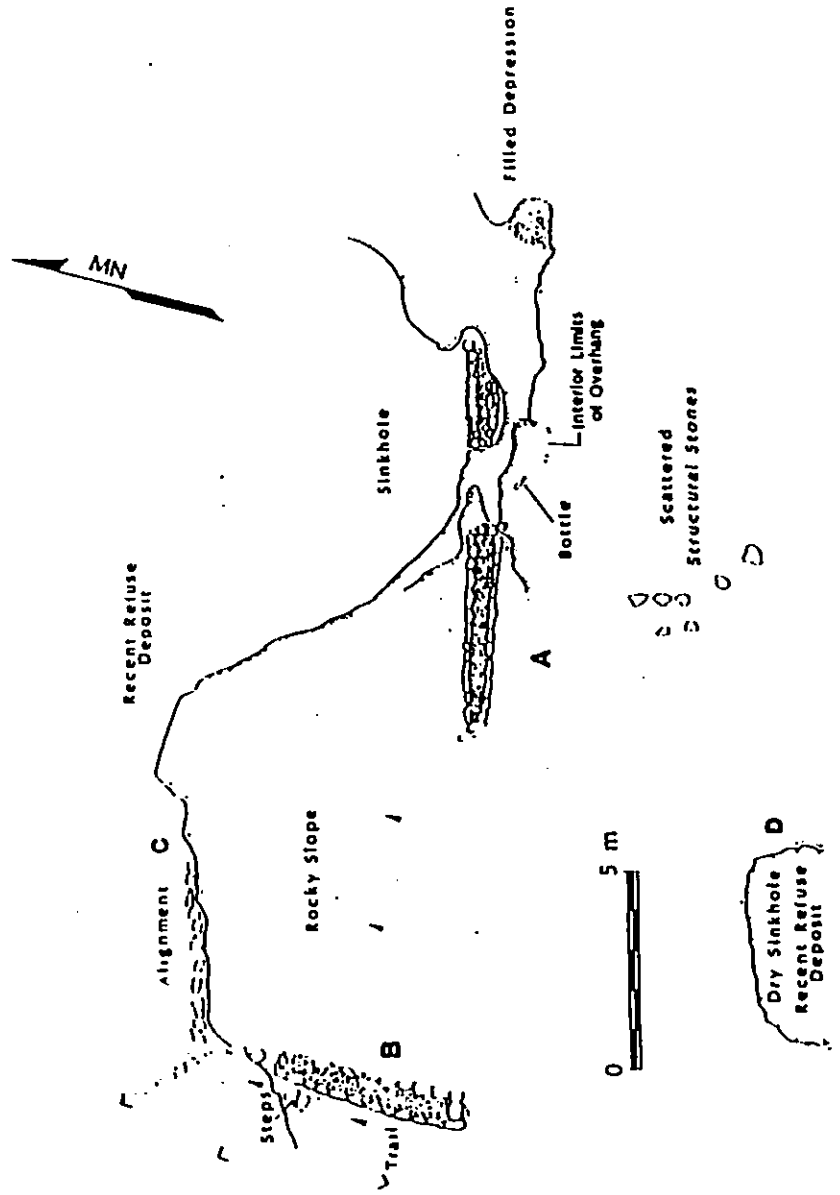


Figure 12. SITE T-18, FEATURES A-D

and 0.8 m wide, with an average height of 0.55 m. There are no indications of connecting perpendicular or parallel walls associated with this feature. A second wall section directly aligned with the main wall section occurs along the lower slope, on a small natural terrace. This section is 2.7 m long and 2.0 m east from the main section. The two walls are separated by exposed bedrock, and may have been originally connected with an alignment. The tops of these walls vary in elevation by c. 0.6 m.

A small overhang occurs along the ridge slope, in the area between the two wall sections. This small shelter is 3.0 m long, 1.0 m wide, and has a ceiling height of 0.45 m. A shallow soil deposit was observed in the overhang, as well as a twentieth century beverage bottle. A coffee bean shaped octopus lure sinker was located just outside the entrance to the overhang. This artifact had been reused as a hammerstone and as a small anvil; it is further described below.

Feature B is a bifacial core filled wall located 9.2 m west from Feature A. This wall is oriented north-south (300 degrees Az), and defines the eastern side of the trail which connects the beach with the Kalawina Church and the Hakalawena-Akahipu'u Trail. The intact section of the wall is 5.2 m long and 0.6 to 1.0 m wide. Two courses of stone are present (0.4 m) and represent the base of the wall. The northern end is abutted with kerbstones which appear to have been more recently positioned. These stones direct the trail to the northwest, away from its original course as indicated by the sand covered wall remants on the beach.

A second stone alignment (Feature C) extends east-west from the trail kerbstones, at the foot of the pahoehoe slope. The alignment is 4.7 m long and constructed from waterworn basalt boulders. The area immediately adjacent to the alignment is covered with a heavy deposit of recent refuse, and it is uncertain whether there are additional alignments or other associated features in this area of the site.

Feature D is a dry sinkhole located 6.0 m south from Feature A. It has an average depth of 0.9 m below ground surface and is circular in plan, with a diameter of 4.6 m. This natural feature has been utilized as a refuse pit; it contains an assortment of household artifacts, primarily kitchen equipment and dishes. The artifacts are of middle twentieth century manufacture, and are probably associated with the period of the former caretaker's residency, rather than with occupation of Site T-18.

T-19 Overhang Shelter

This isolated shelter site is located 320.0 m inland from the coast, in an area of disturbed pahoehoe. The nearest located site (T-17) is 229.0 m to the north. The overhang is situated on the northwest side of a pahoehoe rise, and has an opening 3.6 m long which overlooks a shallow sinkhole. Maximum depth of the overhang is 3.3 m and maximum ceiling height is 1.7 m. Ceiling height at dripline varies from 1.7 to 0.8 m. A crudely stacked wall of ceiling collapse occurs along the dripline and partially blocks the entrance. The rubble wall is 2.7 m long, and ranges in width from 1.7 to 1.0 m; height is 0.8 m.

Portable remains observed in the shelter are limited to faunal remains and include a single Cypraeidae shell fragment, a single Isognomonidae shell fragment, two pieces of Echinoidea shell, and scattered feral goat bones.

T-20 Makalawena-Akahipu'u Trail

This is the only site within the project area that has been given a Bishop Museum site number (50-Ha-D20-12). It was recorded as a feature of Site 8 by Soehren, who identified it as a causeway crossed by a trail that was "...so overgrown that it can no longer be followed" (1963:8), and was also included earlier in Reinecke's Site 97. The trail actually includes a number of causeways along its course from mountains to seashore, and there are at least six causeways, each c. 1.0 m high, within the project area (Figure 13, see also Kelly 1973:83).

The trail enters the eastern end of the project area at a point 262.0 m from the north boundary and 335.0 m from the south boundary. It continues toward the coast, with minor variations in orientation, until it reaches the southeastern tip of Opaeula Pond (Site T-21). From this location, it continues past the Kalawina Church (Site T-13) and Site T-18, where it goes onto the beach. The entire stretch of the trail is discernable on the project area aerial photograph, with the exception of the section between Sites T-21 and T-13. Dense kiawe growth has obscured traces of the trail in this area, where it is also in very poor preservation.

The trail is a historic foot/cart kerbstone route which fits Apple's (1965) "Type C" description. These roads were generally very straight and lined with kerbstones; they were elevated with causeways built of available stone over ravines, and essentially unaltered over smooth pahoehoe. "Type C" roads were constructed with prisoner and taxpayer labor during the latter half of the nineteenth century (Apple 1965:45-48). Many of these roads were constructed over existing footpaths or earlier "Type B" horse trails.

The best preserved sections of the Makalawena-Akahipu'u Trail within the project area are the built-up causeways over ravines. In some areas, where the trail crosses smooth pahoehoe, it is defined only by scattered kerbstones. The trail is, however, discernable for nearly all of its length. Width of the trail averages 2.0 m, with slightly narrower sections over ravines (1.4 to 1.8 m). Surface fill varies from crushed na gravel to pahoehoe cobbles; kerbstones likewise vary, depending upon local stone sources.

T-21 Complex

A walled anchialine pond, terrace, and surface midden scatter were recorded at this site, which is located at the southern tip of an inlet to Opaeula Pond. The walled pond (Feature A) is included in Soehren's Site 8 and Reinecke's Site 97. This feature is 29.1 m long and 8.0 m wide, with

Figure 13. SITE T-20 MAKALAWENA-AKAHIPU'U TRAIL. View to west. (PHRI Neg.500-191)

wall heights of 0.25 to 0.56 m. Portions of the pond perimeter are defined by natural bedrock, and the southern (long) side is defined by the causeway of Site T 20, which also incorporates some natural bedrock. An artificial terrace (Feature B) constructed of pahoehoe rubble is located along the shore, in the center of the north side of the pond. This terrace extends 4 0 m into the pond and is 5.5 m long. It has an average height of 0 56 m, and is 0.4 m above water level. The remains of what may have been a pump house are located on the terrace. Present are a gasoline powered pump (on rollers), sheets of corrugated metal roofing, and lumber.

Feature C is a surface scatter of shellfish remains, located on a smooth pahoehoe peninsula into Opaeula Pond, c. 20.0 m northeast from Feature A. The midden scatter covers an area of approximately 900.0 sq m. Shellfish families observed include Cypraeidae, Neritidae, Patellidae, and Thaididae. No definite concentrations were noted, and no modern refuse was present on the peninsula.

T-22 Complex

Three overhang shelters occur in this complex, which is located in the kiawe thicket, 45.7 m west from Opaeula Pond (Figure 14). The shelters are within an area 25.0 m long and 8.0 m wide, in three small collapsed pahoehoe blisters. The northernmost shelter (Feature A) is under a very shallow (0.8 m) overhang and is 6.8 m wide at the south-facing entrance. Ceiling height varies from 0.5 to 0.7 m, and the overhang is crescent shaped, following the orientation of the small collapsed blister in which it is located. No artificial construction or modification is present at this feature, and rockfall is scattered on the floor of the blister in front of the overhang. A very sparse surface scatter of Cypraeidae, Neritidae, and Echinoidea shell occurs in the shelter, along with a small concentration (0.15 m diameter) of fish bone.

Feature B is located 18.7 m southeast (148 degrees Az) from Feature A It is an overhang shelter situated along the north facing rim of a collapsed blister. The shelter is linear in shape, with an opening 4.3 m wide and maximum depth of 2.3 m. Ceiling height varies from 1.33 m at dripline to 0.8 m at the back of the shelter. No artificial modifications were observed in the feature, but a 4.0 to 5.0 cm deep soil/midden deposit is present. Two volcanic glass flakes were collected from the surface, immediately outside the entrance to the shelter, and a number of shellfish families were observed inside. These include Conidae, Cypraeidae, Neritidae, Patellidae, and Thaididae. Echinoidea remains and feral goat bones are also present.

Feature C is located 7.7 m south (190 degrees Az) from Feature B, and is along the northern rim of an adjacent blister. The overhang shelter opening is 5 0 m wide and 2.0 m deep, with a varied ceiling height of 0.55 to 1.60 m A small shallow depression with standing water occurs at the southern edge of the shelter, immediately outside the dripline. This unmodified "well" is 1 1 m deep and contained 0 4 m of water at intermediate tide. No soil had accumulated in this shelter, but a sparse scatter of Cypraeidae, Neritidae, and Thaididae shell is present

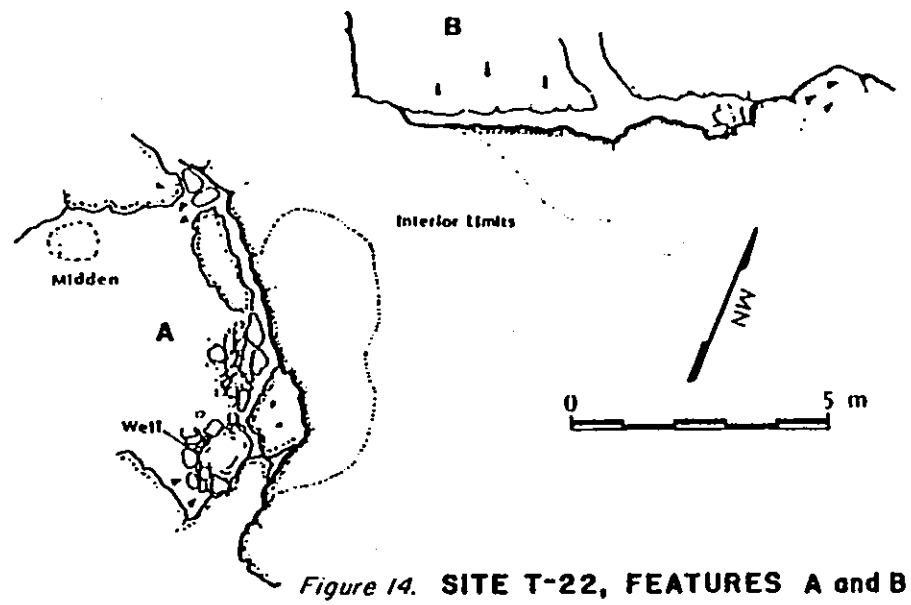


Figure 14. **SITE T-22, FEATURES A and B**

T-23 Complex

Site T-23 is a cluster of temporary shelters located on both sides of the Makalawena-Akahipu'u Trail, 365.0 m inland from the shoreline The shelters are on disturbed pahoehoe, and are utilized collapsed blisters They occur within an area 40.0 m long (north south) and 25.0 m wide Features A, B, C and E are on the south side of the trail, and feature D is on the north side.

Feature A is the largest and most intensively occupied shelter It consists of a collapsed blister with shallow overhangs and a cave The opening in the blister is vertical, with a major axis of 3 1 m and a minor axis of 2.8 m. The floor of the blister is 1 0 m below the opening, and a shallow overhang area 1.5 m deep occurs around the south and west sides of the opening This overhang area connects with a small cave 2 0 m deep and

3.0 m wide at the opening to 5.0 m wide at the back. No artificial modifications were observed in this shelter, but a hearth area (HF-1) was observed. This horizontal feature is a 0.2 m deep depression (0.45 by 0.35 m) filled with ash and burned organic material. Portable remains observed in the shelter include kukui nut shell, wood charcoal, coral, a waterworn basalt boulder, fish bones, metal fragments, shellfish fragments (Cypraeidae, Isognomonidae, Mytilidae, Neritidae), and Echinoidea.

Feature B is a small cairn located 6.0 m southwest (210 degrees Az) from Feature A, at the edge of an an pocket. The Makalawena Akahipu'u Trail is 20.0 m north (7 degrees Az) from this cairn. The base of the cairn is 1.2 by 1.4 m, and height varies from 0.2 to 0.4 m. It is constructed from pahoehoe slabs and cobbles, stacked three courses high.

Feature C is a surface scatter of midden located 2.9 m west from the entrance to Feature A. The 5.5. by 4.0 m scatter is on smooth pahoehoe, and includes the same shellfish families observed inside the Feature A shelter, as well as Melampidae.

Feature D is a collapsed blister, with an overhang shelter and constructed wall, located 17.2 m northeast (30 degrees Az) from Feature A. The blister opening is vertical and has a long axis of 2.8 m, short axis of 1.78 m. The floor of the blister is 0.8 to 0.65 m below the surface of the opening. The overhang floor drops down, so that the ceiling height is 1.45 to 1.84 m inside the shelter. A crudely stacked wall 3.0 m long and 1.2 m wide is positioned across the center of the blister. The wall is constructed from pahoehoe boulders stacked three courses high (0.8 m), and it abuts the east and west sides of the overhang dripline. No portable remains were observed inside this shelter.

Feature E is located 31.3 m southeast (140 degrees Az) from Feature A. It is a shallow overhang shelter at the head of a linear pahoehoe collapse. The overhang is 6.2 m wide at the opening, which faces southwest. Maximum depth is 1.75 m and ceiling height is 1.3 m at the dripline. Large rockfall boulders are scattered inside the shelter, which exhibits no purposive modifications. Subsistence remains observed include Cymatiidae, Cypraeidae, and Thaididae in very sparse amounts.

T-24 Complex

This site consists of a cave shelter and a cairn. It is located in a low area of older pahoehoe, 30.5 m east from the eastern shoreline of Opaeula Pond. It is one in a series of four temporary habitation sites and two cairns that form an east west linear alignment from the Makalawena boundary to the Makalawena Akahipu'u Trail. From east to west, these sites include T 26, T 29, T 30, T 24, and T 22

Feature A is a small cave shelter situated at the base of a west facing pahoehoe ridge slope. Two small entrances 1.3 and 1.5 m wide access the cave, which has a habitable area of 11.25 sq m. The entrances are separated by a bedrock pillar 1.8 m wide that extends 0.5 m into the

main chamber of the cave. A crawlspace 2.6 m long and 2.0 to 0.6 m wide extends from the northern side of the main cave chamber. The cave has a low ceiling height which does not exceed 0.7 m, and has no internal modifications. Portable remains are sparsely scattered on the bedrock floor, but no soil accumulation has occurred. Shellfish families represented include Cypraeidae, Neritidae, Isognomonidae, Thaididae, and Veneridae. Echinoidea is also present in very sparse amounts.

Feature B is a small cairn located 8.0 m south from the south entrance of Feature A. It is situated along the northern upper slope of the pahoehoe ridge, slightly below the ridge crest. The cairn is constructed from large pahoehoe boulders, stacked three courses high (0.7 m), and 0.8 by 0.9 m at the base. No surface material was observed around the cairn.

T-25 Complex

Two features, an overhang shelter and a terrace, occur within this complex, which is located in a sinkhole along the eastern shore of Opaeula Pond (Figure 15). The features are separated by a marshy backwater inlet of the pond, which is 4.0 to 2.0 m wide within the site limits.

Feature A is a small overhang shelter and surface midden scatter located on a bedrock shelf 3.0 m above the marsh surface. The shelf is 11.0 m long, 2.0 m wide, and 1.0 m below the upper surface of the sinkhole. The shelf has been cleared of loose rockfall, which is piled in crevices at the back and used to form small rubble platforms at the base of the slope. Three rubble platforms occur along the marsh shoreline, 2.3 to 1.7 m below the shelf. Midden and artifacts are scattered on the surface of the largest of these platforms, which is 3.2 by 1.5 m. The small overhang is 2.5 m wide at dripline and 1.4 m deep. Midden scatter occurs on the bedrock shelf at the entrance to this overhang.

Portable remains observed on the shelf and small rubble platforms include historic bottle glass, metal fragments, shellfish fragments, coconut husk, waterworn basalt cobbles and pebbles, waterworn coral, Echinoidea, fish bone, and volcanic glass. Shellfish families represented are Chamidae, Conidae, Cypraeidae, Isognomonidae, Neritidae, Patellidae, and Veneridae.

Feature B is a triangular shaped terrace constructed against the northern wall of the sinkhole. The terrace extends 3.5 m into the marsh, and was constructed on a low, narrow pahoehoe peninsula. It is raised on two sides, and a small portion of a third side, to an average of 0.25 m above the surface of the marsh. The longest wall (6.0 m) is oriented east west, the north south wall is 3.5 m long. The terrace is outlined with pahoehoe and waterworn basalt boulders, and currently has a sand covered surface. This sand is quite silty and appears to have originated from raising and subsiding pond water. No subsistence remains were located on the platform, but sheet metal roofing and structural lumber are present

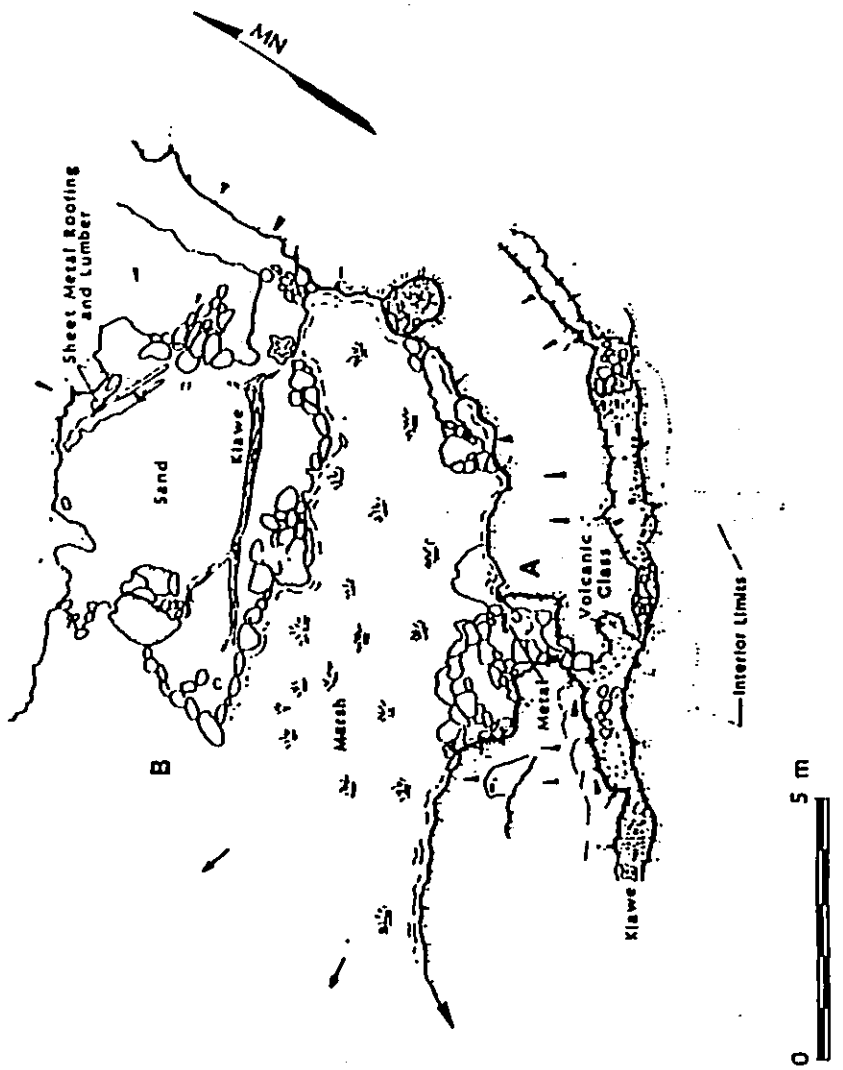


Figure 15. **SITE T-25, FEATURES A and B**

T-26 Enclosure

Site T 26 is the largest high-walled enclosure located within the project area (Figure 16). It was not previously recorded by either Soehren or Reinecke, probably because it is inland of areas covered during their surveys. The enclosure is located in disturbed pahoehoe, on or very near to the northern border of Makalawena. It is square in plan, with side walls of 21.6 to 22.0 m long (interior sides). Wall height is relatively consistent (13 to 15 courses) for interior and exterior sides. Maximum height is 2.6 m on the interior side of the northern wall; minimum intact wall height is 1.30 m, at the northeastern corner. All walls are faced on both interior and exterior sides, and are core filled. Average wall base width is 1.0 m, and average wall top width is 0.85 m. Ground surface inside the enclosure is undulating pahoehoe and a few small pockets of aa. Relief is as great as 1.0 m inside the enclosure, which accounts for variations in wall height.

There is currently no opening in the enclosure wall, but a former gate is indicated in the center of the eastern wall. A 1.0 m wide section of the wall is constricted and considerably lower (0.4 m wide, 0.8 m high), and abuts a former finished wall edge. This walled-up gate is in the center of two radiating chute walls which extend eastward for 18.5 m (Figures 16 and 17). The chute walls are 1.8 m apart at their connection point with the enclosure, and 13.0 m apart at their eastern ends. They are narrower and shorter than the enclosure walls, with an average width of 0.7 m and average height of 1.0 m. Both walls are double faced and core filled, and have disturbed sections.

No portable remains or organic deposits were observed inside the enclosure, which probably functioned as a goat pen.

T-27 Footpath

Site T-27 is the eastern branch of the footpath which encircles the northern shoreline of Opaeula Pond, connecting Sites T 7, T 8, and T 28. It is included as one of the features in Soehren's Site 7, and is described as follows:

> From the goat pen (Site T 8) a trail follows along the shoreline of the pond to and across a finger of an lava to the eastern corner of the pond. Here a natural inlet has been cut off by a wall about 30' long, 2' wide and only 1' high (Site T-28), to form a small compartment. A flock of ducks and several stilts were seen in and near this compartment (1963:91).

This site was also identified by Reinecke as part of his Site 97.

The path is cleared and surfaced with crushed aa, and has an average width of 1.0 m. Cleared aa clinkers have been aligned along the south side of the path in places, and the path surface varies from 0.1 to 0.7 m below surrounding ground surface.

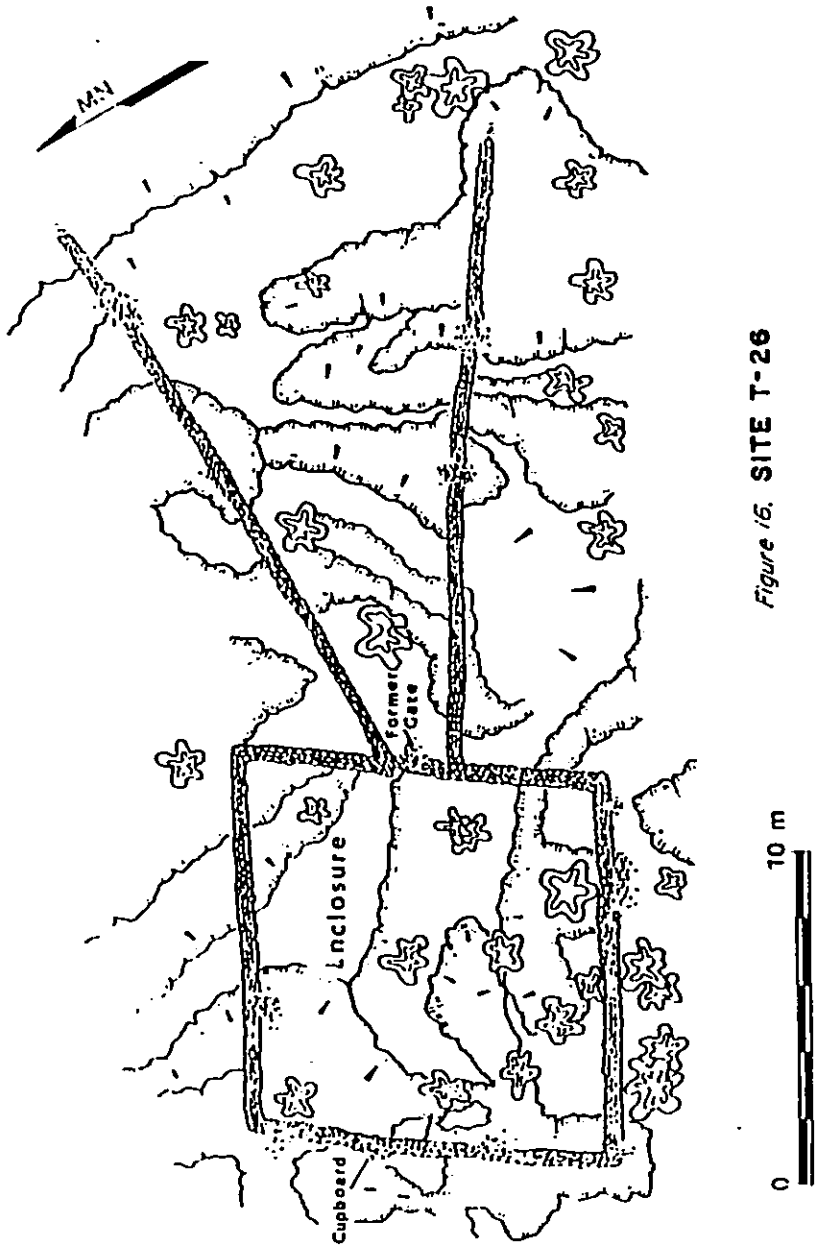


Figure 16. SITE T-26

Figure 17. SITE T-26, ENCLOSURE. View to east (PHRI Neg.501-5)

T-28 Wall.

As indicated above, this feature was included in Sochren's Site 7. This site was also identified within Reinecke's Site 97. It is a 14.5 m long, 1.5 m wide wall constructed across a small inlet of Opaeula Pond. The wall is 0.4 m high, and creates a small pond 14.5 m long by 13.5 m wide at the head of the inlet. Water in this enclosed pond is very shallow, and it appears to have silted in since construction of the wall. The wall is bifacial with core fill; sides are rather haphazardly stacked.

The Site T 27 footpath adjoins directly with the northern end of the wall, and it appears to have served as a footbridge across the inlet. Traces of the path could not, however, be identified on the southern side of the wall. No cultural deposit or portable remains were observed in association with this wall.

T-29 Cairn

This isolated feature is located in the kiawe thicket, on a low, weathered pahoehoe rise. The nearest site (T-30) is 46.7 m to the west. The cairn is constructed from pahoehoe boulders, stacked three to four courses high (0.75 m). The base is circular in plan, with a diameter of 0.8 m, and conical in profile. No footpath or shelter was located in direct association; however, this cairn is part of an aligned series of temporary shelters and other cairns that may have been located along a now undefinable footpath.

T-30 Complex

Three features were identified within this site, all of which occur along the base of the north facing pahoehoe ridge slope in the densely vegetated kiawe thicket. Total site area is linear in shape, with a major axis of 23.0 m (east-west) and a minor axis of 8.0 m. Features present include a surface midden scatter and two overhang shelters.

Feature A is a circular surface scatter of shell midden on a relatively level bedrock surface at the western end of the site. Fragments of Cypraeidae, Neritidae, and Thaididae shells are scattered within an area 3.5 by 3.1 m. Adjacent to the scatter on the west side is a low, collapsed wall 2.5 m long. The wall is currently 0.3 m high and stones are scattered over an area 1.0 m wide. This wall and surface scatter was possibly associated with a temporary shelter.

Feature B is a shallow overhang in a collapsed blister, 4.0 m northeast from Feature A. The shelter is accessed through a circular, vertical opening, 2.5 m in diameter, in the top of the blister. The overhang is to the east side of the blister opening, and is 3.0 m wide at the entrance and 1.0 m deep. Ceiling height is 0.75 m. The northern end of the overhang is defined by a pile of rockfall that was probably cleared from the blister floor. The pile is 1.0 m wide and extends to the dripline. A second pile of rockfall occurs on the ground surface to the south side of the blister opening. This pile of stones is 2.0 m long and 0.35 m high.

Portable remains located inside the Feature B shelter include historic bottle glass sherds, waterworn coral, Echinoidea remains, and shellfish (Cypraeidae, Cymatiidae).

Feature C is an overhang shelter which opens to the west, and is located along the eastern side of a small collapsed blister which is at midslope along the ridgeline. It is 10.0 m northeast from Feature B. The floor of the collapsed blister and overhang is 1.3 m below surrounding ground surface. The overhang opening is 2.5 m wide and 2.0 m deep, with an average ceiling height of 1.3 m. Habitable space within the overhang is 1.8 m wide by 1.6 m deep. A pile of cleared rockfall occurs in the blister, 1.5 m west from the southern end of the overhang entrance. No portable remains were observed in this shelter.

Also present at the site is a small modified hole in the surface pahoehoe, located 5.0 m southeast from Feature B. This opening is 0.52 by 0.45 m and is 0.4 m deep. A few pieces of kukui nut shell, Cypraeidae, Neritidae, and Echinoidea occur in this hole, which may represent a cup board.

T-31 Cave Shelter

Site T-31 is located within a partially collapsed pahoehoe blister, 488.0 m inland from the shoreline. The nearest site is the Makalawena Akahipu'u Trail (T-20), located 350.0 m to the northeast. Feature A, a cave, is entered by a centrally located, vertical hole, 0.8 m long and 0.5 m wide, in surface pahoehoe. The cave is nearly circular in plan (5.5 by 6.0 m), and has an average ceiling height of 2.15 m. A cairn like pile of rockfall (Feature B) is positioned in the center of the cave, just below the northern side of the entrance. This pile is 1.3 by 1.5 m at the base and 1.2 m high; it apparently functioned as a step down into the cave. A sparse scatter of Cypraeidae shell and goat bones occurs inside the cave.

T-32 Cave Shelter

This site is one of four cave shelters located on a band of an and severely disturbed pahoehoe which crosses the center of the project area in a northeast southwest orientation. Site T 33 is the westernmost of the four caves, and is 686.0 m inland from the shoreline. The cave is situated at the northern end of a large, collapsed pahoehoe blister. The blister is 30.0 m long, 20.0 m wide, and 1.2 m deep. The cave opening is 2.85 m wide and faces southwest; it is defined on the eastern end by natural rockfall. A second, smaller entrance (1.8 by 1.0 m) is located immediately east of the rockfall, along the same dripline.

Habitable area inside the cave is 8.05 sq m (3.5 by 2.3 m), and average ceiling height is 1.3 m. A lobe extension (crawlspace) continues from the northeastern end of the main chamber for a distance of c. 10.0 m. No soil or organic deposits were observed in the cave, and very sparse amounts of Cypraeidae, Patellidae, and Thaididae shell were scattered with no concentrations.

T-33 Cave Shelter

Site T-33 is located 61.0 m northeast from Site T-32, on the same band of extremely disturbed pahoehoe with as pockets. The cave is situated at the northern end of a pahoehoe blister, and is accessed through a very small (0.5 by 0.6 m) collapsed opening in the blister ceiling. Ceiling height of the cave at the entrance is 0.6 m, and interior dimensions are 3.0 by 4.0 m. Maximum ceiling height is 0.7 m. No artificial modifications are present in the shelter. An extremely sparse scatter of Cypraeidae shell fragments are present in the cave.

Adjacent to the cave entrance to the south is a crudely aligned stepping-stone path. The path is 6.1 m long and is oriented parallel to the major axis of the blister (235 degrees Az). It crosses extremely rough, broken pahoehoe with positioned pahoehoe slabs that average 0.7 m in width. A few Cypraeidae shell fragments are scattered on the surface in the vicinity of the path, which does not seem to continue beyond the limits of the blister.

T-34 Complex

Four features are present at this site, which encompasses an area of 375.0 sq m (Figure 18). Three of the features are overhang shelters and are located along the base of a north facing pahoehoe ridge slope. Also present is a small rectangular enclosure, located on a low rise, just north of the overhangs. The site is 579.0 m inland from the shoreline, at the southwestern edge of the kiawe thicket, on old pahoehoe.

Feature A is a rectangular enclosure with an interior area of 16.64 sq m (5.2 by 3.2 m). The enclosure walls are constructed from pahoehoe boulders and slabs stacked four courses high, with smaller cobbles placed on top. Average wall height is 0.75 m; maximum wall height is 0.88 m. Wall thickness ranges from 0.80 to 0.95 m. Undisturbed portions of the wall exhibit both interior and exterior facing. A narrow opening (0.4 m) occurs in the western side of the enclosure, 2.0 m from the southwestern corner. No portable remains occur inside or immediately outside.

Feature B is located 7.5 m directly south from Feature A. It consists of an overhang shelter with two exterior walls which partially enclose the north facing entrance. The overhang is 3.4 m wide (maximum width at the opening) and 1.7 m deep, with an average ceiling height of 1.32 m. The easternmost exterior wall abuts the bedrock slope on the east side and is roughly square in plan view. Major axis is 1.8 m and oriented east west; minor axis is 1.6 m. The wall is constructed from pahoehoe slabs and boulders, stacked four courses high (0.8 m). The western end of the wall is 0.5 m from the overhang dripline and 1.0 m east from the end of the second wall. The western wall is 1.82 m long, 1.4 m wide and 0.4 m high. The western end of this wall abuts bedrock and the eastern end is 0.8 m from the overhang dripline. Both of these walls are in very poor condition, and original width was probably less than present width. A very sparse scatter of Cypraeidae and Neritidae shell fragments was observed on the bedrock floor of the Feature overhang; no soil or organic material was observed

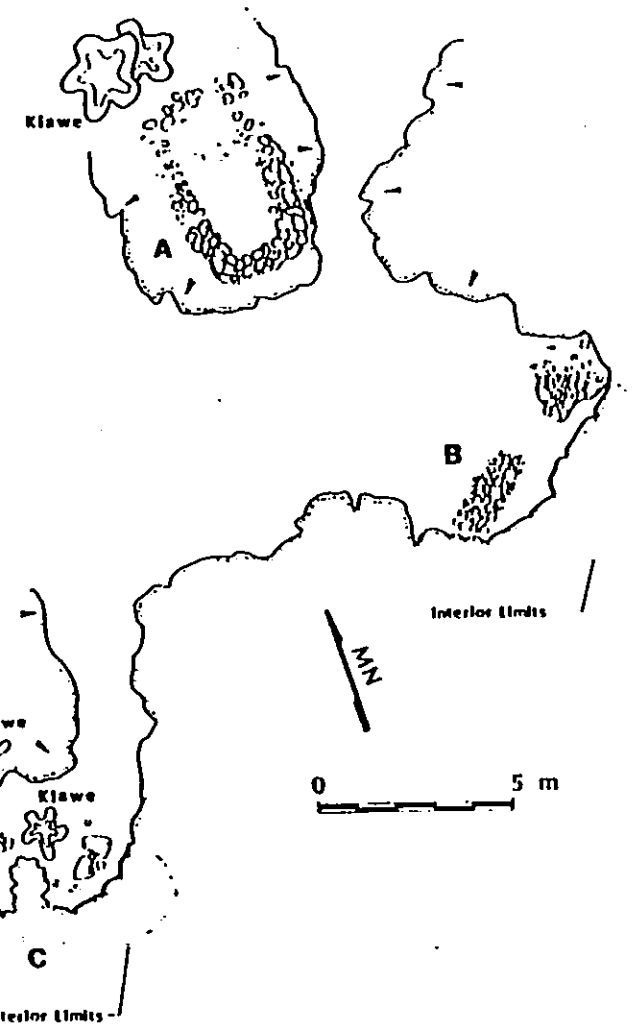


Figure 18. **SITE T-34, FEATURES A-C**

Feature C consists of two small adjacent overhang shelters, located along the lower north facing ridge slope, 12.0 m west from Feature B. The shelters are separated by a narrow (0.9 m) bedrock pillar. The western most overhang is 3.20 m wide at the entrance, and has a maximum width of 4.0 m. It is 2.0 m deep and has a maximum ceiling height of 1.20 m (at dripline). A low (0.4 m), semicircular wall occurs 2.0 m north from the overhang entrance, partially enclosing a circular area in front of the shelter. The wall is 3.7 m long and 0.25 m wide. The eastern overhang of Feature C is 2.96 m wide (maximum width at dripline) and 1.6 m deep, with a ceiling height of 0.6 m. A thin deposit of soil (1.0 to 2.0 m) occurs in patches in this overhang shelter, as well as a very sparse scatter of Cypraeidae shell fragments.

Feature D is located east from Feature B, along the same pahoehoe ridge slope. This overhang shelter is 2.14 m wide at the opening and has a maximum width of 6.0 m. It is 1.55 m deep and has a ceiling height of 0.6 m at the dripline. Maximum ceiling height is 0.75 m. No soil or organic deposits are present in this shelter, and a very sparse scatter of Cypraeidae shell was observed on the bedrock floor.

T-35 Well

Located 38.0 m north from Site T-34, this small anchialine seep has been artificially deepened and partially walled to create a pool of standing water. The well opening is at the base of a broad pahoehoe crevice, and maximum depth of the excavated pool is 1.6 m below surrounding ground surface. The opening is nearly round, with a long axis of 2.0 m and short axis of 1.8 m. The adjacent wall appears to have been constructed from pahoehoe boulders removed during well excavation. It is 5.1 m long, 2.0 m wide and 0.7 m high. The wall is unfaced and resembles a linear rubble pile. A single recent beverage bottle is present at the site.

T-36 Complex

Two walled shelters occur at this site, which encompasses an area of 80.0 sq m. The site is located near the northern border of the project area, 61.0 m south from Site T-26 (a large high walled enclosure). Both features are situated in a collapsed pahoehoe blister, 39.5 m south from the edge of an overlying aa flow.

Feature A is the larger of the two shelters. It is completely enclosed by a stacked pahoehoe wall and bedrock. The wall, which defines the western half of the enclosed area, is 5.5 m long, 0.75 m wide, and 0.65 m high. Major axis of the wall is oriented 215 degrees Az. It is slightly curved and expands at the south end, where it adjoins bedrock. The expanded wall section is 1.5 m long and 1.65 m wide; it is 1.3 m high along the interior (east) side and 0.5 m high along the west side. The eastern side of the shelter is defined by a shallow overhang that has a maximum depth of 1.8 m. Ceiling height varies from 2.3 m at dripline to 0.85 m near the back wall.

A small concentration of shell midden (0.25 m diameter) occurs just inside the dripline of the Feature A shelter. Cypraeidae, Isognomonidae, Neritidae, Tellinidae, and Thaididae are represented in the concentration. These shellfish families, with the exception of Tellinidae, are also scattered about the floor of the enclosed area. Waterworn coral and basalt cobbles are scattered sparsely over the surface of the shelter as well.

Feature B is located 8.0 m northwest (300 degrees Az) from Feature A. It is much smaller in area (5.7 sq m), but is similarly constructed. It is completely enclosed by a semicircular wall and bedrock, and has a shallow overhang along the western side. The overhang is 2.0 m wide at the entrance (maximum width) and 0.7 m deep, with a ceiling height of 0.55 m. A wall of large pahoehoe blocks encloses the overhang and a circular area of 6.0 sq m. The wall is positioned on a low bedrock shelf and the top is 0.6 m above interior ground surface. No soil, organic material, or portable remains were located inside this small shelter.

T-37 Cairn

Site T-37 is an isolated cairn, located on rough pahoehoe in the kiawe thicket, 122.0 m from the nearest site (T-35). The base of the cairn is oval in plan (1.4 by 1.0 m), and 0.75 m high. It is constructed from loosely piled pahoehoe slabs, and is conical in profile. A single slab is positioned upright against the south side of the cairn. No portable remains or traces of any footpath were observed in the vicinity of this feature.

T-38 Cave Shelter

This minimally utilized cave shelter is located on very rough pahoehoe, 60.0 m from two other cave sites (T-32 and 33). It is situated at the northern end of a collapsed lava tube, and has a narrow (1.8 m) entrance which opens to the southwest. The cave is linear in plan, with a major axis of 10.5 m and minor axis of 3.7 m; ceiling height is 0.6 m. A relatively level area at the base of the collapsed tube occurs at the entrance to the cave. This area is 5.7 m long and 2.75 m wide; major axis is parallel with the tube. A small (1.0 m diameter) surface scatter of shell fragments occurs just inside the dripline of the cave. Cypraeidae and Neritidae shells are represented in this sparse scatter.

T-39 Complex

Two features have been identified at this site, which consists of a large collapsed blister in disturbed pahoehoe (Figure 19). It is located along the north facing slope of a major pahoehoe flow which forms a definite north south escarpment across the southern half of the project area. Three other temporary shelter sites (T-32, T-33, and T-38) occur in this zone; Site T-39 is the most intensively utilized.

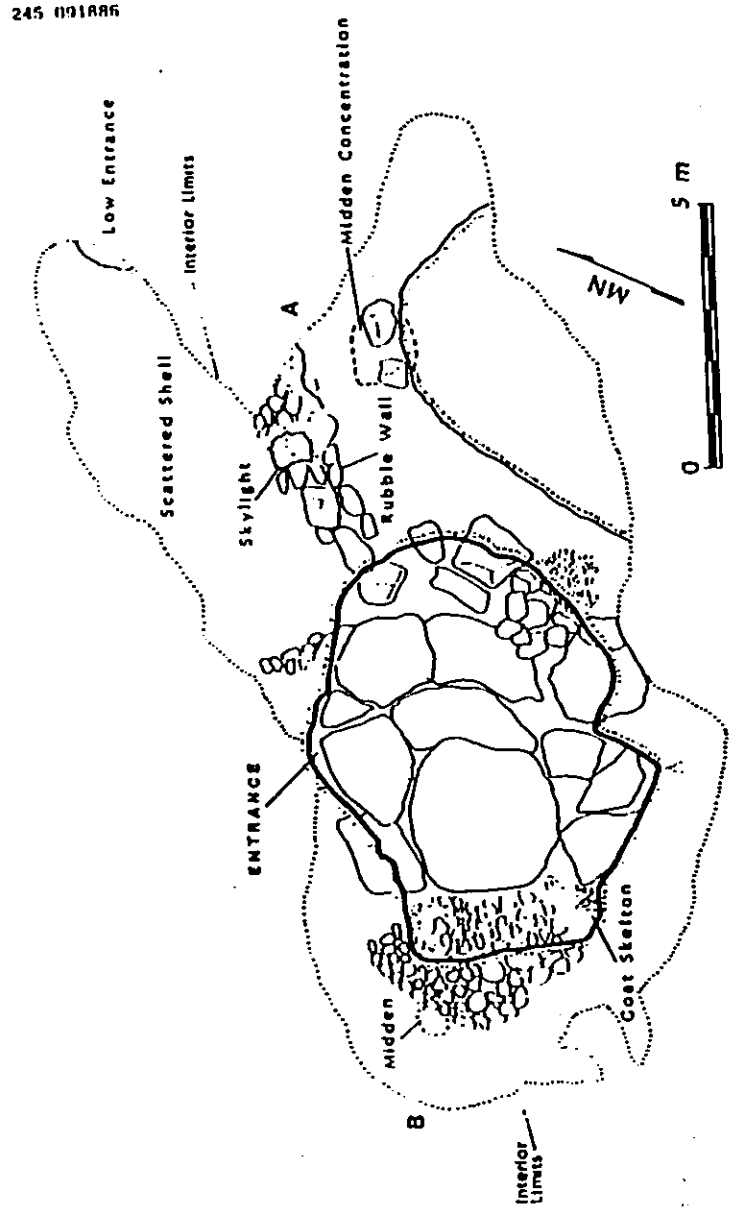


Figure 19. SITE T-39, FEATURES A and B

The cave and overhang at this site are situated on opposite sides of a lava blister with an oval collapsed area near the center. The open portion of the blister has a long axis of 9.0 m and short axis of 6.3 m, with the major axis oriented northeast-southwest (77 degrees Az). The floor of the collapsed area is covered with very large surface pahoehoe slabs (up to 3.0 m diameter) that have not been moved. Where visible, the floor of the blister is 0.95 m below surrounding ground surface.

Feature A is a cave which extends northeast from the eastern side of the collapsed blister. It has a broad entrance which follows the configuration of the oval collapse pattern. The major axis of the entrance is 5.9 m; total width around the dripline is 9.5 m. The cave is divided into two sections by a boulder wall which extends from the back of the cave to the dripline. The wall is 4.5 m long, and separates two distinct tube extensions. It is 1.6 m wide at the back and 0.8 m wide at the front. The northern tube is 10.0 m deep, and has an average width of 3.0 m. The floor of the northern tube is cleared of rockfall and scattered with shell midden.

The southern section of the cave is 8.1 m deep; it is 5.5 m wide at the entrance, 6.0 m wide at the center, and 2.0 m wide at the back. The back 3.0 m of the cave section is crawlspace. A circular concentration of shell midden and organic soil occurs near the back of the habitable area in this section. It is partially defined by large boulders and is 1.3 m in diameter. Material in this concentration is over 5 cm thick. A small surface concentration of small cobbles and pebbles occurs at the southern end of this section, near the dripline. This pavement covers an area 1.3 by 1.0 m, and is defined on the west side by large rockfall boulders.

Feature B is a relatively shallow overhang which incorporates most of the remaining dripline of the blister. It is disconnected from Feature A by large rockfall boulders. The overhang has a major axis of 6.0 m, and incorporates 13.5 m of dripline. The sheltered area has a maximum depth of 2.5 m and an average depth of 1.5 m. Ceiling height averages 0.9 m, and is 1.2 m at dripline. The central portion of this feature is paved with pahoehoe cobbles, apparently obtained from loose rockfall. The paved area is 4.0 m long by 2.5 m wide, and extends beyond the dripline. Midden is scattered over the surface of this feature, and goat bones are also present.

Portable remains observed on the surface at this site include a coral abrader, a basalt hammerstone (fire cracked), waterworn basalt pebbles, and a number of shellfish species, including Littorina pintado, Nerita picea, and N. polita. Additional species are present in the Feature A concentration.

T-40 Cairns

Site T-40 consists of two large cairns, located on a patch of very rough pahoehoe with scattered an. 54.0 m south from the Makalawena Akahipu'u Trail. The cairns are a considerable distance inland (1.23 km

from the shoreline), and 45.0 m east from two rubble piles (Site T 41). The northernmost cairn (Feature A) is somewhat oval in plan, with base dimensions of 3.5 by 2.7 m. It is constructed from piled pahoehoe slabs and boulders, with smaller cobbles placed in a conical pile on top of a larger base. Height of the slab base is 0.2 m; maximum height of the cairn is 0.85 m.

Feature B is located 1.6 m to the southwest. It is nearly square in plan, with base dimensions of 3.0 by 2.8 m. The sides of this cairn are more carefully stacked, and intact walls are present to a height of 0.35 m. Collapsed slab and cobble fill continues to a height of 0.83 m along the west side, and three corners are discernable to heights of 0.4, 0.6, and 0.9 m. Maximum center height is 1.0 m.

T-41 Rubble Piles

This site is located on the west end of a relatively level, smooth pahoehoe flat, in a zone of rough pahoehoe and aa. Site T-40 is within view, and the Makalawena-Akahipu'u Trail is 137.0 m to the north. There are two rubble piles at this site, located within 1.5 m on an east-west line. Feature A is the larger of the two piles. It is circular, with a diameter of 1.8 m and maximum height of 0.4 m. This pile may have originally been a stacked wall; portions of a faced exterior are present at the base of the eastern side.

Feature B is a more haphazard pile of about 15 pahoehoe boulders. It is 1.2 by 1.0 m at the base and 0.2 m high. Stones in these piles appear to have been cleared from the surrounding pahoehoe surface. They may represent the remnants of a walled shelter. No portable remains occur in the vicinity.

T-42 Complex

Site T-42 consists of four adjacent shelters in a partially collapsed lava tube (Figure 20). It is relatively isolated, with the nearest site (T-40) located 244.0 m to the west. The Makalawena-Akahipu'u Trail is 45.7 m to the north, and the shoreline is 1.48 km to the northwest.

The utilized portions of the Site T-42 lava tube occur in a linear pattern, 15.0 m long and 10.9 to 3.0 m wide. The tube is oriented east-west (100 degrees Az) and areas of undisturbed rockfall separate the various features. This lava tube represents the largest inland shelter complex located within the project area.

Feature A is a cave located at the eastern end of the tube. The entrance is crescent shaped, and is defined by constructed rubble piles at the north and south ends. Major axis of the entrance is 2.3 m, and it incorporates 5.5 m of dripline. A narrow pillar (1.0 m diameter) occurs in the center of the entrance. Ceiling height at the entrance is 1.07 m; this increases to 2.2 m in the center of the cave, where the floor drops considerably (Figure 20, profile). The main chamber of the Feature A cave is 18.0 m deep and has a maximum width of 9.0 m.

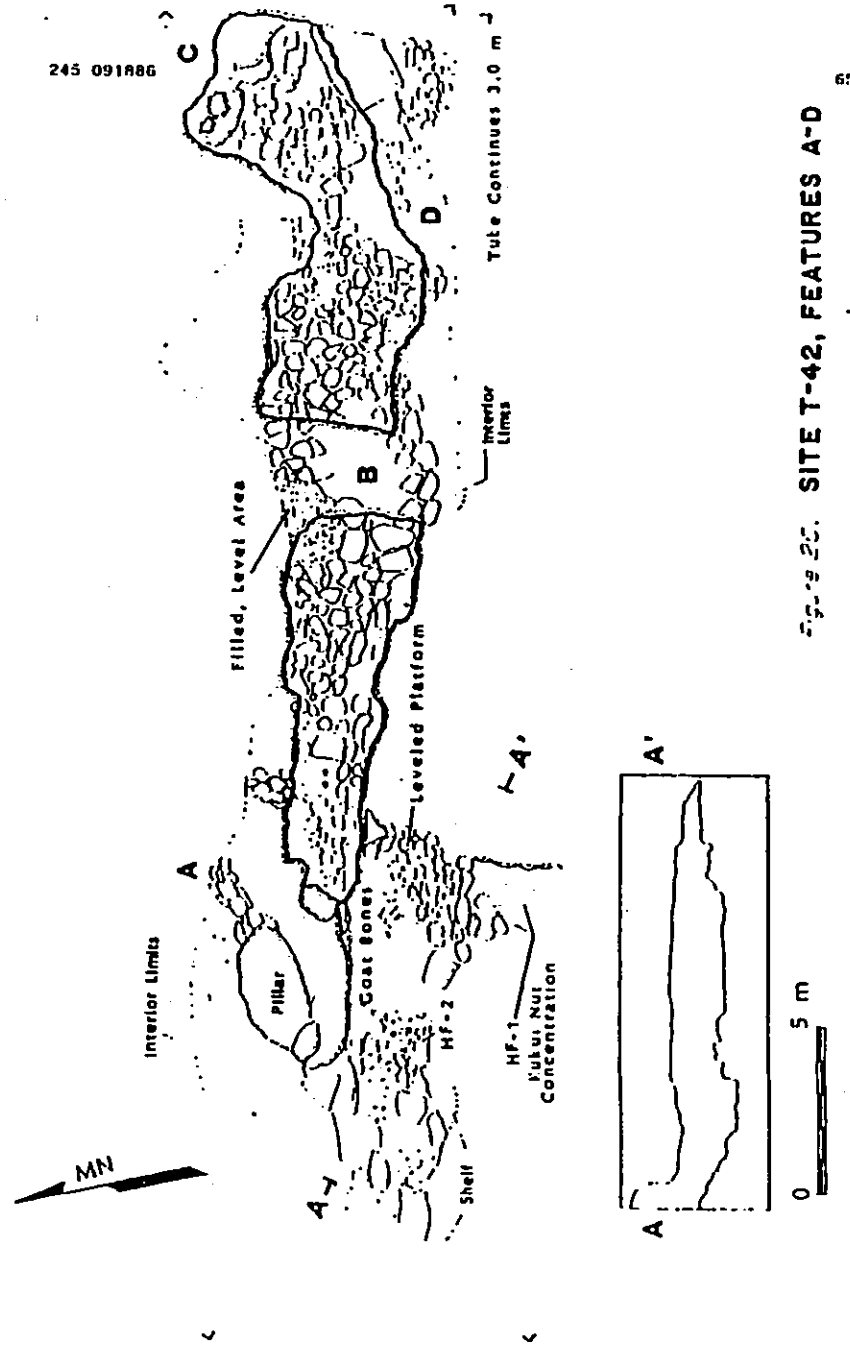


Fig. 20. SITE T-42, FEATURES A-D

To the north of the entrance is a cleared rock shelf that averages 0.6 m above the cave floor. The floor area just inside the entrance has been cleared of loose rockfall, which was used to construct a level platform in the southeastern corner of the cave. The platform is 2.8 m long and 1.9 m wide. It partially blocks a small tube which extends 5.0 m to the south. This extension is 4.3 m wide, and contains a small circular clearing that has a very thick deposit of burned and unburned kukui nut shell. Partially burned wooden sticks, large pieces of Echinoidea shell, and bird bones are also present in this concentration (HP-1).

A second concentration of soil and midden occurs in a small clearing in rough boulder pavement, just east of the central cleared area. Isognomidae shell, Echinoidea shell, kukui nut shell, and unburned wood occurs in this concentration (HP-2).

To the west of this concentration is a pile of rockfall which delimits the central cave area. Ceiling height above the top of the rock pile is 0.65 m. Immediately to the west, ceiling height increases to 2.2 m. To the north of the rockfall pile is a rock shelf crawlspace that is cleared of loose stone and partially blocked off by a low rock wall. A coral abrader was observed at the back of this shelf. Two narrow tubes extend westward from the back of the cave for distances of at least 8.0 m. The northernmost extension contains small chambers and rubble piles that may contain burials.

Feature B is a roofed shelter located under an intact portion of the lava tube ceiling. It is located in the center of the tube, 11.5 m east from the entrance to Feature A. The tube between these two features is totally collapsed, and the floor is covered with in situ rockfall. Side slopes of the tube are gradual and surrrounding ground surface averages 1.0 m above the rock-covered floor.

The intact lava tube ceiling which forms the Feature B roof is 2.7 m wide and is open to the east and west. Most of the floor area under the roof is a bedrock shelf, elevated 0.5 m above the tube floor. This shelf has been totally cleared of loose rock, except for a linear pile along the side walls. A filled and leveled pavement occurs adjacent to the shelf on the west side. This pavement is surfaced with smaller basalt cobbles and pebbles; it is 0.6 to 0.7 m below the surface of rockfall to the west. Approximately half of the paved depression is under the roofed area of the shelter. It is semicircular in shape, with a long axis of 2.5 m and a short axis of 2.0 m. No portable remains were observed in the Feature B area.

Feature C is a cave located at the eastern end of the lava tube, 9.5 m east from Feature B. The cave is accessed through a small circular opening in the south facing, upper slope of the tube. The entrance is 1.6 m in diameter and is a narrow, east oriented chute 2.0 m long. The main chamber of the cave has a major axis of 5.5 m (east-west) and a minor axis of 4.6 m. The floor of the cave is almost completely covered with large slabs of rockfall. A narrow path like area has been cleared across the center of the cave from the entrance to the eastern end. An extension

occurs from the eastern end of the main chamber, accessed through a low (0.60 m) opening in the wall 1.5 m wide. This room is 0.45 m below the floor level of the main chamber; it extends eastward for 3.0 m and turns to the south for 2.0 m. Average width of this room is 1.2 m.

Directly below the entrance to the east extension is a small cupboard or crawlspace in which was located a large wooden bowl containing a coconut husk fiber fishing net and a number of fish bones (Figure 21). Adjacent to the bowl was a wooden spatulate tool with a shallow depression in one side. These artifacts were collected and are further discussed below. No additional portable remains were observed in the Feature C cave.

Feature D is an overhang shelter, situated against the north facing slope of the tube, 5.0 m south from the entrance to Feature C and 5.5 m east from Feature B. The overhang is 4.0 m wide at dripline and defined on both sides with piles of rockfall. It has a maximum depth of 1.7 m. A semicircular area at the front of the dripline has been cleared of rockfall, which was stacked to form a retaining wall around the perimeter of the cleared area. The floor of the clearing is 1.0 m below the surface of surrounding rockfall; it extends a maximum distance of 1.3 m out from the dripline. No portable remains were observed in this small shelter.

T-43 Cairn

This small cairn is located on or very near to the northern boundary of the project area, 320.0 m west from Queen Kaahumanu Highway. The base is roughly circular in plan, with axes of 0.7 and 0.5 m; and is conical in profile, with side slabs leaned upright and inward toward the top. Maximum height is 0.5 m. The cairn consists of about twenty pahoehoe slabs and is in good condition. It may be a surveyor's boundary marker.

T-44 Walled Shelter

Site T-44 is the poorly preserved remnants of a walled shelter located at the edge of an east-facing escarpment dropoff, near the northern boundary of the project area. It is 106.7 m west from Site T-43. Two partially intact wall sections (2.8 m long) are present. These sections are oriented east-west and are parallel, spaced 1.0 m apart. The walls appear to have been joined at the east ends, where the remnants of a north-south wall section 1.2 m long occur. Portions of this wall may have been pushed over the edge of the escarpment, which drops c. 1.0 m. The north and south walls are currently no higher than two courses of stone. No portable remains were observed in association with this feature.

T-45 Cairn

This isolated cairn is located on smooth pahoehoe at the eastern end of the project area, 75.0 m from Queen Kaahumanu Highway. It is constructed from seven large pahoehoe slabs and boulders, in a manner similar

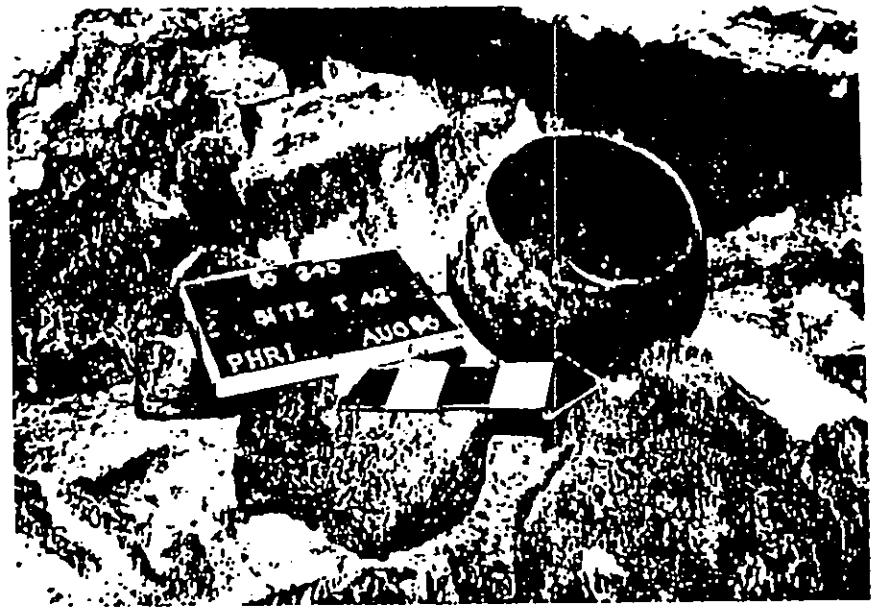


Figure 21. SITE T 42, FEATURE C: WOODEN BOWL AND NET, IN SITU. (PHRI Neg.501-34a)

to the style of Site T-43. The base is circular in plan, with a diameter of 0.9 m. Slabs are leaned upright and inward from base to top of the cairn, with a central large slab set vertically upright in the center. Maximum height is 0.9 m. This cairn is 40.0 m north from the Makalawena Akahipu'u Trail, and is one of six small cairns located near the eastern boundary of the project area.

T-46 Cairn

Site T-46 is 60.9 m south from Site T-45, and 5.4 m from the Makalawena-Akahipu'u Trail. It is a very small cairn constructed from six pahoehoe boulders on a linear pahoehoe rise. The base is circular in plan, and has a diameter of 0.6 m. A single upright slab is positioned in the center, and other stones are leaned against the upright for support. Maximum height is 0.5 m. This feature is probably recent.

T-47 Cairns

Four cairns are included in this site, which encompasses a linear distance of 91.6 m. Three cairns are in a straight line, oriented southeast northwest, and extend roughly parallel to the property boundary.

Feature A is constructed from pahoehoe slabs and boulders piled four to five courses high. The base is tangular in plan, with a long axis of 2.0 m and short axis of 1.7 m. Height varies from 0.2 to 0.5 m. This feature is partially collapsed.

Feature B is located 19.0 m southeast (167 degrees Az) from Feature A. It is constructed from pahoehoe slabs and boulders, and is similar to Feature A in form. The base is 1.5 by 1.2 m and maximum height is 0.55 m. Stones from this feature are also dispersed and it is partially collapsed.

Feature C is located 35.6 m southeast (187 degrees Az) from Feature A, 16.6 m from Feature B. It is less disturbed than the above cairns, and is of very similar material and form. The base is 1.05 by 0.9 m and has a maximum height of 0.75 m. The intact portion of the cairn exhibits nine courses of stacked slabs and remnants of what may have been courses at the base.

Feature D is considerably smaller and spatially detached from the above three cairns. It is located 56.0 m east (85 degrees Az) from Feature A and incorporates a cracked pahoehoe outbrust as a base. It consists of two large boulders piled on top of one another, with the base boulder positioned in the crack. Maximum height is 0.6 m. This feature is probably recent.

T-48 Complex

A small enclosure and cairn are included in this site, located near the eastern boundary of the project area, 90.0 m from Queen Kaahumanu

Highway. The enclosure (Feature A) is nearly square, with an interior space of 9.9 sq m. The north and east sides of the enclosure are in relatively good condition, with portions of an interior faced side still present. The north wall is 0.8 m wide and the east wall is 0.6 m wide. Interior height of these walls are 0.45 and 0.55 m respectively. Stones used in the walls are pahoehoe slabs, many of which are placed upright. The south and west walls are collapsed and scattered. There are no indications of an opening in the wall; however, half of the feature is disturbed. No portable remains were observed in or around the enclosure.

Feature B is a small cairn located 32.0 m southeast (165 degrees Az) from Feature A. It is situated on the edge of a low bedrock rise, and is constructed from loosely piled boulders. The base is oval in plan, with axes of 0.7 and 0.6 m. Maximum height is 0.4 m.

T-49 Modified Ponds

Two modified ponds connected with a narrow footpath are located at this site, which is situated directly east of the sand dune, on an lava from an 1801 flow. The larger of the two ponds (Feature A) has been cleared and deepened. It is keyhole-shaped in plan, with an overall length of 15.0 m and a varying width of 10.5 to 3.7 m. The narrow portion of the pond is at the north end, where most of the modifications occur. Large an boulders have been removed and stacked around the perimeter of the north half to form a wall-like structure 1.0 m above water level. The extreme northern end is open and connects directly with the sand deposit at the eastern foot of the dune. The bottom of the narrow portion of the pond is covered with sand, and it is 0.2 to 0.5 m deeper than the southern portion.

Feature B is a walled pond located 8.0 m southwest (220 degrees Az) from Feature A The pond has a major intertidal axis of 3.5 m and minor axis of 1.7 m. Maximum depth of the water is 0.65 m, which occurs in the center of the pond only. A stacked wall 2.5 m long and 0.45 to 0.8 m wide occurs along the north side of the pond shore. The top of the wall is 0.7 m above water level. All stones used in wall construction are coated with white residue (calcium carbonate ?), and probably had been removed from the pond. This wall is loosely constructed, and probably functioned as a screen rather than as a water retaining feature.

PORTABLE REMAINS

Portable remains were observed at 30 of the 49 sites identified during reconnaissance Materials most frequently observed were unmodified shellfish remains, which were at 25 sites. Thirteen different shellfish families were noted, and most shellfish scatters were considered to be very sparse to light in density (less than 100 fragments of shell present, generally less than 20 per sq m). The most frequently occurring shell species were of the Cypraeidae family; these remains were observed at 22

of the sites with shellfish remains (88%), or 44% of all sites. Nearly all fragments observed were Cypraea caputserpentis, one of the more common small Cypraeidae species. Four additional families were observed in significantly higher numbers than all other families. These include Neritidae (13 sites, principally Nerita picea), Isognomonidae (11 sites), Patellidae (10 sites), and Thaididae (9 sites). Three or more of these five frequently occurring families occur together at 14 sites.

Shellfish families found at very few sites include Veneridae (three sites) and Conidae (two sites). Both occurrences of Conidae are coincident with occurrences of Veneridae, and all three occurrences Veneridae are coincident with at least three of the five most frequently observed families. Families observed at one site only include the following: Chamidae, Littorinidae, Mytilidae, Melampidae, and Fasciolariidae. These rarely occurring families only occur on sites which have a number of additional families present; they do not occur at the 15 sites which have three or less families observable on the surface.

Most of the shellfish scatters observed (76%) consist of four or less different shellfish families. The most varied scatter (seven families) was observed at the overhang shelter of Site T 25. Scatters with more than four families also occurred at Sites T-1, T 23, T 24, T 36, and T-39. All of these sites are tentatively assigned to the prehistoric period, and all are temporary shelter sites (with the possible exception of Site T-1).

Other faunal remains observed include Echinoidea, which was present at six sites, fish remains (four sites), and bird remains (one site). Bird bone was observed at Site T-42, along with Echinoidea, fish, and kukui. Only a single shellfish species (Isognomon californicum) was observed at this modified cave shelter.

Fish remains were observed at one historic house site (T 1) and two temporary shelters (T-23 and T-25), in addition to the cave at Site T 42. Remains were sparse at these three sites, and limited to a few weathered bones. Fish remains observed at Site T-42 were concentrated within a coconut husk fiber fishing net that had been placed in a wooden bowl. They include all nonperishable anatomical parts, such as scales, fins, and bones.

Echinoidea remains were observed in association with a variety of shellfish families, predominantly at temporary habitation sites (T 1, T 19, T 22, T-25, T-30, and T 42). These remains were not observed at any of the historic habitation sites.

In summary, the occurrence patterns for observed subsistence remains at Nakalawena suggest that shellfish exploitation was perhaps more generalized during the prehistoric period than during the historic period. Sites with the widest range of shellfish species are all shelter sites in caves or overhangs and, with one exception (Site T 24), do not contain historic artifacts. The low variability of shellfish remains observed at historic house sites may, however, be related to the nature of the

deposits at the sites (considerably more soil accumulation than in shelters), and additional species may occur in subsurface contexts at these sites.

Non-artifactual vegetal material observed includes kukui nut shell, which was observed at Sites T-23, T-30, and T-42, and partially burned pieces of wood, observed at Site T-42. All of these sites are temporary habitation shelters, tentatively assigned to the prehistoric period.

Formed artifacts were observed at thirteen sites, and are predominantly historic period materials. The most frequently observed items were fragments of metal, which occurred at five sites. Occurrences of metal (sheet metal roofing) at Sites T-2, T-9, T-14, and T-25 represent remnants of structures that were either on or adjacent to the sites. A small, unidentifiable fragment of brass or bronze was observed at Site T-3; this item could be secondary refuse or storm wash. Milled lumber occurs at Sites T-2, T-9, and T-14, also as components of either disturbed coffins or buildings.

Bottle glass was observed at four sites, as well as at a number of refuse dumps associated with middle to late twentieth century caretaker activities. These latter features were not recorded as archaeological sites: they consist almost exclusively of one gallon wine bottles, with a few additional screw-top food jars (not fruit jars). Bottle glass identified as late nineteenth to early twentieth century manufacture occurred at Sites T-5 (modified pond), T-11 (house), T-14 (house), and T-25 (shelter/platform). Sherds observed at these sites represent panel bottles; neck sherds with a hand-applied lips were observed at Sites T-11 and T-14. Other glass artifacts observed are limited to a few pieces of flat glass (window pane) at Site T-13, and modern beverage bottles observed at three sites.

Ceramic materials noted include stoneware and whiteware sherds, which occurred together at three sites (T-3, T-11, and T-14). The latter two sites are house sites, and Site T-5 is a modified pond, which may have had a structural foundation (house?) located in the center of a pond (see site description). The stoneware sherds were generally too small for vessel form identification: a single crock and a bowl were indicated at Site T-5. None of the whiteware sherds exhibited remnants of makers marks, which are important dating components of this very common historic tableware. Whiteware forms represented include plates and a cup. No porcelain sherds were observed during reconnaissance.

Modified shell was observed at three sites, including two houses (T-11 and T-14) and the church (T-13). All items were of Pinctada margaritifera (pearl shell), and all exhibited edges apparently cut with metal tools. Two of the items were small, thin tabs, possibly formed for button or small ornament manufacture. A complete cut pearl shell item was observed at Site T-11 and collected for further study. This adze-shaped item was formed from a relatively large individual; it has a maximum length of 11.97 cm and a maximum width (bit end) of 6.24 cm (Figure 22). The item weighs 78.68 g and ranges in thickness from 1.99 cm at the butt end to

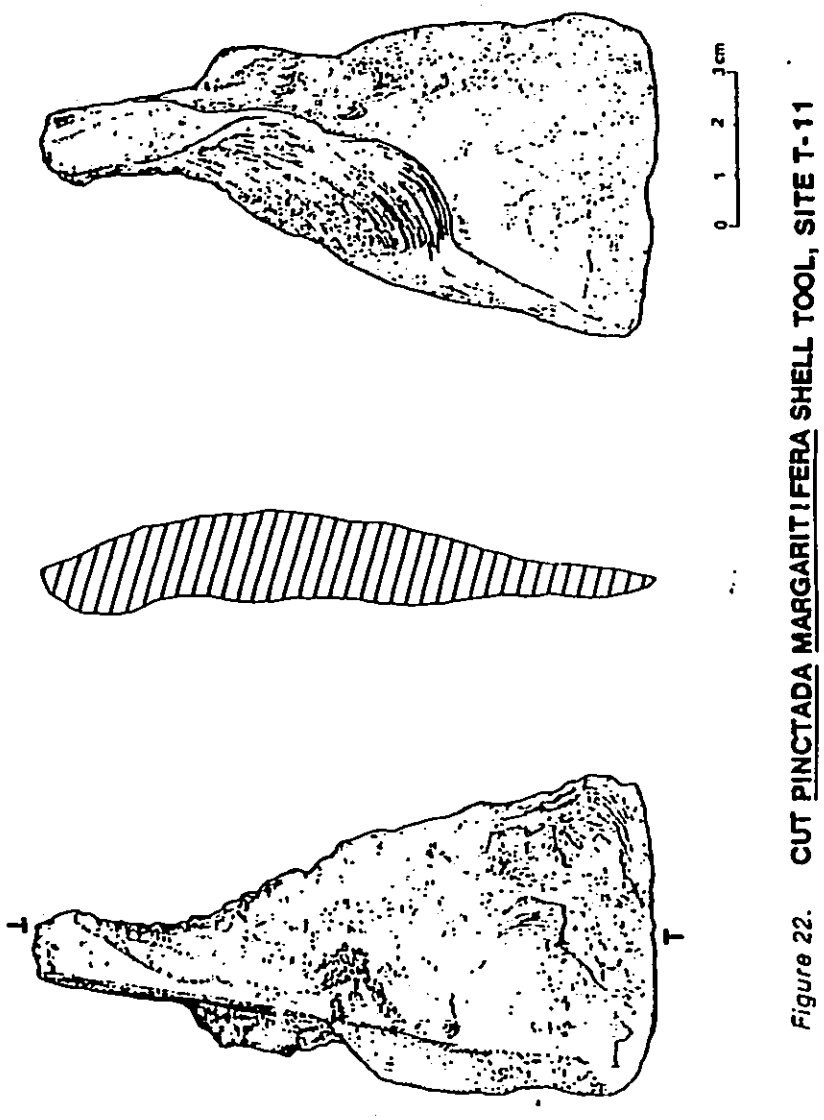


Figure 22. CUT PINCTADA MARGARITIFERA SHELL TOOL, SITE T-11

0.25 cm at the bit end. The butt end of the tool has been cut on two planes: across the ventral surface of the hinge, and through the hinge from the dorsal side, along the long axis of the tool. A third saw scar occurs on the dorsal side of the shell; this 3.85 cm long scar forms a narrow groove. All edges of the adze blade are worn and there are slightly discernable cut lines across the bit end, which was apparently straight prior to useage. Wear is most pronounced on the dorsal side of the shell. This tool may have had a variety of general functions, from scraping to garden maintenance; it is clearly of historic manufacture.

Two formed lithic artifacts were observed and collected during the reconnaissance. The first of these is a basalt coffee bean shaped octopus lure sinker that had been used as both hammerstone and anvil (Figure 23). This item was recovered from a historic house, Site T-18. It is 8.9 cm long, 6.2 cm wide, 4.2 cm thick, and weighs 392.3 g. The item was apparently first modified to function as a octopus lure sinker, by grinding a relatively flat surface on one side and a central groove on the other. The groove is widest (0.89 cm) at the ends and narrows to 0.43 cm near the center. Average depth of the groove is 0.1 cm. All margins of the sinker exhibit varying degrees of battering and pecking, and flakes have been knocked off of the ventral surface and lateral margins. Pecking occurs near the center of both the dorsal and ventral sides, and is most pronounced on the dorsal side, where an amorphous depressed area occurs. This tool may represent a prehistoric octopus lure sinker that was reused as an anvil/hammerstone during the historic period. A definite association with the historic component at Site T-18 is, however, not possible, due to the surface context of the artifact and extent of modern activity in the area.

The second formed lithic tool recovered is a well worn scoria abrader, recovered from the surface of Feature B, Site T-22 (Figure 24). This item is 6.26 cm long and weighs 28.7 g. The narrow end is 0.5 cm thick and 0.93 cm wide; it is ground on all surfaces and a small break occurs at the tip. The wide end of the abrader is ground only on one surface (ventral); all others are worn breaks. This end is 4.0 cm wide and 2.0 cm thick. The ventral surface has been ground to a nearly flat surface, while the dorsal side is ground to 2.53 cm from the wide end. A small area at the edge of the ground portion on the dorsal side is polished, apparently from repeated handling

Additional lithic material recovered from Site T 22 includes three volcanic glass flakes found inside Feature B. These items have been retained for possible hydration rind age determinations at a future date. No additional volcanic glass was observed during reconnaissance; however, it is expected that flakes are present at sites which have midden and/or soil accumulations.

Two wooden artifacts were recovered, both from a small storage cave (feature C) at Site T 42. The larger of these is a bowl which contains a coconut husk fiber fishnet with fish remains (see Figure 21, above). This artifact is in good condition with the exception of a few cracks which originate at the rim. The opening is slightly oil round; maximum interior

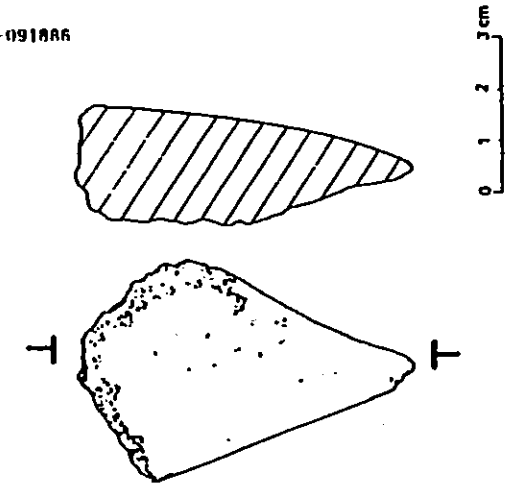


Figure 24. **SCORIA ABRADER, SITE T-22, FEATURE B**

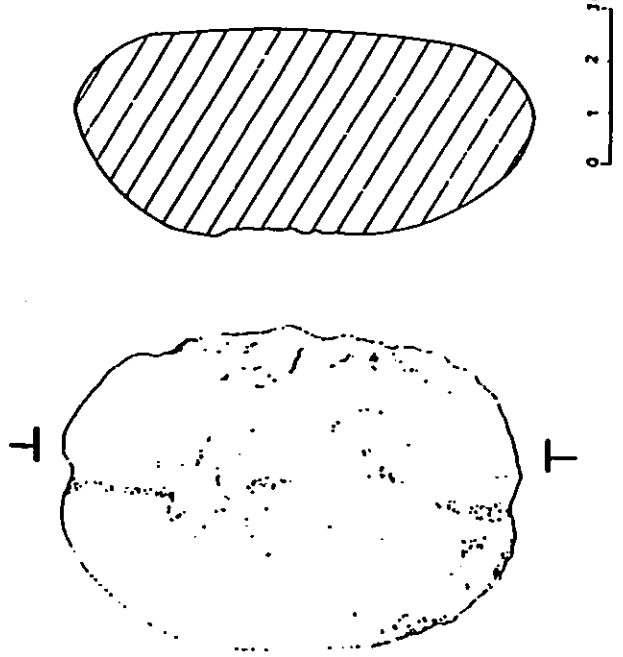


Figure 23. **GROUND BASALT SINKER, SITE T-18**

0.25 cm at the bit end. The butt end of the tool has been cut on two planes: across the ventral surface of the hinge, and through the hinge from the dorsal side, along the long axis of the tool. A third saw scar occurs on the dorsal side of the shell; this 3.85 cm long scar forms a narrow groove. All edges of the adze blade are worn and there are slightly discernable cut lines across the bit end, which was apparently straight prior to usenge. Wear is most pronounced on the dorsal side of the shell. This tool may have had a variety of general functions, from scraping to garden maintenance; it is clearly of historic manufacture.

Two formed lithic artifacts were observed and collected during the reconnaissance. The first of these is a basalt coffee bean shaped octopus lure sinker that had been used as both hammerstone and anvil (Figure 23). This item was recovered from a historic house, Site T-18. It is 8.9 cm long, 6.2 cm wide, 4.2 cm thick, and weighs 392.3 g. The item was apparently first modified to function as a octopus lure sinker, by grinding a relatively flat surface on one side and a central groove on the other. The groove is widest (0.89 cm) at the ends and narrows to 0.43 cm near the center. Average depth of the groove is 0.1 cm. All margins of the sinker exhibit varying degrees of battering and pecking, and flakes have been knocked off of the ventral surface and lateral margins. Pecking occurs near the center of both the dorsal and ventral sides, and is most pronounced on the dorsal side, where an amorphous depressed area occurs. This tool may represent a prehistoric octopus lure sinker that was reused as an anvil/hammerstone during the historic period. A definite association with the historic component at Site T-18 is, however, not possible, due to the surface context of the artifact and extent of modern activity in the area.

The second formed lithic tool recovered is a well worn scoria abrader, recovered from the surface of Feature B, Site T-22 (Figure 24). This item is 6.26 cm long and weighs 28.7 g. The narrow end is 0.5 cm thick and 0.93 cm wide; it is ground on all surfaces and a small break occurs at the tip. The wide end of the abrader is ground only on one surface (ventral); all others are worn breaks. This end is 4.0 cm wide and 2.0 cm thick. The ventral surface has been ground to a nearly flat surface, while the dorsal side is ground to 2.53 cm from the wide end. A small area at the edge of the ground portion on the dorsal side is polished, apparently from repeated handling.

Additional lithic material recovered from Site T-22 includes three volcanic glass flakes found inside Feature B. These items have been retained for possible hydration rind age determinations at a future date. No additional volcanic glass was observed during reconnaissance; however, it is expected that flakes are present at sites which have midden and/or soil accumulations.

Two wooden artifacts were recovered, both from a small storage cave (Feature C) at Site T-42. The larger of these is a bowl which contains a coconut husk fiber fishnet with fish remains (see Figure 21, above). This artifact is in good condition with the exception of a few cracks which originate at the rim. The opening is slightly off round; maximum interior

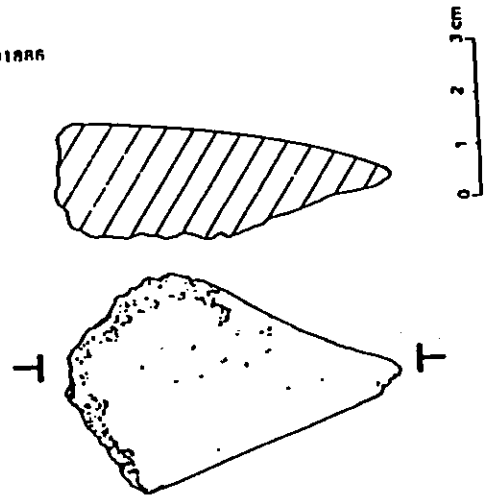


Figure 24.
SCORIA ABRADER, SITE T-22, FEATURE B

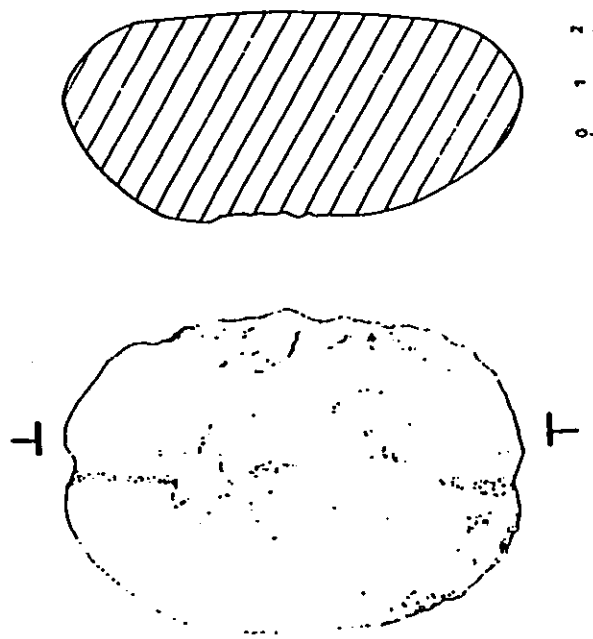


Figure 23.
GROUND BASALT SINKER, SITE T-18

opening diameter is 23.0 cm and average diameter is 23.0 cm. Overall height is 17.5 cm, and thickness where measurable varies from 0.8 to 1.2 cm. The bowl has a globular shape, with slight shoulders 11.5 cm from the rim. The base is rounded and has no footings. The neck is straight and slightly insloping. The rim is straight with no thickening or thinning, and no decorative modifications. A few rodent gnaw marks occur around the rim. The wood used has three knots, two of which are located along opposite side walls of the bowl. A hole is present through the wall of the bowl at one knot; this does not appear to be intentional.

The interior portion of the bowl could not be adequatley examined at this time due to the presence of the coconut husk fiber net, which must be stabilized in order to enable removal intact. The net is folded a number of times, and only the upper portions appear to be decayed. The bowl and net and the other wooden artifacts have been placed in climate controlled storage (Archaeology Laboratory, University of Hawaii-Hilo) until appropriate analysis and conservation procedures can be carried out. These items are significant due to the rarity of their occurrence in archaeological contexts and their currently good state of preservation.

Unfortunately, so few wooden bowls have been located that there is no stylistic typology, or comparative items, which might aid in determining a relative age for the specimen from Site T-42. Kirch refers to a single wooden bowl discovered by Forbes around the turn of the century, near Kawaihae (1985:177). This item was inset with human teeth and bone, and was associated with canoe burials. Chinese porcelain was also present with the bowl, which was apparently not a utilitarian item, and therefore not directly comparable to the Site T-42 specimen.

Associated with the wooden bowl at Site T 42 was a wooden spatulate tool, the specific function of which has not been determined (Figure 25). This artifact is 12.52 cm long and has an average thickness of 1.55 cm. All sides and edges of the item are well worn, and there are no marks to indicate use of metal tools in manufacture. The narrow end is 1.55 cm wide and maximum width is 8.1 cm. The edges of the wide end are somewhat battered in appearance, and a central pit has been gouged out of one side only. This pit is 1.35 cm in diameter and has a maximum depth of 0.15 cm. The surface inside this pit is roughened by what appears to have been repeated application of a sharp instrument. The spatulate tool was possibly used in some phase of net or fabric production, as a hand guard while forcing a needle, awl, or similar tool that did not have an attached handle.

As indicated above, the coconut husk fiber net has not been removed from the bowl at this time, due to the risk of destroying the item. The net is constructed from two ply cords that are twisted in an S twist. Each ply consists of about 20 fiber strands of varying thickness. The overall shape and size of the net is unknown; however, it does not appear to be very large (if complete)

It is not possible to associate the artifacts from Site T 42 with either the prehistoric or historic period at this time. It is anticipated that further examination of the artifacts and the acquisition of datable material from the site will help to resolve this problem.

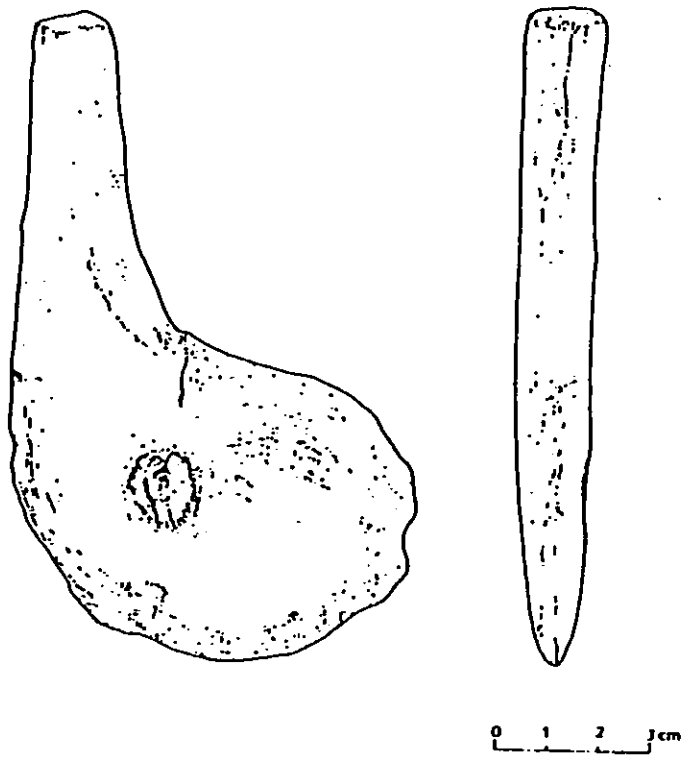


Figure 25.

WOODEN SPATULATE TOOL, SITE T-42, FEATURE C.

CONCLUSION

DISCUSSION

The findings of the reconnaissance survey are summarized here, and interpretive hypotheses are offered where appropriate. Interpretation is limited by the level of investigation conducted at the sites and is, of course, subject to change with subsequent more detailed work. Comparative observations are offered, with particular attention to the recently examined archaeological resources of Awakee, located adjacent to Makalawena to the north (Walker and Denham 1988). The discussion is organized on three levels--features, functional categories of sites, and general temporal periods.

Features

A total of 121 features representing 24 formal types was identified during reconnaissance. Frequencies of each type have been summarized at the beginning of the Findings section (see Table 3), and the relative frequencies of specific types discussed. The following discussion focuses on the spatial patterning of various types and instances of co-occurrence of the feature types, as well as on interpretation of specific feature functions.

The 16 features identified as cairns occur at 12 sites within the project area. Half of these sites are located along or very near the boundary of the project area, within 400.0 m of the Queen Kaahumanu Highway. It is likely that most of these cairns are the result of recent activities that are generally concentrated and visible along the highway corridor. These cairns are small, and each consists of less than ten stones that are generally simple stacks. Large numbers of these features tend to occur in recreational areas.

A single cairn occurs along the northern, inland boundary of the project area (Site T-43). It is small and the construction appears to be recent (slabs are leaned upright in a conical formation that is relatively unstable). This feature is probably a surveyor's marker. Additional boundary cairns occur along the northern border, in the coastal area. These cairns were specifically identified as such by the present Makalawena caretaker; however, they were outside of the project area, as it was delimited on the project area aerial photography provided by Phillips, Brandt, Reddick & Associates (R.M. Towill Corp., Photo No. 4414-4415, 1967). The southern boundary cairns described by Makalawena residents in 1873 (Silva, Appendix A) were not identified during reconnaissance.

Three cairns occur on sites with other feature types. In two cases, the cairns are associated with a footpath or trail through the site (T 10 and T 23), and in one case, the cairn marks an otherwise inconspicuous cave shelter location (Site T 24).

The two largest cairns within the project area occur at the same site (T 40). 670.0 m west from the Queen Kaahumanu Highway. These features are located 54.0 m south from the Makalawena Akahipu'u Trail, and are positioned in a north-south line, 1.6 m apart. This positioning is commonly found in association with trails, which pass between the two cairns; it has been observed at a number of areas in North Kona, including Awakee, which is adjacent to Makalawena to the north. Although no trail was discernable between the cairns at the time of survey, their presence suggests that a former trail most likely did occur here. Two features that are currently rubble piles (Site T-41) occur in a similar pattern 50.0 m directly west of the two cairns. These features are probably disassembled cairns.

Fifteen overhang shelters were identified during reconnaissance. These features are distinguished from caves in that the depth of an overhang is less than the width of its opening, whereas a cave has greater depth than entrance width. Overhangs occur with greater frequency than caves (15:9), and they co-occur with caves at three sites (T 23, T 39, and T-42). In each of these cases, the caves and overhangs were components of a single collapsed blister or lava tube.

Overhang shelters are scattered throughout the project area, but only one is located within 300.0 m from the shoreline (Site T 2). Clusters of three overhangs occur at Sites T-22 and T-34. These, as well as two additional overhang shelter sites (T-25, T-30), are located in the kiawe thicket behind Opaeula Pond.

The distribution of utilized cave shelters is similar to that of overhangs: no caves occur in the immediate coastal zone, and only one is within 400.0 m from the shoreline (Site T-24). A rather conspicuous clustering of cave shelters occurs along the western border of the north-south aa flow which passes through the center of the project area. Four cave shelter sites occur along this area (Sites T-32, T 33, T-38, and T-39). Among these four, Site T-39 was the most intensively utilized; it also includes an overhang shelter. Only one cave shelter was located inland from the band of aa (Site T-42). This cave and overhang complex is 46.0 m south from the Makalawena-Akahipu'u Trail and 1.5 km from the shoreline. The site is aligned with the two cairns hypothesized to mark a former trail; if this hypothesis is correct, the site would have been located along the trail.

Walled shelters are natural features such as lava upthrusts, collapsed blisters, or crevices that have been modified by the construction of a wall. It is assumed that these features had functions generally similar to overhangs, caves, and C-shaped walls, and that they reflect brief and limited utilization as shelters. Four walled shelters were located at three sites during reconnaissance (Sites T 23, T 30, T 44). Two of these sites occur along the northern border of the project area, and one (Site T-23) occurs along the Makalawena Akahipu'u Trail.

Two C shaped walls were identified at Sites T 1 and T 15. These features are structurally quite different and represent diverse functions. The latter feature is probably a recent construction and appears to have

no other use than as a privy. The wall at Site T-1 is associated with a terrace floor and is tentatively interpreted as a possible permanent habitation. The form of this feature has been affected by storm waves, and it is not certain that it was constructed as a C-shape.

The absence of small C-shape shelter walls at Makalawena is notable. These features (or outnumber caves and overhangs at Awakee, immediately to the north (Walker and Denham 1988:9), and they are a predominant structural type in areas such as Anaehoomalu (Barrera 1971).

Thirteen single miscellaneous walls were located at five sites within the project area. All of these features are located within the immediate coastal zone, and over half (seven) occur at two historic habitation sites (T 11 and T 18). Five walls occur at modified anchialine pond sites (T-5 and T 28), where they function as either bridges, divider walls in ponds, or dams. The remaining wall, located at Site T-3, has been damaged by storm waves and is very incomplete.

Nine cleared ponds identified at five sites consist of purposely cleared areas in anchialine pools or ponds. They were created by the removal of loose pieces of aa from selected areas of the bottom of the pond. This process increases water volume and, in some cases, creates a more hospitable area for sitting or standing. Most cleared areas observed are about the size of a bathtub. Brewer suggests that this type of pond modification was conducted "for stock watering purposes" (1986:3.2.5). this may be correct in a limited number of cases; however, the majority of cleared areas were probably (and still are) bathing areas, particularly those cleared areas that are surrounded by low walls or made otherwise inconspicuous. Many of the cleared anchialine ponds readily accessible to beachgoers are subjected to a constant process of structural change. There is currently no reliable means of determining when a particular clearing was created, although more recently removed stones tend to exhibit a fresher deposit of white residue crust than stones exposed to the weather for some time.

Cleared ponds and pools are very common in North Kona wherever anchialine ponds occur, and are rather intensively used in some areas. Recent useage patterns have apparently not had major biological effects on the ponds of Makalawena, and no major structural changes have occurred during the last 15 years (Brewer 1986:4.2).

Seven walled ponds were located at three sites within the project area. These features consist of anchialine ponds that have perimeters or sections of the perimeters defined by faced retaining walls. In all cases, the tops of the walls are level or nearly level with surrounding ground surface, which is principally aa. The walls apparently served to increase water volume in the ponds. None of the retaining walls appear to be of recent construction, and most (particularly those at Site T-7) represent major investments of time and energy. The walled ponds may have been utilized primarily for the maintenance of 'opae'ula and similar shrimp for fishbait, rather than as bathing areas. The walled ponds are relatively large and the water level is lower than most cleared pools.

Functional Categories

Those feature types which represent functional, rather than strictly formal categories (i.e., graves, wells, footpaths, and refuse pits), are discussed in the following paragraphs. General functional interpretations were determined for 41 of the 49 identified sites. Categories used include permanent habitation, temporary habitation, recreation and/or aquaculture, transportation, animal keeping, and religious/burial. These categories are briefly defined and discussed below.

Permanent habitation is indicated by the presence of a structural foundation, an extant structure, or other remnants of a permanent structure or structural platform inferred to have been used for habitation. Features interpreted as remnants of residencies were located at four sites within the project area (Sites T-11, T-12, T-14, and T-18). These sites are all located within the coastal zone and are within the spatial boundaries of the village of Makalawena. They are all assigned to the historic period, on the basis of observed artifacts and architectural design (i.e., mortared floor, bifacial core-filled walls, milled lumber, and sheet metal roofing remnants). It is likely that Sites T 11 and T 18, as well as certain features of Site T-14, date to the nineteenth/early twentieth century (prior to 1930), since they were described as archaeological sites by Reinecke in 1930. Ecofactual remains were visible on these sites at the time of survey, and it is expected that they contain datable artifacts. Of particular interest also is the presence of both indigenous and non-indigenous artifact classes at Sites T 11 and T 18.

A fifth possible habitation site, T-1, may represent the only permanent prehistoric habitation site located within the project area. This partially enclosed terrace has been storm damaged; however, there appears to be a significant deposit of portable remains among the aa gravels used for terrace fill (see previous discussion of Portable Remains). The proximity of this feature to the Makalawena Cemetery raises the possibility that it could contain interments.

It appears that the distribution of permanent habitation sites at Makalawena presents an incomplete picture of the actual nineteenth and twentieth century settlement. The village of Makalawena contained approximately 15 houses during the early twentieth century; nearly all of these structures were totally destroyed by a single tidal wave in 1946. It can be expected, therefore, that early historic and prehistoric permanent habitation patterns would likewise be misrepresented by the archaeological record.

Temporary habitation sites are those which consist of walled shelters, utilized overhangs, and utilized caves. This category currently includes shelters that exhibit very minimal use (i.e., a few pieces of shell), as well as more intensively occupied shelters which contain accumulated midden deposits. There are clearly functional variations within this group; however, there has been no systematic attempt to delineate what these differences imply. Cordy suggests that these sites are better described as "short term special use," rather than as temporary habitations (1976:7). Both terms could be potentially inaccurate, given

the implications of "special use" and "habitation." Cordy equates his term with rest stops that were used for possibly a few hours, as well as with structures built and occupied for several days (while tending crops or gathering forest resources). The latter category of sites would appear to be defined accurately as temporary habitations, whereas the rest stops are more accurately described as short-term occupations. These distinctions could likewise be applied to cave and overhang shelters; however, additional work is required before a meaningful distinction can be made.

The general temporary habitation category is represented by 16 sites, all of which occur in the inland portion of the project area. Three of these sites (T 19, T-22, and T-25) are just over 300.0 m from the shoreline, three sites are 385.0 to 400.0 m from the shoreline (T-23, T 24, and T 30), and the remaining ten sites are over 0.5 km from the shore. Only one of these sites (T-23) is directly associated with an existing transportation route (Makalawena-Akahipu'u Trail). Four sites are located directly east of Opaeula Pond, within 80.0 m of the shoreline (Site T 22, T 24, T-25, and T-30). These sites may have functioned as temporary stations for persons visiting the pond area from elsewhere other than Makalawena Village. Historic materials were observed at one of these sites (T 25).

A second patterned occurrence of temporary sites is the somewhat linear arrangement of Sites T-32, T-33, T-38, and T-39 along the western edge of a broad aa hand. Although no north-south trail or path was observed in this area during reconnaissance, the patterning of these shelters suggests that a trail may have formerly existed along the base of the aa flow.

The overall proportion of temporary shelters or temporary habitation sites at Makalawena (32%) is identical to that for Awakee, where 27 of 84 identified sites were categorized as temporary. The absolute frequency of these sites in Awakee is, however, nearly double the number recorded in Makalawena. This difference is probably most related to the greater expanse of coastal area within Awakee ahupua'a.

The transportation category includes all identified footpaths and trails within the project area. Five footpaths were located, two of which occur at sites with additional features. Four of these paths occur in the northwest corner of the project area, and provide access to and around the anchialine ponds in the area. Two footpaths, Sites T 4 and T 6, continue northward into Awakee, where they eventually connect and form a coral marked path to another anchialine pond complex. These paths are undoubtedly in current usage, as indicated by the scattering of modern rubbish along their courses.

The principal historic transportation corridor within the project area is the Makalawena Akahipu'u Trail, a kerbstone lined and rock filled "type C" trail. The east west (mauka makai) portion of this trail is almost completely intact; the coastal portion, which turned northward along the beach, probably followed what is now the jeep road (see map, Appendix A).

No specific information could be located by Silva documenting the date of construction of the kerbstone trail. It is most likely to have occurred during the late nineteenth century, when the government began conscripting the labor of prisoners and taxpayers for road construction. As indicated in the Highways Act of 1892 (Section 43), properties used by the government for the purposes of road construction become the fee simple property of the government. This property remains in the possession of the government during the period of road use and until such time that the road corridor is offered to the abutters or sold in public auction.

The Makalawena-Akahipu'u Trail may have followed sections of a pre-existing trail, as suggested by the presence of two sets of possible trail marker cairns located 50.0 m south of the trail (Sites T-40 and T 41). The construction of the straight kerbstone trail would have resulted in abandonment of unused sections of the earlier trail, and obscurement of those sections. An implication of this interpretation is that the Makalawena coastal population would have had direct access to upland areas prior to the initiation of government road construction, without having to travel outside of the ahupua'a.

Recreation and/or aquaculture is indicated at six sites, all of which are complexes of modified anchialine ponds (Sites T-5, T-7, T 10, T 16, T-21, and T-49). These sites are located around the periphery of Opaeula Pond or behind the sand dunes, and contain such features as walled ponds, cleared pools, single walls, bridges, enclosures, footpaths, and shelter remnants. These sites occur primarily in loose aa lava which has been extensively landscaped for both access and aesthetic purposes, probably during the period of Makalawena Village occupation.

The extent to which the coastal anchialine ponds and seeps have been modified and landscaped reflects a continuity in pond utilization by more than one or two households. The pond complex located between Opaeula Pond and the cemetery appears to have functioned as a community maintained and utilized area. Additional comments on the ponds have been made above.

Animal keeping is indicated at Makalawena by high walled enclosures that contain no internal features. These enclosures were located at three sites within the project area (T-8, T-17, and T 26). These sites were all previously identified by Soehren and Reinecke as goat pens. Makalawena villagers were known historically to raise goats, and a sizable feral herd still ranges within the project area. Groups of up to 20 goats were observed during the reconnaissance survey, and nearly every cave and overhang in the project area has been utilized or at least visited by the goats.

The enclosures are all located within the coastal zone, either within or adjacent to the loose aa lava fields, which provided building materials for the walls. All three enclosures are in relatively good condition, with the bulk of wall damage caused by large trees. The most interesting and unique of the enclosures is Site T 26, which has two linear chute walls radiating from the eastern side.

The religious/burial category includes two sites, the Kaikalaia Church (T-13, United Church of Christ, Hawaii Conference), and the Makalawena Cemetery (T-9). The church site has been in use since c. 1868, and possibly since 1848 (Springer, Appendix B). Two different structures were erected on the site; the most recent structure was built in 1909, and was situated about 100 yards from the former structure. Both of these buildings served as both the school and church for the community. Beginning in 1912, the Makalawena congregation had to travel to Kohana-iki for services. In 1920, the building was salvaged and the lumber was used to build the Kaunn Ziona Church hall in Kalaoa (Springer, Appendix B). The Kaikalaia Church site is still owned by the United Church of Christ; it is regularly maintained and visited annually by the parishioners, even though the superstructure has been moved to Kalaoa.

The Makalawena Cemetery (Site T-9) is documented on the USGS quadrangle map of the area, and it has been previously described by Reinecke and Soehren. Seven graves were identified at the cemetery during field investigations. All of these features have been extensively disturbed by storm waves, and the original structural features are largely indeterminate. As indicated in the description of this site, all graves appear to have been excavated into the as. Depth of excavation is uncertain; however, most graves were probably quite shallow, since the water table would be encountered within a few feet of the as surface. Certain of these features may have been covered with small platforms that have since been obliterated. As indicated in the site description, skeletal material has been exposed, and the condition of the identified burials is probably very poor. It is, however, expected that additional burials are present and undisturbed.

The positioning of lumber and corrugated sheet metal roofing in the disturbed features suggests that coffins were used. Wooden coffins covered with corrugated sheet metal were present in the historic component of the Keopu Cemetery, northeast of Kailua-Kona, where 13 historic burials were excavated within a large prehistoric cemetery (Ilan 1986:102). The historic component of the Keopu Cemetery is hypothesized to have been used between 1850 and 1910, with most of the burials post dating 1875 (Ilan 1986:108, Garland 1986:163-164). This period overlaps with the hypothesized period of cemetery use at Makalawena, and it can be expected that the mortuary practices exhibited and associated artifacts at the two sites are generally similar. The majority of artifacts recovered from historic burials at Keopu were clothing; eight interments contained personal items such as hand tools, dishes, purses, coins, and hair accessories (Garland 1986:163). Traditional Hawaiian artifacts recovered from the historic burials at Keopu were limited to lauhala matting and pulu pillows (Ilan 1986:109-112).

The sand dunes of Makalawena at Pounili Bay were reported by Emerson to be an "ancient burying ground" where skeletons were disinterred by the waves at times (Emerson 1882, as referenced in Silva, Appendix A). The sand dunes and beach area was carefully walked and examined for skeletal material. In addition, several vertical faces were cut into the face of the dune. These cuts were, however, limited in depth, and it is possible

that additional burials are still present in the lower portions of the dune. This would not be surprising, given the common occurrence of dune cemeteries in the Hawaiian archipelago. Recent subsurface testing of a sand dune burial site on the north shore of Maui has indicated that burial depths in such a feature are highly varied, with burials occurring from just under the surface to nearly 4.0 m deep (Donham 1986a).

General Temporal Periods

The principal archaeological sites tentatively assigned to various general temporal periods are briefly summarized here, using four periods: prehistoric (prior to 1779), early historic (1779-1850), late nineteenth/early twentieth centuries (1850-1930), and modern (1930-present).

The prehistoric period is currently represented by a limited number and variety of functional categories. No permanent habitation sites can be definitely assigned to this period on the basis of reconnaissance level work. It is possible that Site T-1 is such a site; however, it is equally likely that this feature represents a badly storm washed historic burial feature. It is also possible that prehistoric components will be identified at certain of the historic habitation sites, if further examined. Unfortunately, with the exception of Site T-11, most of these sites are likewise damaged by wave action or other causes.

The very low frequency or possible absence of permanent prehistoric habitation sites at Makalawena can be related to one or more of the following factors: (a) the area was environmentally inhospitable and therefore was not intensively settled; (b) the area was under the political control of a chief, and not accessible to other members of society; or (c) the archaeological remains have been washed away by storm waves.

The first alternative explanation is probably the least feasible; Makalawena would have been a preferred rather than avoided environment. It has an extensive sand beach, numerous anchialine ponds, areas of soil accumulation within the coastal zone, and a varied offshore marine environment. Opaeula Pond (assuming that it was marshy during the prehistoric period) would have provided a resource area for waterfowl. If more pond like during the prehistoric period, this body of water could have functioned as a fish pond.

Due to the environmental advantages of the Makalawena coastal area, it is feasible that it could have been reserved for a politically powerful individual. The establishment of chiefly reserves has been indicated or suggested for other coastal areas of North Kona. The anchialine ponds of Kohana iki were demarcated with an alignment of large cairns, which are hypothesized to signify a kapu area for the general populace. The distribution of permanent habitation sites within Kohana iki ahupua'a suggests that it was the prehistoric, rather than the historic period, settlement pattern which reflects avoidance of the anchialine pond zone (Donham 1986b). A similar, although somewhat more imposing, cairn boundary occurs around a smaller anchialine pond reserve of southern Kaloko (Kelly 1977:104).

No material evidence of a boundary demarcation around the ponds of Makalawena was located during reconnaissance. The only evidence of any chiefly restrictions involving the area date to the middle nineteenth century, when the ahupua'a was claimed by a chiefess (Akahi) at the time of the mahele. Certain marine resources were reserved for Akahi's use only between 1852 and 1877 (S[illegible]a, Appendix A). No locational restrictions were imposed at this time, which was during the period of Makalawena Village occupation.

Access to the beach area of Makalawena during the prehistoric period is indicated by Emerson's reporting of an "ancient burial ground" along Pouali'i Bay. The presence of this burial area implies that there was a local population residing within a relatively close distance from the dunes during the prehistoric period, although not necessarily within the area currently defined as Makalawena. The presence of a traditional burial area could have caused some avoidance of the sand dune for permanent settlement (during the period of cemetery use). There is ample evidence of rather intensive prehistoric habitation at Awakee, with a concentration of habitation sites immediately north of the Awakee-Makalawena boundary (Walker and Donham 1986). It might be suggested that this boundary was perhaps not an element of the cultural landscape during the earlier portion of the prehistoric period.

Based on available material information, it appears that the final alternative (destruction by storm waves) is the most feasible explanation for the absence of permanent prehistoric habitation sites along the coast at Makalawena. As indicated above, a considerable proportion of the twentieth century material remains have disappeared, so there is no reason to assume that prehistoric sites would be selectively preserved. The disappearance of the sand dune burial area is a case in point. It should also be noted that the area immediately behind the present sand dune was covered by lava during the Hualalai flow of 1801. This particular area would have been a preferred prehistoric habitation area.

Evidence of prehistoric activities at Makalawena is currently best indicated by the temporary habitation and shelter sites. Unfortunately, most of these sites cannot be definitely placed with any period, due to an absence of diagnostic and datable materials. This type of site was used throughout the historic period, and the absence of historic artifacts at these sites cannot be used to automatically assign them to the prehistoric period. Only a single surface occurrence of volcanic glass was observed at a shelter site (T 22), and three indigenous artifacts were located at two shelters (T 22 and T-42).

No material remains were located during reconnaissance that could be assigned to the early historic period (1778 1850). The village at Makalawena was in existence prior to the end of this period, and in 1848 it probably consisted of about 6-7 houses (based on a count of 21 students at the school [Springer, Appendix B]). Materials dating to this period are most likely to be located at Site T 11, and at the historic cemetery (Site T 9). Any material remains located along the beach would have been destroyed by storm waves. The walled anchialine ponds and one or more of the high walled pond pens could have been constructed during this period; however, it will be difficult t. date these constructions with any degree of precision

The late nineteenth/early twentieth century (1850 1930) is the period best represented at Makalawena. All of the permanent habitation sites (four) have been tentatively assigned to this period, as has the Makalawena-Akahipu'u Trail, the Kaikaiaia Church and school site, the Makalawena Cemetery, and at least one temporary shelter (Site T 25). This period is also best represented by the archival and informant information presented by Silva (Appendix A) and Springer (Appendix B).

Those structures possibly built prior to 1850, such as the walled ponds and animal enclosures were undoubtedly utilized throughout this period. Their continued maintenance is evidenced by the generally good condition of these features.

The village of Makalawena consisted of seven to 15 houses during this period, and was the principal service area for a church and school, located at the village. No references to a store or other type of service center were located during preliminary archival research. The village was literally destroyed in 1946 by a tsunami, and only one family, that of Annie and Una, returned and rebuilt at the village site.

The modern period (1930-present) is represented by two extant habitation structures and a number of extant dependencies at Makalawena. All of these structures are concentrated in the area of Site T 11, which also includes the remnants of a late nineteenth/early twentieth century house.

Additional evidence of human activity in the immediate coastal zone is considerable. These include a number of refuse dump sites, located primarily in pahoehoe crevices and dry sinkholes just inland of the beach. Due to the recent nature of these deposits (c. 1950), they were not recorded as archaeological features. It is possible that early twentieth century refuse is buried beneath the modern rubbish at some of these features. The most likely features to contain buried deposits occur on Sites T-14 and T-18. Other features which date to the modern period include cleared ponds; those located at Sites T 17 and T 49 appear to be most recent

EVALUATIONS AND RECOMMENDATIONS

Evaluations

The significance of cultural remains can be defined in terms of potential scientific research, interpretive, and/or cultural values. These values are not mutually exclusive, and certain resources may be significant in two or three realms. Research value refers to the potential of archaeological resources for producing information useful in the advancement of knowledge concerning past cultural systems. All archaeological resources have some degree of research value, the identification of significant research value is contingent upon the integrity of a given site, as well as on the kinds of research issues recognized as being important to the professional and non professional community

A framework for the assessment of research value has been presented in the introductory section of this report. The application of this general research design to the specific archaeological sites at Makalawena follows. It should be noted that the concerns of the various approaches to archaeological interpretation have implications that extend well beyond the immediate research goals of the archaeological community.

The minimal data requirements for the development of a local culture history include the presence of retrievable remains which permit either a relative or absolute determination of the use period(s) of specific sites. Wood charcoal or volcanic glass for absolute age determination was observed at two temporary shelter sites during reconnaissance (Sites T-22 and T-25). These materials are expected to occur at five additional shelter sites which exhibit soil and midden accumulation (Sites T-23, T-30, T-36, T-39, and T-42); as well as at the habitation sites in the coastal zone (Sites T-1, T-11, T-12, T-14, and T-18). Diagnostic artifacts indicative of specific historic periods are expected to occur at the four historic habitation sites (T-11, T-12, T-14, and T-18).

The requirements for human ecology studies in archaeology include locational data for all functional categories of sites within the study area, as well as the presence of retrievable artifacts, ecofacts, and other structural information that will permit (a) a reconstruction of subsistence patterns, (b) a reconstruction of past environmental conditions, and (c) a consideration of both natural and social constraints on settlement/subsistence patterns.

The 12 sites listed above contain retrievable ecofactual remains; these remains also occur at Sites T-8 and T-21. The locational patterning of all sites, or of general functional categories of sites, is obtainable from data collected during reconnaissance survey. The refinement of a functional typology will best be aided by data collected at the 12 sites listed above. The requirements for a reconstruction of past natural and social constraints on settlement will probably not be met with data collected solely from the Makalawena project area. This is due to the potentially unrepresentative nature of the extant archaeological record. Comparative applications and use of archival resources should aid in this endeavor.

The majority of the temporary habitation or shelter sites contain very limited quantities of ecofactual and/or artifactual remains. These sites have research value as indicators of possible transportation routes or specialized resource acquisition locales, despite the absence of temporal indicators. Their specific metric attributes, location, associated portable materials, and features of the immediate microenvironment constitute the collectable data from these sites. These data have been collected for all temporary habitations and shelters, except in those cases where the ecofactual deposit was too extensive to describe accurately and identify without excavation and laboratory analysis.

Due to the apparent destruction of coastal prehistoric habitation sites at Makalawena, there is not very high potential for an in-depth examination of permanent habitation patterning or locational pattern

changes within the ahupua'a through time. An examination of Makalawena settlement within the regional context of Kekaha might be more productive, but the same restrictions would apply to interpreting prehistoric patterns at a larger scale. Settlement pattern analysis would be more productive for the historic period, since the archaeological record is more complete, and is supplemented with archival data.

The most appropriate issues in culture process and the reconstruction of past lifeways at Makalawena appear to be those focused on the historic resources, particularly those of the late nineteenth/early twentieth century period (1850-1930). All of the habitation sites identified appear to date to this period, and it is likely that the majority of all sites were either first built, or utilized and maintained with modifications, during this time as well. These include the house sites (T-11, T-12, T-14, T-18), footpaths (T-4, T-6, T-27, T-28) and the kerbstone trail to the uplands (T-20), animal enclosures (T-8, T-17, T-24), walled ponds (T-5, T-7, T-16), cleared pools (T-3, T-5, T-7, T-10, T-17, T-49), wells (T-13, T-35), the church and school (T-13), and the cemetery (T-9). These sites are considered to be components of Makalawena Village, which as a historic Hawaiian community is significant for cultural as well as research values.

Archaeological resources with significant interpretive value are those which provide well-preserved and integral examples of specific kinds or types of sites. A major condition in accessing significance in this realm is uniqueness of the feature(s) and immediate site setting. Opaeula Pond, which has been recognized as a significant natural resource (cf. Macioleck and Brock 1984), is also the setting for a number of archaeological features. Taken together, these walled and cleared ponds form a single complex which could be an exemplary interpretive site. Included within this complex are Sites T-5, T-7, T-8, and T-11; sections of footpaths, Sites T-4, T-6, and T-27; and a bridge, Site T-28. The area in the immediate vicinity of these modified ponds and footpaths has been landscaped, and it appears that the complex has played a major role in the culture and traditional activities of the Makalawena community.

One of the historic house sites (T-11) has potential interpretive value, due to its condition, its unique construction features within the context of Makalawena, and due to its location and attendant modification of the shoreline of Opaeula Pond. The interpretive development of this site is, however, contingent upon additional data recovery, since its various construction phases and exact period(s) of use cannot be determined through reconnaissance level work alone.

None of the animal enclosures at Makalawena contain substantive soil deposits or midden, and there does not appear to be any additional archaeological data that should be collected from them at this time. These structures are not particularly unique examples of this site type, however, they do exhibit varied architectural styles and would provide good architectural data for a specialized study. The most interesting of the enclosures is Site T-26, which has two linear chute walls radiating from the eastern side. This site has some interpretive potential due to its construction technique. Site T-8, on the other hand, is immediate

ly along the shoreline of Opaeula Pond and adjacent to cleared anchialine ponds. It provides added variety to the shoreline complex as an interpretive locale.

Archaeological resources with cultural value are those locations with traditional uses, and locations or structures, which have significant meaning in the context of traditional, spiritual, and community systems. A site with cultural significance in a religious context is the Kaikaiaia Church, which is currently owned and maintained by the United Church of Christ. Despite the fact that the church superstructure has been removed, the site is still visited and cared for, as is the section of a major village trail which leads from th Beach to the church (seaward end of the Makalawena Akahipu'u Trail).

The Makalawena Cemetery is culturally significant as a burial site. This site was severely damaged by the 1946 tsunami and the exact boundaries of the cemetery could not be determined by surface reconnaissance alone. It is suspected that there are more than the seven to ten graves located to date.

The sand dune along the shoreline of Puu Ali'i Bay appears to have been utilized as a prehistoric burial area. No direct evidence of this use could be located during reconnaissance survey. A single reference to observed skeletal material was made by the government surveyor in 1882 (Emerson, cited in Silva, Appendix A). The possibility of additional deeply buried interments, with attendant implications of cultural significance, cannot be ruled out at this time.

The Makalawena-Akahipu'u Trail has cultural significance in the context of traditional Hawaiian values and socio-economic systems. This historic period kerbstone trail transects the Land of Makalawena, connecting the coast at Opaeula Pond with Akahipu'u at an elevation of c. 2,232 ft. It is oriented east-west and extends approximately through the center of Makalawena for most of its length (c. 8.0 km). The trail is easily traced on aerial photographs and is in varying states of preservation. The best preserved sections are those which required the most extensive construction effort, such as raised causeways and stretches through aa. Indirect archaeological evidence (two sets of cairns that appear to be trail markers c. 50.0 m from the current corridor) suggests that it follows or parallels the course of an older trail through Makalawena. During the nineteenth and twentieth centuries, this trail linked Makalawena with the north-south Government Road as well as the uplands. The coastal/uplands connection was both economic and social in nature, and its importance in the traditional Hawaiian lifeway is poorly understood and generally underestimated.

The complex of modified ponds around the fringes of Opaeula Pond has cultural value as a traditional source area for 'opae'ula; as a locale of freshwater baths, which had both recreational and religious functions; and as a crossroads area, where the Makalawena Akahipu'u Trail converged with a coastal trail to Awakee. Documentary sources located to date suggest that it was a community maintained and utilized space during the historic period, rather than a privately controlled, restricted area. Even though

the ahupua'a was owned by Chiefess Akahi, there is no indication that she forbade use of the anchialine ponds or commissioned a konohiki or overseer to restrict movement of the villagers within the coastal zone. The extent of artificial modification and landscaping in the area indicates that it was of no small importance to the community: residents of Awakee may have also participated in its use and maintenance.

Recommendations

Specific recommendations for further work at appropriate sites has been summarized in Table 2 (at end). Among the 49 archaeological sites located within the Makalawena project area, 36 may be categorized as being significant solely for their information content. Data recovery was completed to a sufficient degree at 23 of these 36 sites during the reconnaissance survey, and adverse effects to their information content may be considered mitigated (see Table 4 for summary listing).

Additional data recovery as a mitigative action is recommended for 13 sites that are significant solely for their research value, or information content. These include three of the four historic period permanent habitation sites (T-12, T-14, and T-18), a possible prehistoric permanent habitation site (T-1), eight temporary habitation/shelter sites (T 2, T-22, T-23, T-25, T-30, T-36, T-39, and T-42), and a temporary habitation shelter located within the anchialine pond complex at Site T-10. After data recovery at these sites or features, preservation for interpretive or cultural purposes would not be warranted, unless new information reflecting such is recovered. For example, Sites T-1 and T-2 are within the immediate vicinity of the cemetery and may contain human interments, deposited either before or after use of these features as a shelter (T 2) or a possible residential site (T-1).

All of the sites recommended for additional data recovery have been determined to contain information relevant to the research problems outlined in this report. Included in this category are the permanent habitation sites which have no interpretive potential, and the temporary habitation sites which contain significant midden deposits.

Three sites are considered to be significant for both their information content and as good examples of site types with interpretive value (Sites T-8, T-11, and T-21). Site T-8 consists of a high walled animal pen and two associated terraces. Additional data recovery is recommended for the terrace features only. One of these features (C) appears to contain what may be a human interment; and a similar use is possible for the second terrace. Preservation with interpretive development is recommended for the enclosure, which is an element of the anchialine pond complex associated with Opaeula Pond.

The historic habitation Site T-11 probably has greater research than interpretive value; however, it is the best preserved house site in the project area, and is possibly the earliest remaining habitation site. In addition, it is very close to Opaeula Pond and has associated small

walled ponds. It is possible that the proposed pond preserve boundaries may encompass this site: if such is the case, then the site information may be left unrecovered at the site only if sufficient measures are taken to insure that the integrity of the information is maintained. At least some limited data recovery is recommended at the site in order to better determine its significance and role in the settlement pattern of Makalawena.

Additional data recovery with subsequent development for interpretation is recommended at Site T-21, which includes a walled pond, a built-up causeway section of the Makalawena-Akahipu'u Trail, and a surface midden deposit. Data recovery should include the proper mapping of all features and collection of surface midden. Preservation without interpretive development would be feasible, given the nearness of this site to Opaeula Pond; interpretive development is recommended in order to provide access to the site and insure its maintenance.

Preservation with no additional archaeological data recovery is recommended for seven sites, six of which have both interpretive and cultural value as parts of the anchialine pond complex discussed above. These include modified ponds at Sites T-5 and T-7; footpaths T-4, T-6, and I 27; and a font bridge (Site T-28). Given the extent of landscaping already completed in the as terrain of this area, little additional work would be required for interpretive development. Paths connect all features, and they are sufficiently preserved so as to require little or no reconstruction or stabilization.

Current land use plans as proposed for the Makalawena Coastal Development have recognized the importance of Opaeula Pond, and "...the need to design a protection program to preserve the pond's habitat function" (Phillips, Brandt and Reddick 1984:11-12). The archaeological complex located along the northern fringes of the pond would provide an interpretive location for the natural and cultural features present, without subjecting the immediate pond to impacts from visitation. It is recommended that alterations associated with any interpretive development be minimal, and that the original footpaths and walls be retained, without the addition of new structures.

There are additional anchialine pond sites within the project area that should be considered as potential examples of this site type, in the event that the major pond complex is preserved, but made unavailable for visitation within the pond conservation area. A cluster of cleared pools and a large walled pond occurs to the south of Opaeula Pond, some distance from its shoreline (Sites T-16 and T-17). The walled pond at Site T-16 could easily be incorporated into the project area landscaping. This pond is a particularly good example of a pond completely enclosed by faced retaining walls, and it is an aesthetically pleasing feature.

The final site with cultural and interpretive value is the Makalawena Akahipu'u trail. As indicated above, this historic kerbstone trail was constructed by the government and may still be under the jurisdiction of the Highways Act of 1892. It is recommended that the current legal status of this trail corridor be determined prior to any modification of the

right of way corridor. If the trail has been removed from government property, and is no longer a public right-of-way, it is recommended that the well preserved and exemplary sections be preserved, with interpretive development and maintenance. Reconnaissance survey has indicated that well preserved sections occur at the eastern and western ends of the project area, and through areas of rough as in the central portion of the project area.

Preservation "as is" and protection without any interpretive development is recommended for two sites with cultural value, the Makalawena Cemetery (Site T-9) and the Kaikalaia Church/school site (f 13). The cemetery site is recommended for preservation and protection, most feasibly by expanding the boundaries of the Opaeula Pond preserve to the northern border of the project area. If this is not feasible, then a burial search, retrieval, and reburial program will have to be designed. It is possible that there may be living relatives of persons interred at the cemetery; every effort should be made to communicate with these persons and conduct the reburial as respectfully as possible. If the cemetery must be relocated, the human skeletal remains will have research value and should be properly studied prior to reinterment, provided the studies are approved by any living descendants.

The Kaikalaia Church site is currently on property that is not included in Bishop Estate lands. It is assumed that it will remain under the jurisdiction of the United Church of Christ, and will therefore not be directly impacted by development. The site will, however, be indirectly impacted, and access to the grounds could be severely impaired or made nearly impossible by development. Continued use of the church site and retention of its cultural/religious value is dependent upon access to the grounds. The current trail from the beach to the church is the seaward end of the Makalawena-Akahipu'u Trail, which is in itself a culturally significant resource; preservation of this section of the trail would insure access to the church by its membership.

In addition to the recovery of archaeological data at 16 Makalawena sites, further archival and documentary work focused on the village and its inhabitants, is recommended. Research topics have been discussed both above and by Springer, who recommends attention toward "...land tenure and useage, regional access, genealogical associations, and the role of the church, school, and commercial activities in Makalawena community life" (Appendix B). More detailed information on the local population should be available from census and tax records. The archival sources at the Kona Historical Society should be examined, as well as sources in the Hawaii State Archives and other repositories. As suggested by Springer, Hawaiian language newspapers might also be productive sources of further investigation.

In addition to data recovery at located archaeological sites, it is recommended that deep auger testing be conducted in the sand dune area, if alterations are planned for this portion of the project area. This program should consist of systematic augering to a sufficient depth (c. 5.0 m) in order to determine the presence or absence of human burials in the sand dune. There is no direct empirical evidence of sand dune

burials at this time; however, their presence was reported by Emerson in the late nineteenth century. The possibility of additional, deeply buried interments cannot be ruled out; if present, these interments should be left undisturbed. If modification of any portion of the sand dune is planned, subsurface auger testing is recommended.

SUMMARY OF GENERAL SIGNIFICANCE ASSESSMENTS AND RECOMMENDED GENERAL TREATMENTS

To facilitate State and County review of the evaluations and recommendations discussed above, general significance assessments and recommended general treatments for all archaeological sites identified within the Makalawena Project area are summarized in Table 4. Thirty-six of the 49 identified archaeological sites have been determined to be significant solely for their information content. Sufficient data was collected from 23 of these 39 sites during the reconnaissance survey. Therefore, these sites no longe contain endangered significant information (Significance Category X), and no further data collection or other mitigative measures can be justifiably recommended at this time (Recommended Treatment NFW). The 23 sites included in this category are the following:

T-3, T-15, T-17, T-19, T-24, T-26, T-29, T-31 thru T-35, T-37, T-38, T-40, T-41, and T-43 thru T-49.

The remaining 13 sites determined to be significant solely for their information content still contain significant information (Significance Category A), and additional data collection has been recommended for these sites (Recommended Treatment FDC). The following sites are within this category:

T-1, T-2, T-10, T-14, T-12, T-18, T-22, T-23, T-25, T-30, T-36, T-39, and T-42.

Three sites have been determined to be significant for their information content and have also been determined to have interpretive potential as examples of a site type (Significance Categories A and B). Recommended treatment of these sites is to conduct further data collection and to develop the sites as interpretive locales (Recommended Treatments FDR and PID). Sites T-8, T-11, and T-21 are in this category.

One site (Site T-16) does not contain significant scientific data to be further collected, but is of value as an excellent example of a site type (Significance Categories X and B). Preservation with interpretive development (Recommended Treatment PID) is recommended at this site.

Two sites (T-9, T-13) have been determined to require no further archaeological data recovery, and do not have interpretive potential in their current conditions. These sites are culturally significant (Significance Category C), and preservation "as is" with protection and no interpretive development is recommended (Recommended Treatment PAI). In

the event that the recommended treatment is not followed, the significance category of Site T-9 (Makalawena Cemetery) will change (X to A), and further data recovery will be recommended at that site.

Finally, seven sites have been determined to have cultural significance and to be significant examples of site types, with high potential for interpretative development. These resources are such that further archaeological data recovery should not be required for proper interpretation of the sites. Preservation with interpretive development is recommended at these sites, which include T-4 thru T-7, T-20, T-27, and T-28.

Table 4.

SUMMARY OF GENERAL SIGNIFICANCE ASSESSMENTS
AND RECOMMENDED GENERAL TREATMENTS
MAKALAWENA COASTAL DEVELOPMENT PROJECT AREA

Site or Feature Number (T-)	Significance Category A	X	B	C	Recommended Treatment FDC	NFW	PID	PAI
1	•	-	-	-	•			
2	•	-	-	-	•			
10	•	-	-	-	•			
12	•	-	-	-	•			
14	•	-	-	-	•			
18	•	-	-	-	•			
22	•	-	-	-	•			
23	•	-	-	-	•			

General Significance Categories:

A-Important for information content, further data collection necessary (PHRI-research value);
X-Important for information content, no further data collection necessary (PHRI-research value, SHPO-not significant);
B-Excellent example of site type at local, region, island, State, or National level (PHRI-interpretive value); and
C-Culturally significant (PHRI-cultural value)

Recommended General Treatments:

FDC-Further data collection necessary (intensive survey and testing, and possibly subsequent data recovery/mitigation excavations);
NFW-No further work of any kind necessary, sufficient data collected, archaeological clearance recommended, no preservation potential (possible inclusion into landscaping suggested for consideration);
PID Preservation, with some level of interpretive development recommended (including appropriate related data recovery work) and
PAI Preservation "as is," with no further work (and possible inclusion into landscaping), or minimal further data collection necessary

Table 4. (Cont.)

Site or Feature Number (T-)	Significance Category A	X	B	C	Recommended Treatment FDC	NEW	PID	PAI
25	•	-	-	-	•	-	-	
30	•	-	-	-	•	-	-	-
36	•	-	-	-	•	-	-	-
39	•	-	-	-	•	-	-	-
42	•	-	-	-	•	-	-	-
Subtotal: 13	13	0	0	0	13	0	0	0
8	•	-	•	-	•	-	•	-
11	•	-	•	-	•	-	•	-
21	•	-	•	-	•	-	•	-
Subtotal: 3	3	0	3	0	3	0	3	0
16		•	•	-	-	-	•	-
Subtotal: 1	0	1	1	0	0	0	1	0
4	-	•	•	•	-	-	•	-
5		•	•	•	-	-	•	-
6	-	•	•	•	-	-	•	-
7	-	•	•	•	-	-	•	-
20		•	•	•	-	-	•	-
27		•	•	•	-	-	•	-
28		•	•	•	-	-	•	-
Subtotal: 7	0	7	7	7	0	0	7	0
9		•	-	•		-	-	•
10		•	-	•	-		-	•
Subtotal: 2	0	2	0	2	0	0	0	2
3		•				•		
15		•				•		
17		•				•		
19		•				•		
24		•				•		
26		•				•		
29		•				•		
31		•				•		
32		•				•		
33		•				•		
41		•				•		

Table 4. (Cont.)

Site or Feature Number (T-)	Significance Category A	X	B	C	Recommended Treatment FDC	NEW	PID	PAI
35	-	•	-	-		•		
37	-	•	-	-	-	•		-
38	-	•	-	-	-	•		
40	-	•	-	-	-	•	-	-
41	-	•	-	-		•		
43	-	•	-	-	-	•		
44	-	•	-	-		•		
45	-	•	-	-	-	•		
46	-	•	-	-		•		
47	-	•	-	-	-	•		
48	-	•	-	-	-	•		
49	-	•	-	-	-	•		
Subtotal: 23	0	23	0	0	0	23	0	0
Total: 49	16	33	11	9	16	23	11	2

245-091886

REFERENCES CITED

Apple. Russell A.

1965 Trails: From Steppingstones to Kerbstones. B.P. Bishop Museum Special Publication 53. Honolulu: Bishop Museum Press.

Armstrong. R. Warwick (ed.)

..1973 Atlas of Hawaii. Honolulu: University of Hawaii Press.

Barrera. William Jr.

1971 Anaehoomalu: A Hawaiian Oasis. Pacific Anthropological Records No. 15. Dept. Anthro.. B.P. Bishop Museum.

Brewer. William A., and Associates

1986 Appendix D: Baseline Marine and Coastal Pond Surveys, Makalawena. North Kona. Hawaii. IN Makalawena Resort Draft Environmental Impact Statement. Prepared for Kamehameha Schools/Bernice P. Bishop Estate. Honolulu: Phillips. Brandt. Reddick & Associates.

Brock. Julie H., and Richard E. Brock

1974 The Marine Fauna of the Coast of Northern Kona. Hawaii: an Inventory of Fishes and Invertebrates Recorded During Summer. 1972. Sea Grant Advisory Report UNIHI-SEGRANT-AR-74-02. University of Hawaii Sea Grant College Marine Advisory Program.

Char. Winona P.

1986 Appendix A: Flora Survey, Makala-wena Resort Development Project. North Kona. Island of Hawaii. IN Makalawena Resort Draft Environmental Impact Statement. Prepared for Kamehameha Schools/Bernice P. Bishop Estate. Honolulu: Phillips. Brandt. Reddick & Associates.

Ching. Francis K.W.

1971 Appendix 4: The Fishponds of Kekaha. IN The Archaeology of South Kohala and North Kona. From the Ahupua'a of Lalamilo to the Ahupua'a of Hamanamana: Surface Survey Kailua-Kawaihae Road Corridor (Section III). Hawaii State Archaeological Journal 71-1. Dept. of Land and Natural Resources. Div. of State Parks. State of Hawaii.

Cordy. Ross H.

1976 Settlement Patterns in Hawaii Before 1820. Ms. on file. Dept. of Anthropology. University of Hawaii. Manoa.

245-091886

Cordy. Ross H

1981 A Study of Prehistoric Social Change: The Development of Complex Societies in the Hawaiian Islands. New York: Academic Press.

Donham. Theresa K.

1986a Archaeological Survey and Testing, Kapalua Hotel Development Site 2-H. Kapalua Bay Resort. Land of Honokahua. Lahaina. Island of Maui. PHRI Report 224-052286. Prepared for Kapalua Land Company. Ltd. (Kahului).

1986b Full Archaeological Reconnaissance Survey. Kohana-Iki Development Project Area. Land of Kohana-Iki. North Kona. Island of Hawaii. PHRI Report 216-040286. Prepared for Helber. Hastor. Van Horn & Kimura (Honolulu).

Garland. Anne

1986 Report VII: Artifacts and Manuports from the Keopu Burial Site. IN Han et al. 1986:19-164.

Han. Toni L.

1986 Report VI: Ka Po'e Kahiko o Keopu: The Ancient People of Keopu. IN Han et al. 1986:55-117.

Han. Toni L., Sara L. Collins, Stephan D. Clark, and Anne Garland

1986 Moe Kau a Ho'oilo: Hawaiian Mortuary Practices at Keopu. Kona. Hawaii. Departmental Report Series 86-1. Dept. Anthro.. B.P. Bishop Museum.

Hawaii Department of Land and Natural Resources (DLNR)

1970 An Inventory of Basic Water Resources Data: Island of Hawaii. Division of Water and Land Development. Hawaii Department of Land and Natural Resources Report R34. Honolulu.

Kelly. Marion

1973 Appendix B: Historical Background of Kekaha. North Kona. Hawaii. IN Paul H. Rosendahl. Archaeological Salvage of the Ke-ahole to Anaehoomalu Section of the Kailua-Kawaihae Road (Queen Kaahumanu Highway). Island of Hawaii. Departmental Report Series 73-3:77-112. Dept. Anthro.. B.P. Bishop Museum.

Kirch. Patrick V.

1985 Feathered Gods and Fishhooks. Honolulu: University of Hawaii Press.

Macdonald. Gordon A.. and Agatin T. Abbott

1970 Volcanoes in the Sea. Honolulu: University of Hawaii Press.

Macdonald. Gordon A.. Agatin T. Abbott. and Frank L. Peterson

1983 Volcanoes in the Sea. Honolulu: University of Hawaii Press. (Second Edition.)

Macioleck. John A.. and Richard E. Brock

1974 Aquatic Survey of the Kona Coast Ponds. Hawaii Island. Sea Grant Advisory Report UNIHI-SEAGRANT-AR-74-04. University of Hawaii Sea Grant College Marine Advisory Program.

Phillips. Brandt. Reddick & Assoc., Inc.

1984 Makalawena Land Use Plan. Prepared for Kamehameha Schools/Bishop Estate.

Reinecke. John E.

Ms. Survey of Hawaiian Sites: From Kailua. Kona. to Kalaupuaa. Kohala. Unpublished manuscript. Dept. Anthro.. B.P. Bishop Museum. (1930)

Sato. Harry H.. Warren Ikeda. Robert Paeth. Richard Smythe. and Minoru Takehiro. Jr.

1973 Soil Survey of the Island of Hawaii. State of Hawaii. U.S. Dept. Agriculture-Soil Conservation Service and Univ. of Hawaii Agri. Experiment Station. Washington. D.C.: Government Printing Office.

Soehren. Lloyd J.

1963 Archaeology and History in Kaupulehu and Makalawena. Kona. Hawaii. Ms. on file. Dept. Anthro.. B.P. Bishop Museum.

Springer. Hannah Kihalani

1985 Appendix B: Regional Notes from Kekaha: Kuki'o. IN Alan T. Walker and Paul H. Rosendahl. Full Archaeological Reconnaissance Survey. Kukio Resort Development Project Area. Land of Kukio 1st. North Kona. Island of Hawaii. PHRI Report 167-090385. Prepared for Phillips. Brandt. Reddick & Associates and Huehue Ranch.

Walker. Alan T.. and Theresa K. Donham

1986 Preliminary Report Upon Completion of Field Work: Archaeological Reconnaissance Survey. Proposed Awakee Resort Development Project Area. Land of Awakee. North Kona. Island of Hawaii. PHRI Report 265-100386. Prepared for Kahala Capital Corporation (Honolulu).

Table 2.

SUMMARY OF IDENTIFIED SITES AND FEATURES
MAKALAWENA COASTAL DEVELOPMENT AREA

Site & Feature Number	Formal Site/Feature Type	Tentative Functional Interpretation	*Significance Evaluation R	I	C	#Field Work Tasks DR	SC	EX	Comments
T-1	C-shape shelter	Habitation	H	L	L	•		•	Midden has filtered down through ash fill; good excavation potential
T-2	Overhang shelter	Indeterminate	M	L	H	•		•	Within cemetery boundaries; possible grave site
T-3	Complex (3•)	Indeterminate/ recreation	M	L	L				Wall is partial, possible enclosure, pool 6.0 m from wall; recorded by Soehren (No.5) and Reinecke (No.98)
A	Wall segment								
B	Footpath								
C	Cleared pool								
T-4	Footpath	Transportation	M	M	H	•		•	Apparently connects cleared pools in coastal area
T-5	Pond complex (5)	Recreation/ aquaculture	M	H	H	•		•	Part of large complex of modified anchialine ponds adjacent to T 7, 10, 3; recorded by Soehren (No.5) and Reinecke (No.98)
A	Enclosure								
B	Faced retaining wall								
C	Rubble wall								
D	Rubble wall								
E	Dam/pathway								
T-6	Footpath	Transportation	M	M	H	•			Apparently connects modified ponds with area mauka
T 7	Pond complex (6)	Recreation/ aquaculture	M	M	M	•			Part of the major complex of modified anchialine ponds;
A	Walled pond								
B	Walled shelter								

*Significance Evaluation Nature: R - scientific research, I - interpretive, C - cultural; Degree: H - high, M - moderate, L - low

#Field Work Tasks: DR - detailed recording (scaled drawings, photographs, and written descriptions), SC - surface collections, EX - test excavations

•Number of component features within complex

Table 2. (Cont.)

Site & Feature Number	Formal Site/Feature Type	Tentative Functional Interpretation	Significance Evaluation R	I	C	Field Work Tasks DR	SC	EX	Comments
T-7 (Cont.)									
C	Walled pond								recorded by Soehren (No.5) and Reinecke (No.98)
D	Walled pond								
E	Cleared pond								
F	Walled pond								
T-8	Complex (3)	Goat pens/misc activities	M	M	M	-	-	-	Fea. A recorded by Soehren (No.6) and Reinecke (No.98); Fea. C possible burial
A	Enclosure								
B	Terrace on pond								
C	Terrace								
T-9	Complex (7)	Makalawena Cemetery	M	M	H	-	-	-	Recorded by Soehren (No.4) and Reinecke (No.98), also shown on USGS quad sheets; preservation or reinterment
A	Grave								
B	Grave								
C	Grave								
D	Grave								
E	Grave								
F	Grave								
G	Grave								
T-10	Complex (7)	Recreation/ aquaculture	M	M	H	-	-	-	Adjacent to pond complexes T-5 and T-7, ponds not as extensively modified; Feas. C and D possibly shelter remnants; recorded by Soehren (No.5) and Reinecke (No.98)
A	Cairn								
B	Cleared pond								
C	Rubble pile								
D	Rubble pile								
E	Aa excavation								
F	Level, filled area								
G	Cleared pond								
T-11	Complex (8)	Permanent residential habitation	H	M	M	-	-	-	Possibly recorded by Soehren (No.3); concentrations of midden present, relatively well-preserved; recent trash minimal; two construction phases may be represented
A	Terrace								
B	Terrace								
C	Wall in pond								
D	Wall remnant								
E	Buried alignment								
F	Wall								
G	Cleared pool								
H	Wall remnant								
T-12	Complex (3)	Permanent/ habitation	M	L	L	-	-	-	Probably one and/or two historic house sites recorded by Soehren (No.3), very poor preserva
A	Platform (?) remnant								
B	Filled crevice								
C	Rectangular								

Table 2. (Cont.)

Site & Feature Number	Formal Site/Feature Type	Tentative Functional Interpretation	Significance Evaluation R	I	C	Field Work Tasks DR	SC	EX	Comments
T-12 (Cont.)									tion; Fea. B is possibly a prehistoric crevice burial; structural remnants may also be a school site
T-13	Complex (3)	Kaikainia Church	L	M	H				Recorded by Soehren (No.9). The site is regularly maintained by members of the parish and is not on Bishop Estate property
A	Foundation terrace								
B	Mortared walls/ foundation								
C	Well								
T-14	Complex (4)	Permanent residential habitation	M	L	M	-	-	-	Part of occupied residential complex. Fea. A is in disuse, probably earlier house site. Well and lua have extant superstructures. Fea. A has excavation potential; recorded by Soehren (No.3) and Reinecke (No.97)
A	Alignment								
B	Foundation platform with standing structure								
C	Well								
D	Lua (latrine)								
T-15	C-shape wall	Lua (recent)	L	L	L				Wall around small blister critter, recent refuse in blister
T-16	Walled pond	Recreation/ aquaculture	M	M	H				Recorded by Soehren (No.2) and Reinecke (No.97); is well preserved
T-17	Complex (4)	Goat pen/ recreation	M	M	M				Pen recorded by Soehren (No.1) and Reinecke (No.97)
A	Enclosure								
B	Cleared pools								
C	Cleared pools								
D	Cleared pools								
T-18	Complex (4)	Permanent residential habitation	M	L	L				Recorded by Soehren as part of Site 3, and Reinecke
A	Wall								
B	Wall								

Table 2. (Cont.)

Site & Feature Number	Formal Site/Feature Type	Tentative Functional Interpretation	Significance Evaluation R	I	C	Field Work Tasks DR	SC	EX	Comments
T 18 (Cont.) C	Stone alignment								(No.97); identified as house ruins; very little evidence of a structure or habitation area; all refuse 20th century and not associated with site occupation
D	Refuse pit								
T-19	Overhang shelter	Temporary habitation	L	L	L	-	-	-	Very sparse midden; data recovery completed
T 20	Nakalawena-Akahipu'u trail	Transportation	M	H	H	-	-	-	Recorded by Soehren (No.8) and Reinecke (No.97); in various states of preservation; transects project area east-west
T 21	Complex (3)	Recreation/ bath/picnic	M	L	M	-	•	-	Recorded by Soehren (No.8) and Reinecke (No.97); adjacent to Nakalawena-Akahipu'u Trail, midden scatter c. 15.0 m from walled pond; modern gas-powered pump at pond
A	Walled pond								
B	Terrace								
C	Midden scatter								
T 22	Complex (3)	Temporary habitation	M	L	L		•	•	Fea. B has excavation potential; Feas. A and C have very sparse to no surface deposit. Volcanic glass collected
A	Overhang shelter								
B	Overhang shelter								
C	Overhang shelter								
T 23	Complex (5)	Temporary habitation	M	L	L		•	•	Midden and soil deposits in Fea. A, surface midden present as well
A	Cave shelter								
B	Cairn								
C	Midden scatter								
D	Walled shelter								
E	Overhang shelter								

Table 2. (Cont.)

Site & Feature Number	Formal Site/Feature Type	Tentative Functional Interpretation	Significance Evaluation R	I	C	Field Work Tasks DR	SC	EX	Comments
T-24	Complex (2)	Temporary habitation	M	L	L	-	-		Very sparse surface midden, data recovery completed
A	Cave shelter								
B	Cairn								
T-25	Complex (2)	Temporary habitation	M	L	L	-	•	•	Fea. A has midden, artifacts; Fea. B has sand on surface; function indeterminate, structural wood and sheet metal roofing present
A	Overhang shelter								
B	Terrace								
T-26	Enclosure	Goat pen (?)	M	M	L	-			High, walled enclosure with set and drift walls; well preserved
T-27	Footpath	Transportation	M	L	M	•			Recorded by Soehren (No.7) and Reinecke (No.97)
T-28	Wall	Bridge along trail	M	M	M	•			Recorded by Soehren (No.7) and Reinecke (No.97); crosses an inlet finger and Opaeula Pond
T-29	Cairn	Indeterminate	L	L	L				Small cairn; no associated features
T-30	Complex (3)	Temporary habitation	M	L	L	•	•		Midden deposits present in Feas. A and B
A	Midden scatter, wall								
B	Overhang shelter								
C	Overhang shelter								
T-31	Cave Shelter	Temporary habitation	L	L	L				Very sparse Cypraea scatter, data recovery completed
T 32	Cave shelter	Temporary habitation	L	L	L				Data recovery completed
T 33	Cave shelter	Temporary habitation	L	L	L				Data recovery completed

Table 2. (Cont.)

Site & Feature Number	Formal Site/Feature Type	Tentative Functional Interpretation	Significance Evaluation R	I	C	Field Work Tasks DR	SC	EX	Comments
T-34	Complex (4) A Enclosure B Overhang shelter C Overhang shelter D Overhang shelter	Temporary habitation	M	L	L	-	-	-	Data recovery completed
T-35	Well	Water source	M	L	M	-	-	-	Data recovery completed
T-36	Complex (2) A Walled shelter B Walled shelter	Habitation	M	L	L	+	+	-	Midden and soil deposit present
T-37	Cairn	Indeterminate	L	L	L	-	-		Isolated cairn; data recovery completed
T-38	Cave shelter	Temporary habitation	M	L	L	-	-	-	Very sparse shell midden, data recovered
T-39	Complex (2) A Cave shelter B Overhang shelter	Temporary habitation	M	L	L	+	+	+	Midden and soil deposits in Fea. A
T-40	Cairns (2)	Indeterminate	L	L	L	-	-	-	Data recovered
T-41	Rubble piles (2)	Indeterminate	L	L	L	-	-	-	Possibly dismantled cairns, no associated materials
T-42	Complex (4) A Cave shelter B Overhang shelter C Cave shelter D Overhang shelter	Temporary habitation	M	L	L	+	+	+	Artifacts midden deposits in Feas. A and C; well preserved wooden bowl, not recovered from Fea. C
T-43	Cairn	Possible surveyor's marker	L	L	L				Small, isolated feature
T-44	Walled shelter remnant	Temporary habitation	M	L	L				Poorly preserved shelter remnants; data recovered
T-45	Cairn	Indeterminate	L	L	L				Small isolated feature, data recovered

Table 2. (Cont.)

Site & Feature Number	Formal Site/Feature Type	Tentative Functional Interpretation	Significance Evaluation R	I	C	Field Work Tasks DR	SC	EX	Comments
T-46	Cairn	Trail marker	L	L	L				Small, possibly recent cairn along Trail T-20
T-47	Cairns (4)	Indeterminate	L	L	L				Small, possibly recent cairns near highway
T-48	Complex (2) A Enclosure B Cairn	Temporary habitation	M	L	L				No portable remains; data recovery completed
T-49	Modified ponds A Cleared pond B Cleared pond with rubble wall	Indeterminate	L	L	M				Possible recent modifications

APPENDIX A:

PRELIMINARY HISTORICAL DOCUMENTARY RESEARCH

by

Carol Silva, B.A.
Historical Researcher

INTRODUCTION

It is the intent of this preliminary historical research effort to identify and examine immediately available sources for information relative to the Makalawena project area. A sampling of specific mythological, cultural, and historical information has been assembled from the writings of native historians, descriptive accounts, land records, and cartographic sources.

Before proceeding with details relative to TMK:3-7-2-04:1 in Makalawena, North Kona, a cursory study will be presented of the larger land division in which Makalawena is situated. It is intended, by this approach, to define properly the setting which backdrops the project area so as to provide a historically faithful context from which Makalawena can be viewed.

Kekaha - A Traditional Perspective

A distinct set of traditions exists for that broad North Kona land section anciently known as Kekaha. In describing its expanses and boundaries, a kama'aina wrote:

> Kekaha (barren, desolate) was the name given to that section of North Kona from Honokohau, North of Kailua, to Napuu (the Hills), meaning Puuwawaa and Puuanahulu, and along the coast to Anaehoomalu, the boundary of South Kohala.
>
> It is often spoken of as Kekaha Wai Ole (the desolate land without water). Pele, the Volcano, has literally eaten the heart out of this section.
>
> One readily sees the great lava stretches of country, as one travels along the road. It is no wonder that the simple fisherfolks living along the sea coast personified the Volcano as a dreadful being with super natural powers whose wrath bore down on them so much destruction, laying waste their gardens,

> and filling their fishponds with rocks, leaving them on a narrow strip of beach, the ocean on one side, and lava fields on the other (Maguire 1926:5).

The district's waterless condition is memorialized by generations of native residents in the familiar saying (quoted in part above):

> Kekaha wai 'ole o na Kona.
> Waterless Kekaha of the Kona district.
>
> Kekaha in Kona, Hawai'i, is known for the scarcity of water but is dearly loved by its inhabitants (Pukui 1983:185).

Another saying fixed in oral tradition comments on the life sustaining qualities of the sea off Kekaha:

> Ola aku la ka 'aina kaha, ua pua ka lehua i kai.
> Life has come to the kaha lands for the lehua blooms are seen at sea.
>
> "Kaha lands" refers to Kekaha, Kona, Hawai'i. When the season for deep-sea fishing arrived, the canoes of the expert fisher men were seen going and coming (Pukui 1983:271).

Kekaha was also known among those who dwelt at Kailua, Kona as the land from which the gusty Hoolua wind blew. John Papa II noted:

> A little more frequent was a cold wind from Kekaha, the Hoolua. Because of the calm of that land, people often slept outside of [on?] the tapa drying sites at night. It is said to be a land that grows cold with dew-laden breeze, but perhaps not so cold as in Hilo when the Alahonua blows (II 1973:122)

Thus did natives of that land characterize Kekaha in elemental and physical terms. Despite those short-comings acknowledged above, a fairly unique history sprang from this district.

Kekaha - A Historical Brief

The native historian S.M. Kamakau recorded that in the war between Kakaulike of Maui and Alapainui of Hawaii, Kekaulike, in fleeing from Alapainui's forces, pillaged Kona and Kohala and "abused the country people of Kekaha" (Kamakau 1961:60 9). Kekaulike ruthlessly laid waste to the coconut groves of both districts. This deliberate act of destruction was a matter of no small consequence, for to fell trees of such usefulness (to the ancients) was considered truly inhuman. Kekaha's common folk were also slaughtered by the retreating Maui forces.

Kamakau also stated that Kekaha lands had been set apart from the whole of Hawaii Island for the priestly class.

> Waimea was given to the Paao kahuna class in perpetuity and was held by them up to the time of Kamehameha III when titles had to be obtained. But there was one land title held by the kahuna class of Paao for many years and that was Puuepa in Kohala. In the same way the land of Kekaha was held by the kahuna class of Ka-uahi and Nahulu (Kamakau 1961:231).

These Kauahi and Nahulu lines of priesthood assumed active and influential roles well into the historic period. They served as counsel to kings and later even dared to voice strongly their disapproval over Liholiho's "free eating" and his general disregard of traditional precepts. Their Kekaha lands were thus guaranteed by chiefs such as Kalaniopuu and passed quietly to their progeny. Individuals descending from one of these priestly lines, the Nahulu, included the twin chiefs Kameeiamoku and Kamanawa

Of particular note in relation to Kekaha is Kameeiamoku's son, Hiumaheihei Hoapili, who was well-trained in all of the arts of this esteemed lineage. Kamakau recalled:

> He [Hoapili] belonged to the priesthood of Nahulu and was an expert in priestly knowledge. He had been taught astronomy and all the ancient lore (Kamakau 1961:354).

Kamakau further enumerated upon some of the skills Hoapili excelled: debate, knowledge of the history and rule of the chiefly lines, ancient protocol, royal genealogies, and proficiency and literacy in the English language as well. He was entrusted with many key political positions, and governed justly and well. So faithful, and dependable was he that upon the demise of Kamehameha I, Hoapili was given the guardianship of the "Conqueror's" sacred remains, which (it is believed) he carefully hid in Kekaha at Kaloko (Kamakau 1961:215, 355).

With facility we are able to see that in spite of an unassuming appearance Kekaha distinguished itself in its rather unique history and religious and cultural significance. Now that a sketch of the broad land area of Kekaha has been established, we are better able to center specifically on Makalawena.

MAKALAWENA - THE MYTHOLOGICAL PAST

Two traditions relative to the project area were uncovered during the course of research. Both are similar in that they deal with fishing and supernatural beings, and may claim descent from a single older tradition. Each incorporates explanations for the names attached to particular land features

The first tells of thieving spirits who empty fishnets before the villagers of Makalawena are able to pull these nets ashore. So frequently does this occur that the frustrated fishermen seek the assistance of

Kohala's champion spirit catcher, Puniaiki. Upon his arrival at Makalawena, Puniaiki assumes a new name to conceal his identity. He wishes to be known as Kalepeamoa, or "Cock's Comb," due to his baldness. (Kalepeamoa is a point of land located within the Makalawena area.) He brings with him a special fishnet of extremely fine weave, and instructs the villagers of his scheme for driving the spirits into these nets. Shifts of villagers thrash the sea in a certain pattern, and one by one the spirits are lured into the nets and strangled by Kalepeamoa. Hence, the area is refered to as "Kuunaakeakua," or "The Catch of the Gods": Kuunaakeakua is a sand beach in Makalawena (Maguire 1926:40-42).

The second tradition is commemorated in the following saying:

> Moku ka ihu ia Hio iai
> Bitten off is the nose by Hio!
>
> Used by adults to frighten children into staying at home. Hio was an akua (ghost) who wandered about peering into the doors of homes and biting off the noses of those who annoyed him. He escaped when his companions were caught in a fishnet set by the supernatural hero, Kamiki, at Kuunaakeakua (Net let down for akua), Makalawena, Kona (Pukui 1983:238).

MAKALAWENA - HISTORICAL ACCOUNTS

A simple and solitary reference to a particular wind associated with Makalawena is documented in native oral tradition thus:

> Makani 'Eka aheahe o Makalawena.
> The gentle 'Eka breeze of Makalawena (Pukui 1983:228).

Little in the way of physical land description could be uncovered for this district. It appears that because of the inhospitable conditions of much of the terrain, most travel among foreigners between Kawaihae and Kailua was conducted either by ship, or canoe with short trips along the coast as needed, or by way of the inland road on the slopes of Hualalai which connected Kaiahuipuaa, and Kailua proper. In the voyager and missionary sources consulted, no accounts of travel could be found that detail any specific land features, points of interest, or even general comments relative to the residents, or land usage

The old time residents, and government surveyors did provide some valuable indications of Makalawena's physical appearance. Shreds of descriptive data, relative to land and school matters, can be located in correspondences between residents and the government. Extracts from these letters, and reports are provided in the following section in chronological order

MAKALAWENA - SPECIFIC LAND HISTORY OF THE MAKAI PORTION

An early, undated document lists Makalawena as the property of Kamehameha. Prior to the division of lands in the 1840s and 1850s by Kamehameha III, all land belonged (in theory) to the Hawaiian Crown. In an effort to establish ownership of land in fee by the natives, Kamehameha III agreed to apportion his holdings. Native and foreign residents were allowed to claim only those lands that they actively occupied, and cultivated. Claims were registered, and testimony was received in verification of each application before an award was given. This milestone in land ownership in Hawaii was called "The Great Mahele," or "The Great Division." Aside from these awards, separate lands were set apart for the Crown, the chiefs, the Government, and for Fort Lunge.

On January 29, 1848, Akahi, a chiefess of recognized rank, lists among her land claims the land of Makalawena, Kona. Her claim was substantiated by testimony in 1851, and 656 acres were awarded to her under LCA 5388 (R' 7731) (Native Register and Testimony). In January of 1852, Akahi declared that all squid in the waters off Makalawena were reserved strictly for her use; the following January, she claimed ino fish (all-verses) in the sea off Makalawena as hers alone (Interior Dept.).

In August 1873, Charles R. Bishop, representing his wife's relative, the Chiefess Akahi, applied to the Commission of Boundaries for a hearing to settle the correct limits of Makalawena. Two natives, both born at Makalawena, came forward to deliver testimony. The following was given in description of the entire ahupua'a:

Kahalalii K Sworn.

I was born at Makalawena, Kona Akau Hawaii, at time of Palakee, kiamoku, at Honaunau. Have always lived there and know the boundaries my makua (now dead) pointed them out to me. Commencing at the sea shore, the boundary between the land of Makalawena and Mahaiula is a kaheka called Kaelemiha, there is a pile of stones, an ahu; thence mauka across aa, to a cave, a kualapa close to the North side of said cave. Thence to Keanapo a kipuka in the aa flow, from thence mauka to an and thence to where grass is growing; thence to Kalihi an ii aina, thence mauka to Kaluaonaohi a kihapai, at the corner of Kaohimauna's land, on Mahaiula. Thence along an iwi aina, an old trail, to the Government road, the boundary line running some distance to the north side of Huehue, thence to a high hill called "Akahi" the boundary being on the brow of said hill and the South pali on Mahaiula thence to a place, a short distance above the hill, called Puuhulu, where Makalawena corners with the lands of Mahaiula and Awakee, on the boundary of Kaupulehu. I do not know where Kaohimauna's land ends. Thence turn makai along the iwi aina of Awakee, over the top of Puu Akahi to Kaumana, a kihapai at the Government road thence makai, to a place, on the North side of an old kihapai

ai called Haleoku, thence makai to Hehapapawai a small water hole in a small patch of pahoehoe bound upon north side; thence to the prickly pears growing on the aa, to Nukuinapuulehu, aa, thence makai to Pohakuanaiaponapu, a large round stone, thence to Makupohaku, on Kaiwikohola, a large rock in the surf. Makalawena is bounded makai by the sea, and the land has ancient fishing rights, extending out the sea....

Hamae K. Sworn.

I was born at Makalawena North Kona Hawaii but I do not know when (appears to be a middle aged man); have always lived there, and know a part of the boundaries, having heard where they are from the last witness. The boundary at shore between Makalawena and Mahaiula is Nahalenahumaknike a kaheka, thence to an ahu called Kaelemiha thence to Kaluaiapa, he wau kula in pahoehoe. Thence mauka to Naannuiaula, aa pele. Thence to Kalihi, an ili aina on the boundary line, thence to the North side of Huehue. Thence up the South side of Puu Akahi, and from thence mauka to Puuhulu the corner of Makalawena, Mahiula and Awakee and where these lands are cut off by Kaupulehu Thence turn makai across the top of Puu Akahi to kaumana, at the Government road, thence makai to Knopapapa Hehapapawai, the boundary running to the North of it, thence to prickly pears on the pahoehoe, and from thence to Kukuinapulehu; aa with pili growing on it. Thence to Pohakuanaeaponapu a large rock at the sea shore, and from thence to a large rock in the sea called Kaiwi Kohola (Boundary Commission Vol. A:373 5)

In May of 1875, Chiefess A. Akahi (cousin to Bernice P. Bishop's own mother, Konia), visited with the Bishops before they embarked on a long voyage. While a guest at their Honolulu home, Akahi made a will in which she left all of her lands and other possessions to her husband, Kapaa, and to Bernice. Charles R. Bishop was named executor of the estate. On October 8, 1877, Akahi passed away at the Bishop home after being brought up from Kona by Bernice. Regarding Akahi's lands, Charles R. Bishop remarked:

> Her lands brought very little income, that is, not sufficient to keep her along, she had to be helped very often (1 Probate 821).

In May 1882, Government Surveyor J.S. Emerson penned the following description of his work in Makalawena in a letter to the Surveyor General:

> ..We have set flags on every boundary by the coast save one, where a prominent rock made it unnecessary, between Ahupuaas in this district, as far as Nahalenahumaknike between Makalawena and Mahiula (Mahiula ed) Our Akahipuu station is on the exact boundary between Awakee and Makalawena We have taken horizontal and vertical angles to every visible hill, cape, bay

or point of interest in the district recording its local names and the name of the Ahupuaa in which it is situated. Every item of local historical, mythological or geological interest has been carefully sought and noted. Perryman has embellished the pages of the field book with twenty four neatly executed views and sketches from the various trig. stations we have occupied.. (Survey Correspondance 5/21/1882).

One of Perryman's views depicted details of Makalawena; these have been appended to this report (Figure 26). The supplementary notes Emerson makes reference to are found in his field books. He recorded:

17 Puualii Bay 101^0 13' 0"

This beach an ancient burying ground - skeletons disinterred by the waves, at times.

18 Makalawena Sch. House 98^0 58' 30"

N. Gable Makalawena Depress top 2^0 52' 20"

19 Chain of rocks in bay 107^0 27' 0"

Extremity Makalawena Depress 2^0 53' 30"

20 Lae o Kalwikohola 112^0 10' 0"

Makalawena Depress 3^0 38' 30"

Owes its name to the death of a whale that was unfortunate enough to wedge himself in the rocks while in chase of a boat (canoe).

21 Awakee bay 107^0 3' 0"

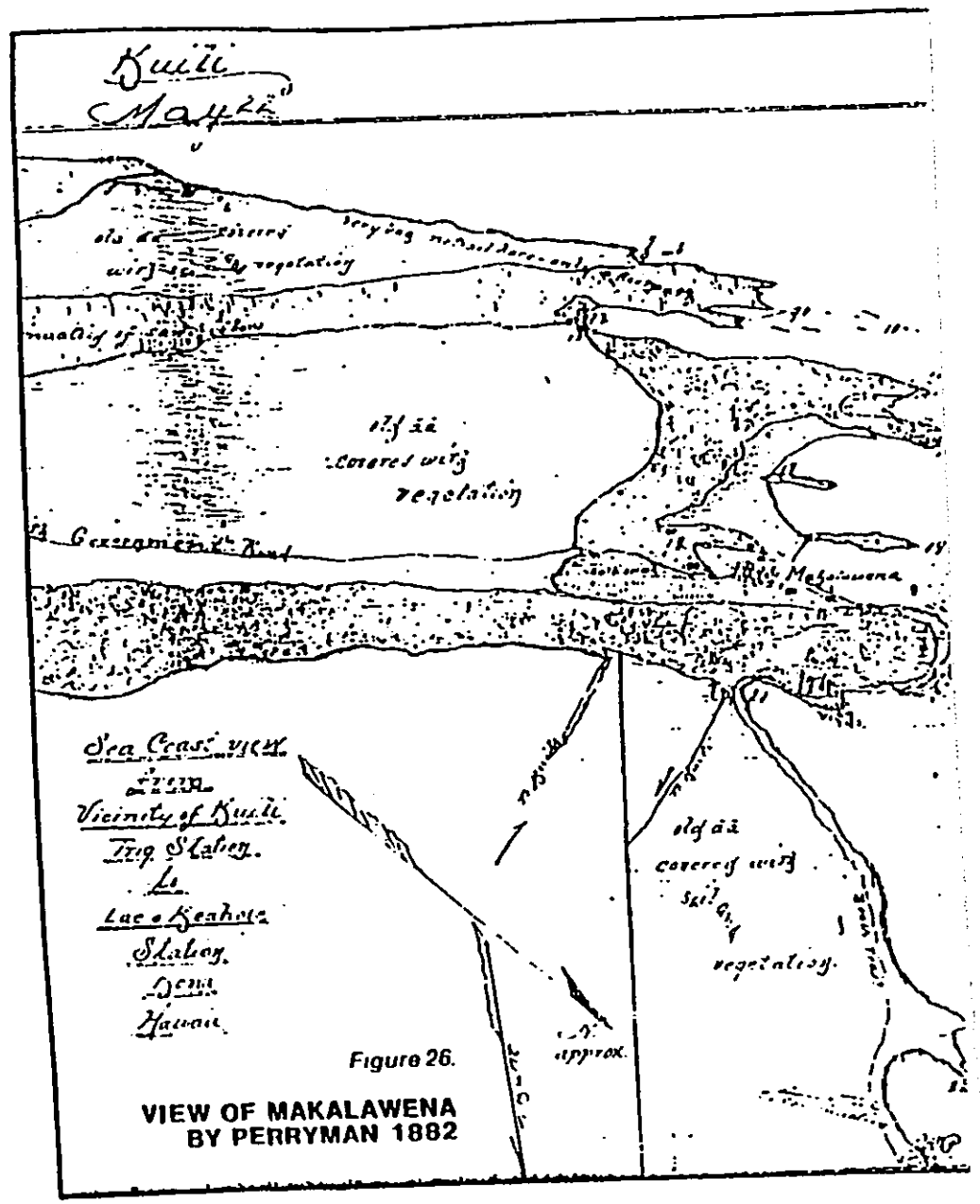
Head in Awakee Depress 5^0 38' 40"

(Survey Dept. Field Bk.).

Some time in early 1883, Charles R. Bishop applied to the Boundary Commission for the formal settlement of Makalawena's limits. In April of 1881, Charles R Bishop described what he knew of Makalawena in a letter to the Commissioner of Boundaries, F.S. Lyons:

The land is of small value except for the fishing rights attached, and so far as I know there is no dispute about boundaries (Boundary Commission Book V 285-111)

Bernice Pauahi Bishop passed away in 1884, and Kapaa died in March of 1890; Akahi's Lands then became absorbed into the Bernice Pauahi Bishop Estate (1 Probate 821).



Relative to the school in Makalawena, nothing could be located in early Department of Public Instruction reports and correspondance that could place an exact date for the formal establishment of Makalawena School. The following extract from a report, dated October 6, 1898, is useful in creating an understanding of land occupation, and general conditions in the area:

> I have visited all the schools in this District - N. Kona. Two of them, Kiholo, and Makalawena, are reached by a ride of three hours over aa and pahoehoe. In Kiholo there are four houses and 13 children at present. It is down on the beach. Nothing grows there but a few halas and some hawani trees. All their food except fish is brought here. There ought not to be any school there, for people shouldn't live there. Makalawena has 9 houses and 32 children. In both places school is held in the church. At Kiholo the church is of stone, roofless and windowless. At Makalawena the church is a bare wooden shanty, 16 x 24, with a few old pews. Both teachers do as good work as could be expected of them (Dept. of Public Instruction 10/6/1898).

In June of 1905, Rev. Albert S. Baker of the Hawaiian Board of Missions, applied to the Department of Public Instruction for the Makalawena land on which the chapel sat. Apparently the same structure functioned as both chapel and school; Baker was seeking clarification of title ownership to the 0.97 acre lot. He wrote:

> You will remember that I called upon you the last of May in regard to church lands in Kona, at which time you asked me to send you a list of buildings on Board of Education lands...
>
> In North Kona there is...(4) a chapel at Makalawena:...
>
> There are no schools carried on at Holualoa and Honokohau makai, but at Makalawena and Puuanahulu the public school is held in the chapels. All these were built as chapels and have services at stated intervals...(Dept. of Public Instruction 6/15/1905).

The arrangement, by which the dual function of chapel/school occurred within the same structure, was further explained in another letter of Baker's:

> I will not go into the details of the lands used for church purposes at this time, but write in regard to a small building at Puuanahulu, North Kona. This building has been used both as a chapel and school house, until the recent completion of the new school house there. The old people tell me that it was originally built for both purposes, the government sending the material and the people transporting and erecting the building. Such arrangements were not uncommon here. The Makalawena school now being conducted in our chapel though on school land. (Dept. of Public Instruction 11/9/1905)

The Department of Public Instruction initiated communication with the Bernice Pauahi Bishop Estate as a result, and by 1906 the lot was conveyed to the Hawaiian Board (Dept. of Public Instruction 1905 61).

The concluding note to this section summarizes the current status of Makalawena:

> Makalawena. A beautiful set of bays with many legends. Makalawena was the most prominent town of this area back in the first decade of this century. Essentially a fishing village, it boasted a church, school, store, and 7 or 8 houses at one time. All houses were wiped out in the 1946 tsunami. Only one house was rebuilt, that of Annie Una. Her last husband, Porto, still lives at Makalawena. Raising goats and chickens, and going fishing are his principal occupations.
>
> "Na Ala Hele", State Dept. of Land and Natural Resources. 1973

> The Makalawena shoreline consists of several coves and inlets that are separated by a series of broken lava points but united by a long, continuous, curving sand beach. From the mid-point of the beach, south to the barren lava flow separating Makalawena from Mahaiula, extensive sand dunes line the backshore. The fine clean white sand of the dunes is covered by pohuehue and kiawe. In some descriptions of the area, this portion of the beach is called Puu Alii Beach, but in common usage the place name Makalawena generally means the entire length of this magnificent beach.
>
> The largest inlet, where the sand dunes are highest, offers the best place for swimming at Makalawena. Although the other coves and inlets are equally shallow and protected, their shorelines and ocean bottoms tend to be rockier and less inviting. Snorkeling and scuba diving are popular offshore activities in this area, which is noted for octopus and shells. During the winter months, big surf causes mild erosion of the beach and occasionally generates some excellent surfing waves. The preferred break for board surfing is located directly offshore a stand of ironwoods in the backshore. The next break to the south is frequented primarily by body surfers.
>
> In addition to its excellent shoreline recreational resources, Makalawena is also noted as the site of Opaeula Pond, an ancient Hawaiian fishpond that is now one of the Big Island's most important waterbird sanctuaries. The 12 acre pond is immediately inland of the small cluster of fishing shacks on the beach and contains large numbers of opaeula, or red shrimp, which the Hawaiians caught and mixed in their poi, or chum, that was used for netting opelu. The waterbirds also feed on the opaeula that inhabit the pond. The Big Island has

very few wetlands suitable for native waterbirds, and so Opae ula Pond plays a vital role in the preservation of many of these birds. It is the most important site for the endangered Hawaiian stilt (aeo) and also provides a habitat for coots, ducks, and blackcrowned night herons, and a feeding ground for golden plovers, wandering tattlers, doves, mynahs, sparrows, and cardinals...(Clark 1985:117-8).

CARTOGRAPHIC SOURCES

Survey notes and extracts from correspondence to the Surveyor General, relative to the immediate project site, were discussed in the previous section. In addition to the above, a portion of the early 1880s map of North Kona, by J.S. Emerson, has been included in this report. The map provides data on the old trail which connects the coastal area with the inland Government road (Figure 27). No additional information could be located regarding this trail, its name, date of construction, or improvements. As it is mentioned in testimony given in 1873 to the Boundary Commission, it may conceivably predate the mid-1800s. Attention should also be directed toward the appended sketches by Perryman. One of the two views plot what are apparent house sites (Figures 27).

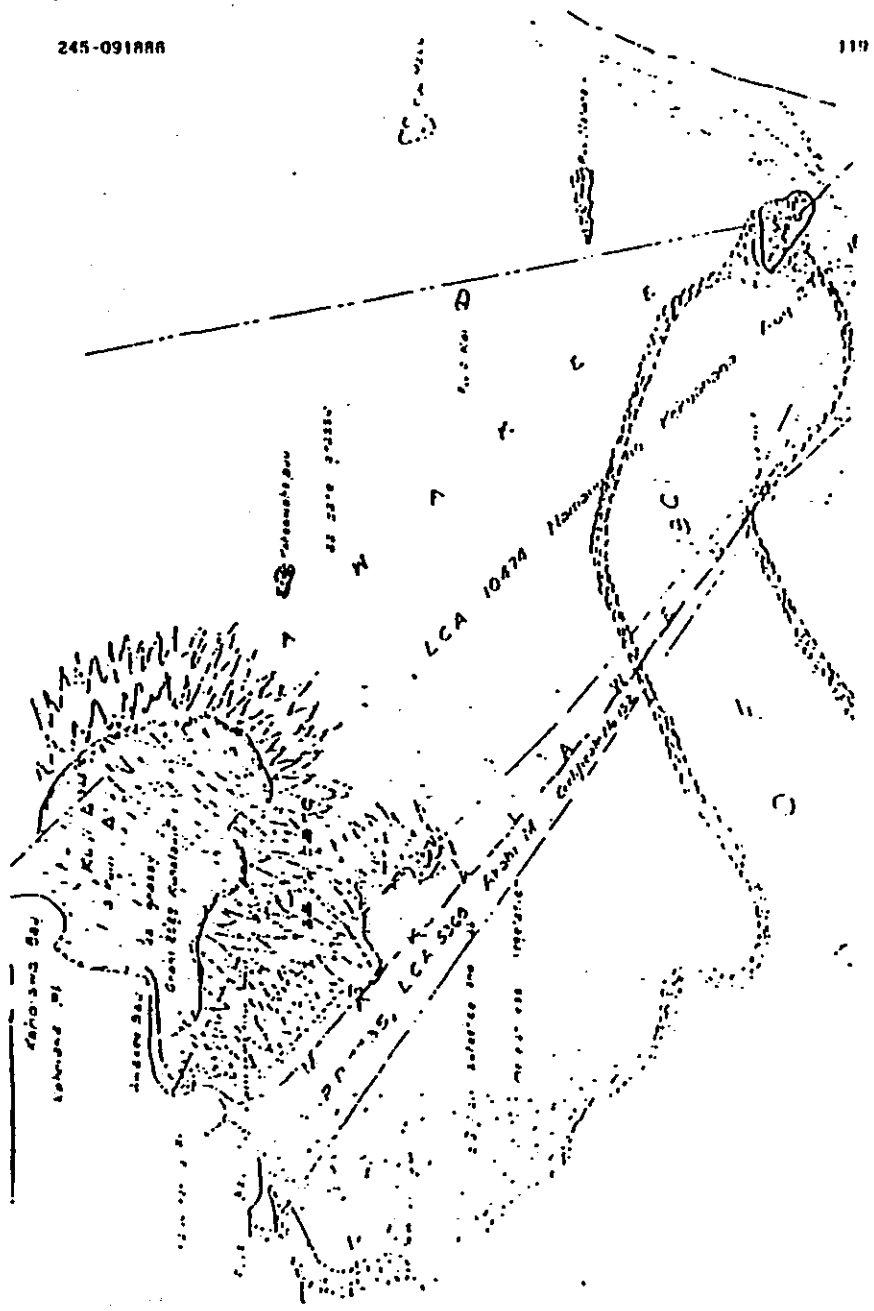


Figure 27. PORTION OF MAP OF NORTH KONA SHOWING TRAIL BY J.S. EMERSON 1882

very few wetlands suitable for native waterbirds, and so Upaa ula Pond plays a vital role in the preservation of many of these birds. It is the most important site for the endangered Hawaiian stilt (aeo) and also provides a habitat for coots, ducks, and blackcrowned night herons, and a feeding ground for golden plovers, wandering tattlers, doves, mynahs, sparrows, and cardinals...(Clark 1985:117-8).

CARTOGRAPHIC SOURCES

Survey notes and extracts from correspondence to the Surveyor General, relative to the immediate project site, were discussed in the previous section. In addition to the above, a portion of the early 1880s map of North Kona, by J.S. Emerson, has been included in this report. The map provides data on the old trail which connects the coastal area with the inland Government road (Figure 27). No additional information could be located regarding this trail. Its name, date of construction, or improvements. As it is mentioned in testimony given in 1873 to the Boundary Commission, it may conceivably predate the mid-1800s. Attention should also be directed toward the appended sketches by Perryman. One of the two views plot what are apparent house sites (Figures 27).

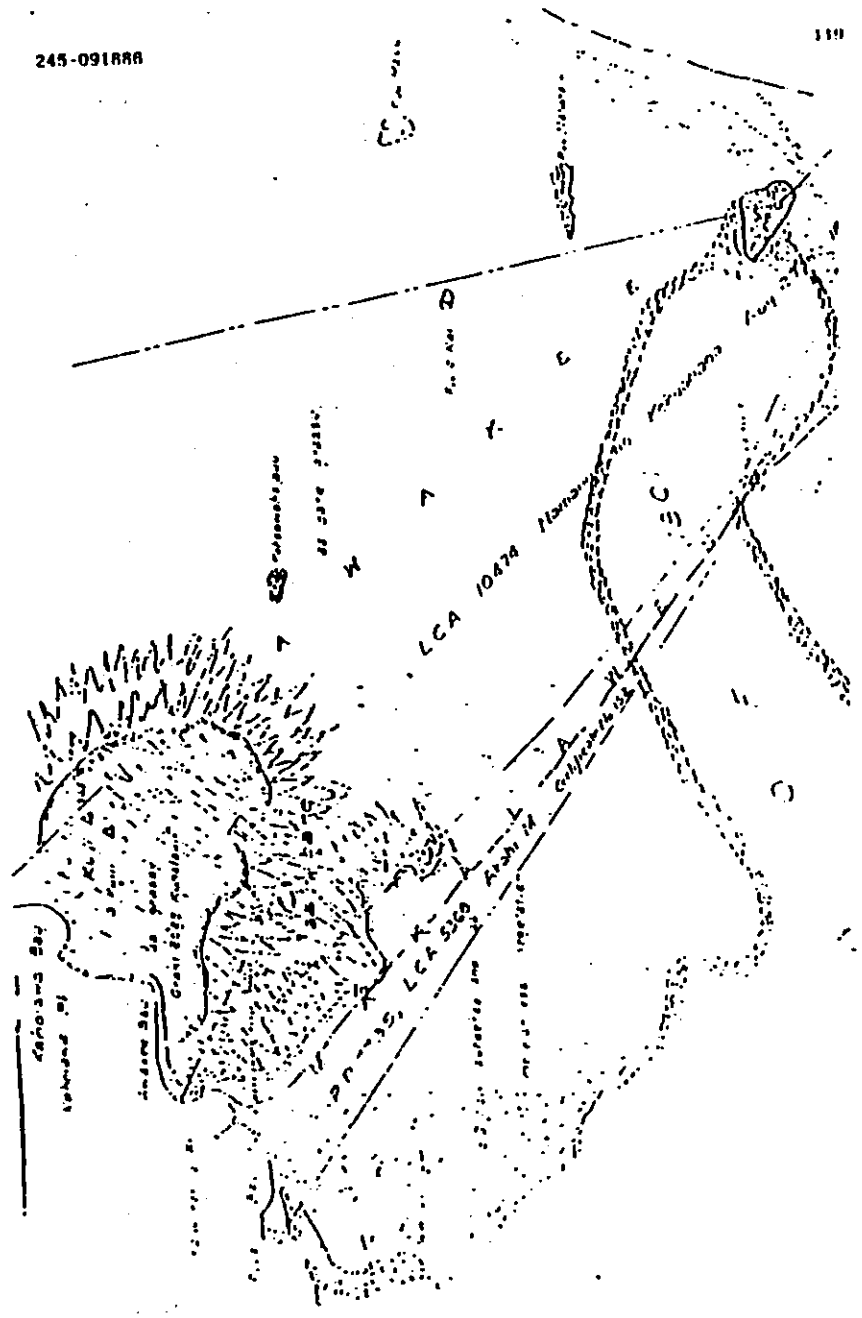


Figure 27. PORTION OF MAP OF NORTH KONA SHOWING TRAIL BY J.S. EMERSON 1882

REFERENCES CITED

Board of Commissioners to Quiet Lar Claims

1929 Indices of Awards made by the Board of Commissioners to Quiet Land Titles in the Hawaiian Islands. Honolulu: Territory of Hawaii

Clark, John

1985 Beaches of the Big Island. Honolulu: University of Hawaii Press.

Hawaii State

Archives
Boundary Commission Books
Interior Department Correspondance
Land File
Native Register and Testimony
Probate Records
Public Instruction Correspondance
Surveyor General Correspondance

Survey Division
Field Books
Maps

Ii, John Papa

1973 Fragments of Hawaiian History. Honolulu: Bishop Museum Press.

Kamakau, Samuel M.

1961 Ruling Chiefs of Hawaii. Honolulu: The Kamehameha Schools Press.

Maguire, Eliza D

1926 Kona Legends. Honolulu: Paradise of the Pacific Press.

Pukui, Mary K

1983 'olelo No'eau. B. P. Bishop Museum Special Publication 71. Honolulu: Bishop Museum Press.

Sterling, Elspeth P

1974 Index Ruling Chiefs of Hawaii. Honolulu: Dept. of Anthro . B.P. Bishop Museum

APPENDIX B:

REGIONAL NOTES FROM KEKAHA: MAKALAWENA

by

Hannah Kihalani Springer

The ahupua'a of Makalawena is part of the region of Kekaha, North Kona, which includes those lands from Honokohau through Pu'uanahulu (Figure 28).

ENVIRONMENT

Geology

The principal rift zone of Hualalai trends approximately N 50 W. is well-defined by cinder and spatter cones, and runs through Kekaha Pu'u'io and Akahipu'u are conspicuous elements of the landscape viewed from Makalawena, as is the 1801 cone and lava of Puhiapele. The cone, Puhiapele, formed by the 1801 eruption of Hualalai is at c. 490.0 m above sea level. This flow moved down the western flank of Hualalai and entered the sea over a front approximately 6.5 km wide, destroying the "fish ponds Paaiea in Makaula and Kaulana in Kekaha" (Ii 1973:132), and the "taho breadfruit of Kaneha'ikana which grew in the uplands of Hu'ehu'e where the flow started" (Kamakau 1961:185).

"Sea sand is buried for 1/4 mile from shore" (Stearns and Macdonald 1946:147). There are remnant beaches along the coast between lava fields, notably at Mahai'ula, Makalawena, Manini'owali, Kukio, and Ka'upulehu These beaches change in size and/or profile with seasonal swell and current conditions.

Though there has been no eruption of Hualalai since 1801, earthquake activity is not unknown. In 1929, the Stillman family excavated their home, Kukui'ohiwai, in Ka'upulehu at c. 610 m above sea level, when "a series of several thousand earthquakes came from beneath its northern flank" (Macdonald and Abbott 1970:292). According to geologist Richard Moore (pers. comm.), "There are a few earthquakes each year, from Hu'ehu'e Ranch on out to sea.... but we do not see swarms of earthquakes, nor do we see harmonic tremor."

Climate

On the leeward side of Hawai'i, Kekaha is less affected by the north east tradewinds (which are distorted, if not blocked by the masses of the major mountains), than by the land sea breezes or other regional winds

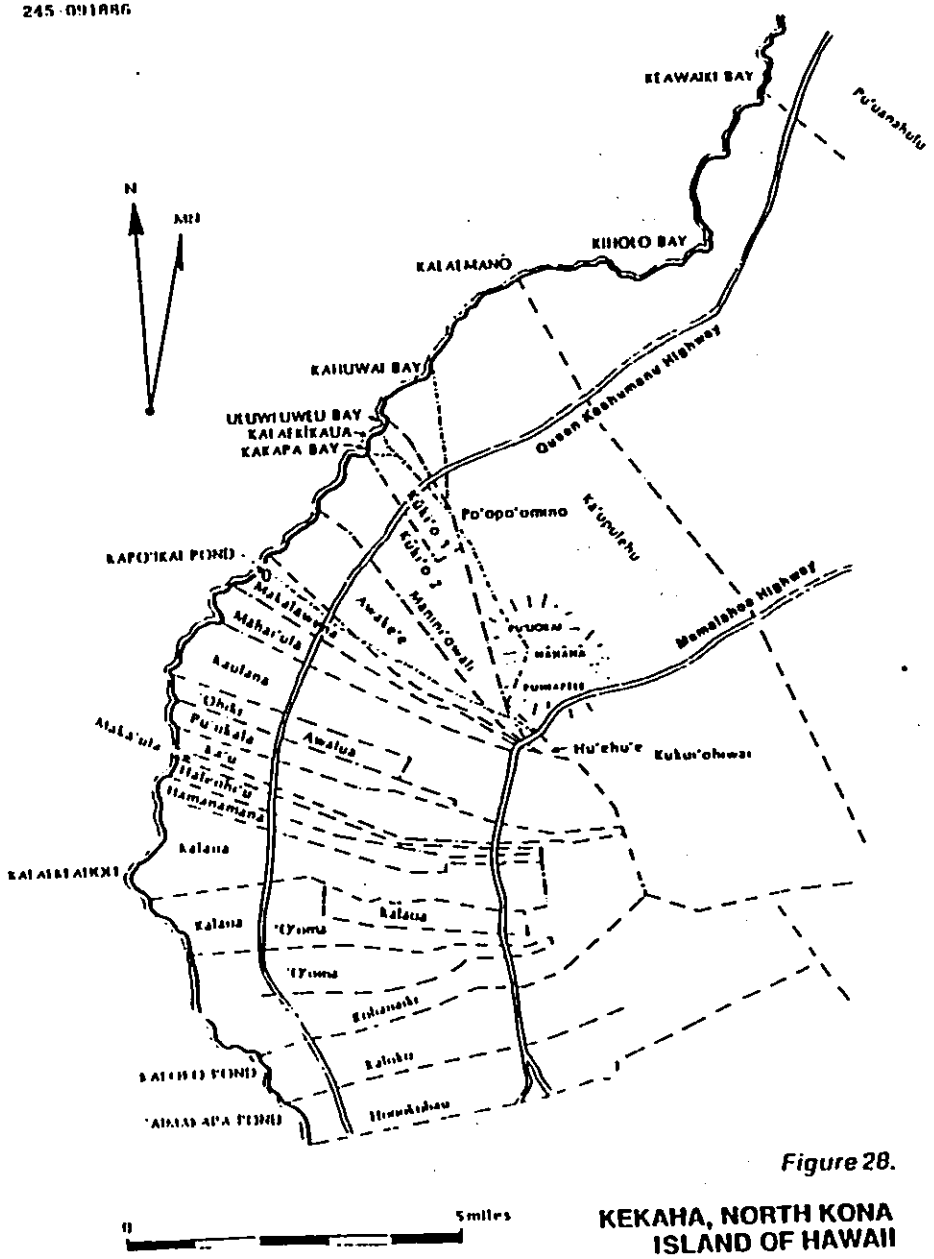


Figure 28.

KEKAHA, NORTH KONA
ISLAND OF HAWAII

Robert Keakealani of Pu'uanahulu described the winds of Kekaha as he learned them: the 'Eka is the Waimea wind, the prevailing wind: the Kau aoku is the wind from Kona: the wind from Maui is called Ho'olua: and the Kuhaoua is the wind from mauka.

Three poetic sayings refering to the 'Eka are to be found in 'Olelo No'eau.

> Ka makani kukulu pe'a nui, he 'Eka."
> The 'Eka, the wind that sets up the big sails.
>
> When the 'Eka wind blew in Kona, Hawai'i, the fishermen sailed out to the fishing grounds (Pukui 1983:159)
>
> Ke 'Eka, makani ho'olale wa'a o na Kona.
> The 'Eka breeze of Kona that calls to the canoemen to sally forth to fish.
>
> Refers to Kona, Hawai'i (Pukui 1983:182).
>
> Makani 'Eka aheahe o Makalawena.
> The gentle breeze of Makalawena (Pukui 1983:228).

An affect of the light and variable breezes of the region is described by Kenki Magoon of Mahai'ula: "Johnny Mano used to tell me about their sailing... they would go up the coast during the morning and come back in the afternoon after the wind changed."

It is the moisture laden sea breezes which move on shore and upslope during the day that generate the afternoon cloud cover and rain showers on the higher slopes of the region. The scant rainfall of the region is reflected in the descriptive terms used to describe Kekaha: "Kekaha wai 'ole" ("waterless Kehaka") (Maguire 1926:5), and "'aina malo'o" (dry, sun-baked land) (Kelly 1971:2).

Water

In an area such as Kekaha, the value of water cannot be underesti mated. Wooden troughs, calabashes, and gourds were placed in lava tubes to catch seepage from the surface. One such tube, known as 'Hakalei at Hu'ehu'e," was used in this manner until the second decade of this century (Maguire 1926:3,29). Thelma Kihalani Stillman Springer of Hu'ehu'e recalls the cave entrance as being "on a flat to the north of the grave yard, towards Kiloo."

Along the coast, basal springs with surface expression were tapped The spring at Laekikaua, Kuki'o, "...is probably the most potable water on the coast of Hualalai" (Stearns and Macdonald 1946:270). This spring is presently tapped to meet some of the domestic needs of the Hu'ehu'e Ranch beach cottage. A spring on the northern side of the Magoon family pro perty at Mahai'ula is similarly tapped

The numerous brackish ponds behind the beach at Makalawena served the needs of na kama'aina (the natives) to the land. Norman Keanu'aina recalls that the ponds for drinking and cooking water were the ones furthest inland. The remains of pumping systems, which once brought water from the ponds to the houses, are still to be seen there.

Vegetation

A dense kiawe (Prosopis pallida) thicket grows behind the pohuehue (Ipomoea pes caprae) mat community of the shoreline. The pohuehue mat was formerly more far reaching, and some of the older folks remember kiawe as being a cultivated plant that required constant tending less it get out of control. This thicket surrounds the wetland plant community associated with Kapo'ikai, also known as 'Opae'ula Pond. Among the kiawe, ironwoods (Casuarina equisetifolia) are scattered, especially near the ponds and close to the shoreline.

Makaloa (Cyperus laevigatus) is said to grow in the Kapo'ikai Wetland. This would have been an important resource (for those who were able to utilize it) to fiber workers. There is speculation that other useful fiber plants grew at Makalawena Beach before the introduction of grazing animals and the tsunami of 1946.

A variety of plants are scattered among the predominant fountain grass (Pennisetum setaceum) ground cover of the surrounding lava, including the native 'ilima (Sida fallax), valued for medicinal and ornamental purposes; the Polynesian introduction noni (Morinda citrifolia), used medicinally, as a source of dye for kapa, and as famine food; 'uhaloa (Waltheria indica var. americana), a shrub with medicinal uses; and indigo (Indigofera suffruticosa), a plant introduced for unrealized commercial purposes, and which has become naturalized in many of the pasture lands of Hualalai.

Pili grass (Heteropogon contortus) becomes conspicuous in Makalawena among the fountain grass near the utility corridor (c. 129.0 m above sea level). Thelma Springer and Norman Keana'aina recall that the ranch lands surrounding and including Pu'u'io locally were referred to as "Pili." Both fountain grass and pili have grown into the trail corridor and make travel along the Makalawena Akahipu'u Trail difficult between c. 90.0 and 180.0 m elevations.

Just off the Makalawena Akahipu'u Trail, on the southern side where the older lava and the 1801 lava meet, is a mango tree (Mangifera indica). It must have been a welcome treat for travelers through the Kekaha lands to enjoy the succulent fruit. Such plantings were favored by travelers who shared water with the plants in anticipation of the fruit to come.

The 1801 lava of Puhiapele supports scattered noni and puapiio (Capparis sandwichiana). As fountain grass is becoming established on the Puhiapele lava, the typical dense ground cover is being formed. Above the Puhiapele flow, on the flanks of Pu'u'io and Akahipu'u, the vegetation of Makalawena is predominately alien species introduced during the tenure of

John Avery Maguire at Hu'ehu'e Ranch. Scattered mulberry (Morus alba f. nigrobacca), ki (Cordyline terminalis), papaya (Carica papaya), citrus, and mango indicate areas where human activity, in addition to ranching, were present.

Bird Life

The ponds and the surrounding kiawe thicket are important wildlife habitat for a variety of both native and alien species. The value of Kapo'ikai Pond and Wetland as native water bird habitat has been reported by various sources. The species of particular interest which frequent Kapo'ikai are ae'o (Himantopus mexicanus knudseni), 'alae ke'oke'o (Fulica americana alai), koloa (Anas wyvilliana), and 'auku'u (Nycticorax nycticorax hoactli). Indigenous migratory birds which frequent the Makalawena shoreline are 'ulili (Heteroscelus incanus), kolea (Pluvialis dominica), 'akekeke (Arenaria interpres), and hunu kai (Calidris alba).

In addition to the recommendations that Kapo'ikai Pond and Wetlands and the other anchialine ponds of Makalawena be preserved as biological resources and/or resort amenities, comes a proposal from Veterans resident Mae E. Mull, Island of Hawai'i representative of the Audubon Society. She proposes that these resources, as well as the sand dune pohuehue environment and the near shore waters of Makalawena, be restored and maintained as wildlife habitats for the educational benefit of the beneficiaries of the will of Bernice Pauahi Bishop.

FOOD SOURCES

Planting

William Ellis, on his tour of Hawai'i in 1823, described Kailua, North Kona, as follows:

> The houses, which are neat, are generally erected by the seashore, shaded with cocoa-nut and kou trees, which greatly enliven the scene. The environs were cultivated to a considerable extent; small gardens were seen among the barren rocks on which the houses are built, where ever soil could be found sufficient to nourish the sweet potato, the watermelon, or even a few plants of tobacco, and in many places these seemed to be growing literally in the fragments of the lava collected in small heaps around their roots.
>
> The next morning, Messrs., Thurston, Goodrich and Hardwood visited the high and cultivated part of the district. After traveling over the lava for about a mile, the hollows in the rocks began to be filled with light brown soil; and about half a mile further, the surface was entirely covered with a rich mould, formed by the decayed vegetation and decomposed lava.

Here they enjoyed the agreeable shade of breadfruit and ohia trees. The path now lay through a beautiful part of the country, quite a garden compared with that through which they had passed, on first leaving town. It was generally divided into small fields, about fifteen rods square, fenced with low stone walls, made of fragments of lava which had been gathered from the surface of the enclosures. These fields were planted with bananas, sweet potatoes, mountain taro, paper mulberry plants, melons, and sugar-cane, which flourishes in every direction (Ellis 1969:80-81).

Areas of planting in Kekaha have been described as follows:

> Wherever a little soil could be heaped together along the dry lava coast of North Kona, a few sweet potatoes were planted by the fishermen at such places as Honokohau, Mahai'ula, Makalawena, Ka'upulehu, Kiholo, Keawaiki and Kapalaoa. Doubtless potatoes were planted on the upland of North Kona, on the lower slopes of Hualalai toward Pu'uwa'awa'a, up to a considerable altitude in rainy seasons. In recent times the flatlands of Pu'u Anahulu, having an elevation of 2,300 feet, have supported a number of patches planted by Hawaiian cowboys (Handy, Handy, and Pukui 1972:527-528).

In the uplands where homesteads were established in 1895, and at Ho'ehu'e prior to the Puhiapele eruption, Ellis' description may probably be applied. In "The Cave of Makalei," the cultivation of taro, sweet potatoes, bananas, sugarcane, and 'awa is described (Maguire 1926:27). The breadfruit grove of Kaaeh'ikana is identified by Kamakau as growing in the uplands of Ho'ehu'e (Kamakau 1961:185). It no doubt was breadfruit from this grove that Pahinahina and Kalamu'o were preparing in "The Two Girls Roasting Breadfruit" (Maguire 1926:18-20).

Norman Keana'aina recalls that "...the old folks grew gardens back by Kapo'ikai Pond where they had a good source of water." Personal experience indicates that even taro will grow well by the shore, given a good water supply and rich mulch as provided by hau (Hibiscus tiliaceus), milo (Thespesia populnea), or kiawe leaves.

Fishing

The Hawaiians exploited both inshore and offshore ocean resources extensively. Management of these resources corresponded to observed natural cycles and where conditions permitted, included man modified environments. Kekaha was famous for its offshore fishing grounds. Kamakau notes the High Chief 'Umi a-Liloa fishing for aku (Katsuwonus pelamis) off Maka'ula (Kamakau 1961:20). When Kaulkeaouli declared the Mahele of 1848, Halehaku in Kekaha was one of the ahupua'a which he reserved for himself (Kelly 1971:4). Much of the ahupua'a had been rendered barren by the Puhiapele flow; it is perhaps that Kaulkeaouli desired the ahupua'a not for its terrestial resources, but rather for the offshore fishing grounds.

People living in upland Kekaha today recall the "old folks" who lived at Makalawena and Ka'upulehu Beaches, and caught and dried 'opelu (Decapterus macrosoma-helenae) for home use, to exchange with family living in the uplands, and to sell or trade at stores. To supplement their protein sources, in addition to deep-sea and coastal fishing and mammal and fowl resources, the Hawaiians also innovated systematic breeding and nurturing networks, or ponds, for certain fish. Kekaha was noted for its fishponds. The ponds at Honokohau and Kaloko remain, while those of Pa'alea and Kiholo were destroyed by the Hualalai flow of 1801 and the Mauna Loa flow of 1859 respectively.

Another aquatic cultigen was 'opae'ula (Halocaridina rubra). The wai 'opae are those brackish ponds where the 'opae are present. The wai'opae were exploited for the shrimp, which were formerly popular eaten for 'opelu. Many of the favored wai'opae were modified to improve access, increase depth, or otherwise make the use of the resource easier. Kapu 'Ikai, today popularly known as 'Opae'ula, is a very large wai'opae.

Mammals and Fowl

Pigs and chickens were probably included, at least for festive occasions, in the traditional diet of coastal dwellers of Kekaha. The pigs that were raised at Kiholo, Ka'upulehu, and Makalawena are remembered by many persons. Chickens roamed the beach and kiawe thicket of Makalawena during the time that Annie Punihaole lived with her first husband, Una, and through the lifetime of her widower, Porto Almodobar.

The feral goats and donkeys that wander the coastal lava plain are descended from the herds kept by different families. For example, the Kaelemakule family of Mahai'ula was associated with raising donkeys, as was Keaka Punihaole. Keaka Punihaole provided donkeys for many of the families of Kekaha. Goats were raised both commercially and for personal use. The herd of goats at Makalawena was noted for its quality, resulting from occasional introduction of improved stock.

Like the kiawe, without appropriate attention these feral herds can be ubiquitous and noxious elements of the environment. In recent years, since the completion of the Queen Kaahumanu Highway, the numbers of these animals has been greatly reduced.

MAKALAWENA

Access and Use

Registered Map No. 1280 (Hawaii State Survey Office), based on survey work done c. 1888 by J.S. Emerson, and traced by H.K. Aki in 1952, shows a trail going mauka (inland) from the Makalawena School. This trail approximately dissects the ahupua'a until the upper boundary at the Puhiapele flow in Makalawena. The trail then goes through Mahai'ula to the southern flank of Pu'u'lo in Pu'ukala, and continues southeast to the old Pu'ukala School.

During the first half of this century, Hu'ehu'e was a popular point of departure for people going makai (seaward). The various gates below the Ranch headquarters were not locked and were used commonly to access the various trails makai. Today, the course of the Makalawena-Akahipu'u Trail through the ranch lands has been generally obscured due to vegetative growth and pasture improvement efforts, but by following conspicuous landmarks, anomalous vegetation, and cultural remains, one can discern the course described by the older people who used the trail regularly.

People from the coast to the north and south of Makalawena would visit the area via na ala kahakai (the coastal trails) or by boat. Na ala kahakai to both the north and the south of Makalawena Beach have probably been entirely converted to four-wheel drive access. The access from the sea remains as it always has been, dependent upon oceanic conditions. Today, the most popular access to Makalawena Beach is from Queen Kaahumanu Highway, through Awake'e to the south of Kuili, and along the shoreline on a jeep road.

With the Mahele and the related acts of the mid-1800s, land tenure was formalized according to the Euroamerican model. Akahi is noted as holding RP 7731, LCA 5368 for Makalawena. Akahi was the wife of Kalanimoku after Likelike, the daughter of Pauelua (Kamakau 1961:251), and the granddaughter of Kaleiwohi (McKinzie 1986:71). Notes from the Kona Historical Society file on Makalawena include reference to the divorce of Akahi from Alapa'i in 1851, and correspondence from Akahi to Keoni Ana dated 15 January 1852. In the letter, Akahi is sending notice to Keoni Ana that "as provided by law, I file a list of my lands and my prohibited fish, so that your work may run along nicely: Kealia - opelu, Keei - kala, Makalawena - hee, Puuepa (Kohala) - uhu."

Makalawena Church and School

Notes from the Office of Hawaiian Affairs office in Kailua, Kona include references to school and church activities at Makalawena Beach. In 1848, S. Ha'aniu was the school superintendent for the region, which included a Protestant school at Makalawena that served 21 students.

In the 1860s, a Ministry was begun at Makalawena by G.P. Kaunohimaka. This Protestant Ministry was a part of Kekaha Church, and one of the six churches founded by G.P. Kaunohimaka. The six churches were known as Kalamakua at Pu'uanahula, Kapalauwa at Kiholo, Kipuna'e at Hu'ehu'e, Kaikalaia at Makalawena Beach, Halcola at Kalaoa (the remains of this church stand behind the present Mauna Ziona graveyard), and Kekaha Church at Kohanaiki.

Kelly quotes Sochren's note that the Makalawena School was begun in 1868. She further notes that during the visit of Rev. Baker to Makalawena in December 1909, Mr. Henry Kamauna was the school teacher at Makalawena School, serving students from Ka'upulehu to the north, to Hahai'ula to the south (Kelly 1973:103).

Norman Keana'aina, kahu (pastor) of Mauna Ziona Church, recounted the following events in the history of the congregation of Kekaha Church. The school and the church shared the same building for decades, the school convening during the week and the church on Sundays. In 1909, a second building was built about 100 yards from the older school/church and dedicated as Kaikalaia Church. Friends and families gathered for the dedication, and congregation of about 100 persons was present (Figure 29).

In about 1912, Reverend Upchurch of Kailua became the kahu of the Kekaha Church(es). Not wanting to "travel all the way to Makalawena," he held regular services at Kohanaiki Church, and Kaikalaia fell out of regular popular use.

In 1920, the congregation's activities became focused in Kalaoa with the building of Mauna Ziona Church. Timber was a very dear commodity in those times; wood was recycled from the church at Makalawena to build the Mauna Ziona Church hall, and wood from the church at Kohanaiki was recycled to build the church itself. This construction effort is said to have taken the congregation approximately one year.

In the 1970s, the Mauna Ziona congregation held Thanksgiving Sunday outings at the Kaikalaia Church site. During these outings, in addition to baptisms in the waters of Makalawena, efforts were made to clean and tidy the area around the Kaikalaia site and the trails to Kapo'ikai, which were the objects of fond memories for many of the Mauna Ziona congregation. Since 1981, there have been some difficulties in securing access to and use of the Kaikalaia site, but Kahu Keana'aina looks forward to resolution of this matter and the resumption of church activities at Makalawena.

Annie Una and Aileen Stillman

According to records kept at the Mormon Church in Kailua, Kona, Annie Punihaole was one of 14 children born to Keaka (Jack) Punihaole of Kohanaiki and Kapahu Kaunonuuanu of Makalawena during the time that these two lived in Kohala. Annie was born in 1891.

Aileen Ruth Kihalani Maguire was born at Kahua, Kohala, in 1893 to Charles Lauluhelmalama Maguire and Mary Kihalaninui Parker Maguire. Aileen was raised at Hu'ehu'e by her paternal grandparents, John Avery Maguire and his first wife, Luka Hopula'au, until the latter's death in 1898, and then by Maguire's second wife, Eliza Davis Low Maguire.

There was a deep bond between Annie and Aileen who, according to information offered by Kelly, were related in that Annie's grandmother Ka'au'ula of Kuki'o and Makalawena was a sister of Aileen's great great-grandmother, Haiha (Kelly 1971:43,46). The two would visit frequently. Sometimes, Aileen and her friends would ride from Hu'ehu'e (Figure 28) to Makalawena Beach (Figure 29). There they would enjoy the pleasantries of the coast (Figure 30). Later, after Aileen had married Arthur Joseph Kahiwahiwa Stillman, the Stillman family would spend summers at Kuki'o Beach, and Annie and her husband, Una, would join with them there (Figure 31).

[Photograph on following page.]

Figure 29. DEDICATION OF KAIKALAIA CHURCH, HAKALAWENA.
1909 Photo by Rev. Baker. (Neg. N-848)

[Courtesy of Hawaiian Mission Children's Society]

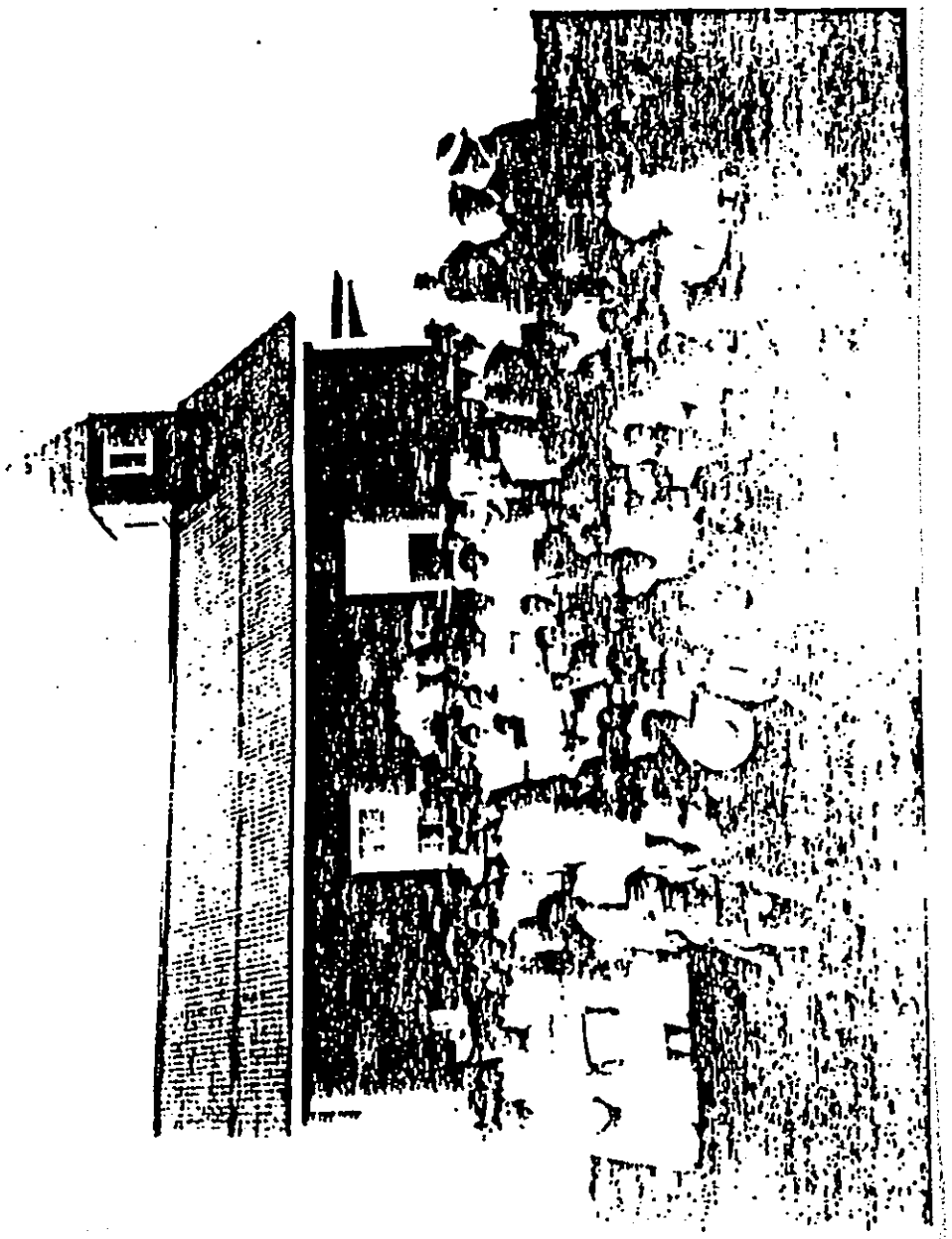


Figure 30. EN ROUTE TO MAKALAWENA FROM HI'EHU'E. Aileen Maguire, second from left, and friends. Akahipu'u in background. Photo by Eliza Maguire, c. 1910. (PUKI Neg. 530 13)

(Photo courtesy of the Kukui'ohiwai Collection.)

Figure 31. RIDING ALONG THE BEACH AT MAKALAWENA. Aileen Maguire and friends at Makalawena Beach. Photo by Eliza Maguire, c. 1910. (PUKI Neg. 530 2)

(Photo courtesy of the Kukui'ohiwai Collection.)

Figure 32. PASSING TIME AT MAKALAWENA. Aileen Maguire on left, and friend. Photo by Eliza Maguire, c. 1910. (PBRI Neg. 530 9)

(Photo courtesy of the Kukui'ohiwai Collection.)

Figure 33. THE STILLMAN FAMILY AND FRIENDS AT KUKI'O BEACH. Aileen Maguire Stillman, far left; Annie Una, center; Una, far right; Thelma Stillman, third from left; c. 1933. (PBRI Neg.530-17)

(Photo courtesy o[illegible] he Kukui'ohiwai Collection.)

Annie was renown for her wanderings along the Kona coast from Mahai-'ula, where she and Una were caretakers, to Kalaemano, a favored place to collect pa'akai (sea salt). Annie's father was noted for the 'ekake (donkeys) that he raised, and Annie would travel either by 'ekake or foot when visiting her favorite haunts.

One of Annie's more poignant journeys was the one she made to the uplands, the Kukui'ohiwai, Ka'upulehu, upon Aileen's death in 1939. Aileen died in the afternoon, recalls her daughter, Thelma Kihalani Stillman Springer. The next morning at about 10 o'clock Annie arrived at Kukui'ohiwai. Before they saw Annie, the Stillman family heard her wailing her lament at the passing of her cherished companion. Annie joined with the family and other mourners in an all-night vigil and in the burial services at the family cemetery at Hu'ehu'e.

Agnes Hale'ama'o Ohira and Molly Kunewa Dunnaway

Agnes is now 84, and though she is firmly of the mountains and goes to the coast only as needed, she recalls that in her younger days "there were lots of Hawaiians at Makalawena." This is consistent with Kelly's report of Makalawena being a prominent "fishing village, it boasted a church, school, store, and at least seven or eight houses" (Kelly 1973:103). Quoting Baker, Kelly notes a population of "about 50 people live at this isolated place by the sea for the excellent fishing. They also raise some goats, and for course have some coconuts. There are about 15 houses" (Kelly 1973:104).

Molly was born in 1910 and has fond memories of visiting family and friends at the coast whenever school holidays and the responsibilities of later life permitted.

> Oh there were so many trails. Sometimes we'd go down over the hills Ka'upulehu side. Sometimes we'd go down to Mahai'ula or right down to Makalawena from Hu'ehu'e.
>
> What fun! People went up and down the coast. People lived at Makalawena, you had Annie and Una. There were lots of people there. There was a church too. At Ka'upulehu you had Mahiko folks. There was always someone at Mahai'ula and Kuki'o. Everyone has family, friends.

Robert Keakealani

Robert Keakealani was born at Ka'upulehu Beach in 1916 to Keakealani (k) and Keola Na'alo (w). He lived there until he was about eight and moved on to Pu'uanahulu Homesteads. His memories of his youth are among his rich and cherished memories.

Auntie Annie and Tutu Una figure greatly in his recollections. He recalls going to stay with them at Makalawena.

> If we were going for church, we would go over on Saturday, nanea (relax, enjoy), then come back after church on Sunday...and we would usually stop, spend time at Kuki'o.
>
> Una would come through his way Ka'upulehu on his way to Kalaemano to gather salt. The men of Ka'upulehu Mahiko, Keakealani, Naka'ainui, and Puhi would join with him and they would gather several bags of salt to be divided among them. The poho (depressions) of Kalaemano were good for pa'akai. Clean.

The salt was used in preparing dried fish and octopus.

Robert and his family would travel the coast of Kekaha and South Kohala by foot or canoe. With a chuckle, he described their plank canoes. "Not the dugout canoes, koa, that people today think of...these were made of two by-fours, pieces of wood." They would paddle or sail the canoes as the conditions and their needs required.

Thelma Kihalani Stillman Springer

Thelma was born at Hu'ehu'e in 1919 to Arthur and Aileen Stillman. Thelma seldom went to Makalawena, though she remembers the kupe'e (Nerita polita) of that place clearly: "There they came in different colors, some were white with red stripes." Only on one occasion did Thelma go behind the beach there: "My dad and I came from Kailua by boat, he wanted to check something at the big pond behind the beach."

Annie fondly remembered the summers she shared with the Stillman family at Kuki'o. Later, when the Nagoon family came to Mahai'ula, the Stillman's would visit them, Annie and Una were a part of those memories too. Thelma recalls that her first visit to Makalawena on the jeep road down from Ka'upulehu and through Awake'e was in 1958, with John Kapehe. Una had died and Annie had remarried Porto Almodober. The hospitality of the Makalawena residents was as it always had been, and the visitors returned to the uplands with dried 'opelu and he'e.

Thelma last saw Annie in the summer of 1959, when she visited Makalawena with Edwin "Bull" Johnson, then the manager of Hu'ehu'e Ranch. When the Springer family visited Makalawena Beach in 1964, Porto was living there alone. Annie had died. An era had ended.

George Nagoon

Alfred Nagoon purchased 40 acres of land on the coast at Mahai'ula and Kaulana from the Ka'elemakule family in 1939. His family continues to enjoy the seaside retreat. Alfred's son, George, recalls that the family would access Mahai'ula by boat or overland from Hu'ehu'e by foot and donkey. The family kept donkeys at Hu'ehu'e for access, which was especially important during the winter when the weather was uncertain. George is firm in his recollection that the trail between Mahai'ula and Hu'ehu'e was better easier to travel than the Makalawena trail.

When the Magoon family came to Mahai'ula in 1939, they retained Annie to work in the house when Mrs. Magoon needed help, and Una to work as caretaker. George noted that Porto was already fishing the Kona coast at that time, and that they were all friends.

The Magoons continued to access Mahai'ula by boat or from Hu'ehu'e by foot and donkey until the late 1940s or early 1950s, when the trail down through Ka'upulehu to Awake'e was modified for jeep use. For awhile, the Magoons would drive to Makalawena, then make the last leg of the trip to Mahai'ula by boat. Eventually, Porto and his "compad," Alfredo, built a road by hand, across the lava to Mahai'ula. This road parallels, and in some places obliterates, an older an paved trail. Today the Magoon family enjoys a paved access from the Queen Kaahumanu Highway.

Norman Keana'aina and Ruby Keana'aina McDonald

Members of the Keana'aina family were in the congregation of Kaikainia Church, and (as noted previously) Norman Keana'aina maintains a relationship with Makalawena based in part upon his ministry of the Mauna Zion congregation.

Norman recalls as a child, going to the coast with his family for a week or two at a time. They would usually go through a gate by Apela Kalua'u's house. "As children we would just take off running, paying no attention to the trail, just going...it was such a joy...and if we stayed on the trail, well, we would have to help fix it where it needed...as kids, we just wanted to go."

Sometimes the family would go down on Friday in the afternoon and come back on Sunday. Many of the families of Kekaha would have similar activities. "It was a matter of where you went first...who you wanted to see or what you wanted to do." If the children went with their mother, she enjoyed going to the area by the lighthouse at Keahole. Her second husband, Henry Palakiko Kamaka, was "an adventurer" who enjoyed visiting the Magoons at Mahai'ula or going out on boats with his friends.

Norman recalls the ponds at Makalawena being kept clean. Those ponds used for drinking or cooking water were never used for anything else. "Today people kapulu (are careless, unclean) the ponds...they show no respect."

Again Annie Una is remembered with fondness. "She had little, but she was generous. The first thing was always "Komo mai, 'ai" (come, eat). "Things really changed after the tidal wave (1946), all the buildings, the drying sheds, even the way the land was, was different. I was away for awhile, on O'ahu, and when I came back the jeep road was in and Annie Una was pau (finished, gone)."

Norman's niece, Ruby, remembers visits to Makalawena Beach with her family: her grandparents, Emily and Henry Palakiko Kamaka, her aunts and uncles and her cousins. The family would go down the jeep road and stay

for one or two weeks. Annie had already passed on. The family would take canned goods and "Ten High" whiskey for Porto, as well as ti leaves for the goats when they would visit Makalawena Beach, in a contemporary adaptation of the old mauka-makai reciprocity. The family would enjoy camping, fishing for immediate use as well as preparing some fish, by drying, for later use. Ruby remembers Porto drying he'e and some 'opelu.

Debbie Chang Abreu

Debbie is a 34 year old resident of Pu'ukala, with an ancestral association to Kekaha through Kalaukoa (k). She enjoys walking on all kahiko (the trails of old) and sees this experience as a continuum between generations. As her life has been enriched through walking the pathways of the ancestors, she would like to see provision for future generations to experience the same enrichment. Debbie's effort to assure the opportunity for present and future generations to have authentic, traditional access to various destinations has made her a very active participant in the planning and community information process. She often addresses issues as the President of Na Ala Hele.

Makalawena has been both the object of and an area passed through during field outings Debbie has participated in. She has organized, coordinated, and led walks along ke ala kahakai (the coastal trail) of Kekaha for both community and school groups. These walks blend recreation with service tasks and resource education. Concern for the health of the Kapo'ikai Wetland; for the maintenance and preservation of auy ala kahakai, the Makalawena-Akahipu'u Trail, and other cultural remains; and for the recreational needs of the region has caused Debbie to consider that a Public Park at Makalawena would best meet the needs of the resources and the surrounding community.

INFORMANT CONCERNS AND CONSIDERATIONS

Kapo'ikai Pond and Wetlands are cherished by those with an interest in the cultural, as well as the natural, history of Makalawena. Where in the past human activity has been carefully exploitive, followed by neglect, it is suggested that today's activity should be conducive to healing maintenance of the resource.

There should be clarification as to which of the trails in the area are still public and subject to the Highway Act of 1892. This Act may still pertain to any remaining sections of ala kahakai and/or the Makalawena Akahipu'u Trail.

The congregation of Kekaha (Mauna Zion) Church still has legitimate claim to lands, access, and use rights in Makalawena. As this is a kama'aina (native born) congregation, representing a continuous bond with na 'ohana (the families) of the ahupua'a, it is no small courtesy owed them they may prove to be a valuable resource with regard to the treatment of

any burials requiring reinterment or other disturbance. Every effort should be made to cultivate a mutually satisfying relationship with this group of people.

Ke ali'i (the chiefess) Bernice Pauahi Bishop willed that her entire estate be used to aid and educate young people of Hawai'i, "giving preference to Hawaiians of pure or part aboriginal blood." This directive deserves review, and any activities initiated should address this as well as the economic incentive. The biological and cultural resources of Makalawena are also educational resources, and part of the living heritage of Bernice Pauahi Bishop.

RECOMMENDATIONS

Further ethnographic and archival work is needed to generate a more complete history of Makalawena. Special attention should be given to land tenure and usage, regional accesses, regional genealogical associations, and the role of the church, school, and commercial activities in Makalawena community life. Further investigation of Hawaiian language newspapers will yield a variety of insights into the region. Every effort should be made to disseminate the information contained in the present and subsequent reports back to the people of Kekaha.

REFERENCES CITED

Ellis, William

1969 Polynesian Researches, Hawaii. Rutland, Vt.: Charles E. Tuttle Company, Inc.

Handy, E.S. Craighill, and Elizabeth Green Handy, with Mary Kawena Pukui

1972 Native Planters in Old Hawaii. B.P. Bishop Museum Bulletin 233. Honolulu: Bishop Museum Press.

Ii, John Papa

1973 Fragments of Hawaiian History. Honolulu: Bishop Museum Press.

Kamakau, Samuel M

1961 Ruling Chiefs of Hawaii. Honolulu: Kamehameha Schools Press.

Kelly, Marion

1971 Kekaha: 'Ainu Mole'o. A Survey of the Background and History of Kaloko and Kukio, North Kona, Hawaii. Departmental Report Series 71-2. Dept. Anthro., B.P. Bishop Museum

1973 Appendix B: Historical Background of Kekaha, North Kona, Hawaii. IN Paul H. Rosendahl, Archaeological Salvage of the Ke ahole to Anaehoomalu Section of the Kailua-Kawaihae Road (Queen Kaahumanu Highway), Island of Hawaii. Departmental Report Series 73-3:77-112. Dept. Anthro., B.P. Bishop Museum.

Macdonald, Gordon A., and Agatin T. Abbott

1970 Volcanoes in the Sea. Honolulu: University of Hawaii Press.

Maguire, Eliza D.

1926 Kona Legends. Honolulu: The Paradise of the Pacific.

McKinzie, Edith Kawelohea

1986 Hawaiian Genealogies. Honolulu: University of Hawaii Press.

Pukui, Mary Kawena

1983 'Olelo No'eau. B.P.Bishop Museum Special Publication 71. Honolulu: Bishop Museum Press.

Stearns, Harold T., and Gordon A. Macdonald

1946 Geology and Ground-Water Resources of the Island of Hawaii. Hawaii Division of Hydrology Bulletin 9. Honolulu: Territory of Hawaii.

ACKNOWLEDGEMENTS

Eo na kupuna a me na makua a me na hoaloha. Mahalo pihu no ko 'oukou kokua ana. He hana maka'i kela no ka mea hi'ipoi kakou i ko kakou 'aina aloha 'o Kekaha. Aloha no.

REFERENCES

Andrews, S. 1981. Black-crowned Night Heron predation on Black-necked Stilt. 'Elepaio, Vol. 41, No. 9, pp 86.

Armstrong, R. W. (ed.) 1973. Atlas of Hawaii, University Press, University of Hawaii, Honolulu, Hawaii.

Balazs, G. H. 1980. Synopsis of biological data on the green turtle in the Hawaiian Islands. NOAA-TM-NMFS-SWFC-7.

Berger, A. J. 1972. Hawaiian Birdlife. The Univ. Press of Hawaii. Honolulu, Hawaii.

Brock, R. E. 1985. Assessment of the conditions and future of anchialine pond resources of the Hawaiian Islands. In Final EIS, Waikoloa Beach Resort, U. S. Army Engineer District, Honolulu.

Brock, R. E. 1977. Occurence and variety of fishes in mixohaline ponds of Kona, Hawaii, Coast. Copeia, Vol. 1, pp 134-139.

Brock, J.H. and R.E. Brock 1974. The marine fauna of the coast of North Kona, Hawaii: an inventory of fishes and invertibrates recorded during summer 1972. Sea Grant Advisory Report, UNIHI-SEGRANT-AR-74-02, University of Hawaii, Honolulu, Hawaii.

Bruner, P. L. 1983. Territorial behavior of wintering Golden Plover in Hawaii. ms. (Paper presented at the 100th meeting of the Amer. Ornith. Union).

Bruner, P. L. 1984a. An avifaunal and feral mammal survey of Mauna Kea Properties, Inc., Hawaii. Unpbl. ms.

Bruner, P. L. 1984b. An avifaunal and feral mammal survey of Waikoloa Beach Resort property, Hawaii. Unpbl. ms.

Bruner, P. L. 1984c. Letter to A. Yoklavich of Belt Collins & Assoc. concerning the recovery of a specimen of the Hawaiian Hoary Bat at Shearaton Royal Waikoloa.

Bruner, P. L. 1985. An avifaunal and feral mammal survey oof Waikoloa Beach Resort property, coastal area between south property boundary and proposed Hyatt st.

Byrd, V., R. A. Coleman, R. J. Shallenberger and C. S. Arume. 1985. Notes on the breeding biology of the Hawaiian race of the American coot. 'Elepaio, Vol. 4.

Chang, S. Y. K. and R. H. F. Young. 1977. An investigation into environmental effects of sewage effluent reuse at the Kaneohe Marine Corps Air Station Klipper Golf Course. Water Resources Research Center, University of Hawaii (WRRC) Rept. No. 53.

Char, W. P. 1984. Assessment of flora, Kuki'o I, North Kona, Hawaii. Rept. Prep. for Phillips Brandt Reddick & Assoc., Inc. Honolulu, Hawaii.

Char, W. P. 1985. Botanical survey for Ka'upulehu developments, Ka'upulehu, North Kona, Hawaii. Rept. prep. for Belt Collins & Assoc., Inc. Honolulu, Hawaii.

Ching, F. K. W. 1971. The archaeology of South Kohala and North Kona: From the ahupua'a of Lalamilo to the ahupua'a of Hamana-mana. Surface survey Kailua-Kawaihae road corridor (section III). Hawaii State Archaeological Jour. No. 71-1. Dept. Land and Natural Resources, Div. State Parks.

Chun, M. J., R. H. F. Young and G. K. Anderson. 1972. Wastewater effluents and surface runoff quality. WRRC Tech. Rept. No. 63.

Clague, D. A. 1982. Petrology of theoleiitic basalt dredged from Hualalai volcano, Hawaii. EOS, Trans. Amer. Geophys. Union. Vol. 63, pp 1138.

Community Resources, Inc. 1984. Socio-economic assessment for proposed Waikoloa Hyatt project. Honolulu, Hawaii.

Community Resources, Inc. and A. Lono Lyman, Inc. 1985. Socio-economic impact assessment of proposed additional development at the Kuilima Resort. Rept. prep. for Group 70, Planners. Honolulu, Hawaii.

Community Resources, Inc. 1986. Assessment of potential qualitative social impacts of the proposed Kukio Beach Resort Project. Rept. prep. for Phillips Brandt Reddick & Assoc. (Hawaii), Inc. Honolulu, Hawaii.

Coopers & Lybrand. 1986. Model and implementation framework for monitoring the impacts of tourism in Hawaii. Rept. prep. for Hawaii State Dept. of Planning & Economic Development. Honolulu, Hawaii.

Corps of Engineers (COE). 1985. Final Environmental Impact Statement Waikoloa Beach Resort, Waikoloa, South Kohala District, Island of Hawaii, State of Hawaii. U.S. Army Engineer District, Honolulu.

Cottington, F. 1969. Socio-psychiatric effects of luxury hotel growth and development on a rual population. Unpbl. ms.

Department of Land and Natural Resources. 1970. An inventory of basic water resources data: Island of Hawaii, Div. of Water and Land Development, DLNR Rept. No. R34.

Dugan, G. L., R. H. F. Young, L. S. Lau, P. C. Eckern and P. C. S. Loh. 1975. Land disposal of sewage in Hawaii, a reality? Jour. Water Poll. Control Fed. 47 (8).

Dugan, G. L., P. C. Eckern and R. T. Tsutsui. 1976. Nitrogen removal from secondary effluent by a laboratory soil column. WRRC Tech. Rept. No. 102.

Dugan, G. L. and L. S. Lau. 1980. Sewage irrigation and recharge consequences. Proc. of Amer. Soc. of Civil. Eng., Nat'l. Conv. and Expos.

Elliot, M. E. and E. M. Hall. 1977. Wetlands and Wetland Vegetation of Hawaii. Rept. prep. for U.S. Army Corps of Engineers, Pac. Ocean Div. Honolulu, Hawaii.

Emory, K. P. 1970. Inventory of archaeological and historical sites in the Kona and Ka'u and in Anaehoomalu, South Kohala, Island of Hawaii. Departmental Rept. Series 70-12. Dept. of Anthropology, B. P. Bishop Museum.

Farrell, B. H. 1982. Hawaii, The Legend That Sells. Univ. of Hawaii Press. Honolulu, Hawaii.

Frank, J. A. 1981. Economic change and mental health in an uncontaminated setting. Amer. Jour. of Community Psych. Vol. 9, pp 395-410.

Handley, L. L. and P. C. Ekern. 1981. Irrigation of Californiagrass with domestic sewage effluent: Water and nitrogen budgets and crop productivity. WRRC T141.

Hawaii Audobon Society. 1984. Hawaii's Birds. Third Edition. Hawaii Audobon Society, Honolulu, Hawaii.

Hawaii, County of. 1971. Hawaii County General Plan.

Hawaii, County of, Dept. of Planning. 1982. Kona Regional Plan.

Hawaii Opinion. 1983. Survey of Big Island residents on planning and housing concerns. County of Hawaii.

Hawaii State Dept. of Planning and Economic Development. 1972. Tourism in Hawaii: Hawaii impact plan, Vol. I: Statewide. Honolulu, Hawaii.

Hawaii, State of. 1978. Hawaii State Plan.

Hawaii, State of. State Functional Plans.

- Transportation Plan. 1984
- Housing Plan. 1984
- Conservation Lands Plan. 1984
- Historic Preservation Plan. 1984
- Education Plan. 1984
- Tourism Plan. 1984
- Agriculture Plan. 1984
- Health Plan. 1984
- Recreation Plan. 1984
- Energy Plan. 1984
- Water Resources Plan. 1984

Holthuis, L. B. 1973. Caridean shrimps found in land-locked saltwater pools at four Indo-West Pacific localities (Sinai Peninsula, Funafuti Atoll, Maui and Hawaii Islands), with the description of one new genus and four new species. Zool. Verhand. No. 128, pp 1-40.

Johnson, O. W., P. M. Johnson and P. L. Bruner. 1981. Wintering behavior and site-faithfulness of Golden Plovers on Oahu. 'Elepaio, Vol. 41, No. 12, pp 123-

Kanehiro, B.Y. and F.L. Peterson. 1977. Groundwater recharge and coastal discharge for the northwest coast of the Island of Hawaii, a computerized water budget approach. WRRC Tech. Rept. No. 110, 1973, Appendix B: Historical background of Kekaha, North Kona, Hawaii in Rosendahl, P.H., Archaeological salvage of the Ke'ahoile to Anaehoohalu Section of the Kailua-Kawaihae Road (Queen Kaahumanu Highway), Island of Hawaii. Department Rept. 73-3, pp 77-112, Dept. of Anthro., B.P. Bishop Mus.

Kay, E. A., L. S. Lau, E. D. Stroup, S. J. Dollar, D. P. Fellows and R. H. F. Young. 1977. Hydrologic and ecologic inventories of the coastal waters of west Hawaii. WRRC Tech. Rept. No. 105.

Kendall, K. W. and T. Var. 1984. The perceived impacts of tourism: The state of the art. Tourism Research Publ. Occasional Paper No. 6. Joint project of the School of TIM and Soc. Sci. Res. Inst., Univ. of Hawaii.

Knox, J. M. 1978. Resident-visitor interaction: a review of the literature and general policy alternative. PEACESAT Conf. on The Impact of Tourism Development in the Pacific. Honolulu, Hawaii and Suva, Fiji.

Kridler, E. 1965. A preliminary report on Makalawena pond. Unpbl. document, USFWS.

Lau, L. S. 1972. Water recycling of sewage effluent by irrigation: a field study on Oahu. WRRC Tech. Rept. No. 62.

Lau, L. S., P. C. Eckern, P. Loh, R. H. F. Young and G. L. Dugan. 1975. Water recycling of sewage effluent by irrigation: a field study on Oahu, final progress report for August 1971 to June 1975. WRRC Tech. Rept. No. 94.

Macdonald, G. A. and A. T. Abbott. 1970. Volcanoes in the Sea, The Geology of Hawaii. Univ. Press, Univ. of Hawaii.

Macdonald, G. A., A. T. Abbott and F. Peterson. 1983. Volcanoes in the Sea, Second Ed. Univ. Press, Univ. of Hawaii.

Maciolek, J. A. and R. E. Brock. 1974. Aquatic survey of the Kona Coast ponds, Hawaii Island. UNIHI-SEAGRANT-AR-74-04.

Mink, J. E. 1986. Hydrological Assessment, Makalawena, North Kona, Hawaii. Report prepared for Kamehameha Schools/B.P. Bishop Estate.

Moore, J. G. 1970. Pillow lava in a historic lava flow from Hualalai volcano, Hawaii. Jour. of Geol. Vol. 78, pp 239-243.

Moore, R. B., D. A. Clague, M. Rubin and W. A. Bohrson. 1985. Hualalai volcano, Hawaii: A preliminary summary of geologic, petrologic and geophysical data. USGS, Washington, D. C., Prof. Paper 1350, in press.

Myers, J. P., P. O. Connors and F. A. Pitelka. 1981. Optimal territory size and the Sanderling compromises in a variable environment. In foraging behavior: ecological, ethological, and psychological approaches (A. C. Kamil and T. A. Sargent, Eds.), Garland STPM Press, N.Y. pp 135-158.

Oceanic Institute. 1977. Survey of the aquatic biota and water quality characteristics of the anchialine ponds at 'Anaeho'omalu, Hawaii. Rrpt prep. for Boise Cascade Corp.

Oceanic Institute. 1984. Post-development survey of the aquatic biota and water quality characteristics of the anchialine ponds at 'Anaeho'omalu, Hawaii. Rept. prep. for Waikoloa Land Co.

Peterson, F. L. and D. R. Hargis. 1971. Effect of storm runoff disposal and other artificial recharge to Hawaiian Ghyben-Herzberg aquifers. WRRC Tech. Rept. No. 54.

Phillips Brandt Reddick & Assoc. (Hawaii), Inc. 1984. Makalawena Land Use Plan. Rept. prep. for Kamehameha Schools/Bishop Estate.

Phillips Brandt Reddick & Assoc. (Hawaii), Inc. 1986. Final Kukio Beach Resort Environmental Impact Statement. Prep. for Huehue Ranch.

Quan, E. L., R. H. F. Young, N. C. Burbank, Jr. and L. S. Lau. 1970. Effects of surface runoff and waste discharge into the southern sector of Kaneohe Bay: January - April 1968. WRRC Tech. Rept. No. 35.

Reinecke, J. 1930. Survey of Hawaiian sites from Kailua, Kona to Kalahuipuaa, Kohala. Dept. of Anthropology, B. P. Bishop Museum.

Sato, H. N., W. Ikeda, R. Paeth, R. Smythe and M. Takehiro, Jr. 1973. Soil survey of the Island of Hawaii, State of Hawaii. U.S. Dept. of Ag. Soil Conserv. Serv. and Univ. of Hawaii Agri. Exp. Sta. Washington, D.C.

Shallenberger, R. J. 1977. An ornithological survey of Hawaiian wetlands. Ahuimanu Productions.

Smith, M. H. 1972. Socioeconomic transition in North Kohala. In R. W. Armstrong and H. T. Lewis (Eds.), Prelim. Res. in Human Ecology, 1970: North Kohala Studies. pp 103-115. Univ. of Hawaii, Soc. Sci. Res. Insti. Honolulu, Hawaii.

SMS Research, Inc. 1984. The 1984 Hawaii State Plan Survey. Appendix Report: Detailed Results. Prep. for State of Hawaii, DPED, Planning Div. Honolulu, Hawaii.

Soehren, L. J. 1963. Archaeology and history in Kaupulehu and Makalawena, Kona, Hawai'i. Dept. of Anthropology, B. P. Bishop Museum.

Springe, H. K. 1985. Appendix B. Regional notes from Kekaha: Kuki'o. IN: A. T. Wake and P. H. Rosendahl, Full archaeological reconnaissance survey, Kukio Resort Development project area, land of Kukio 1st, North Kona, Island of Hawaii, PHRI Rept. No. 167-090385, pp 87-106.

Swedberg, G. E. 1969. Staff report on Opaeula Pond. Hawaii. Unpubl. document. State of Hawaii Div. of Forestry and Wildlife.

Tenorio, P. A., R. H. F. Young and H. C. Whitehead. 1969. Identification of return irrigation water in the subsurface: water quality. WRRC Tech. Rept. No. 33.

Tenorio, P. A., R. H. F. Young, N. C. Burbank, Jr., and L. S. Lau. 1970. Identification of irrigation return water in the subsurface, Phase III Kahuku, Oahu and Kahului and Lahaina, Maui. WRRC Tech. Rept. No. 44.

Tomich, P. Q. 1969. Mammals in Hawaii. B. P. Bishop Museum Spec. Publ. 57. Bishop Museum Press, Honolulu, Hawaii.

Tomich P. Q. 1974. The Hawaiian Hoary Bat. National Parks Conservation Magazine. Vol. 48. pp. 10-13.

U. S. Geological Survey and Div. of Land and Water, Dept. of Land and Natural Resources, State of Hawaii. 1973. Chemical Quality of Ground Water in Hawaii. Rept. No. R48.

Van den Akker, J. B. 1972. Biological ascertainment report Opaeula Pond island of Hawaii. Unpubl. document. USFWS.

van Riper III, C. 1978. Discovery of the Yellow-fronted Canary on Mauna Kea, Hawaii. 'Elepaio Vol. 38, No. 9. pp 99-100.

van Riper, S. G. and C. van Riper III. 1982. A field guide to the mammals of Hawaii. The Oriental Publishing Company. Honolulu, Hawaii.

Ward Research. 1982. A study of Big Island attitudes towards tourism. Prep. for Big Island Visitor Appreciation Com. Honolulu, Hawaii.

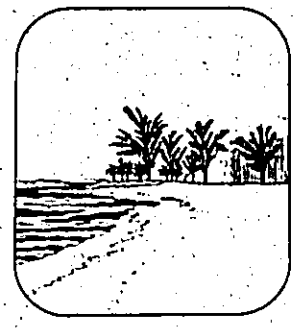
Woodside, D. H. 1979. Staff report on Opaeula pond, island of Hawaii, as a wildlife sanctuary. Unpubl. document. State of Hawaii Div. of Forestry and Wildlife.

Wong, D. C. L. 1975. Algae of the Anchialine Pools at Cape Kinau, Maui and aspects of the tropical ecology of Halocaridina rubra (Holthuis) (Decapoda, Atyidae). M. S. Thesis, Graduate Division, University of Hawaii.

Young, R. H. F., L. S. Lau and N. C. Burbank. 1967. Travel of ABS and ammonia nitrogen with percolating water through saturated Oahu soils. WRRC Tech. Rept. No. 1.

APPENDIX D

BASELINE MARINE AND COASTAL POND SURVEYS



William A. Brewer & Associates
Marine / Coastal / Terrestrial Consultants
for
Micronesia, Asia & the Greater Pacific

BASELINE MARINE AND COASTAL POND SURVEYS, MAKALAWENA, NORTH KONA, HAWAII

prepared for

Kamehameha Schools/Bernice Pauahi Bishop Estate
567 S. King Street, Suite 200
Honolulu, Hawaii 96813

and

Phillips Brandt Reddick, Inc.
Financial Plaza of the Pacific, Suite 1111
Honolulu, Hawaii 96813

September 25, 1986

1188 Bishop St., Suite 3411 • P.O. Box 282 • Honolulu, Hawaii 96809 • (808) 524-3540

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

PLATES

1. INTRODUCTION

By verbal authorization on June 25, 1986 from Phillips Brandt Reddick, Inc., the following scope of services were identified for the proposed Makalawena Resort Project:

- Survey of Opae'ula anchialine pond
  - general site reconnaissance
  - underwater/shoreline biological survey
  - chemical/physical analysis
- Survey of satellite anchialine ponds
  - general site reconnaissance
  - underwater/shoreline biological survey
  - chemical/physical analysis
- Biological survey of intertidal zone and nearshore marine environment at Pu'u Ali'i Beach
  - general site reconnaissance & intertidal surveys
  - underwater qualitative biological surveys
  - chemical/physical analysis

The following sections address this scope of work.

2. METHODS

2.1. PHYSICAL MEASUREMENTS

Salinity and temperature measurements were made with a Yellow Springs Instrument Company (YSI) S-C-T meter equipped with a YSI 3300 Series nickel-platinum conductivity/temperature probe. Based upon manufacturer's design specifications, total instrument temperature error (maximum worst case situation), based upon a 30.0 degree centigrade (C.) sample reading, would be no greater than ±0.9 C. Worst case salinity error would not exceed approximately ±6.5 percent.

Dissolved oxygen values were measured with a YSI Model 518 Dissolved Oxygen Meter equipped with a YSI Model 5739 pressure-compensated probe. The probe consists of a membrane covered polarographic sensor with temperature compensation thermistors. Manufacturer's data indicate a probable error accumulation (maximum worst case situation) of ±0.52 parts per million (ppm).

2.2. BIOLOGICAL SURVEYS

2.2.1. Nearshore Marine Environment

A one-hour preliminary reconnaissance survey was conducted to ascertain the general physiography and benthic community structure occurring within the study area. Qualitative surveys were utilized to assess the represented species populations. Surveys were limited to a maximum depth of approximately 6 meters, which encompassed a zone roughly 200-300 meters from shore. The surveys encompassed all major zones and habitats within a shoreline distance of approximately 1,100 meters (roughly the northern property line to the southwesterly property line), though the immediate area around Kawikohale Point could not be thoroughly surveyed because of poor underwater visibility caused by afternoon wave action.

A total of four dives, encompassing periods of 45-70 minutes each, were conducted during early, mid-day, and late afternoon periods on July 20, 1986, effectively encompassing both low, intermediate and high tide periods (range 0 - +2.6 ft.). Because of the prevailing low biological diversity associated with expanses of unconsolidated coral sand, which encompassed approximately one-half of the total offshore survey area, surveys generally focused upon the communities associated with rocky submerged headlands, surge channels, inshore rock and cobble areas, and several narrow inshore limestone benches.

Corals, macroinvertebrates, algae, and fish noted on the surveys were identified and ranked according to their relative abundance in an area. Notes were taken to indicate general habitat features and the most conspicuous species characterizing a given zone or habitat. Where appropriate, counts or estimates of fish and invertebrate population densities were made, the latter with the assistance of a stainless steel meter-stick which was used to lay out crude one-square meter quadrats. Only macrofaunal species greater than approximately 2-3 centimeters (cm.) were recorded. No attempt was made to locate or identify cryptic species.

Underwater data were recorded on Nalgene Poly Paper sheets. A Nikonos II underwater camera was utilized to document a cross-section of subtidal physiographic features and representative marine life.

2.2.2. Intertidal Zone

The intertidal zone on all the prominent rocky headlands in the study area was censused on foot during a single low-tide

period. Macroscopic organisms were identified in the field and rough estimates of population sizes were noted.

2.2.3. Coastal Pond and Pool Complexes

Larger anchialine pond and pool complexes (discernible as a "suspected" pond or pool complex on 1"=400 ft. scale aerial photo maps) were located in the field to provide an identifiable "base" location upon which reconnaissance of the suspect pond, as well as any smaller pond and pool complexes, could be based ("suspect" in this case denotes the possible presence of a pond whose actual presence or absence was subsequently confirmed in the field). Descriptions and photographs of anchialine ponds inventoried in Aquatic Survey of the Kona Coast Ponds, Hawaii Island (Maciolek & Brock, 1974) were also used for siting and later comparative analyses.

Aerial photo identification was marginally successful, though field observations subsequently indicated that aerial photo resolution was limited to (1) ponds outside of kiawe thickets, and (2) ponds with a surface area in excess of approximately 10-15 square meters. However, the difficulty in attempting to map the location of a small pond or pool complex within both deep and shallow depressions on expansive and relatively non-descript a'a lava and kiawe-lava terrain remained a problem throughout the field surveys. This problem was further compounded by the large number of small ponds or pools that "disappear" during low to intermediate tidal periods. For these reasons, the term "basin" is used to describe a pond or pool within a larger, more readily definable, geographic area, or a pond or pool complex which share similar physical and/or biological features. For the purposes of this study, a "pool" refers to a surface water body with a total area of less than 4 square meters, as indicated by white epilithic algae; a pond refers to a water body in excess of 4 square meters.

The number of ponds or pools identified in the Makalawena area necessitated the selection of several representative ponds and/or pools within a larger pond basin or complex for more detailed chemical, physical and biological analyses. This subjective selection process afforded the opportunity to study a cross-section of representative pond or pool environments within different geographic basins. Five separate geographic pond basins were identified: (1) Opae'ula Pond; (2) North Complex; (3) South Complex; (4) Makai Complex; and, (5) the Dune Complex. Site-specific descriptions of each of these pond complexes are found in the Results section.

Surveys of selected ponds or pools were conducted by

visual reconnaissance from shore, wading the ponds and, where possible, by underwater visual surveys (the latter was possible in relatively few ponds because of the prevailing shallow depths and small sizes which characterized most of the ponds). Collection of free-swimming and mobile benthic organisms was conducted utilizing a 6" diameter nylon dip net with a 2 millimeter square mesh. Rocks were often removed from ponds and examined for attached organisms. Sedimentary deposits and algal crusts were removed with a spatula, stored in a 1:1 glycerin and formaldehyde solution, and returned to Honolulu for identification. Measurements of temperature, salinity and dissolved oxygen were conducted *in situ* and were generally based on one mid-water sample, though in some deeper or elongated ponds, measurements reflecting surface and bottom and mauka-makai conditions were possible.

2.2.4. Opae'ula Pond

Biological sampling and water quality analyses were limited to a single tide period (approximately +2 feet) along the north and northwest shoreline of Opae'ula pond. Impenetrable, nearly circumferential kiawe thickets, and soft pond sediments, nearly a meter in thickness, precluded access to or study of other areas outside the aforementioned shoreline area. The prevailing pond depth of approximately 5-15 cm. precluded the use of any type of boat or floatation device.

Dip-net and direct water samples of shoreline waters and sediments were collected in Zip-Loc bags for taxonomic study. Temperature, salinity and dissolved oxygen values were obtained via *in situ* measurements.

3. RESULTS

3.1. MARINE ENVIRONMENT

3.1.1. Nearshore Water Quality

Temperature, salinity and dissolved oxygen values were variable and reflected the presence of significant subtidal groundwater discharges throughout the entire length of Pu'u Ali'i Bay (Figure 1). During low tide (Table 1) periods surface waters (approximately 0.5 m.) demonstrated lower salinities and somewhat lower temperatures than bottom waters (1.5-2.5 m.) at the same sampling station (Table 2). The mean surface water (0.5 m) temperature during the low tide sampling period was 27.9 degrees C.; mean bottom water temperature during the same period was 28.4 degrees C. Vertical stratification was less evident during the afternoon high tide period because of increased wind

and wave action and resultant greater mixing. Although variability was apparent between stations, mean surface and bottom water temperature for all 5 stations at high tide was 28.7 degrees C. Groundwater seepage was evident from the lower intertidal zone to an estimated 100 meters seaward during underwater surveys. These discharges were detectable to the diver by way of the noticeably cooler "pockets" of water and the schlieren effect created by the mixing of two water masses of differing densities.

Dissolved oxygen levels indicated all samples to be at or in excess of saturation with respect to the prevailing water temperatures and salinities. Dissolved oxygen values were slightly lower in the surface waters during the low tide (morning) sampling period, a factor which may be related to the presence of groundwater and less wind and wave action. Although low saline water can accomodate a significantly higher level of dissolved oxygen than high saline waters (at the same temperature and pressure), the prevalent groundwater discharges may be contributing waters low in dissolved oxygen. Dissolved oxygen levels during high tide periods were uniform in the nearshore water column with both surface and bottom waters demonstrating a mean of 7.1 ppm.

The temperature, salinity and dissolved oxygen values recorded in the study area are representative of summer nearshore waters along much of the Kona coastline. No single physical or chemical parameter would appear to constitute a limiting factor for any marine organism normally associated with nearshore waters.

3.1.2. Marine Biological Surveys

Pu'u Ali'i Bay is located between Kawikohale Point to the northeast and Kawili Point to the southwest. Within this larger embayment, Makalawena consists of approximately 1,100 meters of coastal frontage, intersected by several prominent basalt headlands which create four crescent-shaped, largely white sand, beaches. A massive sand dune dominates the back-beach area along approximately 700 meters of the southwest side of the parcel.

3.1.2.1. Intertidal Zone

The intertidal zone at Pu'u Ali'i Bay, consists of massive, geologically young, basaltic headlands and broad expanses of sand and scattered beach rock. All of the subzones (splash, upper intertidal, middle intertidal, lower intertidal) were nearly devoid of macroscopic plants and animals which may indicate recent storm wave action. A severe winter storm, with

waves of 15-20 feet, hit the west Coast of Hawaii in February 1986. The direction of wave propagation (from the northwest) and the location of Makalawena would have left the coastline and submerged lands extremely vulnerable to storm wave damage.

Beaches on the northeastern, more wave-protected, side of the property were bordered by a broad limestone platform that ranged from less than six (6) meters to perhaps twenty (20) meters in width. This zone harbored dense assemblages of the rock-boring urchins *Echinometra mathaei* and *Echinostrephus aciculatus* (Table 3). Densities ranged from less than 20 to approximately 80/square meter. The small serpulid worm *Protula atypha*, and a second species, *Spirorbis* sp., were locally abundant on a few larger rocks in wave-protected areas. Gastropods were limited to one specimen of *Conus lividus*, widely scattered opihi (*Cellana exarata*) and relatively few pipipi (*Nerita picea*) (a normally common resident of the high intertidal zone). The rock oyster, *Isognomon perna*, was the only bivalve recorded in the lower intertidal zone, however, they were relatively few in number (18 recorded) and generally restricted to the shore-facing, midwater side, of larger boulders. Only two specimens of the intertidal crab *Grapsus tenuicrustatus* were observed. Small manini (*Acanthurus triostegus*) and juvenile pomacentrids dominated the fish fauna of small tide pools in this zone, though no species was particularly abundant. The flora of this zone was sparse and limited to small growths of *Ulva fasciata* (palahalaha), *Enteromorpha* ('ele'ele), and *Sphacelaria furcigera*.

Unlike the beaches on the northern side of Makalawena, beaches on the southwesterly side of the property lacked an inshore bench and were characterized by unconsolidated sand and occasional rock outcrops. With the exception of two large opihi and filamentous, sand-covered blue-green algae, there was no significant intertidal flora or fauna recorded in this area. The southwesterly beaches appear to be exposed to more wave action (from the north) than the northeastern beaches. Wave action maintains a shifting, unconsolidated limestone sand substrate which inhibits biological colonization. The absence of intertidal macroscopic organisms in this area also suggests recent and rather devastating storm-wave action.

3.1.2.2 Subtidal Zone to 18-Foot Contour

The nearshore marine environment (to approximately the 18-foot contour, or from the shoreline to approximately 100-200 meters offshore) at Makalawena is characterized by unconsolidated limestone sands, pahoehoe lava flows with limestone sand veneers, inshore (intertidal and subtidal) limestone benches paralleling

the shore, large expanses of rocks, cobbles, and large basaltic boulders, and submerged basaltic headlands with surge channels perpendicular to the shore. Seaward of the 18-foot contour the substrate is dominated by limestone sand with widely scattered rock or limestone outcrops, except at the extreme southwesterly corner of Makalawena where basalt extends seaward from the shore approximately 250-300 meters before transitioning to a broad seaward-sloping sand bottom.

Diversity and percent coverage of corals was higher by estimation on the north side of Pu'u Ali'i Bay than on the southwest side. Corals were generally found in shallower waters and closer to shore on the north side of the bay. This pattern is due to the presence of beachrock on the north side and the abundance of unconsolidated sand on the southwest side of the bay. Corals are unable to colonize unconsolidated sands. However, neither side supported many species and coral coverage was low at both sites. Estimated coral coverage never exceeded 1 percent in any nearshore area surveyed. Coral coverage in the southwesterly side of Makalawena never exceeded an estimated 0.01 percent.

Pocillopora meandrina was the dominant coral at all sites surveyed at depths less than approximately 3 meters (Table 4). *Porites lobata* occasionally intermixed with *P. meandrina*, but was generally found at depths in excess of 3 meters. Most of the larger *Porites* colonies showed evidence of extensive damage from storm waves (sand abrasion and rock impaction). Some colonies were obviously vegetative forms from a former single colony that had been split into several irregularly-shaped colonies. *Porites compressa* and the zoanthid (soft coral) *Palythoa tuberculosa* were only rarely observed in scattered small colonies at depths in excess of 5 meters. *Pocillopora damicornis*, a common inshore coral in exposed coastal settings, was conspicuous in its absence. This was unusual inasmuch as both *P. meandrina* and *P. damicornis* are regarded as pioneer species in wave-exposed reef environments.

The most extensive coral coverage at Makalawena was found at depths between approximately 8-10 meters, or approximately 400-600 meters from the shoreline. However, the depth precluded any detailed examination of this zone. Observations based on abbreviated snorkel dives indicated that coral coverage in this zone may exceed 60 percent. At least 6 species of corals were tentatively recorded in this zone and included (in relative order of abundance) *Porites lobata*, *Porites compressa*, *Pocillopora meandrina*, *Montipora verrucosa*, *Leptastrea purpurea* and *Pavona varians*.

The seaweed flora of the subtidal zone is also sparse with no species particularly abundant (Table 5). As with the pattern of coral coverage, there was a pattern of increasing diversity and coverage as one moved from the southwest to the north side of the bay. Except for filamentous cyanophytes, macroalgae were limited to the wave zone in rocky, shallow-water, inshore areas. Coralline algae were common, but generally overgrown with filamentous algae and, as a result, not conspicuous. Represented coralline algae included *Porolithon onkodes* and *Hydrolithon breviclavium*. *Enteromorpha* was common in some areas, especially locales influenced by groundwater percolation.

Echinoderms dominated the subtidal macroinvertebrate community at Makalawena. The boring urchins *Echinometra mathaei* and *Echinostrephus aciculatus* were the dominant echinoids. Other common urchins included the slate-pencil urchin, *Heterocentrotus mammilatus*, and the collector urchin, *Tripneustes gratilla*. The long-spined venomous urchin *Diadema paucispinum* (wana) was seen in groups of 3-4 specimens in four locations. Asteroids (sea stars), ophiuroids (brittle stars), and holothurians (sea cucumbers) were not observed in any zone within Pu'u Ali'i Bay.

The nearshore fish fauna at Makalawena was limited, as would be expected, given the absence of any significant coral community. As a result, many of the common "coral reef" fish were absent and overall diversity was low. A total of 13 families, 25 genera and 41 species were recorded (Table 6). The fish checklist would have most likely been substantially greater had the underwater surveys encompassed the offshore deepwater coral community. Acanthurids (surgeonfishes), labrids (wrasses) and the monocanthid (filefish) *Pervagor spilosoma* were the most abundant species. Acanthurids were represented by twelve species with *Acanthurus triostegus* (manini), *A. achilles* (paku'iku'i), and *A. nigroris* (maiko) the more abundant species within the family. *Naso lituratus* (umaumalei) was seen only on three occasions. The labrids were represented by seven species, the more abundant being *Coris flavovittatus* (hilu), *C. gaimard* (hinale''aki-lolo), *Gomphosus varius* ('aki-lolo), *Halichoeres ornatissimus* ('ohua), and *Thalassoma duperreyi* (hinalea luahine). Fourteen juvenile *C. gaimard* were observed within an area of approximately 50 square meters. Such a large number of this strikingly brilliant red and white wrass is unusual. Common pomacentrids (damselfishes) were *Abudefduf abdominalis* (mamo), *A. sordidus* (kupipi), and *Plectroglyphidodon imparipennis*. Butterflyfishes were uncommon, a consideration which may be related to the absence of coral reef habitat or harvesting by aquarium fish collectors.

The goatfishes *Mulloides flavolineatus* (weke) and *M. vanicolensis* (weke-'ula) were found throughout the area, often in mixed schools of 10-15 individuals. Both species were also frequently encountered upon the broad offshore sand zone. At least two species of very large parrotfish were frequently seen in groups of 5-7 individuals at depths of 5-8 meters. *Scarus sordidus* (ulu) was, however, the only species which could be positively identified.

3.2. COASTAL PONDS AND POND COMPLEXES

3.2.1. North Pond Complex

The North Complex consists of sixteen (16) ponds and pools within an a'a lava basin encompassing approximately 4 acres (Figure 2). Five of the sixteen ponds and pools retain standing water at a 0.0 tide; the remainder are distinguished at low tide periods by white epilithic deposits. Two of the ponds have been modified by construction of walls and removal of rocks from the pond bottoms. Two of the larger ponds abut large stands of kiawe on their south sides. Water quality and biological sampling was conducted within six (6) selected ponds or pools which represented a cross-section of pond types in terms of size, mauka or makai setting, adjacent vegetation, and extent of manmade modification.

3.2.1.1. Water Quality

Pond temperatures ranged from 24.8-27.2 degrees C., with small mauka pools generally demonstrating cooler temperatures than large makai ponds or pond complexes (Table 7). A thermal gradient was evident mauka-makai and vertically in the water column only in a single large elongate pond which had pockets in excess of 1 meter in depth (Table 7, Pond #3).

Salinities were variable and ranged from 5.6-9.5 ppt. Mauka ponds or pools had generally lower salinities than makai ponds. Salinity gradients were evident vertically with variations up to 1 ppt detected in Pond 3.

Dissolved oxygen values were generally below saturation as would be expected considering the groundwater origin of the pond waters. Values ranged from 5.0-6.6 ppm. Small mauka ponds were generally lower in dissolved oxygen than larger makai ponds.

3.2.1.2. Biological Surveys

3.2.1.2.1. Structurally Modified Ponds

Two heavily sedimented, structurally modified, ponds occur approximately sixty (60) meters north of Opae'ula pond (Table 7, ponds 1 & 2; Plates 1 & 2). Both have manmade walls and the larger pond (pond #1) has a flat sedimented bottom. Kiawe thickets encompass approximately one-third of southern end of pond #1. Pond #1 is also distinguished by rooted *Ruppia maritima* which covers approximately 15% of the total pond bottom. Approximately 30% of the pond is covered with a floating mat of green filamentous algae. The poeciliid *Gambusia* (mosquito fish) was the only fish observed. Invertebrates were represented by exceptionally high numbers of the mollusk *Melania* sp. which were concentrated around the shoreline. Densities often exceeded 300/0.25 square meter.

Pond #2 encompasses approximately 8 square meters and rests approximately 20 meters north of pond #1. Unlike pond #1 which averaged less than 10 cm. in depth, pond #2 had a center depth of approximately 0.7 m. *Gambusia* was common, as was the snail *Melania* which were concentrated around the shallow perimeter of the pond. A second snail, possibly an ecotype (variant) of *Theodoxus cariosa* or *Theodoxus vespertina* was noted on vertical walls of deeper rocks. The specimens were approximately 0.7 cm. in diameter and lacked the lateral wing-like shell protrusions noted for some varieties of *T. cariosa* with which the author is familiar. This species was not seen elsewhere at Makalawena, but would be extremely difficult to detect wherever it occurs.

3.2.1.2.2. Maciolek & Brock Elongate Pond

The Maciolek and Brock elongate pond is so named because it was photographically documented in the Maciolek & Brock (1974) study. This pond is approximately 50 meters in length and varied from 0.5 meter at its narrowest point to slightly more than 2 meters in width at its widest point during the survey period. Maximum depth was approximately 1.5 meters. The upper (mauka) 2 meters of the pond is physically separated by a man-made rock "trail crossing", though the mauka pool is physically part of the same pond.

Water quality data showed a pronounced mauka-makai increase in temperature and salinity as well as vertical stratification for both temperature and salinity (Table 7, pond #3). A photograph of the pond taken during the field survey in July 1986 showed it to be physically identical to the 1972-1973 period when surveyed by Maciolek and Brock (1974) (Plate 3).

This pond constitutes the classical anchialine pond per the physical and biological definitions of anchialine ponds offered by Holthuis (1973), Maciolek & Brock (1974) and Brock (1985). The mineralized white-to-orange *Schizothrix* crust is present in deeper, possibly subtidal, waters and there is an absence of bottom sedimentary deposits except in the deepest part of the pond.

Anchialine pond fauna was characterized by *Halocaridina rubra* which was infrequently seen in the main body of the pond, but is abundant (5-8/0.25 sq. meter) in the small mauka portion of the pond, above the trail crossing. Two specimens of the glass shrimp *Palaemon debilis* were seen in the small mauka pool. The difference in abundance between the main body of the pond and the mauka pond is probably the result of the presence of one specimen each of *Mugil cephalus*, *Neomyxus chaptalii* (uouoa), and the pomacentrid *Abudefduf sordidus* in the main pond. The main pond was also inhabitated by moderate numbers of *Gambusia*, whereas no more than a dozen very small *Gambusia* were seen in the mauka pool. The manmade rock trail-crossing appears to restrict the movements of larger predatory fish which may account for the populations of *H. rubra* and *P. debilis* that were observed.

Invertebrates were represented by black estuarine crab *Metopograpsus thukuhar* (four specimens recorded) and rarely, *Melania*. *Metopograpsus* was only recorded from this pond and was not observed elsewhere at Makalawena. The difference in abundance of *Melania* in this pond, as contrasted with the walled ponds in this basin (Section 3.2.1.2.1.), may be the result of the absence of *Ruppia* and other sources of soft organic materials that are required for food. There is no vegetation surrounding the Maciolek and Brock pond.

3.2.1.2.3. Mauka Pools

Three isolated ponds of three size classes (Table 7, ponds 4,5,6) were selected as representative unvegetated mauka ponds within the study area. These ponds were generally lower in temperature, salinity and dissolved oxygen than the other ponds previously described and ranged in size from less than 1 to approximately 15 square meters in surface area. These ponds were found to "disappear" during low to intermediate tidal periods. Because of their intermittent nature, none had the *Schizothrix* crust characteristic of true anchialine ponds. Instead, a thin, chalkish-white epilithic crust characterized the boundaries of these small depressions.

The fauna of two of the three ponds was limited to *H. rubra* at densities of approximately 2-3/0.25 sq. meter and a few

juvenile *Gambusia*.

3.2.2. Makai Pond Complex

The Makai Pond Complex consists of nine (9) inventoried ponds or pools in advanced stages of ecological succession (Figure 2). The ponds ranged in size from less than 1 meter to approximately 10 sq. meters. A much larger number of ponds undoubtedly exists on the southeastern and makai borders of the 7-acre Opae'ula wetland, but access to such areas was restricted by impenetrable kiawe thickets.

3.2.2.1. Water Quality

Water temperatures and salinities were higher than in other pond basins and dissolved oxygen levels were generally lower. Temperatures ranged from 26.9-28.9 degrees C. and salinities from 8.8-10.0 ppt. Dissolved oxygen levels ranged from 4.4-6.6 ppm (Table 8).

3.2.2.2. Biological Surveys.

Thick floating mats of filamentous green and blue-green algae dominated most of the generally shallow (rarely more than 10 cm. deep) ponds within this basin, although a few deeper pools (to 0.7 meters) were found mauka of the back-beach area and presumably outside of the zone of wind-blown beach sand deposition. All of the ponds were covered with dense kiawe thickets which contribute significant quantities of leaf litter and indirectly reduce water circulation through the buildup of benthic organic materials. As a result, all of the ponds had a eutrophic character, despite the clarity of the water. One small deep pond had a benthic substrate which appeared to be composed of a thick *Schizothrix* crust which had been overgrown by a dark green *Enteromorpha* mat.

The macrofauna of the ponds was limited to *Gambusia*, occasional *Melania*, and an unidentified hydrophilid beetle. The deeper ponds generally supported fewer *Gambusia* than the shallower ponds.

3.2.3. South Pond Complex

The South Pond Complex encompasses a total of at least 11 ponds or pools which form an estimated 200-meter long basin (Figure 2). Five ponds were selected for detailed examination. With the exception of a large sedimented pond on the north side of the basin, the remaining ponds share similar biological characteristics. This pond complex appears to represent the H

24-28 pond series in the Maciolek and Brock (1974) study (Plate 4).

In the author's opinion this series of ponds represent the most scenic anchialine pond basin within the Makalawena area. The ponds are generally bordered on the north side by kiawe and on the south side by a'a lava and scattered fountain grass, though some ponds are totally covered with kiawe. The contrast between green kiawe leaves, relatively deep (to 1.5 meters) transparent waters, dark brown lava, and orange cyanophyte deposits is often quite striking. The large sedimented pond is also unusual in the near vertical 4+ meter natural lava wall which encircles most of the north and northeastern sides of the pond.

3.2.3.1. Water Quality

Table 9 shows the water quality characteristics of this pond basin. With the exception of pond #1, which is the largest (>100 square meters) and the only sedimented pond in the basin, the remaining four ponds demonstrated similar chemical and physical properties. Pond #1 was the warmest of the ponds within the basin (28.5-28.6 degrees C.) a consideration which may be related to it being shallow, heavily sedimented, and having, presumably, poorer circulation than the adjacent, unsedimented ponds. In general, this pond basin demonstrated lower salinities (3.9-4.6 ppt) than other pond complexes, though this may in part be the result of the sampling interval which occurred during an afternoon high tide period. Pond #1 also demonstrated the lowest dissolved oxygen levels within this pond basin.

Pond #1 was heavily sedimented, except for the extreme southeastern corner which has been modified (deepened) to permit drinking water access for a goat herd which used to occupy Makalawena. This apparent stock watering hole had a surface area of approximately 3 square meters. The abundance of goat-droppings around this pond suggests that this site was a preferred source of drinking water when large numbers of goats were maintained in the area (only about one dozen goats now occupy the Makalawena area).

3.2.3.2. Biological Surveys

With the exception of the sediment-laden pond #1, the entire 11-pond complex displayed the physical characteristics of anchialine ponds and, except for the smallest pools or depressions, all also had the characteristic orange *Schizothrix* substrate.

The most significant biological feature of this interconnected pond complex was the abundance of tilapia (*Oreochromis* (*Sarotherodon*) *mossambicus*), a generally undesirable introduced species. Large numbers of sexually mature, albeit stunted, tilapia characterize all but the smallest ponds or pools within this basin. Despit dense kiawe thickets which overhang many of the ponds and pools, there was no evidence of buildup of organic materials within these ponds, except for pond #1 (as contrasted with the Makai Pond complex). Tilapia may be grazing on plant materials which find their way into the ponds and may, in part, be controlling the buildup of organic sediments which could reduce water circulation.

Gambusia is also found throughout most of the basin. The mullets *Mugil cephalus* and *Neomyxus chaptalii* also occur in some of the larger ponds, but were not observed within pond #1. One of the six *Mugil* counted had a length of approximately 20 cm. and was the largest fish observed within the Makalawena anchialine pond system. All of the aforementioned species also co-occurred in a single pond (pond #3, Table 9) within this basin.

A large number of an unidentified, 2 cm. long, apparently terrestrial, isopod (suborder *Flabellifera*) occurs on moist, intertidal rocks and sediment adjacent to several of the larger ponds in this basin. This species was not observed elsewhere at Makalawena. The snail *Melania* occurs in relatively small numbers thoughout this basin, but was not found in pond #1.

None of the small shrimps characteristic of anchialine ponds were observed within the main 11-pond complex. However, observations of several isolated pools immediately mauka of the main pond basin revealed small populations of *H. rubra* co-occurring with small populations of juvenile *Gambusia*. The absence of anchialine pond shrimp in the main pond complex is probably the result of the presence of introduced fish.

3.2.4. Opae'ula Pond

Opae'ula pond is a seven-acre body of brackish water located near the coast and the northern boundary of Makalawena (Plate 5). Its average depth was approximately 15 cm. during the survey period, though a deeper, apparently manmade swimming or boat launching area, occurs in the approximate middle of the pond's makai side. The pond is characterized (in the areas surveyed) by a thick layer (exceeding 0.7 meter) of unconsolidated silt and organic material which could best be described as an organic "slurry". There is no benthic algal mat in evidence.

This body of water is perhaps best described as a brackish water marsh rather than a pond, because of extensive stands of *Scirpus* and other emergent wetland vegetation. There are approximately 18 small (less than 1 square meter to several hundred square meters) "islands" found throughout the marsh which are composed of silt and wetland plants. Opae'ula pond (also refered to as Kapoikai Pond) is somewhat of an inigma, inasmuch as its name refers to *Halocaridina rubra*, the small red atyid shrimp characteristic of anchialine ponds. However, this shrimp was not observed in the areas surveyed, nor does the pond presently support the rocky, hypogeal habitat apparently required by this species.

3.2.4.1. Water Quality

Water temperatures were warm and demonstrated a rather uniform temperature of 28.3-28.5 degrees C., suggesting poor circulation (Table 10). Salinity was similarly uniform and ranged from 3.8-3.9 ppt. Dissolved oxygen levels ranged from 5.6-6.1 ppm. Maciolek and Brock (1974) described Opae'ula pond as "turbid", a definition which may apply during windy conditions, but was not the condition observed during the field surveys. Although shallow, the water was clear. However, even the slightest disturbance of the benthic organic slurry would reduce visibility to zero in localized areas.

3.2.4.2. Biological Surveys

As noted in the Methods Section (section 2.2.4), only the north and northwest shoreline of the pond was surveyed because of the circumferential kiawe thickets. Efforts to gain access to other pond areas were frustrated by the raucous verbalizations of the stilts, a possible suggestion of active nesting by the species. Thus, to prevent further disturbances to this endangered species, the investigator reluctantly abandoned efforts to examine other pond environments. However, recent low-altitude color aerial photos (July, 1986) indicate that the unsurveyed shoreline areas demonstrated a high degrees of similarity, in terms of vegetation, substrate, and depth, to those areas surveyed.

The surveys indicated that the pond possesses a very limited macrofauna, but a significant infauna and epifauna associated with the surface and upper layers of the organic bottom slurry. A variety of unidentified amphipods (at least two genera within the Suborder Gammaridea), polychaetes, two unidentified swimming/burrowing beetles, and several larvae of unidentified terrestrial insects were noted. Each appeared to have the ability to readily move between the water column/benthic

"slurry" substrate interface.

Macroscopic fauna was limited to the glass shrimp *Palaemon debilis*, which was only occasionally seen associated with shoreline emergent vegetation, and juvenile *Gambusia*.

3.2.3. Dune Complex Ponds and Pools

The dune pond and pool complex consists of at least 21 ponds and pools located parallel to and mauka of the large sand dune on the southwestern side of Makalawena (Figure 2). Most of the ponds are small and all occur within 100-120 meters of the mauka side of the dune. Collectively, this complex occupies an area of approximately 6-7 acres of undulating, unvegetated to slightly vegetated, a'a lava. Inland advance of the dune and associated vegetation on the extreme western side of the parcel appears to have resulted in the filling of some ponds and pools. Many of the larger ponds have also been modified for stock watering purposes. Such ponds are easily identified by their flat bottoms and the whitish circumferential rocks tossed well above the high water mark.

3.2.3.1. Water Quality

Six of the 21 ponds and pools inventoried demonstrated great similarity in water quality parameters. Temperatures ranged from 26.8-27.4 degrees C.; salinities from 4.4-5.3 ppt. With the exception of pond #3, which was highly modified and colonized with *Ruppia*, the remainder of the ponds demonstrated dissolved oxygen levels of 5.7-6.6 ppm (Table 11).

3.2.3.2. Biological Surveys

Biological surveys indicated a rather meager macrofauna consisting of (1) ponds harboring *Halocaridina rubra* and juvenile *Gambusia*; (2) ponds harboring only *H. rubra*; (3) ponds harboring only juvenile *Gambusia*; and, (4) ponds harboring no visible macrofauna. Pond #3, located on the immediate mauka side of the dune and modified for stock watering and/or swimming (sand bottom), was an exception to the preceding faunal characteristics inasmuch as it harbored extensive growths of *Ruppia* and large numbers of juvenile and adult *Gambusia*.

None of the ponds in the dune complex harbored orange cyanophytic algae and, with the exception of (H. rubra), other species usually associated with anchialine ponds. These ponds should be regarded as "intermittent" in character since most would not be visible as surface waters below an estimated +1-foot ocean tide. However, the entire dune complex appears to consist

of one very large underground brackish "lake" which only occasionally expresses itself as a surface pond or pool in infrequent natural surface depressions. It was possible to see standing water within a meter of the a'a lava surface in many low depressions within this extensive flow of geologically young lava.

4. DISCUSSION

4.1 Nearshore Marine Environment

The low diversity and abundance of corals, invertebrates, algae and fish indicates that Pu'u Ali'i Bay has been recently subject to major storm-wave attack. According to local informants, destructive North Pacific storm waves adversely affected the entire Kona Coast during the period February 22-25, 1986 (Tom Daniel, Director, Natural Energy Laboratory of Hawaii, personal communication). Evidence of long-term wave surge and storm wave exposure is also inferred by the presence of numerous surge channels perpendicular to the beach along the westerly portion of the bay and the abundance of white limestone rock cast well above the normal beach zone on both the extreme north and west sides of the bay. The 1946 tsunami, which leveled Makalawena village, also presumably altered the coastline of Pu'u Ali'i Bay to some degree.

Other evidence of recent storm wave damage is demonstrated by the preponderance of biologically-barren subtidal rocks throughout the bay and barren surge channels on the westerly side of the bay. Differences were also noted between the extreme north and west sides of the bay. The westerly portions were composed of unconsolidated sand with scattered, infrequent, rock outcrops, or expansive pahoehoe lava flows with deep surge channels (the latter beginning near the westerly border of Makalawena, with more extensive surge channel development occurring off the abutting property). The intertidal and subtidal zones and subzones of the westerly sector were nearly devoid of epibenthic invertebrates, algae and corals whereas inshore areas on the north side had a more diverse and abundant biota. This pattern is consistant with the typical North Pacific storm wave patterns of Hawaii's winter months which generally impact northward-facing beaches harder than westward-facing beaches.

Physical disturbance from storms is known to be the most significant factor determining the structure of Hawaiian coral reef communities (Dollar, 1981). The frequency and severity of both short-term and long-term storm wave events are known to

significantly influence coral reef structure and organization, both in time and space. Short-term, moderate, wave events generally shape the zonation patterns of Hawaiian reef environments and, in the long-term, promote ecological stability by maintaining well defined reef zones through differential mortality, fragmentation and transport (Dollar, 1977). By contrast, severe or long-term storm wave action often returns a reef area to an earlier successional stage and recovery from such intense events is generally slow. As such, many of the reef communities on the Island of Hawaii have been described as "physically dominated" environments with the represented reef communities reflecting the severity of disturbance. Such is the case at Makalawena. Man is rarely able to compete with nature when it comes to the catastrophic changes which can be precipitated by short-term physical disturbances.

Natural groundwater discharges throughout the intertidal and subtidal zones of Pu'u Ali'i Bay may also influence the structure and composition of marine plant and animal communities. Although algae were poorly represented, *Ulva fasciata*, often an indicator of groundwater discharges and elevated nutrient levels, appeared to be frequently associated with such discharges. The effects of storm waves and groundwater discharges on marine biota are so significant on the Kona coast that researchers classified four South Kohala and North Kona bays (Puako, Waiulua, 'Anaeho'omalu, and Kiholo) on the basis of wave energy and groundwater intrusion (Kay, et al., 1977). Similarly, Dollar (in Kay, et al., 1977) described the composition and distribution of coral communities in three open North Kona/South Kohala bays as being a function of wave energy (breakage and abrasion), available light energy (associated with photosynthesis and calcification processes), sedimentation, available solid substrate (associated with settling), and interspecific competition between corals. The absence of *Pocillopora damicornis* from Pu'u Ali'i Bay (a pioneer species normally associated with shallow water, wave-exposed, environments) attests to the impact of storm waves in the Makalawena area.

The relatively low diversity and low population levels of fishes in nearshore waters of Pu'u Ali'i Bay probably reflects the absence of suitable coral habitat, heavy fishing pressure, and the impact of tropical fish collectors. The low number of chaetodontids (butterflyfishes) (5 species), particularly the more popular aquarium species, suggests that collectors may frequent this area.

4.2 Coastal Pond and Pool Complexes

Mixohaline or anchialine ponds are situated in areas

dominated by lavas of recent origin and are generally within 500 meters of the shoreline. They have been described as:

> "...generally small (less than 100 square meters), shallow (less than 1 meter deep) and having rocky basins. These basins are too porous to support ponded water above sea level and are filled with mixohaline water (average salinity 7 ppt), indicating an inland extension of the oceanic water table diluted by the outflow of subsurface freshwater. Consequently, the ponds are restricted to depressions in lava flows that extend downward into the water table". (Maciolek and Brock, 1974).

Anchialine ponds are also characterized by an absence of surface connections with the sea, but contain saline water and undergo tidal fluctuations. They also harbor a distinctive biota. In the Hawaiian Islands anchialine pools are found along the west and south shorelines of Hawaii, southwest Maui, and Oahu. (Brock, 1985; Wong, 1975). These ponds once figured prominently in Hawaii culture but have lost this prominence with the decline of the culture (Brock, 1977). Five classes of anchialine ponds have been proposed, based on differences in human use and degree of isolation from the sea (Brock, 1977). Holthuis (1973) was the first to describe the shrimp fauna occurring in coastal ponds and also proposed the term "anchialine" to describe these ponds. The most complete description of anchialine ponds, encompassing some 318 surveyed ponds on the Kona Coast, is found in Aquatic Survey of the Kona Coast Ponds, Hawaii Island (Maciolek and Brock, 1974). Brock (1985) also provided an excellent overview on the status and future of anchialine pond resources in the Hawaiian Islands. A detailed treatment of anchialine pond ecosystems is also found in the Final Environmental Impact Statement, Waikoloa Beach Resort, Waikoloa, South Kohala District, Island of Hawaii (Corps of Engineers,. 1985).

A total of 58 ponds were identified during the July 1986 baseline surveys at Makalawena. This represents 33 more ponds than originally inventoried in the pioneering studies of Maciolek and Brock (1974) and may reflect the fact that the surveys were conducted during an exceptionally high (+2.6-foot) tide which probably enabled enumeration of small ponds and pools which would otherwise not be visible during normal tidal periods. With the exception of Opae'ula pond, which is essentially a brackish water marsh and excellent waterbird habitat, the majority of the remaining 57 ponds displayed the physical and biological features characteristic of anchialine ponds, though all pond basins

surveyed demonstrated the presence of at least one species of exotic fish (either *Gambusia* or *Oreochromis (Sarotherodon) mossambicus*, or both).

Gambusia are live-bearers of a relatively small size. Their widespread distribution at Makalawena, which included invasion of even the smallest of intermittent mauka pools, suggests that this species has been able to readily adapt to at least a part-time hypogeal (beneath ground) existence. The surveys also indicated that juveniles of this species co-occur with the atyid shrimp *Halocaridina rubra*, though apparently not with adult fish of the same species. The presence of tilapia in the South pond complex appears to be responsible for the absence of *H. rubra* within the larger ponds, but not within the small mauka pools associated with this pond complex. Tilapia juveniles, unlike the smaller *Gambusia*, are apparently unable to move interstitially within an a'a lava substratum. Evidence also suggests that tilapia may be effective in retarding pond succession (aging) by grazing on leaf litter which may eventually reduce water circulation. Despite an often dense kiawe tree canopy in parts of the South pond complex, there was no evidence of leaf litter or visible organic deposits in this basin. By contrast, the Makai pond complex (which lacked tilapia) were noticeably rich in leaf litter and organic materials and demonstrated reduced circulation (as inferred by the prevailing warmer water temperatures).

The presence of the mullets *Mugil cephalus* and *Neomyxus chaptalii* and the pomacentrid *Abudefduf sordidus* in the Maciolek and Brock pond in the 1986 survey was surprising since the same species were reported (apparently in the same pond) during the 1972-1973 surveys of Maciolek and Brock (1974). Although these species are generally not associated with true anchialine ponds, storm waves or fishermen could easily be responsible for their introductions. As with the introduction of exotic species, the presence of these atypical anchialine pond species resulted in greatly reduced populations of *Halocaridina rubra* and *Palaemon debilis*. Comparison of a photograph of the Maciolek and Brock pond taken during the 1972-1973 period with a photograph taken in July 1986 (Plate 3) showed a striking similarity, despite an interval of 14-15 years. This suggests that despite relatively high human use of the shoreline and nearshore waters, people do not appear to be physically disturbing the pond(s) despite their close proximity to the beach.

Assiminea sp., a small (3.-3.5 mm.) herbivorous snail described as "ubiquitous" in Kona Coast ponds, was not observed at Makalawena, a consideration which may be related to the limited aquatic vegetation present in the area. The absence of

Assiminea appears to be consistent with the earlier observations of Maciolek and Brock (1974).

The Makalawena ponds also reportedly harbor ecotypes or variants of the common glass shrimp *Palaemon debilis*. Taxonomic treatment of this genus has indicated significant differences in morphological features of this species based on geography (Chace, 1972). These geographical morphological variations are apparently not sufficient to qualify for a subspecies designation but, instead, reflect the wide morphological variations which characterize this species.

The Makalawena ponds also demonstrated a number of conspicuous successional stages characteristic of anchialine ponds, as well as varying degrees of natural and manmade disturbance.

Conservative estimates place the number of anchialine (and coastal) ponds on the Island of Hawaii at between 600 and 650 (Brock, 1985). The majority (approximately 420, less those recently filled at Waikaloa) occur along the coast from Kawaihae to Kailua-Kona on the west side of the island. From Kailua-Kona to Ka Lae (South Point) there are approximately 90 ponds (based on aerial photo analysis only). Based on the fact that the recent surveys at Makalawena more than doubled the number of ponds thought to exist in the area, the actual number of anchialine ponds on the island is probably considerably higher than estimates suggest.

In 1985, the U.S. Fish and Wildlife Service classified several anchialine pond organisms as "Category 2" species for the purposes of the Endangered Species Act. These include the opae shrimp (*Metabetaeus lohena*, *Procaris hawaiana* and *Palaemonella burnsi*); a hydroid (*Ostrowouvia horii*); and a snail (*Neritilia* sp.). Category 2 reflects that the organisms probably should be listed as endangered or threatened, but insufficient data prevent an assessment of their status for listing on the Federal List of Threatened and Endangered Species. Thus, the organisms are still considered rare, but are not listed on the aforementioned list and are not currently proposed as candidates for listing. None of the species listed under Category 2 were observed during recent surveys at Makalawena, though *M. lohena* (a known predator on *Halocaridina rubra*) probably occurs in very small numbers at Makalawena. *Neritilia hawaiiensis*, a diminutive (1.0-1.5 millimeter) snail is reportedly, "...only known from the anchialine ponds at Makalawena" (Brock, 1985). However, recent information suggests that this species is probably more widespread than present data would indicate but, because of its extremely small size, has probably been overlooked (Brock, 1986;

personal communication). *H. hawaiiensis* was not recorded during the July 1986 baseline survey at Makalawena.

Maciolek and Brock (1974) identified and ranked a number of ponds/pond systems on the Kona Coast on the basis of their importance as "natural anchialine ecosystems". The ranking of the ponds was based on two criteria:

Class A: Pond sites of exceptional natural value based on physical structure, diversity, represented aquatic community, and new or endemic species. Preservation as a unique resource is recommended strongly; and

Class B: Pond sites of significant aquatic natural value whose importance is increased because of their anthropological or waterbird habitat values. They are threatened by development and, generally, found in accessible or culturally modified areas.

The ponds in the Makalawena (and Awakee) area were ranked in Class B (along with ponds found at Lahuipuoa, Honokohau, and Kealakehe). Ponds ranked in Class A included Anaehoomalu, Puuwaawaa, Kohanaiki, Manuka, Kahuku (north and south), Pakini Nui, and Kamaoa Puueo. Many of the Class A ponds in the Anaehoomalu area were recently filled for development of a major resort complex at Waikoloa.

5.0 LITERATURE CITED

Brock, R.A., 1977. Occurrence and variety of fishes in mixohaline ponds of the Kona, Hawaii, Coast. Copeia (1):134-139.

Brock, R.A., 1983. Assessment of the Conditions and Future of Anchialine Pond Resources of the Hawaiian Islands. In: Final Environmental Impact Statement, Waikoloa Beach Resort, Waikoloa, South Kohala District, Island of Hawaii. U.S. Department of the Army.

Chace, F.A. 1972. *Palaemon debilis* from Hawaii and the status of the genus *Palaemonetes* (Decapoda, Palaemonidae). Crustaceana 23(1):12-19.

Corps of Engineers, 1983. Final Environmental Impact Statement, Waikoloa Beach Resort, Waikoloa, South Kohala District, Island of Hawaii. Department of the Army.

Dollar, S.J. 1977. Coral Communities of Puako, 'Anaeho'omalu, and Kiholo Bays. p 33-35. In: Hydrologic and Ecologic Inventories of the Coastal Waters of West Hawaii. Technical Report No. 105. Sea Grant Cooperative Report UNIHI-SEAGRANT Report CR-77-02 (Water Resources Research Center).

Dollar, S.J. 1981. Storm waves and coral community structure in Hawaii. In: Proceedings of the 4th International Coral Reef Symposium, Volume 1. Manila, Phillipines.

Holthuis, L.B. 1973. Caridean shrimps found in land-locked saltwater pools at four Indo-West Pacific localities (Sinai Peninsula, Funafuti Atoll, Maui and Hawaii Islands), with the description of one new genus and four new species. Zool. Verh. 128:3-47.

Kay, E.A., L.S. Lau, E.D. Stroup, S.J. Dollar, D.P. Fellows & R.H.F. Young, 1977. Hydrologic and Ecologic Inventories of the Coastal Waters of West Hawaii. Technical Report No. 105, Sea Grant Cooperative Report UNIHI-SEAGRANT Report CR-77-02 (Water Resources Research Center).

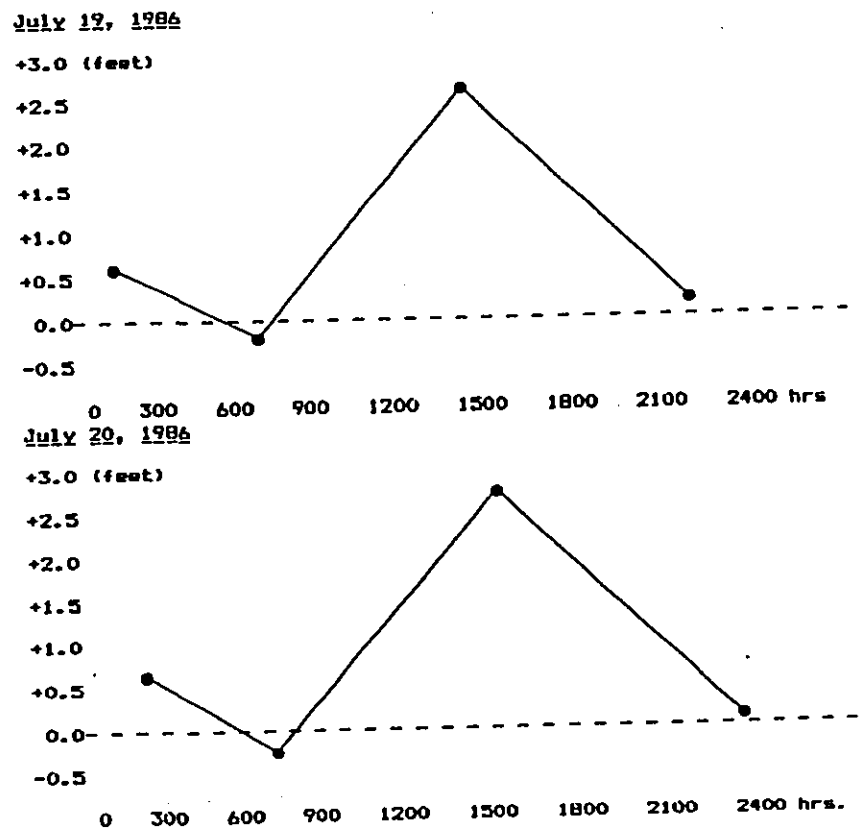
Maciolek, J.A. & R.E. Brock. 1974. Aquatic Survey of the Kona Coast Ponds, Hawaii Island. Sea Grant Advisory Report UNIHI-SEAGRANT-AR-74-04.

Wong, D.C.L. 1975. Algae of the Anchialine Pools at Cape Kinau,

Maui and aspects of the Tropic Ecology of *Halocaridina rubra* (Holthuis) (Decapoda, Atyidae). M.S. Thesis, Graduate Division, University of Hawaii.

TABLE 1

TIDAL RANGE



Source: Honolulu Star Bulletin, July 19, 1986, adjusted to Kona

TABLE 2

NEARSHORE MARINE WATER QUALITY DATA-PHYSICAL/CHEMICAL PROPERTIES

Parameter:		Depth (M)	Temp. (C.)	Salinity (PPT)	Diss. Oxygen (PPM)
Station #					
Station 1	(Low)	0.5	27.6	29.9	6.7
		1.5	28.5	32.0	6.9
	(High)	0.5	29.0	30.5	7.4
		1.5	28.8	31.4	6.9
Station 2	(Low)	0.5	28.0	30.4	6.5
		1.5	28.6	32.3	6.9
	(High)	0.5	28.9	32.3	7.0
		1.5	28.8	32.2	7.5
Station 3	(Low)	0.5	27.9	31.0	6.9
		1.5	28.3	33.0	7.0
	(High)	0.5	28.8	31.1	6.7
		1.5	28.9	31.7	6.9
Station 4	(Low)	0.5	28.0	29.0	6.6
		1.5	28.2	30.4	7.1
	(High)	0.5	28.5	30.1	7.5
		1.5	28.5	30.2	7.5
Station 5	(Low)	0.5	28.0	32.9	7.0
		1.5	28.3	32.5	7.2
	(High)	0.5	28.1	33.6	6.8
		1.5	28.3	33.5	6.9

Sampling Periods: Low Tide: July 19, 1986: 1015-1045 Hrs.
High Tide: July 19, 1986: 1310-1355 Hrs.

TABLE 3

CHECKLIST OF MACROINVERTEBRATES

PHYLUM/FAMILY/GENUS/SPECIES	ABUNDANCE
ANNELIDA (SEGMENTED WORMS)	
Sabellidae	
unident. tube worm	I
Serpulidae	
Protula atypha	I
Spirorbinae	
Spirorbis sp.	C
CRUSTACEA (CRUSTACEANS)	
Grapsidae	
Grapsus tenuicrustatus	R
MOLLUSCA (MOLLUSKS)	
Conidae	
Conus lividus	R
Neritidae	
Nerita picea (pipipi)	I
Patellidae	
Cellana exarata (opihi)	I
Bivalvia	
Isognomon perna	I
ECHINODERMATA (ECHINODERMS)	
Echinoidea (Sea Urchins)	
Diadema paucispinum	I
Echinometra mathaei	A
Echinostrephus aciculatus	A
Echinothrix calamaris	I
Heterocentrotus mammilatus	C
Tripneustes gratilla	C

Symbol Notation:

A = Abundant - Always observed, many individuals counted.

C = Common - Localized concentrations or even distributions of moderate number of individuals.

I = Infrequent - Small localized concentrations or only

several observations.
R = Rare - Only one or two organisms observed.

TABLE 4

CHECKLIST OF CORALS

FAMILY/GENUS/SPECIES	ABUNDANCE
SCLERACTINIAN (HARD CORALS)	
PORITIDAE	
Porites lobata	I
Porites compressa	R
POCILLOPORIDAE	
Pocillopora meandrina	I
ZOOANTHIDEA (SOFT CORALS)	
Palythoa tuberculosa	I

Symbol Notations:

A = Abundant - Always observed, many individuals counted.
C = Common - Localized concentrations or even distributions of moderate numbers of individuals.
I = Infrequent - Small localized concentrations or only several observations.
R = Rare - Only one or two organisms observed.

TABLE 5

CHECKLIST OF ALGAE - PU'U ALI'I BAY

Division/Genus Species	Abundance
CHLOROPHYTA	
Enteromorpha	C
Ulva fasciata	I
PHAEOPHYTA	
Sphacelaria furcigera	I
RHODOPHYTA	
Porolithon onkodes	C
Hydrolithon breviclavium	C

Symbol notations:

A = Abundant - Always observed, many individuals counted
C = Common - Localized concentrations or even distribution of moderate numbers of individuals
I = Infrequent- Small localized concentrations or only several observations
R = Rare - Only one or two organisms observed

TABLE 6

CHECKLIST OF FISHES

FAMILY/GENUS/SPECIES	ABUNDANCE
ACANTHURIDAE (SURGEONFISHES)	
Acanthurus achilles (paku 'iku 'i)	C
Acanthurus dussumieri (palani)	I
Acanthurus leucopareius (maikoiko)	I
Acanthurus mata (pualu)	I
Acanthurus nigrofuscus (ma'i'i'i)	C
Acanthurus nigroris (maiko)	I
Acanthurus olivaceus (na'ena'e)	I
Acanthurus triostegus (manini)	A
Acanthurus xanthopterus (pualu)	I
Ctenochaetus hawaiiensis	I
Naso lituratus (unaumalei)	R
Zebrasoma flavescens (lau 'i-pala)	I
AULOSTOMIDAE (TRUMPETFISHES)	
Aulostomus chinensis (nu nu)	I
BALISTIDAE (TRIGGERFISHES)	
Melichthys niger (humuhumu-'ele'ele)	I
Rhinecanthus rectangulus (humuhumu-nukunuku-a-pua'a)	R
CHAETODONTIDAE (BUTTERFLYFISHES)	
Chaetodon auriga (kikakapu)	I
Chaetodon quadrimaculatus (lau-hau) juveniles	I
Chaetodon ephippium (kikakapu)	R
Forciper flavissimus (lau-wiliwili-nukunuku-'oi'oi)	I
Forciper sp. (juv. *flavissimus* or *longirostris*	R
CIRRHITIDAE (HAWKFISHES)	
Cirrhitus pinnulatus (po'o-pa'a)	R

KUHLIIDAE (FLAGTAILS)	
Kuhlia sandvicensis (aholehole)	R
KYPHOSIDAE (SEA CHUBS)	
Kyphosus bigibbus (nenue)	I
Kyphosus vaigensis (nenue)	I
LABRIDAE (WRASSES)	
Coris bulliesi (malamalama) female only	R
Coris flavovittatus (hilu)	I
Coris gaimard (hinale-'aki-lolo) juv. & adults	I
Gomphosus varius ('aki-lolo)	I
Halichoeres ornatissimus ('ohua)	I
Pseudocheilinus octotaenia	R
Thalassoma duperreyi (hinalea luahine)	I
MONOCANTHIDAE (FILEFILES)	
Pervagor spilosoma ('o'ili-'uwi'uwi)	A
MULLIDAE (GOATFISHES)	
Mulloides flavolineatus (weke)	C
Mulloides vanicolensis (weke-'ula)	C
POMACENTRIDAE (DAMSELFISHES)	
Abudefduf abdominalis (mamo)	C
Abudefduf sordidus (kupipi)	C
Chromis ovalis	I
Plectroglyphidodon imparipennis	C
Stegastes fasciolatus	I
SCARIDAE (PARROTFISHES)	
Scarus sordidus (ulu)	C
Scarus sp.	I
ZANCLIDAE (MOORISH IDOLS)	
Zanclus cornutus (kihikihi)	I
TOTAL FAMILIES	13
TOTAL GENERA	25
TOTAL SPECIES	41

Symbol Notations:

A = Abundant	-	Always observed, many individuals counted.
C = Common	-	Localized concentrations or even distributions of moderate number of individuals.
I = Infrequent	-	Small localized concentrations or only several observations.
R = Rare	-	Only one or two organisms observed.

TABLE 7

COASTAL POND WATER QUALITY - NORTH COMPLEX

Parameter:	Size#	Depth (M)	Temp. (C.)	Salinity (PPT)	Diss. Oxygen (PPM)
Station					
Pond 1 (walled)	2	0.1	26.5	7.3	6.2
Pond 2 (walled)	3	0.2	25.4	6.9	6.6
		0.7	25.5	7.1	6.4
Pond 3 (mauka)	4	0.1	25.5	7.5	5.9
		1.0	24.9	8.2	5.9
(middle)		0.1	25.6	7.8	5.9
		1.0	26.6	8.8	5.7
(makai)		0.1	27.2	9.3	5.4
		0.3	27.2	9.5	5.4
Pond 4	2	0.2	24.9	6.6	5.1
Pond 5	1	0.1	24.8	5.8	5.0
Pond 6	3	0.2	25.0	5.6	5.0

Sampling Period: July 19, 1986; 1430-1510 hours

#Size classification: 1 = <1 square meter
2 = >1 square meter & <10 square meters
3 = >10 square meters & <50 square meters
4 = >50 square meters & <100 square meters
5 = >100 square meters

TABLE 8

COASTAL POND WATER QUALITY - MAKAI COMPLEX

Parameter:	Size#	Depth (M)	Temp. (C.)	Salinity (PPT)	Diss. Oxygen (PPM)
Station No. 1	2	0.1	26.9	8.8	6.6
		0.8	26.9	8.8	6.4
Station No. 2	1	0.3	28.9	10.0	4.5
Station No. 3	3	0.4	28.8	9.9	4.4

Sampling Period: July 20, 1986; 1430-1450 hours

#Size classification: 1 = <1 square meter
2 = >1 square meter & <10 square meters
3 = >10 square meters & <50 square meters
4 = >50 square meters & <100 square meters
5 = >100 square meters

TABLE 9

COASTAL POND WATER QUALITY - SOUTH COMPLEX

Parameter:	Size#	Depth (M)	Temp. (C.)	Salinity (PPT)	Diss.Oxygen (PPM)
Station #					
Pond 1 (N. side)	5	0.1	28.5	4.6	4.9
(W. side)		0.1	28.6	4.5	4.7
(S. side)		0.1	28.6	4.6	4.9
Pond 2	2	0.1	27.5	3.9	6.0
		0.5	27.4	4.0	6.0
Pond 3 (inlet)	3	0.4	26.6	3.9	5.8
(outlet)		0.4	26.8	4.0	6.1
Pond 4	2	0.1	26.6	3.9	5.0
Pond 5	1	0.2	27.1	4.0	5.1

Sampling Period: July 20, 1986; 1015-1115 hours

#Size classifications: 1 = <1 square meter
2 = >1 square meter & <10 square meters
3 = >10 square meters & <50 square meters
4 = >50 square meters & <100 square meters
5 = >100 square meters

TABLE 10

COASTAL POND WATER QUALITY - OPAE'ULA POND

Parameter:	Depth (M)	Temp. (C.)	Salinity (PPT)	Diss. Oxygen (PPM)
Station #				
1	0.1	28.5	3.8	6.1
2	0.05	28.5	3.9	5.8
3	0.1	28.3	3.8	5.6
4	0.05	28.5	3.9	6.1

Sampling Period: July 20, 1986; 1332-1414 hours

TABLE 11

COASTAL POND WATER QUALITY - DUNE COMPLEX

Parameter:	Sizes	Depth (M)	Temp. (C.)	Salinity (PPT)	Diss. Oxygen (PPM)
Station #					
Pond No. 1	2	0.1 0.3	27.3 27.4	4.4 4.8	5.9 5.8
Pond No. 2	1	0.2	26.8	4.8	5.7
Pond No. 3	3	0.3	26.9	4.6	7.0
Pond No. 4	2	0.3	27.1	5.3	6.6
Pond No. 5	1	0.1	26.8	4.9	5.9
Pond No. 6	1	0.1	26.9	4.9	5.9

Sampling Period: July 20, 1[illegible]; 1131-1244 hours

*Size classifications: 1 = <1 square meter
2 = >1 square meter & <10 square meters
3 = >10 square meters & <50 square meters
4 = >50 square meters & <100 square meters
5 = >100 square meters

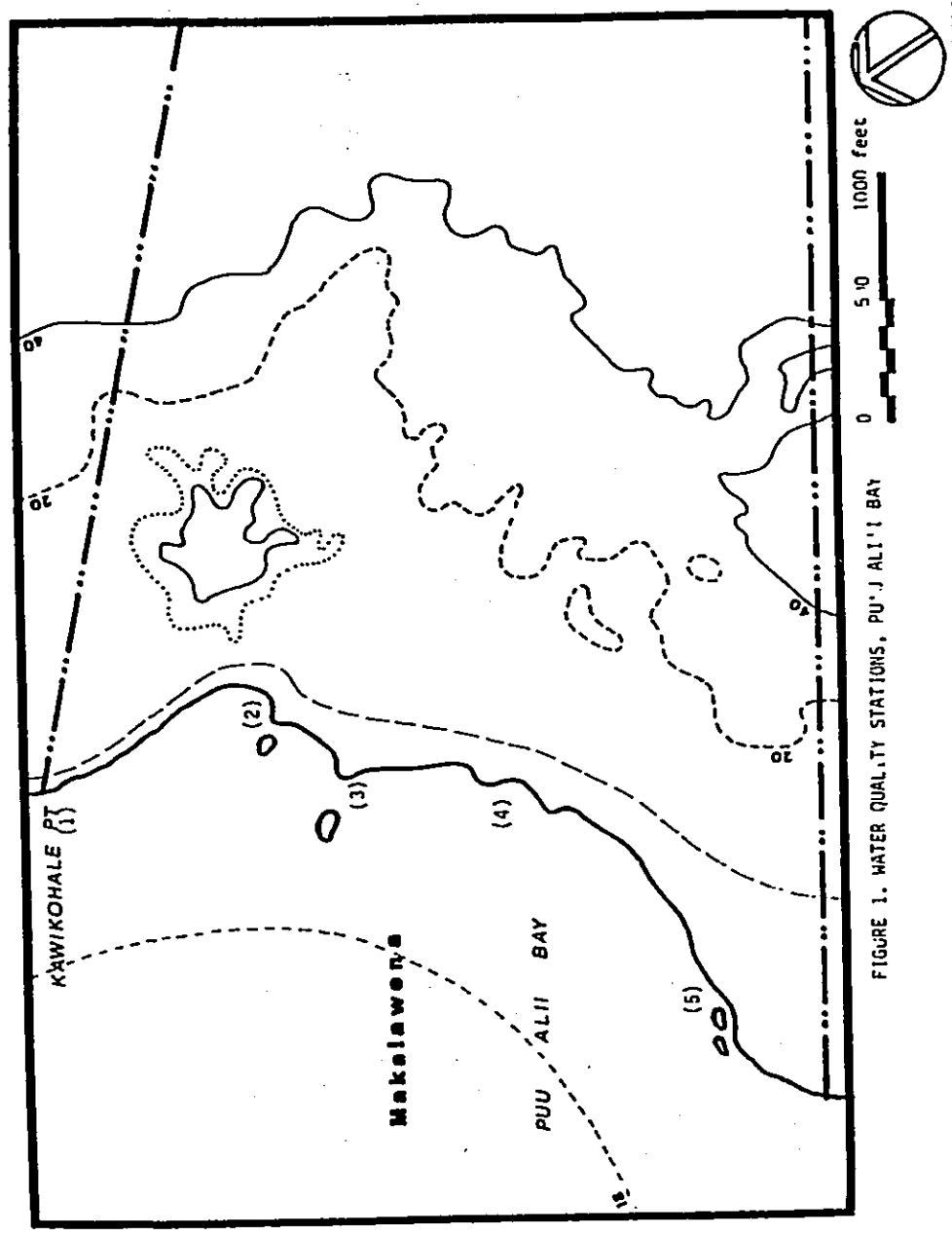


FIGURE 1. WATER QUALITY STATIONS, PU'U ALI'I BAY

TABLE 11

COASTAL POND WATER QUALITY - DUNE COMPLEX

Parameter:	Size*	Depth (M)	Temp. (C.)	Salinity (PPT)	Diss. Oxygen (PPM)
Station #					
Pond No. 1	2	0.1	27.3	4.4	5.9
		0.3	27.4	4.8	5.8
Pond No. 2	1	0.2	26.8	4.8	5.7
Pond No. 3	3	0.3	26.9	4.6	7.0
Pond No. 4	2	0.3	27.1	5.3	6.6
Pond No. 5	1	0.1	26.8	4.9	5.9
Pond No. 6	1	0.1	26.9	4.9	5.9

Sampling Period: July 20, 1[illegible]; 1131-1244 hours

*Size classifications: 1 = <1 square meter
2 = >1 square meter & <10 square meters
3 = >10 square meters & <50 square meters
4 = >50 square meters & <100 square meters
5 = >100 square meters

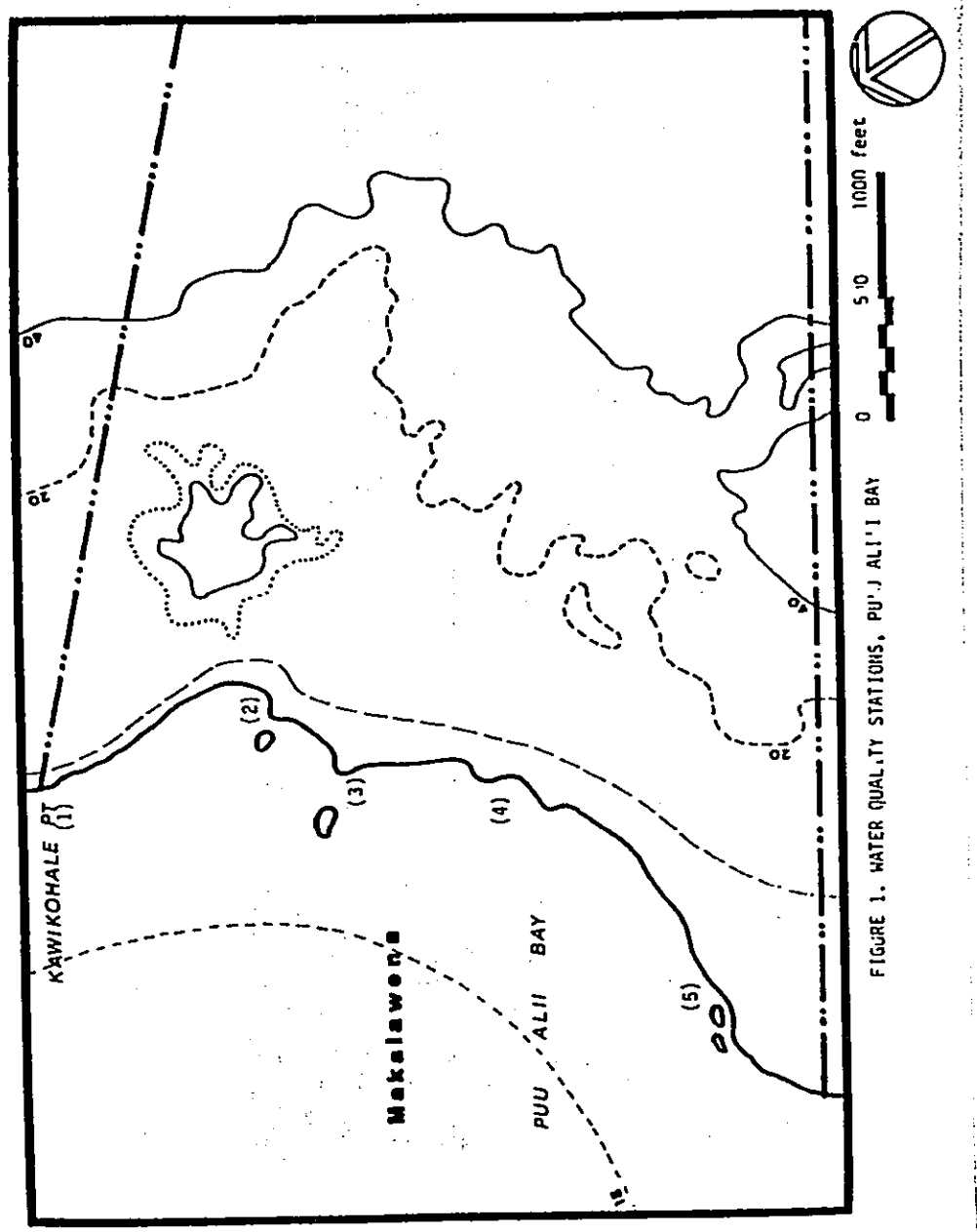


FIGURE 1. WATER QUALITY STATIONS, PU'U ALI'I BAY

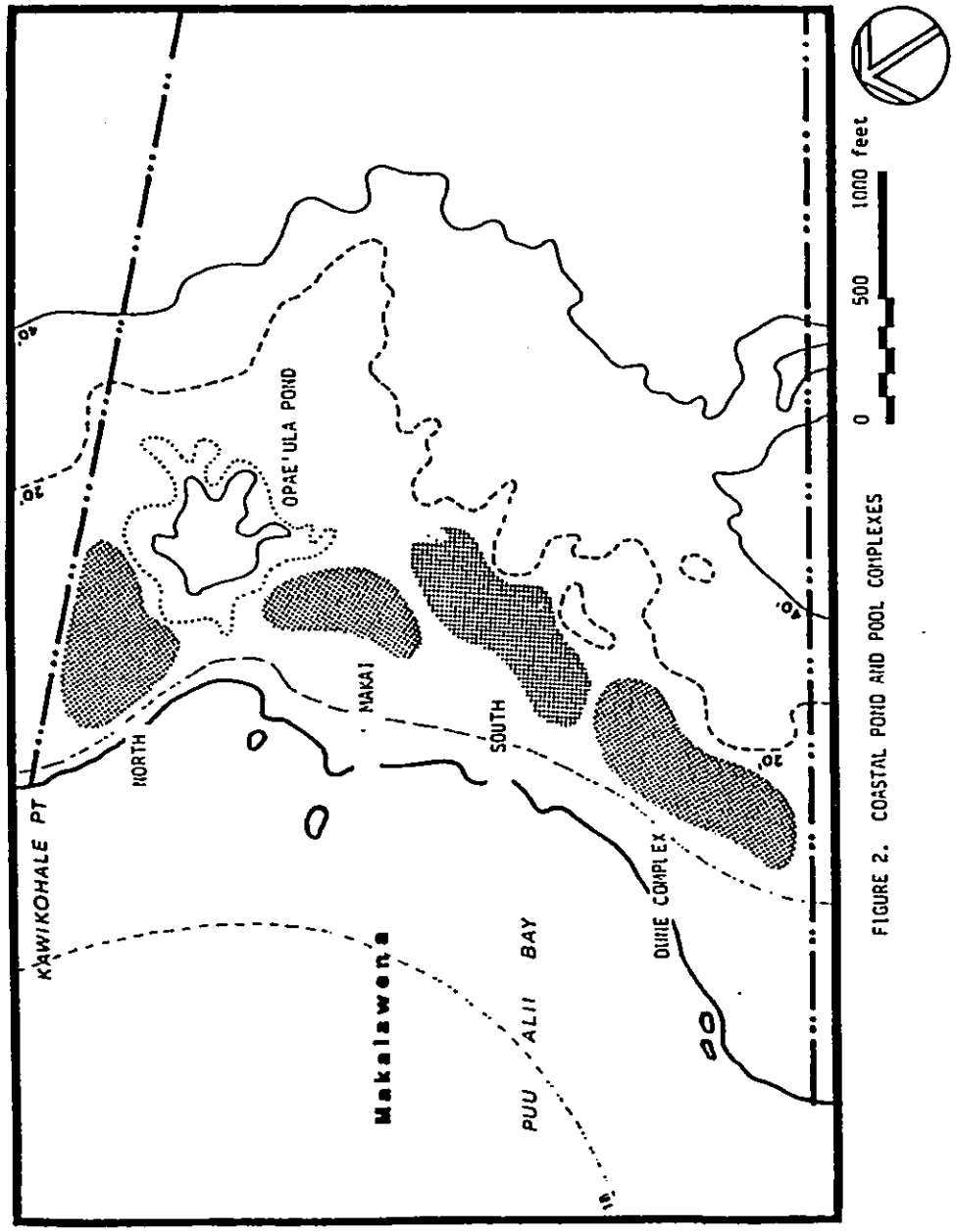


FIGURE 2. COASTAL POND AND POOL COMPLEXES

PLATE 1. North Pond Complex - Structurally Modified Pond (#1)

PLATE 2. North Pond Complex - Structurally Modified Pond (#2)

PLATE 3. Maciolek & Brock Pond (circa 1972-1973)

Maciolek & Brock Pond (July, 1986)

PLATE 4. South Pond Complex - Representative Pond

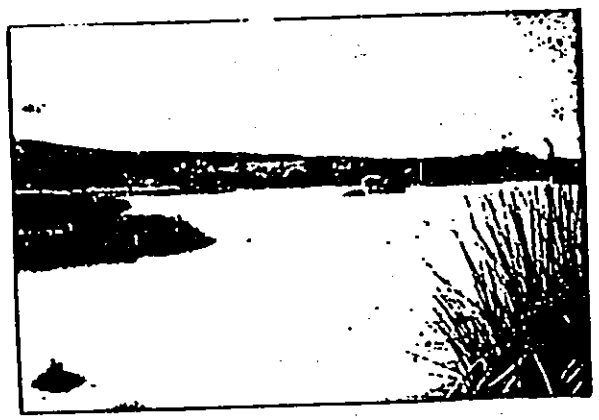


PLATE 5. Opae'ula Pond

APPENDIX E

DRAFT-TENTATIVE COASTAL POND AND WILDLIFE REFUGE MANAGEMENT PLAN

APPENDIX E

POND AND WILDLIFE REFUGE MANAGEMENT PLAN

FOR

MAKALAWENA RESORT
North Kona, Hawaii

December 1986

PREFACE/INTRODUCTION

This Pond and Wildlife Refuge Management Plan for the Makalawena Resort, North Kona, Hawaii has been prepared to identify the primary anchialine pond and wildlife refuge management concerns. The Corps of Engineers, the U.S. Fish and Wildlife Service (USFWS) and the State Department of Land and Natural Resources are studying the anchialine pond organisms and have interests and/or responsibilities to manage or regulate pond modification and use. The USFWS may decide to include some of the species found in the ponds on the Federal List of Endangered and Threatened Species and may designate critical habitats; the action would place the species and the critical habitats under the protection of the Endangered Species Act. If so designated, any future permits to fill or excavate anchialine ponds could be prohibited, subject to satisfying compliance with the Endangered Species Act.

The USFWS currently considers Opae'ula Pond and the surrounding anchialine pond habitats as Resource Category 1 (Federal Register Vol. 46, No. 15, January 23, 1981). Under this category, the habitat to be impacted is of high value for the evaluation species (migratory birds and anchialine pond animals) and is unique and irreplaceable and thus should be managed properly.

Considering the uniqueness of these ponds, organisms and wildlife habitat, the pond and wildlife management plan for Makalawena has several primary objectives:

1) Maintain the environmental integrity and habitat value of ponds; Opae'ula Pond and surrounding ponds;

2) Improve, through management activities, the habitat value of the pond for migratory waterbirds;

3) Protect and manage this habitat resource to provide educational and interpretive opportunities to the public;

4) Provide a landscape setting that compliments the aesthetic character of the ponds and provides an adequate buffer zone to the adjacent resort and recreational uses.

5) Control and monitor construction activities at Makalawena so that any primary, secondary, or cumulative impacts may be identified and mitigated to avoid any detrimental impacts to the ponds or wildlife refuge area; and

6) Provide for a responsible conservation manager to implement the management plan and conduct scientific monitoring programs.

The final pond and wildlife refuge management plan and designation of a manager will be determined prior to or during the Special Management Area permit review process of the County of Hawaii Planning Department.

A. DEFINITIONS

1. Adjacent Sites. The term "Adjacent Sites" means those parcels which share a common border with the Wildlife Refuge Management Area.

2. Owner. The term "Owner" means Kamehameha Schools/Bernice Pauahi Bishop Estate and their authorized representatives, and their successors.

3. Management Zones. Management Zones shall consist of the following three areas:

   a. Wildlife Refuge Management Areas. "Wildlife Refuge Management Areas" shall mean those areas containing Opae'ula Pond and anchialine pond complexes to be preserved and managed.

   b. Management Area Buffer Zone. "Management Area Buffer Zone" shall mean that area immediately adjacent to the Wildlife Refuge Management Areas in which development activities are limited.

   c. Upgradient Control Zone. "Upgradient Control Zone" shall mean areas upgradient or inland of the Wildlife Refuge Management Areas in which additional ground injection of wastewater and stormwater runoff are prohibited.

4. Policing. "Policing" shall mean the collection and carrying away of trash and other refuse and implementation of the management rules.

5. Manager. "Manager" shall be designated by the owner and be responsible for the management responsibilities contained herein. The Manager shall be an individual, organization, or government agency with a record of experience in wildlife conservation management, environmental awareness, education and public relations

B. BOUNDARIES

1. Depiction of Boundaries

   a. The boundaries of the Management Zones as described in Section A herein above shall be determined in consultation with appropriate Federal, State and County

agencies. Metes and bounds descriptions of the management zones are to be completed and attached after the Management Plan is finalized. As described on the attached memorandum and exhibit, a field survey of Opae'ula Pond was completed on December 2, 1988 and the general boundaries of the Wildlife Refuge Management Area (approximately 22 acres) were determined.

b. Prior to initiating site development activities at Makalawena, the Pond and Wildlife Refuge Management Area boundary will be marked off or delineated on the ground based upon the metes and bounds description.

c. The Owner shall notify the Manager so that the boundary delineation can be verified. Once verified, permanent markers shall be installed marking the limits (corner points) of the Pond and Wildlife Refuge Management Areas.

2 Method of Conveyance of Management Rights

a. Limited rights to manage the Pond and Wildlife Refuge Management Areas are to be granted by the owner to the Manager.

C CONSTRUCTION AROUND THE MANAGEMENT AREA

1. Notification of the Start of Construction

a. The Owner shall notify the Manager at least two weeks prior to the start of any major construction or earth moving on parcels adjacent to the Management Area.

2. Initial Construction Restrictions in Areas Adjacent to the Management Area include:

a The toe of any fill placed around the Management Area shall not penetrate the Management Area boundary, and in no event shall the toe of any fill be closer than five (5) feet to the edge of a preserved pond. This restriction applies unless a written variation is authorized by the Manager.

b. The slope of any fill within the Management Area Buffer Zone shall have an angle of repose sufficient to prevent the fill material from slumping into the ponds, except that no slope shall be steeper than one (1) to one (1).

c. The slope of any fill within the Management Area Buffer Zone shall be revetted or stabilized where necessary to prevent fill material from eroding or leaching into the ponds.

D. CONSTRUCTION WITHIN THE MANAGEMENT AREA BUFFER ZONE

1. A Management Area Buffer Zone shall be maintained adjacent to the Management Area. The width of the Management Area Buffer Zone shall be determined by on site inspection of the various edge conditions and may vary depending on natural site features, and adjacent land use and development activities. The width shall be measured from the perpendicular plane of the management area boundary.

2. The Owner shall notify the Manager when the Management Area Buffer Zone boundary is delineated on the ground by corner points so that the boundary can be verified.

3. Construction in the Management Area Buffer Zone

a. Major above grade structures, such as hotel, condominium units, restaurants or snack bars, shops, restroom facilities, and outdoor showers are not allowed within the Management Area Buffer Zone.

b. Walkways and roadways, beach areas, adequate trash receptacles, drinking fountains, utility lines and other necessary infrastructure, landscaping, display areas, and other similar facilities and improvements are allowed within the Management Area Buffer Zone.

c. Landscaping within the Management Area Buffer Zone shall utilize a preponderance of native vegetation.

E. OTHER CONSTRUCTION AND DESIGN RESTRICTIONS

1. Site grading shall be such that stormwater drainage from walkways, roadways, buildings, and other covered areas shall not flow into the Management Areas or the Management Area Buffer Zone.

2. The wastewater collection, treatment, and disposal system shall be designed to prevent overflow during power outages or other emergencies from entering into the management area or into the Upgradient Control Zone

3. All structures in Adjacent Sites, whether above or below grade, used for the storage of chemicals and petroleum products shall be designed to prevent spillage or leakage from entering into the Management Zones

F. MANAGEMENT AREA USE RESTRICTIONS

1. Activities prohibited within the Management Area include:

   a. Disposal of trash, stormwater, wastewater, or other unauthorized material of any kind.

   b Introduction of organisms of any kind into the ponds without the expressed written consent of the Manager.

   c. Unauthorized feeding of pond organisms or wildlife.

   d. Unauthorized removal of pond organisms, to include fishing, gathering, collecting, or netting without the written consent of the Manager.

   e. Unauthorized use of pond organisms.

   f. Any physical or hydrologic modification in the Management Area without written consent of the Manager.

2. Controlled scientific collecting shall be limited to those experiments determined to be necessary for understanding the pond ecosystem and organism life requirements as determined and authorized by the Manager.

G. MANAGEMENT AREA OPERATIONS

1. Objectives. The primary objectives of the management plan include, but are not limited to:

   a Maintenance of a viable pond ecosystem and wildlife habitat for rare or endangered waterbirds or migratory birds.

   b Expansion of scientific understanding of the pond ecosystems and the effects of urban development on them.

   c Education of residents and visitors of the unique nature and value of the wetland habitat and pond resources in Hawaii.

2 Management

   a The Manager shall manage the Pond and Wildlife Refuge Management Area.

   b The Manager may contract services to accomplish its responsibilities.

   c. In the event that the Manager is unable to fulfill its management responsibilities, an individual, organization or government agency with a record of experience in wildlife conservation, management, environmental awareness, education and public relations will be designated as the Manager by the Owner.

3. Responsibilities of the Manager

The Manager shall carry out or cause to be carried out the following duties:

   a. Implement the programs required under the management plan, including the Management Area use restrictions described herein.

   b. Initiate programs to communicate the management objectives and use restrictions to adjacent land owners, their employees, and other users of adjacent lands.

   c. Develop, schedule, and conduct resident and visitor education seminars, tours, and other programs to achieve the management objectives.

   d. Monitor groundkeeping activities by the applicable hotel, condominium or golf course grounds keepers in the Management Area Buffer Zone to insure that their activities do not adversely affect the management area and to enforce the use restrictions.

   e. Conduct a surveillance program to monitor the presence or absence of exotic fish or birds in the ponds or wetlands and, if exotic fish or bird species are found, formulated and executed corrective measures

   f. Monitor and regulate human activities in the Management Area to prevent human disruption of the wetland habitats and the unauthorized introduction of live organisms.

   g. Conduct or assist in carrying out the monitoring program described in this plan

   h. Conduct, assist, facilitate, schedule, or coordinate scientific or education activities in the Management Area.

   i. Provide semi annual update and annual status reports concerning activities undertaken and actions occurring in the Management Area and provide results of the monitoring program to the Owner

j. Notify the Owner of any unforeseen, deleterious events or occurrences in the Management Area.

k. Carry out the monitoring program.

l. After all contemplated construction and development on Adjacent Sites have been completed, the Manager will:

1) Assume maintenance and replacement responsibility for signs posted.

2) Undertake and administer the policing of the Management Area. Provide all equipment and consumable supplies required for such activities.

4. Responsibilities of the Owner

a. Through the completion of construction and development of Adjacent Sites, the Owner shall post and maintain signs around the wildlife refuge informing viewers of the intent of the Management Area, use restrictions, and the availability of educational tours and seminars presented by the Manager. The design of the signs shall be consistent with signage to be used elsewhere within the Makaiwena Resort. Their informational content will be determined in consultation with the Manager.

b. The Owner shall cooperate with the Manager's efforts to assure that resort employees are made aware of the value and sensitive nature of the wildlife habitat resource.

c. The Owner shall be responsible for providing funding support for the Management Plan to the extent stipulated in Section J herein below.

d. The Owner shall provide all notifications required from the Owner by this agreement, including advance notification of intended construction activity.

II MONITORING REQUIREMENTS

1 The Manger shall monitor water quality and faunal assemblages within the Management Area on a periodic basis to assess the ecological viability and conditions of the ecosystem and wetland habitat.

2. Construction Monitoring Requirements

a. Prior to beginning substantial new construction on a parcel adjacent to the Management Area, the applicant shall notify the Manager of the nature of the proposed construction activity. This information will be used by the Manager to determine the need for, and the appropriate duration of, any additional monitoring needed to establish baseline conditions and to detect and characterize daily and seasonal variations.

b. During the course of construction on Adjacent Sites, the wildlife refuge shall be monitored by the Manager at a frequency necessary to detect any adverse impacts.

c. The Management Area shall be monitored at least once each calendar quarter for a period of two years following completion of a construction project on an Adjacent Site. The monitoring frequency shall then be reduced to a frequency necessary to detect any long-term trends in pond water quality and faunal assemblages.

3. Parameters to be Monitored by the Manager

a. Physical parameters to be monitored shall include, but are not limited to: salinity, temperature, water clarity, and dissolved oxygen profiles

b. Surveys of endangered waterbirds and migratory birds shall be conducted annually during September to document the use of Opae'ula Pond by fall migrants (particularly shorebirds) and endemic waterbirds; in December, to determine use by migratory waterfowl, shorebirds, and endemic waterbirds; in March, to count spring migrants and resident endemic waterbirds; and in June, to evaluate still nesting and recruitment.

c. Assessment of wetland vegetation and invertebrate population shall be monitored on regular basis.

d. Chemical parameters to be monitored shall include, but are not limited to: nitrates, nitrites, phosphates, ammonia, petrochemicals, and chlorinated hydrocarbons.

e Measurements shall be taken during all tidal cycles to detect any correlation between physical and chemical parameters and tidal influence

f. Other plant and animal populations shall be inventoried to develop detailed species lists and to calculate population, biomass, density, distribution and frequency of occurrence.

1) Inventories shall be conducted during all tidal cycles to detect any correlation between anchialine pond organism occurrence, population, biomass, density, distribution, behavior and the tides and physical and chemical parameters, and other parameters necessary to detect short-term and long term changes.

g. Chlorophyl levels will be measured to monitor phytoplankton growth in the ponds.

4. Data Analysis

a The data gathered in the monitoring program shall be used to further the scientific understanding of anchialine pond and wetland ecology.

I REMEDIAL AND CORRECTIVE MEASURES

1. If there is the occurrence of such an unforseen deleterious event, the Manager shall determine the need for remedial and corrective action and shall undertake such action using monies provided for in Section J herein below.

2. The Manager shall be responsible for implementing any corrective action or measures when any unforeseen, deleterious event or occurrence impacts the ecological viability of the Management Area.

3. Notwithstanding any future permit or regulatory approval conditions dealing with liability or responsibility of the Owner, the Owner shall be liable for funding any corrective work directed by the Manager when an unauthorized action by the Owner or its employees or agents, within the scope of employment, which is intended to harm the ecological viability of the Management Area occurs.

J FINANCIAL OBLIGATIONS

1 Funding The purpose of this section is to provide sufficient money to administer the business contemplated under this Pond and Wildlife Refuge Management Plan.

a. The Owner shall contribute an initial funding of _____ and pay an annual cost, in accordance with an agreed upon schedule subject to adjustments based on the Consumer Price Index, to provide sufficient money to administer the business contemplated under this Pond and Wildlife Refuge Management Plan.

b. The funds contributed by the Owner under Paragraph J. 1. a. above shall be administered by _ _ _ _ and shall be used to conduct the affairs of the Pond and Wildlife Refuge Management Plan as set forth herein. The funds shall be managed under the doctrine of cy pres.

2. Office Facilities

a. Because of the necessity for the Manager to be on site for extended periods during monitoring, the Owner will provide, without rental compensation, by the Manager space within the Makalawena Resort suitable for use by the Manager on a non exclusive basis, such space to be suitable for use as an office and equipment storage area. The Manager shall also be granted ready access to available toilet facilities maintained by the Owner or its designee.

End

Phillips Brandt Reddick

MEMORANDUM

TO: Sydney Kelipuleole - KS/BE
Ilima Piinaia - County of Hawaii
John Ford - USFWF
John Naughton - NMFS

SUBJECT: Field Survey of Opae'ula Pond - Makalawena
North Kona

DATE: December 3, 1986

FROM: Tom Witten

ATTENDING: County of Hawaii - Ilima Piianaia, Deputy Director; Rodney Nakano, Environmental Planner; and Brian Nishimura, Planner
US Fish & Wildlife Service - John Ford, Peter Stine, Steve Berendzen
National Marine Fisheries Service - John Naughton
Kamehameha Schools/Bishop Estate (KS/BE) - Sydney Kelipuleole, Bill Staton
Phillips, Brandt, Reddick - Frank Brandt, Tom Witten, Phil Bruner (Fauna Subconsultant)

In conjunction with preparation of the Final EIS, an onsite field inspection was made on December 2, 1986 with the above parties attending. The primary purpose was to inspect the onsite conditions of Opae'ula Pond to better estimate the appropriate boundaries and buffer areas for establishing a wildlife refuge in conjunction with the proposed resort development and provide the participants with a better overall understanding of this important wildlife habitat resource. The primary considerations discussed in establishing appropriate boundaries for a wildlife refuge at Opae'ula Pond were control of human access, visual barriers and sightline considerations, flight access, predator control (possible fencing and walls), light intrusion, noise, shoreline access, and adjacent land use activities.

A survey of the entire perimeter of the pond was completed. Surrounded primarily by a thicket of Kiawe, there were several areas where vistas were available of the pond. Measurements were taken at various points along the pond to establish a general sense of adequate setback and buffer areas to separate the wildlife refuge from adjacent uses. It was noted that at present there is little or no suitable nesting areas for the Hawaiian

Stilt, although the site has great potential if nesting areas (small isolated islands set within the pond) were created. Additionally, the clearing of introduced wetland vegetation would provide more feeding areas for the waterbirds.

After some discussion, the following understanding was reached as to the general principle of establishing a wildlife refuge at Opae'ula Pond and its boundaries. The boundaries as discussed are preliminary in nature in that, dependent upon more detailed planning of various adjacent uses, additional buffer areas may be required. The attached exhibit depicts the general wildlife refuge area and buffer determined by this field survey to accomplish a refuge at Opae'ula Pond. This includes a minimum 150-foot setback from the edge of the pond with the exception of the makai boundary where a 135-foot setback would be adequate with a barrier rock wall and landscape planting in a curvelinear form to separate the shoreline recreational use area from the refuge. There is a need for walls, fencing, vegetation barriers and/or a combination thereof to surround the entire refuge boundary refuge to control access and unwanted predators.

Based on the above described boundaries of the wildlife refuge, it is estimated that the refuge would include approximately 22 acres. A wildlife refuge management plan would be refined as more specific plans for the resort development are prepared and a wildlife manager or agency is selected to manage the refuge.

Possible view/interpretation points were also identified as the group hiked around the pond (see attached exhibit). These sites should be designed to provide cover for those viewing the area and located at vantage points that allow the viewer a good perspective of the pond and those areas that the birds would frequent without impacting nesting or breeding activities.

KS/BE indicated their interest in establishing a wildlife refuge at Opae'ula Pond in conjunction with the Makalawena Resort, although the actual means by which this is accomplished needs to be more clearly defined. The role of the Wildlife Refuge Manager and land owner, the details of a Wildlife Refuge Management Plan, and who would be most qualified to manage such a resource needs to be determined. The US Fish and Wildlife Service (USFWS), based on past efforts to acquire the pond as a National Wildlife Refuge and their current assessment of the value of Opae'ula Pond as a

waterbird refuge, is interested in working with the landowner to investigate the various alternative management arrangements by which the USFWS could manage the pond as a wildlife refuge.

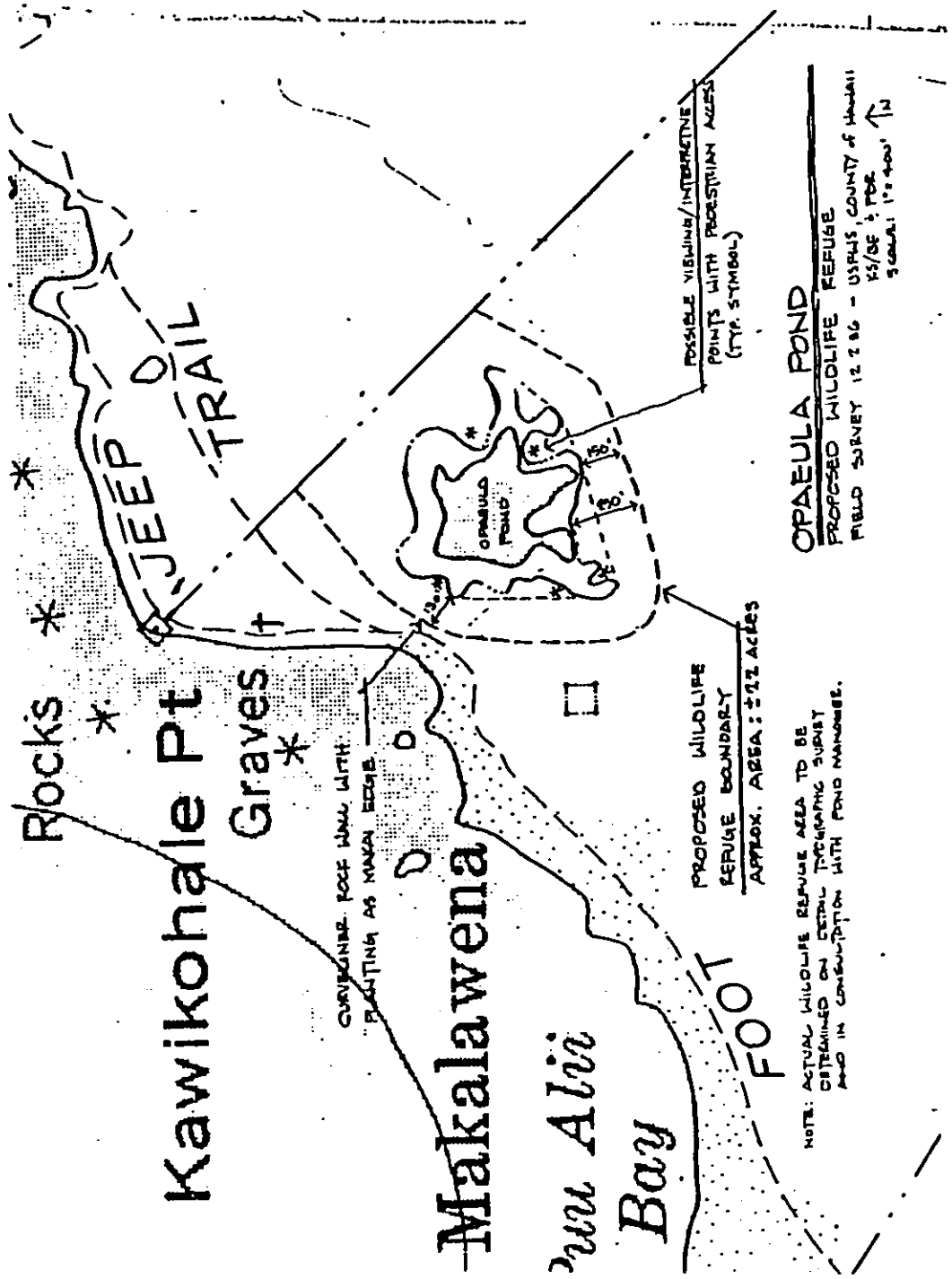
Although the State Department of Land and Natural Resources has not responded to the Draft EIS, they have expressed interest in Opae'ula Pond and should be consulted with regards to the establishment of a wildlife refuge. Additionally, organizations such as the Nature Conservancy and the Hawaii Audubon Society should be consulted.

As a follow-up to this field trip, PBR will include comments in the Final EIS to recognize the general conclusions reached at this field survey and to indicate the general boundary of the proposed wildlife refuge for the purposes of preliminary site development planning.

We appreciate the participation from the County Department of Planning, US Fish and Wildlife Service and National Marine Fisheries Service and are hopeful that further efforts will achieve a management plan for Opae'ula Pond that will improve and maintain this valuable wetland and migratory and waterbird refuge in conjunction with the proposed Makalawena Resort.

Thomas S. Witten, ASLA
Principal

cc: Ms. Mae Mull, Hawaii Audubon Society
Mr. Kelvin Taketa, Nature Conservancy



waterbird refuge, is interested in working with the landowner to investigate the various alternative management arrangements by which the USFWS could manage the pond as a wildlife refuge.

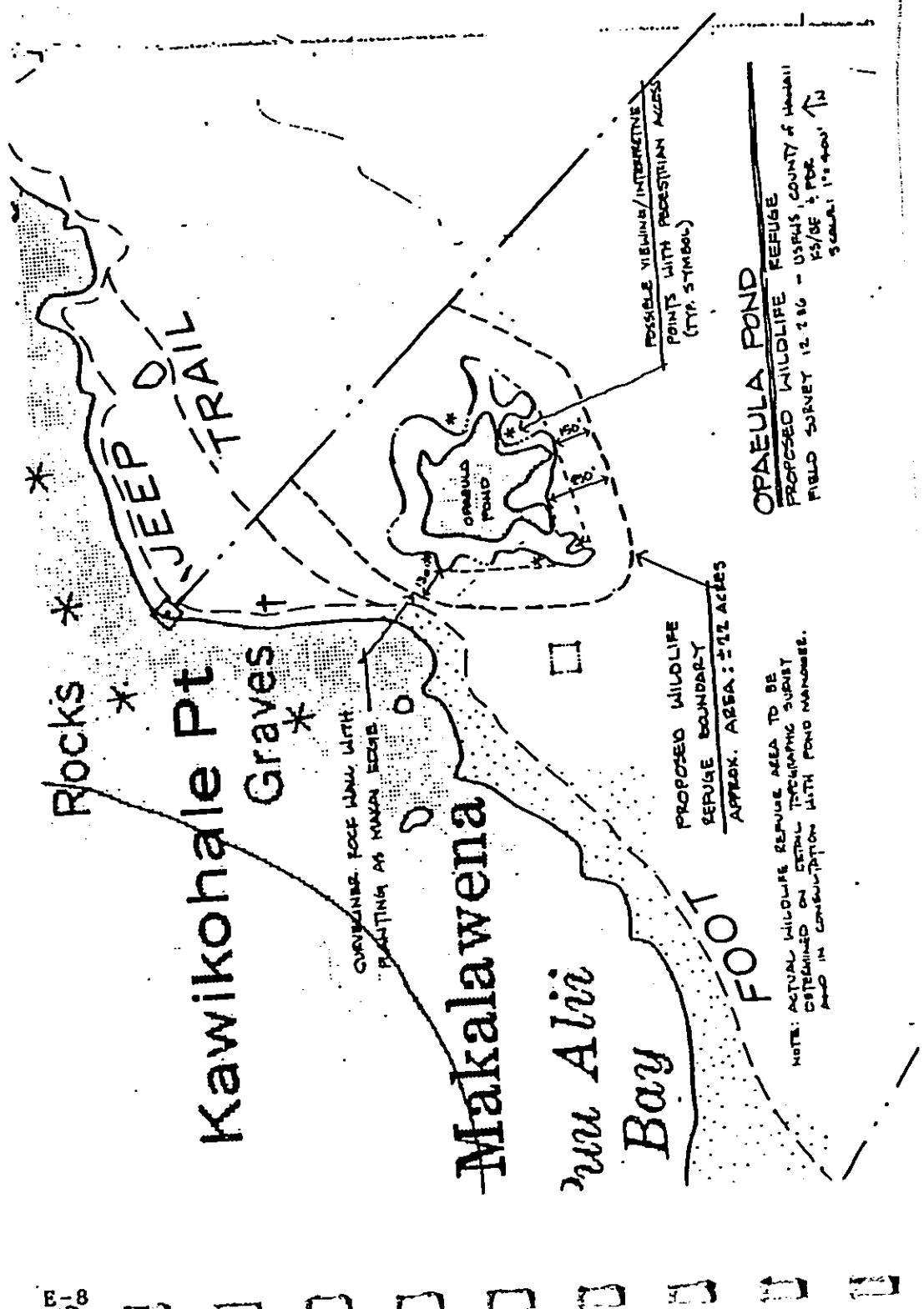
Although the State Department of Land and Natural Resources has not responded to the Draft EIS, they have expressed interest in Opae'ula Pond and should be consulted with regards to the establishment of a wildlife refuge. Additionally, organizations such as the Nature Conservancy and the Hawaii Audubon Society should be consulted.

As a follow-up to this field trip, PBR will include comments in the Final EIS to recognize the general conclusions reached at this field survey and to indicate the general boundary of the proposed wildlife refuge for the purposes of preliminary site development planning.

We appreciate the participation from the County Department of Planning, US Fish and Wildlife Service and National Marine Fisheries Service and are hopeful that further efforts will achieve a management plan for Opae'ula Pond that will improve and maintain this valuable wetland and migratory and waterbird refuge in conjunction with the proposed Makalawena Resort.

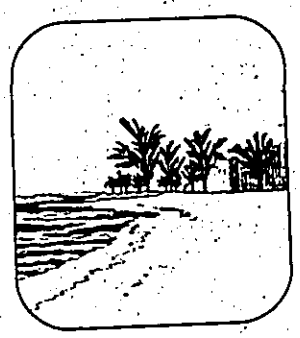
Thomas S. Witten, ASLA
Principal

cc: Ms. Mae Mull, Hawaii Audubon Society
Mr. Kelvin Taketa, Nature Conservancy



APPENDIX F

FEDERAL AND STATE REPORTS ON OPAE'ULA POND WILDLIFE REFUGE



A Preliminary Report on Makalawena Pond

By E. Kridler
October, 1965

Location: Hawaii. North Kona District. Tax key 7-2-04. Makalawena quadrangle.

Owner: Bishop Estate

Description: The water area about 18 acres. Depth variable from 1 to possibly 4-5 feet. Bottom muddy. Water is brackish and the source of fresh water is supposed to be from underground drainage from lava slopes of Hualalai on east and small underground wells. Underground seepage and high salty water table from ocean about 250-300 ft. to the west keeps levels relatively stable throughout year.

The shoreline itself is rough lava, especially on east, north and south shores. Large mud flats exist over one-fourth to one-third pond on north and northeast sides. Somewhat sandy soil on west side becomes all sand progressively toward beach. Remainder of southeast, east and north shores surrounded by rough A-a lava fields. Near pond are numerous pukas in lava 8-10 feet deep and 10-20 feet in diameter some of which contain water on the bottom.

Emergent vegetation around pond is primarily roundstem bulrush (Scirpus sp.) on north shore especially. About 20-25 small islands scattered throughout pond range from a few feet to 4-5 feet in diameter. Most are topped by grass about one-half foot tall or support roundstem stands. Several clumps of bulrush 10-15 feet in diameter found in middle and south ends of pond. Some 3-square bulrush growths scattered throughout mud flats on north end.

A pond weed, thought to be Ruppia maritima (form Pacifica) found in scattered beds throughout pond. A good waterfowl food. Possibly Najas marina growing here also as at Honokahau. If not, it could be introduced. Both would make good coot foods. Brackish water fairy shrimp plentiful.

On west sides between beach and kiawe are some ironwoods. Adjacent beach to north is rocky; that to south sandy. Kiawe 10-15 feet high surround pond except on north end where lava comes to water's edge. Scattered clumps found several hundred yards or more in lava field on east and south sides.

Wildlife: Census of 9/9/65 revealed 17 stilt, 17 adult and 3 immature coot, 1 male shoveler, 4 tattlers, 12 plover, and 2 house finch at pond. Mr. Carlson states several hundred ducks use the pond during fall, winter, and spring months. Coots here all year and probably breed here. Stilt population throughout year about 20 and Carlson and aged caretaker living in old house near pond say they breed here. The pond very valuable for the stilt on Hawaii, especially if Honokahau is lost or filled.

Mongoose (?) observed around pond the day of inspection. Need to be controlled to aid nesting of stilt and coot.

August 11, 1969

Mr. Norman K. Carlson
Bishop Estate
P.O. Box 639
Kealakekua, Hawaii 96750

Dear Norman:

The following is a brief report on probable management of Opaeula Pond improvement and management as a sanctuary for birds. I have discussed this with Eugene Kridler and he is in accord.

Opaeula Pond appears to be very suitable habitat for Hawaiian stilts and coots in its present condition. General observations indicate that the pond is fairly stable but may be filling in with matter, mostly organic, from normal decay of vegetation. The thick layer of mud on the bottom may actually be of fairly recent origin, and a large part of the deposit may have accumulated since the 1946 tsunami. If this is the case, it would appear that in a few years there may be very little open water remaining. In order to maintain conditions favorable for the birds it may become necessary to pump silt out of the pond. Such excess silt could be deposited on adjacent lava with no adverse effects.

It would be desirable to cut off areas of the pond vegetation and mud flats from the surrounding lava where possible, to create additional islets. Also, some of the larger islets should be cut into smaller ones in an effort to decrease predation and to increase the number of nesting territories for the birds.

As development and use of the adjacent beach area increase it would be desirable to construct a fence or other barrier, perhaps a low stone wall, to demark the makai boundary of the refuge area. This wall should be located at least 50 feet from the pond at the point where the pond lies closest to the sea. The barrier should be further from the pond along the western and southern boundaries. The red line on the attached overlay indicates the proposed boundary of the sanctuary area.

It is proposed that the boundary of the refuge area be posted with signs informing the public of its status as a cooperative bird refuge and warning against trespass and molesting the birdlife.

Proposed development for resort of area along beach compatible with stilt and coot use of pond if access controlled and restricted. Fencing necessary and possibly some fencing with hogwire to keep dogs, goats, and pigs out.

EUGENE KRIDLER

The only other maintenance would be a periodic treatment of the area with poison for mongoose and cat control. This would be done on a short, intensive application system where uneaten baits would be recovered and removed from the area. This would be most effective if done in the early spring before the nesting season of the birds.

Patrol of the area would be minimal, with perhaps quarterly scheduled visits by the Fish and Game Warden and a summer inventory and a winter inventory scheduled by the Wildlife Biologist. Other visits by fish and game division staff to effect the predator control, study the nesting of the various birds and to follow up on reported trespass or violations would be made as needed. When access to the area is improved, visits and patrol would be increased considerably. We can expect that Federal Fish and Wildlife Biologists will also visit the pond from time to time on patrol and biological surveys.

It is felt that the heavy growth of kiawe which screens the pond from the south and west could be left as it is or converted to a more attractive vegetation complex with no adverse effects. Such plants as bougainvillea, koa haoani, hala and loulu palm trees would form a more appealing backdrop.

In summary it can be stated that the Division of Fish and Game has no immediate plans for the area in the way of physical improvements. Any action program such as dredging, brush clearing, creating more islets would be undertaken only after consultation with biologists of the U.S. Fish and Wildlife service and with the approval of the Trustees of the Bishop Estate. Also, because of the relatively delicate ecological conditions within the pond, changes would be made slowly and only after experimentation and study.

Sincerely,

DAVID H. WOODSIDE
Wildlife Biologist

DHW:ma

Attach.

19

OPAEULA POND RECOMMENDATIONS

1. Evaluate the pond for its wildlife potential and classify according to the National Wetlands Classification system.
2. Determine the water source for the pond and amount of annual fluctuation in water level.
3. Establish boundaries to include the pond, a buffer zone surrounding it, tidal pools and any upland or coastal water source.
4. Restrict surrounding land use to low-density activities such as a natural area, marine life conservation district, tidal wave zone or hiking area.
5. Management goals: Protection of native and migratory waterfowl with emphasis on habitat development for endangered species, specifically the Hawaiian stilt.
6. Development activities: Develop suitable shallow and deep water areas, mud flats and nesting islands for waterfowl. Encourage the growth of aquatic and emergent vegetation. Fence and post signs on the sanctuary boundary. Reroute present beach access road to bypass the sanctuary.
7. Maintenance: Maintain a dense kiawe belt between beach and sanctuary to reduce tidal wave damage to pond and to provide shelter from beach traffic.
8. Management: Water level control, predator control, prevent pond contamination and siltation, vegetation management and protect sanctuary from trespass.

Prepared by
Carl U. Hoffman
Wildlife Biologist

OPAEULA

Preliminary Management Plan

The primary purpose of acquiring this area would be to promote the management of various native waterbird species. Opaeula pond is situated within the lands of Hakalawena which are owned by B.P. Bishop Estate with the exception of 0.23 acres southwest of the pond belonging to th Board of Hawaiian Evangilical Associations (Frank R. Hicks lease). Tax map key references are 7-2-04. The Opaeula pond area is surrounded with pahoehoe lava. Approximately 4.5 acres are in marshland or open standing brackish water. It is recommended that management of this area as a wildlife refuge conform to standards established under the National Wetlands Classification System.

Various aspects influencing optimum management of this resource are listed below:

1. Access

Alternate access to Puu Alii Bay, to minimize public disturbance, must be established. Approximately 1.32 miles of unpaved roadway to the south of Opaeula would satisfy this need. The existing roadway to Opaeula shall be maintained for official use and must be improved. Presently it is negotiable only by four-wheel drive vehicle.

2. Site Improvements

Vegetation surrounding Opaeula is presently heavily utilized by a herd of some 60 goats. Upon removal of these goats and their owner who lives in a shanty on the coast, native vegetation should be reintroduced (noni, kou, milo, etc.).

Gradual replacement of introduced exotics by native plant species should be accomplished. Kiawe and ironwood trees growing on the western coastal side of the pond should be the last to be replaced as they provide a visual buffer and protect from extreme tidal and tsunami influence.

The effects that introduced fish, at least two species of tilapia, have on brine shrimp and algae should be explored to determine extent of competition with

waterfowl.

The eastern reaches of Opaeula are littered with broken glass, empty glass jugs and old corrugated roofing iron. This debris constitutes a physical hazard and must be removed.

Silting in of the pond area is an ongoing phoenomena that has made suitable waterfowl habitat out of a mullet pond. The long-range effects of continuous silting must be understood. Consultation with persons familiar with the area would help determine the rate of siltation.

Mongooses, cats and rats have been seen in the vicinity of the pond. An intensive predator control effort is needed to remove these predators and keep them away.

3. Site Identification and Size

Approximately fifty acres of land area should be acquired to satisfy minimal needs of the refuge. The entire area should be fenced and posted at 100 foot intervals. Estimated length of the fenceline is 1.3 miles. Camping and casual access to anywhere within the confines of the refuge should be prohibited. The shoreline should be posted to prevent access from the ocean. Off shore fishing from boats may be allowed.

4. Miscellaneous Considerations

1) Construction of nesting islands

2) Construction of viewing platforms to observe wildlife

3) Determine water sources and possible causes of pollution

4) Regular monitoring of water standards through laboratory analyses

5) Maintain present Conservation District Zoning (R) in adjacent areas.

5. Complimentary Sites

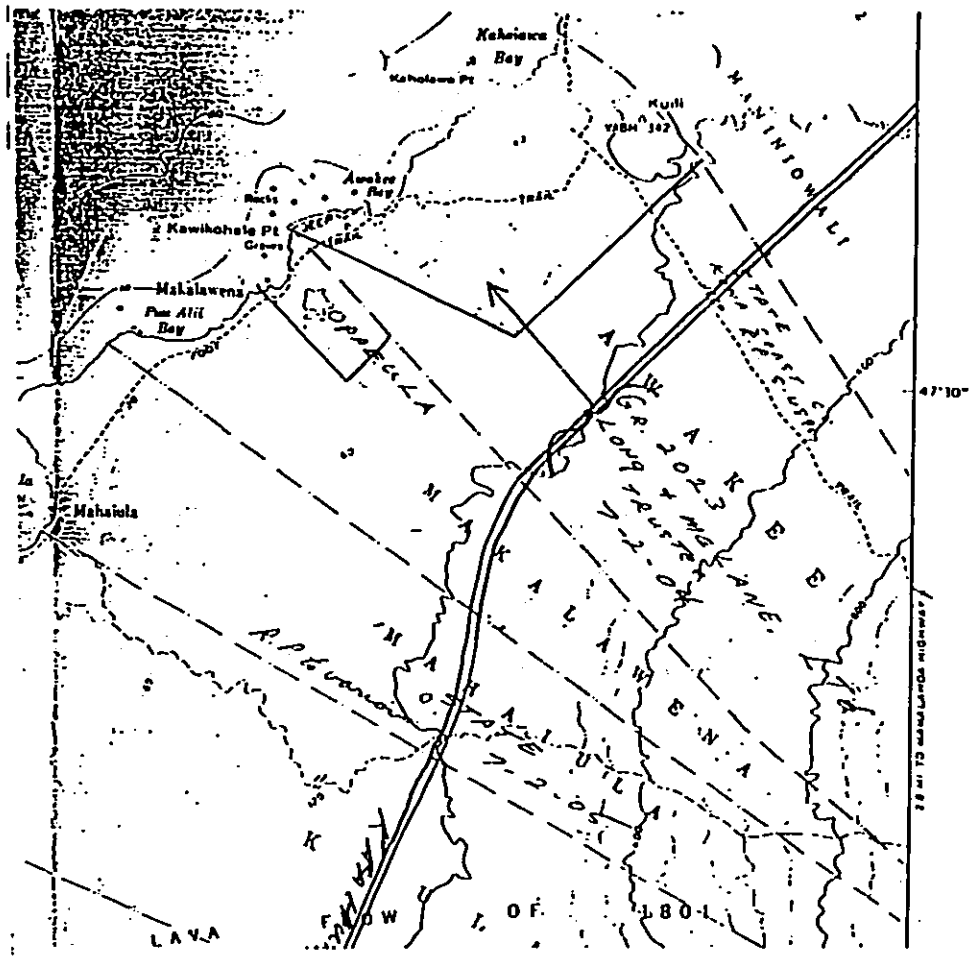
Aimakapa fishpond at Honokahau represents substantial waterfowl habitat. Here, there are approximately 10 acres of open brackish waters surrounded by 15 acres of

marshlands. Tax map key references are 7-4-08 with Lanihau Corporation in listed ownership.

The movement of stilts and ducks between these two areas has been observed. Both sites should become refuges simultaneously and be managed together.

Submitted by:

Ronald Bachman
District Wildlife Biologist
Island of Hawaii



(1969)

STAFF REPORT ON OPAEULA POND, HAWAII

Purpose of this Report:

To provide background information for departmental staff, concerning the importance of, and efforts to preserve Opaeula (also called Nikalawena) Pond on the Island of Hawaii as habitat for rare and endangered species of Hawaiian wildlife.

Background:

For many years, conservationists have been alarmed by the growing list of wildlife species which have become extinct.* In recent years this concern has grown to international scope. On October 15, 1966, Public Law 89-669 entitled, "The Endangered Species Preservation Act" was signed into law. At the same time, the U.S. Fish and Wildlife Service in consultation with the Fish and Game departments of all the states prepared Resource Publication No. 34 which lists 130 species of wildlife which are rare or in danger of becoming extinct. Of these, 23 species are found only in Hawaii.

Of the 23 rare and endangered types of Hawaiian wildlife, the Hawaiian Stilt (Himantopus h. Knudseni) (see photo attached) is one of the species in the most immediate peril. A primary reason for their decline is the loss of suitable habitat. Most of the habitat these birds once used has been drained or so altered by developments that it has become unsuitable. Of the few remaining areas, most are located where resorts or other developments are already being planned. Unless some consideration is given to this species, it will become extinct. Opaeula Pond is the most important area of stilt habitat left on the Island of Hawaii.

Location:

Island of Hawaii, North Kona District, Hakalawena quadrangle, Tax Key 7-2-04. Approximately 11 miles North of Kailua Kona and 5 miles west of Huehue Ranch Headquarters. (See attached map).

Description:

The pond area is approximately 7.5 acres (varies slightly with seasonal heavy rains). Depth ranges from 0" (mud flats) to approximately 3'. The average depth is approximately 6". The bottom is primarily soft, silty mud. Water is brackish, with the source of fresh water originating as underground drainage from Hualalai slopes. Salt water enters from the high salinity water table. The pond is less than 100 yards from the ocean coast. The pond is surrounded by a thicket of exotic vegetation with an overstory of Kiawe (Prosopis chilensis) and ironwood trees (Casuarina sp.). This thicket is surrounded by A-a lava flows.

Ownership:

Owned in fee by Bishop Estate. No existing leases let.

* 24 forms of Hawaiian wildlife have already become extinct.

Wildlife:

Used as a breeding, feeding, and resting area by the Hawaiian Stilt and the Hawaiian Coot (Fulica americana alai), a species that has been proposed inclusion in the list of rare and endangered species. (See photo attached). The Hawaiian duck (Koloa), also an endangered species, has been observed at the pond, but it is not known if use by this species is regular. Another native species found in the area is the Black-crowned night heron (auku'u) (Nycticorax n. hoactli). Migratory wildlife from continental North America, including several species of ducks, and the Pacific Golden Plover (Pluvialis dominica) also use the area seasonally.

Plant Life:

The primary forms of plant life found within the pond include roundstem bullrush (Scirpus sp.) which grows in clumps up to 15 feet in diameter, and a pondweed, apparently Ruppia maritima found in scattered beds throughout the pond.

Past and Present Use:

Evidence of prehistoric developments in the form of remnants of stone walls and platforms indicate that the area adjacent to the pond was used by the early Hawaiians. No use is being made of the area at the present time.

Discussion:

Because of its value as habitat for endangered species, on November 3, 1965 the Division of Fish and Game, after consulting with the U.S. Fish and Wildlife Service requested that Mr. James Detor, Head of the Division of Land Management, contact the Trustees of Bishop Estate concerning the acquisition of the pond area for bird sanctuary purposes (Enc. 1). This was done on December 6, 1965 (Enc. 2). The reply of the Trustees was sympathetic but negative because total development plans for the area were not fully explored (Enc. 3).

On February 19, 1968, as part of an overall plan to make sure that owners of habitat for rare and endangered species were made aware of the presence of critical waterfowl and shorebird habitat on their lands, the Trustees were again notified (Enc. 4) along with other landowners throughout the State.

As a result of this letter, and the deep personal interest in conservation by Mr. Norman K. Carlson, a representative of Bishop Estate, a meeting was called by Mr. Carlson in Kona on May 3, 1968. Attending the meeting were Biologists W. Banko and E. Kridler of the U.S. Fish and Wildlife Service, and E. Kosaka and G. Swedberg of the State Division of Fish and Game. This was an informal meeting to determine the status and what might be done to preserve the pond.

The consensus among the participants was that the area was important enough to merit special efforts toward preservation, and because of plans for the

such
development of the entire coastline was in danger of being destroyed that all efforts should be made to preserve it in such a way as to give it as permanent a status as possible. Possibilities discussed included:

1. A cooperative agreement between Bishop Estate and a government agency (Hawaii Department of Land and Natural Resources or U.S. Fish and Wildlife Service) or private conservation organization.

2. A long-term lease to the State, or Federal government or to a private conservation organization.

3. Acquisition in fee by Hawaii Department of Natural Resources or by the U.S. Fish and Wildlife Service or by a private conservation organization. The possibility of requesting the Bishop Estate to turn the area over to Bishop Museum as a sample of natural environment of the early Hawaiians was also discussed.

It was agreed that as an interim measure, the State should contact the Trustees and ask to establish the area as a wildlife sanctuary through a cooperative agreement (cancellable upon short notice if required by the Trustees as a part of the agreement).

However, at a later meeting between Mr. Carlson and Dr. Force of Bishop Museum, which G. Swedberg attended, Dr. Force agreed to request that the area be turned over to the Museum as an environmental area at an opportune time. It was felt that this request had more chance of success and that such action would give the area more permanent status. Mr. Carlson and Dr. Force requested that the State delay contacting the Trustees regarding a cooperative agreement until Dr. Force has had a chance to present his request to them. No action has been taken to date.

Plans and Recommendations:

A meeting is being called which will include all knowledgeable individuals and responsible agencies concerned with the preservation of endangered species to determine the most critical areas of endangered species habitat remaining within the State and to prepare an action plan for their preservation. Maitalawena (Opaeula) Pond will be included in this plan.

It is recommended that the Department of Land and Natural Resources assist in every way possible to implement the action program plan now being developed.

Respectfully submitted,

GERALD E. SWEDBERG
Wildlife Biologist
State Division of Fish & Game

Prepared: March 19, 1959

T C. 1979

STAFF REPORT ON
OPAEULA POND, ISLAND OF HAWAII, AS A WILDLIFE SANCTUARY

Purpose of this Report is to provide information concerning the importance of Opaeula Pond located at Makalawena in North Kona, Hawaii as a wildlife sanctuary. Opaeula has long been identified as a key habitat for endangered waterbirds (see enclosed booklet). The report will summarize the physical and biological conditions of the pond as a wildlife habitat and suggest some management measures which appear to be desirable in the preservation and management of the area.

Past and Present Use

Evidence of a prehistoric settlement in the form of remnants of stone walls and platforms indicate that the area adjacent to the pond at Makalawena was used by the early Hawaiians. There was apparently continuous occupation of the Makalawena fishing village up until the 1946 tsunami when practically all structures were destroyed. Use of the pond for fish culture ceased at the time, however, fishermen continue to harvest small quantities of the small shrimps known as Opaeula for use as bait in chumming for opelu. One elderly gentlemen remains as a "resident" at the area.

Description of the Area

Pond

Opaeula pond contains approximately 7.5 acres of open water and marshland surrounded by low rough lava on three sides and a sand covered lava barrier on the west or seaward side. The water depth varies from 0 inches where mudflats occur to approximately three feet. The average depths are four to twelve inches. The bottom is composed primarily of a soft, silty mud which apparently extends to a depth of three or four feet over much of the pond. The water is

brackish, with the source of freshwater being primarily underground drainage from the slopes of Hualalai. Salt water enters from the high salinity water table and occasional severe storm waves which wash over the sand beach from the ocean less than 100 yards from the pond.

Vegetation

The pond is surrounded by a thicket of exotic vegetation with an overstory of dense kiawe (Prosopis) on the east and south sides and a fringe of kiawe bordering the pond on the west side and backed by a grove of ironwood (Casuarina) and a few coconut (Cocos) trees. The north side of the pond flanked by a more recent a'a lava flow is more open with a thin border of kiawe along the edge of the pond.

The primary forms of plant life found within the pond include Makaloa (Cyperus) a low rush, pond weed (Ruppia), bullrushes (Scirpus), water hyssop (Bacopa), and beach dropseed grass (Sporobolus).

In the pond is a series of islets ranging in size from few square feet to several hundred square feet. These islets are mostly quite small and are composed of emergent vegetation; however, a few have outcroppings of bare lava showing above the water level.

Other plants which are found in and around the pond area are beach morning glory (Ipomoea), ohelo kai (Lycium), fleabane (Pluchea), and fountain grass (Pennisetum). None of these appear to contribute directly to the welfare of the birds.

Birdlife

Opaeula pond stands out on the island of Hawaii as the most important of three areas identified as primary waterbird habitat. Hawaiian Stilt or Aeo and Hawaiian coots (Alae keokeo) are represented by resident breeding populations of 15 to 20 birds of each species while four to eight Auku or

Black-crowned night heron frequent the pond year-round for feeding, and may nest in the surrounding trees. From September through April flocks of migrant shoveller and pintail ducks feed in the pond. Smaller numbers of several other migratory ducks such as widgeon and scaup are occasional visitors. Migratory golden plovers, sanderlings, wandering tattlers, ruddy turnstones, and other less common shorebirds feed along the shores of Opaeula and its satellite pools.

The Management Plan

Boundary

It is recommended that approximately 40 acres be preserved and managed as a wildlife sanctuary (Figures 1 and 2). The red line on the attached sketch maps indicates the proposed boundary of the sanctuary area.

Habitat Management

The primary purpose of acquiring this area would be to promote the preservation and management of the various native waterbird species and to enhance the survival of other plant and animal life in a native habitat.

The pond itself would be regulated as a wildlife sanctuary with access strictly controlled.

The following are improvements which would be considered for implementation once the area is established as a sanctuary:

A. Fencing, Roads and Area Clean-up

An alternate access to Puu Alii Bay must be established to minimize disturbance to the pond. The only access to this area now is through the narrow corridor between the sea and Opaeula pond. Approximately 1.3 miles of unpaved roadway to the south of Opaeula would satisfy this need. The existing roadway to the pond shall be maintained and slightly improved for official use.

The eastern reaches of Opaeula are littered with broken glass, empty glass jugs and old roofing iron. This debris constitutes a physical hazard, is unsightly and must be renoved.

As development and use of the adjacent beach and surrounding areas increase, it will be desirable to construct a fence or other barrier, perhaps a stonewall, to demark the makai boundary of the sanctuary area. This wall should be located at least 50 feet from the pond at the point where the pond lies closest to the sea. The barrier should be further from the pond along the northern, southern and eastern boundaries.

B. Silt Control

The pond in its present state is excellent water and shorebird habitat and appears fairly stable but may be gradually filling in with matter, mostly organic, from normal natural causes. The thick layer of mud on the bottom may actually be of fairly recent origin, and a large part of the deposit may have accumulated since the 1946 tsunami. If this is the case, and the pond keeps filling in, it may become necessary to pump silt out of the pond in order to maintain habitat for the endangered species. Excess silt could be deposited on adjacent lava with no adverse effects.

C. Plant and Animal Control

Vegetation surrounding the pond is presently heavily utilized by a herd of some 60 goats. Upon removal of these animals native vegetation should be reintroduced (noni, kou, nilo, etc.). Gradual replacement of introduced exotic vegetation by native plant species should be accomplished. The kiawe and ironwood trees growing on the western coastal side of the pond should be the last to be replaced as they provide a visual buffer and protect the pond from extreme storm and tsunami influences.

The effects that introduced fish, at least two species of tilapia are suspected to be in the pond) have on brine shrimp and algae should be explored to determine the extent of competition with waterfowl for these food items. It may be desirable to remove them.

Mongooses, cats and rats have been seen in the vicinity of the pond. An intensive predator control effort is needed to remove these predators and to keep them away. Stray dogs must also be removed.

D. Nest Islands

Wherever possible, areas of pond vegetation and mudflats would be cut off from the surrounding lava to create additional islets and shallow water feeding areas. Also, some of the larger, existing islets could be cut into smaller ones. These modifications would increase the habitat available to native birds for feeding and nesting, and provide greater protection from predation.

E. Posting and Patrol of Sanctuary

The boundary of the sanctuary would be posted with signs informing the public of its status and warning against trespass and molesting the birdlife. Patrol of the area would be accomplished by frequent scheduled visits by the Conservation Enforcement Officers and quarterly inventory trips by Wildlife Biologists. Visits by the wildlife staff and cooperating scientists conducting studies and predator control programs will provide additional surveillance.

F. Compatible Use of Adjacent Lands

The beach lands would remain open to the public as a day-use only park. It is proposed that camping would not be permitted in the area.

Information and Education

A large, informational sign similar to other wildlife sanctuaries would be posted at the entrance to the sanctuary. A bird viewing vantage point will also be identified.

Historical Site Evaluation

Early in the planning process for the development and management of the sanctuary a thorough evaluation of the entire area will be made by the State archaeologist to identify and locate all existing historical sites. Important sites will be preserved as recommended by the State archaeologist.

It is contemplated that the incremental acquisition, planning and development of the sanctuary should be completed within five or six years.

Prepared by: D. H. Woodside
11/1/79

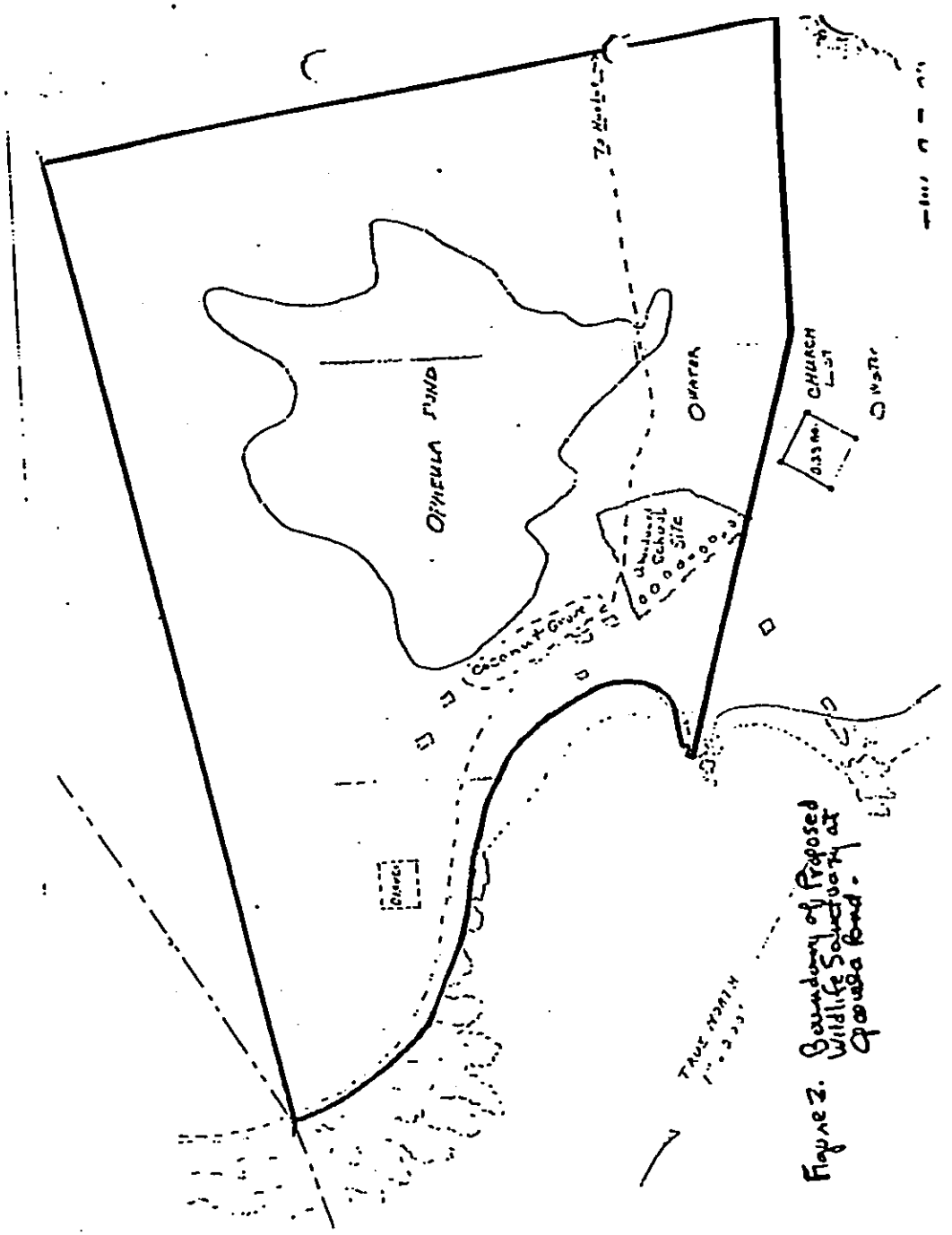


Figure 2. Boundary of Proposed Wildlife Sanctuary at Goleta Pond.