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GOVERNOR OF HAWAII



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
P. O. BOX 62191  
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AUG 27 1991  
OFFICE OF ENVIRONMENTAL  
QUALITY CONTROL

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WATER AND LAND DEVELOPMENT

Office of Environmental  
Quality Control  
465 South King Street, Room 1155  
Honolulu, HI 96813

Gentlemen:

Subject: Environmental Assessment for Right-of-Entry onto and  
Conveyance of Government Lands at Puako, Lalamilo,  
South Kohala, Hawaii

Copies of the above-cited assessment were forwarded for our  
review and comments. Details are as follows:

Paniau Partners, a Hawaii General Partnership for and on behalf  
of the American Trust Company of Hawaii, Inc., a Hawaii  
Corporation, Trustee under Land Trust No. 90-01917 established  
for the benefit of the Annabelle Ruddle Family.

Right-of-entry onto and conveyance of portions of Puako Beach  
Drive Extension and portions of Parcel 12 of Tax Map Key  
3rd/6-9-01 and Parcels 01, 02, 49, 50, 51, and 52 of Tax Map  
Key:3rd/6-9-06 situate at Puako Beach Lots, Lalamilo, South  
Kohala, Hawaii.

As owner of the underlying lands, we have, as requested,  
reviewed said assessment. Please be advised that on the basis of  
the assessment, we find that the proposal will have no adverse  
impact on the environment.

Please find enclosed for your consideration and action three  
(3) copies of the Environmental Assessment together with maps.

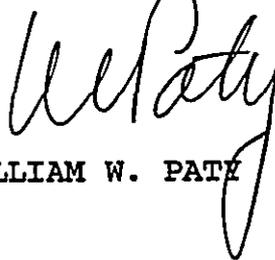
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Office of Environmental  
Quality Control

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For any questions to the foregoing, please contact our Hawaii  
District Land Office at 933-4245.

Very truly yours,



WILLIAM W. PATE

Encls.

c: Hawaii Land Board Member  
Land Management Administrator  
Hawaii District Land Office  
Planning Department, County of Hawaii

1991-09-08-HI-FEA

**FILE COPY**

**ENVIRONMENTAL ASSESSMENT**  
**\* PUAKO BEACH DRIVE EXTENSION**  
**APPLICATION FOR RIGHT OF ENTRY**  
**AND ACQUISITION \***

**Puako, Lalamilo, South Kohala, Hawaii**  
**Tax Map Keys: 6-9-06: portion of 1, 2, 49, 50,**  
**51 & 52 and 6-9-01: portion of 12**

**ENVIRONMENTAL ASSESSMENT**

**PUAKO BEACH DRIVE EXTENSION**  
**APPLICATION FOR RIGHT OF ENTRY**  
**AND ACQUISITION**

**Puako, Lalamilo, South Kohala, Hawaii**  
**Tax Map Keys: 6-9-06: portion of 1, 2, 49, 50,**  
**51 & 52 and 6-9-01: portion of 12**

**Applicant:**  
**Paniau Partners**  
**P. O. Box 1785**  
**Kamuela, Hawaii 96743**

**For Submittal to:**  
**State of Hawaii**  
**Department of Land and Natural Resources**

**April, 1991**

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LIST OF EXHIBITS

Exhibit

- A American Trust Co. of Hawaii, Inc., Consent to Application
- B Land Patent No. 10,559 to Annabelle Ruddle, dated Nov. 30, 1937
- C Letter dated Sept. 8, 1958 from Commissioner of Public Lands re Puako Road Extension Land Exchange
- D Phased Archaeological Inventory Survey, Puako Beach Road Extension Corridor, Paul H. Rosendahl, Ph.D., Inc.
- E Topographic Survey Map of Project Area with Significant Archaeological Sites Identified

**ENVIRONMENTAL ASSESSMENT  
PUAKO BEACH DRIVE EXTENSION**

**1.0 INTRODUCTION AND SUMMARY**

**1.1 Introduction**

This environmental assessment is prepared pursuant to Chapter 343, Hawaii Revised Statutes (HRS), and is intended to supplement an application for a right of entry on State-owned land designated as the Puako Road Extension and for acquisition of adjoining State land for the purpose of constructing an extension of Puako Beach Drive, a government road maintained by the County of Hawaii and the installation of utilities. The project area is situated at Puako, Lalamilo, South Kohala, Hawaii (Figure 1).

The applicant, Paniau Partners is seeking to extend Puako Beach Drive in order to provide access to the 7.42 acre parcel of land also situated at Puako, which it intends to develop into a residential subdivision and planned unit development.

**1.2 Definition of Terms**

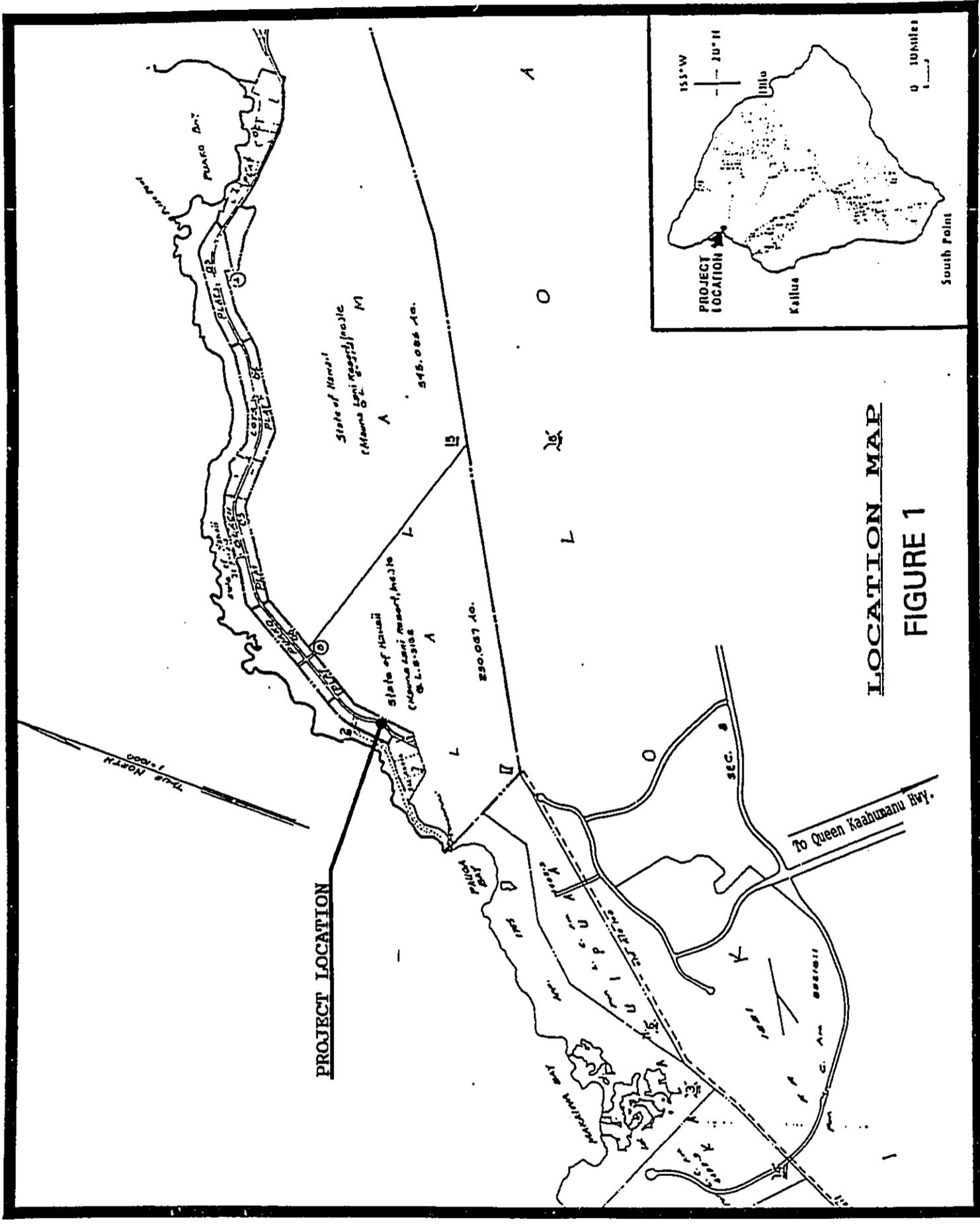
**Applicant:** The applicant is the developer of an adjoining residential zoned parcel of land, Paniau Partners, a Hawaii general partnership, whose mailing address is P. O. Box 1785, Kamuela, Hawaii 96743.

**Applicant's Property:** The applicant's property is a 7.42 acre shoreline parcel situated at Puako at the southern end of Puako Beach Drive, at Lalamilo, South Kohala, Hawaii, designated as Lots 10, 11 and 12 of the Puako Beach Lots and Tax Map Key 6-9-01:7.

**Owner:** The owner is American Trust Co. of Hawaii, Inc., a Hawaii corporation, whose address is 841 Bishop Street, 12th Floor, Honolulu, Hawaii 96813. American Trust owns the property as trustee under Land Trust No. 90-01917, for the benefit of the of the Annabelle Ruddle family. The owner has consented to the proposed action (Exhibit "A").

**Project Area:** The project area consists of a portion of the State owned land which extends from the end of the existing Puako Beach Drive to the applicant's property. The project area includes the State designated Puako Road Extension and adjacent State land.

**Proposed Action:** The action proposed herein contemplates the use of State land for the extension of an existing government road and utilities, including water, electricity, street lights telephone and cable. The roadway extension will provide access from the end of the existing Puako Beach Drive to the applicant's property. The roadway will also provide improved public access to other State parcels, as originally planned by the Territory of Hawaii in 1958, by its land exchange with Annabelle Ruddle, documented by Land Grant



**LOCATION MAP**  
**FIGURE 1**

No. 13,613, for the Puako Beach Drive extension. The improvements will include a paved roadway, constructed to County of Hawaii dedicable standards, with necessary utilities. Upon completion, it is intended that the roadway improvements, with the State's approval, will be transferred to the County of Hawaii.

### 1.3 Development Summary

**Applicant** Paniau Partners  
P. O. Box 1785  
Kamuela, Hawaii 96743

**Owner:** American Trust Co. of Hawaii, Inc.  
841 Bishop Street, 12th Floor  
Honolulu, Hawaii 96813

**Property Location:** Puako Beach Lots, Puako, Lalamilo, South Kohala, Hawaii

**Tax Map Keys and Parcel Sizes:** (3)6-9-06:1 - 14,000 sq.ft.  
(3)6-9-06:2 - 14,114 sq.ft.  
(3)6-9-06:49 - 13,731 sq.ft.  
(3)6-9-06:50 - 14,000 sq.ft.  
(3)6-9-06:51 - 87,301 sq.ft.  
(3)6-9-06:52 - 53,027 sq.ft.  
(3)6-9-01:12 - 25,962 sq.ft.

**Project Area Size:** approximately 44,500 sq.ft.

**Proposed Action:** Applicant Action. This environmental assessment has been prepared pursuant to Chapter 343, HRS, as an integral part of an application for a right of entry on State-owned land designated as the Puako Road Extension and for acquisition of adjoining State land for the purpose of constructing an extension of Puako Beach Drive, a government road maintained by the County of Hawaii, and the installation of utilities.

**Accepting Agency:** Department of Land and Natural Resources, State of Hawaii

**Existing Land Use Regulations:** State Land Use District: Urban  
County General Plan Designation: Low Density Urban  
County Zoning: RS-10 and Open

**Existing Land Uses:** The site is presently undeveloped and is covered with kiawe thickets. There are archaeological sites scattered in the vicinity of the project area.

#### 1.4 Alternatives Considered

Three alternatives to the proposed action were considered: a no action alternative, alternative corridor alignments and a relocated corridor alignment. The first alternative was determined to be undesirable because the alternative would not permit adequate access to the applicant's property. The alternative corridor alignments, following either the path of an existing jeep road or the existing Puako Road Extension alignment, were also determined to be undesirable because of environmental constraints. The third alternative of entirely relocating the access, although possible in theory, was excluded because this alternative would require access along a private road, which could not be secured from the property owner. This last alternative would also require approval from the State for an easement which would extend the private road to the applicant's property.

#### 1.5 Determination

Based on the analyses presented herein, the proposed action will not pose any significant adverse environmental impacts.

#### 2.0 DESCRIPTION OF PROPOSED ACTION, ALTERNATIVES CONSIDERED AND AGENCIES CONSULTED IN PREPARING ASSESSMENT

##### 2.1 Description of Proposed Action

The applicant proposes to construct an extension of Puako Beach Drive, a County maintained government road situated on State land, and to install necessary utilities to provide the access and utility service to the property the applicant is developing. (Figure 2). In order to construct this road extension, the applicant is seeking to secure a construction right of entry from the State of Hawaii along the State land designated as the Puako Road Extension and to acquire from the State of Hawaii additional land adjacent to the Puako Road Extension. The project area includes the portions of Tax Map Keys 6-9-06:1, 2, 49, 50, 51 and 52 and 6-9-01:12 as well as the area designated as the Puako Road Extension. (Figures 2 and 3).

The property being developed by the applicant, Lots 10, 11 and 12 of the Puako Beach Lots, TMK: 6-9-01:7, is 7.42 acres in size and is zoned residential with a minimum lot size of 10,000 square feet (RS-10). The present zoning for the property would permit the subdivision of the property into approximately 31 lots. There are three old houses presently located on the property and access is provided to the lot by means of a jeep road extending from the end of Puako Beach Drive down along the shoreline through the State beach reserve. County water is provided to the property by means of a waterline extending from the end of the County system at the termination point of the present Puako Beach Drive. Other utilities, such as electricity, telephone and cable TV are provided to the applicant's property by means of an undefined easement. Construction of the roadway and the installation of utilities will permit the applicant to develop its property into a low density

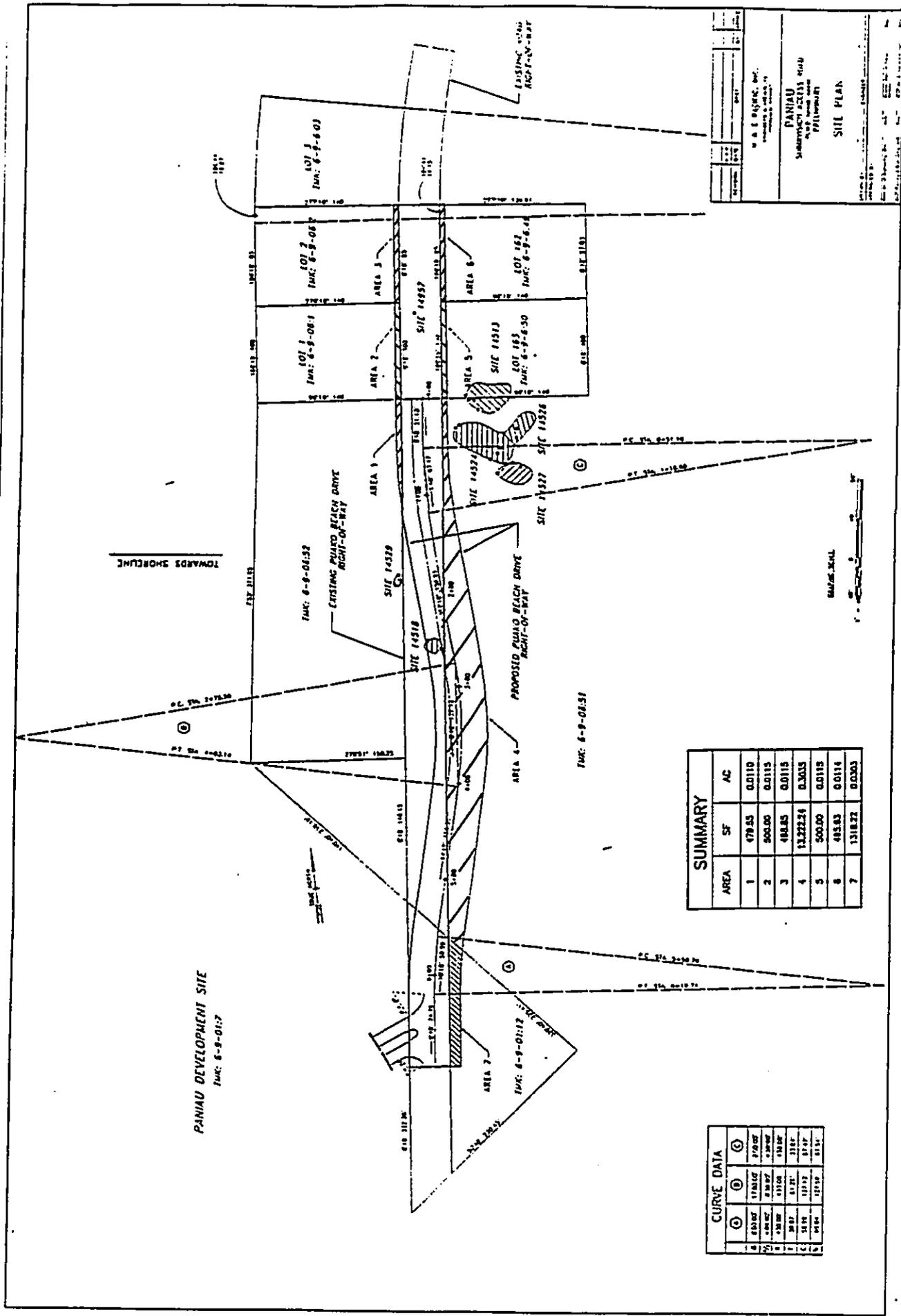


FIGURE 2



planned unit development consisting of approximately 10 buildable residential lots and common open space areas.

The applicant is proposing to extend the existing Puako Beach Drive for a distance of approximately 890 feet in a southerly direction to the north-eastern boundary of the applicant's property. The roadway is proposed to be constructed to County of Hawaii dedicable standards which require a right of way width of fifty feet and an asphalt concrete pavement width of twenty feet. It is proposed to end in a hammerhead design at the applicant's property. The applicant also intends to extend to applicant's property an 8-inch County waterline, which presently terminates at the end of the existing Puako Beach Drive. Other utilities proposed to be extended along the road right of way and reinstalled on applicant's property include electricity, street lights, telephone and cable TV.

The specific alignment of the roadway was selected after an archaeological survey was conducted to locate any historical or archaeological features in the area. The subject roadway alignment is intended to avoid any impact upon significant historical or archaeological sites. Accordingly, the proposed road alignment deviates slightly from the State designated Puako Road Extension.

The roadway alignment proposed would require the acquisition of approximately 17,015 square feet of land from the State adjacent to the Puako Road Extension corridor (see Figure 2). The remaining portion of the roadway of approximately 27,485 square feet would be within the Puako Road Extension corridor.

The applicant is seeking to obtain the subject right of entry and to acquire adjoining State land in order to confirm and define a right of access to the applicant's property from the original grant conveyed by the Territory of Hawaii. (See Exhibit "B"). The applicant's property was conveyed to Annabelle Ruddle from the Territory of Hawaii by Land Patent No. 10,559, dated November 30, 1937, issued as part of a land exchange with Mrs. Ruddle for property conveyed to the Territory for the Hilo airport. Although the Land Patent is silent as to the access to the applicant's property, in 1958 the Territory of Hawaii acquired a portion of Mrs. Ruddle's lot in a land exchange for the extension of the Puako Beach Road. (See Exhibit "C"). This proposed road extension was intended to provide access to the applicant's property as well as the other parcels in the Puako Beach Lots.

## **2.2 Alternatives Considered**

Three alternatives to the proposed action are considered below: a no-action alternative, alternative corridor alignments, and a relocated corridor alternative. All of these alternatives preclude the development of applicant's property and require the applicant to retain its property in its present condition for an undetermined period of time.

(a) **No-Action Alternative.** The no-action alternative would include continued use of the existing jeep road in its present condition. The benefits associated with this alternative

would relate to economic "savings" incurred from refraining from constructing an access road and utilities.

The detriments for the no-action alternative are many. The present condition of the jeep road makes access to the applicant's property difficult and dangerous. Subdivision of the property into individual residential lots would also not be possible under this alternative.

(b) **Alternative Corridor Alignments.** The applicant has looked at improving the existing jeep road as an alternate alignment. However, the jeep road, located on State land, is within the government beach reserve and in places extends into the ocean. The benefit of this alternative would be associated with the use of an existing roadway alignment. The detriments of this alternative would include the engineering problems associated with the construction of a roadway within the beach area, and more importantly, the loss of a portion of the Puako Beach, a valuable recreational resource.

The applicant has also looked at following the designated alignment of the Puako Road Extension. The benefit of this alternative is that the area has already been set aside for road use by the State. The detriment of this alternative would be that utilizing the existing roadway corridor would destroy certain significant archaeological sites.

(c) **Relocated Corridor Alignment.** The applicant has considered the alternative of relocating the access to the southern end of the property. This would involve utilizing an existing private road through the Mauna Lani Resort and securing an easement from the State for an extension of the private road to the applicant's property. This alternative does not appear to be viable because the private road to the public park adjacent to the applicant's property is closed during non-daylight hours.

(d) **Alternative Analysis Conclusion.** The only feasible alternative by which the applicant can realistically develop the applicant's property is by means of the proposed action.

### 2.3 Consulted Agencies

The following agencies were contacted for information used in preparing this assessment:

**State Agencies:**  
Department of Land and Natural Resources

**Hawaii County Agencies:**  
Planning Department  
Department of Public Works  
Department of Water Supply

### **3.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT, POTENTIAL IMPACTS AND MITIGATION MEASURES**

#### **3.1 General Physical Environment**

(a) **Location.** The project area is located within the State designated Puako Road Extension, at the southern end of Puako Beach Drive, and within adjacent State parcels, approximately 150 feet inland or mauka from the shoreline along the coast, at Puako, Lalamilo, South Kohala, Hawaii.

(b) **Surrounding Land Uses.** The project area is located immediately south of the Puako Beach Drive, a roadway constructed in the 1960's to service the Puako Beach Lots. The project area is also south of the Puako Beach Lots, a residential subdivision developed by the Territory of Hawaii. The Puako petroglyph fields, presently leased by the State to Mauna Lani Resort, are located immediately mauka or east of the project area.

Mauna Lani Resort, an ultra-luxury mixed use resort area, is located approximately one-half mile to the south of the project area. Hapuna Beach Park, a State beach park developed for active park use, with cabins and pavilions, is located approximately two miles to the north of the project area. Wailea Beach, a beach area proposed as an extension of Hapuna Beach Park, is located approximately one mile to the north of the project area.

(c) **Climate.** The project area is located in the coastal leeward section of the island of Hawaii and is characterized by a dry (10 inches annual average rainfall) and hot (76 degree mean temperature) climate. This condition is alleviated by on-shore breezes and winds which sweep over the upper Waimea area then down the slopes to Kawaihae and Puako.

(d) **Topography, Physiography & Geology.** The geologic substrate of the project area is of the Hamakua series issuing from Mauna Kea. Land forms are characterized by a general gradual slope to the coast which is broken by numerous eroded ridge and gullies. The elevation ranges between 6 to 18 feet above sea level.

Soils of the area are classified as Kawaihae, extremely stony very fine loam. Permeability for this classification is moderate, run-off is medium with moderate erosion hazard. These soils are used mostly for pasture, wildlife habitat and recreation areas.

(e) **Drainage and Floods.** There are no streams or natural drainageways crossing the project area. Rainwater generally percolates through the soil. The project area is designated as being in Zone (X) on the U.S. Corps of Engineers Federal Insurance Rate Map (FIRM), which is outside of any flood prone area. In addition, it is not within a coastal high hazard or tsunami zone under the FIRM.

### 3.2 Flora and Fauna

Vegetation in the area consists largely of kiawe (*Prosopis padilla*) thickets, with outcrops of various grasses such as bristly foxtail (*Sertaria verticillata*), guinea grass (*Panicum maximum*), fountain grass (*Pennisetum setaceum*), sow thistle (*Sonchus oleraceus*), and kikuya grass (*Pennisetum clandestinum*). The area was subject to an extensive brush fire several years ago, which denuded most of the growth. However, some regrowth has occurred.

Although no specific faunal survey of the project area was taken, known mammals in the area include the mongoose (*Herpestes auropunctatus*), feral goat (*Capra hircus*), house mouse (*Mus musculus domesticus*). Also, stray domestic dogs and cats are known to roam the area. Birds known to occur in the area include the mynah (*Acridotheres tristis*), barred dove (*Geopelia striata*), laced-neck dove (*Streptopelia chinensis*), sparrow (*Passer domesticus*), cardinal (*Cardinalis cardinalis*), chukker and quail.

**Probable Impact.** There are no known endangered plant species in the area and the removal of any of the known vegetation by the proposed action will not constitute a significant impact to any of the plant colonies. Likewise, there are no known endangered mammal or bird species in the area and the removal of kiawe trees in connection with the road construction, is not expected to impose a significant impact upon any endangered bird populations.

### 3.3 Historical/Archaeological Resources

A phased archaeological inventory survey was conducted by Paul H. Rosendahl, Ph.D. within a 100 foot wide study corridor extending from the end of the existing Puako Beach Drive to the applicant's property. (See Exhibit "D"). This survey was comprised of two phases, with Phase I, conducted in October, 1990, consisting of site identification, and Phase II, conducted in December, 1990 and February, 1991, consisting of inventory-level data collection at 15 sites within the project area. The purpose of surveying a 100 foot wide area was to find a suitable location for the alignment of proposed Puako Beach Drive Extension which would not adversely impact significant archaeological resources.

Twenty-five sites consisting of 75 component features were identified during Phase I and Phase II field work. The identified sites include 14 complexes (multiple feature sites) and 11 single feature sites ranging in condition from poor to good, with most being in fair condition. Fifteen formal feature types are represented: cave, petroglyph, terrace, modified outcrop, overhand, modified sink, pahoehoe excavation, paved area, alignment, cairn, mound, rubble concentration, rubble excavation, U-shape wall/enclosure and wall.

Inventory level data collection, consisting of detailed site recording and limited subsurface testing, was conducted at 15 sites during Phase II (Sites 14513, 14514, 14518, 14519, 14520, 14521, 14524, 14525, 14526, 14528, 14531, 14532, 14533, 14534, and

14957). This level of data collection was conducted because it was determined that the 15 sites would be affected by the proposed road construction.

Ten out of the fifteen sites that have undergone inventory-level work were assessed as significant for their information content only (Sites 14514, 14519, 14520, 14521, 14525, 14528, 14531, 14532, 14533, and 14534). These sites were document to the extent that no further work is needed. It was also concluded that no preservation of any of the ten sites was necessary or appropriate.

The five remaining sites, all of which contain one or more petroglyph figures as component features, were assessed as significant for both information content and culture values (Sites 14513, 14518, 14524, 14526, and 14957). Four of the five sites were adequately documented and it was concluded that no further work was needed at those sites. It was, however, determined that one site (14526) needs further data collection work.

Regarding the treatment of the five sites, Dr. Rosendahl concluded as follows in his inventory survey:

"While preservation "as is" would usually be the preferred form of treatment for all five sites, it has been recommended in this instance for only three of the sites. Because roadway design engineering has determined that it would not be possible to construct the proposed road to required Hawaii County standards without directly impacting Sites 14518 and 14957, it has been recommended that the single petroglyph figure present at each site be recorded as completely as possible (already done) and an attempt be made to remove the futures by cutting an appropriate-sized piece of pahoehoe bedrock free. If this removal were successful, then the figures could be moved and placed with other figures at one of the sites recommended for preservation--possibly Site 14529, which has tentatively been assessed as appropriate for preservation with interpretive development. This alternative treatment for Sites 14518 and 14957 has been discussed with DLNR-HPP/SHPO Chief Archaeologist Dr. Ross Cordy, who agreed with the proposed alternative treatment of recordation and removal, rather than "as is" preservation (March 8, 1991)." (p.30).

As a result of the phased archaeological inventory survey, the project area, consisting of a 50 foot wide right of way was designed in an attempt to avoid all five of the sites. (See Topographic Map, Exhibit E). However, following the Hawaii County standards for roadway design, all of these sites could not be avoided by the roadway. Therefore, project area was designed to avoid those sites with clusters of petroglyphs and to relocate the single petroglyphs from Sites 14518 and 14957.

# CORRECTION

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

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Regarding the treatment of the five sites, Dr. Rosendahl concluded as follows in his inventory survey:

"While preservation "as is" would usually be the preferred form of treatment for all five sites, it has been recommended in this instance for only three of the sites. Because roadway design engineering has determined that it would not be possible to construct the proposed road to required Hawaii County standards without directly impacting Sites 14518 and 14957, it has been recommended that the single petroglyph figure present at each site be recorded as completely as possible (already done) and an attempt be made to remove the futures by cutting an appropriate-sized piece of pahoehoe bedrock free. If this removal were successful, then the figures could be moved and placed with other figures at one of the sites recommended for preservation--possibly Site 14529, which has tentatively been assessed as appropriate for preservation with interpretive development. This alternative treatment for Sites 14518 and 14957 has been discussed with DLNR-HPP/SHPO Chief Archaeologist Dr. Ross Cordy, who agreed with the proposed alternative treatment of recordation and removal, rather than "as is" preservation (March 8, 1991)." (p.30).

As a result of the phased archaeological inventory survey, the project area, consisting of a 50 foot wide right of way was designed in an attempt to avoid all five of the sites. (See Topographic Map, Exhibit E). However, following the Hawaii County standards for roadway design, all of these sites could not be avoided by the roadway. Therefore, project area was designed to avoid those sites with clusters of petroglyphs and to relocate the single petroglyphs from Sites 14518 and 14957.

**Probable Impact.** Based upon the phased archaeological inventory survey, most of the significant archaeological sites in the vicinity of the project area will not be affected by the proposed action. The impacts of the proposed action on Site Nos. 13518 and 14957 can be satisfactorily mitigated by recording as completely as possible the singular petroglyph features found at each site, which has already been done, and by relocating the petroglyphs to one of the other sites recommended for preservation.

### 3.4 Air Quality

There are no air quality monitoring stations in the West Hawaii region. Due to the lack of large stationary sources or heavy vehicular traffic in the area, it can be inferred that South Kohala presently experiences a high level of air quality (with the exception of the periodic vog from the ongoing volcanic eruption which significantly impacts the air quality in the area). Air circulation patterns on the leeward side of the island are self-contained because the area is sheltered from the full impact of the northeast tradewinds. Land-sea breezes dominate the wind regime; east-southeast winds prevail during the early morning and evening hours while west-north west sea breezes occur during the remainder of the daylight hours.

**Probable Impact.** The major impact on ambient air quality would result from construction of the roadway. Grubbing and grading will be required to prepare the site for the roadway and utilities. This will involve the use of heavy construction vehicles as well as earthmoving equipment which could stir substantial amounts of dust. This adverse effect is considered short-term, being that it would be confined only to the construction period of the roadway. Mitigating measures, such as watering, will be implemented as required by the County (in compliance with Chapter 10, Erosion and Sedimentation Control of the Hawaii County Code), to reduce or lessen the impact of dust on the surrounding land.

Long-term adverse impacts on air quality would involve primarily vehicular emissions. Approximately ten residential lots are planned by the applicant. The remaining State land is presently undeveloped. Thus, the extent of adverse impact on ambient air quality is expected to be limited.

### 3.5 Noise Quality

The noise generated on the project area comes from existing road traffic along Puako Beach Drive.

**Probable Impact.** Some short-term increase in noise level is expected during construction. This noise will be confined to normal daylight working hours. The impact is expected to be limited to nearby residences, and all operations will be conducted in conformance with the State Department of Health regulations regarding noise and vehicle emissions.

The major source of long-term noise would be generated by increased traffic due to the proposed development on the applicant's property. Considering the size and type of development being proposed, the anticipated noise impact from traffic appears to be minimal.

### **3.6 Visual Attributes**

The landscape of project area is dominated by the thick kiawe growth. Construction of the Puako Beach Drive extension will create a view corridor.

**Probable Impact.** There may be some visual impact from the paving of the roadway. However, since the surrounding property will be left in its present state, the anticipated impact from this roadway extension appears to be minimal.

### **3.7 Socioeconomic Considerations**

The proposed action will provide economic and public benefits by extending the existing government road, with private funds, though State land as well as to the applicant's property.

### **3.8 Public Services and Facilities**

There is no impact anticipated upon the existing public facilities, such as police, fire, medical facilities and schools by reason of the proposed roadway.

The County of Hawaii Department of Water Supply presently supplies water to the residents of the Puako Beach Lots. The proposed action will extend the present County waterline along the roadway, making domestic water service accessible to the State land along the roadway as well as to the applicant's property. The water line extension will also allow for the addition of fire hydrants, as appropriate, along the roadway.

The proposed action will, likewise, extend the present electrical and telephone lines along the roadway corridor.

## **4.0 RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES, AND CONTROLS FOR THE AFFECTED AREA**

### **4.1 State Land Use Law**

All lands within the State have been classified into one of four land use districts: urban, rural, agriculture and conservation, by the State Land Use Commission pursuant to Chapter 205, HRS. The project area lies within the State land use urban district.

#### **4.2 Hawaii State Plan**

The Hawaii State Plan, Chapter 226, HRS, establishes a set of goals, objectives and policies to serve as long-range guidelines for the growth and development of the State.

In general, the proposed action is compatible with these guidelines, particularly those pertaining to improving transportation systems and preserving significant historical resources.

#### **4.3 Hawaii County General Plan**

The Hawaii County General Plan is the policy document for the long range comprehensive development of the island of Hawaii. The plan contains goals, policies and standards as well as land use maps, designated as the general plan land use pattern allocation guide (LUPAG) maps, showing the locations of desired land uses.

The current LUPAG map designates the project area as Low Density Urban which is defined as

"Residential--no more than 8 units per acre (inclusive of ohana dwelling units), ancillary community and public uses, and neighborhood commercial uses."

The proposed roadway, being for public use, is consistent with the General Plan designation for this area.

#### **4.4 Hawaii County Zoning**

A small portion of the project area is zoned under the Hawaii County Zoning Code (Chapter 25 of the Hawaii County Code) as residential, with a minimum lot size of 10,000 square feet (RS-10). The remainder of the project area is zoned open (O). A roadway is generally permitted in both of these districts.

#### **4.5 Special Management Area**

The project area is located within the Special Management Area (SMA) as defined by Chapter 205A, HRS and Chapter 9 of the County of Hawaii Planning Commission Rules. The County of Hawaii regulates all development within the SMA.

Under Rules 9-4(10) of the Planning Commission Rules, "development" excludes

"(ix) The transfer of title of land;

"(x) The creation or termination of easements, covenants, or other rights in structures or land;..."

Since the proposed action seeks the granting of a right of entry onto State land and the acquisition of adjoining State land, an SMA permit is not required at the present time.

The applicant will, however, apply for an SMA permit from the County of Hawaii prior to actual construction of the roadway and development of the applicant's property.

#### **4.6 Environmental Impact Statement**

Section 343-5(a)(1), HRS provides that any use that is proposed within State land is subject to the provisions of the Environmental Impact Statement law, Chapter 343, HRS.

Section 343-5(c), HRS states that applicants proposing actions subject to Chapter 343, HRS

"shall prepare an environmental assessment of such proposed action at the earliest practicable time to determine whether an environmental impact statement shall be required."

This environmental assessment has been prepared to fulfill these requirements.

## REFERENCES

- 1987; Belt Collins & Associates; Draft Environmental Impact Statement, South Kohala . . . Resort, South Kohala, Island of Hawaii; Honolulu, Hawaii
- 1988; Hawaii Environmental Land Planning, Inc.; Environmental Assessment, Randolph B. Stockwell Conservation District Use Application, Lalamilo, South Kohala, Hawaii; Hilo, Hawaii
- 1980; Park, Gerald; Environmental Impact Statement, Paniau, Lalamilo, South Kohala, Hawaii; Honolulu, Hawaii
- 1991; Rosendahl, Paul, Ph.D., Inc.; Phased Archaeological Inventory Survey, Puako Beach Road Extension Corridor, Land of Lalamilo, South Kohala District, Island of Hawaii; Hilo, Hawaii

one/April 19, 1991/paniau/2/assessment



**American Trust**  
Co. of Hawaii, Inc.

12th Floor Davies Pacific Center  
841 Bishop Street  
Honolulu, Hawaii 96813-3947  
Telephone 521-6543

Toll Free WATS Lines:  
From Continental US (800) 367-5210  
From Neighbor Islands (800) 272-5250

November 24, 1990

Re: Lots 10, 11 and 12, Puako Beach Lots  
Puako, Lalamilo, South Kohala, Hawaii  
Tax Map Key 6-9-01:7

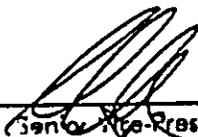
To whom it may concern:

American Trust Co., of Hawaii, Inc. is the owner of the above referenced property. This is to authorize Paniau Partners and their agents to represent American Trust Co. in all matters before the State of Hawaii and the County of Hawaii relating to the development of the subject property.

Very truly yours,

AMERICAN TRUST CO. OF HAWAII, INC.  
as Trustee Under Land Trust 90-01917

By

  
Senior Vice-President

By

  
Vice-President

C:\DATA\11001

EXHIBIT "A"

Land Patent No. 10,559

(Grant)

Issued On

LAND EXCHANGE

By THIS PATENT the Governor of the Territory of Hawaii, in conformity with the laws of the United States of America and of the Territory of Hawaii,

and in accordance with the provisions of Section 73 of the Hawaiian Organic Act and the Revised Laws of Hawaii 1935,

makes known to all men that he has this day granted and confirmed unto

ANNABELLE RUDDLE

for the consideration of the conveyance of those two (2) certain parcels of land required by the Territory of Hawaii for public use, to wit: for addition to the Hilo Airport, and more particularly described in the Exchange Deed, dated the 29th day of November, A. D., 1937, from the said Annabelle Ruddle to the Territory of Hawaii,

all of the land situate at LALAMILO  
in the District of SOUTH KOHALA Island of HAWAII bounded and described as follows:

Lots 10, 11 and 12  
Puako House Lots

Lot 10: Beginning at a + on set stone at the West corner of this Lot, and the North corner of Lot 11, the coordinates of said point of beginning referred to Government Survey Secondary Trig. Station "Pohakupuka" (marked by a  $\Delta$  on a large rock on the boundary between the lands of Lalamilo and Lahuipuaa) being 1317.5 feet North and 970.5 feet East, as shown on Government Survey Registered Map 2993, and running by azimuths measured clockwise from true South:

1. 230° 40' 300.0 feet along Government Reserve to a + on set stone;
2. 320° 40' 435.6 feet along Government land and passing over a + on Solid Pahoehoe at 219.0 feet;
3. 50° 40' 300.0 feet ~~along same;~~
4. 140° 40' 435.0 feet along Lot 11, and passing over a + on set stone at 316.3 feet to the point of beginning.

AREA 3.00 ACRES

B-1

Lot 11 - Beginning at a + on set stone at the North corner of this lot, and the West corner of Lot 10, the coordinates of said point of beginning referred to Government Survey Secondary Trig. Station "Pohakupuka" (marked by a  $\Delta$  on large rock on the boundary between the lands of Lalamilo and Lahuipuaa) being 1317.6 feet North and 970.8 feet East, as shown on Government Survey Registered Map 2993, and running by azimuths measured clockwise from true South:

1. 320° 40' 436.6 feet along Lot 10, and passing over a + on set stones at 119.3 feet;
2. 80° 40' 300.0 feet along Government land;
3. 140° 40' 436.6 feet along Lot 12 to a + on set stone, and passing over a + on set stone at 246.6 feet;
4. 230° 40' 300.0 feet along Government Reserve to the point of beginning.

AREA 2.00 ACRES

Lot 12 - Beginning at a + on set stone at the West corner of this lot, the true azimuth and distance to Government Survey Secondary Trig. Station "Pohakupuka" (marked by a  $\Delta$  on large rock on the boundary between the lands of Lalamilo and Lahuipuaa) being 28° 48' 30" 986.2 feet, as shown on Government Survey Registered Map 2993, and running by azimuths measured clockwise from true South:

1. 232° 43' 236.5 feet along Government Reserve to a + on set stone;
2. 214° 59' 147.0 feet along same to a + on set stone;
3. 320° 40' 436.6 feet along Lot 11, and passing over a + on set stones at 189.0 feet;
4. 97° 38' 563.4 feet along Government land to the point of beginning and passing over a + on set stone at 470.1 feet.

AREA 1.768 ACRES

of  
d  
lany

Attached hereto and made a part of Land Patent Grant No. 10,559

*J. B. King*  
Governor of Hawaii

*L. W. King*  
Commissioner of Public Lands

B-3

Containing 7.768 Acres, more or less.

TO HAVE AND TO HOLD the above granted Land unto the said

ANNABELLE RUDDE

and ~~her~~ heirs and assigns forever.

IN WITNESS WHEREOF, The Governor of the Territory of Hawaii has hereto set his hand and caused the Great Seal of the Territory to be hereunto affixed, this

30th day of November A. D. 1937.

BY THE GOVERNOR:

*J. W. White*  
Commissioner of Public Lands.

*J. M. Pinder*

The above exchange was approved by the Board of Public Lands, November 10, 1937

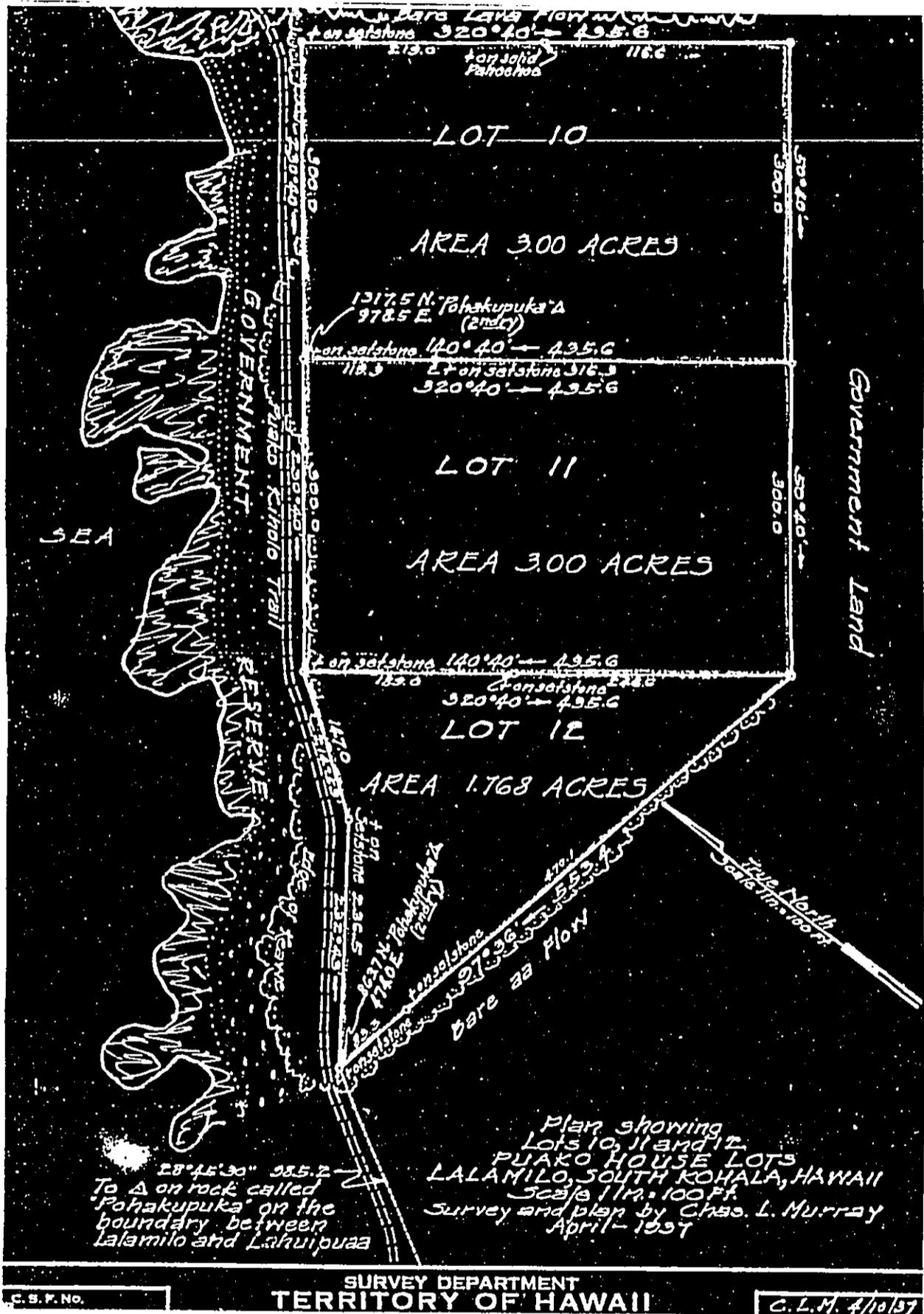
*C. S. [Signature]*  
Member, Board of Public Lands,  
Territory of Hawaii.

Approved as to form:

*B. S. Kemp*  
Attorney General.

Written by *C. S.*  
Checked by *C. S.*

B-4



B-5



TERRITORY OF HAWAII  
OFFICE OF THE COMMISSIONER  
OF PUBLIC LANDS

HONOLULU

September 8, 1958

Mrs. Annabelle Ruddle  
c/o Hilo Land Office  
Hilo, Hawaii

Dear Mrs. Ruddle:

The Land Board at its meeting held on August 29, 1958 approved the exchange between yourself and the Territory for the extension of the Puako Road and projected subdivision extension of the present Puako Beach Lots, as follows:

MRS. RUDDLE TO CONVEY TO THE TERRITORY OF HAWAII:

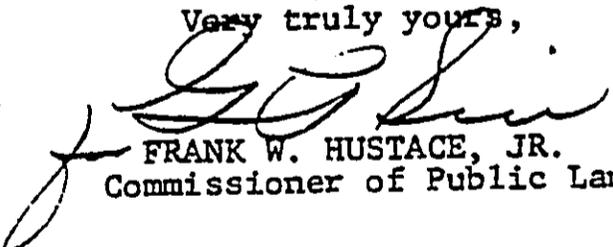
That portion of Lot 10 of the Puako House Lots, containing 22,500 square feet, situate at Lalamilo, South Kohala, Hawaii.

TERRITORY OF HAWAII TO CONVEY TO YOU:

That portion of General Lease 3083 to Richard Smart, containing an area of 9,640 square feet, situate at Lalamilo, South Kohala, Hawaii.

The necessary document will be prepared by this office and you will be further advised when the document is ready for your signature.

Very truly yours,

  
FRANK W. HUSTACE, JR.  
Commissioner of Public Lands

jkm  
cc: Land Agent, Hawaii

C

**Phased Archaeological Inventory Survey  
Puako Beach Road Extension Corridor**

**Land of Lalamilo  
South Kohala District, Island of Hawaii**

EXHIBIT "D"

**PHRI**

**Paul H. Rosendahl, Ph.D., Inc.**

*Archaeological • Historical • Cultural Resource Management Studies & Services*

305 Mohouli Street • Hilo, Hawaii 96720 • (808) 969-1763 • FAX (808) 961-6998  
P.O. Box 12835 • Tumuning, Guam 96911 • (671) 649-3045 • FAX (671) 649-2611

# Phased Archaeological Inventory Survey Puako Beach Road Extension Corridor

## Land of Lalamilo South Kohala District, Island of Hawaii

(TMK: 3-6-9-01: Por.12, Por.17)

by

Amy E. Dunn  
Supervisory Archaeologist

and

Paul H. Rosendahl, Ph.D.  
Principal Archaeologist

Prepared for

Paniau Partners  
P.O. Box 1785  
Kamuela, Hawaii 96743

January 1991

**PHRI**

**Paul H. Rosendahl, Ph.D., Inc.**

*Archaeological • Historical • Cultural Resource Management Studies & Services*

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P.O. Box 12835 • Tumuning, Guam 96911 • (671) 649-3045 • FAX (671) 649-2611

## SUMMARY

At the request of Paniau Partners, Paul H. Rosendahl, Ph.D., Inc. (PHRI) carried out a phased archaeological inventory survey of the Puako Road Extension Corridor, located in the Land of Lalamilo, South Kohala District, Island of Hawaii (TMK:3-6-9-01:Por.12, Por.17). The overall objective of the survey was to provide information sufficient for the preparation of an Environmental Impact Statement (EIS) or similar planning document that could be submitted in conjunction with a State Conservation District Use Application (CDUA) and/or Hawaii County Special Management Area (SMA) Use Permit application.

The survey comprised two phases. Phase I consisted of site identification, and Phase II consisted of collecting data at sites identified during Phase I. The data collection was to meet current inventory-level standards. Phase I was conducted on July 5-6, 1990 under the supervision of Supervisory Archaeologist Berdena D. Burgett, B.A.. During the Phase I field work, 24 sites consisting of 51 component features were identified (Burgett 1990). Phase II was conducted during two periods. The initial Phase II work was conducted December 5-21, 1990 under the supervision of Supervisory Archaeologist Amy E. Dunn. Additional Phase II work was conducted February 26-27, 1991 by Berdena D. Burgett. During the Phase II field work 15 sites consisting of 59 features were recorded to inventory-level standards. The sites ranged in condition from poor to good and consisted of both single and multiple features. Formal feature types encountered include cave, petroglyph, terrace, overhang, pahoehoe excavation, cairn, paved terrace, modified outcrop, walled terrace, paved area, modified sinkhole, alignment, rubble concentration, U-shaped wall/enclosure, mound, and walled overhang. Functional feature types encountered include temporary habitation, indeterminate, marker, and art/communication.

As part of the overall field work, nine test units (c. 7.85 sq m in surface area) were excavated in the project area. Eight units were dug during the Phase II work, and one was excavated during Phase I. The units were placed at eight features in order to ascertain whether the features contained cultural deposits, and to collect dating samples. The units yielded a variety of portable artifacts, midden, and dating samples.

Based on the above criteria, ten of the 15 sites that have undergone inventory-level work are assessed as significant for information content only. No further work is needed on the sites and no preservation of the sites is necessary. The five remaining sites are assessed as significant for both information content and cultural values. Four of the five sites have been adequately documented and no further work is needed; one site (14526) needs further data collection work. Preservation "as is" has been recommended for three of the sites. Because roadway design engineering has determined that it would not be possible to construct the proposed road to required Hawaii County standards without directly impacting Sites 14518 and 14957, it has been recommended that these sites not be physically preserved and that an alternative form of treatment be given the sites.

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## INTRODUCTION

### BACKGROUND

At the request of Paniau Partners, Paul H. Rosendahl, Ph.D., Inc. (PHRI) carried out a phased archaeological inventory survey of the Puako Road Extension Corridor, located in the Land of Lalamilo, South Kohala District, Island of Hawaii (TMK:3-6-9-01:Por.12, Por.17). The overall objective of the survey was to provide information sufficient for the preparation of an Environmental Impact Statement (EIS) or similar planning document that could be submitted in conjunction with a State Conservation District Use Application (CDUA) and/or Hawaii County Special Management Area (SMA) Use Permit application.

The survey comprised two phases. Phase I consisted of site identification (Burgett 1990), and Phase II consisted of inventory-level data collection at 15 of the total project area site. Phase I was conducted on July 5-6, 1990 under the supervision of Supervisory Archaeologist Berdena D. Burgett, B.A.. Phase II was conducted in December, 1990 and February, 1991 under the supervision of Supervisory Archaeologists Amy E. Dunn and Berdena D. Burgett, B.A., and under the overall direction of Principal Archaeologist Dr. Paul H. Rosendahl. Field Archaeologists Ed Archer, Nick Kailipaka, Robert Noah, Varda Zamier, Jennifer Creamer, Sheryl Dowden, Rebecca Sterling, Ed Archer, and Mike Fager assisted with the field work. Approximately 45 man-days of labor were expended conducting the Phases I and II field work.

### SCOPE OF WORK

The basic purpose of an inventory survey is to identify all sites and features of potential archaeological significance present within a specific project area. An *inventory survey* comprises an initial level of archaeological investigation. It is conducted basically to determine the presence or absence of archaeological resources, and indicates both the general nature and variety of archaeological remains present, and the general distribution and density of such remains. Finally, it permits a general significance assessment of the archaeological resources, and facilitates formulation of realistic recommendations and estimates for such further work as might be necessary or appropriate. Such work could include *further data collection*—additional data collection involving detailed recording of sites and features, and selected limited excavations; and possibly subsequent *mitigation*—data recovery research excavations, construction monitoring, interpretive planning and development, and/or

preservation of sites and features with significant scientific research, interpretive, and/or cultural values.

The basic objectives of the Phase I portion of the survey (Site Identification) were fourfold: (a) to identify (find and locate) all sites and site complexes present within the project area; (b) to evaluate the potential general significance of all identified archaeological remains; (c) to determine the possible impacts of proposed development upon the identified remains; and (d) to define the general scope of any subsequent further data collection and/or other mitigation work that might be necessary or appropriate.

Based on a review of readily available background literature, familiarity with both the general project area and the current requirements of State and County review authorities, and based on discussions with client representatives and with Dr. Ross Cordy, chief archaeologist in the Department of Land and Natural Resources-Historic Preservation Program/State Historic Preservation Office (DLNR-HPP/SHPO), the following specific tasks were determined to constitute an appropriate scope of work for the Phase I survey:

1. Conduct limited archaeological and limited historical documentary background research involving review and evaluation of readily available archaeological and historic literature, historic documents and records, and cartographic sources relevant to the immediate project area;
2. Conduct a 100%-coverage, variable-intensity ground survey of the road extension corridor (c. 1,000 ft long, 100 ft wide) to identify and plot the locations of all sites (both previously known and newly identified); and
3. Prepare a final report summarizing (a) all identified sites and (b) tentative general significance assessments and recommended general treatments for all sites.

The overall objective of Phase II was to conduct inventory-level data collection at 15 sites (Sites 14513, 14514, 14518, 14519, 14520, 14521, 14524, 14525, 14526, 14528, 14531, 14532, 14533, 14534 and 14957) that were identified during Phase I. It had been determined that the 15 sites would be affected by the proposed construction project. The data collection consisted of detailed site recording and limited subsurface testing.

The inventory survey was carried out in accordance with the standards for inventory-level survey recommended by DLNR-HPP/SHPO. The significance of all archaeological remains identified within the project area was assessed in terms of (a) the National Register criteria contained in the Code of Federal Regulations (36 CFR Part 60), and (b) the criteria for evaluation of traditional cultural values prepared by the National Advisory Council on Historic Preservation. DLNR-HPP/SHPO and the Hawaii County Planning Department use these criteria to evaluate eligibility for the Hawaii State and National Register of Historic Places. Cultural remains were also assessed in terms of PHRI CRM (Cultural Resource Management) value modes, which are discussed in detail in the Conclusion section.

### PROJECT AREA DESCRIPTION

The Puako Road Extension Corridor is c. 1,000 ft long by 100 ft wide and is located approximately 160 ft east of the coastline. It is bounded on the north by Puako Beach Lot 161; on the west by Puako Beach Lots 1 and 2, government land, and Annabelle Ruddle Puako House lots; on the east by Puako Beach Lots 162, 163, and the undeveloped land within the *ahupua'a* of Lalamilo; and on the south by undeveloped land in the *ahupua'a* of Lalamilo (Figure 1). The project area ranges in elevation from 4-20 feet AMSL (above mean sea level), with an average annual rainfall estimated at less than 10 inches, and a average temperature of 78 degrees F (Kennedy 1980).

The project area is located on the dry leeward coast of Hawaii Island within the coastal zone; this zone has been described by Rosendahl (1972a:11) as "...an arid, gently sloping land, with limited vegetation, thin soils, and a high proportion of relatively recent volcanic materials." The area consists of sloping pahoehoe flows characterized by collapsed blisters, small overhangs, numerous caves, and small upthrusts. As mentioned above, the soil in the area consists of sparse aeolian deposited silt loam present on exposed pahoehoe bedrock and in some of the caves. A few of the coastal caves contain pools of water; there are water line stains on the pool walls—which indicate the water level in the pool may be affected by tides. The dominant vegetation throughout the survey area is *kiawe* (*Prosopis pallida* Humb. and Bonpl. ex Willd.) bushes and trees; some of the trees have fallen. Also present are sparse grasses and *ilima* (*Sida fallax* Walp.).

### PREVIOUS ARCHAEOLOGICAL WORK

A number of previous investigations have been conducted in the general vicinity of the project area. These include

studies by Emory (1955), Ching (1971), Rosendahl (1972a), Kennedy (1980), Tomonari-Tuggle (1982), and Welch (1984).

Kenneth Emory in 1955 briefly investigated sites at Kalahuipuaa and conducted excavations at a large Kalahuipuaa shelter cave (HA-E1-342). During the same period he also excavated a cave shelter (Site H101) at Puako. Results of these excavations were not published, but Kirch's "Notes On the Excavation of Site H101, Paniau Shelter" (Kirch 1979:198), is included as an appendix to his 1979 report entitled *Marine Exploitation in Prehistoric Hawaii*. Kirch also mentions other early investigations at Puako: excavations conducted by Colin Smart, in 1962-63, at the Puako Bay coastal midden site (HA-E3-2); and a 1964 Bishop Museum study of the Puako Petroglyph Fields (E3-1). Excavations at HA-E3-2 yielded portable artifacts and faunal remains but no age determination samples were obtained. During the study of the petroglyph field, a Bishop Museum team mapped and photographed c. 3,000 petroglyphs (*ibid.*).

During the survey of the Kailua-Kawaihae Road Corridor (Ching 1971), located c. 2.5 km inland of the present project area, 665 features were recorded. Features types encountered include dwelling caves, house shelters, rock and cave shelters, walled shelters, enclosures, burials, trails, cairns, refuge cave, *holua* slide, possible *holua* slide, abrader manufacturing areas, petroglyph areas, stone mounds, terraces, walls, unassociated firepits, storage vault, and unknown function. Subsequently, salvage research investigations were conducted at sites within the corridor (Rosendahl 1972a).

In 1972, Bishop Museum conducted a brief survey of the proposed and alternate alignments of the Puako Beach Lots Spur Road located northeast of the present project area (Rosendahl 1972b). Six sites were identified, briefly described, and were plotted. The formal feature types encountered included cairns, pavements, and walled shelters. No further work was recommended for all features/sites.

In 1973 and 1975 Bishop Museum conducted an extensive two-phase archaeological survey in the *ahupua'a* of Kalahuiaa, Waikoloa, and Lalamilo, on lands owned or leased by Mauna Lani Resorts. With the exception of privately owned lands south of Puako Bay, the survey included most of the coastal lands between the shore and the Kailua-Kawaihae Highway from Puako to Honokaope Bay. One hundred seventy-nine sites consisting of 449 features were recorded during the survey (Kirch 1979:3).

Kennedy (1980) reports that Emory surveyed Paniau in 1956 and mapped 34 sites. During Kennedy's 1980 survey,

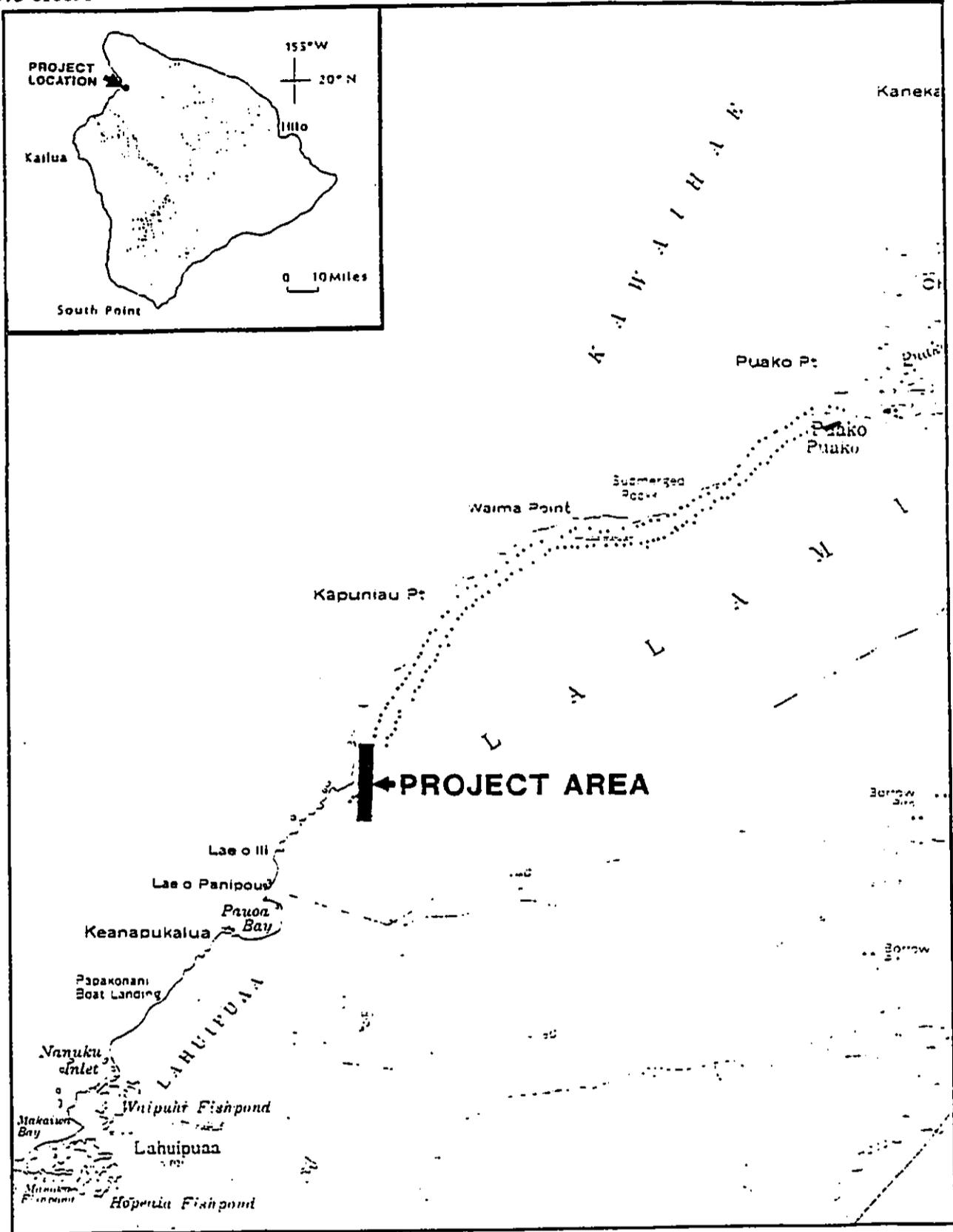


Figure 1. PROJECT LOCATION MAP

24 sites were identified within the Ruddle Property boundaries, and 47 sites containing 149 features were identified within the access road boundaries. Among the recommendations for the access road sites were "...immediate relocation and or stabilization of the petroglyphs", and "...caves containing cultural deposits must have those areas sampled archaeologically" (Kennedy 1980:61).

Additional investigations in the vicinity of the project area include a survey of a parcel adjoining the Puako Petroglyph Fields (Tomonari-Tuggle 1982), a survey of the area south of the Puako Petroglyph Archaeological District (by Bishop Museum; Welch 1984), and data recovery excavations at Site HA-E1-342, a shelter cave in Kalahuipuaa (Hommon 1983).

### FIELD METHODS AND PROCEDURES

The pedestrian survey, conducted during Phase I, consisted of a series of transect sweeps oriented roughly north-south. Intervals between sweeping crew members were maintained at 25 ft, depending on vegetation and terrain encountered. As sites were identified they were marked with pink-and-blue surveyor's flagging tape, and their locations were plotted on a blueline map furnished by the client (scale 1"=100').

The 12 sites recorded to inventory-level standards during Phase II were recorded on standard PHRI site survey forms and were photographed using 35 mm black-and-white film. The recording included written descriptions,

measurements, plan maps, estimation of the limits of cultural deposits, notation of portable remains, notation of formal type, presumed functional type and probable age, and description of surrounding terrain and vegetation. As an aid to future site reidentification, each feature was marked with an aluminum tag bearing the site number, feature letter, date, the letters "PHRI", and PHRI project number (90-975). Sites were also marked with pink-and-blue flagging tape (wrapped around a rock).

Sites identified during the pedestrian survey were assigned temporary field numbers prefixed with "T-", beginning with "T-1." Thirteen of these sites had been previously identified by Kennedy (1980). All identified sites were later assigned permanent State Inventory of Historic Places (SIHP) site numbers (see Table 1 - Correlation of Site Numbers).

During Phase II, eight test units (c. 7.5 sq m in surface area) were excavated at seven features constituting six sites. All units excavated were plotted on site/feature plan maps, and were excavated by arbitrary levels within natural layers, with all fill processed through 1/4- and 1/8-inch mesh to facilitate recovery of portable artifacts and midden. Portions of structural features were dismantled as part of the test unit excavations, and cross sections were recorded. Soils were recorded in detail using standard procedures and terminology as set forth in the Soil Survey Manual (Soil Survey Staff 1962). Eleven radiocarbon samples were submitted for radiocarbon age determination analysis. In addition to the test unit excavations, portable artifacts were collected from the surface of the project area.

Table 1.

## CORRELATION OF SITE NUMBERS

SIHP	Kennedy 1980	PHRI
14513	63	1
14514	-	2
14515	58	3
14516	-	4
14517	57	5
14518	54	6
14519	51	7
14520	8	8A
14521	-	9
14522	-	10
14523	-	11
14524	-	12
14525	-	13
14526	61	14
14527	60	15
14528	55, 56	16
14529	-	17
14530	-	18
14531	53	19E
14532	52	20
14533	-	21
14534	59	22
14535	-	23
14536	-	24
14957	-	25

## FINDINGS

### SURFACE SURVEY

Twenty-five sites consisting of 75 component features were identified during Phase I and Phase II field work (see Table 2, Summary of Identified Sites, and Figure 2) (24 sites were identified during Phase I, and one additional site was identified during Phase II). The identified sites include 14 complexes (multiple feature sites) and 11 single feature sites ranging in condition from poor to good, with most being in fair condition. Fifteen formal feature types are represented: cave (N=26, 34.7%), petroglyph (N=16, 21.3%), terrace (N=7, 9.3%), modified outcrop (N=5, 6.7%), overhang (N=4, 5.3%), modified sink (N=4, 5.3%), pahoehoe excavation (N=2, 2.7%), paved area (N=3, 4.0%), alignment (N=2, 2.7%), cairn (N=1, 1.3%), mound (N=1, 1.3%), rubble concentration (N=1, 1.3%), rubble excavation (N=1, 1.3%), U-shape wall/enclosure (N=1, 1.3%), and wall (N=1, 1.3%).

Probable functional interpretations were determined for the 15 sites fully recorded during Phase II (Tables 4 and 5). Functional site types encountered include temporary habitation, possible habitation, indeterminate, and art/communication.

Detailed site and feature descriptions for the 15 sites recorded to inventory-level standards are contained in Appendix A (at end), and include the following:

1. Site number - State Inventory of Historic Places (SIHP) numbers. SIHP numbers are four-digit numbers prefixed by 50-10-11 (50=State of Hawaii; 10=Island of Hawaii; 11=USGS 7.5' series quad ["Puu Hinai, Hawaii"]);
2. A site type designation - provides formal feature type for sites consisting of a single feature, or designates the site as a complex if the site is comprised of more than one feature. Also lists the total number of features present;
3. A description of site topography - a brief description of the terrain in the area of the site;
4. A listing of site vegetation - lists principal components of the vegetation within and in the vicinity of the site;
5. A statement of the site condition - overall state of preservation of the site (poor, fair, good, or excellent);

6. An assessment of the site integrity - degree of post abandonment modification by human agencies (unaltered, partially altered, and completely altered) and the nature of modifications, if any;
7. A probable age - indicates probable/possible (?) age of the site (i.e. historic or prehistoric);
8. A functional interpretation - probable or possible (?) functions for each site; or, if a function cannot be determined, an indeterminate function is assigned. For sites with multiple functions, the functions are separated by "/";
9. A site description - a brief overall description of the site listing types of constituent features, portable remains present, if any, and other site data; and
10. Feature dimensions - maximum length, width, and height or depth. Dimensions immediately followed by a description of feature construction, associated portable remains, and other descriptive information.

Within the project area are distinct signs of modification, such as bulldozer scars on bedrock, especially in the area of the powerlines.

Sites are randomly distributed throughout the project area. The features most commonly found are constructed of angular pahoehoe cobbles, slabs, and boulders either stacked or placed in such a fashion as to modify a natural feature.

Caves are the most common feature (N=26, 34.7%). Caves, as distinguished from overhangs, were defined as having an interior length greater than the interior width. The caves recorded were found to contain modifications and portable remains, thus making them cultural features. Some caves contained midden scatters or other noticeable cultural deposits; other caves contained structural modifications such as stacked pahoehoe cobbles, slabs, and boulders. The entrances of some caves were modified with windbreak features or roughly paved areas, or both. In some cases the entrances were stepped, immediately outside or immediately inside the opening. Stepped entrances were found at Sites 14518, 14519, 14520, 14524, 14528, 14531, and 14534. All caves recorded were assigned a temporary habitation or habitation function; functional assessments were based on feature/site type, method of construction, location, and presence, type, and density of cultural deposit and portable remains.

Table 2.

## SUMMARY OF IDENTIFIED SITES AND FEATURES

*SIHP Site No.	Formal Site/Feature Type	Tentative Functional Interpretation	#CRM Value Mode Assess.			+Field Work Tasks		
			R	I	C	DR	SC	EX
14513	Complex (8**)	Temporary habitation	M	M	M/H	-	-	-
A	Cave							
B	Petroglyph							
C	Petroglyph							
D	Petroglyph							
E	Terrace							
F	Cave							
G	Petroglyph							
H	Alignment							
14514	Pahoehoe excavation	Indeterminate	M	L	L	-	-	-
14515	Cave	Temporary habitation	M	L	L	+	+	+
14516	Cave	Temporary habitation	M	L	L	+	+	+
14517	Overhang	Temporary habitation	M	L	L	+	-	-
14518	Complex (3)	Temporary habitation	M	M	H	-	-	-
A	Cave							
B	Cairn							
C	Petroglyph							

\* State Inventory of Historic Places (SIHP) numbers. SIHP numbers are five-digit numbers prefixed by 50-10-11 (50=State of Hawaii; 10=Island of Hawaii; 11=USGS 7.5' series quad map ["Fuu Hinai, Hawaii"]).

## # Cultural Resource Management

Value Mode Assessment —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 = limited excavations.

\*\*Number of component features within complex.

Table 2. (cont.)

*SIHP Site No.	Formal Site/Feature Type	Tentative Functional Interpretation	#CRM Value Mode Assess.			+Field Work Tasks		
			R	I	C	DR	SC	EX
14519	Complex (5)	Temporary habitation	M	L	L	-	-	-
A	Cave							
C	Cave							
D1	Overhang							
D2	Terrace							
E	Cave							
14520	Complex (6)	Temporary habitation	M	L	L	-	-	-
A	Cave							
B	Cave							
C1	Terrace							
C2	Modified outcrop							
D	Cave							
E	Terrace							
14521	Complex (2)	Temporary habitation	M	L	L	-	-	-
A	Terrace							
B	Paved area							
14522	U-shape wall/ enclosure	Possible habitation	M	L	L	+	+	+
14523	Modified outcrop	Temporary habitation	M	L	L	+	-	+
14524	Complex (8)	Temporary habitation	M	M	H	+	-	-
A	Cave							
B	Cave							
C	Cave							
D	Cave							
E	Petroglyphs (2)							
F	Petroglyph							
G	Petroglyph							
H	Petroglyph							
14525	Modified sinkhole	Temporary habitation	M	L	L	-	-	-
14526	Complex (11)	Temporary habitation	M	H	H	+	-	+
A	Petroglyph panel							
B	Petroglyph							
C	Petroglyph							
D	Petroglyph							
E	Cave							
F	Terrace							
G	Wall							
H	Cave							
I	Cave							
J	Rubble excavation							
K	Modified sink							

# CORRECTION

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

Table 2. (cont.)

*SIHP Site No.	Formal Site/Feature Type	Tentative Functional Interpretation	#CRM Value Mode Assess.			+Field Work Tasks		
			R	I	C	DR	SC	EX
14519	Complex (5)	Temporary habitation	M	L	L	-	-	-
A	Cave							
C	Cave							
D1	Overhang							
D2	Terrace							
E	Cave							
14520	Complex (6)	Temporary habitation	M	L	L	-	-	-
A	Cave							
B	Cave							
C1	Terrace							
C2	Modified outcrop							
D	Cave							
E	Terrace							
14521	Complex (2)	Temporary habitation	M	L	L	-	-	-
A	Terrace							
B	Paved area							
14522	U-shape wall/ enclosure	Possible habitation	M	L	L	+	+	+
14523	Modified outcrop	Temporary habitation	M	L	L	+	-	+
14524	Complex (8)	Temporary habitation	M	M	H	+	-	-
A	Cave							
B	Cave							
C	Cave							
D	Cave							
E	Petroglyphs (2)							
F	Petroglyph							
G	Petroglyph							
H	Petroglyph							
14525	Modified sinkhole	Temporary habitation	M	L	L	-	-	-
14526	Complex (11)	Temporary habitation	M	H	H	+	-	+
A	Petroglyph panel							
B	Petroglyph							
C	Petroglyph							
D	Petroglyph							
E	Cave							
F	Terrace							
G	Wall							
H	Cave							
I	Cave							
J	Rubble excavation							
K	Modified sink							

Table 2. (cont.)

*SIHP Site No.	Formal Site/Feature Type	Tentative Functional Interpretation	#CRM Value Mode Assess.			+Field Work Tasks		
			R	I	C	DR	SC	EX
14527 A B	Complex (2) Cave Petroglyph (3)	Temporary habitation	M	M	H	+	-	+
14528 A B	Complex (2) Cave Paved Area	Temporary habitation	M	L	L	-	-	-
14529	Petroglyph panel	Art/communication	M	H	H	+	+	-
14530	Cave	Temporary habitation	M	L	L	+	+	-
14531 B C D E1 E2 F	Complex (6) Cave Pahoehoe excavation Paved area Overhang Cave Alignment	Temporary habitation	M	L	L	-	-	-
14532	Modified sinkhole	Temporary habitation	M	L	L	-	-	-
14533	Rubble concentration	Temporary habitation	M	L	L	-	-	-
14534 A B	Complex (2) Cave Cave	Temporary habitation	M	L	L	-	-	-
14535 A B C	Complex (3) Mound Modified outcrop Modified outcrop	Temporary habitation	M	L	L	+	+	+
14536 A B C D	Complex (4) Modified sinkhole Modified outcrop Walled overhang Terrace	Temporary habitation	M	L	L	+	-	+
14957 A B	Complex (2) Cave Petroglyph	Temporary Habitation	M	H	H			

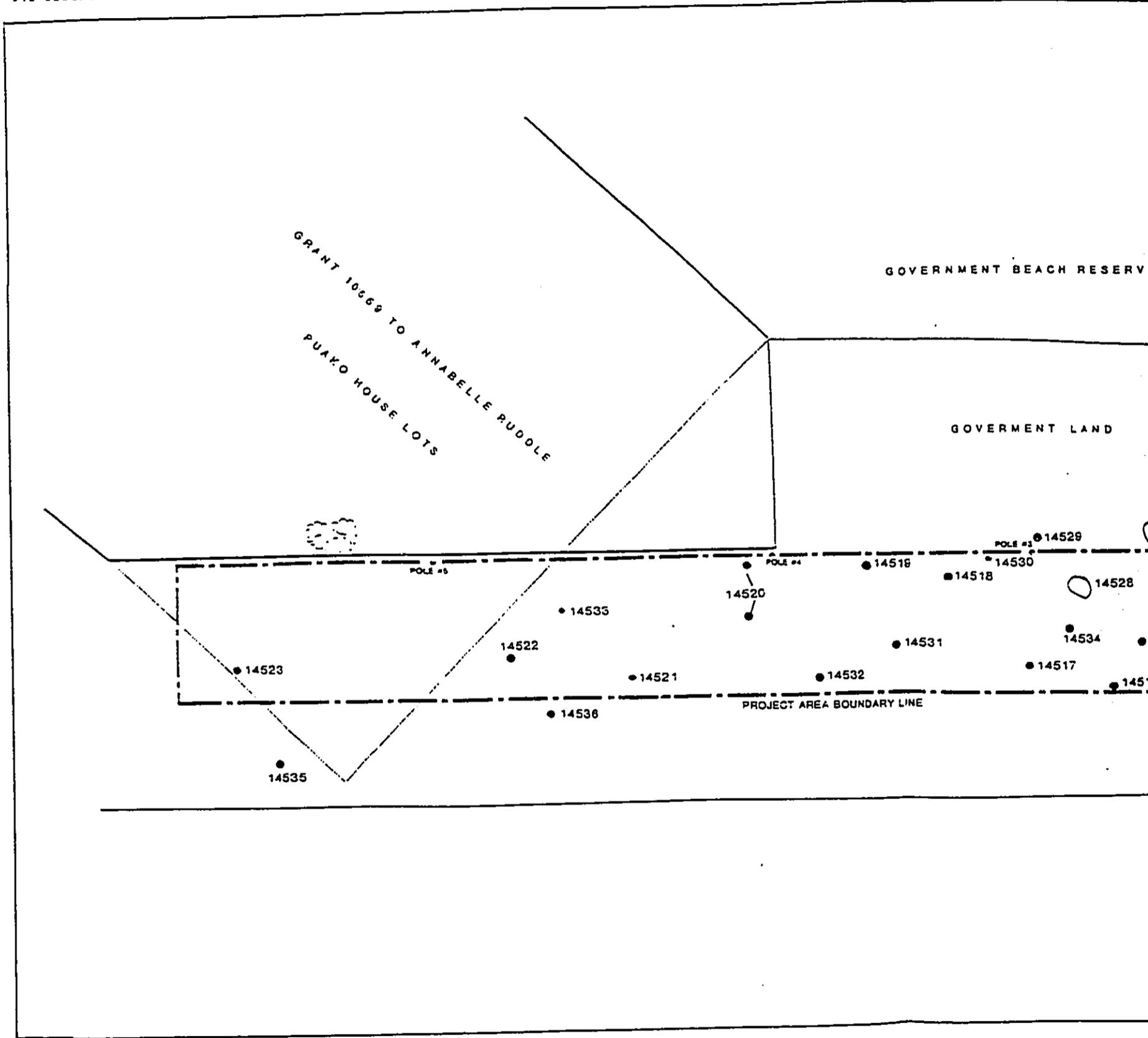
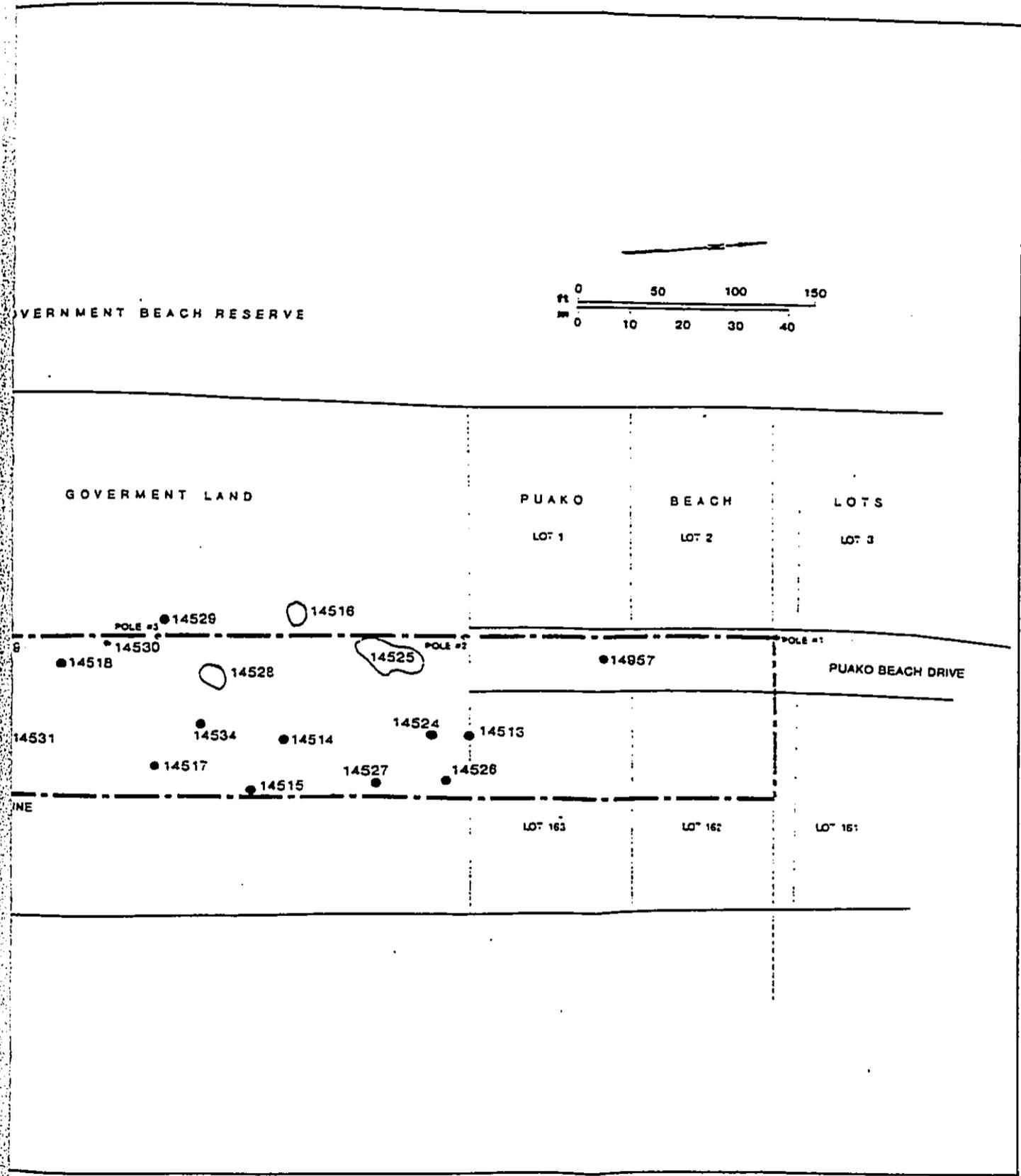


Figure 2. SITE LOCATION MAP



LOCATION MAP

Table 3.

## FREQUENCY OF FORMAL FEATURE TYPES

Formal Type	Number	%
Cave	26	34.7
Petroglyph	16	21.3
Terrace	7	9.3
Modified outcrop	5	6.7
Overhang	4	5.3
Modified sinkhole	4	5.3
Pahoehoe excavation	2	2.7
Paved area	3	4.0
Alignment	2	2.7
Cairn	1	1.3
Mound	1	1.3
Rubble concentration	1	1.3
U-shaped wall/enclosure	1	1.3
Rubble excavation	1	1.3
Wall	1	1.3
<b>Total:</b>	<b>75</b>	<b>99.8</b>

Table 4.

FREQUENCY OF FUNCTIONAL SITE TYPES -  
PHASE II

Functional Type	Number	%
Temporary habitation	14	93.4
Indeterminate	1	6.6
<b>Total:</b>	<b>15</b>	<b>100.0</b>

Table 5.

FREQUENCY OF FUNCTIONAL SITE TYPES -  
PHASES I & II

Functional Type	Number	%
Temporary habitation	22	88.0
Indeterminate	1	4.0
Art/communication	1	4.0
Possible habitation	1	4.0
<b>Total:</b>	<b>25</b>	<b>100.0</b>

Petroglyphs are located at seven sites: 14513, 14518, 14524, 14526, 14527, 14529, and 14957. The petroglyphs were recorded at five of the seven sites; those at sites 14527 and 14529 were not recorded during the survey. Petroglyphs are located at or near temporary habitation features and occur as single figures, in pairs, and as panels with multiple figures. The figures have been engraved on horizontal and vertical pahoehoe surfaces, and on the top of one lava pillar. The petroglyphs represent human figures, lizards, turtles, a *konane* board, and unidentified subjects/objects. One petroglyph at Site 14526, and three petroglyphs at Site 14527 had been previously identified by Kennedy (1980). All petroglyphs were assigned art/communication functions.

Terraces are present at Sites 14513, 14519, 14520, 14521, 14526, and 14536. Only one of the six terraces (Feature D, Site 14536) was not recorded during Phase II field work. The five recorded terraces are constructed on bedrock, are paved with small to medium, angular, pahoehoe cobbles and slabs, and have remnant facing along at least one side. The only walled terrace within the project area, Feature A, Site 14521, has wall constructed, partially faced walls along three sides. Feature E, Site 14513 terrace, constructed outside of the cave opening of Feature A, is partially buried under a deep deposit of soil, sand, marine shell midden and the trunk of a large, toppled *kiawe* tree growing within the cave entrance. All recorded terraces were assigned a temporary habitation function. This function assignment was based upon formal feature type and one or more of the following: location, method of construction, presence of portable remains, and/or associated features.

Overhangs are present at Sites 14517, 14519, 14531, and 14536. Only two sites, 14519 and 14531, were fully recorded during Phase II. Overhangs are distinguished from

caves in that they are defined as being wider than they are deep. All recorded overhangs were assigned a temporary habitation function; the assignment was based on presence of portable remains and modifications.

Modified outcrops are present at Sites 14520, 14523, 14535, and 14536. Only Site 14520 was recorded during Phase II. Site 14520 has been assigned a temporary habitation function, based on the presence of remnant paving and portable remains.

Modified sinkholes are present at Sites 14525, 14532, and 14536. Sites 14525 and 14532 were recorded during Phase II, and both were assigned temporary habitation functions. The cultural modifications within the blisters consist of portable remains, remnant paving, and/or stepped terracing.

Single pahoehoe excavations were present at Sites 14514 and 14531, both of which were recorded during Phase II. Due to a lack of cultural remains, both features were assigned an indeterminate function.

Paved areas were present at Sites 14521, 14528, and 14531; both sites were fully recorded during Phase II. The paved areas were assigned a temporary habitation function. This functional assessment was based on structural form, presence of portable remains, and location.

Single features were recorded at a number of sites. A single cairn is present at Site 14518; the cairn has been assigned a marker function, based on location, type, and method of construction. Smaller rubble excavations were assigned temporary habitation/shelter functions. One rubble concentration was recorded at Site 14533. The feature was

assigned a temporary habitation function, based on the poor structural condition and lack of deposit. A U-shaped wall/enclosure is present at Site 14522 and was assigned a possible habitation function. One mound was identified at Site 14535. The feature was associated with two other features at a complex that was determined to have an overall temporary habitation function.

Fourteen sites had been previously identified by Kennedy (1980). Thirteen of the 14 were reidentified during the present survey (see Table 1). The one site not identified may have been bulldozed.

Kennedy (1980) mentions that Site 59 (SIHP 14534) has an associated petroglyph, but Kennedy does not indicate

where it is. Despite considerable effort, the petroglyph was not located during the present work.

### SUBSURFACE SURVEY

Nine test units were excavated in the project area. Eight were excavated during Phase II, an one was excavated during Phase I. The units were placed within cultural deposits in an attempt to determine the extent and nature of the deposits, and to attempt recovery of dating samples. The units totaled c. 7.85 sq m in surface area and were placed at eight features at seven sites. Sites excluded from subsurface testing lacked deposits, or were recommended for further work in the future. Test unit findings are summarized in Table 6, and detailed descriptions of test unit stratigraphies are presented in Appendix C.

Table 6.

## SUMMARY OF TEST EXCAVATIONS

Site/ Feature Number	Formal Site Type	Tentative Functional Interpretation	Test Excavations		Immediate Action Recommended	Comments*
			Test Units	Area (sq m)		
14513 A	Complex (6) Cave	Habitation	1	1.00	Data recovery	1
14518 A	Complex (3) Cave	Temp. habitation	1	1.00	None	2
14519 A E	Complex (5) Cave Cave	Temp. habitation	1 2	1.00 2.00	None	3
14520 A	Complex (6) Cave	Temp. habitation	1	1.00	None	4
14521 A	Complex (2) Terrace	Temp. habitation	1	1.00	None	5
14533	Rubble concentration	Indeterminate	1	0.50	None	6
14534 B	Complex (2) Cave	Temp. habitation	1	0.35	None	7

- \* 1 20 cm of cultural deposit, containing marine shell midden, volcanic glass and basalt flakes, a volcanic glass core, echinoid abraders, and charcoal.
- 2 28 cm of cultural deposit, containing marine shell midden, non-human bone, gourd fragments, charcoal, historic glass fragments, volcanic glass flakes, a perforated shell, worked bone, and abraders.
- 3 Feature A contained 35 cm of cultural deposit, containing marine shell midden, non-human bone, coconut shell fragment, kukui nutshell, charcoal, coral and echinoid abraders, perforated shells, volcanic glass and basalt flakes, an adze fragment, and a fishhook. Feature E TU-2 contained 53 cm of cultural deposit, containing marine shell midden, non-human bone, charcoal,
- 4 38 cm of cultural deposit, containing marine shell midden, waterworn coral, non-human bone, charcoal, possible coral abrader, volcanic glass flakes, and a polished basalt flake.
- 5 At least 45 cm of cultural deposit, containing rock fill, waterworn basalt and coral ili ili pebbles, sparse marine shell, and volcanic glass flakes.
- 6 No cultural deposit.
- 7 2 cm cultural deposit, containing a fishhook fragment, and five echinoid abrader fragments.

## DATA ANALYSES

### AGE DETERMINATIONS

#### Objectives and Methods

The purpose of age determination analysis is to provide initial chronological data to aid in assessing the relative significance of sites in the project area. Eleven samples of charcoal were chosen from discrete cultural deposits within Site 14519 for age determination using radiocarbon analysis. Samples were selected based on the amount and nature of datable material present, stratigraphic context, and overall distribution within the project area. Unfortunately, test units excavated at Sites 14518, 14520, and 14521, did not unearth deposits of datable material sufficient for age determination analyses. The eleven samples were submitted for radiocarbon analysis to Beta Analytic Inc. of Coral Gables, Florida.

Using standard procedures, the samples were pre-treated with an acid, alkali, acid series of soakings to remove carbonates and humic acids. After pretreatment, samples were combusted to form carbon dioxide gas, were combined with lithium to separate the carbon, and were hydrolized for conversion to liquid form. The liquid was then catalyzed to form benzene and was placed in a liquid scintillation counter to determine the amounts of carbon-13 and carbon-12 present. Two of the samples, RC-925 and RC-935, were small and so were counted for an extended period of time in order to reduce the statistical error associated with small sample size. The isotope values obtained during the counting process were then used to calculate the carbon-13/carbon-12 ratio for each sample, with the final result being determined relative to international standards in order to reduce errors produced by carbon isotope fractionation. Processing of the eleven samples proceeded normally.

#### Results

The results of the radiocarbon age determination are summarized in *Table 7*. The age for each sample is reported as a range corresponding to the calendric age  $\pm$  two standard deviations. Ages were calibrated using the tables provided in Stuiver and Pearson (1986), which correct for variations in atmospheric carbon over time.

As indicated in *Table 7*, seven of the samples yielded definitive age ranges after calibration, while the remaining four samples (RC-927, RC-928, RC-929, and RC-932)

produced multiple age ranges. Multiple ranges are caused by "flat" regions in the calibration curve, which correspond to periods when atmospheric carbon decreased at a rate greater than 1.2 ppm/ 10 years, resulting in more than one possible fit of a sample to the calibration curve. While multiple age ranges are more difficult to interpret archaeologically, detailed examination of the statistical curves, combined with evidence from artifactual material and feature stratigraphy, generally provides a means of selecting one age range as more probable than the others. Based on these criteria, the most likely age ranges for the four samples are as follows: 1390-1659 AD for RC-927, 1460-1700 AD for RC-928, 1430-1680 AD for RC-929, and 1790-1950 AD for RC-932.

The age ranges from the eleven samples can be grouped into two distinct clusters. The first and earliest cluster includes those samples which are clearly prehistoric in age: RC-925, RC-927, RC-928, RC-929, RC-930, and RC-935. The age ranges of the samples, which fall between 1250-1700 AD, generally correlate with the relative stratigraphic position of the six samples. The actual age of RC-925 is probably closer to 1650 AD than 1280 AD, given the 1640-1950 AD age range provided by sample RC-926 from the same stratum; at any rate, the sample is clearly prehistoric.

The second cluster includes those samples whose age ranges span both prehistoric and historic times: RC-926, RC-931, RC-932, RC-933, and RC-934. The age ranges for the samples in this cluster fall between 1510-1950 AD, and agree with the relative stratigraphic positions of samples within the cluster. The abundance of volcanic glass artifacts in the cultural deposits associated with this cluster of samples, however, suggests that the samples are late prehistoric to early historic in age, given that volcanic glass artifacts were quickly replaced by metal artifacts during historic times (post-1790 AD). The stratigraphic sequence of the deposits from each cluster also supports a late prehistoric or early historic age range for the samples in the second cluster.

The results from the age determination analysis argue for a long-term and fairly continuous sequence of occupation at Site 14519, beginning potentially as early as 1250 AD at Feature E and continuing through late prehistoric to early historic times. Construction of Feature A may have occurred somewhat later (c. 1390 AD) than Feature E, but the features appear to have been used contemporaneously once constructed. Within Feature E, the stratigraphic and age range sequences show a clear progression of cultural deposition, with the

Table 7.

## SUMMARY OF RADIOCARBON AGE DETERMINATIONS

PHRI Lab.No. RC-	Lab. No. BETA-	Provenience	C-14 Age Yrs. B.P. (one sigma)	C-13/ C-12 Ratio	C-13 Adjusted C-14 Age Yrs. B.P.	*Calendric Range Yrs. AD
SITE-14519 925	42513	Fea.E, Tu-2, Layer I, Level 1, 16-28 cmbd	490±110	-24.6	490±110	1280-1650
926	42514	Fea.E, Tu-2, Layer I, Level 2, 25-35 cmbd	170±60	-25.2	160±60	1640-1950
927	42515	Fea.E, Tu-2, Layer II, 28-40 cmbd	420±80	-24.3	430±80	1322-1341 1390-1650
928	42516	Fea.A, Tu-1, Layer I, Level 1 21-31 cmbd	270±70	-25.8	260±70	1460-1700 1726-1818 1921-1954
929	42517	Fea.A, Tu-1, Layer I, Level 2, 31-35 cmbd	320±80	-25.0	320±80	1430-1680 1743-1802 1938-1954
930	42518	Fea.E, Tu-2, Layer III, Level 1, 30-40 cmbd	350±70	-25.6	340±70	1430-1670
931	42519	Fea.E, Tu-3, Layer II, Level 1, 21-31 cmbd	120±90	-24.9	120±90	1640-1955#
932	42520	Fea.E, Tu-3, Layer III, Level 1, 25-35 cmbd	60±70	-26.1	40±70 1953-1955#	1670-1780 1790-1950
933	42521	Fea.E, Tu-3, Layer III, Level 2, 35-45 cmbd	130±70	-24.5	140±70	1640-1955#
934	42522	Fea.E, Tu-3, Layer III, Level 4, 55 cmbd	210±70	-25.4	210±70	1510-1950
935	42523	Fea.E, Tu-3, Layer III, Level 3, 45-55 cmbd	510±130	-23.9	530±130	1250-1650

\* Calibrated according to Stuiver and Pearson (1986). Range at two sigmas.

# Denotes influence of bomb C-14.

lower strata yielding age ranges which are prehistoric and upper strata yielding age ranges that span prehistoric and historic times. The sequence from Feature A suggests that it was used during prehistoric times, and was then abandoned.

### PORTABLE ARTIFACTS

Nine hundred seventy artifacts were recovered from the project area; 957 were classified as indigenous, and 13 were classified as non-indigenous. Indigenous artifacts are those fabricated using traditional Hawaiian manufacturing techniques and local raw materials, and range in type from fishing gear and tools to various decorative or religious items. The inventory of indigenous artifacts from the current project area is fairly broad in content, and consists of fishing gear, tools, flaked stone artifacts, domestic implements, and a number of artifacts of uncertain function. The inventory of non-indigenous artifacts consists of glass fragments exclusively. A detailed tabulation of artifacts by deposit area is presented in *Table 8*. The results of the artifactual analysis are discussed below.

#### Fishing Gear

Fifteen specimens of indigenous fishing gear were recovered from the project area. The assemblage derives from Sites 14518, 14519, and 14534, and consists of six complete and fragmentary fishhooks, eight roughed-out fishhook tabs, and one hook blank.

**Fishhooks.** The six fish hook specimens include four fish hook fragments and two complete fish hooks, all of which are manufactured from animal bone. Both of the complete hooks derive from Feature E of Site 14519, while the hook fragments derive from Features A and E of Site 14519. The specimens range in type from one-piece jabbing or rotating hooks, to the shank portion of a two-piece hook. One- and two-piece fishhooks are classified according to the revised Coding System for Hawaiian Fishhooks devised by Sinoto (IN Kirch 1979:231-233). Classification codes for the fishhooks recovered during the current investigation are listed in *Table 9* and are described below using terminology from Emory, Bonk, and Sinoto (1959:8-9).

One of the complete fish hooks and two of the fragments are classified as one-piece fishhooks, while two of the hook fragments may derive from either one- or two-piece hooks. The second complete hook is the shank portion of a two-piece hook. One-piece fishhooks were fashioned as either jabbing or rotating hooks depending on the fisherman's intended catch strategy (Johannes 1981:113). Jabbing hooks are those in which the point is straight or slightly outcurved

or incurved, so that if extended, the point would intersect the shank between the head and upper third portion of the shank. Rotating hooks are hooks in which the point is incurved such that its extension would intersect the shank in the lower two thirds of the shank. The complete hook, and the two fragments classified as one-piece hooks, are jabbing hooks. The two unclassified fragments, if one-piece hooks, may be either jabbing or rotating hooks.

Two-piece hooks, in contrast, are hooks in which the point and shank are manufactured as two separate pieces, usually composed of the same raw material, then lashed together at their bases. It has been conjectured that two-piece fishhooks were created to reduce the problem of breakage caused by stress in the bend area of one-piece fishhooks. Various head types and base types were styled to facilitate lashing, and barbs were sometimes added to the inner or outer point or to the shank. As noted above, the complete two-piece hook represents the shank portion of a separate shank and point assemblage.

Morphologically, the complete jabbing hook has a tipped out point, a characteristic "V"-shaped bend, and no barb. The shank head is flat with a notch on the outer side, just below the top (HT1a). The fragments both include shank and bend portions, one of which is "V"-shaped and one of which is "U"-shaped, but are otherwise dissimilar. The fragment with the "V"-shaped bend lacks the point portion and has a shank head with a wide top which projects inward but has a distinctly protruding knob made by notching the outer edge of the shank and the upper surface of the shank end (HT3c). The fragment with the "U"-shaped bend lacks the shank head portion, has a shank and point which are parallel, and is unbarbed. The complete two-piece hook is unfinished, but shows several characteristic attributes. The shank is clearly curved and slender, and has a head that is flat with a notch on the outer side just below the top (HT1a). The base of the shank is incomplete. Finally, the two unclassified fragments are both shank and bend portions of fish hooks, one of which is unfinished, and are not sufficiently diagnostic in shape to permit further classification.

**Fishhook Tabs.** Nine fish hook tabs, three manufactured from animal bone and six from pearl shell, were encountered in the project area. Two of the tabs derive from Feature A of Site 14518, one derives from Feature A at Site 14519, five derive from Feature E at Site 14519 and one derives from Feature B of Site 14534. Fish hook tabs are categorized according to their manufacturing stage, following terminology outlined by Sinoto (1975). Roughed-out tabs represent the first stage of manufacture, and were prepared by filing or sawing larger pieces of bone or pearl shell material into

Table 8.  
DETAILED DISTRIBUTION OF PORTABLE ARTIFACTS

CATEGORY	Site 14513 Fea. A			Site 14518 Feature A, TU-1			Site 14519 Feature A, TU-1			14519 (cont.) Feature E, TU-2			14519 (cont.) TU-3						
	Surf.	Swf.	I-1	I-2	TOTAL	SURF.	I-1	I-2	TOTAL	I-1	I-2	III	III-1	III-2	TOTAL	I-1	I-2	III	
<b>INDIGENOUS</b>																			
<b>FISHING GEAR</b>																			
Bone																			
Fishhook								1	1	1									
Hook Blank									0										
RIO Tab			1		1				1										
Shell																			
RIO Tab			1		1				0										
<b>SUBTOTAL FISHING GEAR</b>			2		2				2										
<b>FLAKED STONE</b>																			
Basalt																			
Flakes	1				0		3	2	5	6			3		14	4			3
Modified Basalt					0			1	1						1				
Polished Flakes	1				0				0						1				2
Chert					0				0										
Flakes					0				0						1				
Volcanic Glass					0				0										
Core					0				3										
Flakes	7		21	6	27		68	16	84	152			10	9	1	30	14	216	4
Modified					0				0										
<b>SUBTOTAL FLAKED STONE</b>	9	0	21	6	27	0	71	22	93	158	0	13	9	1	36	29	246	8	35
<b>DOMESTIC ITEMS</b>																			
Bone					0				0	1									
Pick					0				0										
Shell					0				0										
Scraper					0				0										
<b>SUBTOTAL DOMESTIC ITEMS</b>	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	2	0
<b>TOOLS</b>																			
Basalt					0				0										
Abrader					0				0										
Adze					0				0										
Coral					0				0										
Abrader	1	1			1	1	1	2	4					1	2	3	6	2	
Echinoid					0				0										
Abrader	1		1	2	3		7	1	8	13	16	3	2		12	6	52	4	4
<b>SUBTOTAL TOOLS</b>	2	1	1	2	4	1	8	3	12	13	16	3	3	0	14	9	58	6	4
<b>UNCERTAIN FUNCTION</b>																			
Bone					0				2										
Modified					0				1										
Coral					0				1										
Modified					0				1										
Shell					0				0										
Cur					0				0										
Perforated					0				3	4					9	3	24	6	7
<b>SUBTOTAL UNCERTAIN FUNCTION</b>	0	0	0	0	0	0	3	3	6	4	0	1	7	0	9	4	25	6	8
<b>TOTAL INDIGENOUS</b>																			
	11	1	24	6	33	1	82	30	113	177	17	17	17	19	1	60	43	334	20
<b>DOMESTIC ITEMS</b>																			
Glass					0				0										
Fragments					0				0										
<b>TOTAL NON-INDIGENOUS</b>	0	0	9	4	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>TOTAL</b>	11	1	33	12	46	1	82	30	113	177	17	17	19	1	60	43	334	20	47



Table 9.  
FISHHOOK TABLE

	Site 14519		Grand Total
	Feature A	Feature E	
<i>IA - JABBING HOOKS</i>			
IA2V(1)(a,b,c,d)a	0	1	1
S-IA1U(1)(b,c,d)a	0	1	1
S-IA2V(1)(a,b,c)a	1	0	1
<b>SUBTOTAL JABBING</b>	<b>1</b>	<b>2</b>	<b>3</b>
<i>IIB - TWO-PIECE HOOKS</i>			
S-IIB3(1)(a,b,x)a	1	0	1
<b>SUBTOTAL TWO-PIECE</b>	<b>1</b>	<b>0</b>	<b>1</b>
<i>III A/B - ONE/TWO-JABBING/ROTATING PIECE HOOKS</i>			
S-III A/B(1)(b,c)a	1	0	1
S-III A/B(1)(b,c,x)a	1	0	1
<b>SUBTOTAL ONE/TWO-PIECE</b>	<b>2</b>	<b>0</b>	<b>2</b>
<b>TOTAL</b>	<b>4</b>	<b>2</b>	<b>6</b>

sizes and shapes appropriate for the desired fishhook. They are usually triangular or rectangular, with rather rough edges and angular corners. Shaped tabs are the second stage; and are distinguished from roughed-out tabs by the refinement of their edges and initial shaping of the shank and bend portions of the fishhook. Hook blanks represent the last stage before actual finishing, and are created by the removal of material to form the inner edges of the hook that separate the point from the shank.

Based on this typology, eight of the tabs are classified as roughed-out tabs and one, the specimen from Site 14534, is classified as a hook blank. The roughed-out tabs range from 7-31 mm long and 6-20 mm wide, and are triangular (3), rectangular (4) or trapezoidal (1). The hook blank measures 25 mm by 10 mm by 2 mm, and appears to be a preform for a one-piece hook. The hook blank was manufactured from animal bone using the notching and filing method described by Sinoto (IN Kirch 1979).

#### Tools

One hundred forty-three tools were encountered in the project area during the current investigation. The assemblage derives from Sites 14513, 14518, 14519, 14521, 14528, and 14534, and includes abraders and adzes. The tools are described by function below.

**Abraders.** A total of 141 abraders, manufactured from echinoid spines, coral, and vesicular basalt, were encountered in the project area. Coral and scoria abraders are evaluated according to their overall shape in plan view, following the classification system and nomenclature set forth by Suggs (1961) to describe coral abraders found at Nuku Hiva in the Marquesas Islands, French Polynesia. In this system, abraders are either informal, meaning that the shape of the raw material is dominant; or formal, indicating that the characteristics of the raw material have been extensively modified by use. Cross-sections are generally taken perpendicular to the tip and butt of the abrader, while the number of abrasion faces is indicative of preferential abrasion on a given surface. Echinoid spine abraders, which tend to be uniformly informal in shape, are evaluated based on the number, location, and type of abrasion faces present, using a system developed by PHRI.

Seventeen of the abraders, including ten fragments and seven complete specimens, are manufactured from coral material. The complete specimens range from 28-105 mm in length, 15-60 mm in width, and 10-44 mm in thickness, while the fragments are generally smaller. The number of abrasion faces represented by the coral abraders ranges from one-five, with the majority having two faces. One of the complete abraders is abraded on all surfaces to form a file. Seven of the coral abraders are informal, meaning that the

natural shape of the coral is dominant, while ten are classified as formal abraders. In cross-section, the abraders are plani-convex/lateral (3), plani-lateral (3), square (1), lenticular-oval (4), right triangular (1), irregular (2) and indeterminate (3). In plan view, the coral abraders are long triangular (3), blunt (2), wedge-shaped (7), and indeterminate (5).

One of the abraders is manufactured from vesicular basalt. It is a fragment of a formal abrader, and measures 7 mm by 55 mm by 15 mm. The specimen has four faces of abrasion, and suggests a long triangular shape in plan view. Its cross-sectional shape is indeterminate.

One hundred twenty-three of the abraders are manufactured from echinoid spines. The assemblage includes complete specimens (17.4%), partial specimens (32.4%), and fragments (50%). The specimens range from 9-71 mm in length, 5-10 mm in width, and 2-10 mm in thickness. The number of abraded faces on the echinoid abraders and abrader fragments varies from 1-2, with the most common type of face being a bevel extending from the midsection to the distal end. Proximal and midsection fragments are more common than distal fragments, due apparently to the preferential use of distal ends on the abraders. All of the echinoid abraders are informal in shape, but show a great deal of variation in the degree of abrasion represented.

Coral artifacts apparently served multiple purposes prehistorically, ranging from "rubbers" used to finish canoes and wooden bowls (Buck 1964), to saws or files used in the manufacture of bone and shell fishhooks (Emory, Bonk, and Sinoto 1968; Suggs 1961). The variety of shapes, edges, and worn surfaces represented by the abraders in the assemblage suggests that the abraders served multiple purposes. Use of a particular surface over time might generate a sawing or filing edge, which in turn would wear down during use to a new shape which could serve a new purpose. Abraders of vesicular basalt may have been used in the same manner as coral abraders, but given greater resistance and coarser texture, would most likely have been used during the early stages of a task, or to shape materials which were themselves resistant to abrasion. Echinoid abraders, in contrast, were used for more specialized tasks such as fish hook manufacture, as they are both smaller and softer tools.

**Adzes.** Two complete adzes were encountered on the surface of Site 14534. Adzes are described according to a system developed by PHRI, based on work done by Craib (1971), which records attributes such as cross-sectional shape, shape in plan-view, poll shape, cutting edge morphology, number and placement of ground surfaces, bevel type and angle, nature of side surfaces, and presence

or absence of tangs. Terminology follows Buck, Emory, Skinner, and Stokes (1930), except that "face" and "base" are substituted for front and back.

The first specimen is a formal adze composed of black aphanitic basalt, and measures 90 mm by 50 mm by 20 mm. It is completely ground on four surfaces and partially ground on the remaining two surfaces. The adze is rectangular in cross-section, with flat sides and a square poll, and is untanged. The cutting edge is straight in plan-view and cross-section and is bevelled on the lower face at a 50 degree angle. The second adze specimen is a formal adze composed of black aphanitic basalt, and measures 88 mm by 50 mm by 16 mm. It is ground on two faces only. The adze is rectangular in cross-section, with convex sides and a square poll, and is untanged. The cutting edge is straight in both plan-view and profile, and is bevelled on the lower face at an angle of 35 degrees.

**Flaked Stone.** Seven hundred forty-two of the indigenous artifacts recovered from the project area are of flaked stone. Of this assemblage, 62 specimens are composed of aphanitic basalt, one is composed of chert, and 679 are composed of volcanic glass. By provenience, the flaked stone artifacts derive from Site 14513 (1.2%), Site 14518 (3.6%), Site 14519 (93.1%), Site 14520 (0.6%), and Site 14521 (1.3%).

All flaked stone is evaluated with respect to flake/core type. Following established procedures for evaluating flaked stone material, diagnostic flakes are defined as those flakes having a complete or partial striking platform and a bulb of percussion. Non-diagnostic flakes are fragments which lack the platform and/or bulb. Cores tend toward multifaceted polyhedral shapes dominated by one or more platforms, and typically show little evidence of subsequent use as tools. Primary cores exhibit only flake scars, while secondary cores are actually flakes with a bulb from which other flakes have been removed. Polished flakes are restricted to the basalt assemblage, and represent flakes which have one or more highly polished surfaces. Modified flakes are flakes which have been cut or abraded along the outer edges, usually to form flat surfaces. Based on the above criteria, the 742 specimens can be separated as follows: four primary flake cores, 507 diagnostic flakes, 220 non-diagnostic flakes, eight polished flakes, and three modified flakes.

**Cores.** Three of the primary cores derive from Site 14519 and one derives from Site 14520. All are volcanic glass in composition. The first specimen measures 21 mm by 10 mm by 8 mm. It has a crushed platform, lacks cortex, and has six unidirectional flake scars. Edge damage is absent. The second specimen from Site 14519 measures

10 mm by 10 mm by 13 mm. It has an irregularly-shaped platform with approximately 20% cortex remaining, and four unidirectional flake scars. Edge damage and platform damage are absent. The third specimen from Site 14519 measures 15 mm by 17 mm by 25 mm. It has an irregularly shaped platform with no remaining cortex, and four unidirectional flake scars. Edgewear and platform damage are absent. The core from Site 14520 measures 30 mm by 30 mm by 15 mm. It has a lenticular shaped platform, and four flake scars, which indicate flaking was performed from two or three directions. Edge damage and platform damage are absent.

**Flakes.** The diagnostic flakes range from 2-32 mm in length and 2-42 mm in width. By composition, 47 of the diagnostic flakes are aphanitic basalt, one is chert/jasper, and 459 are volcanic glass. In cross-section, the flakes are triangular, trapezoidal, rectangular, lenticular, and irregular. In plan view, the flakes show a range of shapes, including triangular, rectangular, oval, and reverse triangular. Bulbs of percussion are diffuse or sheared, while striking platforms are generally unmodified. Flakes are feathered at the terminal end in 75% of the assemblage, with the remaining 25% being truncated. Approximately 30% of the diagnostic flakes exhibit evidence of edge-wear, while 10% have cortex remaining on platforms or faces.

The non-diagnostic flakes range from 2-25 mm in length and 2-20 mm in width. Five of the non-diagnostic flakes are composed of aphanitic basalt, and 215 are composed of volcanic glass. Like the diagnostic flakes, they are triangular, trapezoidal, rectangular, lenticular, or irregular in cross-section; and are triangular, rectangular or reverse triangular in plan view. The majority of the non-diagnostic flakes are feathered at the flake terminus. Percentages of edge-wear and cortex on non-diagnostic flakes are slightly lower, with 20% of the flakes having edge-wear and 7% of the flakes retaining cortex.

Uses for volcanic glass artifacts have been suggested both by Barrera (1971) and Kirch (1973), who observed:

The possible functions ... are many and varied. Basaltic glass holds a fine, sharp edge and the tools make excellent cutting and scraping implements. They may have been used in food preparation, for cutting and scraping plant materials, or for delicate woodworking...[t]hese artifacts are extremely common, being found in virtually every type of [Hawaiian] site. The suggestion, then, is that the ubiquitous basaltic glass flakes functioned as a prehistoric "pocketknife", to use a modern analogy...(1973:185-6).

**Modified Flakes.** Three modified flakes, two composed of aphanitic basalt, and one composed of volcanic glass, were identified in the flaked stone assemblage. All of the flakes have been modified by cutting or abrasion on the edges, resulting in the formation of a rectangular shape for one of the basalt flakes, and triangular shapes for the other two flakes. The rectangular flake measures 21 mm by 13 mm by 2 mm. One triangular flake measures 19 mm by 8 mm by 6 mm, while the second measures 14 mm by 13 mm by 6 mm. The rectangular flake is worn on one edge; the triangular flakes show no indication of use or possible function.

**Polished Flakes.** The eight polished flakes, all of which are composed of aphanitic basalt, derive from Sites 14513 and 14519. All of the flakes are diagnostic, with measurements ranging from 6-35 mm in length and 7-25 mm in width. Five of the flakes show some degree of edge-wear, while two have 20-30% cortex remaining on their faces. The flakes are lenticular or irregular in cross-section, and triangular or oval in plan view. Three of the flakes have a dorsal ridge. The flakes are highly polished on the dorsal surface, with at least 50% of the surface being polished, but are otherwise unmodified. There are no specialized activities associated with polished flakes apart from those discussed for unmodified diagnostic flakes above. Polished flakes apparently result from the retouch or modification of polished tools such as adzes, and retain the polished surface of the original tool much in the way that other flakes retain areas of the original cortex.

## Domestic Implements

Three domestic artifacts were encountered in the project area. The assemblage includes one pick and two scrapers, and derives entirely from Feature E at Site 14519. The domestic implements are described in detail below.

**Picks.** A single pick, manufactured from bird bone, was encountered in TU-2 of Feature E of Site 14519. It measures 41 mm in length and 3 mm in diameter at its thickest point. The articular end of the bone is absent. Picks are commonly associated with shell fish exploitation, and were used to extract the meat from the shells.

**Scraper.** Two scrapers, each manufactured from Cellana shell, were also encountered in Test Unit 2 of Feature E at Site 14519. The first of these measures 52 mm by 44 mm. It is informal, and shows abrasion on approximately 10% of the perimeter surface. The second scraper measures 45 mm by 38 mm, is informal, and is abraded on approximately 25% of the perimeter surface. Titcomb (1979) notes that

Cellana shells with no modifications were used as scrapers. The edge was used for general scooping, scraping, and peeling, as well as in food preparation.

**Uncertain Function.** Fifty-four artifacts of uncertain function were encountered in the project area during the current investigation. The assemblage, which derives entirely from Site 14519, consists of five modified bone artifacts, one modified coral artifact, one cut shell artifact, and 47 perforated shell artifacts.

**Modified Bone.** The five modified bone artifacts, all of which are manufactured from mammal bone, derive from Sites 14518 and 14519. The first specimen is basically triangular in shape, with one cut edge and one edge which has been filed and polished. It measures 27 mm by 12 mm by 3 mm. The second cut bone artifact is curved and filed into the shape of a triangle, and measures 16 mm by 6 mm by 2 mm. It is carbonized to a dark brown and is highly polished. The third cut bone artifact is roughly rectangular. Two sides of the artifact are cut, one side remains rough, and one side is partially cut and notched. The specimen measures 23 mm by 18 mm by 3 mm. The fourth specimen is trapezoidal, and measures 14 mm by 10 mm by 2 mm. Two edges have been cut and filed, while the other two edges are rough. The fifth and final specimen is triangular and measures 8 mm by 7 mm by 5 mm. All five of the modified bone artifacts appear to be tab preforms which were discarded before being completed.

**Modified Coral.** One modified coral artifact was encountered in the deposits of Site 14519. The artifact, which measures 16 mm by 12 mm by 5 mm, is a fragment of a larger, perforated coral artifact. It is formal, abraded on all surfaces, and possesses the remnant of a single perforation at the broken end. The shape of the fragment suggests that the complete artifact was an elongated hexagon in plan view. The presence of the perforation in the possible center of the artifact suggests that it may have been strung, either as a weight of some sort or as an ornament.

**Cut Shell.** One cut shell artifact was encountered in Test Unit 3, Feature E of Site 14519. It is roughly trapezoidal, and measures 12 mm by 11 mm by 1 mm. It is cut on two edges, while the remaining two edges appear to have been left unmodified. Given its shape and size, it is most likely that this artifact is a tab preform which was discarded before completion.

**Perforated Shell.** Forty-seven perforated shell artifacts were encountered in the deposits of Site 14519. Forty-six of the shell artifacts are manufactured from the disk-like

apices of *Conus* shells and have been perforated in the center. They range in diameter from 4-9 mm. These shells are often washed onto the beach, where the hole is created by progressive erosion in the surf rather than by human action, but they were occasionally collected and strung as necklaces. The remaining shell artifact is a *Nerita polita* shell which has a diamond-shaped perforation in the center of its dorsal surface. This artifact may have initially selected as part of an octopus hook assemblage, and then discarded before being further modified, or may have been modified by a burrowing organism and deposited at the site by natural processes.

### Non-Indigenous Artifacts

Thirteen non-indigenous artifacts were encountered in the project area during the current investigation. The artifacts, all of which are unidentified glass fragments, derive from Sites 14518 and 14519. The 13 fragments are amber, and include a variety of shapes and sizes.

### Summary

In general, the artifact assemblage encountered during the current investigation suggests that prehistoric activities in the project area included manufacture of bone or shell artifacts, particularly the production of fishing gear. Stone tool manufacture and use is suggested both by the flaked stone assemblage and the adzes, and may have been accompanied by food processing and craft production activities which relied on the use of flaked stone tools. Domestic activity is suggested by the pick and scrapers. The adzes, as well as some of the coral abraders, indicate woodworking activities, such as canoe manufacture or modification of gourds for drinking vessels.

## MIDDEN

### Objectives and Methods

Midden deposits are archaeologically significant on a number of levels, as the variety and content of food remains contained within a given midden deposit provide useful information concerning prehistoric diet and resource utilization patterns. The analysis of midden remains for inventory survey projects have two primary objectives:

1. To determine midden content, in particular the variety and distribution of the remains for each cultural deposit encountered within the project area;

2. To provide an indication of dietary and resource exploitation patterns for each site, and for the project area as a whole;

All midden recovered from the various test units undergo detailed analysis in the laboratory. Detailed analysis involves splitting the sample into two size classes by passing each sample through 1/4-in and 1/8-in screens. One hundred percent of the material retained in the 1/4-in screen is completely sorted to the lowest taxonomic level possible, while the material retained in the 1/8-in screen is inspected both for artifactual material and for taxa not encountered in the larger portion of the sample. Marine shell identifications are verified and augmented using Kay (1979).

The sampling design outlined above is adapted from Kirch (1979), based on a series of experiments measuring the relative distribution of molluscan and bone material retained on each screen. Kirch concluded that use of the screening process increased the speed of the sorting process without decreasing either the accuracy or statistical validity of the overall analysis. The taxonomic distribution and weight of material retained on the 1/4-in screen should thus be considered as representative of the variety and relative percentages of each taxon present in the entire sample.

## Results

Midden remains were encountered in the deposits at Sites 14518, 14519, 14520 and 14521. The range of taxa present in the midden assemblage from these deposits is summarized in Table 10. Total weights for each taxon (in grams) are tabulated by site and feature, with subtotals indicating the combined weight per feature for each larger material class (e.g. gastropods). The total weight of each taxon in the project area is provided in the final column of the table, while the grand total represents the combined weight of all the midden derived from the project area.

In general, the taxa represented by the midden samples taken from the project area are common inhabitants of the

shorelines, shallow-water areas, solution benches and fringing reefs of the windward islands of the Hawaiian chain. By weight, 93.4% of the 53,785.17 grams of midden material recovered from the project area is contributed by marine gastropods, 3.6% by bivalves, 2.5% by other invertebrates such as echinoids, crustaceans and non-marine gastropods, 0.36% by bone material, and 0.12% by vegetal material. Cypraeidae, *Nerita picea*, and Thaididae are the most abundant marine gastropods by weight, while Isognomonidae, *Brachidontes* and Veneridae are the most common bivalves. *Echinoidea* is the dominant taxon within the other invertebrates category. Fish, bird and mammal taxa are represented in the bone material, with fish bone contributing the largest portion by weight. Vegetal material consists of *Aluerrites moluccana* (*kukui*), charcoal, coconut, and gourd.

The midden assemblages, when examined by site and feature, show the same trends in content and relative distribution as the project area total discussed above. The main exception to this pattern is the assemblage at Site 14521, which contains a lower proportion of marine gastropods (70.9%) relative to bivalves (13.7%) and other invertebrates (15.4%) than the other midden assemblages in the project area, and lacks bone or vegetal remains. The assemblage at Site 14520 also lacks vegetal remains, while the faunal remains in the assemblage consists entirely of fish bones.

The results of the midden analysis indicate that subsistence patterns in the project area included the collection and consumption of a variety of shell fish, ranging from several taxa of marine gastropods and bivalves to echinoids and crustaceans. Fish provided an additional marine resource at all of the sites except Site 14521. The remains of non-marine gastropods, birds and mammals in the midden assemblages of Sites 14518 and 14519 indicate that exploitation of terrestrial vertebrates and invertebrates formed a second component of the local subsistence base. Finally, the presence of vegetal remains indicates that plants were included as part of the terrestrial component of the subsistence activities practiced in the project area.



Table 10. (cont.)

MATERIAL	Site 14519 (cont.)			Site 14520					Site 14521				
	SUB TOTAL	SITE TOTAL	#1	Feature A, TU-1		#2	#3	#4	Feature A, TU-1		#5	SITE TOTAL	GRAND TOTAL
				#1	TOTAL				#5	TOTAL			
MOLLUSCA													
GASTROPODA													
PATELLIDAE	132.84	195.34	0.77	1.03	1.80	0.04	-	-	0.04	-	0.04	206.74	
<i>Celana</i> sp.	0.00												
TROCHIDAE	10.56	10.56	-	-	0.00	-	-	-	0.00	-	0.00	15.24	
<i>Trochus nitentus</i>													
MERIIDAE	6284.28	7517.00	105.20	241.88	347.08	0.14	-	-	0.14	-	0.14	8,839.94	
<i>Meria pisa</i>	459.64	655.92	2.68	1.67	4.35	-	-	-	0.52	-	0.52	670.55	
<i>Meria polda</i>	411.96	446.48	-	3.01	3.01	-	-	-	-	-	-	449.49	
<i>Theodorus</i> sp.													
LITTORIIDAE	64.20	72.72	1.61	2.88	4.49	-	-	-	0.00	-	0.00	79.85	
<i>Littorina prioleo</i>													
STRIGARIDAE	176.84	178.71	0.80	-	0.60	-	-	-	0.00	-	0.00	208.51	
<i>Strombus maculatus</i>	9.32	10.24	-	0.11	0.11	-	-	-	0.56	-	0.56	36.11	
HIPPOICIDAE	25570.32	33045.62	287.50	542.20	829.70	3.16	-	-	2.56	0.87	6.59	36,464.79	
CYPRAEIDAE	2.80	2.80	-	-	0.00	-	-	-	0.00	-	0.00	2.80	
CASSIDIDAE	0.82	14.96	-	-	0.00	-	-	-	0.00	-	0.00	14.96	
CYMATICIDAE	2311.84	2551.32	17.76	37.70	55.46	-	-	-	0.61	-	0.61	2,915.75	
THAIDIDAE													
CONIDAE	214.24	241.24	-	1.14	1.14	-	-	-	0.00	-	0.00	299.58	
<i>Conus</i> sp.	8.80	23.47	-	-	0.00	-	-	-	0.00	-	0.00	23.47	
<i>Conus spines</i>													
PLEUROBRANCHIDAE	4.48	4.48	-	0.11	0.11	-	-	-	0.00	-	0.00	4.59	
<i>Opurzelum aurantium</i>													
SUBTOTAL GASTROPODA	35653.04	44970.86	416.12	831.73	1247.85	3.34	-	-	3.12	2.00	6.46	50,230.37	
BIVALVIA													
MYTILIDAE	397.60	427.80	-	-	0.00	-	-	-	0.00	-	0.00	427.80	
<i>Brachidontes</i> c.													
ISOGNOMONIDAE	816.52	882.36	0.71	13.41	14.12	-	-	-	0.00	-	0.00	999.20	
<i>Isochnomon californicum</i>	0.00	0.00	-	-	0.00	-	-	-	0.00	-	0.00	99.24	
CHAMIDAE	9.96	9.96	-	-	0.00	-	-	-	0.10	-	0.10	10.06	
<i>Ctenabeta</i>	29.64	29.64	0.29	6.68	6.97	-	-	-	0.00	-	0.00	65.73	
TELLINIDAE	181.56	251.60	3.77	2.01	5.78	-	-	-	1.15	-	1.15	263.45	
VENERIDAE	0.00	63.88	-	-	0.00	-	-	-	0.00	-	0.00	63.88	
UNIDENTIFIED BIVALVIA	1435.28	1665.24	4.77	22.10	26.87	0.00	-	-	1.25	0.00	1.25	1,929.36	
SUBTOTAL BIVALVIA	2817.52	3177.52	9.25	42.62	47.67	0.00	-	-	2.50	0.00	2.50	3,281.81	
OTHER INVERTEBRATES													
NON-MARINE GASTROPODS	0.28	0.28	-	-	0.00	-	-	-	0.00	-	0.00	0.28	
ECHINODEA	757.80	925.35	5.56	9.34	14.90	1.40	-	-	1.40	-	1.40	961.01	
CRUSTACEA	321.12	348.52	-	2.49	2.49	-	-	-	0.00	-	0.00	384.25	
SUBTOTAL OTHER	1079.20	1274.15	5.56	11.83	17.39	1.40	-	-	0.00	0.00	0.00	1365.54	
TOTAL INVERTEBRATES	3817.52	4791.05	428.45	865.66	1292.11	4.74	-	-	4.37	2.00	6.37	53,525.27	
VERTEBRATES													
BOVINE	147.56	182.45	0.49	1.37	1.86	-	-	-	0.00	-	0.00	194.70	
SUBTOTAL VERTEBRATES	147.56	182.45	0.49	1.37	1.86	0.00	-	-	0.00	-	0.00	194.70	
VEGETAL REMAINS													
<i>Abietes moluccana</i>	9.75	15.24	-	-	0.00	-	-	-	0.00	-	0.00	16.76	
Charcoal	10.68	27.44	-	-	0.00	-	-	-	0.00	-	0.00	28.20	
Coconut	0.00	2.21	-	-	0.00	-	-	-	0.00	-	0.00	14.20	
Gourd	0.00	6.04	-	-	0.00	-	-	-	0.00	-	0.00	6.04	
SUBTOTAL VEGETAL REMAINS	20.43	50.93	0.00	0.00	0.00	0.00	-	-	0.00	0.00	0.00	65.20	
TOTAL	38045.51	48143.63	428.94	867.00	1293.97	4.74	-	-	4.37	2.00	6.37	53,785.17	

## CONCLUSION

### DISCUSSION

The project area is within an arid coastal region of exposed lava flows, thin soil, and moderate vegetation. There are no watercourses in the area; in general, it is an inhospitable environment. The area evidently was inhabited only temporarily during prehistoric times: among other evidence, the types of structures in the project area and the project's limited artifact assemblage indicate this. The inhabitants probably occupied the area primarily to exploit brackish water ponds inland of the ocean and the littoral fringe and inshore regions. Rosendahl (1972a:85) summarizes early occupation of South Kohala's leeward coastal zone:

**Coastal Occupation**—scattered residential settlements along the shore: people engaged in marine exploitation—fishing, strand gathering of shellfish and seaweed, and production of salt; marginal agricultural activity, principally sweet potato cultivation and possibly some taro, in sandy coastal soils, along the courses of seasonally flowing streams and on the relatively fertile alluvial soil deposits that fanned out from the mouths of such intermittent streams in the inland area between Kawaihae and Puako Bay.

The results of the radiocarbon analysis indicate the project area may have been occupied as early as AD 1250, and that occupation was primarily during two periods, AD 1250-1700 and AD 1510-1950. The former range falls within the Expansion Period, as defined by Kirch (1985:303). According to Kirch, during this period there was a rapid increase in population, which subsequently led to occupation of more arid and less favorable regions. This may have occurred within the project area. The second cluster yielded a range of AD 1510-1950.

The above date ranges generally agree with the ranges derived during previous research in the general South Kohala area. Sites at Kalahuipuaa, south of the present project area, have yielded ranges which indicate occupation took place from AD 1200-1800, with most occupation occurring AD 1500-1800. Abandonment of most of the area began in the 1700s and the area was completely abandoned by the beginning of the 19th century (Kirch 1979:113,181). Ranges obtained from various age determination analyses at Ouli (AD 1600-1800), north of the present project area, represent late prehistoric/early historic occupation (Rosendahl 1983:86). The dates for occupation at Ouli and Kalahuipuaa are in

accord with those obtained from other sites in West Hawaii and with Barrera and Kelly (1974:62) who suggest that abandonment of coastal sites in West Hawaii may have begun prior to European contact. The dates obtained from the Paniau survey (Burgett in prep), immediately south of the current project area, indicate that the area was being occupied at a time when nearby coastal sites were being abandoned.

The features within the project area are limited in range. The feature types present are not representative of all types in the general area or along the leeward coast. Absent features include those associated with recurring or extended occupation, such as well constructed enclosures.

A habitation cave, Site 14513, has a deep deposit of sand, soil, bird and turtle bone, gourd fragments, waterworn coral and basalt, and marine shell midden; the deposit covers most of the terrace located immediately outside of the cave entrance. This deposit, which also contains basalt and volcanic glass flakes, coral abrader fragments, and echinoid spine files, appears to consist of material discarded after screening. A number of excavations were found within the cave, but not in sufficient number to have produced the sizable deposit. Although the cave is located in the vicinity of a habitation cave excavated by Emory in 1955 (Kirch 1979:229), the number of excavations identified, the placement of the backdirt pile (deposit), and the types of artifacts remaining in the backdirt pile would seem to indicate that the cave has been disturbed by pothunters.

### SUMMARY OF GENERAL SIGNIFICANCE ASSESSMENTS AND RECOMMENDED GENERAL TREATMENTS

General significance assessments and recommended general treatments for the 15 sites that have undergone inventory-level work are summarized in *Table 11*, and specific field work tasks for the sites requiring further work are presented in *Table 2*. Tentative significance assessments and recommended treatments for the remaining 10 sites that have not undergone inventory-level work (initially identified during the Phase I - Site Identification portion of the survey) have already been presented in (Burgett 1990); however, they are presented again here, with a few revisions, in *Table 12*, and revised field work tasks for the sites are presented in *Table 2*. The revisions were due to a reassessment of site information.

Table 11.

**SUMMARY OF GENERAL SIGNIFICANCE ASSESSMENTS  
AND RECOMMENDED GENERAL TREATMENTS -  
INVENTORY-LEVEL SITES**

Site Number	Significance Category				Recommended Treatment			
	A	X	B	C	FDC	NFW	PID	PAI
14514	-	+	-	-	-	+	-	-
14519	-	+	-	-	-	+	-	-
14520	-	+	-	-	-	+	-	-
14521	-	+	-	-	-	+	-	-
14525	-	+	-	-	-	+	-	-
14528	-	+	-	-	-	+	-	-
14531	-	+	-	-	-	+	-	-
14532	-	+	-	-	-	+	-	-
14533	-	+	-	-	-	+	-	-
14534	-	+	-	-	-	+	-	-
<b>Subtotal:</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>0</b>
14513	-	+	-	+	-	+	-	+
14524	-	+	-	+	-	+	-	+
<b>Subtotal:</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>2</b>
14518	-	+	-	+	-	+	-	-
14957	-	+	-	+	-	+	-	-
<b>Subtotal:</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>
14526	+	-	-	+	+	-	-	+
<b>Subtotal:</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>Total:</b>	<b>1</b>	<b>14</b>	<b>0</b>	<b>5</b>	<b>1</b>	<b>14</b>	<b>0</b>	<b>3</b>

**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, DLNR-HPP=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;
- PID = Preservation with some level of interpretive development recommended (including appropriate related data recovery work);
- PAI = Preservation "as is", with minimal further work (and possible inclusion into landscaping), or appropriate data recovery/disinterments.

Table 12.

**SUMMARY OF TENTATIVE GENERAL SIGNIFICANCE ASSESSMENTS  
AND RECOMMENDED GENERAL TREATMENTS -  
SITES WITHOUT INVENTORY-LEVEL WORK**

Site Number	Significance Category				Recommended Treatment			
	A	X	B	C	FDC	NFW	PID	PAI
14515	+	-	-	-	+	-	-	-
14516	+	-	-	-	+	-	-	-
14517	+	-	-	-	+	-	-	-
14522	+	-	-	-	+	-	-	-
14523	+	-	-	-	+	-	-	-
14530	+	-	-	-	+	-	-	-
14535	+	-	-	-	+	-	-	-
14536	+	-	-	-	+	-	-	-
<b>Subtotal:</b>	<b>8</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>0</b>	<b>0</b>	<b>0</b>
14527	+	-	-	+	+	-	-	+
<b>Subtotal:</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>
14529	+	-	+	+	+	-	+	-
<b>Subtotal:</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>
<b>Total:</b>	<b>10</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>10</b>	<b>0</b>	<b>1</b>	<b>1</b>

Note: See Table 11 for key.

Significance categories used in the site evaluation process are based on the National Register criteria for evaluation, as outlined in the Code of Federal Regulations (36 CFR Part 60). The DLNR-HPP/SHPO and the Hawaii County Planning Department use these criteria for evaluating cultural resources. Sites determined to be potentially significant for information content fall under Criterion D, which defines significant resources as ones which "...have yielded, or may be likely to yield, information important in prehistory or history." Sites potentially significant as representative examples of site types are evaluated under Criterion C, which defines significant resources as those which "...embody the distinctive characteristics of a type, period, or method of construction...or that represent a significant and distinguishable entity whose components may lack individual distinction."

Sites with potential cultural significance are evaluated under guidelines prepared by the Advisory Council on Historic Preservation (ACHP) entitled "Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review" (Draft Report, August 1985). The guidelines define cultural value as "...the contribution made by an historic property to an ongoing society or cultural system. A traditional cultural value is a cultural value that has historical depth." The guidelines further specify that "[a] property need not have been in consistent use since antiquity by a cultural system in order to have traditional cultural value."

To further facilitate client management decisions regarding the subsequent treatment of resources, the general significance of the archaeological resources identified during the Phase I and II survey was also evaluated in terms of potential scientific research, interpretive, and/or cultural values (PHRI Cultural Resource Management [CRM] Value Modes; see *Table 2* for individual assessment of sites). These three value modes are derived from the above state and federal criteria. Research value refers to the potential of archaeological resources or producing information useful in the understanding of culture history, past lifeways, and interregional levels of organization. Interpretive value refers to the potential of archaeological resources for public education and recreation. Cultural value, within the framework for significant evaluation used here, refers to the potential of

archaeological resources for the preservation and promotion of cultural and ethnic identity and values.

Based on the above criteria, ten of the 15 sites that have undergone inventory-level work were assessed as significant for their information content only. These sites have been documented to the extent that no further work is necessary or appropriate. The five remaining sites, all of which contain one or more petroglyph figures as component features, were assessed as significant for both information content and cultural values. Four of the five sites have been adequately documented and no further work is needed; one site (14526) needs further data collection work.

While preservation "as is" would usually be the preferred form of treatment for all five sites, it has been recommended in this instance for only three of the sites. Because roadway design engineering has determined that it would not be possible to construct the proposed road to required Hawaii County standards without directly impacting Site 14518 and 14957, it has been recommended that these sites not be physically preserved. As an alternative form of treatment, it has been recommended that the single petroglyph figure present at each site be recorded as completely as possible (already done) and an attempt be made to remove the figures by cutting an appropriate-sized piece of pahoehoe bedrock free. If this removal were successful, then the figures could be moved and placed with other figures at one of the sites recommended for preservation--possibly Site 14529, which has tentatively been assessed as appropriate for preservation with interpretive development. This alternative treatment for Sites 14518 and 14957 has been discussed with DLNR-HPP/SHPO Chief Archaeologist Dr. Ross Cordy, who agreed with the proposed alternative treatment of recordation and removal, rather than "as is" preservation (March 8, 1991).

The evaluations and recommendations presented here have been based on a 100% surface survey of the project area and limited subsurface testing. There is always the possibility, however remote, that potentially significant unidentified surface and/or subsurface cultural remains will be encountered in the course of future archaeological investigations or subsequent development activities. In such situations, archaeological consultation should be sought in a few days

**REFERENCES CITED****ACHP (Advisory Council on Historic Preservation)**

- 1985 Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review. Washington, D.C.: Advisory Council on Historic Preservation. (Draft report, August)

**Barrera, W., Jr.**

- 1971 Anaehoomalu: A Hawaiian Oasis. *Pacific Anthropological Records* 15. Dept Anthro., B.P. Bishop Museum.

**Barrera, W., Jr., and M. Kelly**

- 1974 Archaeological and Historical Surveys of the Waimea to Kawaihae Road Corridor, Island of Hawaii. Report 74-1. Dept. Anthro., B.P. Bishop Museum. Prepared for Dept. Transportation, State of Hawaii.

**Burgett, B.D.**

- 1990 Phase I - Site Identification, Phased Archaeological Inventory Survey. Puako Beach Road Extension Corridor. PHRI Report 715-101890. Prepared for The Keith Companies.

in Archaeological Inventory Survey, Paniau Development Parcel Project Area. PHRI Report 715-112190.  
prep Prepared for The Keith Companies.

**CFR (Code of Federal Regulations)**

- 36 CFR Part 60 National Register of Historic Places. Dept. Interior, National Park Service, Washington D.C.

**Ching, F.K.W.**

- 1971 The Archaeology of South Kohala and North Kona from the ahupua'a of Lalamilo to the ahupua'a Hamanamana. Surface Survey Kailua-Kawaihae Road Corridor (Section III). *Hawaii State Archaeological Journal* 71-1. Dept. of Land and Natural Resources, State of Hawaii.

**Hommon, R.J.**

- 1983 Archaeological Data Recovery at Site 342, Kalahuipua'a, Hawaii. Science Management Inc. Prepared for Mauna Lani Resort, Inc.

**Johannes, R.E.**

- 1981 *Words of the Lagoon: Fishing and Marine Lore in the Palau District of Micronesia*. Berkeley: University of California Press.

**Kay, E.A.**

- 1979 Hawaiian Marine Shells, Reef and Shore Fauna of Hawaii. Section 4: Mollusca. Honolulu: Bishop Museum Press.

**Kennedy, J.**

- 1980 The Archaeology of Paniau. Archaeological Consultants of Hawaii. Prepared for Kep Alui, Inc.

**Kirch, P.V.**

- 1973 Archaeological Excavation at Kahalu'u. North Kona, Island of Hawaii. *Departmental Report Series 73-1*. Dept. Anthro., B.P. Bishop Museum.
- 1979 Marine Exploitation in Prehistoric Hawaii. Archaeological Investigations at Kalahuipua'a, Hawaii Island. *Pacific Anthropological Records* No. 29. Dept. Anthro., B.P. Bishop Museum.

**Rosendahl, P.H.**

- 1972a Archaeological Salvage of the Hapuna-Anaeho'omalu Section of the Kailua-Kawaihae Road (Queen Kaahumanu Highway), Island of Hawaii. *Departmental Report Series 72-5*. Dept. Anthro., B.P. Bishop Museum.
- 1972b Report on a Walk-Through Archaeological Survey of the Puako Beach Lots Spur Alignment, Lalamilo, South Kohala, Hawaii Island. Manuscript 101072. Dept. Anthro., B.P. Bishop Museum.

**Rosendahl, P.H., and M. Kaschko**

- 1983 Archaeological Investigation of Ouli Coastal Lands. Intensive Survey and Test Excavation of Mauna Kea Beach Resort Lands Between Hapuna Bay and Kaunaoa Bay. Land of Ouli, South Kohala, Island of Hawaii. PHRI Ms. 38-030182.

**Sinoto, Y.H.**

- 1975 Hawaiian Fishhook, Classification and Coding Systems. Ms.082175. Dept. Anthro., B.P. Bishop Museum.

**Titcomb, M.**

- 1979 *Native Use of Marine Invertebrates in Old Hawaii*. Honolulu: University Press of Hawaii. (Originally published in *Pacific Science* 32(4) (1978))

**Tomonari-Tuggle, M.J.**

- 1982 An Archaeological Reconnaissance Survey of a Parcel Adjoining the Puako Petroglyph Fields, Puako, Hawaii. Prepared for the Waimea Hawaiian Civic Club and Mauna Lani Resort.

**Welch, D.**

- 1984 Archaeological Reconnaissance of The Area South of the Puako Petroglyph Archaeological District, South Kohala, Hawaii Island. Manuscript 102384. Dept. Anthro., B.P. Bishop Museum.

## APPENDIX A

### DETAILED SITE AND TEST UNIT DESCRIPTIONS

**SITE NO.:** State: 14513  
**SITE TYPE:** Complex (8)  
**TOPOGRAPHY:** Pahoehoe flats and collapsed blisters. Bulldozed area to the north, and powerline to the west.  
**VEGETATION:** Moderate density of large *kiawe* trees, and sparse clumps of grass  
**CONDITION:** Fair to good  
**INTEGRITY:** Altered  
**PROBABLE AGE:** Prehistoric  
**FUNCTIONAL INTERPRETATION:** Habitation  
**DESCRIPTION:** This complex is located 33.0 m from the northwest corner of the project area. The site consists of two caves, Features A and F; four petroglyphs, Features B, C, D, and G and; a terrace, Feature E. This site was previously identified by Kennedy (1980), and possibly identified and excavated by Emory in 1955.

**FEATURE: A Cave**  
**FUNCTION:** Habitation  
**DIMENSIONS:** Undetermined  
**DESCRIPTION:** This feature consists of a large lava tube with two distinct entrances and numerous branches. Entrance A is located at the west end of the collapsed blister; it faces east and measures 2.5 m N-S by 1.28 m. A large uprooted *kiawe* tree is immediately inside, altering a small cobble paving there and blocking much of the entrance. The main tube proceeds to the west and branches to at least three lesser tubes, one of which opens to the north, extends northeasterly, and terminates at a fresh water pool and Entrance B. Entrance B is open to the southeast and on the east side of the collapsed blister. The floor of the cave is covered with angular pahoehoe blocks and waterworn basalt cobbles. A rich cultural deposit consisting of marine shell, charcoal, waterworn basalt and coral, non-human bone (bird, turtle, and fish), coconut shell, gourd fragments, bamboo, cut wood, kukui nutshells, and marine shell midden (*Periglypta*, *Isognomonidae*, *N. picea*, *Cypreidae*, *Cellana sp.*, rock oyster, *Echinoidea*, conus, and *Brachidontes c.*). Numerous artifacts were also evident at Feature A.

Outside Entrance B there is evidence of terracing, remnant facing, and scattered angular basalt cobbles and boulders beginning approximately 1.0 m southeast of the entrance and extending to the south and east. A large waterworn basalt cobble that showed signs of an artificially ground face was found among the scatter.

A test unit (TU-1) measuring 1.0 m by 1.0 m was excavated along the south wall c. 2.5 m inside Entrance A. A unit datum was set at ground surface in the southeast corner of the unit. The test unit appeared to contain a single layer of soil, Layer I (0-20 cmbd), containing angular basalt

cobbles and gravels, small coral fragments, volcanic glass and basalt flakes, echinoid abraders, and a high density of marine shell midden. A dating sample was collected from the center of the unit at 0-15 cmbd. Excavation was terminated on bedrock, ranging in depth from 10-20 cmbd.

**FEATURE B: Petroglyph (Figure A-1)**  
**FUNCTION:** Art/communication  
**DIMENSIONS:** 37.0 cm SW-NE by 12.0 cm NW-SE by 0.5 cm (approx.)  
**DESCRIPTION:** A series of 11 small depressions, each c. 2.0 cm by 2.0 cm in area, are pecked in two parallel columns into the smooth pahoehoe surface. This could be the unfinished *konane* board mentioned previously by Kennedy (Kennedy 1980). Immediately to the southeast there is a small concave area, c. 25 cm by 25 cm, where the smooth pahoehoe surface appears to be artificially abraded.

**FEATURE C: Petroglyph (Figure A-2)**  
**FUNCTION:** Art/communication  
**DIMENSIONS:** 75.0 cm SSE-NNW by 39.0 cm WSW-ENE by 0.1 cm (approx.)  
**DESCRIPTION:** The feature consists of a series of connecting geometric lines pecked into the smooth pahoehoe surface to form a figure of reptilian appearance. It is located c. 3.0 m NNE of Feature A, Entrance A.

**FEATURE D: Petroglyph (Figure A-3)**  
**FUNCTION:** Art/communication  
**DIMENSIONS:** 27.0 cm SSE-NNW by 22.0 cm ENE-WSW by 0.1 cm (approx.)  
**DESCRIPTION:** A series of connecting geometric shapes pecked into the smooth pahoehoe surface forming the appearance of a human figure. It is located c. 2.5 m ESE of Feature C. Located c. 1.0 m to the west is a conical vesicular basalt cobble which appeared to be abraded. It was surface collected.

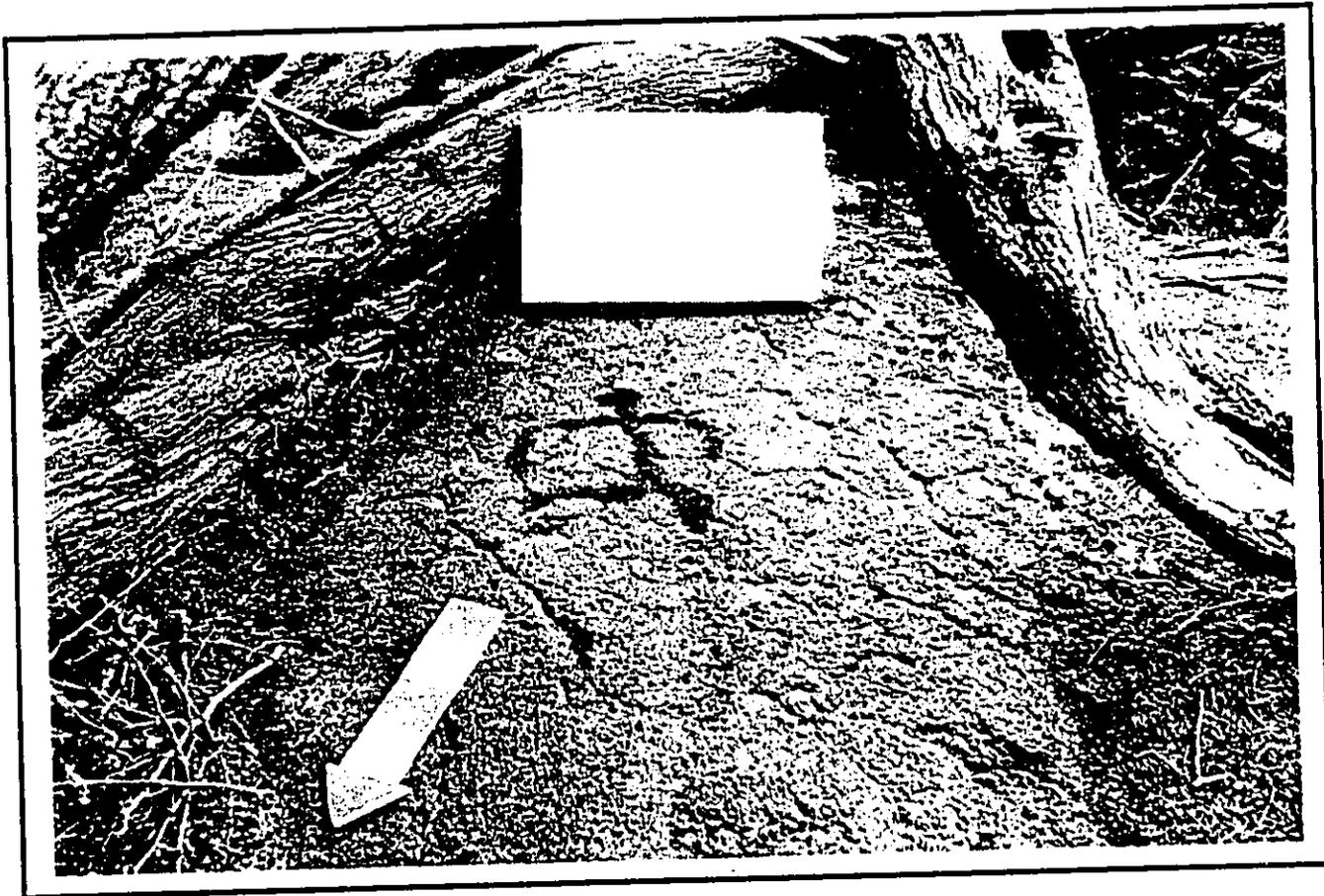
**FEATURE E: Terrace**  
**FUNCTION:** Habitation  
**DIMENSIONS:** 8.64 m E-W by 1.0 m N-S by 0.71-0.93 m (approx.)  
**DESCRIPTION:** A retaining wall constructed across the south of Feature A, Entrance A, is stacked three to five courses high for a distance of 2.09 m. The wall is faced on the cave interior from floor to dripline, c. 1.0 m high. The remainder of the feature extends southeast c. 6.0 m. and is visible along the boundary of the collapsed blister. It consists of roughly piled angular basalt cobbles. Feature E may be considerably more extensive, but due to the uprooted



*Figure A-1. SITE 14513, FEATURE B. (NEG.1622-13A)*



*Figure A-2. SITE 14513, FEATURE C. (NEG.1622-9A)*



*Figure A-3. SITE 14513, FEATURE D. (NEG.1622-11A)*

*kiawe* at the cave entrance and the apparent midden backpile from previous archaeological work and curiosity seekers, a portion of it may be covered.

Portable remains and artifacts are evident, but these seem to be the result of the midden backpile, and include at least 1.0 m of soil containing a variety of marine shell, waterworn coral and basalt, abraders, volcanic glass, basalt flakes, non-human bone (bird, fish, and turtle), and gourd fragments.

**FEATURE F: Cave**

**FUNCTION:** Habitation

**DIMENSIONS:** 3.0 m E-W by 0.56-3.15 m N-S by 0.74 m (approx.)

**DESCRIPTION:** The feature is located on the south side of the collapsed blister c. 1.84 m above the sink floor and 4.3 m southeast of the west end of Feature E. A level pahoehoe floor extends c. 1.27 m outside the dripline. Medium to large angular and subangular cobbles are set across the exposed outer floor surface from a filled crack at the east end of the overhang from the dripline area. The interior overhang area is not paved.

Measuring 1.2 m wide by 0.5 m high, a small tube opens off the east end of the overhang. It extends c. 11.73 m west to a small opening near powerlines, below where there are bulldozer scars. The tube may have been opened during the powerline construction activity. Sparse marine shell midden is scattered throughout the area. No other cultural material or deposit was present.

**FEATURE G: Petroglyph**

**FUNCTION:** Art/Communication

**DIMENSIONS:** 50.0 cm NW-SE by a 50.0 cm SW-NE by c. 0.5 cm

**DESCRIPTION:** The petroglyph includes 37 unconnected oval and round dots and a gecko figure pecked into the pahoehoe surface above and c. 1.30 m WSW of Feature F.

**FEATURE H: Boulder alignment**

**FUNCTION:** Undetermined

**DIMENSIONS:** c. 4.65 m SW-NE by .47-.68 m high

**DESCRIPTION:** This alignment extends northeast from the base of the pahoehoe ridge at the south end of the site and ends near the base of a lava pillar. The boulder alignment appears to mark a division between Sites 14513 and 14526.

**SITE NO.:** State: 14514 (*Figure A-4*)      **PHRI:** T-2

**SITE TYPE:** Pahoehoe Excavation

**TOPOGRAPHY:** A small depressed area of smooth pahoehoe surrounded by moderate to large rugged upthrusts

**VEGETATION:** Moderate to thick *kiawe* trees

**CONDITION:** Fair-good

**INTEGRITY:** Unaltered

**PROBABLE AGE:** Prehistoric ?

**FUNCTIONAL INTERPRETATION:** Indeterminate

**DIMENSIONS:** 2.75 m by 2.5 m by 0.58 m.

**DESCRIPTION:** A crack in smooth pahoehoe flow, oriented roughly SSE-NNW, has been expanded by the excavation of pahoehoe blocks. The excavated area is from 0.14 m to 0.5 m below the surrounding surface. The floor appears to be covered with angular pahoehoe blocks under a 0.1 m thick duff layer. A large waterworn basalt cobble, apparently without modification, was noticed among the floor scatter. A small, low wall, which appears to be constructed of the excavated pahoehoe, lies across the north-northwest end and perpendicular to the general excavated area. It is flush with the lip of the excavated area on both and faced on both sides at least two courses high. Several angular pahoehoe blocks are scattered adjacent to and immediately west of the excavated area on the pahoehoe surface.

**SITE NO.:** State 14518

**PHRI:** T-6

**SITE TYPE:** Complex (3)

**TOPOGRAPHY:** Undulating pahoehoe flow with numerous collapsed blisters

**VEGETATION:** Moderate to thick *kiawe* and small sparse *'ilima*

**CONDITION:** Fair-good

**INTEGRITY:** Slightly altered

**PROBABLE AGE:** Prehistoric

**FUNCTIONAL INTERPRETATION:** Temporary habitation

**DESCRIPTION:** The complex area measures c. 10.7 m N-S by 5.5 m E-W, and consists of a cave, Feature A; a cairn, Feature B; and 2 petroglyphs, Feature C.

The complex was previously identified by Kennedy (Kennedy 1980) and designated Site 54.

**FEATURE A: Cave (*Figure A-5*)**

**FUNCTION:** Temporary habitation

**DIMENSIONS:** 10.5 m E-W by 8.0 m N-S by 1.55 m (approx.)

**DESCRIPTION:** The entrance is 4.2 m wide by 1.55 m high, and opens to the west. A short wall is located immediately under and in the center of the dripline; it appears to be a wind break, runs perpendicular to the opening, and is constructed of large angular pahoehoe cobbles and small boulders. It is stacked six to seven courses high, two to four courses wide, and has an overall measurement of 1.4 m E-W by 0.8 m N-S by 0.95 m.

Circa 6.0 m to the east, a second chamber extends. It contains a gourd fragment, a coral abrader, and scattered surface marine shell midden.

Because a cultural deposit of 0.1+ m thick exists at Feature A, a test unit (TU-1) (*Figure A-6*) measuring 1.0 m by 1.0 m was excavated in the center of the first chamber c.

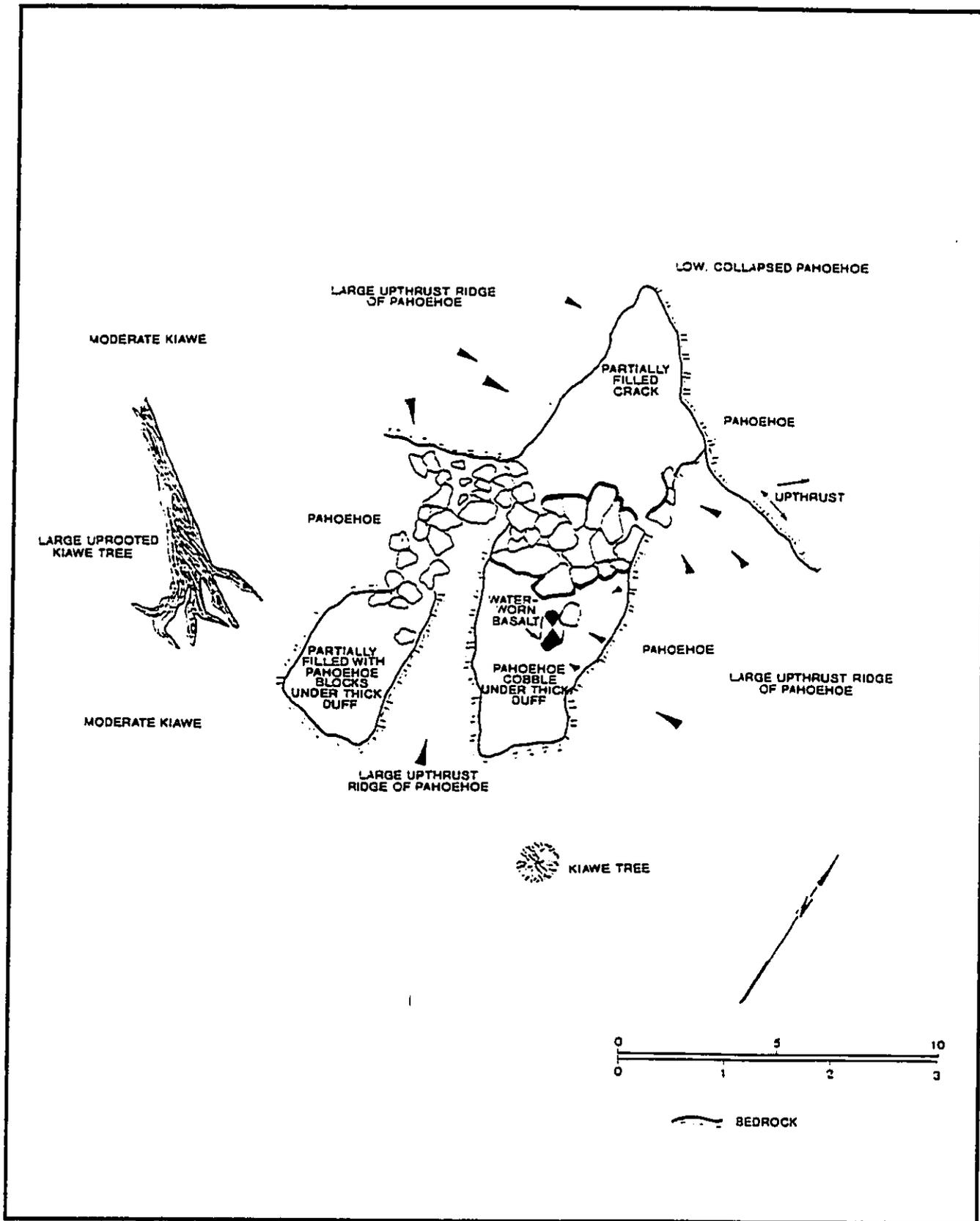


Figure A-4. SITE 14514.

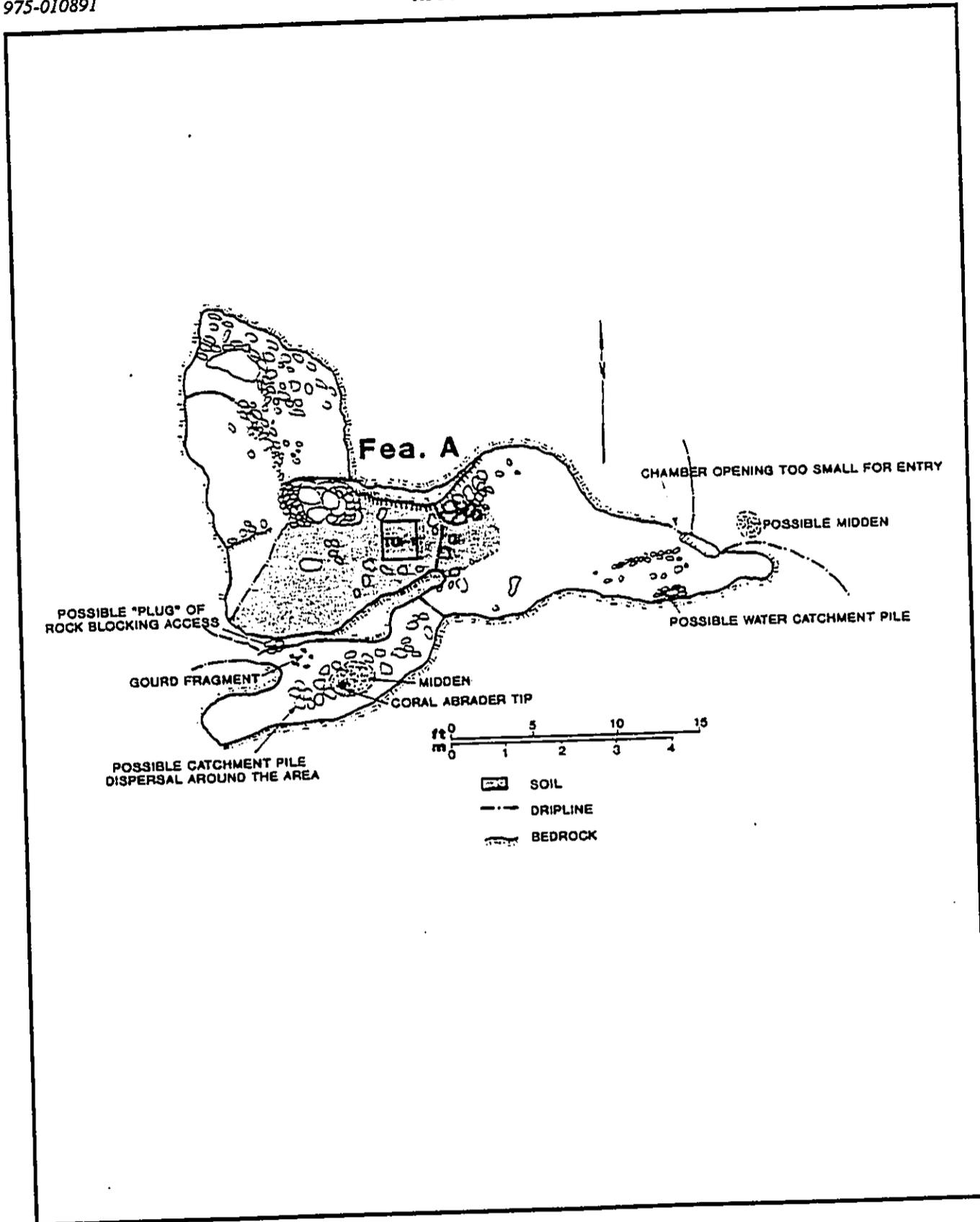


Figure A-5. SITE 14518, FEATURE A.

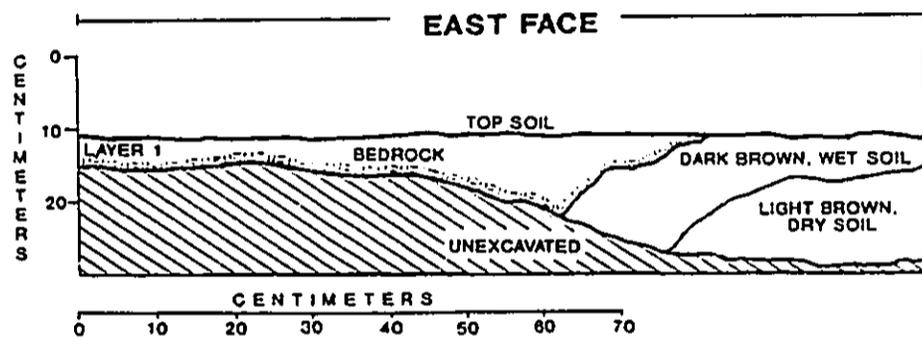


Figure A-6. SITE 14518, FEATURE A, TU-1, EAST FACE.

2.0 m east-southeast of the entrance. A unit datum was set at 17 cm above the ground surface in the northwest corner of the unit. A single soil layer was encountered, Layer I (0-28 cmbd), which was excavated in two arbitrary levels. The unit displayed the following stratigraphy:

Layer I-1 (0-17 cmbd) was a total of 17 cm thick, due to a sloping surface from the south of the unit. Cultural material contained in this level includes a high density of marine shell midden, waterworn coral and basalt cobbles, gourd fragments, historic glass, volcanic glass flakes, non-human bone, an abrader, worked bone, perforated shell, and charcoal. Layer I-2 (17-28 cmbd) contained the same amount and type of cultural material. Excavation was terminated on bedrock at a range of depths from 15 cmbd in the northeast corner of the test unit to 28 cmbd in the southeast corner.

**FEATURE B: Cairn (Figure A-7)**

**FUNCTION:** Marker

**DIMENSIONS:** 1.5 m NE-SW by 1.5 m NW-SE by 0.25-0.33 m (approx.)

**DESCRIPTION:** The cairn is c. 7.4 m north of the center of the entrance of Feature A. It appears to be constructed atop a natural bedrock pedestal which stands c. 0.85 m above the surrounding ground surface, and consists of three to five courses of stacked angular basalt slabs and cobbles.

**FEATURE C: Petroglyph (Figure A-8)**

**FUNCTION:** Art/communication

**DIMENSIONS:** 0.21 m N-S by 0.18 m

**DESCRIPTION:** The feature consists of a series of connecting geometric shapes pecked into smooth, flat pahoehoe surface, located c. 4.2 m west of the center of the dripline of Feature A. The petroglyph has the appearance of a human figure: head, arms, and torso.

**SITE NO.:** 14519

**PHRI:** T-7

**SITE TYPE:** Complex (5)

**TOPOGRAPHY:** Undulating smooth pahoehoe with numerous collapsed blisters, moderate upthrusts, caves, and overhangs.

**VEGETATION:** Sparse, large *kiawe* trees, sparse grasses and leafy ground cover.

**CONDITION:** Fair

**INTEGRITY:** Slightly altered

**PROBABLE AGE:** Prehistoric

**FUNCTIONAL INTERPRETATION:** Temporary habitation

**DESCRIPTION:** The complex area measures c. 24 m NW-SE by 13.6 m NE-SW, and is located in the central west portion of the project area along the powerlines. The site

consists of three caves, Features A, C, and E; an overhang, Feature D1; and a terrace; Feature D2. In general these are natural features that have been modified by midden deposits and cultural placement of angular basalt cobbles, and are slightly altered due to collapse, and human and goat activity.

Because of the rich cultural deposit present at Features A and E, test units were excavated (TU-1, TU-2, and TU-3). A sparse marine shell scatter was present at Feature C; waterworn basalt cobbles present at Features A, D2, and E; and waterworn coral present at Features A and D1.

This site was previously identified by Kennedy (Kennedy 1980) and designated Site 51.

**FEATURE A: Cave**

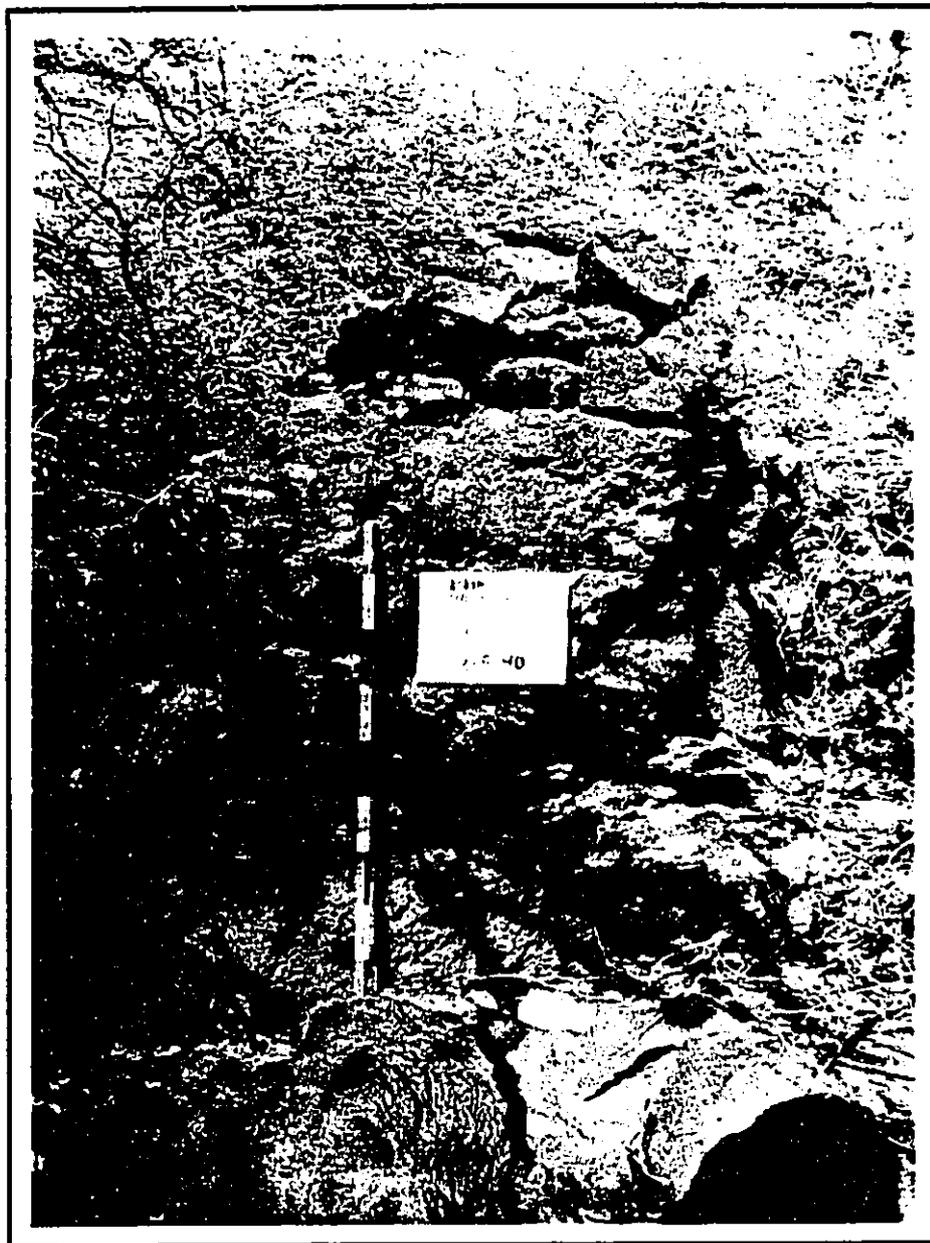
**FUNCTION:** Temporary habitation

**DIMENSIONS:** 13.5 m E-W by 10.4 m N-S by 1.6 m

**DESCRIPTION:** The feature consists of a natural cave with an entrance measuring 3.2 m wide by 1.48 m high and opening to the east. The main chamber measures 10.5 m E-W by 7.4 m N-S by 1.2 m high, and contains two small, sealed entrances opening to the west at the back of the chamber. A small tube opens to the southwest at the back southwest of the main chamber, extends c. 3.0 m and terminates at a pool of water. No cultural deposit was evident in the small tube. The main entrance of the cave is terraced with four tiers of rough paving of angular and waterworn basalt cobbles, and coral, extending c. 3.0 m to the east beyond the dripline. On both sides of the entrance angular basalt cobbles and boulders are stacked three to four courses high and nicely faced in the interior. A rich cultural deposit is evident in the main chamber in 10+ cm of soil. Marine shell midden, waterworn basalt and coral, charcoal, basalt flake, coconut shell, and echinoid abraders are seen on the terraced area and within the cave.

A test unit (TU-1) measuring 1.0 m by 1.0 m was excavated against the south wall of the main chamber, c. 5.0 m west of the entrance. A unit datum was set in the center of the west boundary of the unit, at 24 cm above the ground surface. Prior to the excavation, a coral abrader was mapped *in situ* and was collected from the surface, and seven angular basalt cobbles which appeared to be ceiling collapse were mapped and removed. The following stratigraphy was revealed:

Layer I (21-35 cmbd) was excavated in two arbitrary levels. Layer I-1 (21-31 cmbd) contained a high density, approximately 90%, of marine shell midden, 10-15 small angular basalt cobbles, volcanic glass flakes, coral and echinoid abraders, two waterworn basalt cobbles, waterworn coral, bird bone, coconut shell, *kukui* nutshell, and charcoal. Layer I-2 (31-35 cmbd) contained a few small waterworn coral and basalt cobbles, a decrease in the density of marine shell to approximately 55%, charcoal, non-human bone



*Figure A-7. SITE 14518, FEATURE B. (NEG.1601-12)*

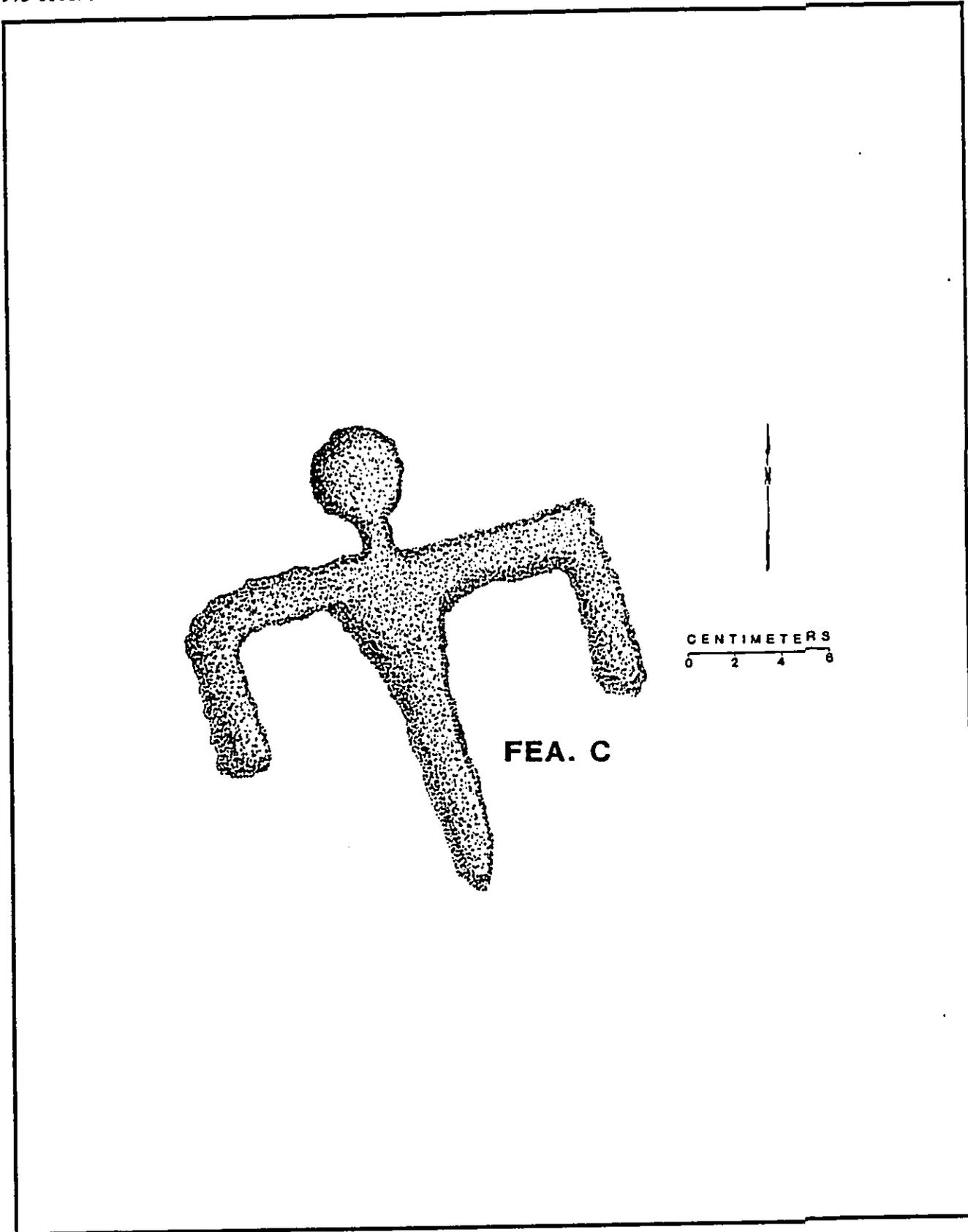


Figure A-8. SITE 14518, FEATURE C.

(bird, fish, and small mammal), volcanic glass and fine-grained basalt flakes, an adze fragment, a fish hook, worked bone, and abraders. Excavation was terminated on bedrock, encountered from 23-35 cmbd in the majority of the unit, except for a small crack in the far southwest portion of the unit and this appeared to be a natural crack containing sparse marine shell, and terminating at 57 cmbd due to difficulty in excavation. Two samples (RC-928 and RC-929) were submitted for age determination analysis and yielded an overall range of AD 1460-1954 and AD 1430-1954, respectively.

**FEATURE C: Cave****FUNCTION:** Temporary habitation**DIMENSIONS:** 3.6 m E-W by 2.6 m N-S by 0.7-1.0 m**DESCRIPTION:** This feature consists of a small cave, open to the northwest, and located c. 3.8 m southeast of the entrance to Feature E. There is a thin soil deposit with scattered marine shell midden inside the cave, but no other cultural modification.**FEATURE D1: Overhang****FUNCTION:** Temporary habitation**DIMENSIONS:** 3.3 m NW-SE by 2.2 m NE-SW by 0.1-1.6 m (approx.)**DESCRIPTION:** The overhang is c. 8.0 m south of Feature E, and opens to the northwest. It measures 1.7 m deep (NW-SE) by 2.3 m wide by 0.6-1.6 m high, and does not appear to be modified or to contain any cultural deposit. Immediately outside the entrance overhang is a small area, c. 1.68 m E-W by 1.38 m N-S by 0.1-0.2 m, of rough paving consisting of 14 pahoehoe slabs, and cobbles with smaller clinkers, arranged on bedrock to create a somewhat smooth surface. Two pieces of waterworn coral were present among the paving material.**FEATURE D2: Terrace****FUNCTION:** Temporary habitation**DIMENSIONS:** 6.0 m NW-SE by 3.5 m NE-SW by 0.3-0.6 m (approx.)**DESCRIPTION:** The feature is located c. 10.0 m north of Site 14520, Feature A, and c. 3.0 south of Feature E, Site 14519. The terrace is approximately L-shaped. It is constructed partially on a bedrock outcrop of angular pahoehoe basalt cobbles, small boulders and clinkers, ranging in size from 10 by 10 by 5 cm to 40 by 40 by 20 cm, roughly seven to ten courses wide and three to four courses high. Facing is evident along the interior west and south sides, and along the exterior northeast side. The feature shows collapse around all boundaries, but it is most noticeable beyond the southwest faced boundary. A total of 12 small waterworn basalt cobbles are at the southwest boundary of the feature.**FEATURE E: Cave****FUNCTION:** Temporary habitation**DIMENSIONS:** 8.5 m N-S by 3.8 m E-W by 0.54-1.1 m (approx.)**DESCRIPTION:** The feature consists of a single lava tube located c. 13.5 m southeast of Feature A. The entrance opens to the south and is 3.6 m E-W wide by 1.6 m high; it has been modified on both the east and west sides by stacked angular basalt cobbles and small boulders which create a partial windbreak. On the east side of the entrance, from the base of the opening to the dripline, cobbles have been stacked three to six courses high, measuring c. 3.2 m long by 1.2 m wide by 0.62 m high. Angular pahoehoe cobbles and slabs stacked two to three courses high measuring c. 1.8 m E-W by 3.0 m N-S by 0.6 m high modify the west side of the entrance, and are somewhat collapsed, due in part to a large *kiawe* tree growing in the center of the entrance. The interior of the cave is disturbed because of goat activity. Portable remains identified within include marine shell midden, and waterworn basalt cobbles.

A total of two test units (TU-2 and TU-3) were excavated inside the cave to determine the extent and density of cultural deposit.

Test unit (TU-2) was excavated along the interior east wall of the cave c. 1.0 m from the entrance, measuring 1.0 m by 1.0 m. A unit datum was set at 18 cm above the ground surface in the northeast corner of the unit. The following stratigraphy was revealed:

Layer I (16-35 cmbd) was excavated in two arbitrary levels. Layer I-1 (16-28 cmbd) contained a high density of marine shell midden, non-human bone, charcoal, gourd fragments, echinoid abraders, basalt and volcanic glass flakes, perforated shell, and worked bone. Layer I-2 (28-35 cmbd) contained the same types and density of cultural material as the above level. Bedrock was encountered in the east half of the unit at 35 cmbd. Four samples (RC-925, -926, -927, and -930) were submitted for age determination analysis and yielded overall ranges of AD 1280-1650, AD 1640-1950, AD 1322-1650, and AD 1430-1670, respectively.

On interior of north wall (Appendix C for detailed description) five samples were taken at TU-3 (RC-931, -932, -933, -934, and -935) (Figure A-9) and were submitted for age determination analysis and yielded overall ranges of AD 1640-1955, AD 1670-1955, AD 1640-1955, AD 1510-1950, and 1250-1650, respectively.

**SITE NO.:** 14520 (Figure A-10)**PHRI:** T-8A**SITE TYPE:** Complex (6)**TOPOGRAPHY:** Undulating pahoehoe flow with small upthrusts and collapsed blisters.**VEGETATION:** Sparse *kiawe* and sparse small, leafy

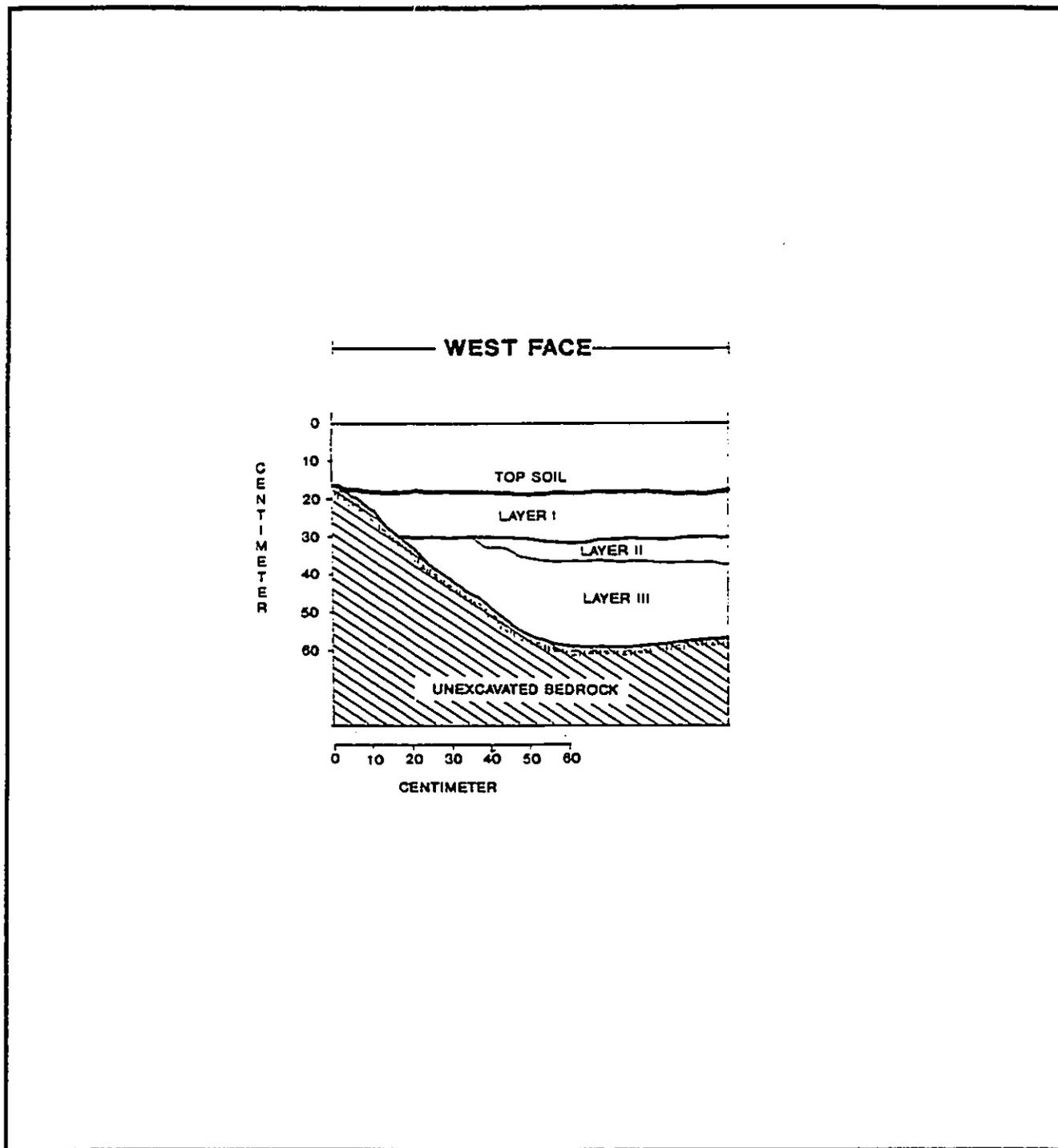


Figure A-9. SITE 14519, FEATURE E, TU-3 PROFILE.

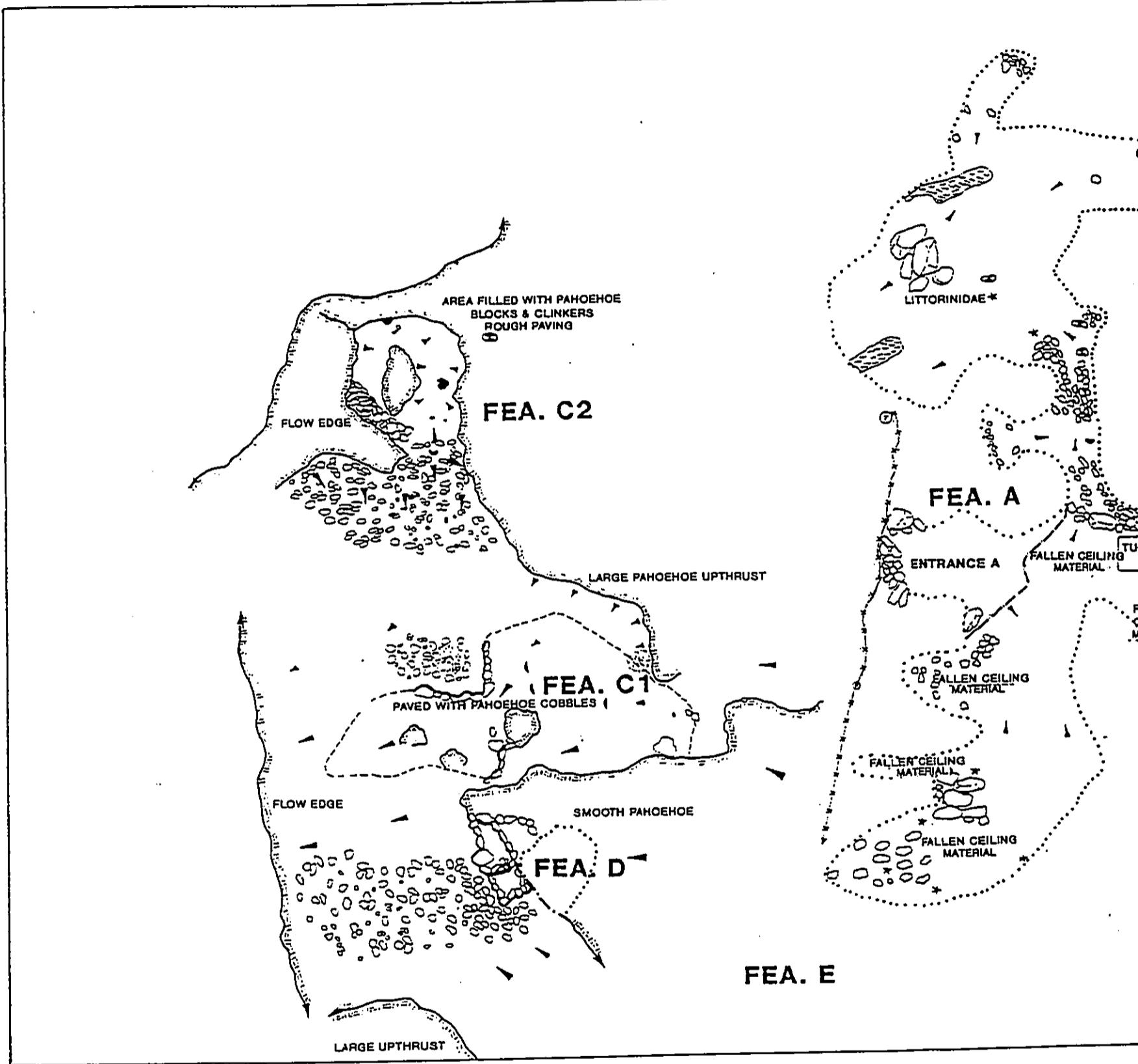
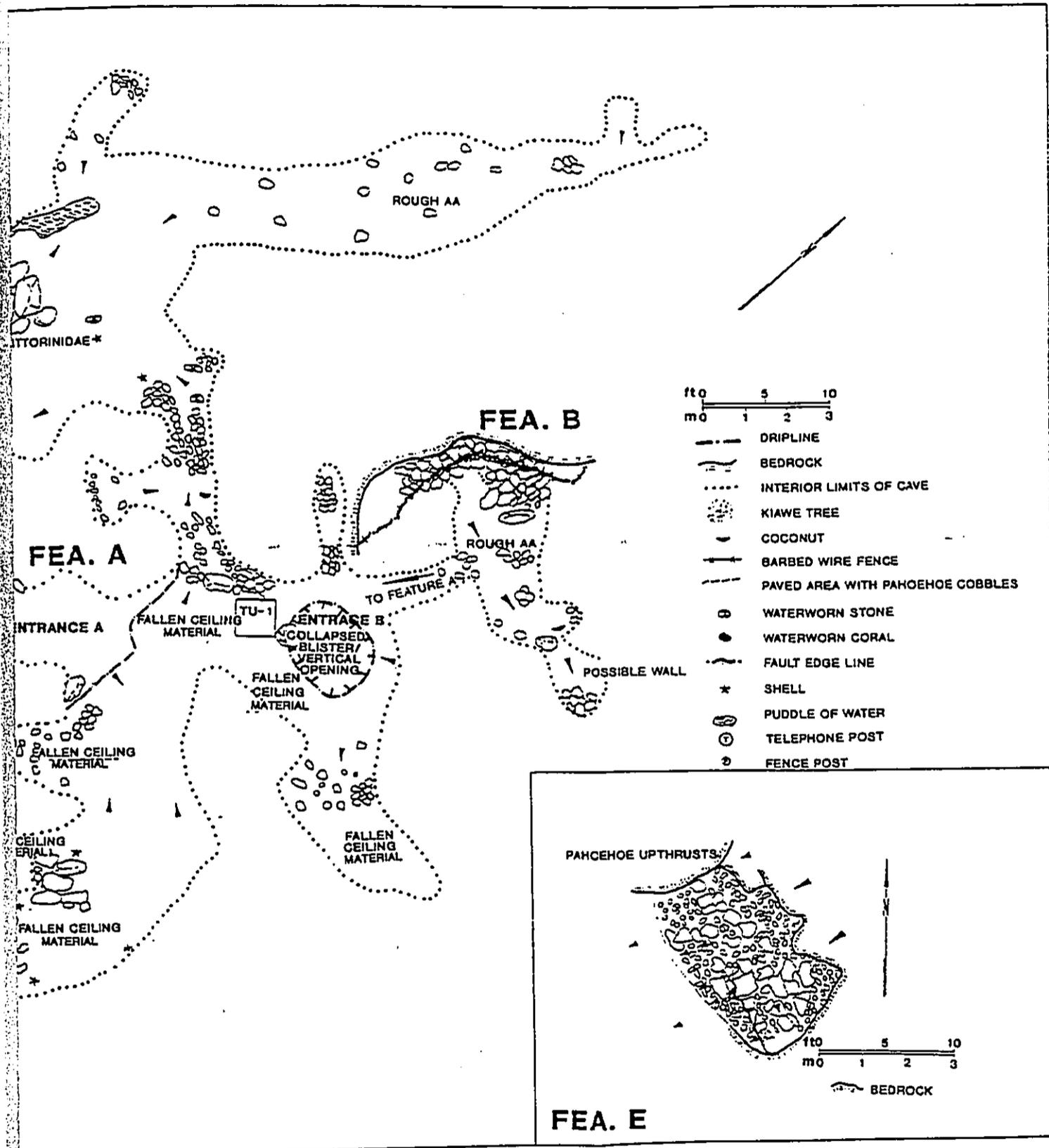


Figure A-10. SITE 14520, FEATURES A, B, C1, C2,



FEATURES A, B, C1, C2, D, AND E.

ground cover.

**CONDITION:** Fair

**INTEGRITY:** slightly altered

**PROBABLE AGE:** Prehistoric

**FUNCTIONAL INTERPRETATION:** Temporary habitation

**DESCRIPTION:** The complex area measures c. 30.5 m WSW-ENE by 15.5 m NNW-SSE, and is c. 10 m west-southwest of Site 14519, Feature D2. The site consists of three caves, Features A, B, and D; two paved terraces, Features C1 and E; and one modified outcrop, Feature C2. The site largely utilizes natural features and modifies them by stacking and paving with pahoehoe angular cobbles.

Portable remains present throughout the site include marine shell midden at Features A and B; a coconut shell at Feature B; waterworn basalt cobbles at Features A and C2; waterworn coral at Feature C1 and C2. A test unit was excavated at Feature A to determine the nature and extent of cultural deposit.

**FEATURE A: Cave**

**FUNCTION:** Temporary habitation

**DIMENSIONS:** 24.6 m N-S by 19.5 m E-W by 0.1-1.3 m (approx.)

**DESCRIPTION:** The feature is a cave with two entrances. The main entrance, designated A, opens to the west and is 2.9 m wide by 1.16 m high. The exterior area, measuring c. 1.6 m E-W by 0.57 m, has been partially paved with pahoehoe slabs and cobbles, sizes from 15 by 10 by 4 cm to 25 by 20 by 5 cm. A second vertical opening, designated B, is located c. 4.0 m east of Entrance A and measures 1.47 m by 1.08 m by 1.6 m above the cave floor. Entrance B seems to have been widened at the northeast by excavation. Angular pahoehoe blocks, cobbles, and boulders are scattered throughout the cave floor area and appear to be ceiling fall.

Two small areas of standing water and isolated areas of soil deposit c. 0.15 m thick were noted along the northwest boundary of the cave. Portable remains evident throughout the cave include marine shell midden, two coconut shell fragments, and waterworn basalt cobbles.

A test unit (TU-1) measuring 1.0 m by 1.0 m was excavated c. 2.0 m inside entrance A and c. 1.1 m from the south wall of the main chamber. A unit datum was set in the center of the north wall 28.0 cm above the unit surface. The following stratigraphy was revealed:

Layer I (28-34 cmbd) contained marine shell midden including burnt shell, waterworn coral, a possible coral abrader, and a volcanic glass flake. Layer II (32-38 cmbd) contained a higher density of marine shell midden, non-human bone, charcoal, polished basalt flake, and volcanic flakes. Excavation was terminated on bedrock, which was encountered at 35.0 cmbd in the northwest portion of the

unit, and at 38.0 cmbd throughout the rest of the unit floor area.

**FEATURE B: Cave**

**FUNCTION:** Temporary habitation

**DIMENSIONS:** 6.7 m SSE-NNW by 2.5 m WSW-ENE by 0.1-0.9 m (approx.)

**DESCRIPTION:** The small cave is c. 12.3 m northeast of the fence and c. 5.0 m east of Feature A, Entrance B. A vertical entrance measuring 0.6 m long by 0.6 m wide and 1.6 m is mostly blocked by large angular basalt cobbles and boulders. Approximately 2.5 m inside the cave a small tube branches to the west and appears to connect with Feature A east of entrance B, although most of this tube is blocked by boulders from ceiling fall. A few pieces of marine shell were noted on the cave floor, and a coconut shell fragment was located at the back of the cave.

**FEATURE C1: Terrace**

**FUNCTION:** Temporary habitation

**DIMENSIONS:** 10.1 m N-S by 4.7 m E-W by 0.3 m (approx.)

**DESCRIPTION:** The feature is located c. 6.0 m southwest of Feature A, Entrance A. It is oriented roughly N-S in a low area surrounded by small upthrusts of pahoehoe on the north, east, and west sides, and by a flow edge to the immediate south. The surface of the terrace, constructed on smooth pahoehoe, is paved with angular basalt cobbles and clinkers and is fairly smooth in appearance. Approximately halfway down the terrace is a natural step, accentuated on the east and west sides with basalt cobbles to create an upper and lower portion of the area. Remnant facing is noticeable along the upper and lower terrace and along the southwest boundary.

The upper terrace is less disturbed and more evenly paved than the south, and three pieces of waterworn coral were noted among the paving materials.

**FEATURE C2: Modified outcrop**

**FUNCTION:** Temporary habitation

**DIMENSIONS:** 4.3 m E-W by 3.6 m N-S by 0.4 m (approx.)

**DESCRIPTION:** The feature is located c. 2.0 m northeast of the flow edge and c. 6.0 west of Feature C1, in a small depressed area which is filled with angular pahoehoe cobbles and small boulders. A small terrace is evident along the south side of the feature, measuring c. 2.0 m E-W by 0.5 m by 0.4 m. It is constructed of angular basalt cobbles stacked three courses high with evident facing along the northwest side. Scattered angular basalt cobbles and boulders on the east side of the outcrop may be the result of collapse from the upper paved area of the bedrock outcrop.

**FEATURE D: Cave****FUNCTION:** Temporary habitation**DIMENSIONS:** 4.0 m E-W by 3.1 m N-S by 0.3-0.8 m (approx.)

**DESCRIPTION:** The feature is a small cave located c. 4.0 m east of Feature C1. The entrance opens to the south-southeast and measures 2.0 m E-W wide by 0.8 m high. There is modification near the entrance, which may be some type of paving, but with much scattered rubble, due to collapse, paving cannot be positively identified. West of the entrance, in an area measuring c. 2.8 m E-W by 1.0 m N-S by 0.3-0.75 m high, are two small terraces of angular pahoehoe cobbles and boulders stacked two to five courses. This small terraced area partially obstructs the entrance. The cave measures 3.0 m E-W by 2.0 m N-S by 0.8 m. No modification appears to exist inside, however roof collapse covers the floor area.

**FEATURE E: Terrace****FUNCTION:** Temporary habitation**DIMENSIONS:** 5.5 m NNW-SSE by 3.3 m ENE-WSW by 0.1-0.9 m (approx.)

**DESCRIPTION:** The feature is located c. 10.0 m north-northeast of Feature D, and oriented roughly north-northwest by south-southeast. A remnant retaining wall is along the west boundary. The south portion of the wall is stacked five courses high. The north portion is badly collapsed, appears to be constructed on bedrock, and is surrounded on all sides by exposed bedrock. The back, east portion of the feature is roughly paved with angular pahoehoe cobbles and small boulders proceeding eastward to exposed bedrock.

**SITE NO.:** 14521**PHRI:** T-9**SITE TYPE:** Complex (2)**TOPOGRAPHY:** Undulating pahoehoe flow edge with lower soil area to the southwest.**VEGETATION:** High density of large *kiawe* trees, many of which have uprooted and overturned.**CONDITION:** Fair-good**INTEGRITY:** Slightly altered**PROBABLE AGE:** Prehistoric**FUNCTIONAL INTERPRETATION:** Temporary habitation

**DESCRIPTION:** The complex area measures c. 13.2 m E-W by 8.4 m N-S. It is located c. 90.5 m from the southeast corner and along the east boundary of the project area. The site consists of two features, a walled terrace, Feature A; and a paved area, Feature B; Both are constructed of angular pahoehoe cobbles and boulders along the edge of the flow, which extends from the north-northeast. The large trees have caused alteration to both features because of root

disturbance and limb collapse. Waterworn basalt cobbles are present at both features.

**FEATURE A: Terrace (Figure A-11)****FUNCTION:** Temporary habitation**DIMENSIONS:** 6.9 m WSW-ENE by 6.0 m NNW-SSE by 0.3-0.98 m (approx.)

**DESCRIPTION:** The feature consists of a terrace, roughly rectangular, paved with pahoehoe cobbles, slabs, and clinkers. It is constructed on smooth pahoehoe and somewhat even in appearance. The west, or front portion of the terrace, is well defined by an alignment of angular pahoehoe cobbles parallel to and c. 1.0 m east of the flow edge. The north, east and south sides of the terrace are bordered by a wall constructed of stacked angular pahoehoe cobbles and slabs. The interior east portion of the wall is stacked six courses high and well-faced. The interior has remnant facing along the south, but the north and south sides are stacked only two to three courses high. The exterior north side of the wall is faced and stacked five courses high. Both the south and east exteriors have multiple stacked wide walls and slope from the top of the wall to ground level. A single waterworn basalt cobble was noted among the terrace pavings.

**FEATURE B: Paved area (Figure A-11)****FUNCTION:** Temporary habitation**DIMENSIONS:** 3.38 m WNW-ESE by 1.95 m by 0.15 m (approx.)

**DESCRIPTION:** The feature is a small roughly paved area located c. 3.5 m west of Feature A, and immediately southwest and below the edge of the pahoehoe flow edge. The area is constructed of angular pahoehoe cobbles and slabs with a rough alignment that bounds the far southeast side. One waterworn basalt cobble was noted c. 2.5 m to the southwest of the feature.

A test unit (TU-1) measuring 1.0 m by 1.0 m was excavated along the east side of the paved terrace abutting the faced wall. A unit datum was set in the northeast corner at the paved surface. The following stratigraphy was revealed:

Layer I (0-25/34 cmbd) consisted of the terrace paving stones, angular pahoehoe slabs, cobbles and clinkers. A few small 'ili 'ili pebbles were noticed while excavating, both waterworn basalt and coral. One volcanic flake was found in situ at the base of this layer.

Layer II (25-80 cmbd) commenced when soil was encountered beneath the paving, ranging from 25 cmbd in the northeast quad to 34 cmbd in the south portion of the unit. This layer was excavated in five arbitrary levels. Layer II-1 (25-35 cmbd) was excavated in the northeast portion of the unit and contained volcanic glass flakes, a few

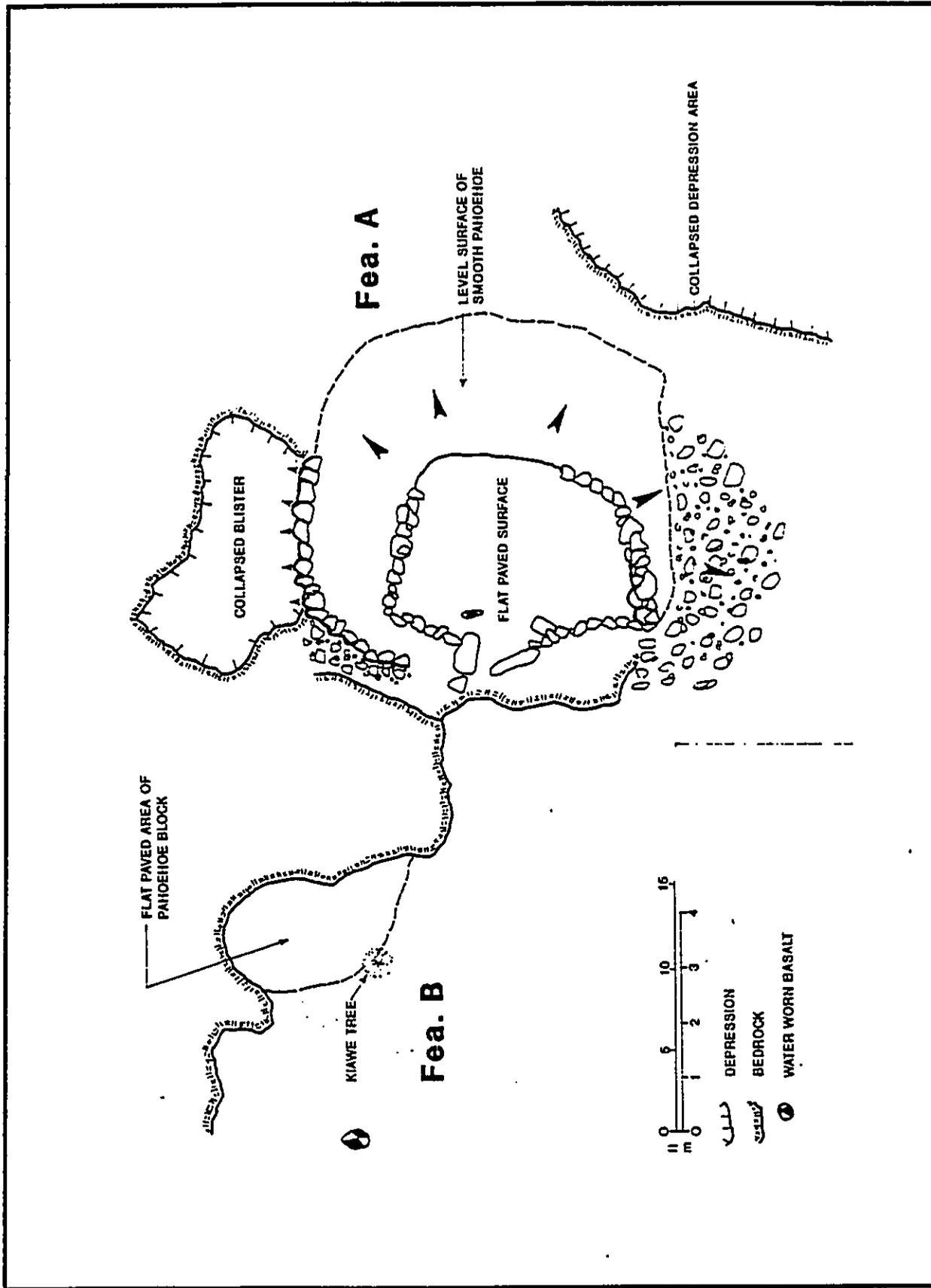


Figure A-II. SITE 14521, FEATURES A AND B.

pieces of marine shell, and 'ili 'ili pebbles of waterworn basalt and coral. Layer II-2 (35-45 cmbd), Layer II-3 (45-55 cmbd) contained sparse marine shell midden, a few 'ili 'ili pebbles of waterworn basalt and coral, and volcanic glass flakes. Layer II-4 (55-65 cmbd) contained one volcanic glass flake. Layer II-5 (65-80 cmbd) contained no cultural material and terminated on bedrock at a maximum depth of 80 cmbd. Where bedrock was encountered there were small thin pockets of beach sand.

**SITE NO.:** 14524

**PHRI:** T-12

**SITE TYPE:** Complex (8)

**TOPOGRAPHY:** Pahoehoe flats, ridges, and upthrusts oriented generally east-west. Several lava pillars and numerous caves are in the immediate area.

**VEGETATION:** Kiawe and sparse grass

**CONDITION:** Poor-good

**INTEGRITY:** Unaltered

**PROBABLE AGE:** Prehistoric

**FUNCTIONAL INTERPRETATION:** Temporary habitation/shelter

**DIMENSIONS:** 19.70 m 315°/135° Az. by 9.40 m 45°/225° Az.

**DESCRIPTION:** The site is located in a linear depression formed by the collapse of a large lava blister. The features are located along three sides and at a lava pillar at the southeast end. The site consists of four caves, Features A,B,C,D, and five petroglyphs, Features E,F,G, and H.

**FEATURE A: Cave**

**FUNCTION:** Temporary habitation

**DIMENSIONS:** Overall c. 3.40 m NE-SW by 3.80 m NW-SE

**DESCRIPTION:** The cave is located near the east end of the site at the base of a pahoehoe ridge running approximately E-W. A small sink in front of the cave opening has been filled with cobbles to within .50 m of the top. The cave floor lies 2.03 m below the top of the sink. The sink fill and cobbles stacked within the entrance create two steps that meet a sloping cobble pile extending to the cave floor. The sink fill and piled cobbles have reduced the entrance size to an opening measuring 1.20 m by .50 m.

A small lava tube, extending west toward Feature B, opens at the west end of the cave. The cave floor is here has only a trace of aeolian soil. Two small pieces of waterworn coral and a waterworn coral cobble were present in the steps near the entrance.

**FEATURE B: Cave**

**FUNCTION:** Temporary habitation

**DIMENSIONS:** Overall, c. 6.20 m E-W by 2.50 m W-S

**DESCRIPTION:** This feature is located on the north side of the site at the bottom of the sloping ridge face. The 1.8 m by .92 m entrance opens into a 4.50 m by 2.15 m that extends west toward Feature C. The cave is blocked between the two features. There is a .70 m by .76 m opening in the cave floor immediately inside of the entrance. Pahoehoe slabs are on the cave floor at the the west side of the opening. A sloping pile of angular and subangular cobbles extends from inside the opening to the floor of a small lava tube c. 1.3 m below. Small cobbles cover the floor for a distance of 1.8 m east of the opening. At that point the tube appears to be blocked by roof fall. One waterworn basalt cobble is present inside of the entrance and another is visible beyond the blocked portion of the tube.

**FEATURE C: Cave**

**FUNCTION:** Temporary habitation

**DIMENSIONS:** 9.70 m NW-SE by 3.95 m NE-SW by c. 2.00 m

**DESCRIPTION:** This cave feature is located on the southwest side of the site. The cave has two openings, one on either side of the ridge. The southwest opening, 2.10 m above the floor, measures 1.70 m by .70 m and faces 65° Az. A low curved wall, constructed of loosely piled cobbles, extends across the width of the cave below the opening. Two small pieces of waterworn coral are at the base of the wall and two small waterworn stones are on the floor to the northwest. The cave floor is broken and drops .50 m at the east side of the wall. A 2.70 m by 1.70 m brackish water pool is located in the lower level at the northeast end of the wall. One waterworn coral cobble rests on the bottom of the pool.

A second entrance to the cave is located at the top of the ridge, c. 3.45 m to the south. This entrance faces 207° and opens 1.34 m above the cave floor. Boulders are piled on the bedrock across the lower edge of the opening. Piled cobbles and boulders slope from the entrance to the cave floor.

**FEATURE D: Cave**

**FUNCTION:** Temporary habitation

**DIMENSIONS:** 3.00 m by 1.50 by 0.50 m

**DESCRIPTION:** This cave is located at the base of a lava pillar near the east end of the site. The pillar base is surrounded by a small, fractured lava bubble that rises 1.16 m above the surrounding surface. A fissure (1.20 m by .65 m) at the base of the pillar has been partially filled with small cobbles leaving a small opening (.29 m by .50 m) into the cave below. The opening is too small to allow entry into the cave. No manuports or cultural materials are present but a petroglyph has been carved in the smooth pahoehoe surface below the filled fissure.

**FEATURE E: Petroglyphs (2)****FUNCTION:** Art/communication**DIMENSIONS:** Overall, 1.6 m by .34 m

**DESCRIPTION:** Two human figure petroglyphs have been pecked into the elevated pahoehoe surface at the west end of the site. Both figures have been pecked into the surface using a pointed instrument that left lines with fairly regular depth and width. Figure number 1 is 34 cm tall and 24 cm wide. The figure is asymmetrical with a triangular torso positioned to the left of center and sharply angled arms and legs. Figure number 2 is 30 cm tall and 20 cm wide. This petroglyph is a lineal or stick figure representation of a human form. The shoulders extend straight from the torso with short arms extending down. The upper legs form outward curves with short, straight lower leg sections attached.

**FEATURE F: Petroglyph****FUNCTION:** Art/communication**DIMENSIONS:** 32 cm tall by 33 cm wide

**DESCRIPTION:** This human figure petroglyph has been pecked into a vertical ridge surface at the southwestern end of the site. The pahoehoe around the figure has fractured separating the carving from the surrounding surface. The linear figure has narrow outlines, a short torso, and extended arms and legs.

**FEATURE G: Petroglyph****FUNCTION:** Art/communication**DIMENSIONS:** 37 cm tall by 23 cm wide

**DESCRIPTION:** This petroglyph has been carved into the side of the small lava blister at the base of a lava pillar. It is a human figure with a triangular torso and has sloping shoulders and bent arms and legs. It has been pecked into the slanting surface in the same manner as the other petroglyph features at this site.

**FEATURE H: Petroglyph****FUNCTION:** Art/communication**DIMENSIONS:** 27 cm tall by 33 cm wide

**DESCRIPTION:** This petroglyph has been pecked into the top surface of a 1.84 m high lava pillar at the east end of the site. The top of the pillar is eroding and the head, shoulders, upper torso, and right arm of the figure have been destroyed.

**SITE NO.:** 14525 (Figure A-12)**PHRI:** T-13**SITE TYPE:** Modified sinkhole

**TOPOGRAPHY:** Collapsed blister in undulating pahoehoe  
**VEGETATION:** Moderate to thick *kiawe*, and sparse *'ilima* surrounding the blister. No vegetation in the collapsed blister.

**CONDITION:** Fair**INTEGRITY:** Slightly altered**PROBABLE AGE:** Prehistoric**FUNCTIONAL INTERPRETATION:** Temporary habitation**DIMENSIONS:** 10.5 m E-W by 8.0 m N-S by 0.52-1.35 m (approx.)

**DESCRIPTION:** The collapsed blister is at the north one-fourth of the project area, along the west boundary, and below the powerlines. The floor is modified with rough paving throughout. Circa 1.2-1.35 m below the sinkhole lip, the construction is of angular pahoehoe cobbles and boulders. The northeast portion of the paving is more even and in much better condition. The remaining portion of the feature contains many collapsed cobbles and boulders. A total of five waterworn basalt cobbles were noticed among the paving materials.

**SITE NO.:** 14526**PHRI:** T-14**SITE TYPE:** Complex (11)

**TOPOGRAPHY:** Pahoehoe flats, ridges, and upthrusts oriented generally east-west. Several lava pillars and numerous caves are in the immediate area.

**VEGETATION:** *Kiawe* and sparse grass**CONDITION:** Poor-good**INTEGRITY:** Unaltered**PROBABLE AGE:** Prehistoric**FUNCTIONAL INTERPRETATION:** Temporary habitation/shelter**DIMENSIONS:** 17.00 m NE-SW by 7.00 m NW-SE

**DESCRIPTION:** The site is located at the base of a cliff formed by the collapse of a large lava blister. Site 14513 is located at the northwestern end of the collapsed blister. Feature H, Site 14513 is located 2.50 m /310° from Feature A, Site 14526. This site consists of a petroglyph panel, Feature A; 3 petroglyphs, Features B, C, D; 3 caves, Features E, H, I; a wall, Feature G; terrace, Feature F; boulder excavation, Feature J; modified sink, and Feature K.

**FEATURE A: Petroglyph panel****FUNCTION:** Art/communication**DIMENSIONS:** 1.40 m by 1.05 m

**DESCRIPTION:** The panel contains two human figures, an unidentified animal figure, and 15 small oval depressions pecked into the pahoehoe surface. One of the human figures appears to be holding a sling or other object in the left hand; a series of small dots lead from the raised hand, curves over the heads of both figures, and ends in an oval with a pecked interior surface. The animal petroglyph is positioned below the feet of the figure with the sling. Ten pecked ovals, 3.0-4.0 cm long by 2.0-4.0 cm wide by .50-1.5 cm deep, curve downward from the animal figure.

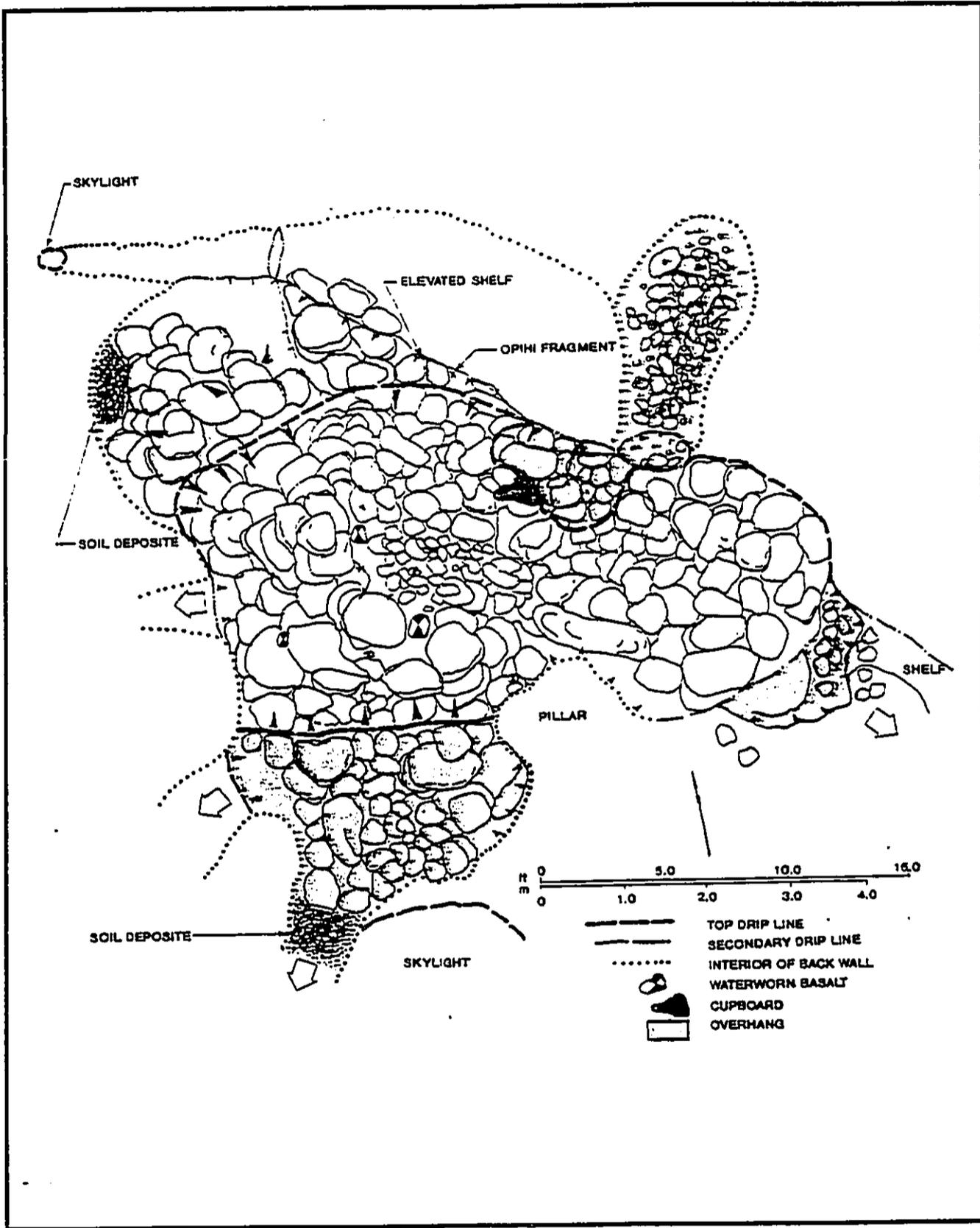


Figure A-12. SITE 14525.

**FEATURE B: Petroglyph****FUNCTION:** Art/communication**DIMENSIONS:** 23 cm high by 30 cm wide**DESCRIPTION:** This is a basic linear human figure pecked into the vertical side surface of a collapsed blister. The bottom of the figure is positioned .48 m above the ground surface. It differs from most of the other human figure representations in the vicinity only by the fact that it is one of the two that have lines representing feet; in manner of execution it is the same.**FEATURE C: Petroglyph****FUNCTION:** Art/communication**DIMENSIONS:** 26 cm high by 29 cm wide**DESCRIPTION:** This linear human figure has been pecked into the flat surface of a large boulder that appears to have fallen from the top of a nearby lava pillar. The boulder has been propped with several cobbles leaving the flat surface vertical and raised .61 m above the ground.**FEATURE D: Petroglyph****FUNCTION:** Art/communication**DIMENSIONS:** 23 cm high by 26 cm wide**DESCRIPTION:** This petroglyph has been pecked into the northwest side of the collapsed blister holding Feature B. A *kiawe* tree growing against the blister partially conceals the linear human figure which has been carved into the vertical face .48 m above the ground surface. The left foot of the figure has been removed by a fracture in the pahoehoe.**FEATURE E: Cave****FUNCTION:** Temporary habitation**DIMENSIONS:** 24.30 m by 2.0-3.5 m by c. 1.10 m**DESCRIPTION:** This feature is a lava tube opening from the northeast end of a collapsed blister. The overhang dripline is positioned 1.2 m west and 1.90 m above the cave entrance which measures 0.77 m by 0.53 m. The opening faces 260° Az. The cave interior has boulders and cobbles piled on either side of the entrance for a distance of 4.00 m. Two branches open off of the the main tube; both contain shell midden and waterworn stones. Shell midden, waterworn stones, and a soil deposit are present along the length of the cave. The cave floor holds a soil deposit c. 07 cm deep. A deeper deposit of soil and marine shell midden is located near the opening at the northeast end of the cave.**FEATURE F: Terrace****FUNCTION:** Temporary habitation**DIMENSIONS:** c. 1.65 m NE-SW by 1.7 m NW-SE**DESCRIPTION:** A large cobble alignment extending across the overhang, immediately inside the dripline, confirms the east edge of an irregular shaped cobble terrace. The terrace abuts exposed bedrock on the south and southwest and is confined by three large boulders on the west. A low boulder

and cobble wall (Feature G) abuts the northeast end of the terrace. No cultural remains were visible on or in the feature.

**FEATURE G: Wall****FUNCTION:** Temporary habitation**DIMENSIONS:** c. 7.10 m by .60-2.1 m by .28-.45 m**DESCRIPTION:** This low, V-shape wall is constructed of loosely piled cobbles and boulders. The wall is not attached or faced and varies in width. It abuts Feature F terrace at the southeast end, a boulder rubble concentration at the northeast end, and bedrock at the southwest end. The east wall section is built against the base of a bedrock cliff and the wider west wall is resting on a fairly level bedrock surface. No midden or other cultural remains were present in or around the wall.**FEATURE H: Cave****FUNCTION:** Temporary habitation**DIMENSIONS:** c. 2.20 m by 1.35 m**DESCRIPTION:** This cave opens at the base of the cliff formed by the collapse of the lava blister. Boulder rubble around the cave opening has been moved to form a cleared area c. 0.36 m by 0.30 m by 1.00 m deep allowing access to the cave entrance. A 0.75 by 0.78 m opening at the cliff base leads into a small chamber c. 2.20 by 1.35 by c. .42 m. The chamber floor is bare and contains no cultural material. A cleared opening at the top of the cliff leads to a shelf 1.70 m above the cave entrance.**FEATURE I: Cave.****FUNCTION:** Temporary habitation**DIMENSIONS:** c. 1.00 m by 1.00 m**DESCRIPTION:** This small cave is located at the cliff base c. 2.30 m NNE of Feature H. Boulder rubble has been cleared from above the entrance exposing a pahoehoe surface 0.51 m below the rubble. An 0.55 by 0.50 opening in the pahoehoe leads to the 0.65 by 0.36 by 0.52 cave at the base of the cliff. A small waterworn stone is located in the rubble at the northeast side of the opening. The exposed pahoehoe on the northwest side of the opening has been paved with small cobbles and pebbles between the opening and Feature J. A large (1.00 by 0.62 m) pahoehoe slab is positioned above the opening.**FEATURE J: Boulder excavation****FUNCTION:** Temporary habitation**DIMENSIONS:** c. 1.45 m by 1.0 m by 1.09 m**DESCRIPTION:** Boulders have been removed from the rubble concentration 1.50 m northwest of Feature I creating a roughly rectangular excavation 1.09 m deep. The bottom of the excavation has small cobble and pebble paving. One piece of waterworn coral is present on the surface of the paving.

**FEATURE K: Modified sink**  
**FUNCTION:** Indeterminate  
**DIMENSIONS:** c. 2.05 m by 2.00 m  
**DESCRIPTION:** A pahoehoe sink, located at the southwest end of the site has been filled with angular and subangular cobbles to the level of the surrounding bedrock. The northeast corner of this feature abuts the slab holding Feature D. *Kiawe* trees are growing at the northeast and northwest corners. No cultural materials are present on the feature.

**SITE NO.:** 14528 **PHRI:** T-16  
**SITE TYPE:** Complex (2)  
**TOPOGRAPHY:** Undulating pahoehoe with moderate upthrusts  
**VEGETATION:** Moderate *kiawe* and sparse *'ilima* and bunch grass.  
**CONDITION:** Fair  
**INTEGRITY:** Slightly altered  
**PROBABLE AGE:** Prehistoric  
**FUNCTIONAL INTERPRETATION:** Temporary habitation  
**DESCRIPTION:** The overall complex area measures c. 13.2 m N-S by 8.2 m, is located in the northern third of the project area along the far west boundary near the powerlines, and contains two caves, A and B, with culturally modified entrances.

This site was previously identified by Kennedy (1980) and designated Sites numbers 55 and 56.

**FEATURE A: Cave**  
**FUNCTION:** Temporary habitation  
**DIMENSIONS:** 8.5 m E-W by 6.5 m N-S by 0.77-1.3 m (approx.)  
**DESCRIPTION:** The cave opening is to the west-northwest and measures 2.1 m wide by 1.5 high. Immediately inside the bedrock floor is modified by a rough paving constructed of angular pahoehoe cobbles, two courses thick, and measuring c. 2.0 m N-S by 1.7 m E-W. Located outside and to the northeast of the entrance, an area measuring c. 1.7 m N-S by 1.6 m appears to be the remnant of a terrace constructed of pahoehoe cobbles and clinkers stacked seven to ten courses high (1.3-1.4 m high). Southwest of the entrance in an area measuring c. 2.25 m SW-NE by 1.0 m, there is a rough paving constructed of angular pahoehoe cobbles measuring from 5 by 5 by 3 cm to 25 by 15 by 8 cm. Ten fragments of recent historic glass, one marine shell fragment, and a coral abrader were found in the cave. The coral abrader was collected.

**FEATURE B: Paved area**  
**FUNCTION:** Temporary habitation  
**DIMENSIONS:** 3.3 m N-S by 1.1 m E-W by 1.5 m (approx.)

**DESCRIPTION:** The feature consists of a roughly paved area constructed of angular pahoehoe cobbles and boulders, from 10 by 10 by 5 cm to 35 by 25 by 20 cm in size. To the immediate east, a small cave opens to the east-northeast. Exterior paving appears to be three to four courses deep and constructed on bedrock. Inside there is no apparent modification. A portion of the cave entrance is blocked by collapse, also evident around the paved area. This is due to the location which is between two moderate upthrusts of pahoehoe.

**SITE NO.:** 14531 **PHRI:** T-19  
**SITE TYPE:** Complex (6)  
**TOPOGRAPHY:** A depressed area of smooth pahoehoe surrounded by moderate to large upthrust ridges.  
**VEGETATION:** Moderate *kiawe*, sparse *'ilima*, grass and green leafy ground cover  
**CONDITION:** Fair-good  
**INTEGRITY:** Unaltered to slightly altered  
**PROBABLE AGE:** Prehistoric  
**FUNCTIONAL INTERPRETATION:** Temporary habitation  
**DESCRIPTION:** The area measures c. 20.5 m E-W by 12.0 m N-S, and is located c. 20.0 m northeast of Site 14519. It consists of two caves, Features B and E2; a pahoehoe excavation, Feature C; a paved area, Feature D; an overhang, Feature E1; and an alignment, Feature F. A variety of construction methods are used throughout the complex area including paving, excavation, and stacking of pahoehoe angular cobbles and boulders. Portable remains present include waterworn coral and marine shell midden. This site was previously identified by Kennedy (1980) and designated Site 53.

**FEATURE B: Cave**  
**FUNCTION:** Temporary habitation  
**DIMENSIONS:** 9.2 NW-SE by 2.0 m by 0.52-1.84 m (approx.)  
**DESCRIPTION:** The feature is a small cave containing three chambers. The entrance faces southeast and measures c. 2.15 m wide by 1.22 m high. It appears to be modified by an area c. 4.2 m WNW-ESE by 1.2 m that is roughly paved of angular pahoehoe clinkers, cobbles and boulders stacked approximately four courses high. There is some ceiling collapse. The cave contained no cultural material.

**FEATURE C: Pahoehoe excavation (Figure A-13)**  
**FUNCTION:** Indeterminate  
**DIMENSIONS:** 4.44 m ESE-WNW by 3.6 m by 0.32-0.67 m (approx.)  
**DESCRIPTION:** The feature, a smooth pahoehoe blister, a is located c. 8.4 m south of Feature B, and measures c. 2.6 m E-W by 2.5 m, and ranging in depth from 0.53-

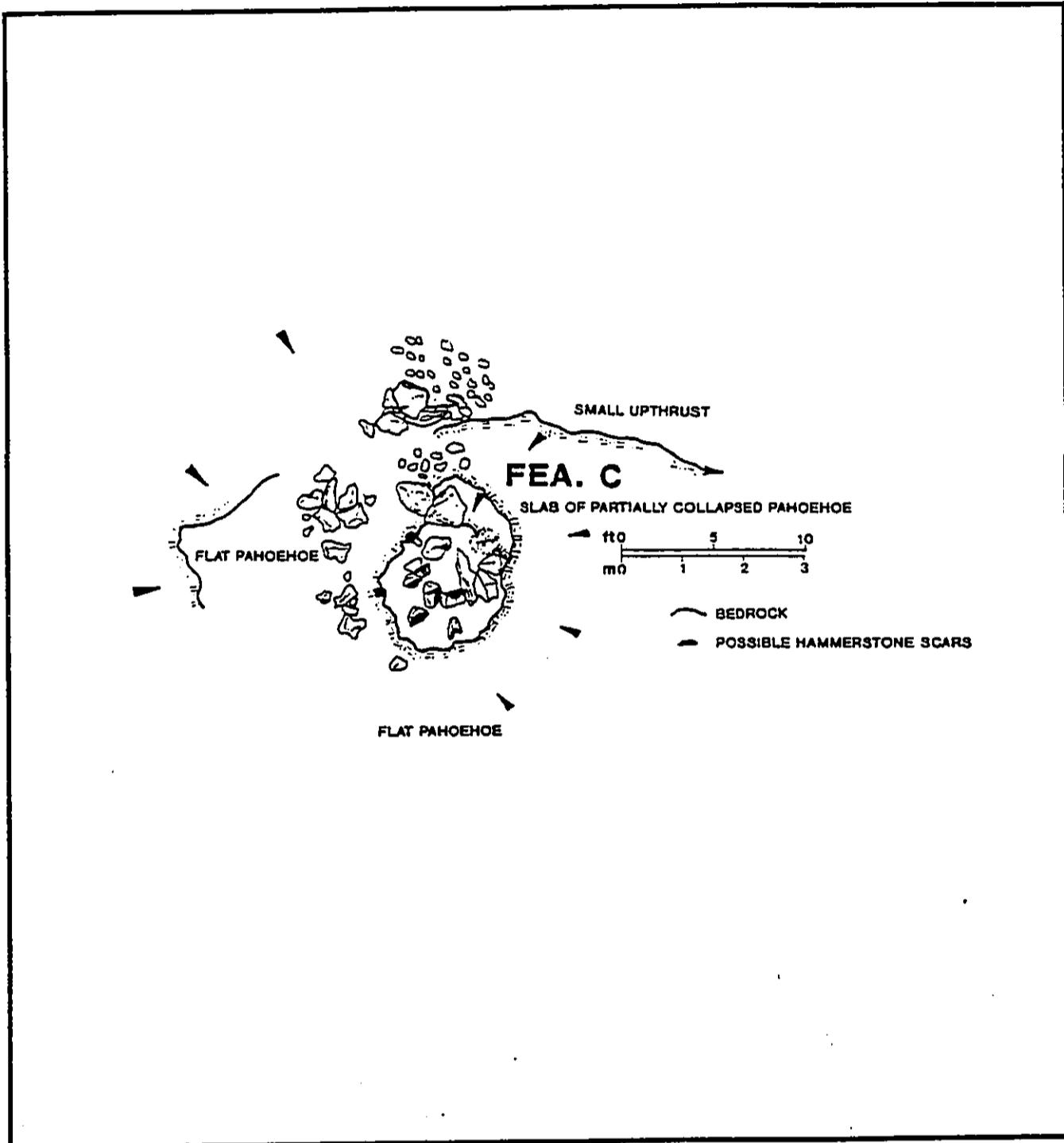


Figure A-13. SITE 14531, FEATURE C.

0.67 m. The northeast portion of the blister has natural collapse which contains a large *kiawe* tree. The rim is c. 0.35 m above the floor. The southwest rim appears to be excavated, is c. 0.31-0.35 m thick, and c. 0.59 m above the floor. At two points along the southwest rim there are places that appear to have hammerstone scars. The floor of the blister is scattered with angular blocks, a few of which appear to have fallen because of excavation on the rim. Along the south and southwest rim of the blister are eight angular pahoehoe blocks, average size about 30 by 29 by 34 cm, which appear to have been excavated from the feature.

Located c. 2.0 m west-northwest of the blister, a small alignment measuring c. 1.52 m southwest-northeast by 0.8 m by 0.63 m, is apparently paved with blocks excavated from the blister. The alignment is one to two courses high and one to two courses wide, constructed of blocks from 11 by 14 by 6 to 46 by 31 by 24 cm. in size.

**FEATURE D: Paved area****FUNCTION:** Temporary habitation**DIMENSIONS:** 3.6 m N-S by 2.8 m

**DESCRIPTION:** The feature is located c. one m east of Feature C, and appears to be a small depressed area or crack in the surrounding smooth pahoehoe which has been paved from the center with angular pahoehoe slabs, clinkers, and cobbles. The cobbles are from 6 by 3 by 5 cm to 29 by 9 by 30 cm in size. Paved boundaries are evident but not more than 0.12 m above the surrounding pahoehoe. Located c. two m to the east, there appears to be a small alignment which may be a remnant feature associated with a path or trail.

**FEATURE E1: Overhang****FUNCTION:** Temporary habitation**DIMENSIONS:** 3.5 m W-NE by E-SE by 2.5 by 0.7-1.2 m (approx.)

**DESCRIPTION:** A natural overhang located c. 8.5 m east-northeast of Feature D, opening to the southwest, with modification at the entrance and inside. Four small upright basalt boulders are stacked at the far northwest of the entrance, and four small upright boulders are stacked at the south portion of the entrance. An area c. 1.0 m by 0.5 m, near the rear north portion of the overhang, contains small angular pahoehoe slabs stacked one to two courses thick on the bedrock floor and having the appearance of paving. One marine shell was present at the center of the overhang.

**FEATURE E2: Cave****FUNCTION:** Temporary habitation**DIMENSIONS:** 1.9 m E-SE by W-NW by 1.7 m by 0.85 m (approx.)**DESCRIPTION:** The cave is located c. 1.5 m west-southwest

of Feature E1, and has a partially sealed entrance that opens to the south-southwest. Large angular pahoehoe boulders stacked with cobbles appear to be the only modification at the cave.

**FEATURE F: Alignment****FUNCTION:** Indeterminate**DIMENSIONS:** 2.7 m E-SE by W-NW by 1.0 m by 0.1-0.45 m (approx.)

**DESCRIPTION:** The alignment is c. 2.5 m southwest of Feature D, constructed on smooth pahoehoe of angular pahoehoe cobbles from 10 by 8 by 5 cm to 40 by 40 by 30 cm in size. Northwest, the alignment is stacked three courses high by three courses wide and is in good condition. The southeast portion of the feature consists of fifteen scattered angular cobbles, in some places stacked two courses high.

**SITE NO.:** 14532**PHRI:** T-20**SITE TYPE:** Modified sinkhole**TOPOGRAPHY:** Undulating pahoehoe surrounding a collapsed blister.**VEGETATION:** Sparse *kiawe* and leafy ground cover.**CONDITION:** Poor**INTEGRITY:** Altered**PROBABLE AGE:** Prehistoric**FUNCTIONAL INTERPRETATION:** Temporary habitation**DIMENSIONS:** 8.0 m NE-SW by 4.0 m by 1.9 m (approx.)

**DESCRIPTION:** The feature consists of a large collapsed blister located in the south one-third of the project along the far east boundary. The site area contains three caves, but no cultural material or modification was found. There are remnant terraces on five areas of the collapsed blister floor. They are constructed of angular basalt cobbles and small boulders from 1.0 m to 3.0 m. in length; actual widths can not be determined due to collapsed rubble and alteration from human and goat activity.

This site was previously identified by Kennedy (1980) and designated Site 52.

**SITE NO.:** 14533 (*Figure A-14*)**PHRI:** T-21**SITE TYPE:** Rubble concentration**TOPOGRAPHY:** Undulating pahoehoe sloping from the east and northeast.**VEGETATION:** High density of large *kiawe* trees, some of which are uprooted.**CONDITION:** Poor**INTEGRITY:** Altered**PROBABLE AGE:** Possible prehistoric

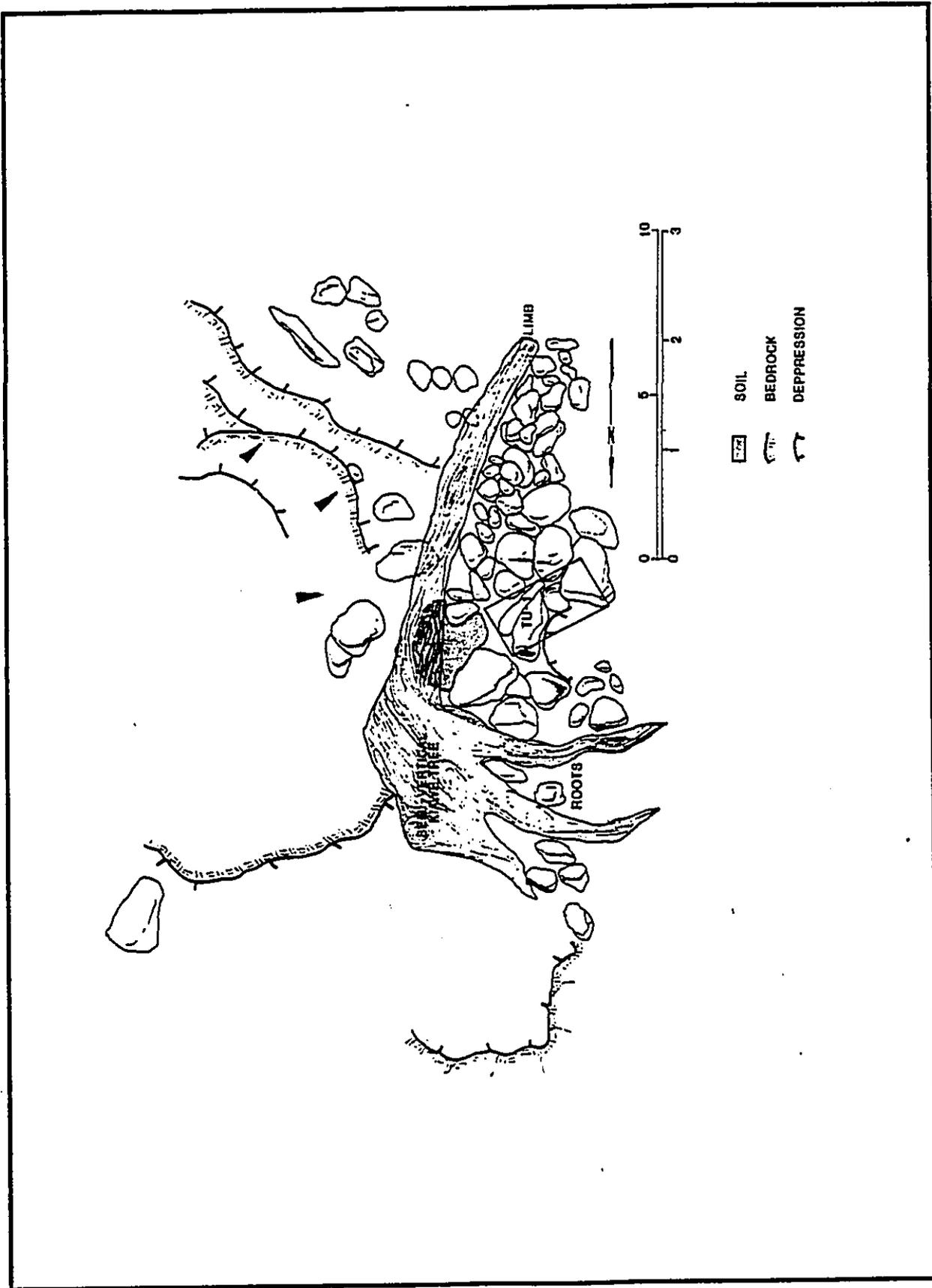


Figure A-14. SITE 14533.

**FUNCTIONAL INTERPRETATION:** Indeterminate  
**DIMENSIONS:** 5.5 m N-S by 1.5 E-W by 0.35 (approx.)  
**DESCRIPTION:** The feature is located in the central-south one-third of the project area, and is constructed of angular and waterworn basalt cobbles arranged three to four courses wide. Five pieces of coral were noted at the feature, and one large uprooted *kiawe* tree.

A test unit (TU-1) measuring 1.0 m by 0.5 m was excavated at the central southwestern portion of the feature. Both layers encountered were excavated in arbitrary 10 cm levels. No cultural materials or deposit were evident throughout the test unit. The unit was excavated to and terminated at bedrock, at a maximum depth of 0.37 mbs.

**SITE NO.:** 14534

**PHRI:** T-22

**SITE TYPE:** Complex (2)

**TOPOGRAPHY:** Undulating pahoehoe with moderate upthrusts.

**VEGETATION:** Thick density of *kiawe*.

**CONDITION:** Fair-good

**INTEGRITY:** Unaltered

**PROBABLE AGE:** Prehistoric

**FUNCTIONAL INTERPRETATION:** Temporary habitation

**DESCRIPTION:** The site is located in the central north-half of the project area and consists of two caves. The complex of area measures c. 12.0 m E-W by 6.0 m N-S.

This site was previously identified by Kennedy (1980) and designated Site 59.

**FEATURE A:** Cave

**FUNCTION:** Temporary habitation

**DIMENSIONS:** 2.3 m N-S by 2.1 m by 0.5-1.6 m (approx.)

**DESCRIPTION:** The feature consists of a small cave with a partially vertical entrance open to the south and measuring 0.8 m by 0.5 m by 1.6 m above the cave floor. The immediate entrance area appears to be partly paved with small angular basalt cobbles and slabs, measuring c. 2.5 m SW-NE by 1.9 m. The cave floor is covered with large angular basalt cobbles and boulders which appear to be ceiling fall. Portable remains collected and identified include two fine-grained, polished basalt adzes.

**FEATURE B:** Cave

**FUNCTION:** Temporary habitation

**DIMENSIONS:** 6.5 m E-W 2.4 m N-S by 1.0 m (approx.)

**DESCRIPTION:** The feature consists of a small single-chambered cave located c. 8.3 m to the east-southeast of Feature A. The entrance measures c. 1.3 m by 0.6 m and angles downward and to the west c. 1.57 m to the cave floor, where a split dog tooth and an echinoid abrader were

collected in situ. A small soil deposit measuring 0.7 m by 0.5 m in area and c. 0.02 m thick, was collected from the back of the cave and screened for cultural material. A fishhook fragment and five echinoid abrader fragments were recovered. No other modification was observed in the cave.

**SITE NO.:** 14957

**PHRI:** T-25

**SITE TYPE:** Complex (2)

**TOPOGRAPHY:** Boulder push piles and bulldozed terrain to the north and northeast, utility right of way to the west, pahoehoe flats, ridges, sinkholes, and caves to the south and southeast.

**VEGETATION:** *Kiawe* and sparse grass

**CONDITION:** Fair-good

**INTEGRITY:** Unaltered

**PROBABLE AGE:** Prehistoric

**FUNCTIONAL INTERPRETATION:** Temporary habitation/shelter

**DIMENSIONS:** 6.50 m at 205°, 7.80 m at 140° by 1.85-4.40 m

**DESCRIPTION:** This site consists of a petroglyph, Feature A, and a cave with three openings, Feature B. It is located at the northwest end of a collapsed lava blister, c. 16.5 m NE of the entrance to Feature A, Site 14513.

**FEATURE A:** Petroglyph

**FUNCTION:** Art/communication

**DIMENSIONS:** 40.0 cm by 44.0 cm

**DESCRIPTION:** The petroglyph has been pecked into the flat pahoehoe surface above cave entrance number one. This petroglyph appears to represent a female figure; the wide body is formed by curving lines rather than the rigid triangular torso associated with male figures. The short legs are extensions of the body outline and terminate at upturned feet.

**FEATURE B:** Cave

**FUNCTION:** Temporary habitation

**DIMENSIONS:** 12.30 m by 1.83-4.40 m

**DESCRIPTION:** This cave has been formed by the sloping sides of a collapsed blister. There are three openings into the cave but passage between openings is restricted by interior heights ranging from 0.25 to .54 m. Heights at the entrances are 0.79 m at entrance number one, 0.94 m. at entrance number 2, and 0.62 m at entrance number three. Waterworn coral is present at all three entrances. The only modification is at entrance number one where small cobbles have been piled in the opening; the other openings have been cleared of rubble. Small, unpassable lava tubes lead southeast from entrance number one and east from entrance number three.

## APPENDIX B

### HISTORICAL DOCUMENTARY RESEARCH

by Lehua Kalima, B.A.

#### INTRODUCTION

The *ahupua'a* of Lalamilo is located in South Kohala District, island of Hawaii. Early references refer to the area of Lalamilo as "Puako"; the name Puako today refers to a small village on the coast of Lalamilo. Land Index records of the mid-1800s reveal that Lalamilo was the name of an 'ili in Puako, but a 1928 Territory of Hawaii map and later references show the *ahupua'a* is named Lalamilo. Whether the *ahupua'a* of Puako got absorbed into other *ahupua'a* and the 'ili of Lalamilo became an *ahupua'a* itself, or the names just got switched around, is unclear. Documents dealing with Lalamilo refer more to the upland area close to Waimea Town rather than to the area where Puako lies. Because the project area is in Paniau, at the south end of Puako Beach Road, and because more historical information is available on Puako, the area today called Puako will be the main focus of this report.

The name Puako translates as "sugar cane blossom" (Pukui et al. 1974:191). Puako is also referred to as a "Village, quadrangle, bay, point; land division and flume, Kohala and Waipi'o Qds., Hawaii. About 3000 petroglyph units are in the Kohala area. The dog thief, Pupualenalena, lived in one of these places" (ibid.).

Lalamilo is referred to as a "land section, Puako Qd., Hawai'i. Lit.- milo tree branch" (ibid:128).

Joseph Kennedy conducted an archaeological survey in the project area in 1980. His comments on the area are as follows:

The area in question is known as Paniau and is also called "Ruddle's" after the name of the family that has owned the land since the 1930's. Paniau (literally, enclosed by current) (Pukui et al. 1974) is a 7.428 acre shoreline parcel located at the south end of Puako Beach Drive, in the *ahupua'a* of Lalamilo, S.Kohala. TMK 6-9-01:7. The property is actually legally separated from the shoreline, in part, by the Puako-Kiholo jeep road. The old Hawaii trail that used to connect Puako and Kiholo has been destroyed by high seas or covered by the jeep road; at any rate, no sign of it remains either

fronting or through the property at Paniau (Kennedy 1980:2).

#### PUAKO IN LEGEND

Various legends deal with the area called Puako; none could be found for the land of Lalamilo. Abraham Fornander tells two tales about the Puako area.

The legendary dog, Pupualenalena, lived at Puako. Pupualenalena was a remarkable dog who could carry out any task asked of him. He lived with a fisherman who let him eat all the fish he wanted in exchange for 'awa from Waipio Valley. Pupualenalena stole this 'awa from a large field belonging to Hakau, a high chief and the brother of 'Umi who became the ruler of Hawaii. The field was at the base of Puaahuku cliff in Waipio, and one day Pupualenalena was caught when on one of his 'awa stealing trips. Because of this thievery, Pupualenalena and his master were condemned to die. A reprieve was earned when Pupualenalena successfully stole a shell trumpet owned by the spirits who lived above Waipi'o for Hakau. Hakau rewarded Pupualenalena and his master by giving them a piece of land (Fornander 1917 [4]:558-560).

In another legend Puako is identified as a "...very handsome man whose form was perfect." He fell in love with Mailelailii, one of five sisters from Kona who were travelling together through Kohala, sightseeing. Puako took Mailelailii as wife but Mailelailii's sisters didn't approve of her romance with Puako because he was only a salt maker. They watched him carrying sea water and filling pools for salt making, and were worried that he would ask them to help him. They feared that, if they did such work, their skins would soon "...look like the windward bark of a noni tree," so Mailelailii told her husband that she and her sisters wanted to continue their sightseeing and he consented. They all left Puako and continued their journey through Kohala. At Kokoiki they met Hikapoloa, the chief of Puuepa and Hukiaa. He also was single and took Mailelailii for his wife. His chiefly status pleased her sisters and they settled down to live in his household.

One day Hikapoloa learned that the sisters had five brothers who had some very rare pearl shell fishhooks with

which they caught all the *aku* they wanted. Hikapoloa wanted such a fishhook and sailed to Holualoa, Kona, where the brothers lived. They were happy to give their brother-in-law a pearlshell fishhook, and loaded his canoe with dried and fresh *aku* for their return trip to Kohala.

When Hikapoloa took the new fishhook out in his canoe to try it, he held it in his hand all day, thinking that the *aku* would jump into the canoe of their own accord. When the fish didn't, he vowed to kill his brothers-in-law, because he thought they had tricked him. Soon after, Kona experienced a drought and food was very scarce. Mailelailii's brothers traveled to Kohala, thinking that they might ask Hikapoloa to provide them with food. They landed their canoe at Kukuipahu, faint with hunger from lack of food. The chief's watchman sent them up the hill to the houses of Hikapoloa on Puuiki. As each brother entered Hikapoloa's house, each was beheaded, cooked, and eaten. When the sisters discovered the evil deed, they trapped Hikapoloa in his house by causing the *maile* and *'ie* vines to grow over it. They trapped him in there while the rain beat down, the wind blew in a gale, and fog and mist covered the land. Hikapoloa died and the house was set on fire. The sisters then collected the bones of their brothers, brought them back to life, and they all returned to Kona, vowing, "...never to be covered with the same *kapu* with any man or woman from Kohala" (ibid:568).

Another tale, by Samuel Kamakau, a native Hawaiian historian, deals with Puako in the time of Kamehameha the Great:

While Kamehameha was living with the chiefs at Waimea [he was] engaged in restoring the old heiaus. When the fence of images (*paehumu*), the oracle tower (*anu'unu'u*), and the pavement (*kipapa*) of the heiau of Uli had been restored, all the people had to go down to Puako after coconuts. When each had taken up his load to return there remained still 480 nuts unhusked. All had gone except Kamehameha and one other to whom the chief was unknown. Kamehameha turned to him and said, "It looks as if there would not be enough coconuts for the dedication in the morning." It is possible that the man recognized the chief for he replied, "They will all be there. The two put the nuts into nets and fastened them together into a huge load that stood taller than either of them. The road from Puako to Waimea is close to twenty miles in length. Occasionally when the man seemed tired Kamehameha took a turn at the load. At dusk as they neared their destination, and it came time for

evening prayer, Kamehameha left the man saying, "When you get to the heiau spend the night with people of the place, but do not tell them that Kamehameha helped carry the load on his back." Because of this feat of strength and another later, when he took up two hogs each more than a fathom long and carried them without help, this Kuihelani, as his name was, became a great favorite with the chief and held an important office under him. He was allowed to have ten wives, an honor allowed to no other chief besides, and there was no home happier than his, no governor of a district to be compared with Kuihelani (Kamakau 1961:183).

### EARLY HISTORICAL ACCOUNTS

Early visitors to this area include Archibald Menzies, who visited Hawaii in 1792 with Captain Vancouver. Menzies stated that along the coast of North Kona and South Kohala the land was "...barren and rugged with volcanic dregs and fragments of black lava...in consequence of which the inhabitants were obliged to have recourse to fishing for their sustenance" (1920:99).

Twenty years later, in 1812, John Papa Ii, a native historian and member of Kamehameha III's court, made a similar observation: "The sustenance of those lands was fish" (Ii 1963:109).

In his book, *Hawaiian Planter*, Handy describes the native agriculture in Puako and on the coast of North Kona and South Kohala:

From Puako to Anaehoomalu at the southern end of Kohala and from Kapalaoa, at the northern extreme of Kona, to Kailua there are no streams whatever, and certainly there were no terraces. South Kohala produced much dry taro in the lower forest zone which formerly extended far down over what is now open pasture (Handy 1940:119).

The coastal section of Waimea, now called South Kohala, has a number of small bays with sandy shores where fishermen used to live, and where they probably cultivated potatoes in small patches. Anaehoomalu, Waialua Honokaope, Kalahuipuaa and Pauoa all have sandy strips along the sea; and there is an area of black cinder in this section where sweet potatoes might be grown in rainy seasons. Puako was a sizable fishing village at one time where were undoubtedly many sweet potato patches. (ibid:163).

In his survey of Paniau, Kennedy reinforces the fact that Puako was once a fishing village and comments:

The abundance of marine edibles coupled with the apparent lack of agricultural features in the immediate area of this property leads to the unavoidable conclusion that the Paniau site was primarily a fishing village. Accordingly, it is reasonable to assume that the efforts of the people living there were directed towards earning a subsistence living from the sea. Whatever trade or redistribution systems that may have occurred then between Paniau and other parts of Lalamilo *ahupua'a* or other places, are unknown and remain to be investigated (Kennedy 1980:9-10).

In *Beaches of the Big Island* Clark refers to a book by Emma Doyle (1945) about Lorenzo Lyons. The following is a quote by Lyons, a missionary who came to Hawaii in the mid-1800s, and who had a church in Puako:

Puakou [sic] is a village on the shore, very like Kawaihae, but larger. It has a small harbor in which native vessels anchor. Coconut groves give it a verdant aspect. No food grows in the place. The people make salt and catch fish. These they exchange for vegetables grown elsewhere (Doyle IN Clark 1985:130).

Clark also refers on his own to the Puako area—by various sites there, and he includes a bit of the history of Lorenzo Lyons:

The residential community of Puako, which dates from the early 1950's, begins at Puako Bay and extends for 3 1/2 miles of shoreline along the paved extent of Puako Road. A large wave-washed bench of rock fronts almost the entire length of this long stretch of low-lying coast, but the irregular beach contains many small points, inlets, coves, and tidal pools, all of which are suitable for pole fishing, net fishing, spearfishing, snorkeling and in some areas, swimming. For sunbathers and beachcombers, there is a narrow white sand beach almost the full length of the bench. Public access to Puako Beach is available from the boat ramp in Puako Bay, from six rights-of-way along Puako Road and at the end of the paved road, where surfers also occasionally find waves suitable for riding. The surfing break fronts the Ruddle estate, so surfers generally refer to the site as Ruddle's. Fresh water intrusion from shoreline springs in this area often forms a layer of cool, brackish water on the surface of the ocean.

The only true fringing reef of consolidate limestone on the Big Island fronts this section of the shoreline, an excellent site for nearshore scuba diving.

Two sites of historical interest along Puako Road are a field of petroglyphs and Hokuloa Church. The extensive petroglyph field, thought to contain some of the oldest carvings on the Big Island, is marked by a Hawaii Visitors Bureau warrior sign. Hokuloa Church, also easily found, was originally dedicated on March 21, 1859, and is one of fourteen churches built by the Reverend Lorenzo Lyons. Lyons, known to his Hawaiian congregations as Makua Laiana, "Father Lyons," had an excellent command of the Hawaiian Language and composed many songs before his death in 1886. His most famous composition is the poignant and haunting song, "Hawaii Aloha," which was rediscovered during the 1970's and has become a powerful musical statement of the uniqueness of the Hawaiian culture, the beauty of the Hawaiian spirit, and the need to preserve both (ibid.).

Although Clark writes that the residential community dates from the early 1950s, settlement in the Puako area, as revealed in the legends of Puako, began many years before that. Clark is surely referring to the modern settlement in Puako and not to settlement in general.

In 1977, a book about the Kohala area was written by various residents of the area. The book indicates sugar cane was grown in the area. The writers note that the name Puako is said to mean "sugar cane flower" and that "Puako once supported an early attempt at a sugar plantation run by John Hind. The name however is older than the Hind attempt at growing cane" (Stephenson 1977:84).

#### PREVIOUS ARCHAEOLOGICAL FINDINGS

As stated earlier, Joseph Kennedy conducted an archaeological survey within the project area (survey of TMK 6-9-01:7). He identified 24 sites incorporating 28 features (including six petroglyphs) Welch (1984) reviewed Kennedy's report and proposed that the area "was probably a main residential area including shelters, enclosures, platforms, petroglyphs, and one large structure that may have been a men's house [*mua*]" (Welch 1984:6).

Various other surveys have been conducted in the area—by Emory (1955), Ladd and Apple (1962), Soehren (1962), and Smart (1963 and 1964). Bishop Museum

conducted a detailed study of the Puako petroglyph fields in 1964 (Kennedy 1980:14); the area was mapped on a total of 29 separate sheets, and it was noted that the area was one of the largest fields of its kind in the Hawaiian Islands.

Listed below are some of the types of sites in the area and their numbers, as noted by Kennedy (1980:20-26):

Rock structures: Sites 80-1, 2, 14, 16, 17, 29, and 30

Rock walls: Sites 80-3, 25, and 28

Petroglyphs: Sites 80-3, 23, and 24

Large complex structure: Site 80-4 (may be the men's house)

Cave openings: Sites 80-5, 6, 7, 8, 25, 31, and 32

Lava sinks: Sites 80-9 and 27

Enclosed structures: Sites 80-10 and 11

Rock mounds: Sites 80-12 and 28

Lava platforms: Sites 80-13 and 15

Kennedy also noticed a large, neat, square area of midden located just *mauka* of the unimproved road, toward the Ruddle property lines. Mr. Ruddle told Kennedy that there had been an "ancient Hawaiian Kuleana" standing there, but the stones had been taken by people in a pickup truck seeking materials for a wall they were building (ibid:60).

It was also reported that Site 80-25, a cave entrance, was used by a Mr. Uehara in the 1940s to hold his pigs.

In a project carried out by PHRI in 1989, various people familiar with the area spoke to archaeologists (Wong Smith 1990). According to a Mrs. La'au, a one-time resident of Kawaihae, there was a La'au burial cave located in Puako. Mrs. La'au said that Jack Paulo was the last one who knew the "key" rock to the entrance of the cave. Having been inside the cave herself, Mrs. La'au commented that it was big and there were "plenty people inside there" (Wong Smith 1990:11).

Whether or not the above-mentioned burial cave is within the project area is not known, but it should be noted that some of the caves (Sites 80-31 and 32) surveyed by Kennedy are presumed to have had burials inside (Kennedy

1980:26). It may well be that the cave referred to by Mrs. La'au is one of these.

## LAND TENURE

In 1848, during the reign of Kamehameha III, the traditional Hawaiian land ownership system was replaced with a more Western-style system. This radical restructuring was called The Great Mahele (division). The Great Mahele separated and defined the undivided land interests of the King and the high-ranking chiefs, and the *konohiki*, who were originally those in charge of tracts of land on behalf of the king or a chief (Chinen 1958:vii and Chinen 1961:13). More than 240 of the highest-ranking chiefs and *konohiki* in the kingdom joined Kamehameha III in this division. The first *mahele* was signed on Jan. 27, 1848 by Kamehameha III and Princess Victoria Kamamalu, and by her guardians Mataio Kekuanoa and Ione Ii. The last *mahele* was signed by the King and E. Enoka on March 7, 1848 (Chinen 1958:16).

The Great Mahele did not convey title to any land. The chiefs and *konohiki* were required to present their claims to The Land Commission to receive awards for lands quitclaimed to them by Kamehameha III. They were also required to pay commutations to the government in order to receive royal patents on their awards. Until an award was issued, title remained with the government. The lands awarded to the chiefs and *konohiki* became known as Konohiki Lands. Because there were few surveyors in Hawaii at the time of the Mahele, the lands were identified by name only, with the understanding that the ancient boundaries would prevail until the land could be surveyed. This expedited the work of the Land Commission and speeded the transfers (Chinen 1961:13).

During this process all land was placed in one of three categories: Crown Lands (for the occupant of the throne), Government Lands, and Konohiki Lands. These were all "subject to the rights of native tenants" (Laws of Hawaii, 1848:22). Native tenants were the common Hawaiian people who lived on the land and worked it for their subsistence. Questions concerning the nature of these rights began to arise as the King, the government, and *konohiki* began selling parcels of land. On December 21, 1849 the Privy Council attempted to clarify the situation by adopting four resolutions intended to protect the rights of native tenants referred to in the 1848 law (Chinen 1958:29).

These resolutions authorized the Land Commission to award fee simple title to all native tenants who occupied and improved any portion of Crown, Government, or Konohiki

lands. These awards were to be free of commutation except for house lots located in the districts of Honolulu, Lahaina, and Hilo (ibid.).

Before receiving their awards from the Land Commission, the native tenants were required to prove that they cultivated the land for a living. They were not permitted to acquire wastelands or lands which they cultivated "with the seeming intention of enlarging their lots." Once a claim was confirmed, a survey was required before the Land Commission was authorized to issue any award. These lands became known as "Kuleana Lands" (ibid:30). Until its dissolution on March 31, 1855, the Land Commission issued thousands of awards to the native tenants for their *kuleana*; even so, less than 30,000 acres of land were awarded to the native tenants as Kuleana Lands.

Four people were listed as having land claims in the then named *ahupua'a* of Puako (Board of Commissioners 1929):

Awardee	L.C.A.	Area
Akahi	3758	.37 acres
Kamahaii	4102	.38 acres
Lunalilo, Wm. C.	8559-B	
Iliaina (Lalamilo) Ap.6		
Wahakane	3736	1.08 acres

As stated in the introduction, the Land of Lalamilo was listed as an *'ili* in Puako Ahupua'a. This was awarded to Lunalilo (Kamehameha V) in the Great Mahele.

The following testimonies were given by the claimants for their parcels or to verify what they saw on other claimant's parcels. Lunalilo, being an *ali'i*, was not required to give testimony for his lands.

L.C.A 3736, Wahakane, Native Testimony 4:19  
Kamahaii has sworn and stated: I have seen it at the *'ili* of Lalamilo in Puako, HI. It has not been enclosed and there is one house for Wahakane and another for Kau. Kau is a house dweller under Wahakane and the boundaries are mauka, Waho, and on all the other sides Vilama Pekele's land. This had been a vacant land before Vilama had received it in 1843. No one has objected to this day. Wahakane has three sections. In have not seen parcels 2 and 3.

L.C.A. 3958, Akahi(f)

Kamahaii sworn and stated: I have seen Akahi's place; it is at Puako in Waimea, HI, in 1 section. It

has been enclosed and there are 4 houses, 2 of which are for Akahi, 1 for Kahenehene and the other for Napuupuu. Mauka is Waho, Vilama, the konohiki; makai, Hueu's land; Kawaihae, Vilama Pekele's land. Akahi has a very old claim and no one has objected to him to this day.

The following testimony was given for a parcel in Puako, but this land was later relinquished by Keawekuloa and Co.

L.C.A. 4099

There are three houses...Kaholoaa (po'e) has 7 coconut trees and Puahala there, also a pond. Section II, salt land...good work has been done on this salt land...They also have some potato patches on which the boundaries cannot be cited...

Here is further information from the Land Index Files about Lalamilo and Puako:

Interior Dept., Dec. 28, 1854

Testimony given by Palea and Kuuku re: above Ili that said Ili rightfully belongs to Wm. C. Lunalilo.

Aug. 31, 1864 Letter from S.C. Wiltse to J.O. Dominis ...G.D. Davis claims that all the ilis in the ahupuaa as named are all his and being a part of his private property known as Waikoloa...

July 19, 1858 Letter from Isaac Y. Davis to Wm. Webster Requesting that Lalamilo and Waimea in Puako not be given to Kauhini until they have talked the matter over together.

Land Patents were granted to people who wanted to insure their claims to lands. Although the LCAs were generally regarded as a sign of outright ownership, patents further insured that no claims could be put against your land. Richard Smart of the Parker Ranch was the first to apply for a patent in the Puako area (patent for a parcel in LCA 8559-B applied for in 1952)(Patent S-8547). The patent verified that the land was originally the property of Lunalilo and had not been given up for commutation to the government (further verified in the Indices of Awards p.22), and that Richard Smart was the absolute owner.

A title search on the land in 1965 brought forth the following notes:

...[said land] containing an area of 7.42 acres, or thereabouts, and being a portion of the lands that

was conveyed to the said Richard Smart by Leighton Hind, Mona H. Holmes, unmarried, Robson K. Hind, Margaret H. Paris, Erman H. Lillie, unmarried, and Robert Hind, Ltd., a Hawaiian Corporation, by deed dated April 22, 1952... (Bureau of Conveyances in Liber. 2598:383-389). (Note: Attention is called to the fact that no patent has ever been issued on L.C.A. 8559-B, Apana 6 and the Abstractors recommend that the same be obtained from the office of the Bureau of Land and Natural Resources. 6-28-1965)

How the above people acquired the right to sell the land to Smart is not known, but since no patent had been placed before this one, various explanations could account for their acquisition of it. It's possible they were heirs of people who had once lived on the land, and so felt they were entitled to it, or perhaps they themselves moved onto the land, and getting no resistance from the real owners, felt they owned the land. Smart was indeed wise in attaining a land patent for the parcel, due to the confusion sometimes caused by people claiming lands awarded in the Mahele which had no patent and therefore were not absolutely guaranteed to claimants.

The current project area was acquired by Annabelle Ruddle in 1937 through Grant 10559, bought from the Territory of Hawaii government. How the land passed from the Lunalilo estate to the Territory is not known, but since no patents had been issued on Lunalilo's land until Richard Smart's, the land may have been claimed by someone other than Lunalilo—someone who later sold the land to the government.

Kennedy notes that when the Ruddle's assumed ownership of the property in the mid-1930s the entire lot was completely covered by a thick blanket of *kiawe*, and that there was no access to the land other than by sea (Budger Ruddle, pers. comm., IN Kennedy 1980:6). The thorny menace had been introduced to the area by Eben Low, Mr. Ruddle's grandfather (ibid.). Kennedy found it interesting that the Reverend A.S. Baker, who visited in 1919, noted "very little *kiawe*" in this area. Both accounts are probably accurate, being that the *kiawe* can take over very quickly and completely.

Records at the Real Property Tax office in Hilo reiterate that the land identified as TMK 6-9-01:7, a parcel of 7.428 acres, was awarded to Annabelle Ruddle in 1937 from the Territory of Hawaii in Land Grant 10559. At her passing the land was broken up as follows:

1/4 to Elizabeth Spielman  
 1/4 to George Ruddle  
 1/4 to Francis Ruddle  
 1/12 to Annabelle Lindsey  
 1/12 to Alberta Sylva  
 1/12 to Francis Ruddle

On June 18, 1987 the land was transferred to American Trust Company of Hawaii, who are the present owners, as trustees for Elizabeth Spielman et al.

Earlier records for this parcel indicate that from 1944-66 the land was classified as a beach lot. The area is noted as having three dwellings, two wash houses and a generator.

In 1982 Myra Tomonari-Tuggle and David Tuggle prepared a nomination form on behalf of Waimea Hawaiian Civic Club and Mauna Lani Resort nominating the Puako Petroglyph Archaeological District (State Site No. 50-80-11-4713) to the National Register of Historic Places. In June 1982 the site complex was placed on the State of Hawaii Register of Historic Places, and in April 1983 it was placed on the National Register (Welch 1984:6).

It is easy to conclude from previous archaeological evidence that Puako, Lalamilo is an area of rich historical value. The solid archaeological findings and amount of research done in this area provide extensive information about Puako as a west Hawaii coastal fishing village. Being a part of the West Hawaii coastal community, it may be assumed that this area would be similar to other areas along the coast which have been more extensively researched. Places such as Anaehoomalu and Kaupulehu have turned up various sites, including Hawaiian burials; it is assumed that Puako would have similar types of sites.

## REFERENCES CITED

## Board of Commissioners

- 1929 *Indices of Awards made by the Board of Commissioners to Quiet Land Titles in the Hawaiian Islands.* Honolulu.

## Chinen, J.J.

- 1958 *The Great Mahele: Hawaii's Land Division of 1848.* Honolulu: University of Hawaii Press.  
1961 *Original Land Titles in Hawaii.* Honolulu: privately published.

## Clark, J.R.K.

- 1985 *Beaches of the Big Island.* Honolulu: University of Hawaii Press.

## Fornander, A.

- 1917 *Hawaiian Antiquities and Folk-Lore. Memoirs. Vol. 4.* B.P. Bishop Museum, Honolulu.

## Handy, E.S.C

- 1940 *The Hawaiian Planter: His Plants, Methods and Areas of Cultivation.* B.P. Bishop Museum Bulletin 161. Bishop Museum Press, Honolulu.

## Handy, E.S.C., and E.G. Handy

- 1972 *Native Planters in Old Hawaii.* B.P. Bishop Museum Bulletin 233. Bishop Museum Press, Honolulu. (With M.K. Pukui)

## H, J.P.

- 1973 *Fragments of Hawaiian History.* Honolulu: Bishop Museum Press.

## Kamakau, S.

- 1961 *Ruling Chiefs of Hawaii.* Honolulu: The Kamehameha Schools Press.

## Kennedy, J.

- 1980 *The Archaeology of Paniau.* Archaeological Consultants of Hawaii.

## Menzies, A.

- 1920 *Hawaii Nei, 128 Years Ago.* Honolulu: The New Freedom Press. (Edited by William F. Wilson)

Pukui, M.K., S.H. Elbert, and E.T. Mookini

1974 *Place Names of Hawaii*. Honolulu: University of Hawaii Press.

Wong Smith, H.

1990 Appendix B: Limited Historical Documentary Research. IN Rosendahl, Archaeological Inventory Survey, Queen's Land at Mauna Kea, Land of Kawaihae 2nd, South Kohala District, Island of Hawaii. PHRI Report 591-052090. Prepared for Mauna Kea Properties, Inc.

Stephenson, L.K.

1977 *Kohala Keia (This is Kohala) Collected Expressions of a Community, A Product of Kohala People*. Privately published.

Welch, D.J.

1984 Archaeological Reconnaissance of the Area South of the Puako Petroglyph Archaeological District, South Kohala, Hawaii. Prepared for Mauna Lani Resort, Inc.

## APPENDIX C

### DETAILED DESCRIPTIONS OF STRATIGRAPHIES

#### SITE 14518 FEATURE A, EAST FACE

LAYER	DESCRIPTION
I-1	0-17 cmbd; dark reddish brown (5YR 3/3 moist); silt loam; weak, very fine crumb structure; soft and weakly coherent, friable, non-sticky and non-plastic; lower boundary is abrupt and clear in profile;
I-2	18-28 cmbd; dark brown (7.5YR 3/2 moist); silt loam; weak, very fine crumb structure; soft and weakly coherent, friable, non-sticky and non-plastic; lower boundary is very abrupt and wavy;
II	15+ cmbd; bedrock

#### SITE 14519 FEATURE A, SOUTH FACE

LAYER	DESCRIPTION
I	21-35 cmbd, ranges from 5-14 cm in thickness; black (10YR 2/1 moist); silt loam; weak, fine crumb structure; very few roots; soft and weakly coherent, very friable, slightly sticky and slightly plastic; lower boundary is very abrupt and smooth;
II	35+ cmbd; bedrock

#### FEATURE E, NORTH FACE

LAYER	DESCRIPTION
IA	18-25 cmbd, ranges from 3-5 cm in thickness; dark reddish-brown (5YR 3/2 moist); silt loam; weak, very fine single grain structure; loose, loose, non-sticky and non-plastic; no roots; lower boundary is clear and smooth;
IB	24-35 cmbd, ranges from 2-11 cm in thickness; dark reddish-brown (5YR 3/2 moist); silt loam; weak, very fine single grain structure; soft and weakly coherent, very friable, slightly sticky and slightly plastic; roots common; lower boundary is clear and smooth;
II	24-37 cmbd, ranges from 2-12 cm in thickness; dark reddish-brown (5YR 3/3 moist); silt loam; moderate, coarse columnar structure; many roots; soft and weakly coherent, very friable, sticky and plastic; lower boundary is clear and smooth;
III	31-42 cmbd, ranges from 2-10 cm in thickness; very dark grayish-brown (10YR 3/2 moist); silt; weak, very fine granular structure; many roots; soft and weakly coherent, very friable, non-sticky and slightly plastic; lower boundary is clear and smooth;
HF-1	38-53 cmbd, ranges from 2-10 cm in thickness; dark reddish-brown (5YR 3/3 moist); silt; weak, very fine granular structure; roots common; loose, very friable, non-sticky and non-plastic; lower boundary is clear and smooth;
IV	36+ cmbd; bedrock

**FEATURE E, WEST WALL**

<i>LAYER</i>	<i>DESCRIPTION</i>
I	17-30 cmbd; dark reddish-brown (5YR 3/2 moist); silt loam; weak very fine granular structure; soft and weakly coherent, very friable, slightly sticky and slightly plastic; lower boundary is clear and smooth;
II	30-36 cmbd; dark reddish-brown (5YR 3/2 moist); silt loam; weak, fine granular structure; soft and weakly coherent, very friable, sticky and slightly plastic; lower boundary is very abrupt and wavy;
III	30-58 cmbd, ranges from 2-20 cm in thickness; dark brown (7.5YR 3/2 moist); loam; weak, fine granular structure; soft and weakly coherent, very friable, slightly sticky and non-plastic; lower boundary is abrupt and smooth;
IV	17+ cmbd; bedrock

**SITE 14520  
FEATURE A, EAST WALL**

<i>LAYER</i>	<i>DESCRIPTION</i>
I	28-34 cmbd; dusky red (2.5YR 3/2 moist); silt; structureless; loose, very friable, non-sticky and slightly plastic; lower boundary is abrupt and smooth;
II	32-38 cmbd; dark reddish-brown (5YR 3/2 moist); silt; structureless; soft and weakly coherent, friable, non-sticky and slightly plastic;
III	38+ cmbd; bedrock

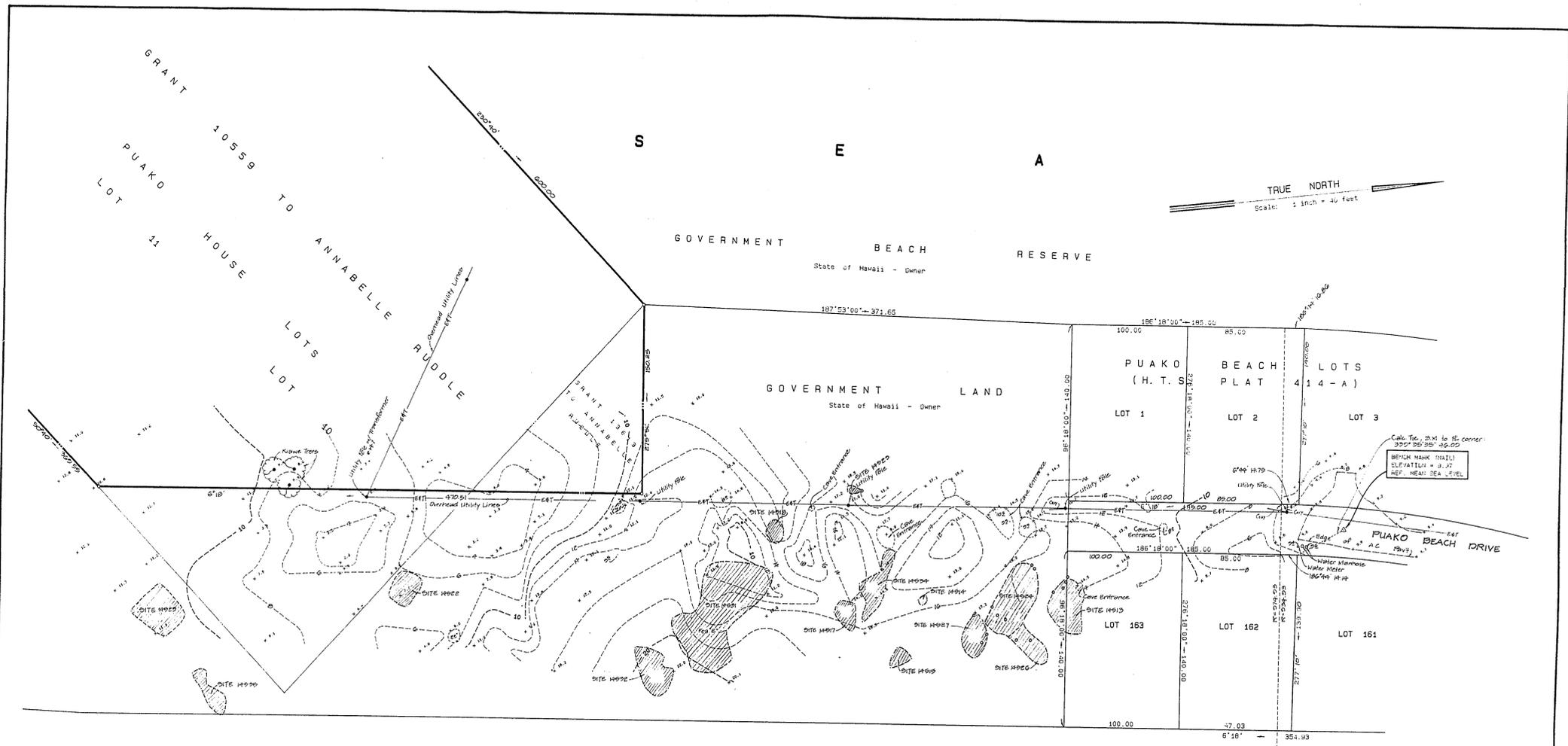
**SITE 14521  
FEATURE A, WEST FACE**

<i>LAYER</i>	<i>DESCRIPTION</i>
I	0-34 cmbd; pahoehoe cobbles and clinkers
II	25-80 cmbd; dark brown (7.5YR 3/4 moist); loam; moderate, medium blocky structure; very fine roots common; loose, friable, slightly sticky and non-plastic; lower boundary is abrupt and irregular;
III	68+ cmbd; bedrock



Exhibit "E" Topographic  
Survey Map of Project Area  
with Significant  
Archaeological Sites  
Identified

0089 F



- NOTES :
1. Azimuths and coordinates are referred to Government Survey Triangulation Station "PUAKO".
  2. Features shown herein represent conditions existing on September 9, 1990.
  3. Elevations are referred to Mean Sea Level.

\* • Denotes individual petroglyph that were located.



**TOPOGRAPHIC SURVEY MAP SHOWING  
PORTION OF GOVERNMENT LAND**  
AT LALAMILO, SOUTH KOHALA, ISLAND AND COUNTY OF HAWAII  
STATE OF HAWAII

Prepared For :  
C. & H. PROPERTIES  
C/O BOB CHANDLER  
P.O. Box 1785  
Kamuela, Hawaii 96743

Prepared By:  
HES THOMAS & ASSOCIATES, INC.  
--Land Surveyors--  
75-5722 Kaiawa Street  
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Tel. (808) 328-2353

REVISION: February 23, 1991 Delete old arch loc.  
REVISION: February 19, 1991 Change site row to 10 digit  
REVISION: February 14, 1991 Add'l Arch. Sites

PROJECT NO.: 07862  
DATE: OCTOBER 4, 1990  
TAX MAP KEY: 6-9-01 (NO DIVISION)  
FIELD BOOK NO.: 884 p02  
DISK NO.: 239  
REVISION: October 23, 1990 HNTec to H

009F