

# **Kona View Estates Subdivision**

## **Draft Environmental Assessment**

TMK (3rd) 7-4-026:001-030  
Honokōhau 1st, North Kona, District, Hawai‘i Island, State of Hawai‘i

February 2008

Prepared for:  
Hawai‘i County  
Planning Department  
101 Pauahi Street, Suite 3  
Hilo, Hawai‘i 96720

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**CLASS OF ACTION:**

Use of State Lands (Highway Right-of-Way)

This document is prepared pursuant to:  
The Hawai‘i Environmental Policy Act,  
Chapter 343, Hawai‘i Revised Statutes (HRS), and  
Title 11, Chapter 200, Hawai‘i Department of Health Administrative Rules (HAR).

## **TABLE OF CONTENTS**

SUMMARY .....	ii
PART 1: PROJECT DESCRIPTION AND E.A. PROCESS .....	1
1.1 Project Description and Location .....	1
1.2 Environmental Assessment Process.....	1
1.3 Public Involvement and Agency Coordination .....	6
1.4 Schedule .....	6
PART 2: ALTERNATIVES .....	7
2.1 No Action Alternative.....	7
2.2 Alternative Locations.....	7
PART 3: ENVIRONMENTAL SETTING, IMPACTS AND MITIGATION .....	8
3.1 Physical Environment.....	8
3.1.1 Geology, Soils and Geologic Hazard.....	8
3.1.2 Drainage, Water Features and Water Quality .....	9
3.1.3 Flora, Fauna, and Ecosystems .....	9
3.1.4 Air Quality, Noise and Scenic Resources .....	11
3.1.5 Hazardous Substances, Toxic Waste and Hazardous Conditions .....	12
3.2 Socioeconomic and Cultural .....	13
3.2.1 Socioeconomic Characteristics .....	13
3.2.2 Cultural and Archaeological Resources .....	14
3.3 Infrastructure .....	18
3.3.1 Utilities .....	18
3.3.2 Roadways.....	18
3.4 Secondary and Cumulative Impacts.....	19
3.5 Required Permits and Approvals .....	21
3.6 Consistency with Government Plans and Policies.....	21
3.6.1 Hawai‘i State Land Use Law .....	21
3.6.2 Hawai‘i County SMA, Zoning and General Plan .....	22
PART 4: DETERMINATION .....	27
PART 5: FINDINGS AND REASONS.....	27
REFERENCES .....	29
LIST OF TABLES	
TABLE 1 Selected Socioeconomic Characteristics.....	13
LIST OF FIGURES	
FIGURE 1 Property Location Map .....	2
FIGURE 2 TMK Map .....	3
FIGURE 3 Project Site Photographs .....	4
FIGURE 4 HELCO Pole Location Details .....	5
APPENDIX 1	Comments in Response to Pre-Consultation
APPENDIX 2	Botanical Report
APPENDIX 3	Faunal Report
APPENDIX 4a	Archaeological Inventory Survey and Related Correspondence
APPENDIX 4b	Archaeological Data Recovery Plan and Related Correspondence

## **SUMMARY OF THE PROPOSED ACTION, ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES**

The Kona View Estates Subdivision in Honokōhau, North Kona, which consists of 29 one-acre lots zoned Ag-1, obtained final subdivision approval on September 26, 2006, and since that time has completed all of its internal infrastructure improvements. After construction was complete and accepted by the County of Hawai‘i, the developer was informed by HELCO that, due to the location of its HELCO pole connection on the right-of-way of State Highway 190, the County subdivision permit pertaining to this development was not exempt from the need to prepare an EA. Therefore, although the subdivision is complete and ready to be occupied, it requires an EA in order to obtain electrical power and other utilities from HELCO poles in the State Highway right-of-way.

Biological and archaeological studies were conducted as part of the subdivision process. No valuable biological resources were found on the property, which has a long history of farming. Archaeological features from both prehistoric and historic eras were present; inventory and data recovery mitigated effects to these resources, and one site, a burial, has been preserved. Impacts to traffic and infrastructure were considered and mitigated where necessary by the County during subdivision approval and development. Kona View Estates has design guidelines that encourage homes to take advantage of natural light and ventilation and to utilize indigenous plants in landscaping. Owners are also encouraged to create homes that reflect the rural Hawaiian setting by drawing upon indigenous building traditions and materials but at the same time to utilize solar hot water systems, solar power generating equipment, new building technologies, innovative building materials, thoughtful site planning and creative construction systems to create more energy-efficient homes.

## **PART 1: PROJECT DESCRIPTION AND ENVIRONMENTAL ASSESSMENT PROCESS**

### **1.1 Project Description and Location**

This Environmental Assessment (EA) is being prepared by Thomas M. Smith of 327 Kona LLC, developer of the Kona View Estates Subdivision near State Highway 190 in Honokōhau, North Kona (Figure 1). 327 Kona LLC obtained final subdivision approval on September 26, 2006, and since that time has completed all of the internal improvements for the Kona View Estates subdivision, which consists of 29 one-acre lots zoned Ag-1 (Figures 2-3). After construction was complete and accepted by the County of Hawai‘i, 327 Kona LLC was informed by HELCO that, due to the location of its HELCO pole connection on the right-of-way of State Highway 190 under the jurisdiction of the Department of Transportation (DOT) (Figure 4), the County subdivision permit pertaining to this development was not exempt from the need to comply with Chapter 343, HRS (the Hawai‘i Environmental Policy Act). As of June 2007, the Hawai‘i State Department of Transportation began requiring an EA before allowing subdivisions and certain other classes of activity to obtain electrical power from HELCO poles in the right-of-way of a State Highway.

Kona View Estates has design guidelines and Conditions, Covenants and Restrictions that promote use of natural light and ventilation as well as indigenous plants in landscaping. Easements on certain lots have designated areas for special landscape treatment that protect them from development in order to preserve the natural or recreated landscape. Owners are also encouraged to create homes that reflect the rural Hawaiian setting by drawing upon indigenous building traditions and materials. At the same time, resource conservation through site and building design and innovative construction techniques is also encouraged. Such measures include solar hot water systems, solar power generating equipment, new building technologies, innovative building materials, thoughtful site planning and creative construction systems used to create more energy-efficient homes.

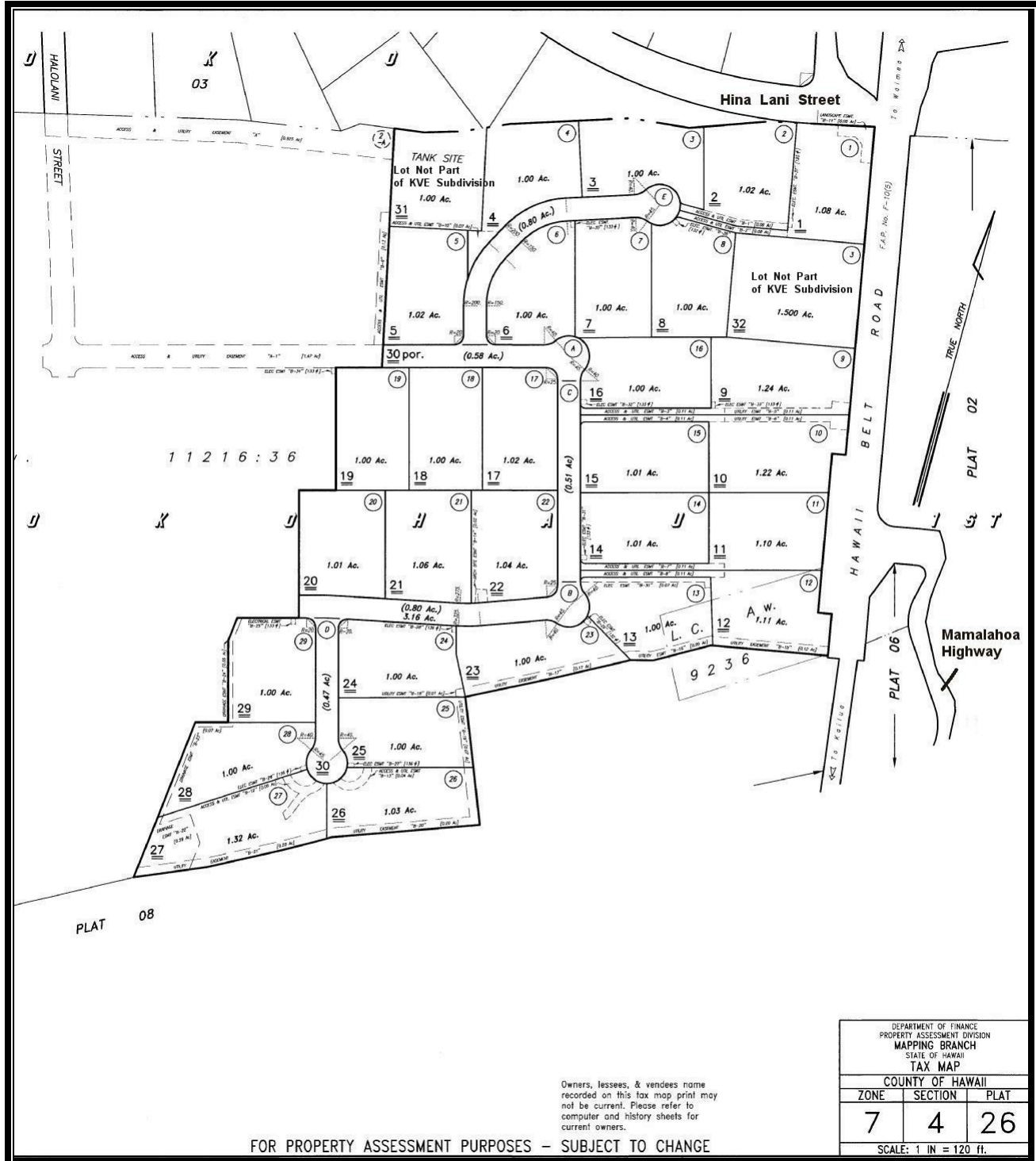
### **1.2 Environmental Assessment Process**

This Environmental Assessment (EA) process is being conducted in accordance with Chapter 343 of the Hawai‘i Revised Statutes (HRS). This law, along with its implementing regulations, Title 11, Chapter 200, of the Hawai‘i Administrative Rules (HAR), is the basis for the environmental impact assessment process in the State of Hawai‘i. According to Chapter 343, an EA is prepared to determine impacts associated with an action, to develop mitigation measures for adverse impacts, and to determine whether any of the impacts are significant according to thirteen specific criteria. Part 4 of this document states the anticipated finding that no significant impacts are expected to occur; Part 5 lists each criterion and presents the preliminary findings for each made by the consultant in consultation with the Hawai‘i County Planning Department, the approving agency. If, after considering comments to the Draft EA, the approving agency concludes that, as anticipated, no significant impacts would be expected to occur, then the

**Figure 1**  
**Property Location Map**



**Figure 2**  
**TMK Map**





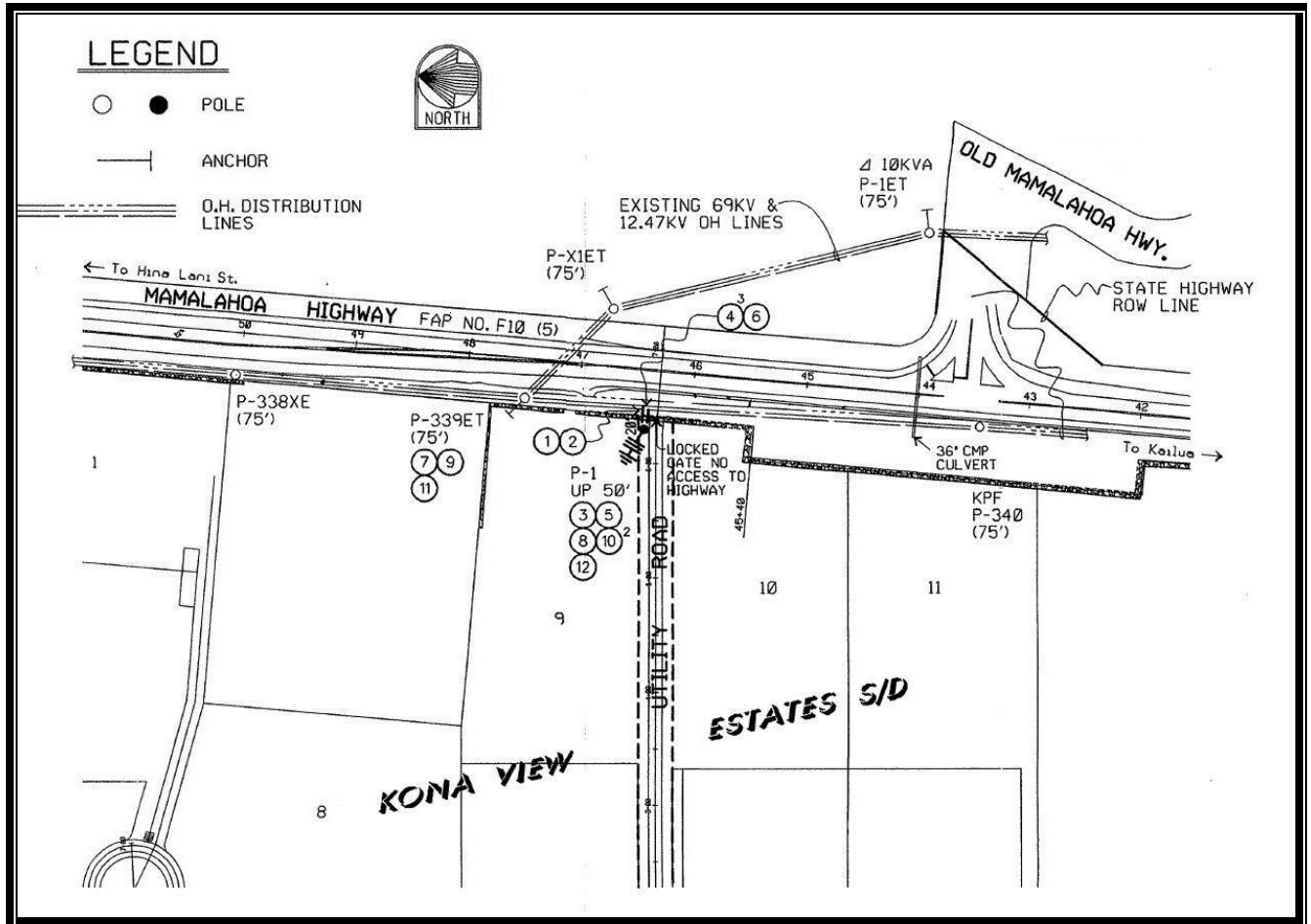
**Figure 3. Project Site Photographs**



**Top: Entrance to Subdivision; Middle: Completed Streets; Bottom: Typical Lot**



**Figure 4**  
**HELCO Pole Location Details**



agency will issue a Finding of No Significant Impact (FONSI), and the action will be permitted to occur. If the agency concludes that significant impacts are expected to occur as a result of the proposed action, then an Environmental Impact Statement (EIS) will be prepared.

### **1.3 Public Involvement and Agency Coordination**

The following agencies and organizations were consulted by letter during development of the Environmental Assessment.

State:

Department of Health, Environmental Health Administration  
Department of Land and Natural Resources, Director  
Department of Land and Natural Resources, Historic Preservation Division  
Department of Transportation, Highways Division, Hawai'i District  
Office of Hawaiian Affairs (Honolulu and West Hawai'i)

County:

County Council  
Department of Parks and Recreation  
Department of Public Works  
Planning Department  
Police Department

Private:

Kona Outdoor Circle  
Kona Hawaiian Civic Club  
Sierra Club

Responses received are contained in Appendix 1.

### **1.4 Schedule**

As discussed in Section 1.1, the project has completed construction of all of its internal infrastructure. The only remaining task is to connect subdivision utilities to the HELCO poles for electricity, telephone, and cable TV service. If the Planning Department determines that a FONSI is appropriate, the connections would be made immediately, and lot owners would be able to begin construction of their homes and to occupy them once built.

## **PART 2:     ALTERNATIVES**

### **2.1     No Action Alternative**

Under the No Action Alternative, the Kona View Estates subdivision would not obtain power, telephone, or cable TV service from the HELCO power poles. Alternate power arrangements probably involving a combination of onsite generators and solar power would be utilized for power, while telephone service would likely be exclusively from cellular providers and TV service would be via satellite. Internet service, which is provided by telephone or cable, would likely be through satellite or cellular service. This would be an inconvenience and expense to residents and would provide no benefit to any public or private party.

### **2.2     Alternative Locations**

The proposed location for the HELCO pole connection on State Highway 190 (see Figure 4) was selected because it was the most rational point for the connection. All infrastructure has been built with the expectation of this connection point. No environmental impacts are associated with connecting in this particular location, and there are no other potential connection points with any advantages with respect to environmental impacts, costs, or any other reason. Therefore, no alternative connection points have been identified or advanced in this Environmental Assessment.

## **PART 3: ENVIRONMENTAL SETTING, IMPACTS AND MITIGATION MEASURES**

### *Basic Geographic Setting*

The Kona View Estates subdivision is referred to throughout this EA as the project site. The term *project area* is used to describe the general environs of this part of Kona.

The project site is located at an elevation of 1,120 to 1,320 feet above sea level makai of State Highway 190, between Hina Lani Street and Palani Junction (the intersection of Palani Road and Mamalahoa Highway) in Honokōhau, North Kona, on the island of Hawai‘i (Figures 1-3). The average maximum daily temperature is approximately 78 degrees F, with an average minimum of 65 degrees, and annual rainfall averages about 40-50 inches (U.H. Hilo-Geography 1998:57). Adjacent land is primarily residential, with scattered agricultural uses and undeveloped lots. Much of the project site was repeatedly cleared for farming during several eras, after which it naturally revegetated with native and alien plants. The mixed native-alien forest that was present on the project site as of 2005 was largely cleared and mass-graded to create subdivision infrastructure and lots over the course of the last two years (Figure 3).

### **3.1 Physical Environment**

#### **3.1.1 Geology, Soils and Geologic Hazards**

##### *Environmental Setting*

Geologically, the project site is located on roughly 3,000-year old lava from Hualālai Volcano. (Wolfe and Morris 1996). Soil over most of the project site is classified as Punaluu extremely rocky peat with a small area of Kaimu extremely stony peat located in the southeastern corner of the project area. The Kaimu soil has rapid permeability, slow runoff and slight erosion hazard, and is in Capability subclass VIIs, which is often considered unsuitable for cultivation but may have small areas in coffee, macadamia nuts, and other crops. Punaluu soil is rapidly permeable in the peat layer but very slowly permeable within the pahoehoe. Because of rapid water movement through cracks, it generally has slow runoff and slight erosion hazard, and is in Capability Subclass VIIs as well (U.S. Soil Conservation Service 1973).

The United States Geological Survey (USGS) classifies all of Kailua-Kona, which is on the slopes of the dormant volcano Hualālai, as Lava Flow Hazard Zone 4, on a scale of ascending risk 9 to 1 (Heliker 1990).

In terms of seismic risk, the entire Island of Hawai‘i is rated Zone 4 Seismic Probability Rating (*Uniform Building Code, 1997 Edition*, Figure 16-2). Zone 4 areas are at risk from major earthquake damage, especially to structures that are poorly designed or built, as the 6.7-magnitude (Richter) quake of October 15, 2006, demonstrated. The subdivision does not appear to be subject to subsidence, landslides or other forms of mass wasting.

### *Impacts and Mitigation Measures*

Geologic conditions do not appear to impose any constraints on the proposed action and the subdivision is not imprudent to construct, build on or occupy, given the County and State government commitment to such land uses as expressed in land use plans. All infrastructure has taken into account the soil setting and slopes, and home builders will be required to design homes and accessory structures in accordance with regulations in the Building Code related to the seismic setting.

#### **3.1.2 Drainage, Water Features and Water Quality**

##### *Existing Environment*

The project area has no streams, ponds, lakes, wetlands or other surface water bodies. The Flood Insurance Rate Maps (FIRM) show that the project site is in Flood Zone X, outside the 100-year floodplain. No known areas of local (non-stream related) flooding are present.

##### *Impacts and Mitigation Measure*

There have been and will be no adverse impacts to water quality or water features, given continuing adherence to standard Best Management Practices during construction. Drainage improvements consisting of drywells meeting all County of Hawai‘i requirements have already been built.

#### **3.1.3 Flora, Fauna and Ecosystems**

##### *Existing Environment*

Given the rainfall, geologic substrate, and existing vegetation, the general area probably supported a Lowland Dry-Mesic Forest (Gagne and Cuddihy 1990) prior to human disturbance, with *lama* (*Diospyros sandwicensis*) and *alahe‘e* (*Psydrax odoratum*) as co-dominants. These original communities, however, have been destroyed or heavily degraded by cattle grazing, agriculture and clearing for farms and residences, and the vegetation of the project area is now either managed vegetation (i.e., farms, pasture or landscaped grounds) or adventive “communities” of various alien weeds. A few remnant patches of native forest, degraded to various degrees by invasive species, are present in the general project area. Historical information referenced in the archaeological inventory survey and the presence of terraces and *kuaiwi* walls (see Appendix 3) indicates that the project site supported traditional Hawaiian agriculture before 1850 and other farming, including coffee, later.

A botanical survey of a larger 347-acre area including the project site was conducted by Palmer & Associates Consulting in April 2005. The survey is included in full as Appendix 2 and is summarized here. The upper area that became the Kona View Estates subdivision was dominated

by Guinea grass (*Panicum maximum*), silk oak (*Grevillea robusta*), strawberry guava (*Psidium cattleianum*), and various natives, including *lama* (*Diospyros sandwichensis*), *alahe'e* (*Psydrax odoratum*), *maiapilo* (*Capparis sandwichiana*), *'ulei* (*Osteomeles anthyllidifolia*), *mamane* (*Sophora chrysophylla*), and a relatively rare species, *'ohe makai* (*Reynoldsia sandwichensis*). No listed, candidate or proposed endangered plant species (USFWS 2007) were found on the project site. In terms of conservation value, however, no botanical resources requiring special protection were deemed to be present.

A faunal survey of a larger 347-acre area including the project site was conducted by Rana Productions in October 2004. This survey is included in full as Appendix 3 and is summarized here. The large majority of bird species and individual birds detected were alien species, with Japanese White Eyes (*Zosterops japonicus*), House Finches (*Carpodacus mexicanus frontalis*), Zebra Doves (*Geopelia striata*), Spotted Doves (*Streptopelia chinensis*), and Common Mynas (*Acridotheres tristis*) being the most common. One Hawaiian Hawk (*Buteo solitarius*) was seen outside of the survey period near the project site.

Although not detected during this survey, it is possible that small numbers of the endangered endemic Hawaiian Petrel (*Pterodroma sandwichensis*), or *ua 'u*, and the threatened Newell's Shearwater (*Puffinus auricularis newelli*), or *'a 'o*, overfly the project area between the months of May and November. Both species were formerly common on the island of Hawai'i. The Hawaiian Petrel is a pelagic seabird that reportedly nested in large numbers on the slopes of Mauna Loa and in the saddle between Mauna Loa and Mauna Kea, as well as at the mid- to high elevations of Hualālai. Within recent historic times it has been reduced to relict breeding colonies located at high elevations on Mauna Loa and, possibly Hualālai. Newell's Shearwaters breed on Kaua'i, Hawai'i and Moloka'i in extremely small numbers. Newell's Shearwater populations have dropped precipitously since the 1880s. This pelagic species nests high in the mountains in burrows excavated under thick vegetation, especially *uluhe* fern. There is no suitable nesting habitat within the project area for these birds.

Biologists believe that the leading cause of death for both these species in Hawai'i is predation by alien mammals at the nesting colonies, followed by collision with man-made structures. Exterior lighting disorients these night-flying seabirds, especially fledglings, as they make their way from land to sea during the summer and fall. When disoriented, seabirds often collide with manmade structures and, if not killed outright, the dazed or injured birds are easy targets for feral mammals.

A number of mammals are present on the property, but all but one are alien and deleterious to native ecosystems. The endemic Hawaiian hoary bat (*Lasiurus cinereus semotus*), often seen in the project area and in many other parts of the island of Hawai'i, was not detected during the survey but may use resources within the project site.

### *Impacts and Mitigation Measures*

Although native plants are present, as they are in most locations in Kona, the lack of intact native ecosystems and threatened or endangered plant species meant that no adverse impacts to botanical resources would have occurred as a result of the already accomplished clearing nor from occupation of the subdivision.

The zoologist included a number of recommendations for mitigation for impacts to native fauna:

- In the unlikely event that an active Hawaiian Hawk nest is encountered during clearing and grubbing, halt any construction activity within 100 meters of the nest tree and consult with the U.S. Fish and Wildlife Service.
- In order to reduce effects to Hawaiian hoary bats, clearing and grubbing should not be undertaken during the period from the beginning of June to the end of August, when bats are caring for their young and most vulnerable to disturbance.
- In order to reduce the threat for downing endangered Hawaiian Petrels and threatened Newell's Shearwaters after they become disoriented by external lighting, shield any such lighting, in conformance with the Hawai'i County Outdoor Lighting Ordinance (Hawai'i County Code Chapter 9, Article 14), which requires shielding of exterior lights so as to lower the ambient glare.

According to developer Thomas M. Smith of 327 Kona LLC, all these recommendations were followed during development of the subdivision, and no Hawaiian Hawk nests were present or affected.

#### **3.1.4 Air Quality, Noise, and Scenic Resources**

##### *Environmental Setting*

Air pollution in West Hawai'i is mainly derived from volcanic emissions of sulfur dioxide, which convert into particulate sulfate and produce a volcanic haze (vog) that persistently blankets North and South Kona.

Noise on the project site is low to moderate and is derived from several sources. The principal source is road and highway noise, as the project site lies near or along Hina Lani Street, State Highway 190, and Palani Road. Other permanent sources are residences and agricultural activities; construction in the area is a temporary source of noise. Moderate levels of noise mainly affect those few lots fronting the main road.

The Hawai'i County General Plan denotes no sites of particular natural beauty within the project site or in the surrounding area, and no other scenic resources or viewplanes appear to be present.



### *Impacts and Mitigation Measures*

During mass grading and infrastructure preparation, contractors were required as part of their construction contracts to prepare a dust control plan and to implement measures such as water sprinkling and site housekeeping in order to minimize dust.

Development involved excavation, grading, compressors, vehicle and equipment engine operation, and construction of new infrastructure. These activities had the potential to generate noise exceeding 95 decibels at times, impacting nearby sensitive noise receptors on the margins of the subdivision. Whenever construction noise is expected to exceed the Department of Health's (DOH) "maximum permissible" property-line noise levels, contractors are required to consult with DOH per Title 11, Chapter 46, HAR (Community Noise Control) prior to construction. DOH then reviews the proposed activity, location, equipment, project purpose, and timetable in order to decide whether a permit is necessary and what conditions and mitigation measures, such as restriction of equipment type, maintenance requirements, restricted hours, and portable noise barriers, will be necessary. The contractor consulted with DOH and determined that permit restrictions would consist of construction being limited to daylight hours. To 327 Kona LLC's knowledge, no noise complaints related to the construction of subdivision infrastructure were received.

Future noise-generating activities will consist of normal home-building and are not expected to generate any substantial noise or to require a permit. Future legal uses of the properties for homes and gardens will also generate noise consistent with expectations in areas zoned Ag-1, which is thus not considered an impact.

### **3.1.5 Hazardous Substances, Toxic Waste and Hazardous Conditions**

#### *Environmental Setting, Impacts and Mitigation Measures*

According to Thomas M. Smith, the 327 Kona LLC developer, the site is not known to have been used for industry, modern intensive farming or as a dumping ground. This site history does not suggest the presence of hazardous materials. No hazardous substances were found on the project site prior to or during infrastructure development.

As development of home sites proceeds, in the unlikely event that any evidence of hazardous materials or toxic substances such as chemical drums or petroleum stained soil/odor is discovered, the Department of Health should be contacted to determine if further investigation is warranted.

## 3.2 Socioeconomic and Cultural

### 3.2.1 Socioeconomic Characteristics

The project would most directly affect the mauka communities centered along Palani Road and State Highway 190 in North Kona, and in a wider sense, the entire North Kona District. Table 1 provides information on the socioeconomic characteristics of North Kona along with those of Hawai'i County as a whole for comparison, from the 2000 U.S. Census of Population.

**Table 1. Selected Socioeconomic Characteristics**

Characteristic	Hawai'i County	North Kona	Characteristic	Hawai'i County	North Kona
Total Population	148,677	28,543	21 to 65 Years, Disabled (%)	19.2	17.4
Median Age	38.6	39.4	Employed and Disabled, 21 to 65 Years, (%)	51.8	64.1
Older Than 65 Years (%)	13.5	11.8	65 Years of Older, Disabled (%)	40.3	38.1
Race (%)			Employment in:		
White	31.5	47.1	Management	30.2	26.6
Asian	26.7	16.3	Service	22.2	24.3
Hawaiian	9.7	8.9	Sales	25.1	27.8
Other Pacific Islander	1.5	1.8	Office	3.8	2.2
Two or More Races	28.4	23.5	Farming, Fishing and Forestry	9.9	10.4
Hispanic (Any Race)	9.5	7.9	Production, Transportation	8.9	8.8
Family Households (%)	69.6	68.6	Families Below Poverty Line (%)	11.0	5.6
Households with Female Householder, no Husband, With Children (%)	7.7	6.7	Households with Female Householder, no Husband, With Children, Below Poverty Line (%)	28.1	17.5
Householder Lives Alone (%)	23.1	20.1	Individuals Below Poverty Line (%)	15.7	9.7
Average Household Size	2.75	2.70	Over 65 Below Poverty Line	7.2	5.3
Average Family Size	3.24	3.13	Median Household Income (\$)	39,805	47,610
Over 25 Years Old With High School Diploma (%)	84.6	87.7	Housing Owner-Occupied (%)	64.5	58.5
Married Now (%)	52.0	53.9	Housing Rented (%)	34.5	41.5
Widowed (%)	6.3	4.9	Housing Vacant (%)	15.5	19.7
Divorced Now (%)	10.7	11.4	Median Home Value, 1999 (\$)	153,700	233,900
Veterans (%)	14.5	14.8	Median Rent, 1999 (\$)	645	745
Over 16 in Labor Market (%)	61.7	69.2	Rent is Greater Than 25% of Income (%)	46.0	47.2
Residence 5 Years Ago (%)			Poverty by Race:		
Same Home	57.7	49.9	White	14.5	8.8
Different Home, Same County	26.5	28.8	Asian	7.3	6.2
Different County in Hawai'i	4.8	3.5	Native Hawaiian/Pacific Islander	26.4	15.8
Different State/Country	11.0	17.8	Two or More Races	20.4	10.3

Source: U.S. Bureau of the Census, May 2001. *Profiles of General Demographic Characteristics, 2000 Census of Population and Housing, Hawai'i*. (U.S. Census Bureau Web Page).

## *Impacts and Mitigation Measures*

Population increase as result of the subdivision's 29 house lots is likely to be minor. Based on the North Kona District's average household size and vacancy rates, the population may increase by 68 residents. This is not large enough to cause any significant shifts in demographic characteristics, unemployment rates, demands on public services or infrastructure (which are discussed below in Section 3.3), or any other socioeconomic measures. Importantly, the population increase is consistent with the predominantly Ag-1 zoning. It is also noteworthy that the County of Hawai'i General Plan, which matches available land with desired land uses, specifies this area as Urban Expansion, which would produce higher densities than those proposed.

New housing increases the tax base for the County, and new residents often contribute to other government revenues including general excise and income taxes. The number of new lots and residents is unlikely to cause any substantial benefits from increases in such revenues.

### **3.2.2 Cultural and Archaeological Resources**

A study of archival documents and historical literature conducted for the lands of Honokōhau by Kepā Maly (2000) was the primary source of cultural information. The study used both archival-historical research and oral history interviews with descendants of the native Hawaiian families and others who were known to be familiar with the natural and cultural landscape and history of land use in Honokōhau and the Kekaha region. All of the interview participants had lived upon or worked the lands of Honokōhau and provide documentation gained from personal experiences dating back to the 1890s. Several of the interview participants were descended from families who lived at Honokōhau since at least the 1840s.

Kona was apparently first settled along the sheltered and watered bays in the region extending south from Kailua. As population increased, people began establishing permanent settlements in arid Kekaha. Kona, like other large districts on Hawai'i, was divided into *‘okana* or *kalana* (ancient regions). In the region now known as Kona *‘akau* (North Kona), there are several *kalana*. The southern portion of North Kona was known as “Kona kai *‘ōpua*” (interpretively translated by Maly as “Kona of the distant horizon clouds above the ocean”), and included the area extending from Lanihau (the present-day vicinity of Kailua Town) to Pu‘uohau. The northernmost portion of North Kona was called “Kekaha”, a term used to describe an arid coastal region. Native residents of the region affectionately referred to their home as Kekaha-wai-‘ole o nā Kona (“Waterless Kekaha of the Kona district”), or simply as the *‘āina kaha*.

Only a few early (pre-nineteenth century) historical accounts specifically name Honokōhau, as most of the accounts describe the area in the context of the larger Kekaha region. One of the earliest datable accounts that describes the importance of the Kekaha region comes from the mid-sixteenth century, following ‘Umi-a-Līloa’s unification of the island of Hawai‘i under his rule. Writing in the 1860s, native historian Samuel Kamakau (1961) recounted the reign of ‘Umi and his visits to Kekaha:

“Umi-a-Līloa did two things with his own hands, farming and fishing...and farming was done on all the lands. Much of this was done in Kona. He was noted for his skill in fishing and was called Pu‘ipu‘i a ka lawai‘a (a stalwart fisherman). Aku fishing was his favorite occupation, and it often took him to the beaches (Ke-kaha) from Kalahuipua‘a to Makaula”

Working fishponds in the Honokōhau-Kaloko vicinity date back to at least the early seventeenth century. In Kamakau’s (Ibid.) description of events that occurred in the life time of Lono-i-ka-Makahiki, ‘Umi’s grandson, the ponds are mentioned as well.

“Soon the fishing canoes from Kawaihae, the Kaha lands, and ‘O‘oma drew close to the ship to trade for the pa‘i‘ai (hard poi) carried on board, and shortly a great quantity of aku lay silvery-hued on the deck. The fishes were cut into pieces and mashed; and all those aboard fell to and ate, the women by themselves.”

Historian John Papa I‘i also stated that Honokōhau had one of the famous surf breaks of the region (I‘i 1959).

In 1819, following the death of Kamehameha I, Liholiho (Kamehameha II) retreated to Kawaihae. Following the period of mourning and purification, he returned to the Kailua. Kamakau (1961) reported that on the way there he stopped at Honokōhau and dedicated a *heiau* to his god and prepared for his return. It was soon after this that Liholiho declared *ai noa* (free eating), a breaking of the *kapu* (restrictions) of the gods that quickly led to the demise of the ancient religious system.

While historical references are few, some vivid pictures of life in this arid region were written. In 1840-41, Charles Wilkes of the U.S. Exploring Expedition wrote:

“A considerable trade is kept up between the south and north end of this district. The inhabitants of the barren portion of the latter are principally occupied in fishing and the manufacture of salt, which articles are bartered with those who live in the more fertile regions of the south, for food and clothing.” (Wilkes 1845)

In 1924, J.W.H.I. Kihe wrote a series of accounts in the Hawaiian language newspaper *Ka Hōk o Hawai‘i*. One discussed the depopulation of Kekaha:

“The lands of Honokōhau were filled with people in those days, there were many women and children with whom I traveled with joy in the days of my youth. Those families are all gone, and the land is quiet. There are no people, only the rocks remain, and a few scattered trees growing, and only occasionally does one meet with a man today [1924]. One man and his children are all that remain.”

According to cultural historian Kepā Maly, despite the lack of water, the lands of Honokōhau were among the favored lands of the North Kona District. Honokōhau, which extended from the

sea to the forests of Hualālai (including the project site), was carefully managed for resources. There were both open ocean and nearshore fisheries (*ko‘a*) as well as intricate *loko i‘a* (fishponds and fish traps). Springs were vital and protected resources. A wide range of environmental zones (*wao*), extending from near shore to upland forests provided the natural resources and materials necessary for the development of a sophisticated agricultural system. These resources allowed the native residents of the lands to meet their immediate community needs as well as contribute to the overall support of the larger Hawaiian social, economic, religious and political system of Kona. The project site itself is situated within the *‘apa‘a* zone of the Kona Field System within Honokōhau, a mid-elevation zone used for dryland cultivation of taro, sugar cane, sweet potato, and ti.

Valued natural, cultural and historical resources are still present in various parts of Honokōhau. *Koa* fishing grounds and the natural landmarks such as *pu‘u* (hills) that guide fishermen to them are examples. Springs, ponds, and other coastal water features have not only biological but also cultural significance. Burial sites for *‘iwi kupuna*, including caves, are important resources to protect. On a wider level, the entire range of *wao*, from the *kahakai* (shoreline) to the *wao akua* (cloud forests), that make up the *ahupua‘a* have a level of cultural importance.

Although the action involves only provision of utility connections and occupation of a subdivision that is already built, the Office of Hawaiian Affairs (Honolulu and West Hawai‘i) and the Kona Hawaiian Civic Club were contacted to determine if they had any knowledge of cultural resources that may be present or practices that may be ongoing on the property. No specific resources or practices were identified, which was expected given the developed context and the mid-elevation location of the property within the *ahupua‘a* of Honokōhau. Aside from the burial site that was identified during data recovery and protected and preserved in an easement as part of a burial treatment plan (as discussed below), no cultural sites are known to exist.

### *Archaeological Resources and Surveys*

Archaeological work, including inventory survey, data recovery plans, and data recovery, was performed by Haun and Associates between 2005 and 2007. The purpose of the archaeological inventory survey was to document the presence of any historic or traditional cultural properties that might exist within the project area, assess their significance, determine if any impacts would occur, and formulate mitigation, if appropriate. The study used historic maps and documents, archaeological summaries of the area, and field investigation. The report is contained in Appendix 4a and summarized in this section, which also reports on subsequent data recovery (Appendix 4b) and preservation actions.

Historical research indicated that the project site was likely to have supported traditional Hawaiian agriculture, resource use and permanent and temporary settlement for many centuries prior to 1778. As stated above, the *‘apa‘a* zone in which the project site is found supported dryland cultivation of taro, sugar cane, sweet potato, and ti. Permanent habitations were present but infrequent, and dwellings observed by early historic chroniclers were for temporary use in

conjunction with agriculture, bird hunting, and collecting of plant resources. These uses would have changed after 1778, at first gradually, and then rapidly, as depopulation and population shifts, new economic and resource values, and foreigners influenced land use. Japanese coffee farmers reportedly used the project site in the early 1900s, cotton was reportedly cultivated, and the area was also used for grazing.

The inventory survey noted 651 component features comprising 26 archaeological sites, including permanent habitations with platforms, terraces, and enclosures; temporary habitations utilizing lava tube caves; and agricultural fields, including *kuaiwi* (broad walls parallel to the slope, a hallmark of the Kona Field System), retaining walls and terraces, and clearing features. Prehistoric artifacts included marine shell midden, charcoal, volcanic glass flakes and rock rings used to support water collecting gourds below seeps in lava tubes. Historic artifacts included a clay pipe stem, glass shards, wooden remains, and ceramic fragments.

Sites recorded during the inventory survey were assessed for their significance based on criteria established by the SHPD (State Historic Preservation Division) and contained in the Hawai'i Administrative Rules 13§13-284-6. All sites were considered to be significant in that they have yielded, or were likely to yield, information important for research on prehistory or history. Sixteen sites were determined to have sufficient information collected, and ten other sites were recommended for data recovery. The significance evaluation and treatment recommendations were concurred with by the SHPD in a letter of August 30, 2005 (see end of Appendix 4a for correspondence).

The next step in the archaeological process involved preparation of the data recovery plan (Appendix 4b). The plan involved research at ten sites including five habitation lava tube caves, two habitation complexes, a habitation enclosure, a habitation platform, and an agricultural complex. The research objectives were to establish the age of the sites and to determine their functions and the type and varieties of activities conducted there. This plan was approved by the SHPD in a letter of November 3, 2005 (see correspondence at end of Appendix 4b). Although fieldwork for data recovery is complete, laboratory analysis and write-up are continuing and SHPD approval of the data recovery report is not yet final.

During data recovery, a burial was discovered within an enclosure. The SHPD, the Police Department and the County Coroner were immediately contacted, per regulations, and the burial was protected from any harm. The planned street pattern of the subdivision was altered to provide a protected easement and restrictive covenant that was incorporated into the deed of the property and recorded with the bureau of conveyances. During construction, orange fencing was erected around the site and construction supervisors were explicitly notified about the nature and location of the site and the meaning of the delineated buffer zone. This EA does not contain information on the burial location, but parties with a legitimate interest in the location may contact the Burials Program of the SHPD for information.

## *Impacts and Mitigation Measures*

Aside from the burial site that was identified during data recovery and protected and preserved in an easement (as discussed above), no significant cultural or archaeological sites are known to exist or have the potential to be affected. This Draft EA has been distributed to agencies and groups who might have knowledge in order to confirm this finding.

In the unlikely event that archaeological resources or human remains are encountered during future development activities within the current study area, work in the immediate area of the discovery should be halted and DLNR-SHPD contacted as outlined in Hawai'i Administrative Rules 13§13-275-12.

### **3.3 Infrastructure**

#### **3.3.1 Utilities**

##### *Existing Facilities and Services and Impacts*

Electrical power to the site is supplied by Hawai'i Electric Light Company (HELCO), a privately owned utility company regulated by the State Public Utilities Commission, via its island-wide distribution network. Telephone service is available from Hawaiian Telcom.

As discussed in Section 1.1, these services are available from a pole in the right-of-way of State Highway 190, the use of which is the reason for this EA. 327 Kona LLC has made all necessary arrangements to obtain these services. All impacts on existing utilities have been mitigated by service agreements with the utilities and no impacts on the any of these utilities' systems or on their capacity to provide service will occur as a result of connection or use of the utilities.

Water lines have been built and are adequate to serve all lots and provide fire protection. No municipal wastewater treatment service is available in this part of Kona, and households must use individual wastewater treatment systems meeting with the requirements of the State Department of Health.

#### **3.3.2 Roadways**

##### *Existing Facilities*

The site is accessed by Waiaha Street, which connects to Halolani Street, which in turn connects to Hina Lani Street (see Figure 2). Hina Lani Street is a secondary arterial with traffic signals at its termini on Queen Ka'ahumanu Highway (State Highway 19) and Mamalahoa Highway (State Highway 190). Although the subdivision has five lots that border State Highway 190, no direct access has been provided to this highway, in keeping with Department of Transportation (DOT) requests.



### *Impacts and Mitigation Measures*

Subdivision access was approved by the Hawai‘i County Department of Public Works during the subdivision process. Access is adequate for the 29-lot subdivision and no traffic impacts requiring mitigation were identified.

In a comment letter of November 19, 2007, in response to early consultation, DOT recommended that the final plat map be revised to include a 10-foot wide “no vehicle access” planting screen easement for all lots (1, 9, 10, 11 and 12) along the State Highway 190 frontage. DOT stated that this will provide “property owners with a clear direction to the access for the property and minimize any misinterpretation or misunderstanding of their property rights.”

The County of Hawai‘i has accepted and filed the final plat of Kona View Estates for 327 Kona LLC. Covenants, Conditions and Restrictions (CC&Rs) have been filed of record which govern the ownership and use of lots and provide for the placement and types of screening. Lots have already been sold based on these CC&Rs and the Final Plat. According to developer Thomas M. Smith, given the foregoing, amending the Plat and CC&Rs is not practical. The developer will encourage the owners along the DOT right-of-way to use screening where possible. It should be noted that the topography makai of the DOT right-of-way in the southern portion of subdivision slopes steeply downward, and this area does not lend itself to planting since the only level ground is on the DOT right-of-way.

### **3.4 Secondary and Cumulative Impacts**

Cumulative impacts result when implementation of several projects that individually have limited impacts combine to produce more severe impacts or conflicts in mitigation measures. The fast-growing North Kona District is the center of the visitor industry and real-estate development that powers the economy of the island. There are many public and private projects being planned at any given time, the details of which often change daily in response to market conditions and the regulatory process. The description below is meant to provide some context for development occurring in the area north of Kailua-Kona.

A variety of large-scale market and affordable housing projects are underway here. At the Villages of La‘i‘ōpua in Kealahou, less than a mile downslope of Kona View Estates, the Department of Hawaiian Home Lands is developing about 1,740 homes for lease to Native Hawaiians who qualify under the Hawaiian Homes Act. The Keahuolu Affordable Housing Project is being undertaken by the Hawai‘i Housing Finance and Development Corporation, which is building on about 270 acres of land two miles down Palani Road from Kona View Estates. Various alternatives are under consideration, one of which has as many as 2,330 planned dwelling units.

The Shores at Kohanaiki, located makai of Queen Ka‘ahumanu Highway downslope from the project site, includes a 500-home golf course community featuring a shoreline park, public parking for more than 120 cars and an 8,000 square foot beach facility with a snack bar,

restrooms and showers. Directly north of Kohanaiki, Kona Village, LLC has proposed the 'O'oma Beachside Village, a master-planned shoreline community on 300 acres of land. The project would include a mixture of single-family lots, affordable homes, several mixed-use villages, a coastal preserve/open space and shoreline park with a public canoe club hale, a private beach club, and various other parks and preserves.

Hiluhilu Development Company has obtained approvals for its Palamanui project, a master-planned community with a mix of single-family and multiple-family residential units, commercial spaces, a village inn, 18-hole golf course, and related improvements and infrastructure.

The Kula Nei project will provide approximately 270 homes including 50 to 70 affordable homes in a 150-acre site between the existing Kona Acres and the future Kaloko Heights subdivisions. The controversial Kona Kai Ola project proposes a marina, hotel, time-share and retail development near Honokōhau Harbor.

Various infrastructure projects are also in planning or construction. The Department of Water Supply is upgrading its water system by providing a new transmission line from Mamalahoa Highway to Palani Road, about a mile from the project site. This agency is also converting an exploratory well on its Keopu-Pu'uhonua site to a 650-gallon per minute capacity production well and building a one million gallon reservoir to provide storage. The Department of Transportation is widening Queen Ka'ahumanu Highway to four lanes from Kailua-Kona to the Kona International Airport. The Department of Public Works is building two roads in Kealakehe within two miles of the project site. The Ane Keohokalole Extension, often called the Mid-Level Road in planning documents, will connect Henry Street to Palani Road and beyond to the future West Hawai'i Civic Center (another long-range County of Hawai'i project), the Kealakehe Schools, and the Villages of La'i'ōpua. A smaller project is the Manawalea Connector, which will link the Kealakehe Schools with residential areas located above, bypassing Queen Ka'ahumanu Highway and improving traffic circulation.

Several large-scale natural resource protection and restoration projects are also underway in the area. The Honua'ula Forest Reserve Reforestation Project is being undertaken by the Department of Land and Natural Resources Division of Forestry and Wildlife, which proposes to stimulate the regeneration of native *koa* trees within approximately 1,000 acres of heavily degraded native forest areas in the Honua'ula Forest Reserve, about three miles from Kona View Estates. The 'Ola'a-Kilauea Partnership is undertaking the North Kona Protective Fencing Project, which would build up to 22 miles of ungulate-proof fencing, eventually enclosing approximately 13,000 acres on the slopes of Mauna Loa in North Kona on the island of Hawai'i. The Department of Hawaiian Home Lands is building a system of dry forest plant preserves at Kealakehe, about a mile downslope of the project.

Although it is difficult if not impossible to systematically determine the complex interaction of environmental impacts in this fast-growing region, the Kona View Estates project has rather discrete and limited impacts that will not tend to accumulate with those of other projects. Impacts to natural resources are limited because of the basically disturbed, alien nature of the vegetation that was in place prior to infrastructure construction. Archaeological resources were properly inventoried and the one site considered significant was preserved, adding to a very large number of preserved sites in Kona. The low density and design guidelines of the subdivision will not contribute to a loss of scenic character or interference with viewplanes, even considering the development going on around the area.

The only potential cumulative impacts are related to occupation of the subdivision, specifically the increase in traffic. Increases in the tax base generated by new occupants can provide the funding for new infrastructure, as the County and State projects listed above demonstrate. There is often a lag time, however, between population growth and full infrastructure development, which has led many in Kona to call for restrictions or moratoriums on development to allow infrastructure to “catch up.” Leaving aside the issue of equity for imposing such restrictions on zoned and entitled property (as opposed to land seeking new entitlements), the addition of 29 lots and perhaps 68 residents will not noticeably and adversely affect traffic or other public infrastructure. The subdivision approval process involved County agency evaluation of access and traffic, and the approved access was deemed adequate for the 29-lot subdivision and no traffic impacts requiring mitigation were identified. No adverse cumulative effects are anticipated.

### **3.5 Required Permits and Approvals**

The following permits and approvals would be required:

- Approval for Work Within State Highway Right-of-Way

### **3.6 Consistency with Government Plans and Policies**

#### **3.6.1 Hawai‘i State Land Use Law**

All land in the State of Hawai‘i is classified into one of four land use categories – Urban, Rural, Agricultural, or Conservation – by the State Land Use Commission, pursuant to Chapter 205, HRS. The property is in the State Land Use Agricultural District and the proposed subdivision is consistent with the regulations regarding this Land Use District.

### 3.6.2 Hawai'i County SMA, Zoning and General Plan

*Special Management Area.* The property is not situated within the County's Special Management Area (SMA).

*Hawai'i County Zoning.* The project site is zoned A-1a, (agricultural, minimum lot size 1 acre). The project is entirely consistent with this designation. A small strip of some lots is zoned A-5a (agricultural, five-acre minimum)

The *General Plan* for the County of Hawai'i is a policy document expressing the broad goals and policies for the long-range development of the Island of Hawai'i. The plan was adopted by ordinance in 1989 and revised and adopted again in 2005 (Hawai'i County Department of Planning). It contains both descriptive and map components.

The *Hawai'i County General Plan Land Use Pattern Allocation Guide (LUPAG)* is a graphic representation of the Plan's goals, policies, and standards as well as of the physical relationship among land uses. It also establishes the basic urban and non-urban form for areas and specifies planned public and cultural facilities, public utilities and safety features, and transportation corridors. The LUPAG map specifies this area as Urban Expansion, which would produce higher densities than those proposed

The *General Plan* itself is organized into thirteen elements, with policies, objectives, standards, and principles for each. There are also discussions of the specific applicability of each element to the nine judicial districts comprising the County of Hawai'i. Most relevant to the proposed project are the following Goal and Policies, and Courses of Action of particular chapters of the General Plan:

#### ECONOMIC GOALS

Provide residents with opportunities to improve their quality of life through economic development that enhances the County's natural and social environments.

Economic development and improvement shall be in balance with the physical, social, and cultural environments of the island of Hawaii.

Strive for diversity and stability in the economic system.

Provide an economic environment that allows new, expanded, or improved economic opportunities that are compatible with the County's cultural, natural and social environment.

*Discussion:* The proposed project is in balance with the natural, cultural and social environment of the County, and it has created, and will continue to create, temporary construction jobs for local residents and indirectly affect the economy through construction industry purchases from local suppliers. A multiplier effect takes place when these employees spend their income for food, housing, and other living expenses in the retail sector of the economy. Such activities are in keeping with the overall economic development of the island.

#### ENVIRONMENTAL QUALITY GOALS

Define the most desirable use of land within the County that achieves an ecological balance providing residents and visitors the quality of life and an environment in which the natural resources of the island are viable and sustainable.

Maintain and, if feasible, improve the existing environmental quality of the island.

#### ENVIRONMENTAL QUALITY POLICIES

Take positive action to further maintain the quality of the environment.

#### ENVIRONMENTAL QUALITY STANDARDS

Pollution shall be prevented, abated, and controlled at levels that will protect and preserve the public health and well being, through the enforcement of appropriate Federal, State and County standards.

Incorporate environmental quality controls either as standards in appropriate ordinances or as conditions of approval.

*Discussion:* The proposed project, which occurs in an area designated for 1-acre agricultural lots that has been farmed throughout history, would not have a substantial adverse effect on the environment and would not diminish the valuable natural resources of the region. The project has obtained permits and followed the conditions designed to reduce or eliminate pollution and environmental degradation.

#### HISTORIC SITES GOALS

Protect, restore, and enhance the sites, buildings, and objects of significant historical and cultural importance to Hawaii.

Appropriate access to significant historic sites, buildings, and objects of public interest should be made available.

## HISTORIC SITES POLICIES

Agencies and organizations, either public or private, pursuing knowledge about historic sites should keep the public apprised of projects.

Require both public and private developers of land to provide historical and archaeological surveys and cultural assessments, where appropriate, prior to the clearing or development of land when there are indications that the land under consideration has historical significance.

Public access to significant historic sites and objects shall be acquired, where appropriate.

*Discussion:* Archaeological resources have been protected through inventory survey, as well as the formulation and implementation of data recovery and burial preservation actions, all of which has been reviewed and approved by the State Historic Preservation Division.

## FLOOD CONTROL AND DRAINAGE GOALS

Conserve scenic and natural resources.

Protect human life.

Prevent damage to man-made improvements.

Control pollution.

Prevent damage from inundation.

Reduce surface water and sediment runoff

## FLOOD CONTROL AND DRAINAGE POLICIES

Enact restrictive land use and building structure regulations in areas vulnerable to severe damage due to the impact of wave action. Only uses that cannot be located elsewhere due to public necessity and character, such as maritime activities and the necessary public facilities and utilities, shall be allowed in these areas.

Development-generated runoff shall be disposed of in a manner acceptable to the Department of Public Works in compliance with all State and Federal laws.

## FLOOD CONTROL AND DRAINAGE STANDARDS

Applicable standards and regulations of Chapter 27, “Flood Control,” of the Hawaii County Code.

Applicable standards and regulations of the Federal Emergency Management Agency (FEMA).

Applicable standards and regulations of Chapter 10, “Erosion and Sedimentation Control” of the Hawaii County Code.

Applicable standards and regulations of the Natural Resources Conservation Service and the Soil and Water Conservation Districts.

*Discussion:* The property is within the Zone X, or areas outside the 100-year floodplain, according to the Flood Insurance Rate Maps (FIRM). The improvements were subject to review by the Hawai‘i County Department of Public Works to ensure that all relevant standards of Chapter 27 and Chapter 10 were addressed, and improvements were inspected and accepted.

## NATURAL BEAUTY GOALS

Protect, preserve and enhance the quality of areas endowed with natural beauty, including the quality of coastal scenic resources.

Protect scenic vistas and view planes from becoming obstructed.

Maximize opportunities for present and future generations to appreciate and enjoy natural and scenic beauty.

## NATURAL BEAUTY POLICIES

Increase public pedestrian access opportunities to scenic places and vistas.

Protect the views of areas endowed with natural beauty by carefully considering the effects of proposed construction during all land use reviews.

Do not allow incompatible construction in areas of natural beauty.

*Discussion:* The construction of the subdivision occurred in an area with similar residential/agricultural uses on three sides. No adverse visual impacts are expected.



## NATURAL RESOURCES AND SHORELINES GOALS

Protect and conserve the natural resources of the County of Hawaii from undue exploitation, encroachment and damage.

Provide opportunities for the public to fulfill recreational, economic, and educational needs without despoiling or endangering natural resources.

Protect and promote the prudent use of Hawaii's unique, fragile, and significant environmental and natural resources.

Ensure that alterations to existing landforms and vegetation, except crops, and construction of structures cause minimum adverse effect to water resources, and scenic and recreational amenities and minimum danger of floods, landslides, erosion, siltation, or failure in the event of earthquake.

## NATURAL RESOURCES AND SHORELINES POLICIES

The County of Hawaii should require users of natural resources to conduct their activities in a manner that avoids or minimizes adverse effects on the environment.

Encourage the use of native plants for screening and landscaping.

*Discussion:* The proposed project is not located on the shoreline. Impacts to existing natural landforms and vegetation have been mitigated through permit-regulated Best Management Practices to avoid any impacts related to flooding, landslides, sedimentation or other similar impacts.

## LAND USE GOALS

Designate and allocate land uses in appropriate proportions and mix and in keeping with the social, cultural, and physical environments of the County.

## LAND USE POLICIES

Allocate appropriate requested zoning in accordance with the existing or projected needs of neighborhood, community, region and County.

## LAND USE, OPEN SPACE GOALS

Provide and protect open space for the social, environmental, and economic well-being of the County of Hawaii and its residents.

Protect designated natural areas.

## LAND USE, OPEN SPACE POLICIES

Open space shall reflect and be in keeping with the goals, policies, and standards set forth in the other elements of the General Plan.

*Discussion:* The Ag-1 subdivision is in keeping with County and State land use plans and does not detract from important open space.

## **PART 4: DETERMINATION**

Based on the information to this point, the Hawai‘i County Planning Department is expected to determine that the proposed project will not significantly alter the environment. It is therefore anticipated that an Environmental Impact Statement is not warranted and that the Hawai‘i County Planning Department will issue a Finding of No Significant Impact (FONSI). A final determination will be made by the Hawai‘i County Planning Department after consideration of comments on the Draft EA.

## **PART 5: FINDINGS AND REASONS**

Chapter 11-200-12, Hawai‘i Administrative Rules, outlines those factors agencies must consider when determining whether an Action has significant effects:

1. *The proposed project will not involve an irrevocable commitment or loss or destruction of any natural or cultural resources.* No valuable natural or cultural resources would be committed or lost by the project. Project infrastructure, including streets, drainage facilities, and mass grading for lots, has already been built. In any case, these resources were properly inventoried and the one significant resource, a burial site, has been responsibly protected.
2. *The proposed project will not curtail the range of beneficial uses of the environment.* The proposed project in no way curtails beneficial uses of the environment in this area.
3. *The proposed project will not conflict with the State's long-term environmental policies.* The State's long-term environmental policies are set forth in Chapter 344, HRS. The broad goals of this policy are to conserve natural resources and enhance the quality of life. The project provides housing in an appropriate area for residents of Hawai‘i County, fulfilling needed County and State goals while avoiding significant impacts to the environment. It is thus consistent with all elements of the State's long-term environmental policies.
4. *The proposed project will not substantially affect the economic or social welfare of the community or State.* The major effects are beneficial, providing housing and jobs. Although considering the cumulative deficiency of infrastructure, all population increase in Kona involves potentially adverse effects to traffic, the access to the subdivision was designed in a way to minimize the effects of traffic on the local roadway system from the additional 29 lots.
5. *The proposed project does not substantially affect public health in any detrimental way.* No effects to public health are anticipated.

6. *The proposed project will not involve substantial secondary impacts, such as population changes or effects on public facilities.* No secondary effects are expected to result from the 29-lot subdivision, which is not large enough to directly or indirectly tax public infrastructure or facilities.
7. *The proposed project will not involve a substantial degradation of environmental quality.* The project is minor, has been regulated by permits to avoid environmental degradation, and would thus not contribute to environmental degradation.
8. *The proposed project will not substantially affect any rare, threatened or endangered species of flora or fauna or habitat.* The project site supports overwhelmingly alien vegetation. Impacts to rare, threatened or endangered species of flora or fauna will not occur.
9. *The proposed project is not one which is individually limited but cumulatively may have considerable effect upon the environment or involves a commitment for larger actions.* The 29-lot subdivision is not related to other activities in the region in such a way as to produce adverse cumulative effects or involve a commitment for larger actions.
10. *The proposed project will not detrimentally affect air or water quality or ambient noise levels.* Due to the character and density of the project, no adverse effects on these resources would occur.
11. *The project does not affect nor would it likely to be damaged as a result of being located in an environmentally sensitive area such as a flood plain, tsunami zone, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal area.* Although the project is located in an area with volcanic and seismic risk, the entire Island of Hawai'i shares this risk, and the project is not imprudent to undertake. No floodplains are involved.
12. *The project will not substantially affect scenic vistas and viewplanes identified in county or state plans or studies.* The project site is not noted for its natural beauty in the Hawai'i County General Plan, and no aspect of the project would adversely impact scenic resources or viewplanes.
13. *The project will not require substantial energy consumption.* Although subdivision infrastructure construction did require the use of energy, as will home construction, no major adverse effects to energy consumption would be expected, and there is no feasible way to provide housing without energy consumption. Design guidelines and CC&Rs strongly promote and encourage energy conservation.

For the reasons above, the action would not have any significant effect in the context of Chapter 343, Hawai'i Revised Statutes and section 11-200-12 of the State Administrative Rules.

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**Kona View Estates Subdivision**

**Environmental Assessment**

**APPENDIX 1**

**COMMENTS IN RESPONSE TO EARLY CONSULTATION**

LINDA LINGLE  
GOVERNOR



STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

HAWAII DISTRICT  
50 MAKAALA STREET  
HILO, HAWAII 96720  
TELEPHONE: (808) 933-8866 • FAX: (808) 933-8869

November 19, 2007

BARRY FUKUNAGA  
DIRECTOR

Deputy Directors  
MICHAEL D. FORMBY  
FRANCIS PAUL KEENO  
BRENNON T. MORIOKA  
BRIAN H. SEKIGUCHI

IN REPLY REFER TO:

HWY-H 07-2.1086

Mr. Ron Terry  
Principal  
Geometrician Associates  
P.O. Box 396  
Hilo, Hawai'i 96721

Dear Mr. Terry:

SUBJECT: Early Consultation on Environmental Assessment for Use of State Land in  
Association  
With HELCO Electrical Power Easement for Kona View Estates Subdivision  
Subdivision No. 05-000036 (Formerly TMK 7-4-008:047)  
T.M.K. 3<sup>rd</sup> Div. 7-6-026:001-032  
Project No. F-10(5)  
Route 190, Mamalahoa Highway  
Honokohau 1st, North Kona, Island of Hawai'i, Hawai'i

The subject subdivision is adjacent to the state highway route 190 Mamalahoa Highway. In keeping with the intended purpose of the facility for regional traffic, we have tried to minimize the number of driveway connections to the state highway. We recommend the final plat map be revised to include a ten-foot wide "no vehicle access" planting screen easement for all lots (1, 9, 10, 11, 12) along the Mamalahoa Highway frontage. This will provide the future and prospective individual property owners with a clear direction to the access for the property and minimize any misinterpretation or misunderstanding of their property rights.

If you have any questions please call Mr. Clinton Yamada at 933-1951.

Very truly yours,

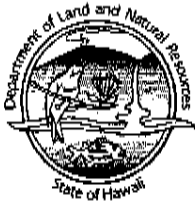
A handwritten signature in black ink, appearing to read "Stanley M. Tamura".

STANLEY M. TAMURA  
Hawai'i District Engineer

LINDA LINGLE  
GOVERNOR OF HAWAII



LAURA H. THIELEN  
CHAIRPERSON  
BOARD OF LAND AND NATURAL RESOURCES  
COMMISSION ON WATER RESOURCE MANAGEMENT



**STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
LAND DIVISION**

POST OFFICE BOX 621  
HONOLULU, HAWAII 96809

November 16, 2007

Geometrician Associates, LLC  
Box 396  
Hilo, Hawaii 96721

Attention: Mr. Ron Terry

Gentlemen:

Subject: Early Consultation on Environmental Assessment for HELCO Electrical Power Easement  
Within DOT Highways Right-of-Ways, North Kona, Hawaii, Tax Map Key: (3) 7-4-26:1  
to 32

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR) has no other comments to offer on the subject matter. Should you have any questions, please feel free to call our office at 587-0433. Thank you.

Sincerely,

  
for Morris M. Atta  
Administrator

**Harry Kim**  
Mayor



**Lawrence K. Mahuna**  
Police Chief

**Harry S. Kubojiri**  
Deputy Police Chief

## County of Hawaii

### POLICE DEPARTMENT

349 Kapiolani Street • Hilo, Hawaii 96720-3998  
(808) 935-3311 • Fax (808) 961-2389

November 20, 2007

Mr. Ron Terry  
Geometrician Associates  
P.O. Box 396  
Hilo, Hawaii 96721

Dear Mr. Terry:

RE: Early Consultation on Environmental Assessment for Use of State Land in  
Association with HELCO Electrical Power Easement for Kona View Estates  
Subdivision, Honokohau 1<sup>st</sup>, North Kona, TMK: 7-4-026:001-032

Staff has reviewed the Environmental Assessment for the above project and has no  
objections or comments to offer at this time.

Thank you for the opportunity to comment. Should you have any questions, please  
contact Captain Randy Apele, the Kona District Commander, at 326-4646, ext. 249.

Sincerely,

LAWRENCE K. MAHUNA  
POLICE CHIEF

DEREK D. PACHECO  
ASSISTANT POLICE CHIEF  
AREA II OPERATIONS

RA:dmv



**Harry Kim**  
Mayor



**County of Hawaii**  
**PLANNING DEPARTMENT**

101 Pauahi Street, Suite 3 • Hilo, Hawaii 96720-4224  
(808) 961-8288 • FAX (808) 961-8742

**Christopher J. Yuen**  
Director  
**Brad Kurokawa, ASLA**  
**LEED® AP**  
Deputy Director

November 21, 2007

Mr. Ron Terry  
Gcometrician Associates, LLC  
P.O. Box 396  
Hilo HI 96721

Dear Mr. Terry:

**Subject: Pre-Environmental Assessment Consultation**  
**Applicant: 327 Kona LLC**  
**Project: Kona View Estates Subdivision**  
**TMK: 7-4-26:1 to 32, Honokohau 1<sup>st</sup>, North Kona, Hawaii**

This is in response to your request for comments on the above-referenced subdivision.

Based upon a recent interpretation of Hawaii's EIS law by the Hawaii State Attorney General, the State Department of Transportation now requires an EA before allowing the applicant to obtain power from HEI.CO poles in the right-of-way of a State Highway.

Subdivision 05-000036 was approved on September 12, 2006. This Phase I of the Kona View Estates Subdivision consists of 32 lots.

Prior to final subdivision approval, the project site was identified as TMK: 7-4-8:47. We have the following to offer on this site:

1. This area is designated Agricultural by the State Land Use Commission.
2. The General Plan designation appears to be Urban Expansion Area which  
*"Allows for a mix of high density, medium density, low density, industrial, industrial-commercial and/or open designations in areas where new settlements may be desirable, but where the specific settlement pattern and mix of uses have not yet been determined".*


Mr. Ron Terry  
Geometrician Associates, LLC  
Page 2  
November 21, 2007

3. The County zonings are Agricultural (A-1a and A-5a).
4. It is not located in the County's Special Management Area.

Please provide us with a copy of the Environmental Assessment for our review and file.

If you have questions, please feel free to contact Esther Imamura of this office at 961-8288, extension 257.

Sincerely,



CHRISTOPHER J. YUEN  
Planning Department

ETJ:cd

P:\wpwin60\ETJ\Adraft\Prc-consul\Terry HFLCO Kona View Estates 7-4-26 1 32.rtf

xc: Planning Department, Kona

PHONE (808) 594-1888

FAX (808) 594-1865



**STATE OF HAWAII**  
**OFFICE OF HAWAIIAN AFFAIRS**  
711 KAPI'OLANI BOULEVARD, SUITE 500  
HONOLULU, HAWAII 96813

HRD07/3411

December 13, 2007

Ron Terry, Principal  
Geometrician Associates, LLC  
P.O. Box 396  
Hilo, Hawaii 96721

**RE: Early Consultation on Environmental Assessment for Use of State Land in Association with HELCO Electrical Power Connection for 6-Lot Subdivision in Pu'uana'hulu, North Kona, Island of Hawai'i, TMK 7-1-005:004**

Aloha nō Mr. Terry,

The Office of Hawaiian Affairs (OHA) is in receipt of your December 1, 2007 request for early consultation on a draft Environmental Assessment for a proposed 6-Lot subdivision in Pu'uana'hulu, North Kona, Island of Hawai'i (TMK 7-1-005:004).

We note that your request mentions an Archaeological Inventory Survey (AIS), which you state was conducted as part of the subdivision process; OHA would like to review the information contained in and the resources consulted throughout the AIS segment prior to our issuing comments for the early consultation.

OHA hereby duly requests a hard copy of the AIS document addressed to my attention, if possible. At this time, OHA respectfully reserves the opportunity to comment pending our receipt and adequate review of the survey data and conclusions.

Notwithstanding the AIS document, an Environmental Assessment (EA), in accordance with Chapter 343 of the Hawai'i Revised Statutes (HRS), should include a Cultural Impact Assessment (CIA). In accordance with the requirement of Act 50, Session Laws of Hawai'i 2000, a CIA shall include information relating to the practices and beliefs of the Native Hawaiians who once inhabited this area, and it is recommended that community involvement be included in this assessment.

**Kona View Estates Subdivision**  
**Environmental Assessment**

**APPENDIX 2**  
**BOTANICAL REPORT**

# **Botanical Survey of TMK: 7-3-08:47 North Kona District, Island of Hawaii**

Prepared for:  
Rana Productions, Ltd.  
P. O. Box 1371  
Kailua, Kona Hawaii 96745-1371

&

Smith & Collins, L.L.P.  
4054 McKinney, Suite 310  
Dallas, Texas 75204

Prepared by:  
Palmer & Associates Consulting  
P. O. Box 637  
Pahoa, Hawaii 96778

April 2005

## Introduction

A field survey for rare and endangered plants (rare plants, USFWS listed endangered, USFWS threatened, USFWS candidate, and USFWS species of concern plants) was conducted on the site of a proposed development in North Kona, Hawaii Island. The project area consists of 327 acres. The project site would be grubbed, graded, and otherwise completely changed from its existing condition and use.

Pristine vegetation of the western slope of Hualalai in the project area was Hawaiian "Dry Forest", consisting of a rich mixture of native trees and shrubs. Several rare and endangered native plants are known from this habitat type. The project area, however, is not pristine native vegetation, although many native plants are present.

The extensive archeological features throughout much of the project area indicate that the vegetation was modified long ago from its pre-human condition. Many of the native plants found on the site are known to have been utilized by the Hawaiians. The presence of numerous sweet potato mounds, walls, terraces, and other archeological features indicate that the site has been used for agriculture since prehistoric times.

The present vegetation of the project area reflects the conversion of the original prehistoric agricultural fields to cattle grazing. The dominant plants on the site now are introduced weeds associated with grazing and other invasive plants (see figures and species list). Fruit trees from a period of historical occupation are found in one portion of the project area associated with the ruins of an abandoned homestead.

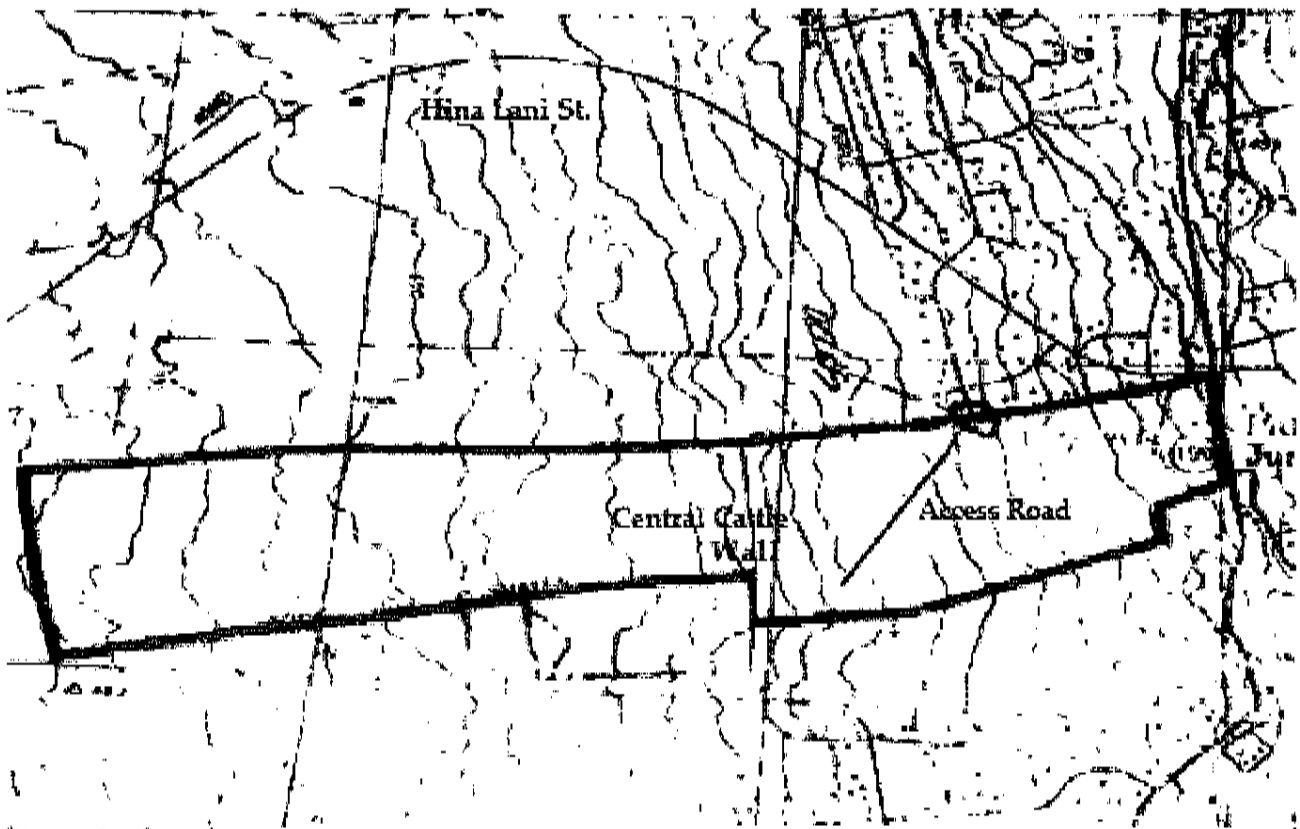


Figure 1. Project area

## Vegetation

Three areas were defined for purposes of the vegetation survey: (1) upper area -between the central access road and the highway at Palani Junction; (2) middle area -between the access road and the central cattle wall running across the middle of the property; (3) lower area - below the cattle wall, the old agricultural fields and cave shelter areas.

The upper area is dominated by introduced weeds that reflect the present use of the land for cattle (Figure 2). Guinea Grass (*Panicum maximum*) dominates, with scattered silk oak (*Grevillea robusta*), strawberry guava (*Psidium cattleianum*), and various native trees and shrubs including, lama (*Diospyros sandwicensis*), 'alahe'e (*Canthium odoratum*), Hawaiian caper (*Capparis sanwichiana*), 'ulei (*Osteomeles anthyllidifolia*), mamane (*Sophora chrysophylla*).

We found 'ohe (*Reynoldsia sandwicensis*), a USFWS "species of concern" (SOC) growing out of a lava tube collapse or cave (Archeological site T29) in the upper area. Only one individual was found, obviously protected from the cattle by the vertical sides of the collapse or pit out of which it was growing (Figure 6).

The vegetation of the middle 1/4 of the project area, between the access road and the central cattle wall is similar to the upper area but more open with a similar mixture of introduced and native shrubs and trees (Figure 3). Again, Guinea Grass is an important component, with other typical cattle-field weeds such as Triumfeta (*Triumfetta rhomboidea*), Indigofera (*Indigofera suffruticosa*), Abutilon (*Abutilon grandifolium*), and Hyptis (*Hyptis pectinata*) dominant in local sites.

Many shrubs and trees are present scattered throughout the middle area. A mix of native and introduced species is present. Introduced shrubs include: haole koa (*Leucaena leucocephala*), klu (*Acacia farnesiana*), coffee senna (*Senna occidentalis*), sour bush (*Pluchea symphytifolia*), Jacaranda (*Jacaranda mimosifolia*), African tulip tree (*Spathodea campanulata*), Christmas berry (*Schinus terebinthifolius*), Melia (*Melia azedarach*), and strawberry guava (*Psidium cattleianum*).

Native trees and shrubs present include: lama (*Diospyros sandwicensis* - Figure 9), mamane (*Sophora*



Figure 2. Vegetation of the upper 1/4 of the project area. Guinea Grass is a dominant



Figure 3. Vegetation of the middle 1/4 of the project area. Grazed, with introduced and native shrubs and trees.

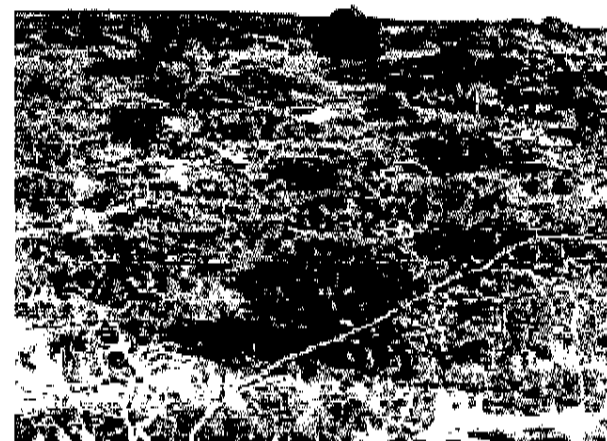


Figure 4. Vegetation of the lower 1/2 of the project area. Note sweet-potato mounds.



Figure 5. *Bidens micrantha* ssp. *ctenophylla* (USFWS "candidate") growing next to an old stone wall in the project area.



Figure 6. *Reynoldsia sandwicensis* (USFWS SOC) growing out of a cave (Arch. site T29) in the upper part of the project area.



Figure 7. *Capparis sandwichiana* (USFWS SOC) scattered throughout the project area.



Figure 8. Other native trees in the project area, such as this large *Canthium* are similarly vigorous, probably due to fertilization by grazing animals.



*chrysophylla*), alahe'e (*Canthium odoratum* - Figure 8), kaliaoa (*Caesalpinia bonduc*), 'ulei (*Osteomeles anthyllidifolia*), alahe'e *Dodonaea viscosa*, and mai'apilo (*Capparis sandwichiana*), a USFWS species of concern (Figure 7).

Throughout the project area, in the upper, middle, and lower areas, are scattered groves of kukui (*Aleurites moluccana*). Many of these groves are clearly associated with archeological sites, and are an additional indication of the ancient agricultural use of the project area. Figure 11 shows an old kukui tree associated with one such site.

The Lower area, approximately the makai 1/2 of the property below the central cattle wall, clearly shows the remains of an old Hawaiian agricultural field. Large rock mounds, formerly used for growing sweet potato, are common in the lower area. The lower area is also infested with haole koa (*Leucaena leucocephala*), most of which has been recently bitten off by the resident cattle. Some native trees and shrubs are present, such as alahe'e (*Canthium*), along with most of the weeds found in the upper and middle areas.

Another native plant, with the USFWS designation "Candidate", *Bidens micrantha* ssp. *ctenophylla*, (ko'oko'olau) occurs in the lower area. This plant occurs as scattered, depauperate individuals throughout the lower area. Since ko'oko'olau species are known to be medicinal, its presence may be associated with the Hawaiian agricultural field. Species designated as "Candidate" are not legally protected.

All of the *Bidens micrantha* on the project site are small individuals that have recently grown from seed. No large perennial individuals of *Bidens micrantha*, such as occur in other sites in the general vicinity of the project area, were found. Apparently, the species is common in the area, its barbed seeds being readily distributed by grazing animals, who also create openings and disturbed areas where seedlings can develop. Unfortunately, these small plants are quickly trampled and/or grazed, so that none are able to perennate.

## Conclusions and Recommendations

Although numerous native Hawaiian plants are present in the project area, including two USFWS SOC.s and one USFWS "Candidate", the vegetation of the project area does not represent pristine native



Figure 9. Lama (*Diospyros sandwichensis*) in the central part of the project area.



Figure 10. Shrub collection in middle area: Coffee berry, *Canthium*, and Kukui.



Figure 11. Old kukui tree at archeological site. Lower middle area at central cattle wall.

vegetation. The original native vegetation, which we surmise was native dry forest, such as found in other parts of western Hualalai, was modified long ago by Hawaiian planters (see Handy, Handy, and Pukui 1972). The present vegetation of the project area is indicative of a long history of agricultural use, first by Hawaiian planters and later by cattle grazing. Many, if not all, of the native plants present on site are known to have been utilized by the Hawaiians, either as food, medicine, or for making tools (Handy, Handy, and Pukui 1972).

Although three species of native plants with USFWS designations were found in the project area, none are legally protected or require further planning consideration. Because of the lack of any pristine or semi-pristine habitat in the project area and the absence of listed species, we conclude that the proposed project will have no significant effect on native botanical resources.

#### Recommendation:

Where practical the use of native species in landscape design and maintenance would greatly increase the esthetic appeal of the development.



Figure 12. Typical disturbed/grazed site - lower area - supporting *Bidens micrantha* ssp. *stenophylla*. Note flagging in upper center marking tiny *Bidens* plants on ground below.



Figure 13. Near makai end of lower area looking northwest. Note old sweet-potato mounds in the foreground. In the upper right distance is a water tank on Hina Lani Street, about 3000 feet north of the project area.

## Field Methodology

Field methods for endangered plants followed Nelson (1987) and Palmer (1987). Flowering plant nomenclature follows Wagner, et al. (1999). Fern nomenclature follows Palmer (2003). Some introduced plants were identified with the aid of Neal (1965) and USDA (1971).

## References

- Handy, E. S. C., E. G. Handy and M. Pukui. 1972. Native Planters in Old Hawaii: Their Life, Lore, and Environment. Bishop Museum Special Publication 233
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- Nelson, J. 1987. Rare Plant Surveys: Techniques for Impact Assessment. *in* Elias, T. S. and J. Nelson (eds.). Conservation and Management of Rare and Endangered Plants. Publ. by The California Native Plant Society.
- Palmer, Rexford, et al. 1987. Ecology and Distribution of *Poa marcida* Hitch. in Northwestern Oregon. *Ibid*.
- Palmer, Daniel D. 2003. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu.
- Rock, J. F. 1913. The Indigenous Trees of the Hawaiian Islands. Reprint by Charles Tuttle Co., Inc., Tokyo.
- USDA. 1971. Common weeds of the United States. Dover Publications, Inc., New York.
- Wagner, W. L., D. R. Herbst, and S. H. Sohmer. 1999. Manual of the Flowering Plants of Hawaii. Revised Edition. Vols. 1 & 2. University of Hawaii Press, Honolulu.

**Vascular Plant Species  
Found On The  
Palani Junction Project Site**

<u>FAMILY</u>	<u>Genus/Species</u>	<u>Common Name</u>	<u>Dist.*</u>
<b>Pteridophytes</b>			
NEPHROLEPIDACEAE	Sword Fern Family		
	<i>Nephrolepis cordifolia</i> (L.) Presl	ru'ani'au	I
	<i>Nephrolepis multiflora</i> (Roxb.) F. M. Jarrett ex C. V. Morton	sword fern	A
POLYPODIACEAE	Common Fern Family		
	<i>Phlebodium aureum</i> (L.) J. Sm.	laua'e haole	A
	<i>Phymatosorus grossus</i> (Langsd. & Fisch.) Brownlie	laua'e	A
PSILOTACEAE	Whisk Fern Family		
	<i>Psilotum nudum</i> (L.) P. Beauv.	moa	I
PTERIDACEAE	Wire Fern Family		
	<i>Adiantum hispidulum</i> Sw.	rough maidenhair	A
	<i>Cheilanthes viridis</i> (Forssk.) Sw.	cliffbrake	A
<b>Dicotyledons</b>			
ACANTHACEAE	Shrimp-plant Family		
	<i>Thunbergia alata</i> Bojer	black-eyed susan	A
AMARANTHACEAE	Amaranth Family		
	<i>Achyranthes aspera</i> L.	achyranthes	A
	<i>Amaranthus spinosus</i> L.	spiny amaranth	A
	<i>Amaranthus viridis</i> L.	amaranth	A
ANACARDIACEAE	Mango Family		
	<i>Mangifera indica</i> L.	mango	A
	<i>Schinus terebinthifolius</i> Raddi	Christmas Berry	A

## APOCYNACEAE

## Dogbane Family

*Cascabela thevetia* (L.) Lippold  
*Catharanthus roseus* (L.) G. Don

be-still tree A  
 periwinkle A

## ARALIACEAE

## Ginseng Family

*Reynoldsia sandwicensis* A. Gray  
*Shefflera actinophylla* (Endl.) Harms

'ohe makai E  
 octopus tree A

## ASCLEPIADACEAE

## Milkweed Family

*Asclepias physocarpa* (e. Mey.) Schlechter  
*Stapelia gigantea* N. E. Brown

balloon plant A  
 carrion flower A

## ASTERACEAE

## Sunflower Family

*Ageratum conyzoides* L.  
*Bidens micrantha*  
     subsp. *ctenophylla* (Sherff) Nagata & Ganders  
*Bidens pilosa* L.  
*Crassocephalum crepidioides* (Benth.) S. Moore  
*Emetia fosbergii* Nicolson  
*Pluchea symphytifolia* (Mill.) Gillis  
*Sigesbeckia orientalis* L.  
*Tridax procumbens* L.

ageratum  
 ko'oko'olau E  
 spanish needles A  
 crassocephalum A  
 Flora's paintbrush A  
 Sourbush A  
 small yellow crown beard A  
 coat buttons A

## BEGONIACEAE

## Begonia Family

*Begonia reniformis* Dryander

begonia A

## BIGNONIACEAE

## Bignonia Family

*Jacaranda mimosifolia* D. Don  
*Spathodea campanulata* P. Beauv.

Jacaranda A  
 African tulip tree A

## BUDDLEIACEAE

## Butterfly Bush Family

*Buddleia asiatica* Lour.

dog tail A

## CACTACEAE

## Cactus Family

*Opuntia ficus-indica*

prickly pear A

## CAPPARACEAE

## Caper Family

*Capparis sandwichiana* DC  
*Cleome gynandra* L.

mai'apilo E  
 wild spider flower A

## CARICACEAE

## Papaya Family

<i>Carica papaya</i> L.	papaya	A
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## CHENOPODIACEAE

## Goosefoot Family

<i>Chenopodium carinatum</i> R. Br.	pigweed	A
<i>Chenopodium murale</i> L.	goosefoot	A

## CLUSIACEAE

## Mangosteen Family

<i>Clusia rosea</i> Jacq.	autograph tree	A
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## CONVOLVULACEAE

## Morning Glory Family

<i>Ipomoea indica</i> (J. Burm.) Merr.	koali	I
<i>Ipomoea obscura</i> (L.) Ker-Gawl.	little morning glory	A
<i>Ipomoea tuboides</i> Degener & Ooststr.	Hawaiian moon flower	E

## CRASSULACEAE

## Orpine Family

<i>Kalanchoe pinnata</i> (Lam.) Pers.	air plant	A
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## CUCURBITACEAE

## Cucumber Family

<i>Coccinia grandis</i> (L.) Voigt	ivy gourd	A
<i>Momordica charantia</i> L.	bitter melon	A

## EBENACEAE

## Ebony Family

<i>Diospyros sandwicensis</i> (A. DC) Fosh.	lama	E
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## EUPHORBIACEAE

## Poinsetta Family

<i>Aleurites moluccana</i> (L.) Willd.	kukui	P
<i>Chamaesyce hirta</i> (L.) Millsp.	hairy spurge	A
<i>Chamaesyce hypericifolia</i> (L.) Millsp.	gracefull spurge	A
<i>Euphorbia heterophylla</i> L.	kaliko	A
<i>Euphorbia leucocephala</i> Lotsy.	snow on the mountain	A
<i>Mauhot glaziovii</i> Mull. Arg.	Ceara rubber tree	A
<i>Phyllanthus debilis</i> Klein ex Willd.	niruri	A
<i>Ricinus communis</i> L.	castor bean	A

## FABACEAE

## Bean Family

<i>Acacia farnesiana</i> (L.) Willd.	klu	A
<i>Caesalpinia bonduc</i> (L.) Roxb.	kakalaioa	I
<i>Chamaecrista nictitans</i> (L.) Moench	Partridge pea	A
<i>Crotalaria incana</i> L.	fuzzy rattlepod	A

<i>Crotalaria pallida</i> Aiton	rattlepod	A
<i>Desmodium incanum</i> DC	spanish clover	A
<i>Glycine wightii</i> (Wight & Arnott) Verdc.	glycine	A
<i>Indigofera suffruticosa</i> Mill.	indigo	A
<i>Leucaena leucocephala</i> (Lam.) deWit	haole koa	A
<i>Mimosa pudica</i> L.	sleepy grass	A
<i>Prosopis pallida</i> (Humb. & Bonpl. ex Willd.) Kunth	kiawe	A
<i>Senna occidentalis</i> (L.) Link	coffee senna	A
<i>Senna pendula</i> (Humb. & Bonpl. ex Willd.) H. Irwin & Barneby	kolomona	A
<i>Sophora chrysophylla</i> (Salisb.) Seem.	mamane	E

## LAMIACEAE

## Mint Family

<i>Hyptis pectinata</i> (L.) Poit.	Comb hyptis	A
<i>Plectranthus parviflorus</i> Willd.	'ala'ala wai nui pua ki	I
<i>Salvia occidentalis</i> Sw.	West Indian Sage	A

## LAURACEAE

## Laurel Family

<i>Persea americana</i> Mill.	avocado	A
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## MALVACEAE

## Hibiscus Family

<i>Abutilon grandifolium</i> (Willd.) Sweet	hairy abutilon	A
<i>Malva parviflora</i> L.	cheese weed	A
<i>Malvastrum coromandelianum</i> (L.) Garcke	false mallow	A
<i>Sida cordifolia</i> L.	false 'ilima	A
<i>Sida fallax</i> Walp.	'ilima	I
<i>Sida rhombifolia</i> L.	false 'ilima	A
<i>Sida spinosa</i> L.	prickly sida	A
<i>Sidastrum micranthum</i> (St. Hil.) Fryx.	sidastrum	A

## MELIACEAE

## Mahogany Family

<i>Melia azedarach</i> L.	China berry	A
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## MENISPERMACEAE

## Moonseed Family

<i>Cocculus trilobus</i> (Thunb.) DC	huehue	I
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## MORACEAE

## Mulberry Family

<i>Artocarpus altilis</i> (Parkins.) Fash.	'uku	P
<i>Ficus microcarpa</i> L. fil.	banyan	A
<i>Morus alba</i> L.	mulberry	A

## MYRTACEAE

## Myrtle Family

<i>Psidium cattleianum</i> Sabine	strawberry guava	A
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## OXALIDACEAE

## Wood Sorrel Family

*Oxalis corniculata* L.  
*Oxalis corymbosa* DC

'ihi P  
pink wood sorrel A

## PASSIFLORACEAE

## Passion Flower Family

*Passiflora edulis* Sims  
*Passiflora suberosa* L.

passion fruit A  
hue hue haole A

## PHYTOLACCACEAE

## Pokeweed Family

*Rivina humilis* L.

coral berry A

## PIPERACEAE

## Pepper Family

*Peperomia leptostachya* Hook. & Arnott

'ala'ala wai nui I

## PORTULACACEAE

## Portulaca Family

*Portulaca pilosa* L.  
*Talinum triangulare* (Jacq.) Willd.

hairy portulaca A  
jewels of Opar A

## PROTEACEAE

## Protea Family

*Grevillea robusta* A. Cunn. ex R. Br.

silk oak A

## ROSACEAE

## Rose Family

*Osteomeles anthyllidifolia* (Sm.) Lindl.

'ulei I

## RUBIACEAE

## Coffee Family

*Canthium odoratum* (G. Forster) Seem.  
*Coffea arabica* L.  
*Morinda citrifolia* L.

alaha'e I  
Arabian coffee A  
noni P

## SAPINDACEAE

## Soapberry Family

*Dodonaea viscosa* Jacq.

'a'ali'i I

## SOLANACEAE

## Nightshade Family

*Solanum americanum* Mill.

nightshade A

## STERCULIACEAE

## Cacao Family

*Waltheria indica* L.

'uhaloa I



## TILIACEAE

## Linden Family

*Triumfetta rhomboidea* Jacq.  
*Triumfetta semitriloba* Jacq.

bur bush A  
 Sacramento bur A

## VERBENACEAE

## Verbena Family

*Lantana camara* L.  
*Stachytarpheta jamaicensis* (L.) Vahl  
*Stachytarpheta urticifolia* (Salisb.) Sims

lantana A  
 Jamaica vervain A  
 false vervain A

## Monocotyledons

## AGAVACEAE

## Agave Family

*Cordyline fruticosa* (L.) A. Chev.

ti P

## ARECACEAE

## Palm Family

*Livistona chinensis* (Jacq.) R. Br. ex Mart.

Chinese fan palm A

## COMMELINACEE

## Spiderwort Family

*Commelina diffusa* N. L. Burm.

honohono A

## DIOSCOREACEAE

## Yam Family

*Dioscorea bulbifera* L.

hoi P

## LILIACEAE

## Lily Family

*Aloe arborescens* Mill.  
*Asparagus plumosus* Baker

aloe A  
 Asperagus fern A

## POACEAE

## Grass Family

*Brachiaria mutica* (Forssk.) Stapf  
*Cenchrus ciliaris* L.  
*Chloris radiata* (L.) Sw.  
*Digitaria ciliaris* (Retz.) Koeler  
*Eleusine indica* (L.) Gaertn.  
*Eragrostis tenella* (L.) P. Beauv. ex Roem & Schult.  
*Melinis minutiflora* P. Beauv.  
*Oplismenus hirtellus* (L.) P. Beauv.  
*Panicum maximum* Jacq.  
*Pennisetum purpureum* Schumach.  
*Pennisetum setaceum* (Forssk.) Chiov.  
*Rhynchosytrum repens* (Willd.) Hubb.  
*Sporobolus indicus* (L.) r. Br.

California grass A  
 buffleggrass A  
 radiate fingergrass A  
 crabgrass A  
 wiregrass A  
 lovegrass A  
 molasses grass A  
 basketgrass A  
 Guinea grass A  
 elephant grass A  
 fountain grass A  
 natal redtop A  
 smutgrass A

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**\*Distribution:**

**A = Alien, introduced**

**I = Indigenous, native but also found elsewhere**

**E = Endemic, found only in Hawaii**

**P = Polynesian introduction**

**Kona View Estates Subdivision**  
**Environmental Assessment**

**APPENDIX 3**  
**FAUNAL REPORT**

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# A Survey of Avian and Terrestrial Mammalian Species on TMK: 7-3-08:47, North Kona District, Island of Hawai'i.

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## *Table of Contents*

<i>Table of Contents</i> .....	2
<i>Introduction</i> .....	3
<i>General Site Description</i> .....	3
<i>Mammalian Survey Methods</i> .....	5
<i>Avian Survey Methods</i> .....	5
<i>Mammalian Survey Results</i> .....	6
<i>Avian Survey Result</i> .....	6
<i>Discussion</i> .....	6
<i>Potential Impacts to Protected Vertebrate Species</i> .....	10
<i>Hawaiian hoary bat</i> .....	10
<i>Hawaiian Hawk</i> .....	11
<i>Hawaiian Petrel and Newell's Shearwater</i> .....	11
<i>Recommendation</i> .....	11
<i>Glossary</i> .....	12
<i>Literature Cited</i> .....	13

## *Figures & Tables*

<i>Figure 1. Project Site</i> .....	4
<i>Table 1. Avian Species Detected Within TMK: 7-3-08:47</i> .....	7

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## Introduction

This report summarizes the findings of an ornithological and mammalian survey of an approximately 327-acre site that Smith & Collins L.L.P. is planning on developing into a residential subdivision. The property is officially described as TMK: 7-3-08:47 (Figure 1). The property runs in a east (*mauka*) to west (*makai*) direction in the *ahupua`a* of Honokōhau 1<sup>st</sup> (USGS 1996). The property is bounded to the east by Māmalahoa Highway (State Route 190), the Kona Heavens subdivision to the north and undeveloped lands to the south and west (Figure 1). Fieldwork was conducted between October 28<sup>th</sup> and 29<sup>th</sup> 2004.

The primary purpose of the survey was to determine if there were any federally listed endangered, threatened, proposed, or candidate avian or mammalian species on, or in the immediate vicinity of the subject property. Federal and State of Hawai'i listed species status follows species identified in the following referenced documents (DLNR, 1998, Federal Register, 1999a, 1999b, 2001, 2002, 2004).

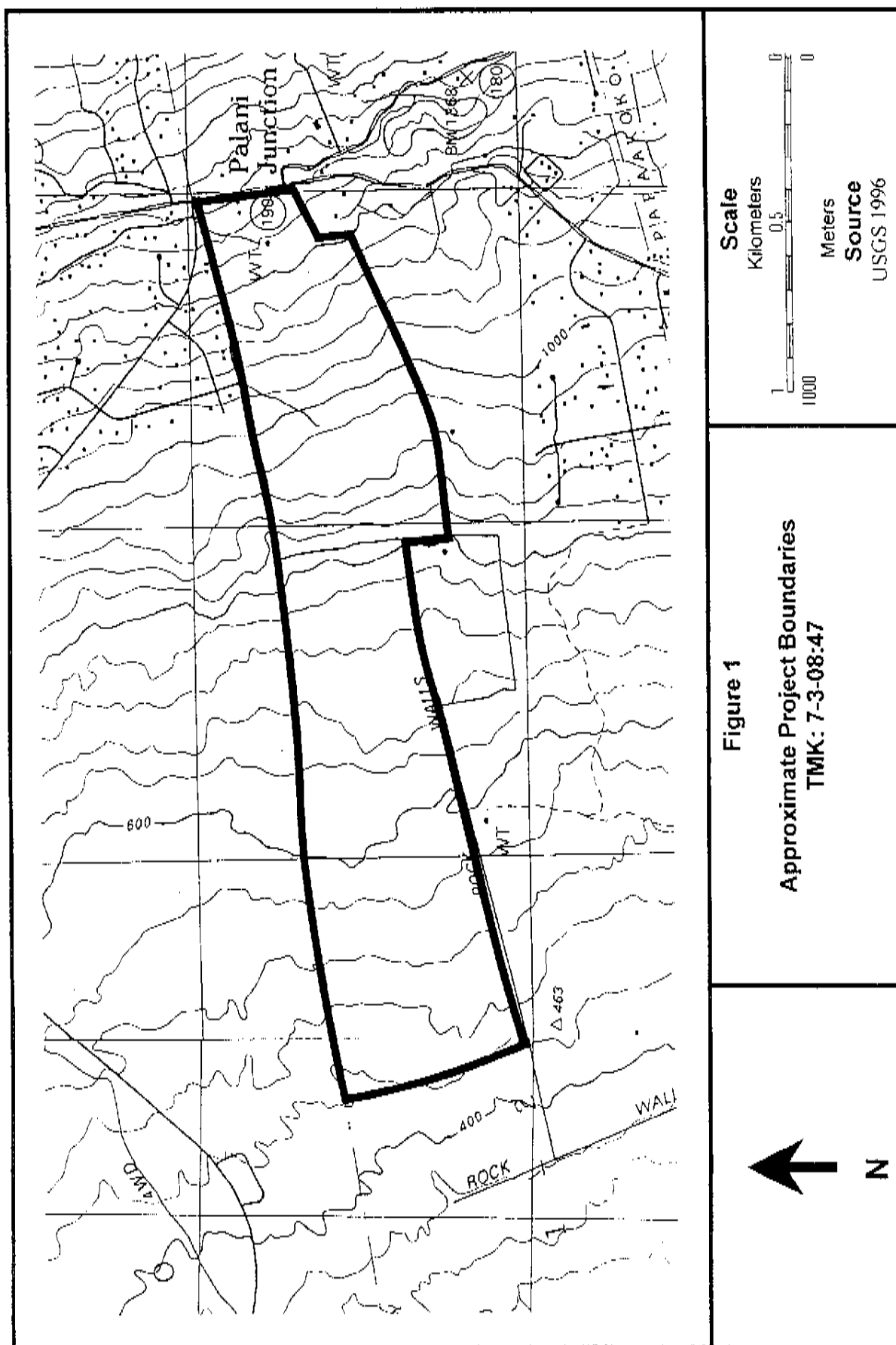
Avian phylogenetic order and nomenclature follows *The American Ornithologists' Union Checklist of North American Birds 7<sup>th</sup> Edition* (American Ornithologists' Union 1998), and the 42<sup>nd</sup> through the 45<sup>th</sup> supplements to *Check-list of North American Birds* (American Ornithologists' Union 2000; Banks et al. 2002, 2003, 2004). Mammal scientific names follow *Mammals in Hawaii* (Tomich 1986). Plant names follow *Manual of the Flowering Plants of Hawai'i* (Wagner et al. 1990). Place names follow *Place Names of Hawaii* (Pukui et al. 1974).

Hawaiian and scientific names are italicized in the text. A glossary of technical terms and acronyms used in the document, which may be unfamiliar to the reader, are included at the end of the narrative text on (Page 12).

## General Site Description

The approximately 327-acre property slopes from east to west from a maximum elevation of ~ 405-meters above mean sea level (MSL), down to ~ 135-meters MSL (USGS 1996). The terrain is composed of a mix of a'a and pāhoehoe lava flows disgorged from Hualālai during the Holocene age. Lava flows on the top two thirds of the site were laid down between 1,500 and 3,000 years ago. Flows on the lower third of the site were formed between 3,000 and 5,000 years ago (Wolfe and Morris 1996).

The vegetation present on the upper two thirds of the site is dominated almost to the exclusion of native species by alien grasses, weedy species, ornamental and fruit trees. The bulk of this habitat is covered with an almost impenetrable under story of Guinea grass (*Panicum maximum*), interspersed with *kiawe* (*Prosopis pallida*), *koa haole*



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(*Leucaena leucocephala*), silk oak (*Grevillea robusta*) and an assortment of monkeypod (*Samanea saman*), kuku'i (*Aleurites moluccana*), African tulip (*Spathodea campanulata*), mango (*Mangifera indica*), and papaya (*Carica papaya*) trees. Shrubs include lantana (*Lantana camara*), Christmasberry (*Schinus terebinthifolius*). In the mid section of the property, where more recent cattle grazing has occurred, or is still ongoing, there are numerous areas of low stature alien weedy species, air plants (*Kalanchoe pinnata*), and low stature grasses.

On the bottom third of the site on the older flows the habitat is an open low stature 'ōhi'a (*Metrosideros polymorpha*) forest, with large areas of bare a'a. Within this zone there are more endemic and indigenous plant species including 'ohe makai (*Reynoldsia sandwicensis*), Indian Mulberry (*Morinda citrifolia*) and uhaloa (*Waltheria indica*), though this area is dominated by alien species including fountain grass (*Pennisetum setaceum*), an aggressive African invasive fire-adapted species.

### ***Mammalian Survey Methods***

With the exception of the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), or 'ōpe'ape'a as it is known locally, all terrestrial mammals currently found on the Island of Hawai'i are alien species. Most are ubiquitous. No trapping program was proposed or undertaken to quantify the use of the property by alien mammalian species. The survey of mammals was limited to visual and auditory detection, coupled with visual observation of scat, tracks, and other animal sign. A running tally was kept of all vertebrate species observed and heard within the project area. Visual and electronic scans, using a Broadband AnaBat II<sup>®</sup> ultrasonic bat detector were made for bats during crepuscular periods on the evening of October 28<sup>th</sup> and on the morning of October 29<sup>th</sup>, 2004.

### ***Avian Survey Methods***

Following a site visit and a rough assay of the different habitats present within the site, 14 avian count stations were established along a linear transect running the length of the property (Figure 1). Eight-minute variable circular plot counts were made at each station. Stations were each counted once. Field observations were made with the aid of Leitz 10 X 42 binoculars and by listening for vocalizations. Counts were concentrated between 07:00 a.m. and 10:30 a.m., the peak of daily bird activity. An additional two hours were spent within the project area on the evening of October 28<sup>th</sup> and on the morning of October 29<sup>th</sup>, 2004, in an attempt to detect nocturnally flying seabirds and owls over flying the project area. Time not spent counting was used to search the project area for species and habitats that were not detected during count sessions.



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## ***Mammalian Survey Results***

Seven alien mammalian species were detected during the course of this survey. Numerous dogs (*Canis f. familiaris*) were heard barking from outside the project site, dog sign was prevalent along the recently cleared corridors on the edges of the site. Several small Indian mongooses (*Herpestes a. auropunctatus*) were seen within the site. Cat (*Felis catus*) sign was encountered in the same open areas where dog sign was recorded. Numerous pig (*Sus s. scrofa*) trails were seen running throughout the site, and at least 11 individual pigs were seen during the course of this survey. Domestic cattle (*Bos Taurus*) were seen within the middle section of the site, and scat and sign was seen throughout most of the site where the vegetation was sparse enough to see the ground. Horse (*Equus c. caballus*) sign and scat was seen in several areas, as was goat (*Capra h. hircus*) sign and scat which was predominately seen in the lower more open rocky areas of the site.

Hawai'i's sole endemic terrestrial mammalian species, the endangered Hawaiian hoary bat, was not detected during this survey. All of the alien species recorded during this survey are deleterious to avian and floristic components of the remaining native ecosystems present on the Island.

## ***Avian Survey Results***

A total of 16 avian species representing 10 separate families were recorded during station counts (Table 1). All of the species detected during station counts are alien to the Hawaiian Islands. An additional species; Hawaiian Hawk (*Buteo solitarius*) was recorded as an incidental observation near the top of the property while transiting the project site (Table 1). The Hawaiian Hawk is listed as an endangered species under both the federal and State of Hawai'i's endangered species programs (DLNR 1998, Federal Register 1999a).

Avian diversity was relatively low, densities were also low, with the exception of three species; Japanese White-eye (*Zosterops japonicus*), House Finch (*Carpodacus mexicanus frontalis*) and Zebra Dove (*Geopelia striata*) which accounted for 66% of the total number of all birds recorded during station counts. The most common avian species recorded was the Japanese White-eye, which accounted for 27% of the total number of individual birds recorded. An average of 34 birds were detected per station count.

## ***Discussion***

A one-time survey can not provide a total picture of the wildlife utilizing any given area. Certain species will not be detected for one reason or another. Seasonal variations in populations coupled with seasonal usage and availability of resources will cause different usage patterns throughout a year or, in fact, over a number of years.

Table 2

## Avian Species Detected Within TMK: 7-3-08:47

Common Name	Scientific Name	ST	RA
<b>PHEASANTS &amp; PATRIDGES – Phasianidae</b>			
Grey Francolin	<i>Francolinus pondicerianus</i>	A	0.71
Erckel's Francolin	<i>Francolinus erckelii</i>	A	0.14
Red Junglefowl	<i>Gallus gallus</i>	D	0.43
Common Peafowl	<i>Pavo cristatus</i>	A	0.07
<b>HAWKS &amp; ALLIES - Accipitridae</b>			
Hawaiian Hawk	<i>Buteo solitarius</i>	EE	IN-1
<b>PIGEONS &amp; DOVES - Columbidae</b>			
Spotted Dove	<i>Streptopelia chinensis</i>	A	2.43
Zebra Dove	<i>Geopelia striata</i>	A	5.43
<b>PARROTS - Psittacidae</b>			
Mitred Parakeet	<i>Aratinga mitrata</i>	A	0.57
<b>SILVEREYES - Zosteropidae</b>			
Japanese White-Eye	<i>Zosterops japonicus</i>	A	9.21
<b>MOCKINGBIRDS &amp; TRASHERS -Mimidae</b>			
Northern Mockingbird	<i>Mimus polyglottus</i>	A	0.36
<b>STARLINGS - Sturnidae</b>			
Common Myna	<i>Acridotheres tristis</i>	A	3.29
<b>EMBERIZIDS - Emberizidae</b>			
Yellow-billed Cardinal	<i>Paroaria capitata</i>	A	0.71
<b>SALTATORS, CARDINALS &amp; ALLIES – Cardinalidae</b>			
Northern Cardinal	<i>Cardinalis cardinalis</i>	A	0.92
<b>CARDULINE FINCHES &amp; ALLIES - Fringillidae</b>			
House Finch	<i>Carpodacus mexicanus frontalis</i>	A	7.86
Yellow-fronted Canary	<i>Serinus mozambicus</i>	A	0.14
<b>WAXBILLS &amp; ALLIES – Estrildidae</b>			
African Silverbill	<i>Lonchura cantans</i>	A	0.79
Java Sparrow	<i>Padda oryzivora</i>	A	1.07

**KEY TO TABLE 1**

<b>ST</b>	Status
<b>A</b>	Alien Species
<b>D</b>	Domesticated Species
<b>EE</b>	Endangered Endemic Species
<b>RA</b>	Relative Abundance: Number of birds detected divided by the number of count stations (14)
<b>IN</b>	Incidental observation / not counted during station counts, but seen within the project area # of birds

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The findings of the mammalian survey are consistent with other surveys conducted in the North Kona District within the recent past (David 1999, 2000a, 2000b, 2000c, 2000d, 2001, 2003). It is likely that Hawaiian hoary bats use resources within the project site at least occasionally, as they have been seen in areas both *mauka* and *makai* of the project site on a seasonal basis (Jacobs 1994, R. David unpublished field notes 1985-2004).

It should be noted that current survey techniques available for gathering information on the distribution, abundance and usage of resources within a given area by Hawaiian hoary bats are inadequate and/or time and cost prohibitive. Data gathered by these methods only indicate whether bats are present or not in any given area. The two main methods currently being used to monitor lasiurine bats are; heterodyne echolocation detector surveys and mist netting. Scientists currently have no understanding of detection probabilities associated with either method (Carter et al., 2000). It may be impossible to standardize detection probabilities among surveyors, studies, or over time (O'Shea and Bogen, 2000). The inability to estimate detection probability, limits the usefulness of data collected using un-calibrated indices produced by either mist netting or echolocation surveys.

Unlike nocturnally flying seabirds, which often collide with man-made structures, bats are uniquely adapted to avoid collision with obstacles, man-made or natural. They navigate and locate their prey primarily by using ultrasonic echolocation, which is sensitive enough to allow them to locate and capture small volant insects at night.

Although no live rodents were detected during the course of this survey, it is likely that roof rats (*Rattus r. rattus*), Norway rats (*Rattus norvegicus*), European house mice (*Mus domesticus*) and possibly Polynesian rats (*Rattus exulans hawaiiensis*) use resources within the general project area. Without conducting a trapping program, it is difficult to assess the population densities of these often hard-to-see mammals. All of these introduced rodents are deleterious to native ecosystems and the native faunal species that are dependant on them.

The relatively low diversity of avian species detected during this survey was in keeping with the results of several other surveys conducted in the North Kona District in recent years (David 1999, 2000a, 2000b, 2000c, 2000d, 2001, 2003). The habitat currently found within the project area and within the alien dominated lowland areas in North Kona is not conducive to supporting native forest birds, with the possible exception of Hawaiian Hawks. There are not wetland features within the study area, thus no endemic waterbirds were expected, nor were any recorded.

One Hawaiian Hawk was seen soaring over the upper reaches of the proposed development site. That we recorded an endangered Hawaiian Hawk over-flying the site was not unexpected. This species is readily seen foraging in the mid-elevation areas in the

North Kona District. The habitat currently found within the proposed project site is not ideal for this species; there are few trees in which hawks could perch, and the dense under-story provides deep cover for any rodents and other prey items usually consumed by this species. The site also lacks the medium to large stature 'ōhi'a trees in which Hawaiian Hawks normally site their nests.

The Hawaiian Hawk is the only extant *falconiforme* in Hawai'i. It is currently endemic to the island of Hawai'i. Sub-fossil remains indicate that it was also formerly found on Moloka'i, and Kaua'i (Olson & James 1982, 1997). Several incidental unconfirmed sightings of this species exist from Kaua'i (Dole 1879, Beaglehole, 1980) and Maui (Banko 1980c). This species was first mentioned in the western literature by Cook and King in 1784, and was scientifically described by Peale in 1848, from a specimen collected in "Kealahakua" (Medway 1981, Peale 1848).

Hawaiian Hawks are found in nearly all vegetation habitats that still have some large tree components. Densities are highest in mature native species dominated forests with grassy under stories. This habitat with high amounts of forest edge supports large populations of game birds, and the four species of introduced rodents known from the island; it also provides numerous perches and nesting sites (Klavitter 2000). Much of this habitat has been created by logging, land clearing and cattle grazing. It appears that Hawaiian Hawks can coexist with, and may have in fact benefited from anthropogenic land clearing activities – this is not to say that more clearing is going to result in more hawks, but does indicate that the species can coexist with anthropogenic natural resource extraction and, or clearing activities, as long as natural resource management plans ensure the continued recruitment of native trees and the regeneration of native species dominated forests.

Current population estimates based on John Klavitter's research, extrapolates that there are currently 1,457 Hawaiian Hawks, which in his estimation is equal to, or higher than what was present in pre-contact times (Klavitter 2000).

Hawaiian Hawks, like many other Hawaiian endemic avian species have low mortality  $\leq 9\%$ , and reproductive rates; lay only one egg per season, fledge one chick and live ~ 20 years (Klavitter 2000). Hawaiian Hawks breeding season starts in late March, chicks hatch in May, and begin fledging in July (Griffin *et al.* 1998). Although hawks use resources in most forest habitats, they usually pick 'ōhi'a trees in which to nest. Of 112 nests found during the 1998, and 1999 nesting seasons, 82% of the nests were located in 'ōhi'a trees (Klavitter 2000).

Although not detected during this survey it is possible that small numbers of the endangered endemic Hawaiian Petrel (*Pterodroma sandwichensis*), or ua'u, and the threatened Newell's Shearwater (*Puffinus auricularis newelli*), or 'a'o, over fly the project

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area between the months of May and November (Banko 1980a, 1980b, Day et al. 2003, Harrison 1990).

Hawaiian Petrels were formerly common on the Island of Hawai'i (Wilson and Evans 1890–1899). This pelagic seabird reportedly nested in large numbers on the slopes of Mauna Loa and in the saddle area between Mauna Loa and Mauna Kea (Henshaw 1902), as well as at the mid to high elevations of Mount Hualālai. It has, within recent historic times, been reduced to relict breeding colonies located at high elevations on Mauna Loa and, possibly, Mount Hualālai (Banko 1980a, Banko et al. 2001, Cooper and David 1995, Cooper et al. 1995, Day et al. 2003, Harrison 1990, Hue et al. 2001, Simons and Hodges 1998).

Newell's Shearwaters were formerly common on the Island of Hawai'i (Wilson and Evans 1890–1899). This species breeds on Kaua'i, Hawai'i and Moloka'i in extremely small numbers. Newell's Shearwater populations have dropped precipitously since the 1880s (Banko 1980b, Day et al., 2003). This pelagic species nests high in the mountains in burrows excavated under thick vegetation, especially *uluhe* fern.

The primary cause of mortality in both these species is thought to be predation by alien mammalian species at the nesting colonies (Ainley et al. 2001, Cooper and Day 1995, 1998, Day and Cooper 1997, Hue et al. 2001). Collision with man-made structures is considered to be the second most significant cause of mortality of these seabird species in Hawai'i. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. When disoriented, seabirds often collide with manmade structures, and if they are not killed outright, the dazed or injured birds are easy targets of opportunity for feral mammals (Ainley et al. 1995, 1997, 2001, Cooper and Day 1995, 1998, Day and Cooper 1997). There is no suitable nesting habitat within or close to the subject property for either of these pelagic seabird species.

### ***Potential Impacts to Protected Vertebrate Species***

#### ***Hawaiian hoary bat***

The principal potential impact that development of the project site poses to Hawaiian hoary bats is during the clearing and grubbing of the site. Female bats while caring for their young are extremely vulnerable to disturbance. While carrying young and feeding them the adult bats are under immense stress, and may move relatively slowly. If a lactating bat carrying young were to be roosting in vegetation that was removed during clearing and grubbing operations it is possible that she would not be able to flee the vegetation as it was being cleared, possibly resulting in harm or mortality to her and/or her pup.

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### ***Hawaiian Hawk***

There is a very slim chance that upon occasion Hawaiian Hawks may attempt to nest at the higher elevation on this site. Though given their general preference for mid-to-large stature 'ōhi'a trees in which to nest, the likelihood of this occurring is slim. In the event that a hawk did nest on the property the principal potential impact that development of the petition area poses to Hawaiian Hawks would be during the clearing and grubbing of the site. If disturbed while sitting on eggs, or caring for young, adult birds may abandon the nest, thus putting their eggs, or young at grave risk of harm or mortality.

### ***Hawaiian Petrel and Newell's Shearwater***

The principal potential impact that development of the petition area poses to Hawaiian Petrels and Newell's Shearwaters is the increased threat that birds will be downed after becoming disoriented by exterior lighting that may be required in conjunction with the construction and operation of the development.

### ***Recommendations***

To reduce the potential for interactions between clearing and grubbing activity and Hawaiian hoary bats, it is recommended that clearing and grubbing not be undertaken during the period that bats are caring for young; namely between the months of June and August (Menard 2001)

In the unlikely event that an active Hawaiian Hawk nest is encountered during clearing and grubbing activities it is recommended that construction activity be immediately halted within 100 meters of the nest tree. Immediate consultation with the U. S. Fish & Wildlife Service should be initiated prior to conducting further clearing activity within 100 meters of the nest

To reduce the potential for interactions between nocturnally flying Hawaiian Petrels and Newell's Shearwaters with external lights and man-made structures, it is recommended that any external lighting planned to be used during construction or within the completed project be shielded (Reed et al. 1985, Telfer et al., 1987). This mitigation would serve the dual purpose of minimizing the threat of disorientation and downing of Hawaiian Petrels, and Newell's Shearwaters, while at the same time complying with the Hawaii County Code § 14 – 50 *et seq.* which requires the shielding of exterior lights, so as to lower the ambient glare caused by unshielded lighting to the astronomical observatories located on Mauna Kea.

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### ***Glossary:***

Ahupua'a – Traditional Hawaiian land division, usually extending from the uplands to the sea.

Alien - Introduced to Hawai'i by humans.

Commensal – Animals that share humans food such as rats and mice.

Crepuscular – Twilight hours.

Diurnal – Daytime

Domesticated – Feral species, not considered established in the wild on the Island of Hawai'i

Endemic – Native and unique to the Hawaiian Islands

Falconiforme – Diurnal birds of prey – 271 species worldwide

Indigenous - Native to the Hawaiian Islands, but also found elsewhere naturally.

Incidental observation – A species not counted during station counts, but seen within the project area.

Mauka – Upslope, towards the mountains

Makai – Down-slope, towards the ocean.

Volant – Flying, capable of flight - as in flying insect.

Xeric – Extremely dry conditions or habitat.

DLNR – Hawaii State Department of Land & Natural resources.

ESA - Federal Endangered Species Act of 1973, as amended.

VCP – Variable Circular Plot, method of censusing birds.

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**Kona View Estates Subdivision**

**Environmental Assessment**

**APPENDIX 4A**

**ARCHAEOLOGICAL INVENTORY SURVEY  
AND RELATED CORRESPONDENCE**

**ARCHAEOLOGICAL INVENTORY SURVEY**  
**TMK: (3) 7-4-08:POR. 47, LAND OF HONOKOHAU 1**  
**NORTH KONA DISTRICT, ISLAND OF HAWAI'I**

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## SUMMARY

At the request of Mr. Thomas Smith, Haun & Associates conducted an archaeological inventory survey of a 50-acre portion of TMK: 3-7-4-08:47, situated in the Land of Honokohau 1, North Kona District, Island of Hawai'i. The objective of the survey was to satisfy historic preservation regulatory review inventory requirements of the Department of Land and Natural Resources-Historic Preservation Division (DLNR-HPD), as contained within Hawaii Administrative Rules, Title 13, DLNR, Subtitle 13, State Historic Preservation Rules.

The archaeological survey identified 26 sites with 651 component features. The sites consist of 19 single feature sites and seven complexes of features. Formal feature types include mounds/modified outcrops, terrace, *kua'iwi*, walls, enclosures, lava tube caves, charcoal ovens, platforms, walled terraces, a cart path and a faced mound. Functionally the features are comprised of agriculture, livestock control, permanent habitation, temporary habitation, historic habitation, charcoal manufacture, flood control, firepit and transportation.

The survey results generally conform to the expectations derived from historical and archaeological background research. As expected, agricultural features and scattered habitations were identified. The temporary habitation sites consist of lava tubes containing sparse marine shell and charcoal. All except one of the sites are part of a lava tube system that parallels the north project area boundary. Three tubes have rock rings on the floor that were used to support gourds used to collect water from seeps in the cave ceiling. The permanent habitation sites consist of enclosures, platforms, and terraces. Test excavations at these sites produced moderate amounts of marine shell midden, charcoal, and, with one exception, a few artifacts, primarily volcanic glass flakes. The excavation at one terrace produced 340 volcanic glass flakes indicating probable specialized use for some plant processing activity requiring extensive cutting or scraping.

Agricultural clearing features are the most common evidence of traditional agricultural activity. *Kua'iwi*, walls and terraces in the project area define at least 88 formal fields. The fields extend over most of the southern half of the project area, with scattered fields to the north, east and west. No fields are present in the central portion of the parcel though it is likely that this gently sloping area was also cultivated though with no surface remains. One concentration of probable historic agricultural fields is present in the southwestern corner of the project area. The complex apparently was used for historic coffee cultivation by Japanese coffee farmers in the early to mid-1900s.

Also as expected, historic features include dwelling and ranch-related features. Other historic features consist of a cart road and two charcoal ovens. Five sites consist of historic habitation features based on the presence of glass shards, ceramic fragments, and metal artifacts including hardware. Surviving wooden structural remains at one site indicate a relatively recent period of use. Oral historical accounts document residential use that continued until the mid-1900s. These accounts also indicate use of the project area for cultivating cotton and cattle ranching. Indigenous artifacts, primarily volcanic glass flakes, were found mixed with historic artifacts in test excavations at two sites indicating potential early historic occupations.

All 26 sites are assessed as solely significant for the sites information content. The mapping, written descriptions, photography, and test excavation at 16 sites adequately documents them and no further work or preservation is recommended. Ten sites retain the potential to yield information important for understanding prehistoric and early historic land use and are recommended for data recovery. These sites consist of five temporary habitation lava tube caves, four permanent habitation sites, and the agricultural complex. Data recovery at these sites would entail excavation and surface collection to obtain a larger sample of portable remains and dating samples. The data recovery work would be guided by a Data Recovery Plan prepared for DLNR-SHPD review and approval.

# CONTENTS

## Introduction · 1

Scope of Work · 1

Project Area Description · 1

Field Methods · 3

## Archaeological and Historical Background · 5

Historical Documentary Research · 5

Previous Archaeological Research · 9

## Project Expectations · 14

## Findings · 15

## Conclusion · 68

Discussion · 68

Significance Assessments · 72

Recommended Treatments · 72

## References · 74

## ILLUSTRATIONS

Figure 1. Portion of USGS Keahole Point Quadrangle showing Project Area · 2

Figure 2. Project area overview · 3

Figure 3. Project area overview · 3

Figure 4. Land Commission Awards in Honokohau · 8

Figure 5. Portion of 1888 Map · 10

Figure 6. Previous Archaeological Work · 12

Figure 7. Site Location Map · 17

Figure 8. Pig Gate in Site 18115 Wall · 19

Figure 9. Site 18726 Cart Path with Site 18115 Wall in Background · 19

Figure 10. Site 24374 Wall · 21

Figure 11. Site 24375 Wall · 21

Figure 12. Site 24378 Plan Map · 23

Figure 13. Site 24379 Plan Map · 25

Figure 14. Site 24380 Plan Map · 26

Figure 15. Site 24381 Plan Map · 27



## ILLUSTRATIONS (cont.)

Figure 16. Site 24382 Plan Map	29
Figure 17. Site 24383 Plan Map	32
Figure 18. Site 24384 Plan Map and TU-110 North Face Profile	33
Figure 19 Site 24385 Map and TUs 95 and 96 Profiles	35
Figure 20. Site 24386 Plan Map	37
Figure 21. Site 24387 Plan Map and TU-107 West Face Profile	39
Figure 22. Site 24388 Map and TUs 92 and 93 Profiles	40
Figure 23. Site 24389 Plan Map	42
Figure 24. Site 24390 Map and TUs 109 and 134 Profiles	43
Figure 25. Site 24391 Possible Firepit	46
Figure 26. Site 24392 Charcoal Oven	46
Figure 27. Site 24392 Plan Map	47
Figure 28. Site 24393 Plan Map	49
Figure 29. Site 24394 Plan Map	50
Figure 30. Site 24395 Plan Map	52
Figure 31. Site 24396 Map and TUs 113 and 114 Profiles	54
Figure 32. Density of Site 24397 Agricultural Clearing Mounds	58
Figure 33. Site 24397, Feature CC Faced Mound	59
Figure 34. Site 24397, Feature B Terrace	59
Figure 35. Site 24397, Feature DC Plan Map and TU-94 South Face Profile	61
Figure 36. Site 24397, Feature BA <i>Kua'iwi</i>	63
Figure 37. Site 24397, Feature F Wall	63
Figure 38. Site 24397, Feature DB Plan Map and TU-116 North Face Profile	64
Figure 39. Site 24397, Feature DD Plan Map and TU-108 North Face Profile	66
Figure 40. Site 24397, Feature DA Plan Map and TU-115 South Face Profile	67
Figure 41. Distribution of Agricultural Fields in Project Area	71

## TABLES

Table 1. Land Commission Award Claims	6
Table 2. Summary of Previous Archaeological Work	11
Table 3. Summary of Identified Sites	16
Table 4. Summary of Test Units	15

**TABLES (cont.)**

Table 5. Summary of Site 24397 Terraces	56
Table 6. Summary of Site 24397 <i>Kua'iwi</i> and Walls	57
Table 7. Summary of Site 24397 Miscellaneous Features	60
Table 8. Summary of Site 24397 Agricultural Fields	69
Table 9. Site Significance and Recommended Treatment	73

## INTRODUCTION

This report presents the results of an archaeological inventory survey of a c. 50 acre portion of TMK: 3-7-4-08:47 situated in the Land of Honokohau 1, North Kona District, Island of Hawai'i (*Figure 1*). The objective of the survey was to satisfy current historic preservation regulatory review inventory requirements of the Department of Land and Natural Resources-Historic Preservation Division (DLNR-HPD), as contained within Hawaii Administrative Rules, Title 13, DLNR, Subtitle 13, State Historic Preservation Rules (DLNR 2003).

The survey fieldwork was conducted between December 27, 2004 and February 11, 2005 under the direction of Dr. Alan Haun. Approximately 30 field days of labor were required to complete the fieldwork portion of the project. Described in this final report are the project scope of work, field methods, and survey findings. Also included is background information relevant to the project area, site significance assessments, and recommended site treatments.

## Scope of Work

Based on DLNR-SHPD rules for inventory surveys the following specific tasks were determined to constitute an appropriate scope of work for the project:

1. Conduct background review and research of existing archaeological and historical documentary literature relating to the project area and its immediate vicinity--including examination of Land Commission Awards, *ahupua'a* records, historic maps, archival materials, archaeological reports, and other historical sources;
2. Conduct a high intensity, 100% pedestrian survey coverage of the project area;
3. Conduct detailed recording of all potentially significant sites including scale plan drawings, written descriptions, and photographs, as appropriate;
4. Conduct limited subsurface testing (manual excavation) at selected sites to determine site/feature function;
5. Analyze background research and field data; and
6. Prepare and submit Final Report.

## Project Area Description

The project area consists of a c. 50-acre parcel situated seaward of Palani Road and south of Hina Lani Street. The parcel is bounded on the north, south and east by stone walls and by undeveloped ranch land to the west. The south end of Halolani Street is situated in the northwestern corner of the parcel. The project area ranges in elevation from c. 1,108 to 1,332 ft, with the terrain sloping slightly to moderately towards the ocean (west and southwest). Rainfall in the vicinity of the project area averages 30-40 inches per year (Armstrong 1983) and the mean annual temperature is 70 to 75 degrees F (Juvik and Juvik 1998).

The soil within the project area is comprised predominately of Punaluu extremely rocky peat (6-20% slopes; Sato et al. 1973:48). This soil is characterized by a thin (4") black peat underlain by pahoehoe bedrock, with rock outcrops occupying 40-50% of the surface. This soil evidences a rapid permeability, a slow runoff and a slight erosional hazard, and is classified as suitable for pasturelands. A small area of Kaimu extremely stony peat (6-20% slopes) is located in the southeastern portion of the parcel. This soil consists of a thin (3") very dark brown extremely stony peat underlain by fragmental a'a lava (Sato et al. 1973:22). This soil type also evidences a rapid permeability, a slow runoff and a slight erosional hazard. Sato et al. states that the Kaimu soil is suitable primarily for native woodlands, with small areas used as

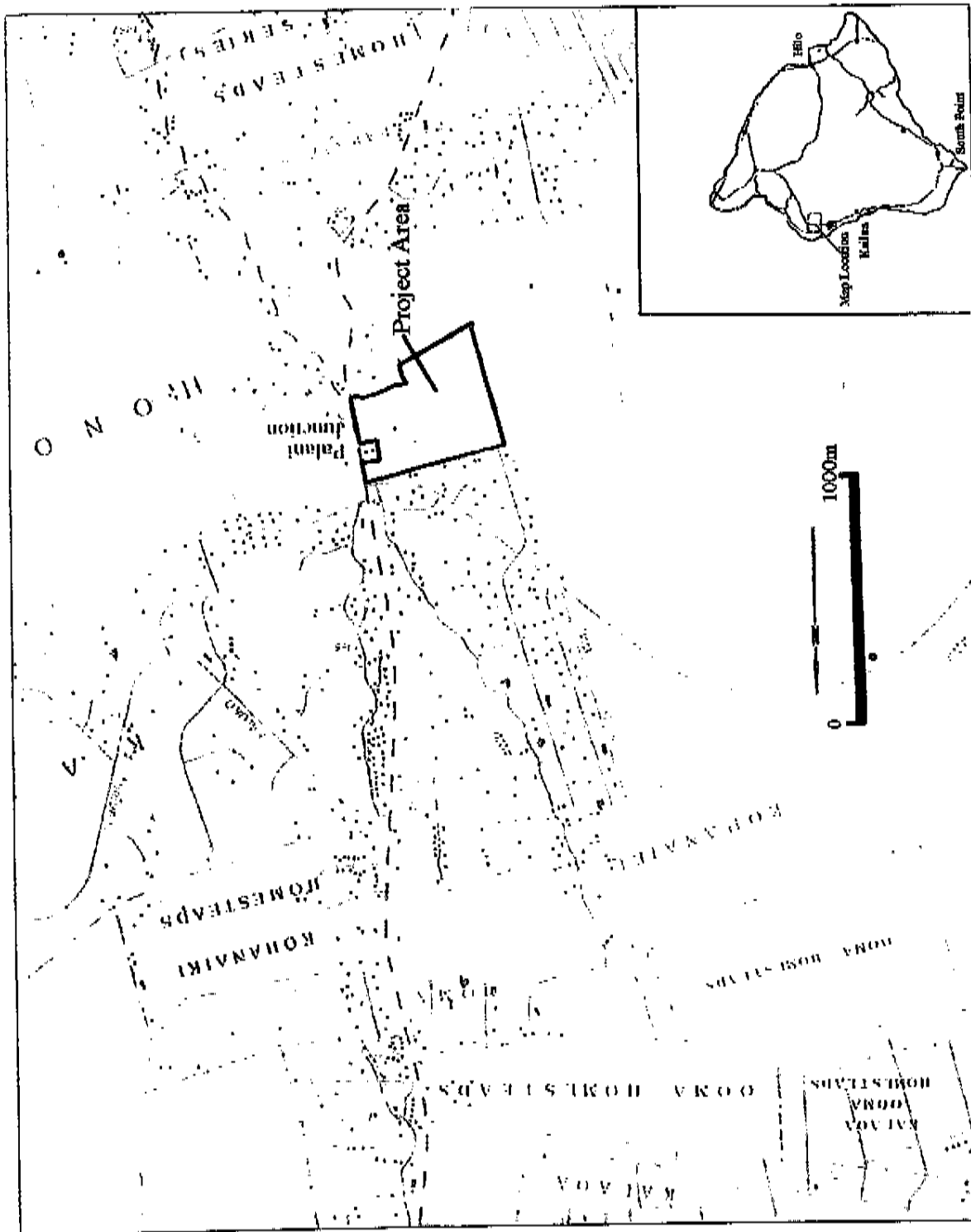


Figure 1. Portion of USGS Keahole Point Quadrangle showing Project Area

pasture or the cultivation of macadamia nuts, papaya and citrus (1973:22). The underlying bedrock substrate within the project area of lavas from Hualalai Volcano, deposited from 1,500 to 3,000 years ago (Wolfe and Morris 2001).

The project area was recently owned by Palani Ranch and the parcel was used by the ranch for cattle grazing during the survey. A modern pole barn with a tin roof is present in the inland portion of the parcel at c. 1,225 ft elevation and a concrete water trough is located adjacent to the barn to the northwest. A metal gate is situated at the southern end of Halolani Street in the northwest corner of the parcel. A dirt road extends to the southwest from the gate, extending out of the project area in this direction.

The vegetation within the project area is comprised predominately of grass and *kou haole* (*Leucaena glauca*) trees. Also present are scattered *kiawe* (*Prosopis pallida*), monkeypod (*Samanea saman*), *kukui* (*Aleurites moluccana*), pandanas (*Pandanus tectorius*), avocado (*Persea Americana*), guava (*Psidium guajava*), mango (*Mangifera indica*), breadfruit (*Artocarpus altilis*), silveroak (*Grevillea robusta*), coffee (*Coffea Arabica* L.), citrus trees, passion fruit (*Passiflora edulis*) and lantana (*Lantana camara*). The fruit bearing trees and plants are generally located in the southwestern portion of the project area in the vicinity of historic habitation sites and agricultural features. Figures 2 and 3 illustrate the project area vegetation encountered during the survey.

## Field Methods

The project area was subjected to a 100% surface examination, with surveyors spaced at 10-15 meter intervals. Transects were oriented in a roughly north-south direction. Ground surface visibility throughout the parcel was good to excellent due to extensive cattle grazing within the parcel. The identified sites/features were flagged with pink and blue flagging tape and their locations plotted on a scaled project area map with the aid of Garmin Global Positioning System (GPS) III+. The accuracy of the GPS device for a single point is +/- 15 m. This accuracy is increased to less than c. 3-5 meters by taking multiple points including property corners and overlying the plotted points on a scaled map using AutoCAD software.

Numerous agricultural features were identified during the project. These features consisted of clearing piles (mounds and modified outcrops), terraces, *kua'iwi*, and walls. The clearing piles were not individually recorded during the project, but were counted during the transect sweeping so that elevational density information could be obtained. The agricultural terraces, *kua'iwi*, field boundaries and walls were subjected to minimal recording, consisting of documenting the length, width, height, and method of construction of the features. Photographs were taken of representative feature types.

Non-agricultural sites were subjected to detailed recording including preparing scaled plan maps, completing standardized site/feature forms, and photographic documentation. A metal site tag was placed at each site and the tag's location was plotted on the site plan map.

Subsurface testing during the project consisted of the excavation of 14 test units at 12 features of seven sites. A total of 18.25 sq m of excavation were undertaken. The units were excavated in arbitrary levels within stratigraphic layers and were terminated on bedrock. Standardized excavation records were prepared after the completion of each stratigraphic layer. The soil removed during excavation was screened through ¼ "mesh. Portable remains collected were placed in paper bags labeled with the appropriate provenience information. Recovered charcoal samples were carefully removed from either in situ locations or collected during the screening process. These samples were deposited in aluminum foil pouches and placed in properly labeled paper bags. Following the excavation, a section drawing depicting the stratigraphy was prepared and post-excavation photographs were taken. Recovered cultural remains were transported to Haun & Associates' office for analysis.



**Figure 2. Project Area overview, view to northwest**



**Figure 3. Project Area Overview, view to southwest**

## ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

### Historical Documentary Research

Archival research was conducted at the University of Hawaii-Hilo Hawaiian Collection, the Land Survey Office and the Archives Division of the Hawaii Department of Accounting and General Services, and the Hawaii State Public Libraries in Honolulu and Hilo. Honokohau lies within the southern-most portion of lava-covered land north of Kailua called Kekaha, which “describes a dry, sun-baked land” (Kelly 1971:2). Honokohau is divided into Honokohau 1 to the north and Honokohau 2 to the south, also referred to as Honokohau Nui and Honokohau Iki, respectively. Honokohau is well known for its fishponds, Ai-makapa and Aiopio.

There is little mention of Honokohau in Hawaiian legendary and traditional history. Kelly (1971) and Wong-Smith (in Donham 1990a) summarize the limited references. The fishponds at Honokohau are mentioned in a story told by Kamakau (1961) of a spy sent to Hawaii by the ruling chief of Maui. The spy reported seeing the fishpond upon his return to Maui. Kelly (1971:22) believes this occurred between the late 1600s and early 1700s depending upon the generation span used in calculating chiefly genealogies.

Ellis reported the observations of the Reverends Thurston and Bishop during a walk along the coast north from Kailua in 1823. They described houses along the coast built on lava and small gardens in the lava where sweet potatoes, watermelon, and tobacco were grown.

During The Great Mahele, Honokohau 1, including Aiakapa Fishpond, was given to the granddaughter of Kamchameha I, Mikahela Kekauonohi (LCA 11216, 2653 acres). Honokohau 2 with Aiopio Fishpond was given to William Pitt K'elikolani the heir to Governor Kuakini (LCA 9971H, 480 acres). These Land Commission Awards (LCA) and subsequent *kuleana* claims for Honokohau are listed in *Table 1*. The locations of all awarded parcels, except 10775, are shown on *Figure 4*. The Waihona 'Aina (2000) database lists twenty-three LCA claims for forty-three parcels within Honokohau. Seventeen claimed parcels were in Honokohau 2, nine in Honokohau 1, and the rest were listed simply as Honokohau. Fourteen claims were awarded. The awarded *kuleana* parcels range from 1.0 to 6.8 acres in area with an average of 3.5 acres. All, except three claims, consist of a single awarded parcel. One LCA, 7890, consists of two awarded parcels.

The testimonies refer to at least 23 *ili* land divisions. Twenty *ili* are mentioned two or more times. Using *ili* names for the location of awarded LCAs and *ili* names appearing in boundary descriptions a rough geographic ordering of *ili* is possible. All of the *kuleana* awards are situated inland between approximately 800 ft and 1700 ft elevation. Beginning from the south in Honokohau 1, Hanapouli 1 and 2 lie along the boundary, followed by Puukou, Haleolono, and Waipio along the northern *ahupua'a* boundary. The modern tax map and USGS quadrangle map (see *Figure 1*) of the area identifies the *ili* of Papaakoko (Grant 3456) along the southern boundary of Honokohau 2 between approximately 700 ft and 2,000 ft elevation. It is unclear whether this *ili* was part of Honokohau or the adjacent *ahupua'a* of Kealahou. Other *ili* within Honokohau 1 with undetermined locations include Hulihuli, Elepaio, Pukalani, and Ahualoa. In Honokohau 2, Leleiohoku appears to be situated in the south, Kanakahikale in the north, and Kao and Kealahou are centrally located. Other *ili* with uncertain locations in Honokohau 2 include Onca, Ukakoni, Halemahahuka, Puukou, Mokuaweoweo, Pohakupalahalaha, Nuhiwa.

The majority of claimed land parcels were conveyed to the claimants between 1819 and 1849. Five parcels were given by Malo, and two each by Hao, Kapche, and Kaupokii. Hao is mentioned in several claim testimonies as a *konohiki* in Honokohau 2. The other individuals giving more than one parcel may also have been *konohiki*. Thirteen other individuals are named as conveyors of land.

A variety of land uses are described in the LCA claim testimony. Twelve claimed parcels included houses and eighteen mention cultivated plots. Eight claims list taro plots and one each mentions coconuts,

Table 1. Land Commission Award Claims in Honokohau

LCA	Claimant	Area claimed	Section No.	Ahupua'a	IB	Land Use	Boundary East	Boundary South	Boundary West	Boundary North	Date Rec'd	Grver	Acres	Comment
4107	John H. Kahle	1	0	Honokohau	N/D*	half clump, four trees, four plums, & bushes	N/D	N/D	N/D	N/D	N/D	N/D	0.0	Dying place for <i>na kaka Hawaii</i> ?
4108	John H. Kahle	1	0	Honokohau	N/D	house lot	N/D	N/D	N/D	N/D	N/D	N/D	0.0	Intended to build house
5108	L. Karamawa	1	0	Honokohau	Honopouli	former house lot	N/D	N/D	N/D	N/D	1830	Victoria Kaunimani III	0.0	
5533	Karonn	1	0	Honokohau	Elekmi	house lot	N/D	lo'i pa'akao	N/D	N/D	N/D	N/D	0.0	
6026	Ukaaka Lanai	1	0	Honokohau	Honopouli	former residence	N/D	N/D	N/D	N/D	N/D	N/D	0.0	Claimed entire IB
7396	Kekipi	1	1	Honokohau 2	Punkou	N/D	N/D	N/D	N/D	N/D	1839	Malo	2.8	Waikona 'Anna says ahupua'a uncertain
7429	Kamukawiole	3	0	Honokohau ?										Uncertain which lots awarded
7490	Solomon Polapola	4	1											
						3 totia plants & 2 breadfruit trees	N/D	N/D	N/D	N/D	N/D	Kaupouli		
			1	Honokohau 2	Leleiohoku									
			2	Honokohau 2	Leleiohoku	taro kihapai	N/D	N/D	N/D	N/D	N/D	Kare		
			3	Honokohau 1	Pukalani	sweet potato kihapai	N/D	N/D	N/D	N/D	N/D	Koiki		
			4	Honokohau 1	Waiipo	4 taro kihapai	N/D	N/D	N/D	N/D	N/D	Kurua		
7867	Kamohai	1	0	Honokohau 1	Waiipo	taro kihapai	Honohu	Honohu	Honohu	Honohu	1847	Kapehe	0.0	
7870	Kamohai	1	1	Honokohau 1	Waiipo	taro kihapai	Honohu	Honohu	Honohu	Honohu	1847	Kapehe	0.0	
7890	Kakona	2	2	Honokohau	Honopouli 2	cultivated house lot	Hulihuli	Honopouli 1	Haleolono	Punkou	N/D	N/D	0.0	Awarded 2 apua
8218	Hiki	1	1	Honokohau 2	Waiipo	N/D	N/D	N/D	N/D	N/D	N/D	Kaohakano	2.3	
8259	Huhie	1	0	Honokohau 2	?	N/D	Haleolono	Kepapali	Pulapali	Elapao	N/D	N/D	0.0	Claimed entire IB. Honohu is Hoo
8267	Inoahe	10	0	Honokohau ?	Various	N/D	N/D	N/D	N/D	N/D	N/D	N/D	0.0	Waikona 'Anna says ahupua'a uncertain
9061	Kanae	2	1	Honokohau 2							1819	grandparents	4.6	Uncertain which lot awarded
			1											
			2											
9114	Kapulehu	1	0	Honokohau	Kanakaikale		Waiha	Punkou	Umiiahaahumano	Mokuawewewo	1820	Nalia	0.0	Surrounding lands all Honohu
9158	Koala	1	0	Honokohau	Pachala		Elapao	Pouasahu	road	Kakoko	1849	Malo	0.0	Surrounding lands all Honohu
9161	Kalimo	1	0	Honokohau 2	Waiha	N/D	Kanapaala	Waiha	Mokuawewewo	Kepoko	1849	Kaupouli	0.0	
9180	Kahama	1	0	Honokohau 1	N/D	kihapa	road	Kaupouli	Pachala	Halemahua	N/D	N/D	0.0	Land named Walewahae. Honohu is Nili



Table 1. Land Commission Award Claims in Honokohau (cont.)

LCA	Claimant	Aparua claimed	Aparua awarded	Section No.	Aparua's	Ill	Land Use	Boundary East	Boundary South	Boundary West	Boundary North	Date Rec'd	Grver	Acres	Comment
9231	Kulachole	1	0		Honokohau 2	Holipia	house lot & taro plots	Waiha	Holipia 2	Oluka	Puukou	N/D	N/D	0.0	Konohiki was Hao
9236	Kahaulewahi	1	3		Honokohau 2	Kazo 2	N/D	N/D	Waiha	Puukachae	Pohakupahala 1	1844	Kua	3.2	Surrounding lands, all Konohiki
9240	Kuareasa	1	0		Honokohau	Onca 2	N/D	Pohakupahala	Waiha	Moanawao	Keopaka	1839	Kuhi	0.0	
9971H	Wai P. Leleiohoku	1	1		Honokohau 2	N/A	N/D							480.0	Awarded entire ahupua'a
10319	Nabina	1	1		Honokohau 2	Halelono	N/D	Hanapouli	Puukou	Elepalo	Alunaloa	N/D	N/D	3.5	Konohiki was Hao
10474H	N. Nanaulu	1	0		Honokohau	Pohakupahala	N/D	N/D	N/D	N/D	N/D	N/D	N/D	0.0	
10521	Puinahe	1	0		Honokohau	Halelono	cultivated	Kanaloa	Onca	Kazo	Ukaloa	1839	Malo	0.0	Claimed entire ill
10521B	Puinahe	1	1		Honokohau	Halelono	cultivated	Kanaloa	Onca	Kazo	Ukaloa	1839	Malo	6.8	
10529	Kuhi	1	0		Honokohau	Leleiohoku	house lot	N/D	N/D	N/D	N/D	N/D	N/D	0.0	
10599B	Nahi	1	0		Honokohau 1	Nuakiwa	house lot	N/D	N/D	N/D	N/D	N/D	N/D	0.0	
10699	Kapuni	1	0		Honokohau 2	Makaili	house lot	N/D	N/D	N/D	N/D	1839	Malo	0.0	
10762	Alia	1	1		Honokohau 2	Nuakiwa	4 taro kikapu	Konohiki	Konohiki	Konohiki	Konohiki	1844	Hao	2.2	
10775	Solomona Polapolo	1	1		Honokohau 2	Leleiohoku	house lot & 2 coconut trees	N/D	N/D	N/D	N/D	N/D	Hao	?	Claimed entire ill; Konohiki was Hao
10949	Willikoki	1	0		Honokohau 2	Honopouli 2	N/D	N/D	N/D	N/D	N/D	N/D	N/D	0.0	
11064	Apua	1	1		Honokohau 1	Kanaloa	7 cultivated plots & house	Kapoka	Kanepilai	road	Leleiohoku	Time of Kuakini	Kahaloa	2.5	
11186	Kekipi	1	0		Honokohau	N/D	cultivated house lot	Kailino	Benjamin	Heolan	Kunaz	N/D	ancestors	0.0	
11216	M. Kakaumohi	1	1		Honokohau 1	N/A	N/D							2653.0	Awarded entire ahupua'a

\* N/D=No data

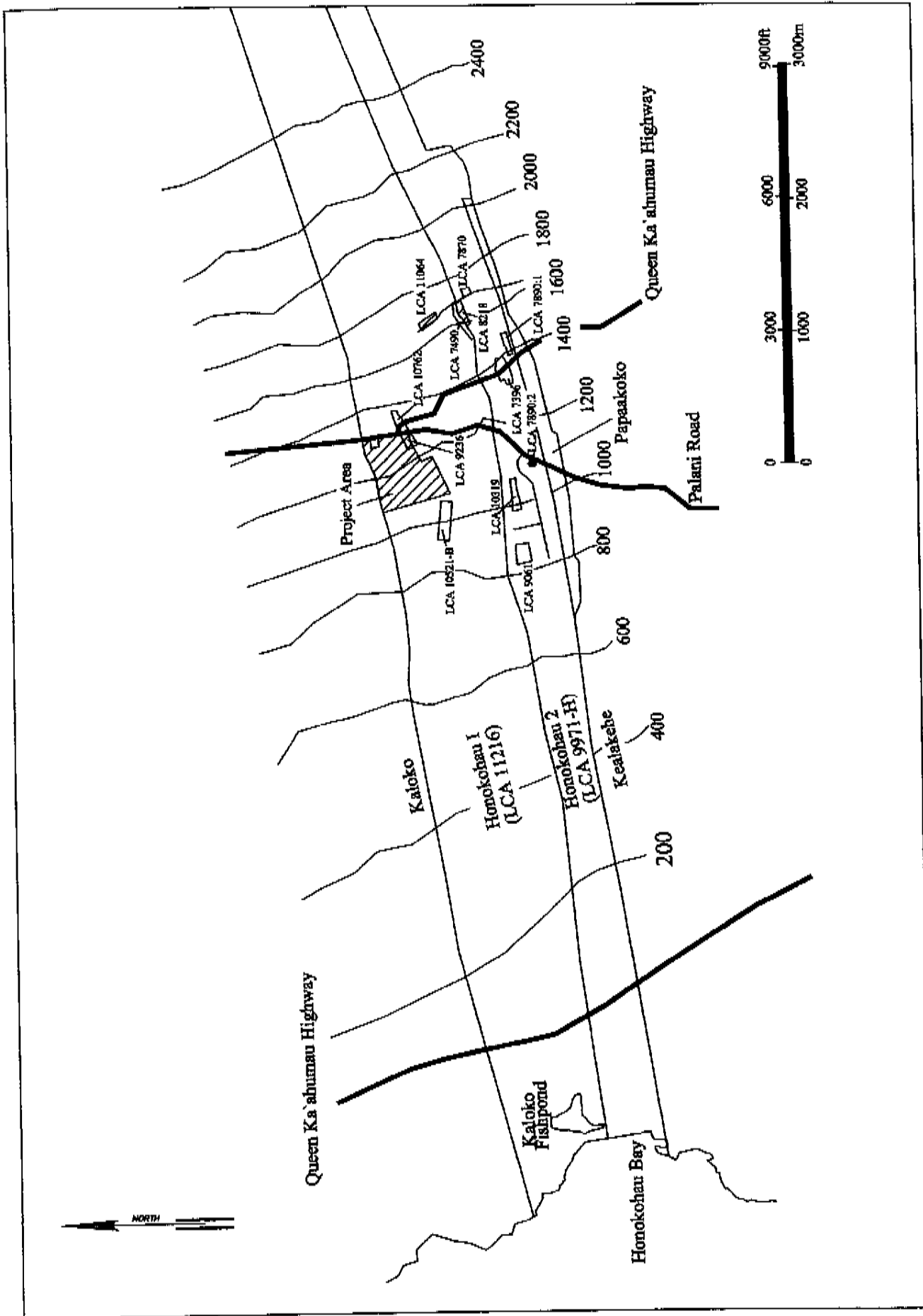


Figure 4. Map of Land Commission Awards in Honokohau I and 2

breadfruit, and sweet potatoes. Pandanus groves, *Loulu* palm trees and *kou* trees are also mentioned. LCA 9236 extends into the southeast corner of the project area. There is very little information in the claim testimony from Kahaulawahine, who received the land from Kau in 1844. The claim was situated in the 'ili of Kao 2 and was surrounded by lands belonging to the *konohiki* described as Pohakupalahalaha to the north, Waiha to the south, and Puukakacke to the west. No other information is given.

1870s Boundary Commission records (cited in Robins et al. 1998) mention a banana grove and two waterholes at the inland-most end of Honokohau 2. Places along the inland portion of the boundary between Honokohau 1 and 2 include a small settlement called Ikuana, a breadfruit tree, an ohia tree grove and a pandanus tree grove.

Kelly (1971:12) cites missionary and later census data that documents a decline in the population of North Kona in the 1800s. The Hawaiian Kingdom Directory for 1880-1881 lists a coffee planter in upland Honokohau (Kelly 1971:13). A map by J.S. Emerson in 1888 shows two houses between the coastal fishponds, one occupied by Kalua and one where Beniamina resided (Figure 5). The inland portion of the map (Kelly 1983:59, Figure 34) shows the lower limit of the forest was between 750 ft and 800 ft elevation in Honokohau. A trail extends from the south side of Aimakapaa Fish Pond through the lower portion of Honokohau 2 and across Kaloko to inland Kohanaiki. Along the inland boundary between Honokohau 1 and 2 the map shows Grant 3022 to Kalua and Kuakaha's house. The Honokohau School House is situated immediately inland of a road that roughly follows the alignment of Palani Road.

Robins et al. (1998) summarize the late 1800s to 1900s development of Honokohau. Henry Nicholas Greenwell arrived in Hawaii in the 1850s and began leasing and purchasing land in Honokohau. He initially began growing oranges, but later expanded his commercial ventures to include coffee and cattle and sheep ranching. Greenwell died in 1891 and in the early 1900s his land holdings were divided into three parts. The lands in Honokohau became the Frank Greenwell Ranch, also known as Honokohau Ranch and Hualalai Ranch. The ranch encompassed 20,000 acres from the ocean to 5,400 ft elevation. One half of the land was suitable for grazing with approximately 1,500 head of cattle. The Frank Greenwell Ranch later became Palani Ranch. The project area continues in use for pasture today.

Extensive oral history interviews for Honokohau 1 and 2 were conducted by Maly (2000). Maly's interview of James Mallaby Greenwell provided information about the project area vicinity. The entire *ahupua'a* of Honokohau 1 was purchased by the Greenwell family in 1876. In the 1980s, the seaward portions of Kaloko, and Honokohau 1 and 2, below the Queen Ka'ahumanu Highway were purchased by the U.S. Government and became the Kaloko-Honokohau National Historical Park. In the 1920s, three Japanese farmers grew coffee along the southern boundary of the project area immediately seaward of Palani Road. There were three farms belonging to Moto Katsu, Isimoto, and Kuni from east to west. Two of Maly's informants are descendants of families that had residences at the coast and inland in Honokohau 2. They recalled going with family members to cultivate sweet potatoes and other crops in the lowlands of Honokohau 2. Kimiona Kanakamaika'i and his wife resided at the coast of Honokohau 2 where they maintained the fishpond from 1927 until 1940. Later several Filipino families resided at the coast and took care of the fishpond.

Mr. Clarence Rapoza, Palani Ranch Manager, provided information on his recollections of the project area. He was born in 1944 and has lived in the area since he was eight years old. He recalls that two individuals Kurazawa and Moto Katsu lived and grew coffee in the southern portion of the project area. Mr. Rapoza helped harvest the coffee when he was younger. Cotton was another crop grown in the area. He also recalled that an old man lived there named Bildo, who built stone walls for the ranch. The area was exclusively used for pasture after about the 1960s. Mr. Rapoza was aware of charcoal ovens in the project area, but the ovens were already abandoned when he was a child.

## Previous Archaeological Research

More than 30 archaeological survey and excavation projects have been conducted in Honokohau and the adjacent *ahupua'a* of Kealakhe and Kaloko. Figure 6 shows the locations of the projects and Table 2 summarizes the projects. Not included in the figure are the Cordy et al. (1991) study of Kaloko Ahupua'a and the general study by Stokes (Stokes and Dye 1991), which focused on major sites, primarily *heiau*, throughout Hawaii Island. None of the prior studies included the project area. Stokes reported Laupauwila Heiau in Kealakhe situated approximately 3.5 miles inland and Pu'uoina Heiau near the shore in Honokohau 2.



Figure 5. Portion of 1888 Map

Table 2. Summary of Previous Archaeological Work

Author	Date	Land	Study Type*	Elevation	Acresage	Historic Use	No of sites	Sites/acre	No of Feas	Feas/acre	Hab Feas	Hab Feas/acre	Perm Hab Feas	Temp Hab Feas	Ag Feas	Ag Feas/acre	Burial Feas	Ritual Feas	Trell	Misc. Indet. Feas	Historic Feas.	Comment
Guff	1971	Honokohau 1 and 2	RS	0-80	276	?	63	0.33	85	0.33	51	0.18	25	26			29		5	3		100s of sites/features noted but not recorded - Feature totals estimated
Rosenbath, Emory and Soehren	1930/1971	Kaiko, Honokohau and Kaalekaha	RS	0-80	1315	?	77	0.06	213	0.16	45	0.03	45	1	24	0.02	53+	8	5	23+	48	Feature Totals estimated, 5 burials, 18 burials are Historic/modern, Misc features incl. papamu, petroglyphs, and hula
Robbins et al.	1993b	Honokohau 1-2	IS	40-1200	803	?	284	0.35	543	0.68	278	0.35	196	32	148	0.18	10	7	13	65	14	Misc. features incl. 8 papamu & 12 petroglyphs
Wahik and Hazenatt	1995	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Hazenatt	1991b	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Soehren	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Soehren	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
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Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
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Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
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Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
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Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
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Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
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Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
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Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
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Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Rosenbath	1990a	Kaalekaha 1-4	IS	40-143	120		17	0.14	29	0.24	6	0.05		6	4	0.03			6	8	2	Misc. features incl. 2 petroglyphs
Rosenbath																						

RS=Reconnaissance Survey, F=Field Inspection, DR=Data Recovery, EX=Excavations

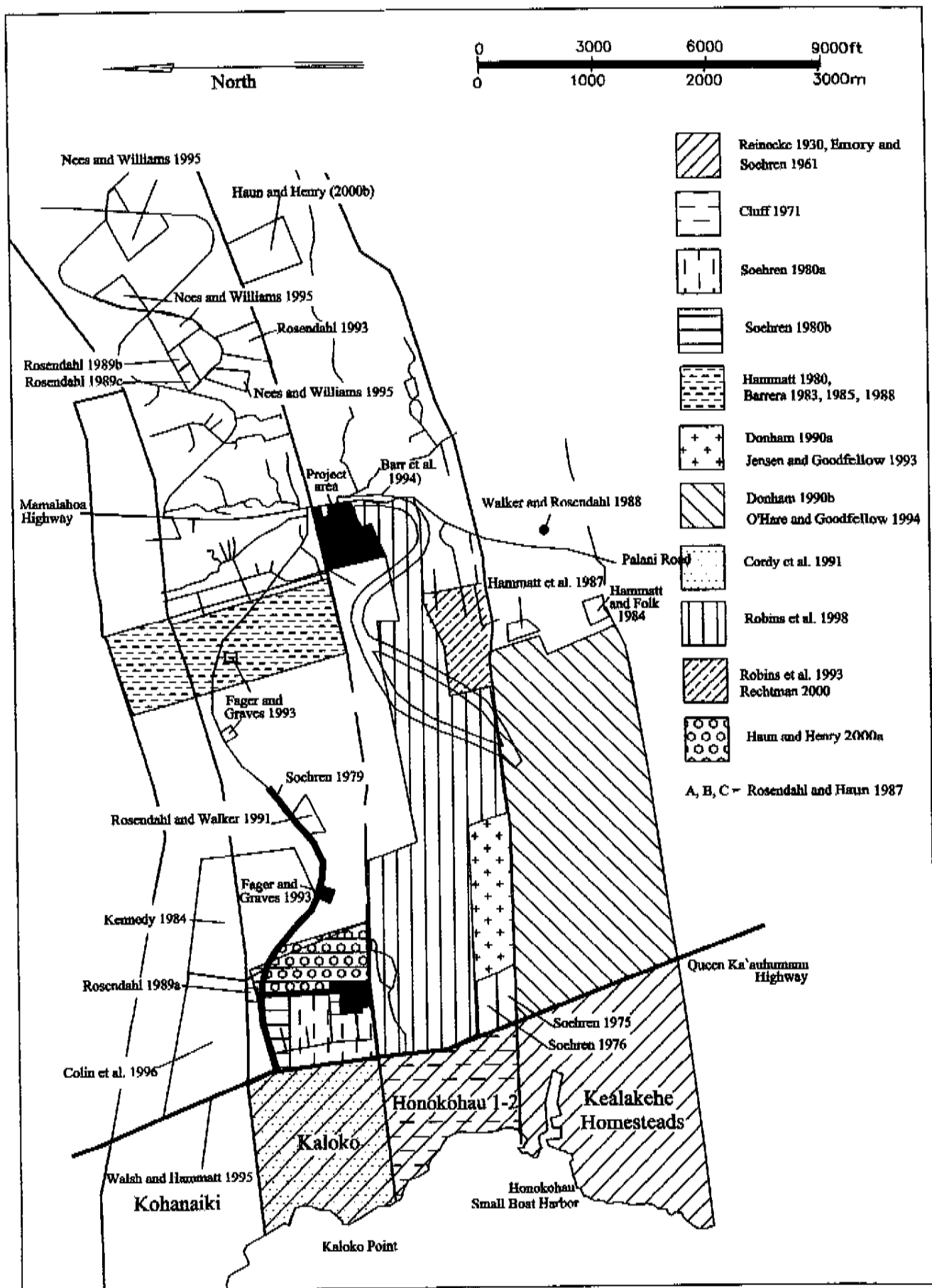


Figure 6. Previous Archaeological Work

The surveys in *Table 2* cover over 6,300 acres identifying 989 sites with 2,850 features. To aid in reconstructing settlement patterns, features were quantified by probable age and function, and the studies are ordered by elevation. Traditional Hawaiian features were categorized as habitation, agricultural, burial (including possible burials), ritual, and trail, and rock art. Features not assignable to these categories were categorized as miscellaneous/indeterminate. Traditional sites in this category include *holua* slides, *papamu*, petroglyphs, over 140 pahoehoe excavations, and *ahu*. Habitation sites are further subdivided into temporary and permanent for studies making this distinction. Density per acre values are given for sites, features, and habitation and agricultural features. Overall, the studies have identified 355 permanent habitation features, 334 temporary habitations, 1,456 agricultural features, 153 burials, 23 ritual features, and 92 trail segments. Historic features were not segregated by function. The majority of the historic features are ranch walls.

Density values for inventory surveys larger than 80 acres and the large reconnaissance surveys of Emory and Soehren (1971) and Kennedy (1984) do not show any consistent trends by elevation. Overall feature density values range from 0.14 to 2.31 features per acre, but most studies encountered densities between 0.31 and 0.91 features per acre. Habitation feature density ranges from 0.02 to 2.5 features per acre with an average of 0.35. Agricultural feature density ranges from 0 to 4.09 features per acre with an average of 0.89. The highest agricultural feature density comes from the Barrera (1988) study between 800 and 1,000 ft elevation. Qualitatively, permanent habitations are most common at the coast and inland above 500 ft elevation. Temporary habitations are present at all elevations. Agricultural features are present below 300 ft elevation and are most frequent above 500 ft. The majority of burial and ritual sites are present near the coast with a moderate number reported for surveys between 500 ft and 1,200 ft elevation.

Forty-nine radiocarbon dates are reported in the studies by Donham (1990a), Fager and Graves (1993), Barr et al. (1994), Haun and Henry (2000a), Jensen and Goodfellow (1993), O'Hare and Goodfellow (1994), and Rechtman (2000). Nearly all of the age determination results produced multiple age ranges or long single age ranges between the 1600s and 1950. When all potential age ranges are examined, seven ranges span the 1200s or 1300s, sixteen include the 1400s, twenty two span the 1500s, and 40 encompass the 1600s or subsequent centuries. The results indicate initial use of the area in the 1200s followed by a gradual increase during the 15<sup>th</sup> and 16<sup>th</sup> centuries. The most intensive use dates to the 1600s to early historic period.

Cordy et al. utilized four environmental zones to characterize settlement patterns: (a) the Coastal Zone from sea level to 15 ft elevation, (b) the Middle Zone from 15 ft to 800-900 ft elevation, (c) the Lower Upland Zone from 900 ft to 1500 ft elevation, and (d) the Upland-Forest Zone between 1,500 and 6,000 ft elevation. Their settlement pattern model has been largely confirmed by the subsequent studies described above.

Based on their data, the authors believe the *ahupua'a* was permanently settled between AD 900 and 1200. Most of the sites were presumed to have been occupied in late prehistory in the 1600s and 1700s and this period is used to generate the settlement pattern model. Many sites also had a historic component. A *heiau*, coastal trail, *ahupua'a* boundary shrine, and permanent habitation sites, including the residence of at least one chief and four men's houses, were clustered next to the shoreline and around the fishpond. Temporary habitation sites were also present in the coastal zone. Branch trails linked habitation sites with subsistence sites and water sources along the coast. Subsistence sites included the fishpond at the coast and animal enclosures and agricultural complexes in the lower portion of the middle zone. A series of *mauka-makai* trails extend from the coast inland. Burials were concentrated in a cemetery in the lower middle zone and individual burials were present at two coastal sites.

Inland of the lower Middle Zone adjacent to the Coastal Zone, sites were widely scattered and primarily consisted of trails leading to the uplands associated with markers (cairns) and temporary habitations, primarily in lava tubes. Settlement pattern data for the Upland Zone were derived from historic records. In the early to mid-1800s, the zone was used for agriculture and scattered habitations. This pattern is assumed to have prevailed in late prehistory as well. By the 1870s and 1880s, residential sites were more common and agricultural use continued as a small community developed near the upper road. This coin-

cided with the near abandonment of the coastal habitations. In the late 1800s to early 1900s, the focus of land use shifted to large-scale ranching.

The Upland-Forest Zone was characterized by an extensive field system consisting of formal walled fields from 900 ft elevation up to approximately 2,300 ft, which was believed to be the lower limit of the late prehistoric forest edge. The major field boundary walls were perpendicular to the coast. Other agricultural features included terraces, depressions, mounds, and probable pigpens. Temporary habitation sites were scattered among the fields and at least one small shrine was present. Below 900 ft and above 2,300 ft elevation agricultural features were present, but were scattered and informal. By the mid-1800s, the forest edge was reported to be at the 1,700 ft elevation, leading the author's to conclude that much of the area was abandoned coincident with depopulation between European Contact and the 1850s.

## PROJECT EXPECTATIONS

The project area is situated in the Lower Upland Zone as defined by Cordy et al. (1991). Prehistoric use of the project area is potentially represented by scattered habitation sites associated with trails and agricultural features. Chronologically, sites may have been used as early as the 900-1200s, with the most extensive period of use occurring between the 1600s and early historic period.

In the early to mid-1800s, LCA claims indicate that settlement and cultivation was concentrated between 700 and 2,000 ft elevation. One awarded parcel is situated in the southeast corner of the project area. Associated sites may include residences and agricultural features. Inland areas were used for water sources, collecting forest resources, and probably scattered plots of bananas and taro. By the late 1800s to early 1900s, sites associated with coffee farming and cattle ranching are expected. Ranching activity, which continues today, would be evidenced by stone walls and corrals, and later wire fencing.



## FINDINGS

The survey identified 26 sites with 651 features. The sites consist of 19 single feature sites and seven complexes of features comprised of from two to 612 features. Two of the sites (Sites 18115 and 18726) consist of inland portions of sites previously identified by Barr et al. (1994) during a survey of an area adjacent to the project area to the west. The identified formal feature types consist of mound/modified outcrop (504), terrace (61), *kua'iwi* (28), wall (27), enclosure (15), lava tube cave (8), charcoal oven (2), platform (2), walled terrace (2), cart path (1) and faced mound (1). Functionally, the features include agriculture (612), livestock control (9), permanent habitation (9), temporary habitation (8), historic habitation (8), charcoal manufacture (2), flood control (1), firepit (1), and transportation (1). The identified sites are summarized in *Table 3* and their locations are illustrated in *Figure 7*.

Subsurface testing during the project consisted of the excavation of 14 units at 12 features of seven sites. A total of 18.25 sq m of excavation were undertaken. The tested features consist of two permanent habitation platforms (Sites 24388 and 24390, Feature D), two permanent habitation enclosures (Sites 24374, Feature A and 24387), a permanent habitation terrace (Site 24390, Feature B), an historic habitation terrace (Site 24385, Feature A), two historic habitation enclosures (Site 24396, Features A and B), two agricultural enclosures (Site 24397, Features DB and DD), and agricultural walled terrace (Site 24397, Feature DA) and an agricultural terrace (Site 24397, Feature DC). These units are summarized in *Table 4* and the results of these excavations are incorporated into the following site descriptions.

**Table 4. Summary of Test Units**

TU No.	Site	Feature	Feature Type	Function	Unit Size (m)	Unit Area (sq m)
92	24388	-	Platform	Permanent Habitation	1.0 by 1.0	1.00
93	24388	-	Platform	Permanent Habitation	1.0 by 1.0	1.00
94	24397	DC	Terrace	Agriculture	1.0 by 3.0	3.00
95	24385	A	Terrace	Historic Habitation	1.0 by 1.0	1.00
96	24385	A	Terrace	Historic Habitation	1.0 by 1.0	1.00
107	24387	-	Enclosure	Permanent Habitation	1.0 by 1.0	1.00
108	24397	DD	Enclosure	Agriculture	1.0 by 1.0	1.00
109	24390	D	Platform	Permanent Habitation	1.0 by 4.0	4.00
110	24384	A	Enclosure	Permanent Habitation	0.5 by 0.5	0.25
113	24396	A	Enclosure	Historic Habitation	0.5 by 0.5	0.25
114	24396	B	Enclosure	Historic Habitation	0.5 by 0.5	0.25
115	24397	DA	Walled Terrace	Agriculture	0.5 by 0.5	0.25
116	24397	DB	Enclosure	Agriculture	0.5 by 0.5	0.25
134	24390	B	Terrace	Permanent Habitation	2.0 by 2.0	4.00

The survey also identified two non-cultural caves which consisted of small blister caves containing no cultural remains or evidence of utilization. These caves consist of NCC-39 located at c. 1,261 ft elevation and NCC-40 situated at c. 1,201 ft elevation.

The present c. 50-acre project area represents the inland portion of a larger 327-acre parcel recently surveyed by Haun & Associates. More than 670 temporary site designations were assigned during the surface examination of the 327-acre parcel and 170 test units were excavated. The discontinuous temporary site numbers and test unit numbers discussed below reflects the annexation of the upper portion of

Table 3. Summary of Identified Sites

SIHP Site No.	Type	Function	Age	No. of Features	Function													Temp. Field No.					
					Mound/Modified outcrop	Terrace	Kua'iwi	Wall	Enclosure	Lava Tube Cave	Charcoal oven	Platform	Walled terrace	Cart Path	Faced mound	Agriculture	Livestock control		Permanent Habitation	Temporary Habitation	Historic Habitation	Charcoal manufacture	Flood control
18115	Wall	Livestock control	Historic	1				1										1					1
18726	Cart Path	Transportation	Historic	1									1									1	494
24374	Wall	Livestock control	Historic	1				1										1					507
24375	Wall	Livestock control	Historic	1				1										1					863
24376	Wall	Livestock control	Historic	1				1										1					865
24377	Wall	Livestock control	Historic	1				1										1					27
24378	Enclosure/with cave	Livestock control	Historic	1				1										1					541
24379	Lava Tube Cave	Temporary Habitation	Prehistoric	2					2										2				540/590
24380	Lava Tube Cave	Temporary Habitation	Historic/Prehistoric	2					2										2				595
24381	Lava Tube Cave	Temporary Habitation	Prehistoric	1					1										1				596
24382	Lava Tube Cave	Temporary Habitation	Historic/Prehistoric	2					2										2				629/831
24383	Lava Tube Cave	Temporary Habitation	Prehistoric	1					1										1				545
24384	Complex	Permanent Habitation	Prehistoric	3		1		2											3				552/553
24385	Complex	Historic Habitation/ Livestock control	Historic	2		1		1										1	1				659/664
24386	Enclosure	Livestock control	Historic	1				1										1					637
24387	Enclosure	Permanent Habitation	Prehistoric	1				1										1					635
24388	Platform	Permanent Habitation	Prehistoric	1									1					1					671
24389	Enclosure	Flood control	Historic	1				1												1			624
24390	Complex	Permanent Habitation	Prehistoric	4		2		1				1						4					619
24391	Enclosure	Historic firepit	Historic	1				1												1			613
24392	Oven	Charcoal manufacture	Historic	1					1											1			602
24393	Complex	Historic Habitation	Historic	2		2													2				800/503
24394	Oven	Charcoal manufacture	Historic	1					1											1			606
24395	Complex	Historic Habitation	Historic	3		1		2										1	2				564/563
24396	Complex	Historic Habitation	Historic	3				2					1							3			565/665/667/1
24397	Complex	Agriculture	Historic/Prehistoric	612	504	54	28	22	2				1	1	612	9	8	8	6	2	1	1	1
		Total		661	504	61	28	27	15	8	2	2	2	1	1	612	9	8	8	6	2	1	1

see Tables 5, 6 and 7

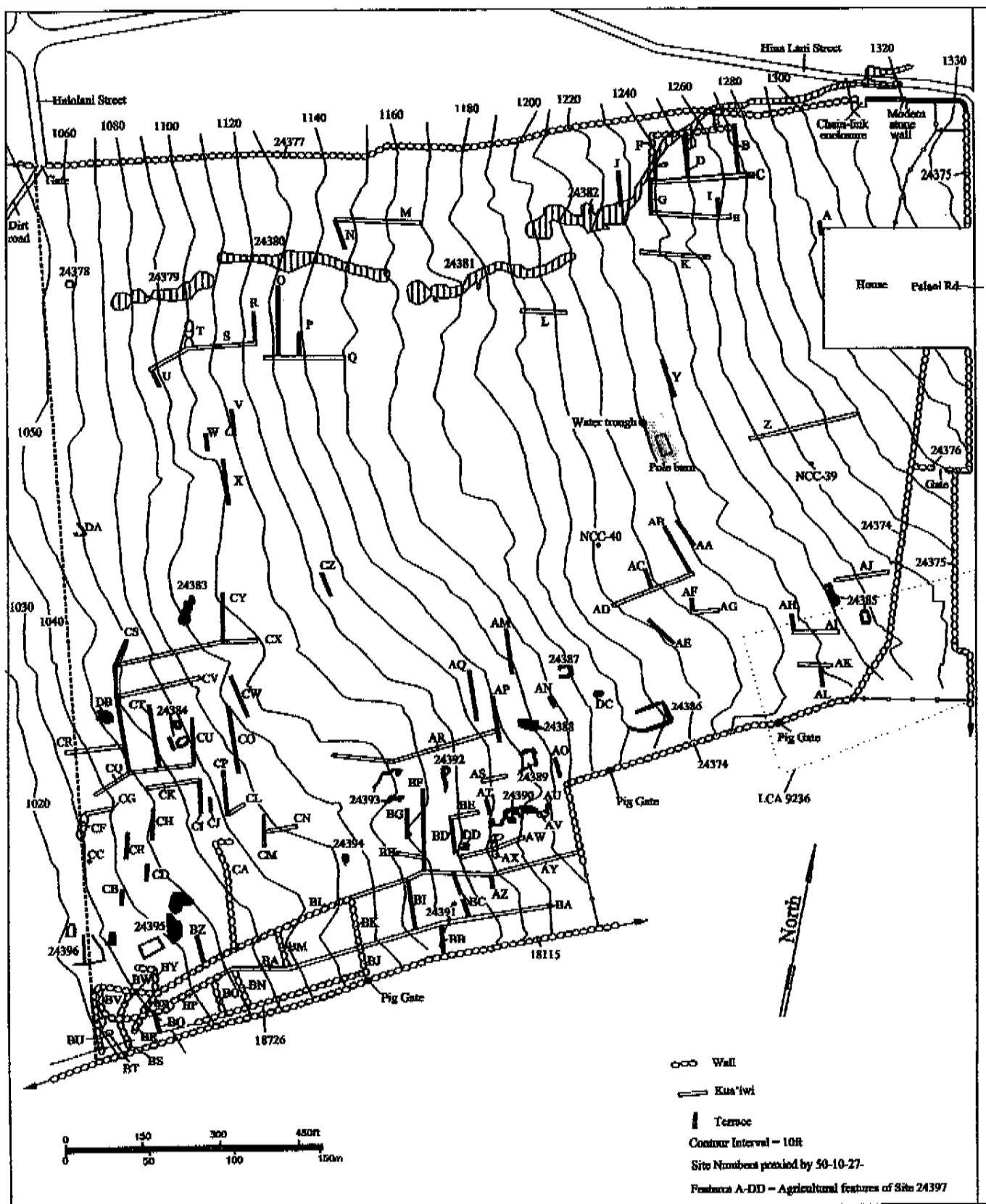


Figure 7. Site Location Map

the parcel. The results of the lower 277-acre portion of the 327-acre parcel will be presented in a report currently under preparation by Haun & Associates.

In the following site descriptions permanent habitation features are defined as the primary dwelling structures at a permanent habitation site. Permanent habitation features were defined based on a criteria developed by Cordy (1981:66-82). In his model, Cordy presents the following attributes for permanent habitation structures: (a) external area greater than 16.0 to 19.0 sq m; (b) substantial construction (i.e. faced walls, paving); (c) presence of special purpose structures (small structures for work and storage); and (d) location (permanent housing clustered primarily along the shoreline or at the mouth of and on the sides of valleys). Other attributes used in this study as evidence of substantial construction include architectural features such as constructed doorways and steps and internal subdivision into rooms.

Special purpose structures, which are smaller in area than Cordy's permanent habitation size criteria, consist of structures present at permanent habitation sites, but which do not comprise the basic dwelling structure. Their specific functions cannot usually be determined at the inventory level of investigation. These structures may represent sleeping structures, cookhouses or storage areas. Special purpose structures are typically smaller and less formally constructed than permanent habitation features.

For this study other features, which would not have supported roof structures, are classified as permanent habitation ancillary features. These features consist of pavements and mounds, and often functioned as site furniture such as tables, benches or drying racks. Large enclosures surrounding permanent habitations sites are also termed ancillary features, functioning to define the limits of enclosed yards.

As defined by Cordy (1981), temporary habitations are (a) less than 16 sq m in external area, (b) insubstantial constructions, (c) contain numerous features of internal stratification (multiple firepits), and (d) have few or no associated structures. These habitations are characterized by occupations of short-term or recurrent duration.

### **Site 18115**

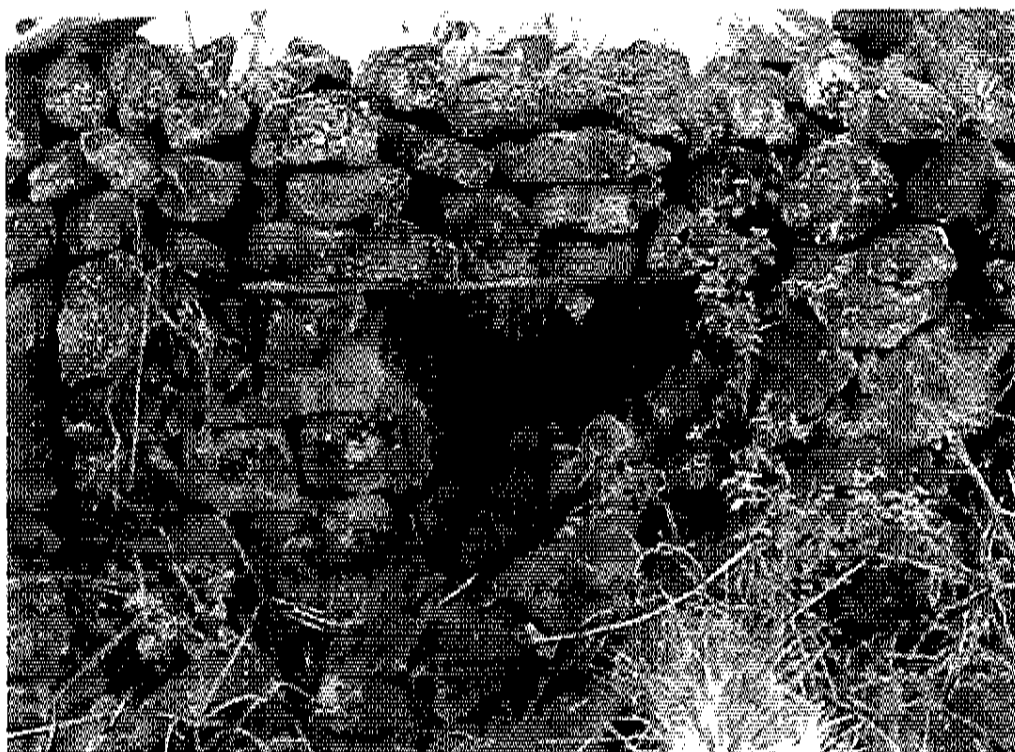
Site 18115 is an inland-seaward oriented stone wall that forms a portion of the southern project area boundary. The wall has been recorded by Barr et al. (1994) and Robins et al. (1998). The portion of the wall within the project area enters the parcel at c. 1,015 ft elevation and extends upslope to the east-northeast a distance of 30.5.0 m to the 1,050 ft elevation (see *Figure 7*). The wall continues outside the project area in this direction. Robins et al.'s (1998) examination of the wall indicates it continues to the c. 1,230 ft elevation.

The portion of the wall within the project area is built of stacked cobbles and small boulders, ranging in width at the base from 0.85 to 1.0 m and at the top from 0.7 to 0.85 m. The majority of the wall is intact, ranging in height from 0.8 to 1.2m, with some areas of collapse. The interior of the wall is narrowly core-filled with small cobbles. A pig gate is located in the Site 18115 wall at c. 1,180 ft elevation (*Figure 8*). This gate is comprised of a prepared opening through the base of the wall that permits pigs to pass through the wall. This opening is 0.6 m wide and 0.5 m tall.

Site 18115 is interpreted as a livestock control feature designed to restrict the movement of cattle based on its height and method of construction. The wall is unaltered and in fair to good condition.

### **Site 18726**

Site 18726 consists of an historic cart path located along the southern project area boundary, north of the Site 18115 wall (see *Figure 7*). This wall was previously identified by Barr et al. (1994) during a survey of a parcel seaward of the present project area. An intact portion of the cart path within the current project area was noted at c. 1,035 ft elevation, extending upslope to the east-northeast a distance of 105.0 m where it terminates at c. 1,085 ft elevation. The inland end of this section ends at Feature BJ of the Site 24397 complex (discussed below), which consists of a north-south oriented stone wall.



**Figure 8. Pig Gate in Site 18115 Wall, view to south**



**Figure 9. Site 18726 Cart Path with Site 18115 wall in background, view to southwest**

The portion of the cart path in the project area consists of a stacked cobble and small boulder wall located 2.5 to 3.5 m north of the Site 18115 wall. Large portions of the wall have collapsed, though intact faced sections were noted, ranging in height from 0.75 to 1.25 m on the north side and 0.5 to 0.7 m on the south side (*Figure 9*). The surface of the path is comprised of sloping soil, exposed bedrock and areas of rough cobble pavement. No cultural remains were found in association with the path. Additional intact sections of the cart path were noted seaward of the present project area by Barr et al. (1994) and by Haun & Associates (in prep).

Site 18726 is interpreted as an historic inland-seaward transportation route based on its orientation and formal type. Barr et al. suggest that the path, "was a travel route used by the Japanese homesteads in the area, presumably connecting to Palani Road or Mamalahou Road at one time" (1994:103). No evidence of the cart path was noted inland of Feature BJ and no remains were present between the seaward end of the intact section and the western project area boundary. This may indicate that the path pre-dates the historic portion of the Site 24397 complex in this area, with the stones from the path removed to construct the agricultural features. The site is altered and in poor to fair condition.

### Site 24374

Site 24374 is a stone wall that forms a portion of the southern project area boundary, then angles to the north, paralleling the inland project area boundary (see *Figure 7*). The wall is built of stacked cobbles and small boulders, ranging in width at the base from 1.0 to 1.2 m and at the top from 0.8-0.9 m, with a core-filled interior of small cobbles (*Figure 10*). The majority of the wall is intact with only minor collapse, ranging in height from 0.75 to 1.2 m.

The southern end of the wall originates at the northern end of a barbed wire fence at c. 1,150 ft elevation. This wire fence extends to the south, terminating along the north side of the Site 18115 wall. The wall extends to the north-northwest from the fence a distance of 48.5 m, where it encounters a 90 degree corner. The wall turns to the east-northeast at this corner and extends in this direction for 174.0m, to the 1,230 ft elevation. There are two pig gates in this section, similar to the one noted in the Site 18115 wall. At the inland end of this section, the wall angles to the north-northeast for 37.5 m, then turns to the north for 173.0 m where it terminates against a modern stone wall bordering a house at c. 1,308 ft elevation.

Site 24374 is interpreted as an historic livestock control feature used to restrict the movement of cattle. This is based on its height and method of construction. The wall is unaltered and in fair to good condition.

### Site 24375

Site 24375 is a stone wall that forms the inland boundary of the project area, seaward of Palani Road at elevations ranging from 1,265 to 1,335 ft (see *Figure 7*). The wall is constructed of stacked cobbles and small boulders, ranging in width at the base from 0.85 to 1.1 m and at the top from 0.6 to 0.8 m (*Figure 11*). The wall evidences a core-filled interior of small cobbles. The wall is generally intact with minor wall collapse noted. No cultural remains were present.

The wall enters the project area at the southeast corner. The wall extends to the south-southeast outside the project area an undetermined distance. From the southeast corner, the wall extends to the north-northwest for 27.7 m where it angles to the west-northwest for 11.2 m. The wall then turns back to the north-northwest for 106.4 m. At this point the wall turns to the west-northwest for 8.5 m. The inland end of the Site 24376 wall (discussed below) abuts this intersection. At this intersection, the wall angles back to the north-northwest and extends in this direction for 71.5 m where it has been truncated by a modern wall surrounding a house. The wall continues on the northern side of the house lot, extending to the north-northwest for 66.0 m where it terminates against a modern stone wall that borders the intersection of Palani Road and Hina Lani Street.

Site 24375 is interpreted as an historic livestock control feature used to restrict the movement of cattle, based on its height and method of construction. This wall, along with Site 24374 and 24376 form



Figure 10. 24374 Wall, view to southeast



Figure 11. Site 24375 wall, view to south



two enclosures seaward of Palani Road that range in length from 68.5 to 138.5 m and in width from 25.0 to 66.0 m. The southern end of the south enclosure is bordered by a barbed wire fence. Site 24375 is altered and in fair condition.

### **Site 24376**

Site 24376 is a section of wall that extends between the Sites 24374 and 24375 walls at c. 1,284 to 1,290 ft elevation. The wall is 22.9 m long (east-west) and ranges in width from 1.0 to 1.2 m at the base and 0.6 to 0.8 m at the top. The wall has a core-filled interior and is generally intact, ranging in height from 0.8 to 1.1 m. A 2.5 m long wooden gate is located in the center of the wall. No cultural remains were present. Site 24376 is interpreted as an historic livestock control feature used to restrict the movement of cattle, based on its height and method of construction. As stated, this wall serves as a division wall that separates two large enclosures. It is unaltered and in fair condition.

### **Site 24377**

Site 24377 consists of a stone wall that forms the northern boundary of the project area. This wall is situated on the boundary between Kaloko to the north and Honokohau I to the south. The wall enters the project area on the inland side of a metal gate at the south end of Halolani Street at c. 1,050 ft elevation. The wall continues downslope out of the project area to the west-southwest. The wall extends from the gate to the east-northeast a distance of 480.0 m where it terminates at a small chain-link enclosure at c. 1,312 ft elevation adjacent to Hina Lani Street. A modern mortared stone wall continues inland from the east side of the chain-link enclosure, replacing the Site 24377 wall. This modern wall terminates at the northern end of the Site 24375 wall that parallels Palani Road.

Site 24377 is constructed of stacked cobbles and small boulders, with near vertical sides and a core-filled interior of cobbles. The wall ranges in width at the base from 0.85 to 1.0 m, from 0.5 to 0.7 m at the top and in height from 0.85 to 1.3 m. Portions of the wall are intact though sections have been impacted by house construction and landscaping activity associated with a housing development to the north of the project area. Site 24377 is interpreted as an historic livestock control feature designed to restrict the movement of cattle based on its height and method of construction. Its location on the boundary between Kaloko and Honokohau I indicates it also functioned as an historic land division marker. The wall is altered and in fair to good condition.

### **Site 24378**

Site 24378 is an oval-shaped enclosure constructed around the edge of vertical sinkhole, located in the northwestern portion of the project area at c. 1,056 elevation. The enclosure is 5.15 m long (north-south) and 4.5 m wide (east-west) with a wall built of stacked cobbles and small boulders (*Figure 12*). The wall is constructed of stacked cobbles and small boulders and is 0.52 to 0.87 m in width and 0.25 to 0.75 m in height. There is no entrance into the interior of the enclosure.

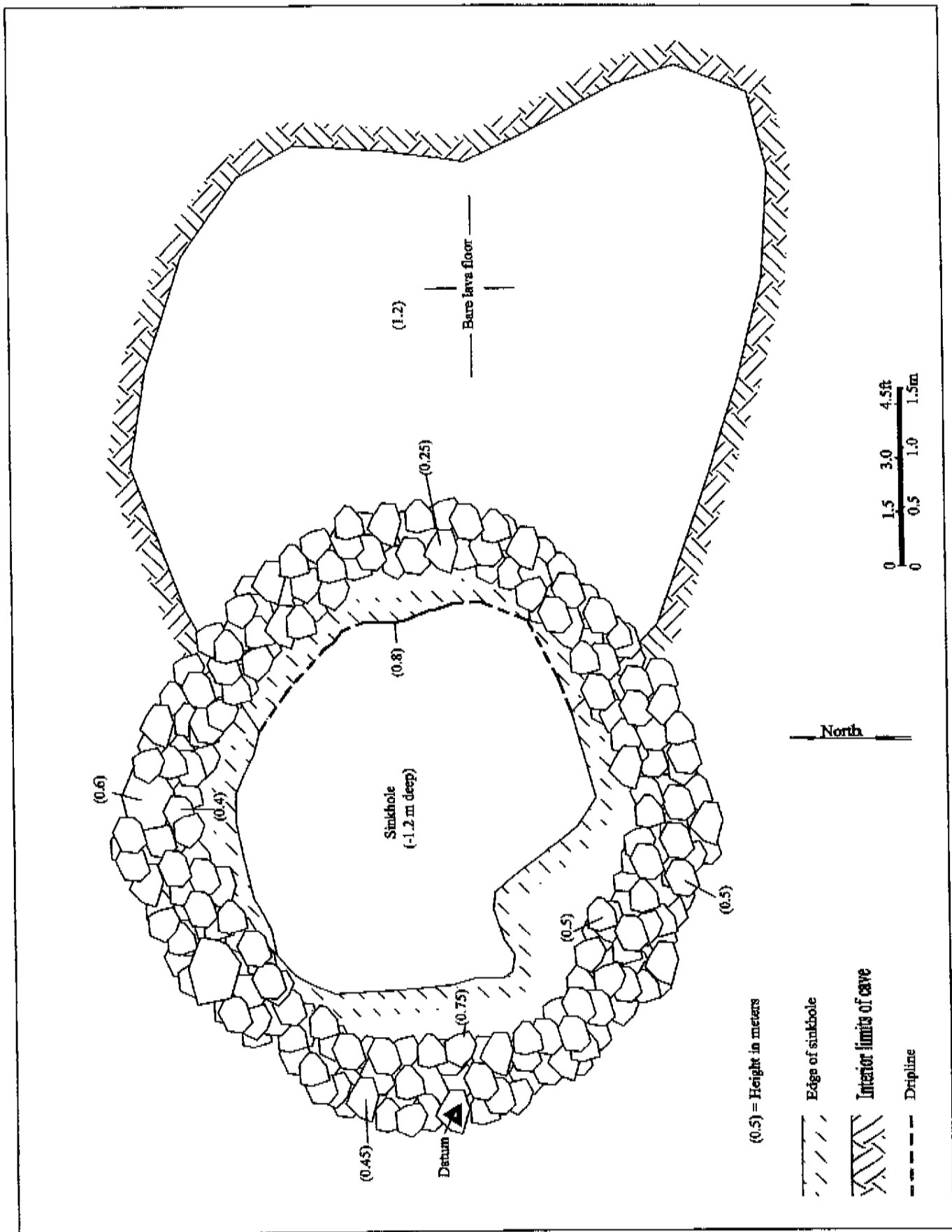
The sinkhole is 3.3 m in length (east-west), 2.4 to 2.8 m in width and 1.2 m in depth below the surrounding ground surface. The entrance to a small cave is situated on the eastern side of the sinkhole. This entrance is 2.7 m wide and 0.8 m in height. The interior of the cave is roughly oval-shaped and is 3.9 to 4.8 m long (east-west) and 5.0 m wide. The floor of the cave is comprised of bare lava and the ceiling height averages 1.2 m. No cultural remains were found at the site.

Site 24378 is interpreted as an historic livestock control feature designed to prevent cattle from falling into the sinkhole. This is based on the location of the wall around the sinkhole perimeter and the absence of cultural remains within the sinkhole and cave. The site is unaltered and in good condition.

### **Site 24379**

Site 24379 is a large lava tube with two entrances located in the northwestern portion of the project area at elevations ranging from 1,073 to 1,109 ft. The inland entrance (Feature A) consists of an oval-shaped, rubble filled sinkhole that is 11.2 m long (northwest by southeast), 10.5 m wide and 1.9 m in depth,





located at c. 1,105 ft elevation (*Figure 13*). A chamber extends to the southwest from the sinkhole, with an entrance that is 8.6 m wide and 1.55 m in height. The chamber is 29.7 m long and from 1.3 to 9.3 m wide, with ceiling heights that range from 0.9 to 2.7 m. The floor of this chamber is comprised of bare lava with an area of sloping roof fall at the western end. Two fragments of *Cypraea sp.* shell are located 2.5 m west of the Feature A entrance, and a concentration of charcoal is located on the cave floor 8.9 m to the southwest of the shells. No other cultural remains were present in this chamber.

The Feature B entrance is located at the western end of the Feature A chamber at c. 1,083 ft the elevation. The entrance consists of a rubble filled sinkhole that is oval in shape and is 9.3 m long (north-west by southeast), 3.5 m wide and 2.6 m in depth. The entrance into the Feature B chamber is located at the southern end of the sinkhole, measuring 8.9 m wide and 1.1 m in height. The chamber is irregular-shaped and is 20.8 m long (east-west) and from 1.45 to 9.9 m wide, with ceiling heights ranging from 0.8 to 1.4 m. The floor of this chamber consists of bare lava with areas of roof fall in the center of the chamber and at the western end. A fragment of weathered marine shell is present on the cave floor 2.5 m south of the dripline and a small bird bone awl is located 5.1 m to the west-northwest. A fragment of *Cellana sp.* shell is present on the central pile of roof fall.

Site 24379 is interpreted as a temporary habitation site based on its formal type and the presence of the cultural remains. The site is unaltered and in good condition.

### Site 24380

Site 24380 is a large lava tube located in the northwestern portion of the project area at elevations ranging from 1,109 to 1,161 ft. The entrance to the cave is comprised of a vertical sinkhole that is 6.5 m long (north-south) and 6.1 m wide (*Figure 14*), located at c. 1,151 ft elevation. The floor of the sinkhole is 4.5 m in depth below the surrounding ground surface and is filled with rubble and historic debris. This debris is comprised of a green glass Canada Dry bottle, four clear glass Gordin's Gin bottles, a brown glass Walker's whiskey bottle, three clear glass jars, 20 brown, clear and green glass bottles with no markings, an enameled pot lid, and a tin oil can.

Passages extend to the east (Feature A) and west (Feature B) of the sinkhole. The entrance to the Feature A passage is 4.4 m wide and 1.55 m in height. This chamber is 18.7 m long (east-west) and from 4.2 to 6.7 m wide and the floor is comprised of sloping rubble roof fall and bare lava. The ceiling height within the chamber varies from 2.0 to 5.4 m. A waterworn basalt pebble and the bones of a small mammal are located along the northern edge of the chamber, 5.9 m east of the entrance. A single human incisor tooth fragment, snapped off at the root line is present on a small boulder 6.7 m east of the entrance.

The entrance to the Feature B passage is 2.7 m wide and 0.6 m in height. This passage is 74.9 m long, oriented in a roughly east-west direction. The passage varies in width from 4.0 to 12.4 m, with ceiling heights that vary from 1.2 to 3.0 m. The floor throughout the passage consists of bare lava. Sloping rubble is located just west of the entrance, sloping down into the interior. A fragment of *Cypraea sp.* shell and a waterworn coral pebble are located at the base of the sloping rubble.

A 0.8 m diameter rock ring comprised of cobbles is located in the center of the passage 14.3 m west of the entrance. An area of roof fall is situated 6.5 m west of the rock ring. The passage is divided into two chambers .5 m west of the roof fall by a floor to ceiling column. This column is 8.8 m long and 1.7 to 3.4 m wide. A 1.0 m long by 0.6 m wide rock ring is located within the southern chamber, against the south wall of the cave.

A concentration of scattered charcoal and kukui nut shells is situated in the center of the cave, 4.5 m west of the western end of the column. These remains are situated in an area 3.1 m long by 2.5 m wide. A fragment of charcoal is present at the extreme western end of the passage on the cave floor.

Site 24380 is interpreted as a temporary habitation site. This is based on its formal type and the presence of the cultural remains. The kukui nuts, charcoal and rock rings suggest that the cave was used prehistorically, while the bottles and other debris within the sinkhole indicate an historic utilization. The

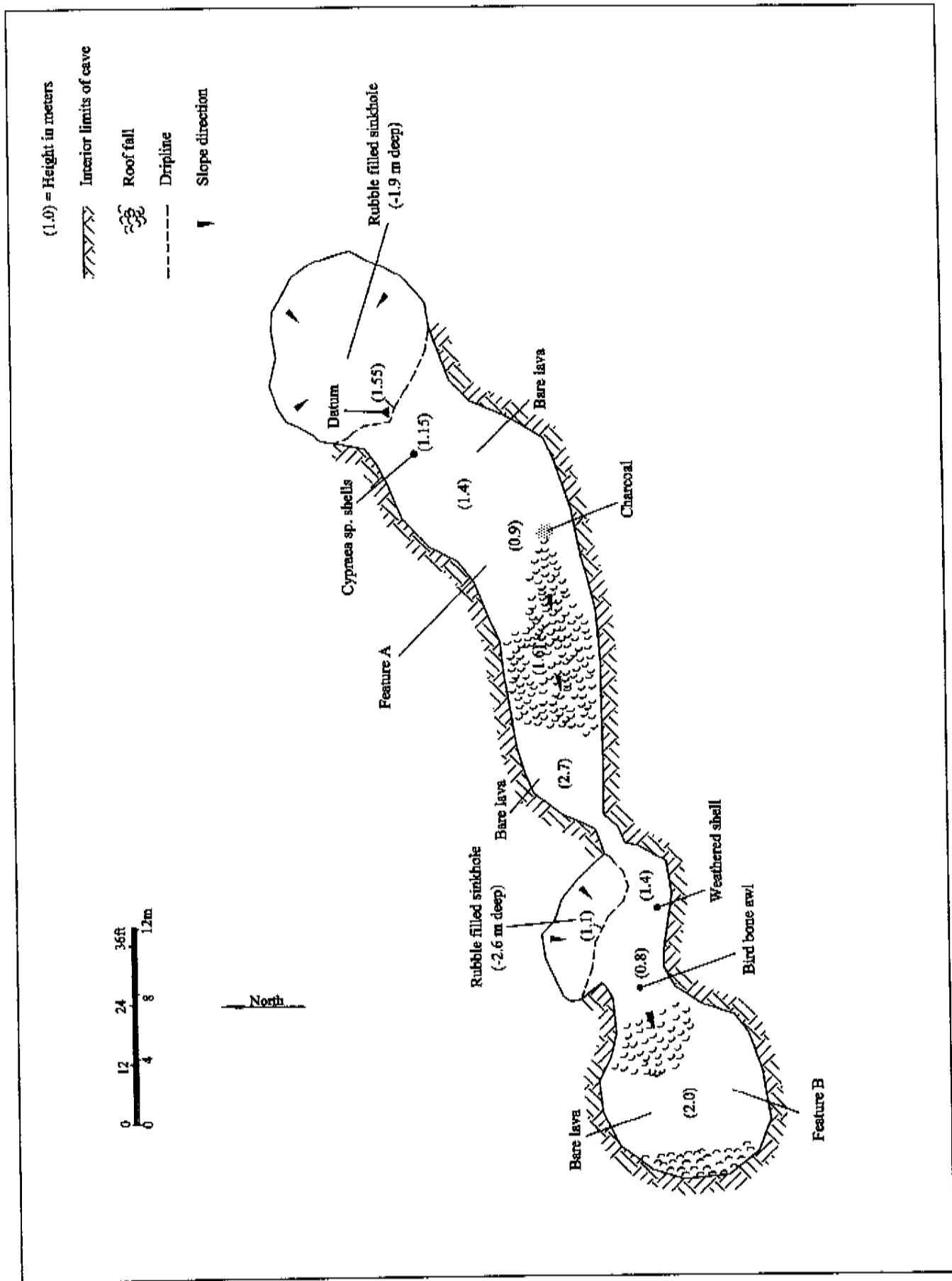


Figure 13. Site 24379 Plan Map

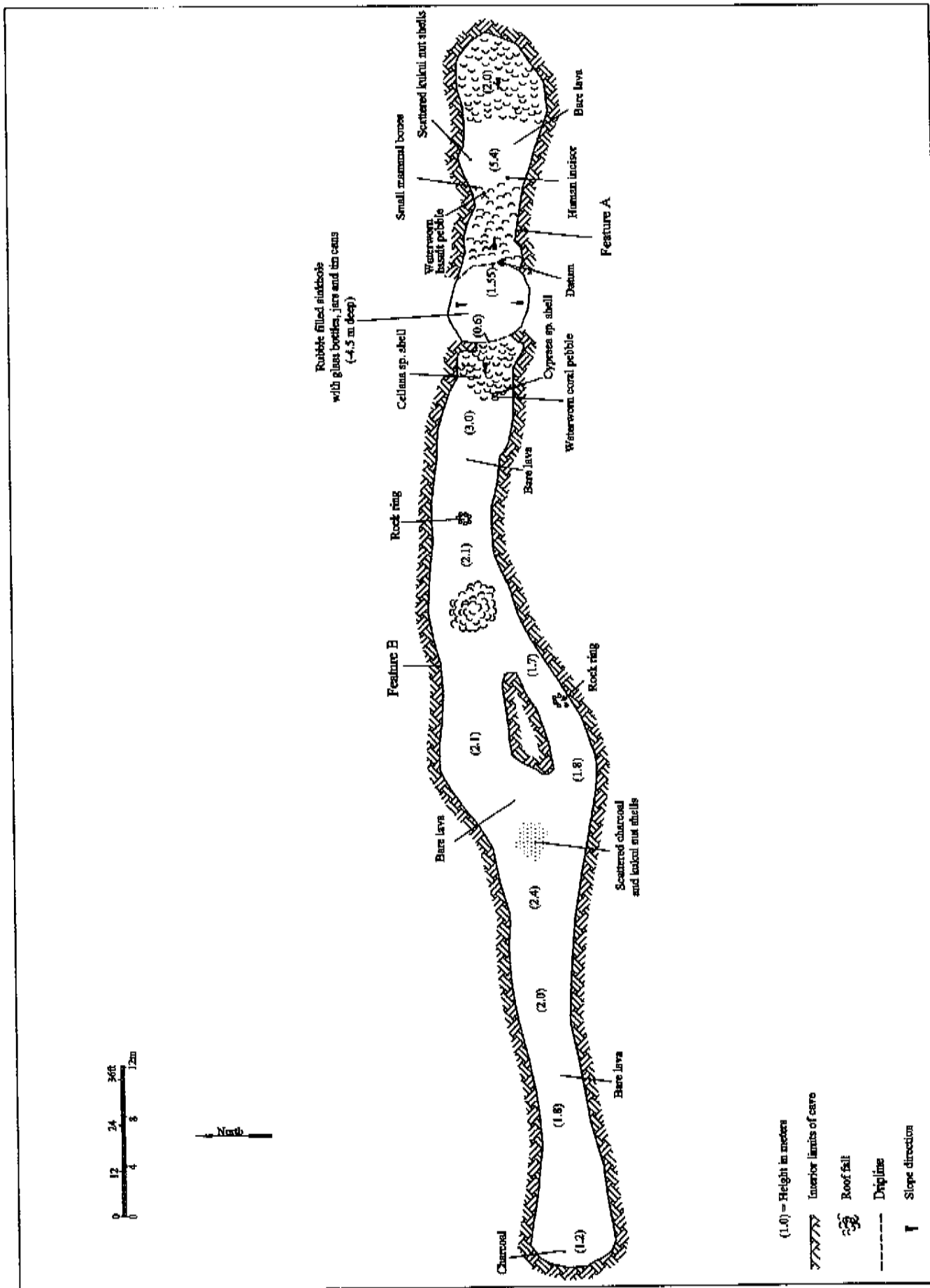


Figure 14. Site 24380 Plan Map

rock rings indicate the cave was also used as a water source, with the rings used to support gourds in which drip water would accumulate. The site is unaltered and in good condition.

DLNR-SHPD Burial Sites Program staff were consulted on February 16, 2005 regarding the human tooth noted in the eastern passage. As the tooth was snapped off cleanly at the root line it was determined that it was likely deposited in its current location after someone fell down the sloping rubble entrance. The tooth was collected and is being temporarily curated by SHPD.

### **Site 24381**

Site 24381 is a lava tube located in the north-central portion of the project area at elevations ranging from 1,162 to 1,211 ft. The entrance to the cave is comprised of a vertical sinkhole that is 14.8 m long (north-south) and 14.4 wide (*Figure 15*), located at c. 1,165 ft elevation. The floor of the sinkhole is 2.5 m in depth below the surrounding ground surface and is filled with rubble. There is a small opening at the base of the sinkhole along the eastern side that is 3.0 m wide and 0.8 m deep. This opening leads to linear chamber with an overall length of 105.0 m, oriented in a roughly northeast by southwesterly direction. The chamber varies in width from 3.0 to 8.3 m and in height from 1.3 to 3.5 m. The majority of the tube floor is comprised of bare lava though several areas of roof fall were noted.

The western end of the chamber consists of an area of sloping rubble that angles down into the tube a distance of 12.0 m from the small opening. A small tube extends to the south, 2.2 m east of the opening. This tube is 2.1 m long (north-south), 0.8 to 1.0 m wide and 1.1 m in height. A second area of roof fall is located in the center of the tube 3.0 m further east. A 0.8 m diameter rock ring comprised of aligned cobbles is located on the bare lava floor against the north wall of the tube, 3.5 m northeast of the second roof fall pile. A concentration of surface charcoal is located in the center of the cave, 2.5 m northeast of the rock ring. This concentration is 4.0 m long and 3.5 m wide.

Two adjacent rock rings are located near the north wall of the tube, 17.5 m northeast of the charcoal concentration. These rings are 0.9 to 1.0 m long and 0.5 to 0.65 m wide. Another rock ring is situated against the south tube wall directly south of the two adjacent rings. This ring is 0.8 m long and 0.6 m wide and contains a large amount of charcoal, indicating it likely functioned as a hearth.

An area of sloping roof fall is located 4.0 m east of the hearth, angling down to the west. The area to the south and southeast of the roof fall consists of a surface scatter of charcoal. Three rock rings are situated on the surface of this charcoal scatter. These rings range in length from 0.6 to 1.0 m and in width from 0.4 to 0.6 m. Another rock ring is located adjacent to the south tube wall, 6.5 m east-northeast of the charcoal scatter on the bare lava floor. This ring is 0.5 m in diameter. An isolated fragment of charcoal was noted on the tube floor 12.6 m northeast of the rock ring. No other cultural remains were observed within the cave.

Site 24381 is interpreted as a temporary habitation cave based on its formal type and on the presence of the cultural remains and modifications. The charcoal and hearth feature suggest that the tube was used as a shelter and the rock rings indicate it also functioned as water source. Site 24381 is unaltered and in good condition.

### **Site 24382**

Site 24382 is a large lava tube located in the northeastern portion of the project area at elevations ranging from 1,197 to 1,325 ft. The tube has two sinkhole entrances; one situated at the western end of the site (Feature A), and one located 43.5 m to the east-northeast (Feature B; *Figure 16*). The majority of the tube is situated within the project area, though the inland portion exits the parcel at the c. 1,265 ft elevation continuing to the east under Hina Lani Street.

The Feature A entrance is situated at c. 1,197 elevation. This rubble-filled sinkhole is 15.5 m long (east-west), 8.8 m wide and 3.5 m in depth. An overhang is located along the northern side of the sinkhole,

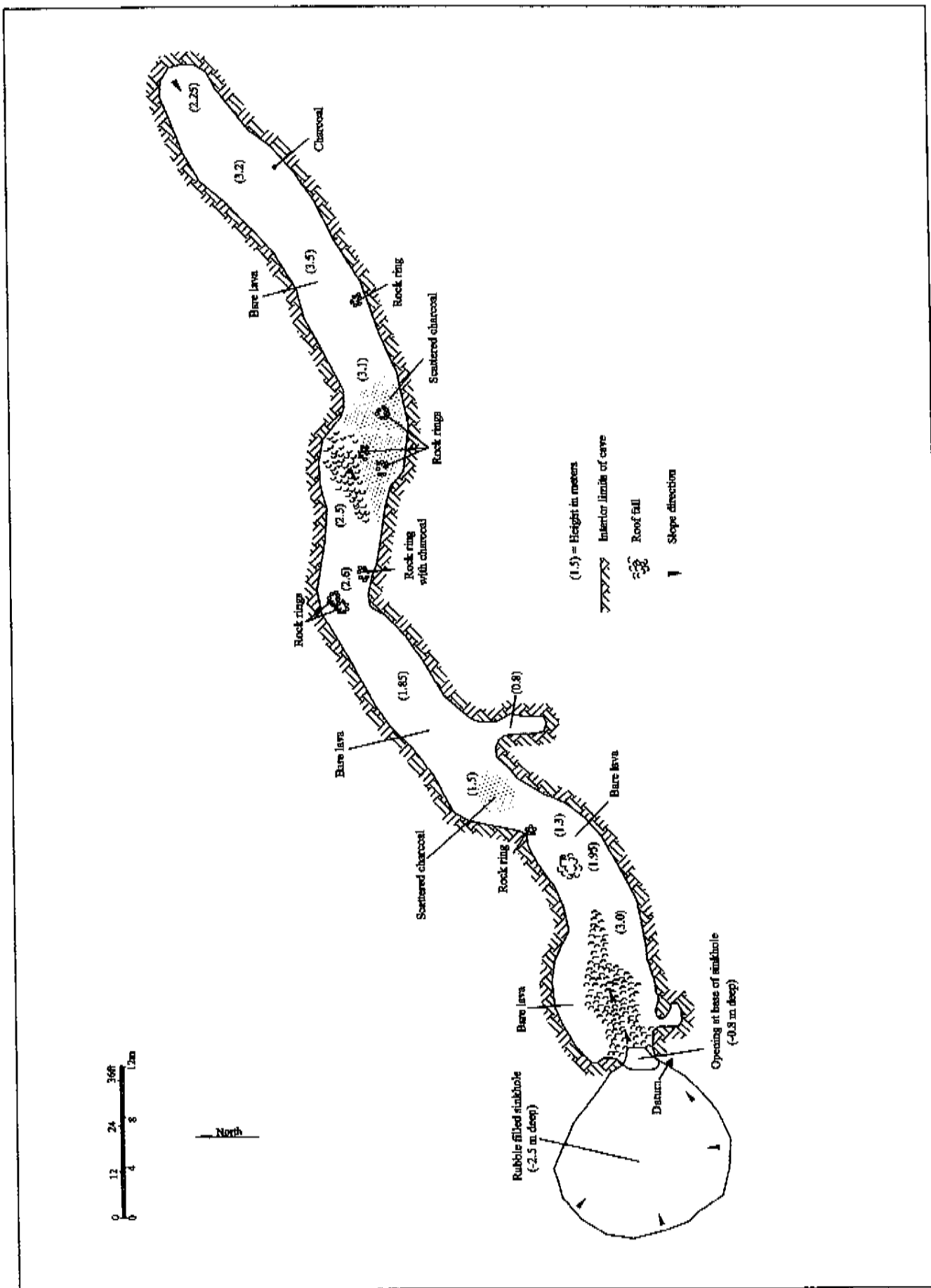


Figure 15. Site 24381 Plan Map

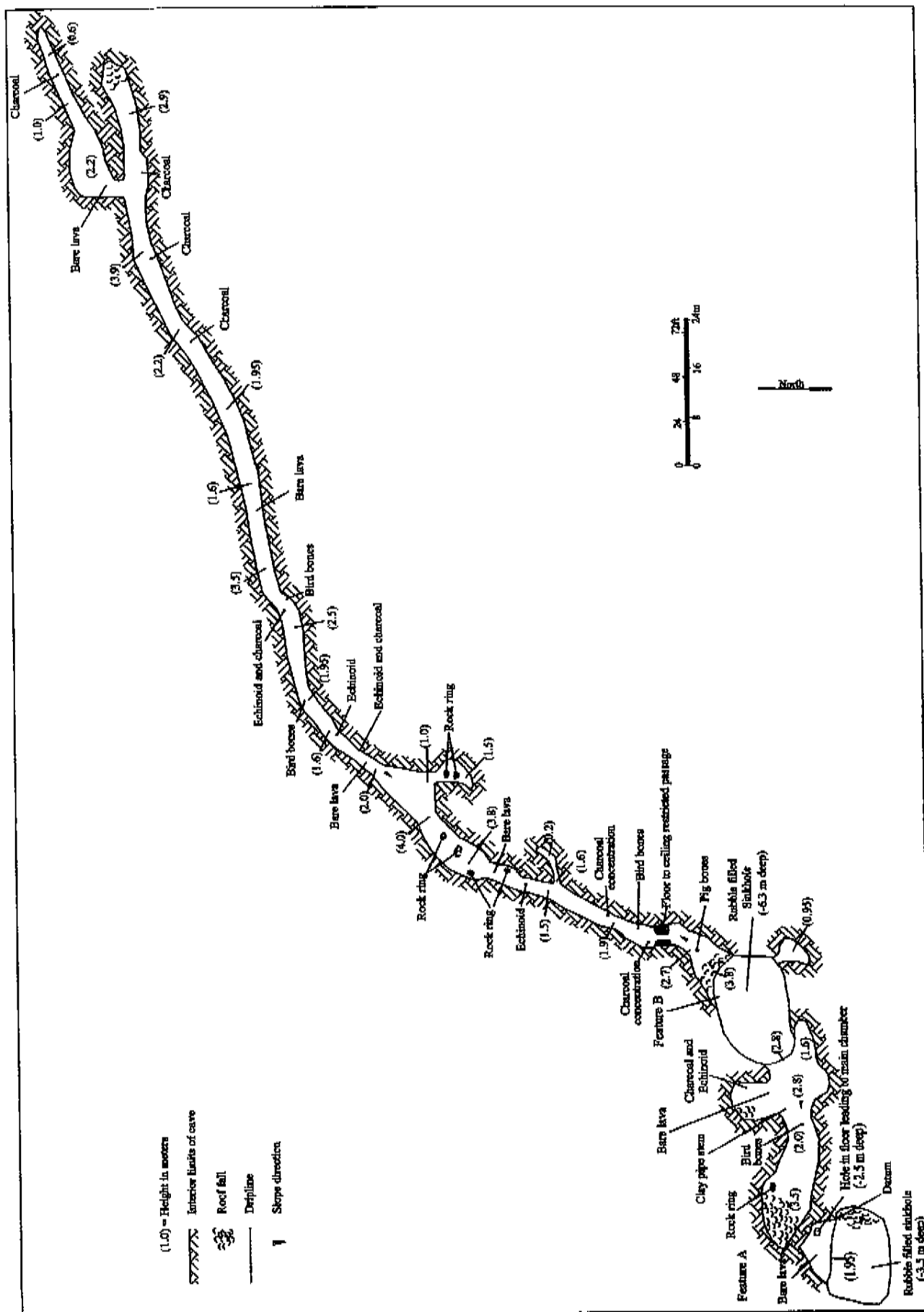


Figure 16. Site 24382 Plan Map

with an entrance that is 10.6 m wide and 1.95 m in height. The interior of the overhang is 10.6 m long (east-west) and 4.4 m wide, with a bare lava floor and no cultural remains.

There is a hole in the lava floor of the overhang that is 1.0 m long, 0.6 m wide and 2.5 m in depth, that opens a large chamber that extends between Features A and B. This chamber is irregular in shape and is 29.3 m long (east-west) and from 4.4 to 16.0 m wide, with ceiling heights that range from 1.6 to 3.5 m. The Feature B sinkhole is situated at the eastern end of the chamber. An area of roof fall is located at the northwestern end of the chamber, with the remaining portion of the floor comprised of bare lava.

A rock ring (1.1 m long by 0.5 m wide) is located on the cave floor 10.6 m northeast of the entrance hole. A concentration of unidentified small bird bones are located in the center of the cave floor 11.5 m southeast of the rock ring and a clay pipe stem is situated 4.0 m northeast of the bird bones. A concentration of *echinoid* and charcoal is located at the northeast end of the chamber, 3.5 m northeast of the pipe stem.

The Feature B sinkhole is rubble filled and is 18.6 m long (east-west), 11.5 m wide and 6.3 m in depth, with near vertical sides. This entrance is located at c. 1,225 ft elevation. A small, non-cultural cave is located at the southeast end of the sinkhole, with a 1.3 m wide by 0.8 m tall entrance, leading to an oval chamber that is 5.7 m long (northeast by southwest), 2.6 m wide, with a bare lava floor and an average ceiling height of 0.95 m.

A lava tube extends to the northeast from the Feature B sinkhole, accessed through an opening that is 8.8 m wide and 3.8 m in height. This tube evidences an overall length of 202.5 m, oriented in a north-northeast and northeasterly direction. This tube varies in width from 1.75 to 6.2 m with ceiling heights that range from 1.0 to 4.0 m. The floor at the entrance to this chamber is comprised of sloping rubble that angles down to the northeast. With the exception of an area of roof fall at the northeast end of the tube, the floor is comprised of bare lava.

A concentration of pig bone is located in the center of the tube 5.3 m northeast of the entrance. A floor to ceiling wall is built across the tube 6.2 m to the north-northeast of the pig bones. This wall is partially collapsed and appears to have been breached in the past. The wall is 2.3 m thick with an 0.8 m wide and 0.8 m high opening in the center just below the cave ceiling. The sides of the opening are not faced and it appears to be the result of dismantling the wall to gain access to the formerly sealed portion of the tube. A concentration of charcoal is located just north of the wall and a concentration of unidentified small bird bone is located 2.6 m northeast of the charcoal. A second charcoal concentration is located 5.3 m north-northeast of the bird bones.

A small side tube extends to the east, 19.5 m north-northeast of the wall. This tube is 6.6 m long, 1.3 m wide with a 1.6 m tall ceiling that tapers down to 0.2 m at its eastern end. No cultural remains were present in this tube. Fragments of *echinoid* are located in the center of the main tube, 4.4 m north of the side tube entrance. A series of four rock rings are situated to the north-northeast of the *echinoid*, ranging in length from 0.8 to 1.6 m long and in width 0.6 to 0.8 m.

A second side tube extends to the south from the main chamber, 26.0 m north-northeast of the first. This tube is 5.3 m long, 3.0 to 3.5 m wide and 1.0 to 1.5 m in height. Two rock rings each measuring roughly 1.0 m long by 0.6 m wide are present in this side tube.

A concentration of *echinoid* and charcoal are located along the east side of the tube 8.5 m north-northeast of the entrance to the side tube, with a second *echinoid* cluster located 4.8 m further to the north-east. Unidentified small bird bones are located 7.1 m to the northeast of the second *echinoid* cluster, and a concentration of *echinoid*, charcoal and bird bone are situated 14.6 m further east-northeast. The tube continues in a roughly east-northeasterly direction for 71.3 m from the bird bones, where the main tube divides into two chambers, one extending to the east and one to the north. Two clusters of charcoal on the bare cave floor were noted between the bird bones and the division.



The eastern passage is 19.5 m long (east-west), 2.6 to 3.0 m wide and 2.9 m wide. A concentration of charcoal is present on the floor at the west end of this passage. The eastern end terminates in an area of roof fall. The northern passage extends in this direction for 4.5 m, then angles to the east-northeast for 26.6 m where it terminates. This passage is 1.7 to 6.2 m wide and 1.0 to 2.2 m in height. A concentration of charcoal was noted on the bare lava floor near the east end of this passage.

Site 24382 is interpreted as a temporary habitation cave based on its formal type and on the presence of the cultural remains and modifications. The rock rings indicate it also functioned as water source. The presence of the clay pipe stem indicates the cave was used historically, with the remainder of the cultural remains suggesting a prehistoric occupation. Site 24382 is unaltered and in good condition.

### **Site 24383**

Site 24383 consists of a small cave located at the northern end of a sinkhole in the west-central portion of the project area at the c. 1,090 ft elevation. The sinkhole is oval in shape and is 12.4 m long (north-south), 4.75 to 7.4 m wide and 1.0 to 2.2 m in depth below the surrounding ground surface (*Figure 17*). No cultural remains were present inside the sinkhole.

The cave is situated at the north end of the sinkhole, accessed through an entrance that is 3.9 m long (east-west) and 2.1 m in height. The interior is irregularly-shaped and is 3.0 to 5.9 m long (north-south) and 2.7 to 5.1 m wide. The floor of the cave is comprised of a thin soil over bedrock with the ceiling heights ranging from 1.2 to 1.9 m. A single *Cypraea sp.* shell was present inside the cave at the northern end.

A stacked cobble and small boulder wall is located at the southern end of the sinkhole, built against the near vertical, exposed bedrock sides. The wall is 0.9 to 1.2 m wide, 0.8 to 1.7 m in height on the interior side and 0.2 to 0.4 m in height on the exterior side (above the surrounding ground surface). No cultural remains were found in association with the wall.

Site 24383 is interpreted as a temporary habitation cave based on its formal type and on the presence of the marine shell. The function of the wall at the south end of the sinkhole is uncertain though it is unlikely to have been built to prevent cattle from entering the sinkhole due to its low exterior height. Site 24383 is unaltered and in fair condition.

### **Site 24384**

Site 24384 is a complex of three features located in the western portion of the project area at elevations ranging from 1,065 to 1,070 ft. The features are comprised of two enclosures (Features A and C) and a terrace (Feature B; *Figure 18*), located in an area of dense agricultural features. The site encompasses an area 18.0 m long (north-south) by 12.5 m wide.

Feature A is comprised of a double enclosure that is 8.3 m in length (northeast by southwest) and from 4.2 to 5.1 m with no apparent entrance. The northeastern compartment is 5.3 m long and 5.1 m wide with walls built of stacked cobbles and small boulders that range in width from 0.7 to 1.2 m and in height from 0.35 to 0.75 m. A vertical basalt slab is incorporated into the exterior wall of the enclosure along the southern side, measuring 0.45 m in height. The majority of the structure is intact, with some minor collapse along the north side.

The interior of the northeastern compartment is comprised of level soil with scattered cobbles with no cultural remains. A 0.5 by 0.5 m test unit (TU-110) was excavated within this compartment, revealing a single soil deposit over bedrock (see *Figure 18*). Layer I consisted of 0.12 to 0.15 m of a very dark brown (10YR 2/2) silt with 20% subangular basalt pebble, cobble and gravel inclusions. A single *Cypraea sp.* shell (1.2 grams) was recovered from this deposit.

The southwestern compartment abuts the northeastern compartment to the southwest, separated by a stacked cobble and small boulder retaining wall. The surface of the southwestern compartment is 0.6 to

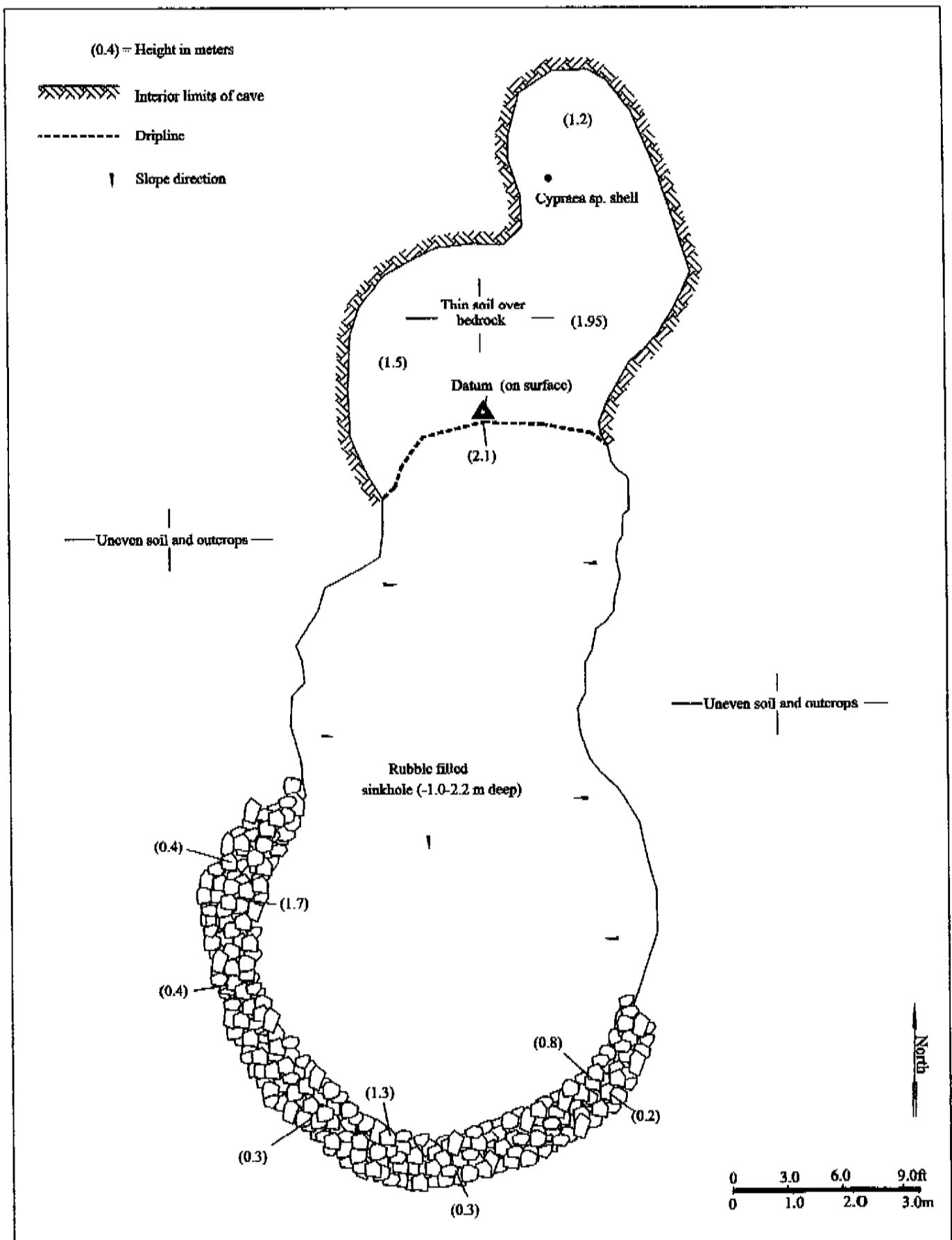


Figure 17. Site 24383 Plan Map

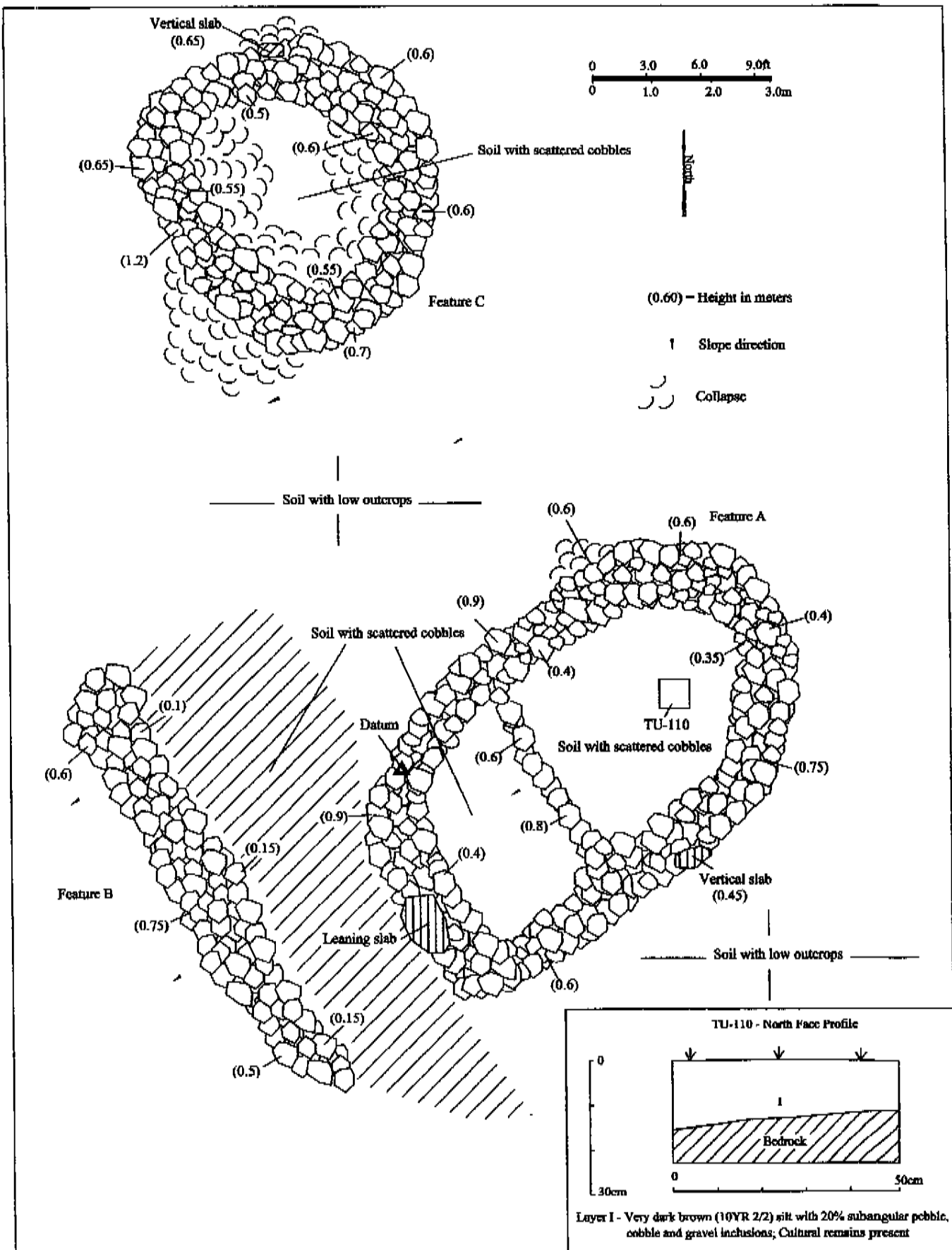


Figure 18. Site 24384 Plan Map and TU-110 North Face Profile

0.8 m below the surface of the northeast compartment, and is comprised of soil with scattered cobbles. The compartment is 5.0 m long (northwest by southeast) and 3.4 m wide with walls also built of stacked cobbles and small boulders. These walls range in width from 0.85 to 1.0 m and in height from 0.4 to 0.9 m. A leaning basalt slab is incorporated into the exterior side of the enclosure at the southwestern end. No cultural remains were present.

The Feature B terrace is located adjacent to the Feature A enclosure to the west. A piled cobble and small boulder retaining wall extends along the southwestern side of the feature, measuring 8.3 m long (northwest by southeast) and 0.8 to 1.3 m wide. The southwestern, downslope side of the retaining wall is 0.5 to 0.75 m in height, with the upslope side ranging in height from 0.1 to 0.15 m. The surface of the terrace is comprised of level soil with scattered cobbles. No cultural remains were noted.

The Feature C enclosure is situated 6.0 m north-northwest of Feature A. The enclosure is roughly oval in shape and is 5.2 m long (north-south) and 5.0 m wide, with walls built of stacked cobbles and small boulders. These walls range in width from 0.95 to 1.15 m and in height from 0.5 to 1.2 m. A vertical basalt slab is incorporated into the exterior of the enclosure at the north end (0.65 m in height). The majority of the structure is intact though wall collapse is present on both the interior and exterior sides. The interior of the enclosure is comprised of a level soil deposit with scattered cobbles. No cultural remains were present.

The Feature A and C enclosures are interpreted as the foundation for permanent habitation structures based primarily on their large areas (Feature A – 42.3 sq m; Feature C – 26.0 sq m). The presence of slab-faced walls and the internal subdivision of Feature A are attributes of substantial construction. The Feature B terrace likely functioned as an ancillary feature which may have served as an associated work area. The site is unaltered and in fair condition.

## Site 24385

Site 24385 is a complex of two features located in an area of level soil and outcrops the southeastern portion of the project area at elevations ranging from 1,240 to 1,248 ft. The features consist of a large terrace with adjoining C-shape (Feature A) and an enclosure (Feature B). The site encompasses an area 35.0 m long (northwest by southeast) by 9.75 m wide (*Figure 19*). The site is unaltered and in good condition.

Feature A is a large roughly rectangular-shaped terrace and C-shaped wall located at the northwest end of the site. The feature evidences overall dimensions of 13.9 m long (northwest by southeast) by 2.9 to 4.4 m wide. The terrace portion of the feature is 10.4 m long (northwest by southeast) and from 2.9 to 4.4 m wide. A vertical stacked and faced retaining wall extends along the southwest and portions of the northwest and southeast sides of the terrace, ranging in height from 0.7 to 1.1 m. The remaining portion of the southeast side consists of a flat pahoehoe slab and two courses of stacked cobbles (0.25 m tall), with minor wall collapse. The remaining portion of the northwest side adjoins the C-shape portion of the feature. The northeast side is comprised of a single course alignment of cobbles and small boulders ranging in height from 0.1 to 0.15 m. The area inland of the terrace is comprised of level soil.

The surface of the terrace is comprised of a level pavement of flat slabs, cobbles and small boulders. A vertical slab (0.3 m in height) is located near the inland side of the terrace at the northern end. No cultural remains were noted on the surface.

Two 1.0 by 1.0 m test units (TUs 95 and 96) were excavated into the surface of the terrace. TU-95 was situated at the northwest end of the feature. This excavation revealed a stone architectural layer (Layer I), over a soil deposit (Layer II) over bedrock (see *Figure 19*). Layer I consisted of 0.56 to 0.68 m of loosely packed cobbles, slabs and small boulders with no cultural remains. The surface of the unit was partially capped by flat slabs. The Layer I deposit partially extended into the Layer II soil and no evidence was found to indicate that it had been built during more than a single construction episode.

The Layer II deposit consisted of 0.04 to 0.18 m of a black (10YR 2/1) silt with 30% subangular basalt cobble, pebble and small boulder inclusions. Cultural remains from Layer II consisted of a basalt

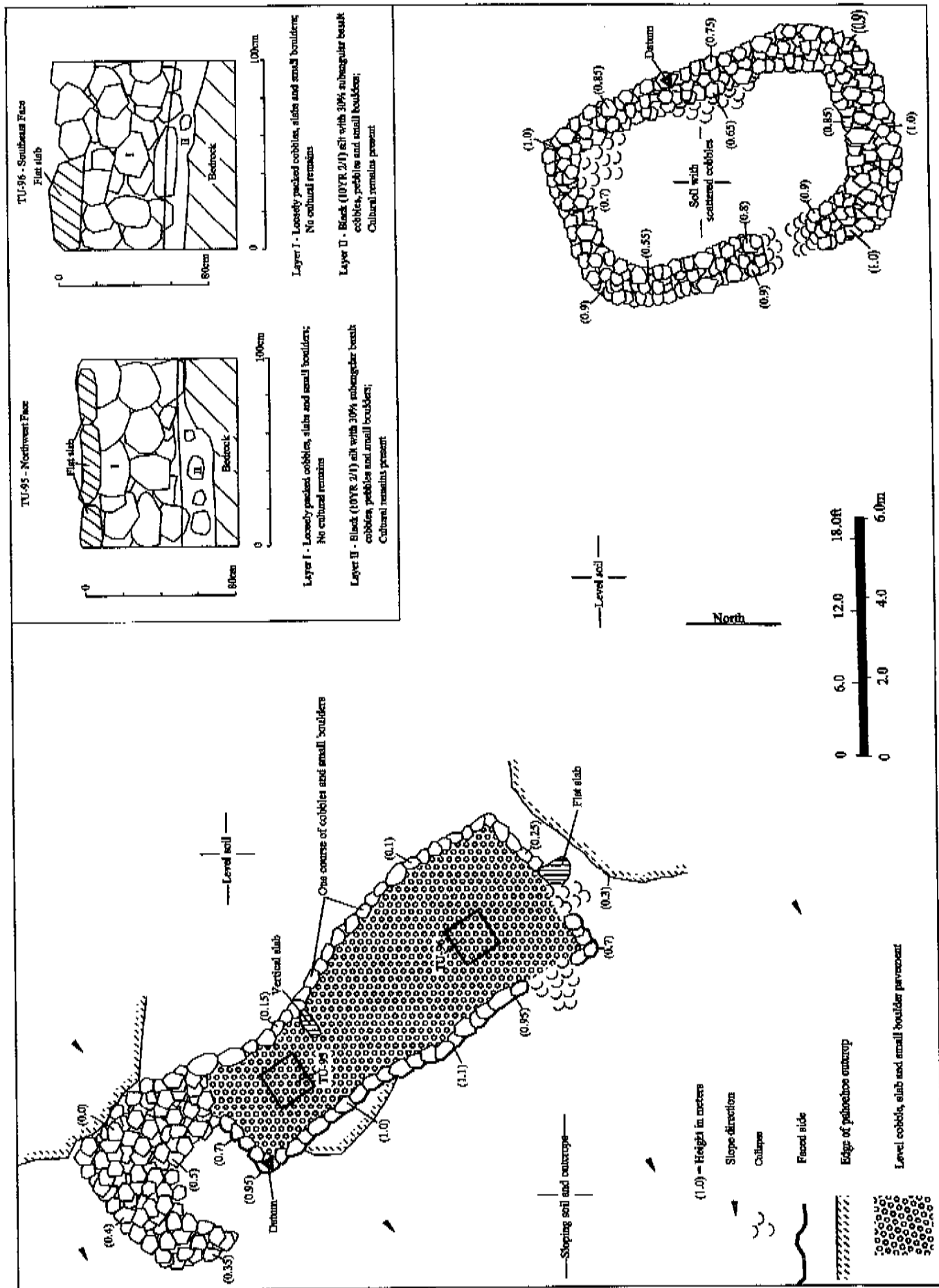


Figure 19. Site 24385 Plan Map and TUs 95 and 96 Profiles

flake (1.2 grams), a fragment of groundstone (2.1 g), a metal button with four 1.5 mm diameter holes (0.8 g), and what appears to be the handle for a metal utensil such as a fork or spoon. This measures 56mm long, 5 to 17mm wide and 1mm thick, weighing 7.0 grams.

TU-96 was located at the southeastern end of the terrace. This excavation revealed identical stratigraphy to that noted in TU-95 (see *Figure 19*) Layer I consisted of 0.59 to 0.67 m of loosely packed cobbles, slabs and small boulders with no cultural remains. Several flat slabs were also located on the surface of this unit. The Layer II deposit consisted of 0.1 to 0.16 m of a black (10YR 2/1) silt with 30% subangular basalt cobble, pebble and small boulder inclusions. Cultural remains from this deposit consisted of 33.9 grams of large chunks of charcoal, a metal strip (11.2 g), a fragment of clear bottle glass (2.5 g), a fragment of green bottle glass (1.3 g), a volcanic glass flake (0.4 g), and two small fragments of unidentified small mammal bone (5.5 g). Bedrock was encountered beneath the Layer II deposit.

A crude C-shaped enclosure abuts the northwest end of the terrace. This enclosure is 4.3 m long (northeast by southwest) and 2.3.6 m wide, with a 1.5 m wide opening along the western side. The walls vary in width from 0.9 to 2.2 m wide and from 0.35 to 0.5 m in height. The northeast side of the enclosure abuts a bare lava outcrop. The interior is comprised of level soil with no cultural remains.

Feature A is interpreted as an historic era house foundation. This is based on its large size and the presence of historic debris noted within the test units. The presence of the volcanic glass, groundstone and the basalt flake suggests that the structure may date to early in the historic era when indigenous tools were still in use. The C-shape at the northwest end of the terrace may have served as the foundation for an associated structure, such as a cook house.

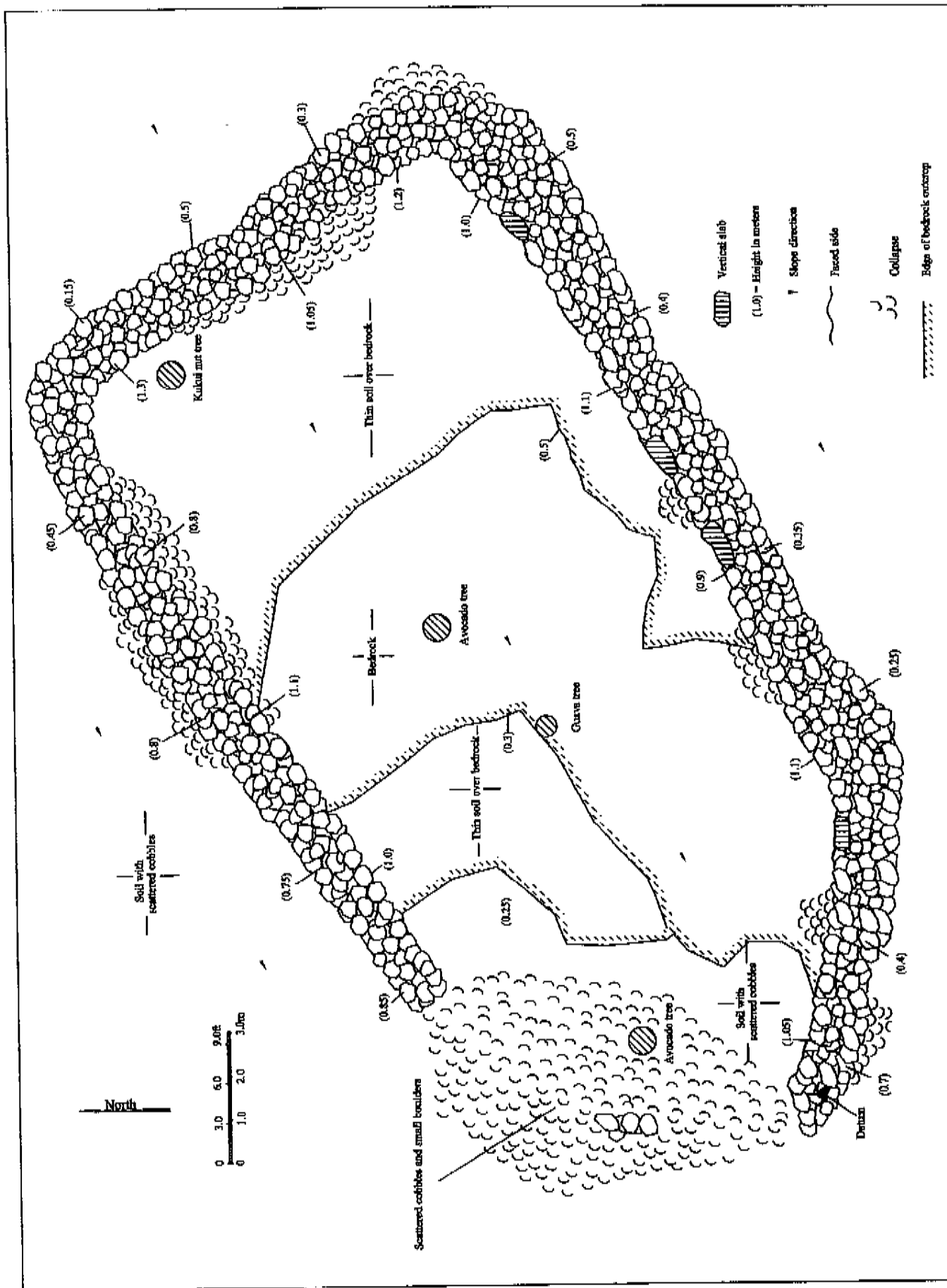
The Feature B enclosure is located 13.4 m southeast of Feature A. The enclosure is oval-shaped and is 8.6 m long (north-northwest by south-southeast) and 5.5 m wide. The walls are built of stacked cobbles and small boulders, ranging in width from 0.95 to 1.2 m and in height from 0.55 to 1.0m. There is a 1.3 m wide possible entrance into the interior along the western side of the enclosure. The interior floor of the enclosure consists of soil with scattered cobbles. Wall collapse is present along the interior east and northeast sides and at the possible entrance. Feature B is interpreted as an historic possible animal pen used in conjunction with the Feature A terrace. This is based on the height of the walls, the entrance and its spatial relationship with the terrace.

## Site 24386

Site 24386 is a large enclosure located in the south-central portion of the project area at elevations ranging from 1,180 to 1,193 ft. The structure is situated within a shallow swale or drainage that angles down to the southwest. The enclosure is roughly rectangular in shape and is 24.9 m long (northeast by southwest) and from 13.3 to 14.0 m wide (*Figure 20*). The walls are constructed of stacked cobbles and small boulders, with several vertical slabs incorporated into the south wall on the interior side. The walls range in width from 1.0 to 2.1 m and in height from 0.25 to 1.3 m. The majority of the structure is intact though wall collapse is present on the interior and exterior sides.

An area of scattered cobbles and small boulders is located at the western end of the enclosure, possible representing the remnant of an entrance. The interior floor of the enclosure consists of area of exposed bedrock or thin soil (0.05 m thick based on probes) over bedrock. No cultural remains were present. A *Kukui* nut tree, two avocado trees and a guava tree are growing inside the enclosure.

Site 24386 is interpreted as a probable livestock control pen. This is based on its large size, the height and width of the walls and the possible entrance at the western end. The site is unlikely to represent a house enclosure due to the absence of habitation debris and internal surface structures, or an agricultural enclosure due to the paucity of soil. The site is unaltered and in fair condition.



## Site 24387

Site 24387 is a well-built rectangular enclosure located in the south-central portion of the project area at c. 1,166 to 1,171 ft elevation. The enclosure is 7.6 m in length (east-northeast by west-southwest) and 7.15 m wide, with walls built of stacked cobbles and small boulders (*Figure 21*). The walls range in width from 0.8 to 1.25 m and in height from 0.25 to 1.2 m, with a 2.9 m wide opening in the center of the western wall. Large portions of the enclosure walls have collapsed though intact, faced sections are present on the exterior north side, on portions of the exterior west side and at the interior northwest corner. The ground surface slopes to the west outside the entrance.

The interior of the enclosure is comprised of a level soil deposit with scattered surface cobbles. No cultural remains were observed. A 1.0 by 1.0 m test unit (TU-107) was excavated within the interior of the structure, revealing a single soil deposit over bedrock (see *Figure 21*). Layer I consisted of 0.63 to 0.71 m of a very dark brown (10YR 2/2) silt with 60% subangular basalt cobbles and small boulder inclusions. Cultural remains from this deposit consisted of 20.8 grams of charcoal, one *Cypraea* sp. shell (1.5 g), two pig teeth (2.2 g), three waterworn basalt pebbles (19.2 g), and one fragment of waterworn coral (1.1 g).

Site 24387 is interpreted as a permanent habitation, ancillary feature which functioned as a yard surrounding a pole and thatch roofed house. This is based on its formal type, substantial construction (faced sides) and large area (53.9 sq m). The site is unaltered and in fair condition.

## Site 24388

Site 24388 is a large roughly rectangular platform located on the side of a slope angling down to the west in the south-central portion of the project area at elevations ranging from 1,146 to 1,153 ft. The platform is constructed on and around a large pahoehoe outcrop with overall dimensions of 11.5 m long (east-west) and from 4.0 to 5.9 m wide (*Figure 22*). The sides of the structure are built of stacked cobbles and small boulders, ranging in height from 0.6 to 1.4 m. Portions of the platform have collapsed outwards though faced intact sections are present along the north, west and south sides.

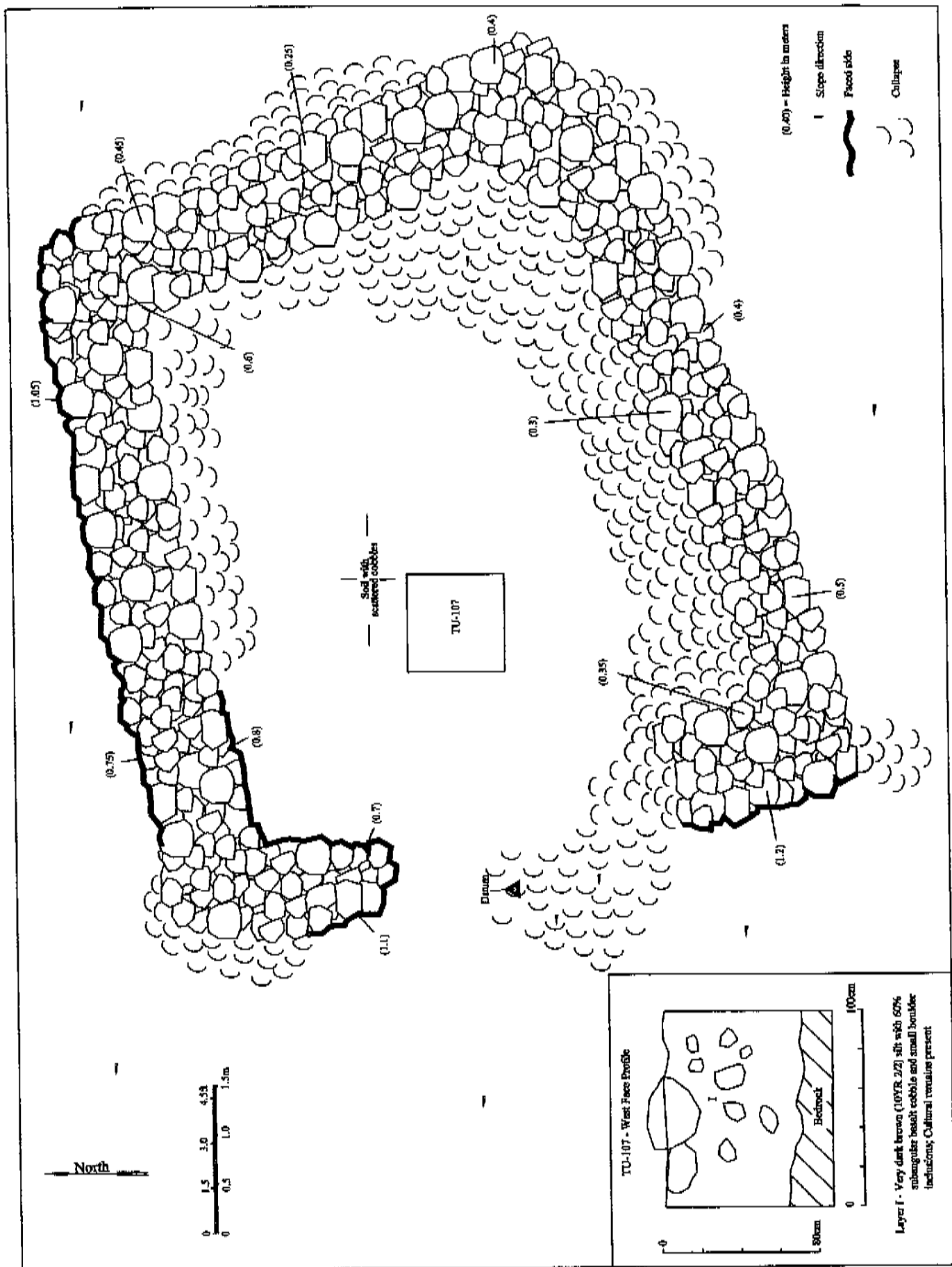
The surface of the platform consists of a level, poorly sorted cobble and small boulder pavement. An area of exposed bedrock, representing the surface of the outcrop is present in the center of the platform. No cultural remains were noted on the structure. A sloping ramp is located at the southeastern corner of the platform, angling down to the east. The ramp is 3.35 m long (east-west) and is constructed with stacked cobbles and small boulder sides (0.5 m tall), and a level, unpaved cobble and small boulder surface.

Two 1.0 by 1.0 m test units (TUs 92 and 93) were excavated into the surface of the platform. TU-92 was situated at the western end of the structure. The excavation revealed a stone architectural layer (Layer I), over a soil deposit (Layer II), over bedrock (see *Figure 22*). Layer I consisted of 0.23 to 0.4 m of tightly packed subangular basalt cobbles and small boulders with no cultural remains present. The base of Layer I intrudes into the Layer II soil and no evidence was found to indicate that it had been built during more than a single construction episode.

Layer II was comprised of 0.09 to 0.37 m of a black (10YR 2/1) silt with 10-20% subangular basalt cobble and pebble inclusions. Cultural remains from this deposit consisted of 19 *Cypraea* sp. shells (19.6 g), 11 fragments of *Isognomon* sp. shell (3.3 g), one *Nerita picea* shell (0.1 g), one *Turbonilla corneliana* shell (0.5 g), four unidentified marine shell fragments (0.3 g), a shark's tooth (0.2 g), five volcanic glass flakes (6.8 g), a basalt flake (0.15 g), three waterworn basalt pebbles (6.1 g), two waterworn coral pebble (5.2 g) and 5.9 grams of charcoal.

TU-93 was located in the eastern portion of the platform. The excavation of this unit revealed identical stratigraphy to that observed in TU-92 (see *Figure 22*). Layer I consisted of 0.1 to 0.13 m of tightly packed subangular basalt cobbles and small boulders with no cultural remains. Layer II was comprised of 0.07 to 0.19 m of a black (10YR 2/1) silt with 10-20% subangular basalt cobble and pebble inclu-





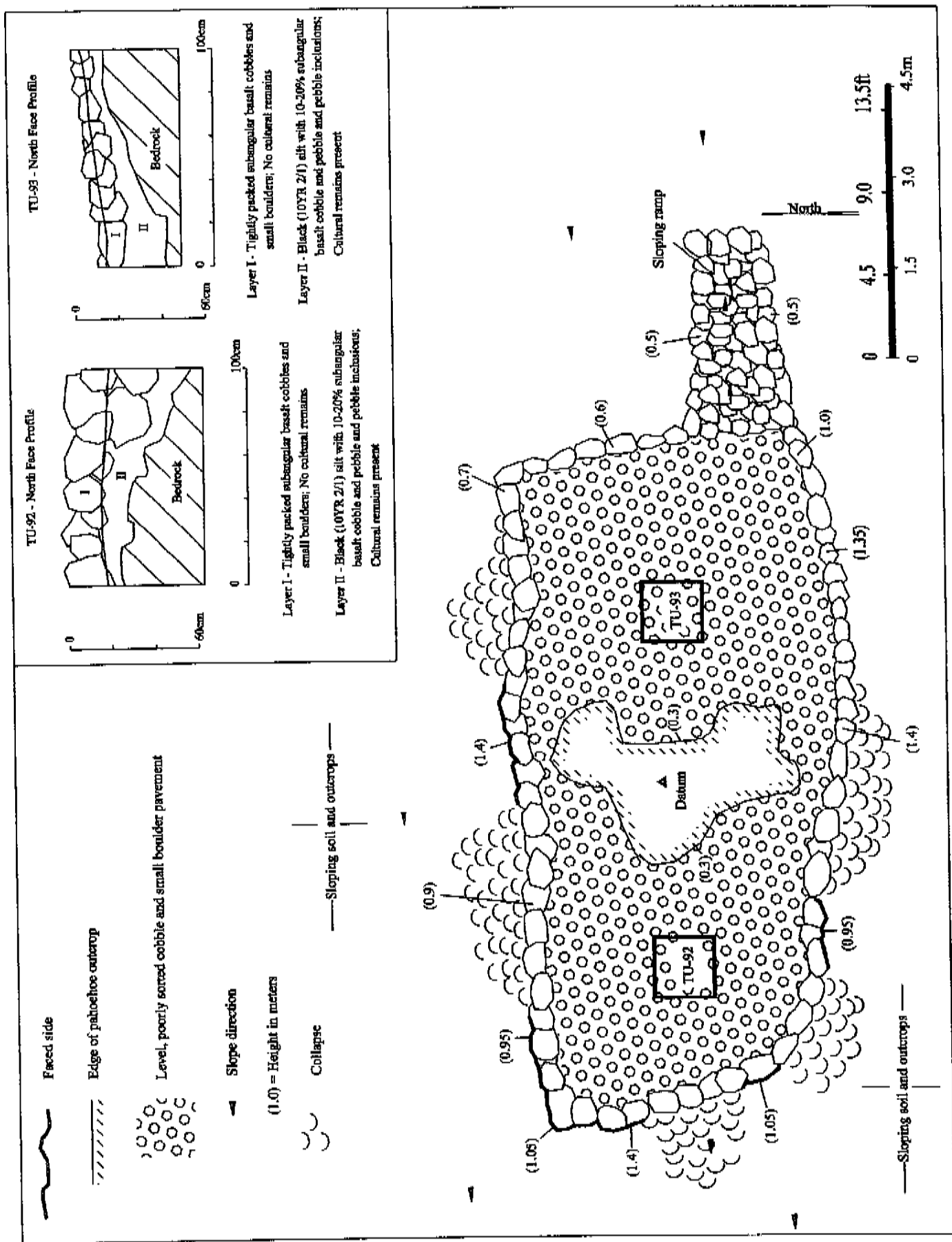


Figure 22. Site 24388 Plan Map and TUs 92 and 93 Profiles

sions. Cultural remains from Layer II consisted of eight *Cypraea sp.* shells (22.4 g), two fragments of *Conus sp.* shell (2.9 g), three fragments of unidentified marine shell (0.9 g), one waterworn basalt pebble (4.1 g) and 20.7 grams of charcoal.

Site 24388 is interpreted as the foundation for a permanent habitation structure. This is based on its formal type, substantial construction (faced sides, paved surface) and area (56.9 sq m). The site is unaltered and in fair condition.

### Site 24389

Site 24389 is an enclosure built within a shallow drainage, which angles down to the southwest, in the south-central portion of the project area at 1,139 to 1,145 ft elevation. The enclosure is comprised of a freestanding stone wall along the northwest side, by a terrace-like wall built against a pahoehoe outcrop on the northeast side, and by an alignment of small boulders on the southeast side (*Figure 23*). The enclosure is open to the southwest and has overall dimensions of 11.6 m long (northeast by southwest) and 10.7 m wide.

The northwest wall is 7.4 m long (northeast by southwest), 1.05 to 1.7 m wide and from 0.5 to 0.8 m in height. The wall is built of stacked cobbles and small boulders with an uneven surface. The interior, southeast side of the wall is faced. The northeastern side of the enclosure consists of a discontinuous stacked and piled cobble and small boulder wall built against a sloping bedrock outcrop. This portion of the structure is 10.7 m long (northwest by southeast), 0.9 to 2.1 m wide, 0.8 to 1.7 m in height on the downslope side and 0.1 to 0.6 m in height on the upslope side. The surface of the wall is uneven and slopes slightly to the southwest. A 1.1 m wide gap is present in the center of the wall. The southeast side of the enclosure consists of a single course alignment of small boulders that is 7.0 m long (northeast by southwest). The alignment is located on bare lava.

The interior of the enclosure is comprised of bare lava that appears to have been scoured by moving water. A shallow bedrock channel oriented in a northeast by southwest direction extends through the interior. An avocado tree is growing adjacent to the enclosure at the southeastern end. No cultural remains were present at the site.

Site 24389 is interpreted as a possible flood control feature designed to keep moving water within the confines of the shallow drainage. This is based on its location within the shallow drainage and the absence of soil and cultural remains. The site is unaltered and in fair condition.

### Site 24390

Site 24390 is a complex of four features located in the south-central portion of the project area at elevations ranging from 1,129 to 1,145 ft. The site is surrounded by agricultural features and is comprised of an enclosure (Feature A), two terraces (Features B and C) and a platform (Feature D; *Figure 24*). The site is situated in an area of sloping soil and outcrops that angles down to the west and encompasses an area 29.5 m long (east-west) and 9.0 m wide. It is unaltered and in fair condition.

The Feature A enclosure is located at the western end of the site. It is 5.85 m long (east-west) and 4.2 m wide. The west side of the feature consists of a free-standing stone wall, and the south side consists of a wall built against a bare lava outcrop. The east side is formed by the west side of the Feature B terrace (discussed below) and the enclosure is open to the north.

The west wall is 4.3 m long (north-northwest by south-southeast), 1.0 to 1.35 m wide and 0.55 to 1.2 m in height. The wall is built of stacked cobbles and small boulders, faced on the western, downslope side, with minor wall collapse present on the east side. The south wall is comprised of stacked cobbles and small boulders, measuring 0.55 to 0.85 m wide and 0.6 to 0.9 m in height on the north side. The south side of the wall is level with an adjacent pahoehoe outcrop. The east end of this wall originates at the southwest corner of the Feature B enclosure and extends 7.25 m to the west, extending past the western wall 2.2 m. This wall is intact, with a faced section at the western end.

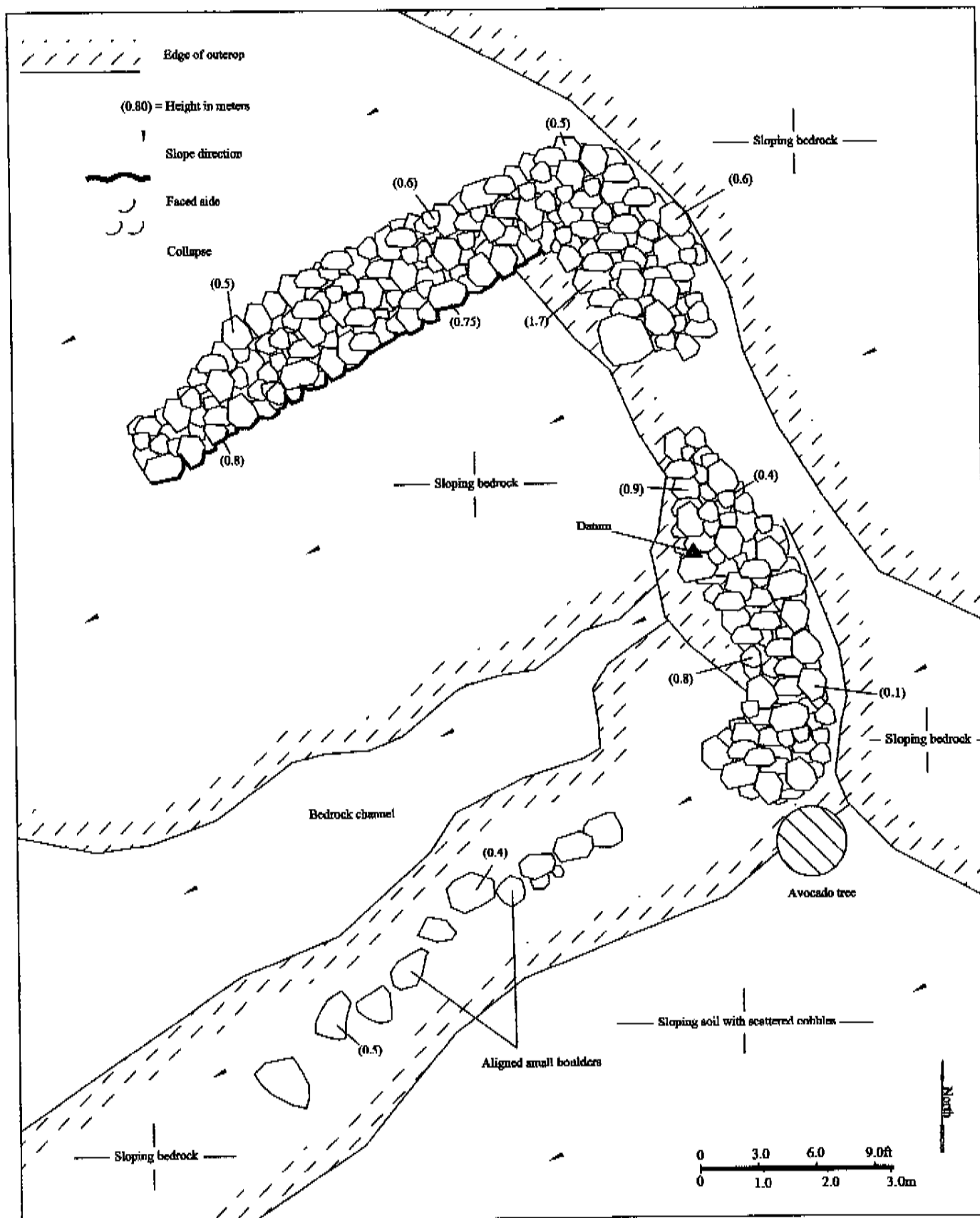


Figure 23. Site 24389 Plan Map

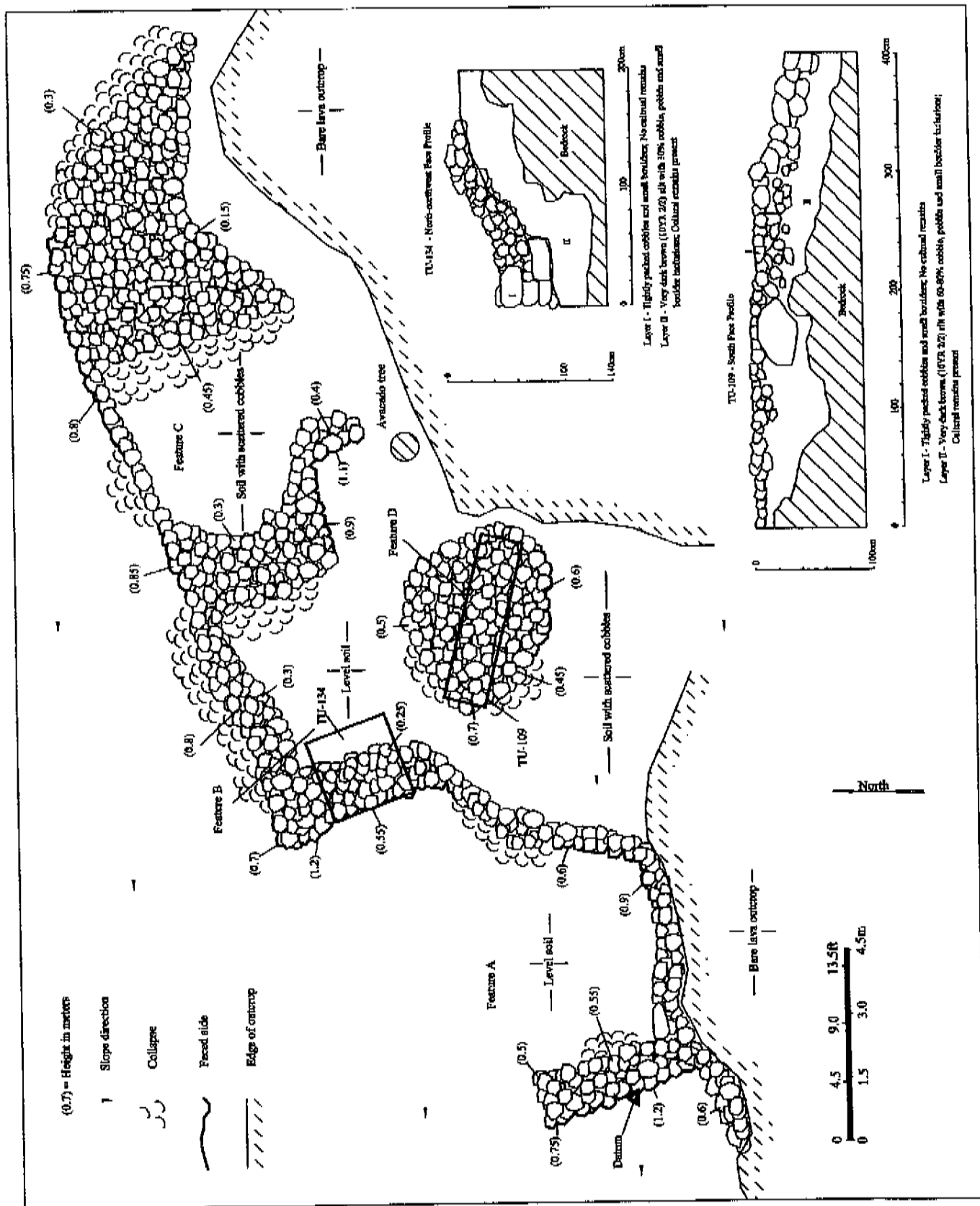


Figure 24. Site 24390 Plan Map and TUs 109 and 134 Profiles

The interior of the enclosure is comprised of a level soil deposit with no surface cultural remains present. Feature A is interpreted as the possible foundation for a permanent habitation structure. This is based on its formal type, substantial construction (faced side) and area (24.5 sq m).

The Feature B terrace is located at the eastern end of the Feature A enclosure. The Feature C terrace is situated adjacent to Feature B to the east, and the Feature D platform is located on the surface of Feature B. This terrace is irregularly-shaped and is 10.4 m long (north-south) and 5.7 to 11.2 m wide. A stacked cobble and small boulder retaining wall extends along the west and north side of the terrace, ranging in height from 0.6 to 1.2 m. Portions of this wall have collapsed outward, though intact, faced sections are present. The southern side of the terrace is bordered by a low pahoehoe outcrop. The surface of the terrace consists of a level soil deposit with scattered surface stones. No cultural remains were noted on the surface. An avocado tree is growing in the soil area at the southeast corner of the feature.

A 2.0 by 2.0 m test unit (TU-134) was excavated into the surface of the terrace at the northwestern end. This excavation revealed a stone architectural layer (Layer I), over a soil deposit (Layer II), over bedrock (see *Figure 24*). Layer I consisted of 0.09 to 0.55 m of tightly packed cobbles and small boulders, with no cultural remains present, located in the western two-thirds of the unit. The eastern one-third consists of the Layer II soil on the surface. The base of Layer I intrudes slightly into the Layer II soil deposit and no evidence was found to indicate that it had been built during more than a single construction episode.

The Layer II deposit is comprised of a very dark brown (10YR 2/2) silt with 30% cobble, pebble and small boulder inclusions. This deposit varied in thickness from 0.17 to 0.83 m. Cultural remains from Layer II consisted of seven *Cypraea sp.* shells (19.5 g), one *Cellana sp.* shell (5.1 g), two unidentified marine shell fragments (1.4 g), 340 volcanic glass flakes (190.8 g), two basalt flakes (7.3 g), one waterworn coral pebble (16.9 g), one small waterworn basalt cobble (105.0 g), and 52.8 grams of charcoal. The excavation of TU-134 was terminated on bedrock.

Feature B is interpreted as the foundation for a permanent habitation structure based on its formal type, substantial construction (faced sides) and large area (87.8 sq m). It is possible that a pole and thatched roofed structure once existed in the soil area where TU-134 was excavated, with a second structure located on the Feature D platform (discussed below). It is also possible that the soil portion of Feature B functioned as a work area used in association with Feature D, based on the abundance of volcanic glass flakes.

The Feature C terrace abuts Feature B to the east. This feature is irregularly-shaped and is 13.1 m long (east-west) and from 3.5 to 5.5 m wide. Stacked cobble and small boulder retaining walls extend along the north and west sides of the terrace, ranging in height from 0.75 to 0.9 m. Portions of these walls have collapsed outward, though intact faced sections are present. An area of level soil with scattered soil is present in the western portion of the terrace, with a area of mounded cobbles (0.15 to 0.3 m in height) comprising the eastern portion of the terrace. No cultural remains were noted on the surface. Feature C is interpreted as the possible foundation for a permanent habitation structure, based on its formal type, substantial construction (faced sides) and large area (58.9 sq m). It is possible that a pole and thatched roof structure may have been situated on the level soil portion of the structure.

The Feature D platform is located in the southeastern portion of the Feature B terrace. The platform is oval-shaped and is 4.3 m long (east-west) and 3.9 m wide. The sides of the structure are built of stacked cobbles and small boulders that range in height from 0.45 to 0.7 m. The northwest and southwest sides of the structure have collapsed outward though an intact faced section is located along the south side. The surface of the feature is comprised of a level cobble and small boulder pavement with no cultural remains present.

A 1.0 by 4.0 m test unit (TU-109) was excavated through the center of the platform in a roughly east-west direction. This excavation revealed a stone architectural layer (Layer I), over a soil deposit (Layer II), over bedrock (see *Figure 24*). Layer I consisted of 0.09 to 0.4 m of tightly packed cobbles and small boulders. A small fragment of an abraded basalt tool with one smooth facet was recovered from Layer I (38.2 g). The base of Layer I intrudes slightly into the Layer II soil deposit and no evidence was found to indicate that it had been built during more than a single construction episode.

Layer II consisted of 0.13 to 0.48 m of a very dark brown (10YR 2/2) silt with 60-80% cobble, pebble and small boulder inclusions. Cultural remains from Layer II consisted of nine volcanic glass flakes (12.1 g), a basalt adze fragment (78.2 g), one small waterworn coral pebble (0.8 g), and 3.7 grams of charcoal. The excavation of TU-109 was terminated on bedrock. Feature D is interpreted as the foundation for a permanent habitation structure. This is based on its formal type, substantial construction (faced side) and area (16.7 sq m).

### **Site 24391**

Site 24391 is a small oval-shaped enclosure located in an area of slightly sloping soil in the south-central portion of the project area at c. 1,114 ft elevation. The enclosure is located in a coffee grove along the southern project area boundary in an area of agricultural terraces and *kua'iwi*. The enclosure is 2.4 m long (northwest by southeast) and 1.6 m wide, built of one to three courses wide and two to four courses tall of stacked cobbles, small boulders and slabs (*Figure 25*). The enclosure varies in height from 0.3 to 0.55 m in height. The interior is 0.6 m long by 0.5 m wide, and is filled with small cobbles and pebbles over soil. A clear glass jar was noted on the enclosure at the northwest end. No other cultural remains were noted. Site 24391 is interpreted as a probably historic firepit. This is based on its small size and appearance, and on its location within the agricultural complex. It is unaltered and in fair condition.

### **Site 24392**

Site 24392 consists of a charcoal oven and adjoining terrace located in the south-central portion of the project area at c. 1,116 ft elevation. The oven consists of an oval-shaped enclosure that is 5.0 m long (east-west) and 4.7 m wide (*Figure 26 and 27*). The top of the oven has collapsed inward, with the interior measuring 2.55 m long (north-south), 2.2 m wide and 0.45 to 1.0 m in depth below the top. The interior sides are comprised of vertical slabs and stacked small to medium sized boulders that have been coated in mortar. A remnant of a mortar roof is present along the eastern side of the interior, and a 0.5 m wide opening leading to the outside of the structure is located on the western side. The interior floor is partly filled with rubble and fragments of mortar.

The exterior of the oven is comprised of stacked cobbles and small boulders along the north, northeast and west sides, ranging in height from 0.6 to 1.1 m. The southeast side is built against the surface of a level soil area, measuring 0.3 m in height. A 0.65 m leaning slab is located along the eastern side of the exterior. Wall stones along the north side of the entrance have collapsed, though remaining sides of the structure are intact. A faced section is present at the northwest end, with a 1.5 m long, 0.55 m wide and 0.5 m step located below the faced side.

A terrace extends to the south from the charcoal oven a distance of 9.4 m (north-northwest by south-southeast). The terrace is comprised of a stacked cobble and small boulder retaining wall along the west side, with an area of level soil located upslope to the east. The north end of the wall has collapsed though the southern end is intact and faced. The retaining wall is 0.6 to 1.7 m wide, 0.5 to 0.9 m in height on the western downslope side and 0.2 to 0.5 m on the upslope side. The level surface behind the wall consists of soil with scattered cobbles. No cultural remains were found in association with the site.

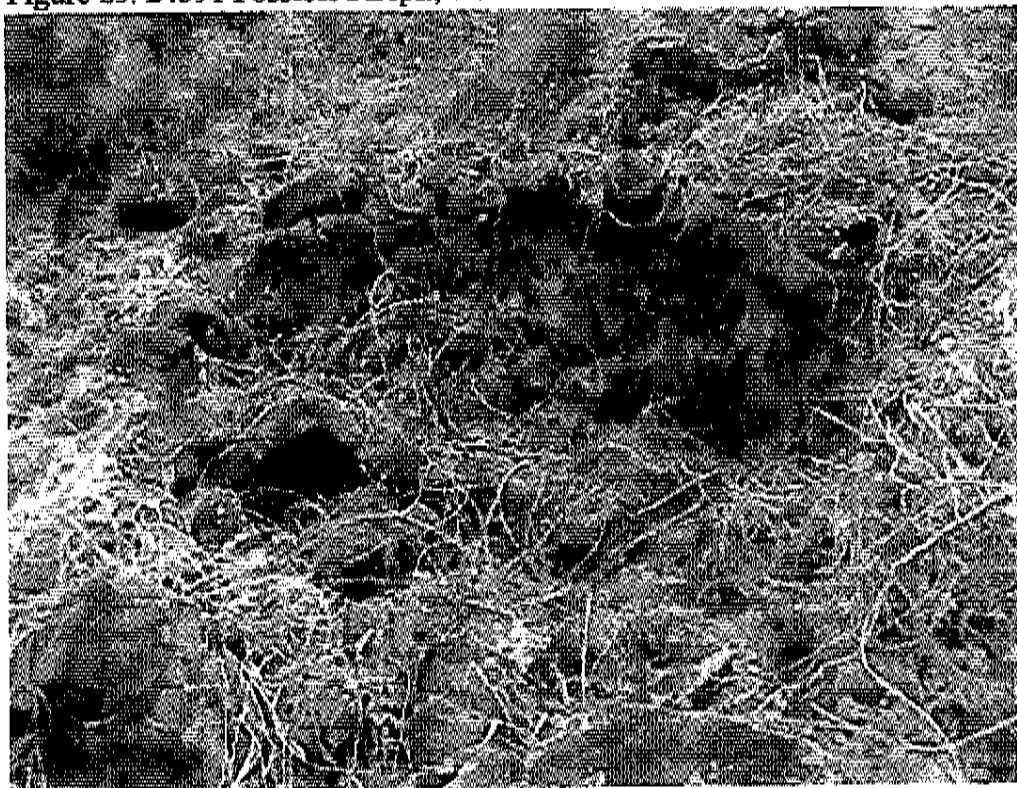
Site 24392 is interpreted as an historic oven used in the manufacture of charcoal. This is based on its formal type and appearance. The adjacent terrace likely functioned in association with the oven based on its proximity, potentially used to store wood. The site is unaltered and in poor to fair condition. Barr et al. (1994) identified a similar feature in an area just seaward of the present parcel. Feature A of Site 18728 consisted of a circular domed enclosure that was 3.7 m long by 3.2 m wide, with a mortared interior and roof remnant.

### **Site 24393**

Site 24393 is a complex of two features located in the south-central portion of the project area at c. 1,097 to 1,103 ft elevation in an area 20.6 m long (north-south) by 18.3 m wide. The site is situated in a broad, shallow drainage that angles to the southwest, which appears to have been impacted by flooding.



**Figure 25. 24391 Possible Firepit, view to west**



**Figure 26. Site 24392 Charcoal Oven, view to north**



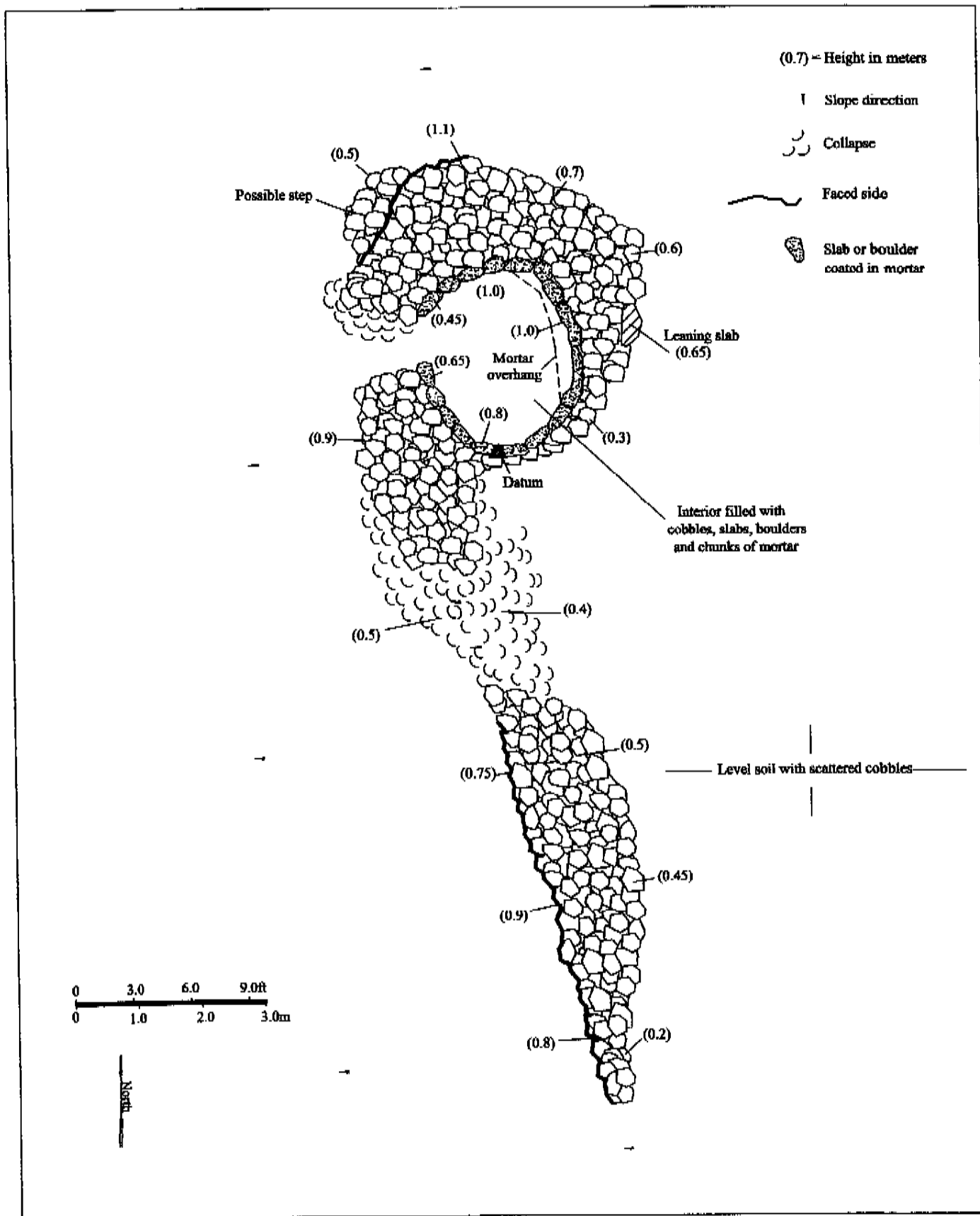


Figure 27. Site 24392 Plan Map

The surface of the drainage is comprised of numerous scattered cobbles and small boulders. The eastern side of the site abuts the edge of a large natural soil terrace. The Site 24393 features consist of a terrace with an adjoining C-shape (Feature A) and a terrace with adjoining wall (Feature B; *Figure 28*). The site is altered and in poor to fair condition.

The Feature A terrace is located at the southern end of the site. The main portion of the feature consists of a rectangular terrace that is 4.9 m long (northeast by southwest) and 2.3 m wide. A stacked and faced cobble and small boulder retaining wall extends along the southeast side of the terrace, ranging in width from 0.5 to 0.7 m and in height from 0.65 to 0.9 m. The northeast and southwest sides of the terrace are bordered by aligned cobbles and small boulders and the surface consists of a level soil deposit. The northwest side consists of sloping rubble that slopes down to the northwest. The retaining wall continues 2.3 m to the west-southwest from the southwest corner of the terrace. A green glass bottle with no markings is present on the retaining wall at the western end and a fragment of white glazed ceramic was noted on the soil surface of the terrace at the northeast end.

A crude C-shape enclosure is situated adjacent to the Feature A terrace to the northeast. This enclosure 4.1 m long 2.6 m long (northeast by southwest) and 2.3 m wide, open at the southwest end. The walls are built of stacked and piled cobbles and small boulders, ranging in width from 0.4 to 0.75 m with an average height of 0.4 m. on the exterior side and 1.1 m on the interior side. The interior of the C-shaped consists of sloping soil with no cultural remains.

The Feature B terrace is situated 11.5 m to the north of Feature A. The terrace is roughly rectangular in shape and is 3.9 m long (north-south) and from 1.6 to 3.4 m in width. A stacked cobble and small boulder retaining wall extends along the west and south sides of the structure, with the north side abutting the side of the slope and the east side built against the side of the natural soil terrace. The retaining wall is 0.3 to 0.65 m wide and 0.5 to 0.7 m in height on the downslope side. The upslope side is level with the surface of the terrace, which consists of a level soil deposit with no cultural remains.

A wall extends to the west from the northwest corner of the terrace a distance of 2.4 m. The wall then angles to the southwest for 6.4 m, then turns to the south-southwest for an additional 9.8 m. The east and southwest ends of this wall are relatively intact, with the central portion comprised of rubble cobbles and small boulders. The intact portions consist of stacked cobbles and small boulders, ranging in width from 0.5 to 0.75 m and in height from 0.4 to 1.1 m. The collapsed portions are 1.0 to 1.2 m wide and 0.4 to 0.8 m.

Site 24393 is interpreted as the disturbed remnant of an historic habitation site. This is based on the historic debris noted at Feature A and the sites close proximity to the Site 24392 and 24394 charcoal ovens (Site 24392 is 24.0 m east and Site 24394 is 38.0 m southwest). It is possible that the terraces at Features A and B functioned as structural foundations, with the wall at Feature B functioning as an enclosing yard. The flooding that has occurred in this area has significantly disturbed the site. It is altered and in poor to fair condition.

## Site 24394

Site 24394 consists of a charcoal oven situated in the south-central portion of the project area at c. 1,083 ft elevation. The site is comprised of an oval-shaped enclosure that is 6.9 m long (north-northwest by south-southeast) and 2.75 m wide (*Figure 29*). The top of the oven has collapsed into the interior and the inside is partially filled with rubble and fragments of mortar. The interior of the oven is oval-shaped and is 3.65 m long (north-northwest by south-southeast) and 1.5 m wide and 0.35 to 0.8 m deep. There is 1.2 m wide gap in the center of the west wall that likely represents the remnants of an entrance into the oven. The sides of the interior is comprised of vertical basalt slabs that have been coated in mortar. Several leaning slabs and a fallen slab are present inside the oven.

The east and south sides of the oven abut the edge of an area of level soil, with the north, northwest and southwest sides comprised of a stacked cobble and small boulder wall that is 0.6 to 1.35 m wide and 0.7 to 0.9 m in height. The western side of the wall is faced, with the northern portion having collapsed

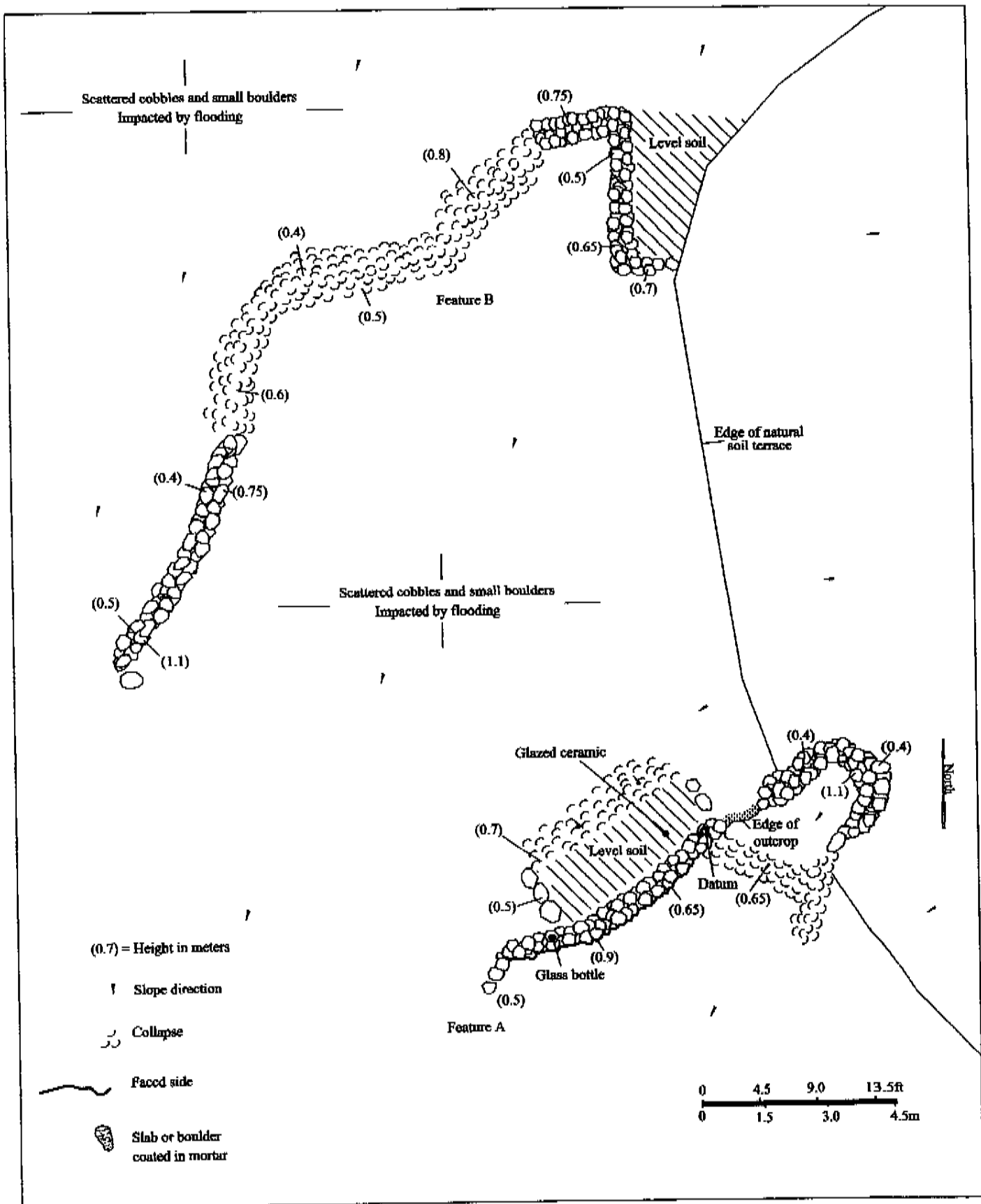


Figure 28. Site 24393 Plan Map

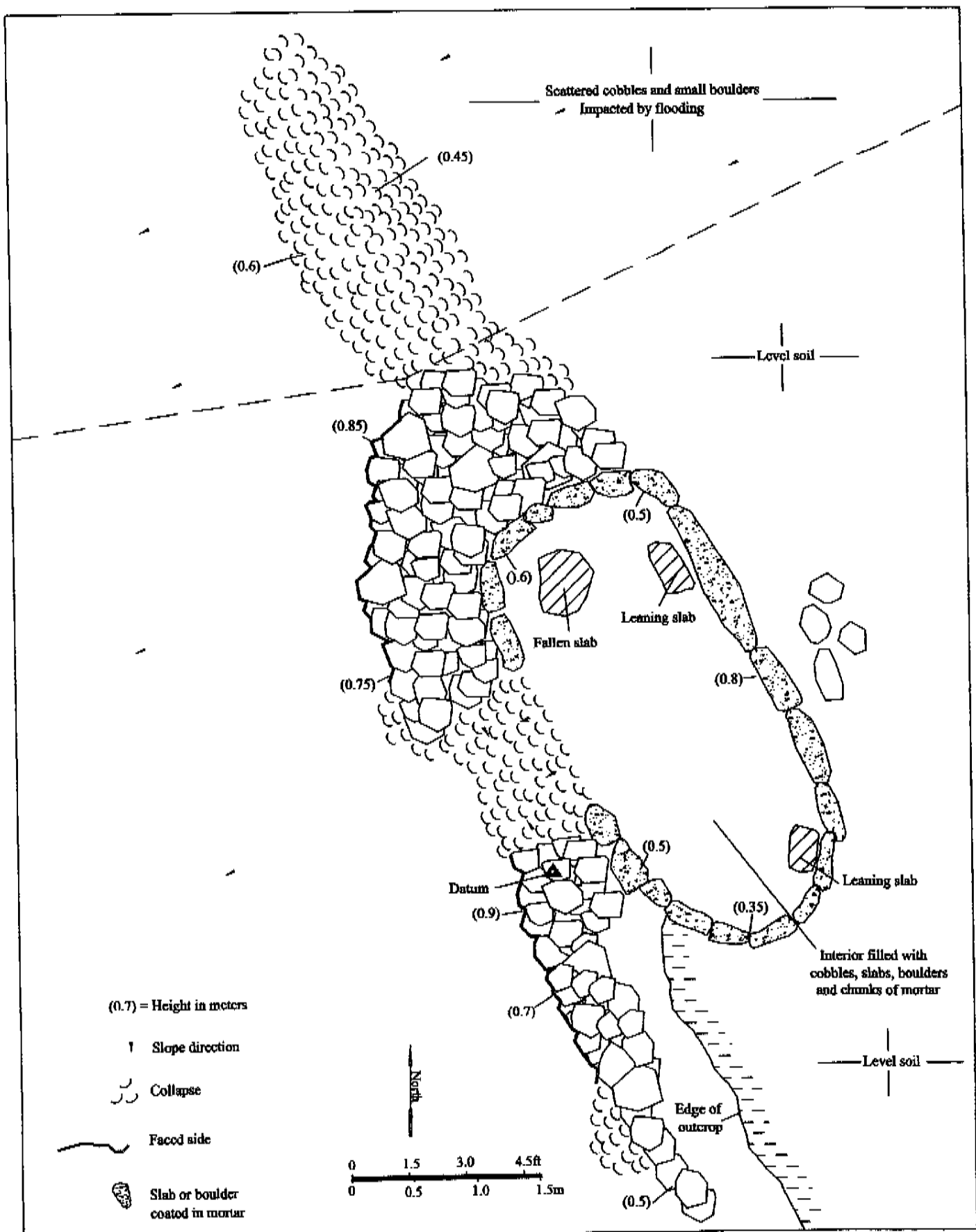


Figure 29. Site 24394 Plan Map

outwards. An alignment of small boulders extends 1.3 m to the south-southeast from the southwest corner of the wall.

A rubble wall extends to the north-northwest from the exterior of the enclosure a distance of 2.9 m. This wall is located within an area of scattered cobbles and small boulders which appears to have been impacted by flooding. This wall is 0.9 to 1.2 m wide and 0.45 to 0.6 m in height. No cultural remains were present at the site. Site 24394 is interpreted as a charcoal oven based on its formal type and appearance, and similarity to the Site 24392 oven. The site is altered and in poor to fair condition.

## Site 24395

Site 24395 is a complex of three features located in the southwestern portion of the project area at elevations ranging from 1,034 to 1,051 ft. The site is located in an area of sloping soil and outcrops that angles down to the southwest, in an area 68.1 m long (northeast by southwest) and 20.3 m wide. The features are comprised of two enclosures (Features A and C) and a terrace (Feature B; *Figure 30*). The site is unaltered and in fair condition.

Feature A is a rectangular-shaped enclosure located at the southwest end of the site. It is 13.1 m long (northwest by southeast) and 7.8 m wide. The enclosure consists of freestanding walls along the southwest and southeast sides, with a terrace along the northeast and north sides and a sloping rubble berm along the northwest side. The southwest and southeast walls range in width from 0.8 to 1.3 m wide and from 0.4 to 1.45 m in height. The interior and portions of the exterior sides of these walls are faced, with collapse present at the exterior southwest corner and along the interior side of the southeast wall.

The interior of the enclosure is comprised of scattered cobbles in the southwestern portion and level soil in the northeastern portion. A pile of weathered milled lumber and corrugated tin is located in the northwest corner of the enclosure, with a 4" x 6" wooden post set vertically in the ground (0.95 m in height) located adjacent to the pile to the northeast. A framed wooden door jamb is built into the base of the southwestern wall, 2.5 m northeast of the southern enclosure corner. This jamb is 0.45 m wide and 0.4 m in height and has a hinged wooden door in the interior built of nailed 1" x 4" lumber.

The terrace along the northeast and north sides of the enclosure is comprised of stacked and faced cobbles and small boulders, ranging in width from 0.65 to 0.7 m wide and 1.0 to 1.3 m in height. An area of level scattered cobbles measuring 12.2 m long (north-south) and 5.2 to 8.3 m wide is located on the inland side of the terrace wall, extending between Features A and B. No cultural remains were present in this portion of the feature.

The Feature B terrace is located on the inland side of the level scattered cobble area 5.2 m north-east of Feature A. The feature consists of a stacked cobble and small boulder retaining wall that is 16.4 m long (north-northwest by south-southeast), 0.5 to 0.6 m wide and 0.8 to 1.2 m in height on the downslope side and 0.0 to 0.4 m in height on the upslope side. There is a collapsed section of wall, 2.3 m wide, located at the northern end of the retaining wall. The surface of the terrace is comprised of scattered cobbles with no cultural remains, encompassing an area 17.1 m long (north-northwest by south-southeast) and 2.5 to 7.3 m wide. The southern side of the terrace abuts the side of the slope and the northeast side is bordered by a pahoehoe outcrop that is 0.15 to 1.2 m in height.

The Feature C enclosure is located 2.5 m north of the inland end of Feature B. This feature is comprised of a terrace-like wall along the north side, a low pahoehoe outcrop on the southwest side and a low wall, vertical slab and outcrop along the southeast side. The remaining sides of the enclosure consist of the side of the slope. The enclosed area is 12.0 m long (north-south) and from 6.5 to 12.5 m wide. The terrace wall on the north side is 12.5 m long (east-west), 1.0 to 1.3 m wide, 0.9 to 1.1 m in height on the downslope side and 0.3 to 0.5 m in height on the upslope side.

The outcrop on the southwest side is 0.4 m in height and contains an alignment of four small basalt boulders. The low wall on the southeast side is 2.5 m long (north-northeast by south-southwest), 0.8 m wide and 0.7 m in height. A 1.1 m long vertical slab is leaning against the edge of the pahoehoe outcrop

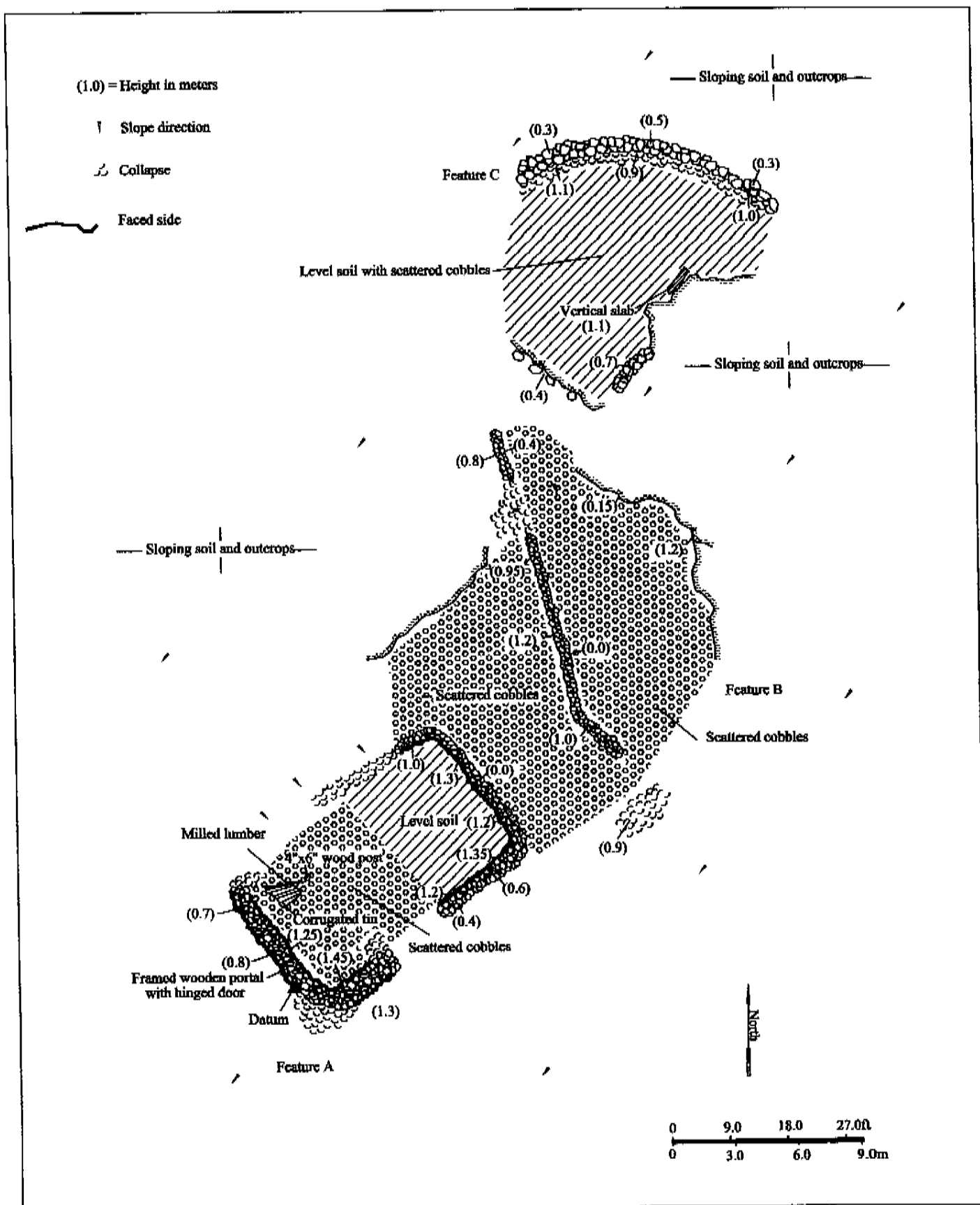


Figure 30. Site 24395 Plan Map

2.9 m northeast of the inland end of the low wall. The surface of the enclosure consists of level soil with scattered cobbles. No cultural remains were noted at Feature C.

Site 24395 is interpreted as an historic habitation complex with an associated animal enclosure. This is based on the nature of the features, the debris noted at Feature A and the wooden doorway in the southwest wall of Feature A. The Feature B terrace and the Feature C enclosure potentially functioned as structural foundations, with the level terraced area between Features A and B possibly serving as an associated *lanai* or work area. The Feature A enclosure may have functioned as a possible pig pen due to the presence of the door.

## Site 24396

Site 24396 is a complex of three features located along the western project area boundary at elevations ranging from 1,022 to 1,033 ft. The project area boundary bisects the site through its approximate center in a north-northwest by south-southeast direction. The features are comprised of three enclosures situated in an area 30.0 m long (east-west) by 24.0 m wide (*Figure 31*). The site is unaltered and in fair condition.

Feature A is a rectangular enclosure located at the west end of the site. It is 8.15 m long (north-south) and 5.5 m wide, with freestanding walls along the north and west sides, and aligned cobbles along the east and south sides. The north and west walls range in width from 1.2 to 1.4 m and in height and in height from 0.7 to 1.1 m. The interior sides and portions of the exterior are faced, with wall collapse noted on the west and southwest sides. The east side of the enclosure is bordered by a single course alignment of cobbles and small boulders, 6.0 m long (north-south) 0.25 to 0.45 m wide and 0.45 to 0.7 m in height. The southern side consists of a wall remnant consisting of aligned cobbles on the north and south sides, filled with rubble. This side is 2.6 m long (east-west), 1.2 to 1.3 m wide and 0.3 to 0.75 m in height.

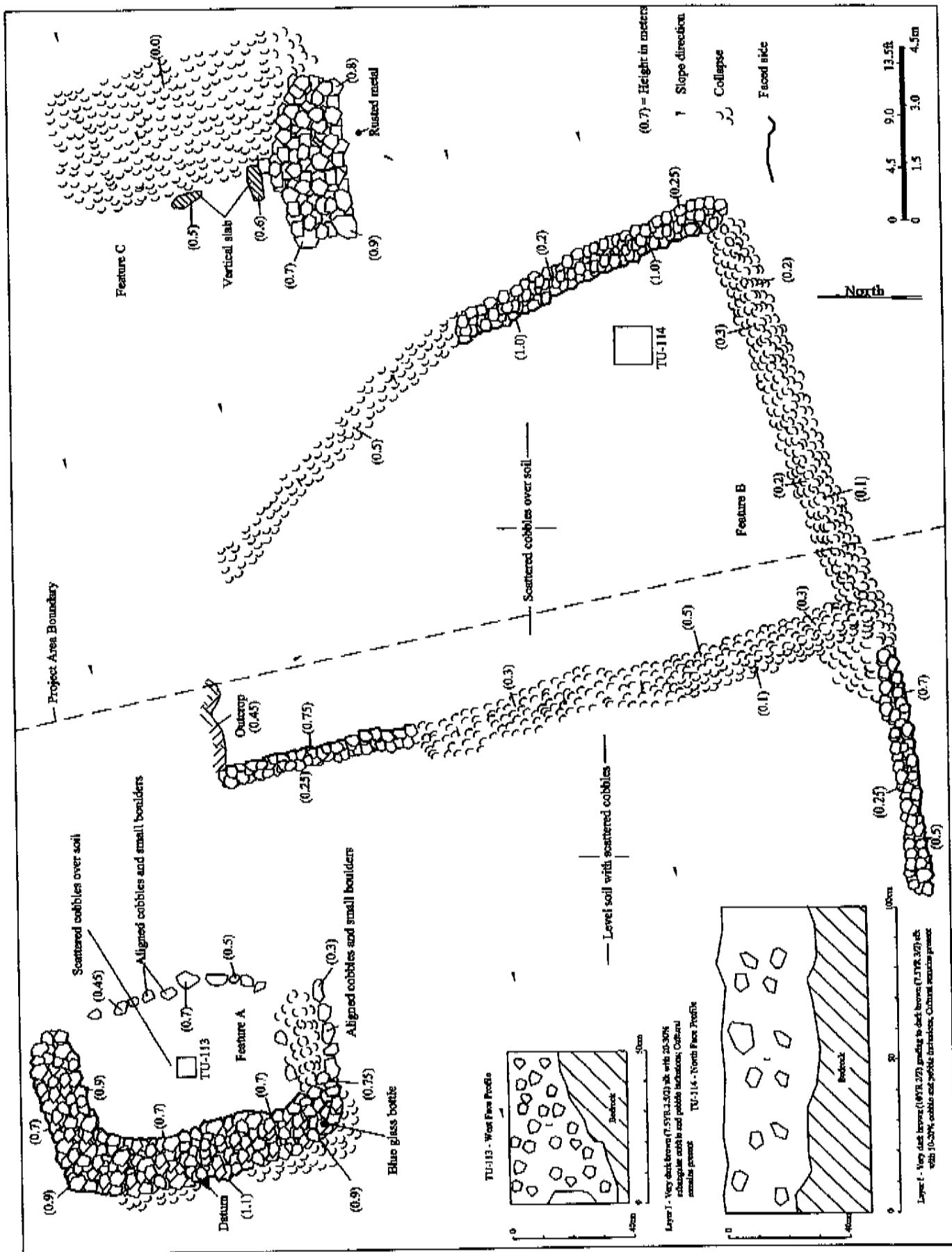
The interior of the enclosure is comprised of a level soil deposit with scattered surface stones. No cultural remains were present inside the enclosure, though a blue glass Shoyu bottle with no markings was noted on top of the wall at the southwest corner.

A 0.5 by 0.5 m test unit (TU-113) was excavated within the enclosure in the center, revealing a single soil deposit over bedrock (see *Figure 31*). The Layer I deposit consisted of 0.17 to 0.35 m of a very dark brown (7.5YR 2.5/2) silt with 20-30% subangular cobble and small boulder inclusions. Cultural remains from Layer I consisted of a metal wire (not collected).

Feature B is a large enclosure within a natural depression, bordered by stacked and piled cobble and small boulder walls. Feature B is located 5.4 m east of Feature A. The enclosure is 18.1 m long (north-northwest by south-southeast) and from 6.0 to 12.2 m wide, open at the north end. The north end of the west wall and the south end of the east wall consists of stacked cobble and small boulder walls that range in width from 0.6 to 0.95 m. The east wall is 0.2 to 0.25 m high on the exterior (east) side and 1.0 m on the interior side. The west wall is 0.25 m on the exterior (west) side and 0.75 m in height on the interior side.

The remaining sides of the enclosure consist of rubble walls that range in width from 0.95 to 1.3 m and in height from 0.1 to 0.5 m. The north end of the east wall and the central portion of the west wall slope down into the interior of the enclosure. The south wall and the southern end of the west wall are low free-standing walls. A stacked wall extends to the west from the southwest corner of the enclosure a distance of 6.8 m. This wall is 0.6 to 0.7 m wide, 0.5 to 0.7 m on the south side and 0.25 m on the north side.

The interior of the enclosure is comprised of a relatively level soil deposit covered in scattered cobbles with no cultural remains. A 1.0 by 1.0 m test unit (TU-114) was excavated within the enclosure at the southeastern end. The excavation of this unit revealed a single soil layer over bedrock (see *Figure 31*). Layer I consisted of 0.23 to 0.33 m of a very dark brown (10YR 2/2) to dark brown (7.5YR 3/2) silt with 10-20% cobble and pebble inclusions. Cultural remains from Layer I consisted of two fragments of brown bottle glass (3.3 g), two volcanic glass flakes (2.3 g) and 15.4 grams of charcoal.



**Figure 31. Site 24396 Plan Map and TU 113 and 114 profiles**



Feature C is an enclosure remnant located 3.3 m east of Feature B. The feature consists of a stacked cobble and small boulder wall along the south side and a sloping rubble berm along the east side, in an area 7.5 m long (north-south) by 5.6 m wide. Two vertical basalt slabs (0.5 to 0.6 m tall) are located at the base of the rubble berm. The intact wall is 4.7 m long (east-west), 1.6 to 1.8 m wide and 0.7 to 0.9 m in height. A piece of rusted metal is located adjacent to this wall to the south. The sloping rubble berm 7.1 m long (north-south) and 3.5 m wide. The surface of this berm is level with the surrounding ground surface on the east and west sides.

Site 24396 is interpreted as an historic habitation complex. This is based on the nature of the features and the presence of historic debris noted at each feature. It is possible that the Feature A enclosure may have functioned for the foundation for a historic structure, with Feature B possible functioning as either a yard in which a wooden structure was located or a garden or animal enclosure. The poor condition of Feature C makes a determination of its function difficult, though the vertical slabs and wide wall may indicate it also served as a structural foundation.

### Site 24397

Site 24397 is a complex of 612 agricultural features scattered throughout the project area. The site is comprised of 504 mounds/modified outcrops, one faced mound, 54 terraces, 28 *kua'iwi*, 22 walls, two enclosures and a walled terrace. The mounds/modified outcrops were not individually recorded but were counted during the transect survey of the project. The physical characteristics of the terraces are summarized in *Table 5*, the *kua'iwi* and walls are summarized in *Table 6*, and the enclosures, the walled terrace and faced mound are summarized in *Table 7*. The distribution of the 107 non-mound/modified outcrop features is presented in *Figure 7*.

### Clearing Piles

A total of 504 agricultural mounds/modified outcrops were identified during the initial transect sweeping of the project area. These features are interpreted as clearing piles that were created by consolidating surface stones from adjacent planting areas. Typically these features are comprised of informally constructed piles of basalt cobbles and small boulders, with uneven sides and surfaces and no cultural remains. The mounds are comprised of stone piles situated on the ground surface and the modified outcrops consist of piled stones on exposed bedrock outcrops. No cultural remains were found in association with the clearing piles.

*Figure 32* illustrates the density of the agricultural clearing piles identified in the project area. As indicated in this figure, the density of clearing piles decreases significantly with elevation. The majority of the features are situated in the seaward half of the parcel below the 1,150 ft contour. This is 26.2 acres in size (49.4% of project area) and contains 387 piles or 76.8 % of the total features. This indicates a per acre density of 14.7 piles per acre.

The density of features drops to 5.3 features per acre in the central portion of the parcel, extending between the 1,150 and 1,240 elevations. This area is 17.2 acres in size (32.5 % of project area) and contains 91 clearing piles, or 18% of the total piles. The inland portion of the parcel contained the fewest clearing piles, extending inland of the 1,240 ft contour to the east project area boundary at elevations ranging from 1,265 to 1,335 ft. This portion of the parcel is 9.6 acres in area (18.1% of project area) and contained 26 agricultural features (5.2 % of total features). The feature density in this inland portion of the parcel is 2.7 features per acre.

An additional mound (Feature CC) was identified during the project that differed from the majority of the clearing piles. This mound has a faced side and is located along the seaward project area boundary in the southwestern portion of the parcel at c. 1,031 ft elevation. This feature is oval-shaped and is 4.1 m long (east-west), 2.7 m wide and from 0.4 to 0.6 m in height (*Figure 33*). The surface is uneven and slightly domed. The northeast, east, south and west sides of the mound have collapsed outward, though the northwest end is intact, with a faced side. No cultural remains were present.

**Table 5. Summary of Site 24397 Terraces**

Feature	Length	Width	Upslope Height	Downslope Height	Construction	Field No.
A	8.5	1.3-2.5	0.3-0.4	0.4-0.6	Piled cobbles and small boulders	654
B	29.4	1.0-1.5	0.4-0.5	0.75-1.1	Stacked and piled cobbles and small boulders	652
D	26.1	1.2-1.5	0.1-0.5	0.5-0.9	Piled cobbles and small boulders	651b
G	21.8	1.5-2.1	0.3-0.5	0.75-1.2	Stacked and piled cobbles and small boulders	630b
I	10.5	1.5-2.0	0.3-0.4	0.8-1.2	Stacked and piled cobbles and small boulders	650b
J	21.0	1.2-1.7	0.4-0.5	0.5-1.1	Stacked and piled cobbles and small boulders	630a
N	18.4	1.0-1.7	0.4-0.5	0.5-0.9	Piled cobbles and small boulders	593
O	41.0	1.2-1.7	0.4-0.5	0.75-1.3	Stacked and piled cobbles and small boulders	592
P	13.9	1.8-2.0	0.3-0.5	0.75-1.2	Piled cobbles and small boulders	597b
R	17.4	1.5-2.0	0.3-0.5	0.75-1.0	Piled cobbles and small boulders	591
U	10.6	1.0-1.5	0.2-0.5	0.65-1.2	Stacked and piled cobbles and small boulders	543
V	15.3	1.0-1.8	0.2-0.4	0.5-0.9	Piled cobbles and small boulders	588
W	10.4	1.3-2.1	0.1-0.4	0.75-1.2	Piled cobbles and small boulders	587b
X	27.2	1.9-2.3	0.3-0.5	0.75-1.2	Piled cobbles and small boulders	586
Y	23.3	1.2-1.5	0.1-0.4	0.6-0.8	Piled cobbles and small boulders	648
AA	18.4	1.4-1.9	0.4-0.5	0.8-1.2	Piled cobbles and small boulders	646
AB	31.4	1.5-2.5	0.4-0.5	0.6-1.2	Piled cobbles and small boulders	643b
AC	11.7	2.0-2.5	0.2-0.3	0.7-1.3	Piled cobbles and small boulders	643a
AE	20.6	1.5-2.0	0.4-0.5	0.5-1.0	Stacked and piled cobbles and small boulders	640/641
AF	7.5	1.8-2.0	0.1-0.3	0.5-0.7	Stacked and piled cobbles and small boulders	642
AH	10.5	1.8-2.0	0.1-0.4	0.6-0.9	Piled cobbles and small boulders	660b
AL	11.7	1.5-2.0	0.1-0.3	0.6-0.8	Stacked and piled cobbles and small boulders	662
AM	27.2	1.2-1.5	0.4-0.5	0.6-1.2	Piled cobbles and small boulders	628
AN	7.5	1.0-1.2	0.4-0.5	0.6-1.2	Stacked and piled cobbles and small boulders	638
AO	12.0	1.5-1.8	0.2-0.3	0.5-0.9	Stacked and piled cobbles and small boulders	639
AP	28.2	1.2-1.8	0.3-0.5	0.8-1.3	Stacked and piled cobbles and small boulders	626b
AQ	28.9	2.0-2.3	0.5-0.6	0.75-0.95	Piled cobbles and small boulders	626a
AT	8.5	1.5-1.6	0.1-0.5	1.0-1.3	Stacked and piled cobbles and small boulders	622
AU	5.2	1.6-1.8	0.0-0.1	0.4-0.8	Piled cobbles and small boulders	620a
AZ	8.5	1.0-1.2	0.0-0.1	0.4-0.6	Piled cobbles and small boulders	614
BB	17.5	1.0-1.1	0.0-0.3	0.5-0.8	Stacked and piled cobbles and small boulders	610
BC	24.2	1.3-1.6	0.3-0.4	0.5-1.0	Stacked and piled cobbles and small boulders	612
BD	20.3	1.5-2.5	0.4-0.6	0.6-1.2	Stacked and piled cobbles and small boulders	621b
BF	48.8	1.8-2.0	0.0-0.2	1.1-1.5	Stacked and piled cobbles and small boulders	615
BG	17.2	1.0-2.0	0.0-0.3	0.4-1.3	Stacked and piled cobbles and small boulders	604
BI	30.6	1.5-2.0	0.3-0.5	1.2-1.5	Stacked and piled cobbles and small boulders	609c
BQ	11.8	1.0-1.1	0.4-0.5	0.0-0.1	Stacked and piled cobbles and small boulders	571b
BZ	18.1	1.0-1.4	0.1-0.3	0.5-0.8	Stacked and piled cobbles and small boulders	574
CB	9.0	1.5-1.8	0.4-0.6	0.75-0.9	Stacked and piled cobbles and small boulders	582
CD	10.1	1.0-1.2	0.3-0.4	0.5-0.9	Stacked and piled cobbles and small boulders	581
CE	15.4	1.5-1.6	0.3-0.4	1.0-1.2	Stacked and piled cobbles and small boulders	558
CH	19.1	1.5-1.8	0.3-0.5	0.75-1.3	Piled cobbles and small boulders	559
CI	20.1	1.3-1.5	0.3-0.4	0.6-0.7	Piled cobbles and small boulders	580b
CJ	8.0	1.2-1.5	0.1-0.4	0.5-0.7	Piled cobbles and small boulders	580a
CM	19.1	1.5-1.7	0.5-0.6	0.8-1.2	Stacked and piled cobbles and small boulders	579
CO	40.7	1.3-1.8	0.4-0.5	0.6-1.2	Piled cobbles and small boulders	581
CP	28.9	1.5-1.6	0.3-0.5	0.5-0.8	Stacked and piled cobbles and small boulders	578a
CS	79.1	1.0-1.9	0.2-0.5	0.6-1.2	Stacked and piled cobbles and small boulders	547
CI	37.6	1.8-2.2	0.3-0.5	0.6-1.0	Piled cobbles and small boulders	550
CU	27.5	1.3-1.8	0.3-0.5	0.7-1.2	Piled cobbles and small boulders	554b
CW	26.0	1.5-2.0	0.1-0.4	0.5-0.9	Piled cobbles and small boulders	582
CY	30.4	1.5-2.0	0.1-0.5	0.65-1.1	Piled cobbles and small boulders	584
CZ	15.3	1.5-2.0	0.5-0.6	0.7-1.1	Piled cobbles and small boulders	599

**Table 6. Summary of Site 24397 Kua'iwi and Walls**

Feature	Type	Length	Width	Height	Construction	Field No.	Comment
C	Kua'iwi	60.5	1.8-2.1	0.75-1.0	Stacked and piled cobbles and small boulders	651a	
E	Wall	48.9	1.0-1.3	0.7-1.0	Stacked and piled cobbles and small boulders	653	
F	Wall	28.0	0.8-1.1	0.6-0.85	Stacked cobbles and small boulders	651c	
H	Kua'iwi	47.1	1.8-2.0	0.6-1.2	Piled cobbles and small boulders	650a	
K	Kua'iwi	41.2	1.8-2.5	0.6-1.2	Piled cobbles and small boulders	649	
L	Kua'iwi	27.0	1.8-3.0	0.4-1.0	Piled cobbles and small boulders	632	
M	Kua'iwi	50.7	1.5-2.0	0.5-1.2	Piled cobbles and small boulders	594	
O	Kua'iwi	47.7	1.8-2.5	0.75-1.3	Piled cobbles and small boulders	597a	
S	Kua'iwi	65.4	2.0-2.8	0.7-1.3	Piled cobbles and small boulders	589	
T	Wall	15.2	1.3-1.5	0.5-1.2	Stacked and piled cobbles and small boulders	542	
Z	Kua'iwi	65.0	2.0-2.5	0.6-1.0	Piled cobbles and small boulders	669	
AD	Kua'iwi	51.5	2.0-3.0	0.8-1.3	Stacked and piled cobbles and small boulders	634/645	
AG	Kua'iwi	21.4	1.5-2.0	0.6-1.2	Piled cobbles and small boulders	644	
AI	Kua'iwi	27.5	2.0-2.5	0.6-1.2	Piled cobbles and small boulders	660a	
AJ	Kua'iwi	32.5	1.8-2.5	0.75-1.3	Piled cobbles and small boulders	670	
AK	Kua'iwi	20.1	1.2-2.0	0.5-1.1	Stacked and piled cobbles and small boulders	661	
AR	Kua'iwi	97.7	2.0-2.5	0.6-1.2	Piled cobbles and small boulders	601/625	
AS	Kua'iwi	15.0	1.8-2.2	0.45-0.8	Piled cobbles and small boulders	623	
AV	Wall	5.3	1.0-1.2	0.5-0.7	Piled cobbles and small boulders	620b	
AW	Kua'iwi	39.6	2.0-3.0	0.75-1.2	Piled cobbles and small boulders	617	
AX	Wall	17.1	0.8-1.0	0.5-1.4	Stacked cobbles and small boulders	616	Historic
AY	Kua'iwi	136.4	2.0-3.0	1.0-1.5	Piled cobbles and small boulders - with stacked cobble and small boulder wall on top	608a	
BA	Kua'iwi	199.3	2.0-2.2	1.2-1.5	Piled cobbles and small boulders	611a	
BE	Kua'iwi	17.0	1.5-3.0	0.4-0.9	Stacked and piled cobbles and small boulders	621a	
BH	Kua'iwi	16.5	2.2-3.0	1.0-1.5	Piled cobbles and small boulders	605	
BJ	Wall	16.6	1.0-1.2	0.8-1.3	Stacked and faced cobbles and small boulders	609a	Historic
BK	Wall	29.7	1.0-1.2	0.8-1.3	Stacked and faced cobbles and small boulders	609b	Historic
BL	Wall	157.7	1.1-1.2	1.0-1.3	Stacked and faced cobbles and small boulders	608b	Historic
BM	Wall	23.5	1.1-1.2	1.0-1.2	Stacked and faced cobbles and small boulders	572a	Historic
BN	Wall	26.4	1.0-1.1	0.6-0.9	Stacked and faced cobbles and small boulders	572b	Historic
BO	Wall	19.4	0.8-1.0	0.8-0.9	Stacked and faced cobbles and small boulders	571a	Historic
BP	Wall	68.4	1.1-1.2	0.8-1.2	Stacked and faced cobbles and small boulders	611b	Historic
BR	Wall	10.2	1.2-1.3	0.9-1.2	Stacked and faced cobbles and small boulders	571e	Historic
BS	Wall	16.8	1.0-1.1	0.8-1.25	Stacked and faced cobbles and small boulders	569b	Historic
BT	Wall	11.2	1.1-1.2	0.5-0.7	Stacked cobbles and small boulders	569e	Historic
BU	Wall	38.8	1.0-1.2	0.5-0.8	Stacked cobbles and small boulders	569d	Historic
BV	Wall	13.4	1.0-1.1	0.8-1.2	Stacked and faced cobbles and small boulders	569c	Historic
RW	Wall	14.2	0.9-1.1	0.7-1.2	Stacked and faced cobbles and small boulders	569a	Historic
BX	Wall	12.2	1.1-1.3	0.8-1.0	Stacked cobbles and small boulders	571d	Historic
BY	Wall	27.4	1.2-1.4	1.0-1.1	Stacked and faced cobbles and small boulders	571c	Historic
CA	Wall	73.2	1.0-1.2	0.75-1.0	Stacked and faced cobbles and small boulders	573	Historic
CF	Wall	15.0	1.2-1.5	0.75-1.2	Stacked and piled cobbles and small boulders	556a	
CG	Kua'iwi	17.2	1.8-2.5	0.5-1.0	Piled cobbles and small boulders	556b	
CK	Kua'iwi	31.6	2.0-2.5	0.6-1.1	Stacked and piled cobbles and small boulders	555	
CL	Kua'iwi	11.2	1.5-1.8	0.75-0.8	Piled cobbles and small boulders	578b	
CN	Kua'iwi	18.8	1.5-2.2	0.6-0.9	Piled cobbles and small boulders	577	
CQ	Kua'iwi	63.4	2.1-2.6	0.75-1.3	Piled cobbles and small boulders	554a	
CR	Kua'iwi	35.1	1.5-2.5	0.6-1.3	Stacked and piled cobbles and small boulders	551	
CV	Kua'iwi	52.1	1.7-2.0	0.4-0.9	Stacked and piled cobbles and small boulders	549	
CX	Kua'iwi	85.6	1.8-2.5	0.6-0.9	Piled cobbles and small boulders	546/583/587	

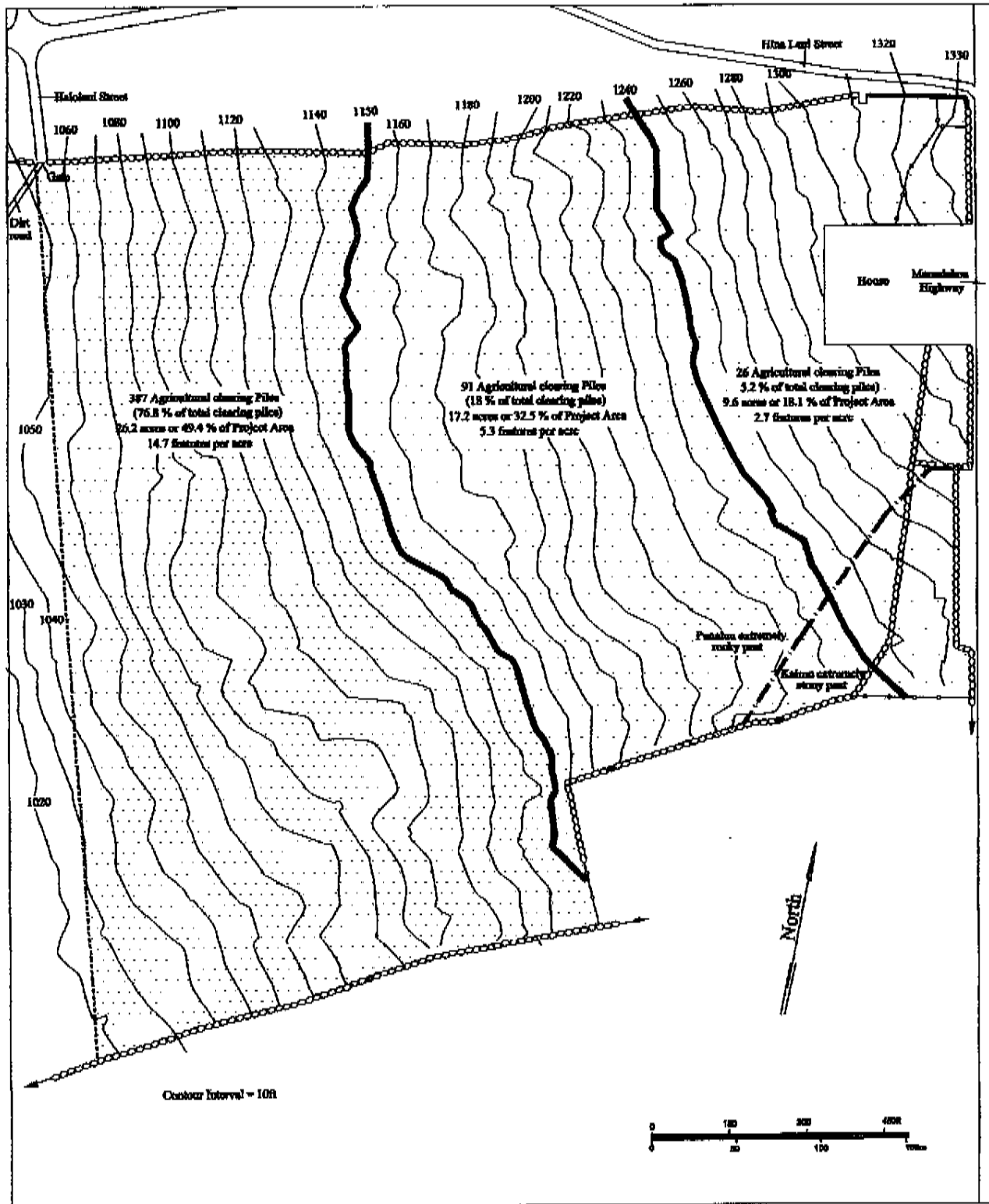


Figure 32. Density of Site 24397 Agricultural Clearing Piles



**Figure 33. 24397, Feature CC Faced Mound, view to south**



**Figure 34. Site 24397, Feature B Agricultural Terrace, view to northeast**

**Table 7. Summary of Site 24397 Miscellaneous Features**

Feature	Type	Length	Width	Height	Construction	Field No.
CC	Faced Mound	4.1	2.70	0.4-0.6	Domed surface, mostly collapsed with one faced side	560
DA	Walled Terrace	7.8	6.60	0.90	Piled cobbles and small boulders with some stacking and one faced section - Level soil and outcrop surface	548
DB	Enclosure	8.1	5.60	0.50	Piled cobbles and small boulders with some stacking - Level soil surface	544
DC	Terrace	5.6	4.00	0.90	Stacked cobble and small boulder sides with some facing - Level, roughly paved cobble surface	636
DD	Enclosure	2.4	2.20	1.25	Stacked and faced cobble and small boulder wall built against outcrop forming an enclosure	618

Barr et al. (1994) and Haun & Associates (in prep.) identified numerous faced mounds during a survey of the parcel just seaward of the present parcel. Many of these mounds were dismantled and subjected to subsurface testing, revealing no cultural remains. This absence of cultural remains resulted in these features being classified as well built agricultural mounds by Barr et al. (1994) and Haun & Associates. As Feature CC is similar to these previously documented mounds, it is also assigned an agricultural function.

## Terraces

A total of 54 agricultural terraces were identified within the project area. The majority of these (n=53) consist of linear features constructed on sloping terrain with a stone retaining wall situated on the downslope side (*Table 5*). These 53 features functioned to retain level or slightly sloping soil areas for planting. No cultural remains were found in association with any of these terraces. The retaining walls are built of either piled cobbles and small boulders (n=26) or stacked and piled cobbles and small boulders. The width of the terrace walls vary from 1.0 to 2.5 and average 1.6 m wide. The downslope sides of the terrace retaining walls range in height from 0.4 to 1.5 m, averaging 0.84 m, with the upslope sides ranging from 0.0 to 0.6 m in height, averaging 0.34 m. The terraces range in length from 5.2 to 79.1 m, averaging 21.6 m long. An example of a Site 24397 terrace is presented in *Figure 34*.

The remaining terrace (Feature DC) was more formally constructed than the previously discussed 53 features. This feature is an oval-shaped terrace located in the south-central portion of the project area at c. 1,175 ft elevation. The terrace is 5.6 m long (northeast by southwest) and 4.0 m wide, with a stacked and faced retaining wall extending along the southwestern, downslope side (*Figure 35*). This wall ranges in height from 0.7 to 0.9 m. The northwest and southeast sides slope down to the southwest and range in height from 0.25 to 0.7 m, with the northeast side comprised of one course of cobbles and small boulders that average 0.1 m in height. The southeastern side of the terrace has collapsed outward, with minor wall collapse along the southern side.

The surface of the terrace is comprised of a level, rough pavement of cobbles and small boulders. No cultural remains were present on the surface. A 1.0 by 3.0 m test unit (TU-94) was excavated through the center of the terrace, revealing a layer of stones (Layer I), over a discontinuous soil deposit (Layer II; see *Figure 35*). Layer I consisted of 0.36 to 0.75 m of loosely packed cobbles and small boulders with no cultural remains present. No evidence was found to indicate that it had been constructed during more than a single construction episode. The majority of this layer rests on bedrock, with several isolated pockets of a very dark brown (10YR 2/2) silt (Layer II) that varied in thickness from 0.01 to 0.05 m. No cultural re-

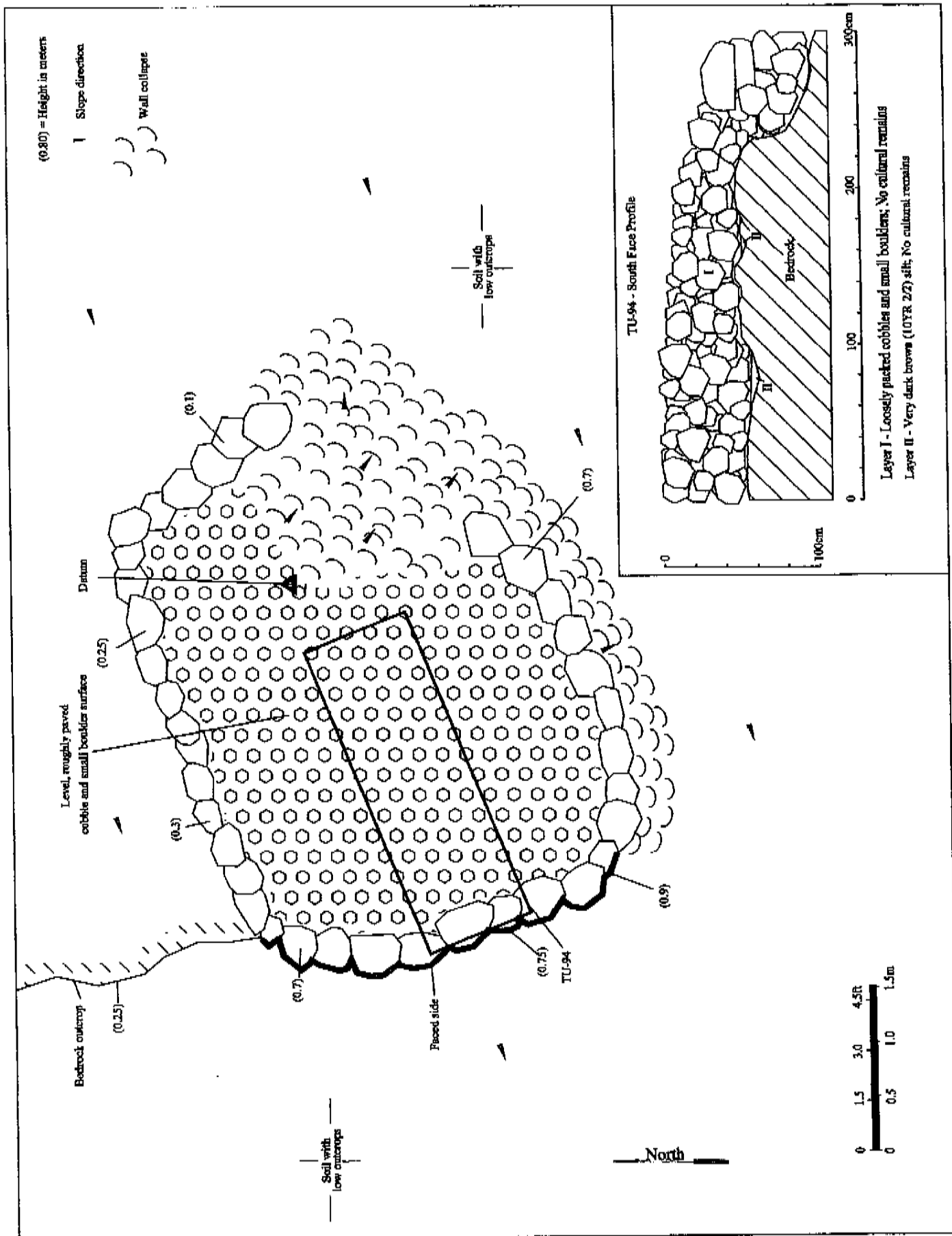


Figure 35. Site 24397, Feature DC Plan Map and TU-94 South Face Profile

mains were present in Layer II. Feature DC is interpreted as an agricultural feature based on the absence of cultural remains. It is unaltered and in fair condition.

## Kua'iwi

The 28 *kua'iwi* are linear features generally oriented in inland-seaward directions, which were likely created by clearing surface stones from adjacent areas. These features are interpreted as functioning to define the north-south boundaries of agricultural fields. The *kua'iwi* in the project area range in length from 11.5 to 199.3 m with an average length of 53.5 m. These features range in width from 1.2 to 3.0 m (averaging 2.13 m) and in height from 0.4 to 1.5 m (averaging 0.9 m). The majority of these features are constructed of piled cobbles and small boulders (n=21), with the remaining seven *kua'iwi* evidencing some stacking. One of the *kua'iwi* (Feature AY) has a stacked cobble and small boulder wall built on top of it. *Figure 36* depicts an examples of a *kua'iwi* recorded within the parcel. No cultural remains were present at the *kua'iwi*.

## Walls

The 22 walls are comprised of linear cross-slope and inland-seaward features that function to delineate the boundaries of agricultural fields. The cross-slope walls differ from terraces in that they do not retain soil on their upslope sides. The agricultural walls in the project area range in length from 5.3 to 157.7 (averaging 31.3m long), in width from 0.8 to 1.5 m (averaging 1.1 m wide) and in height from 0.5 to 1.4 (averaging 0.91 m in height). The majority of these features (n=13) located in the southern portion of the parcel, evidence stacked and faced sides. The remaining features consist of stacked sides (n=5), stacked and piled sides (n=3) and piled (n=1). No cultural remains were present. *Figure 37* illustrates a Site 24397 wall.

At least seventeen walls are probably historic in age based on their well-preserved condition and association with historic residential features. These walls (Features AX and BJ-CA) are concentrated in the southwest corner of the project area. The BU wall, BI wall and a wall following the crest of the Feature AY *kua'iwi* form a large enclosure that was probably used for historic coffee cultivation and incorporated pre-existing features (terraces and *kua'iwi*) of the Kona Field System.

## Enclosures

The two agricultural enclosures consist of Features DB and DD. Feature DB is a crude enclosure located near the western project area boundary at c. 1,060 ft elevation. The feature is located on a slight slope that angles down to the west. A large *kukui* nut tree is located just west of the enclosure. The enclosure is situated in a shallow swale and is 8.1 m in length (northwest by southeast) and 4.6 to 5.6 m wide (*Figure 38*). There is a stacked cobble and small boulder wall along the southern side of the feature that is 4.3 m long (east-northeast by west-southwest), 0.3 to 0.5 m wide, 0.35 to 0.5 m in height on the north side and 0.0 to 0.2 m in height on the south side. A mounded piled cobble and small boulder wall forms the northeast side of the enclosure, measuring 8.1 m long (northwest by southeast), and 0.75 to 1.55 m wide. This wall is 0.2 to 0.5 m tall on the west side and 0.0 to 0.25 m on the east side. The southern end of this wall angles down into the interior, with the north end consisting of a low free standing wall. An area of sloping rubble is located at the southwest end of the feature, angling down into the interior.

The surface of the enclosure consists of an area of exposed lava at the northeast end, with the remainder comprised of grass covered soil. No cultural remains were noted. A 0.5 by 0.5 m test unit (TU-116) was excavated into the interior of the enclosure at the western end (see *Figure 38*). The excavation revealed a single layer of a very dark brown (10YR 2/2) silt with 10% subangular pebble and gravel inclusions that varied in thickness from 0.05 to 0.19 m. *Kukui* nut shell, likely deposited from the adjacent tree were recovered from this deposit and no cultural remains were present. The excavation of TU-116 was terminated on bedrock. Feature DA is interpreted as an agricultural enclosure based on its informal construction and the absence of cultural remains. It is unaltered and in fair condition.

Feature DD is a wall built against a pahoehoe outcrop forming an enclosure, located in the south-central portion of the project area at c. 1,122 ft elevation. The feature is comprised of a linear stacked cobble and small boulder wall that is 2.4 m long (east-west), 0.95 to 1.0 m wide and 0.7 to 1.25 m in height





Figure 36. Site 24397, Feature BA Kua'iwi, view to southwest

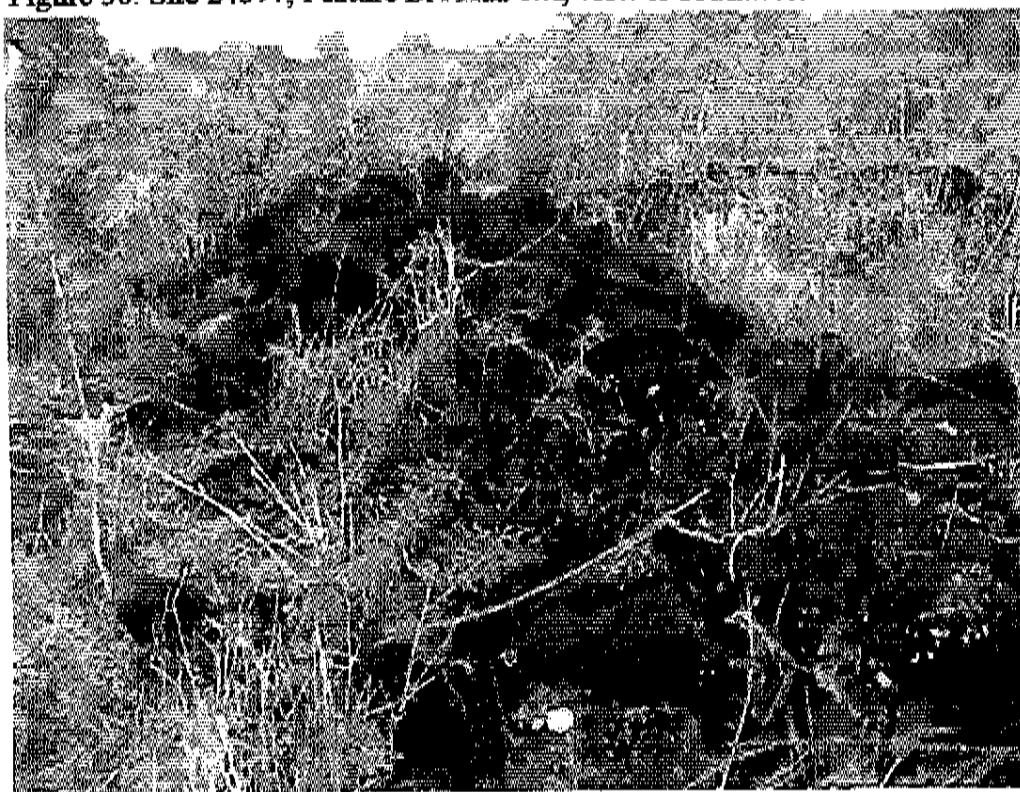


Figure 37. Site 24397, Feature F Wall, view to north

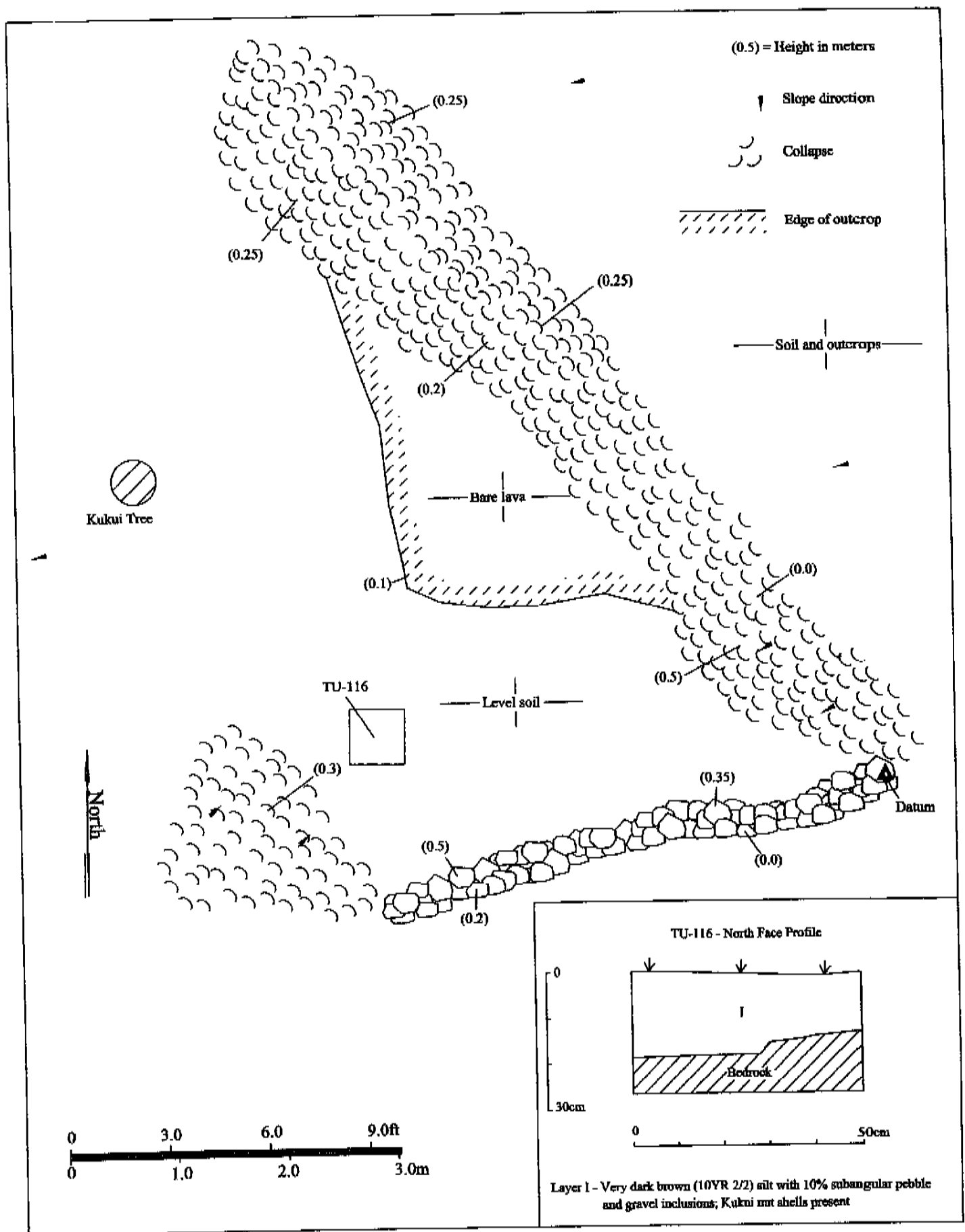


Figure 38. Site 24397, Feature DB Plan Map and TU-116 North Face Profile

(Figure 39). A portion of the wall at the east end of the north side has collapsed outward, though the remaining portions are intact and faced. The east end of the wall abuts a bare pahoehoe outcrop that ranges in height from 0.3 to 0.6 m. The wall and outcrop form an enclosure that is 2.4 m long (east-west) and 2.2 m wide, with a surface comprised of level soil. No cultural remains were present.

A 1.0 by 1.0 m test unit (TU-108) was excavated into the level soil deposit, revealing a single soil deposit over bedrock (see Figure 39). Layer I consisted of 0.26 to 0.36 m of a very dark brown (10YR 2/2) silt with 30-40% subangular basalt pebble, cobble and gravel inclusions. Cultural remains from Layer I consisted of two volcanic glass flakes (7.7 g). No other cultural remains were present.

Feature DD is assigned an agricultural function due primarily to the absence of habitation debris. It is possible that this enclosure functioned as a temporary work station used in conjunction with the agricultural features in the area. This is indicated by the volcanic glass flakes which were likely used as plant processing implements. It is unaltered and in good condition.

## Walled Terrace

Feature DA is crudely constructed walled terrace located along the western project area boundary at c. 1,054 ft elevation. The feature is situated on the side of a moderate slope that angles down to the west. Feature DB evidences overall dimensions of 7.8 m long (east-west) and from 4.9 to 6.8 m (Figure 40). A mounded retaining wall extends along the west side of the feature constructed of piled cobbles and small boulders. This wall is curvilinear and is 5.25 m long (north-south), 0.6 to 1.25 m wide, 0.7 to 1.2 m tall on the downslope side and 0.3 m in height on the upslope side.

The surface of the terrace is comprised of level soil and exposed bedrock and is 5.3 m long (east-west) and 5.1 to 5.4 m wide. A curved cobble and small boulder wall extends along the northeast and east side of the terrace, ranging in width from 0.65 to 1.4 m. The majority of this wall is collapsed and built of stacked and piled cobbles and small boulders, though an intact faced section was present on the western side. A cow trail bisects the wall at the northeastern end. The wall ranges in height from 0.4 to 0.9 m on the western side and 0.2 to 0.3 m on the eastern side. No cultural remains were present at the feature.

A 0.5 by 0.5 m test unit (TU-115) was excavated into the surface of the terrace adjacent to the faced section (see Figure 40). This excavation revealed a single soil layer over bedrock. Layer I was comprised of 0.1 to 0.2 m of a very dark brown (10YR 2/2) silt with 10% subangular pebble and gravel inclusions. No cultural remains were present. Feature DA was assigned an agricultural function based on the generally informal construction and absence of cultural remains. It is in fair condition and is unaltered.

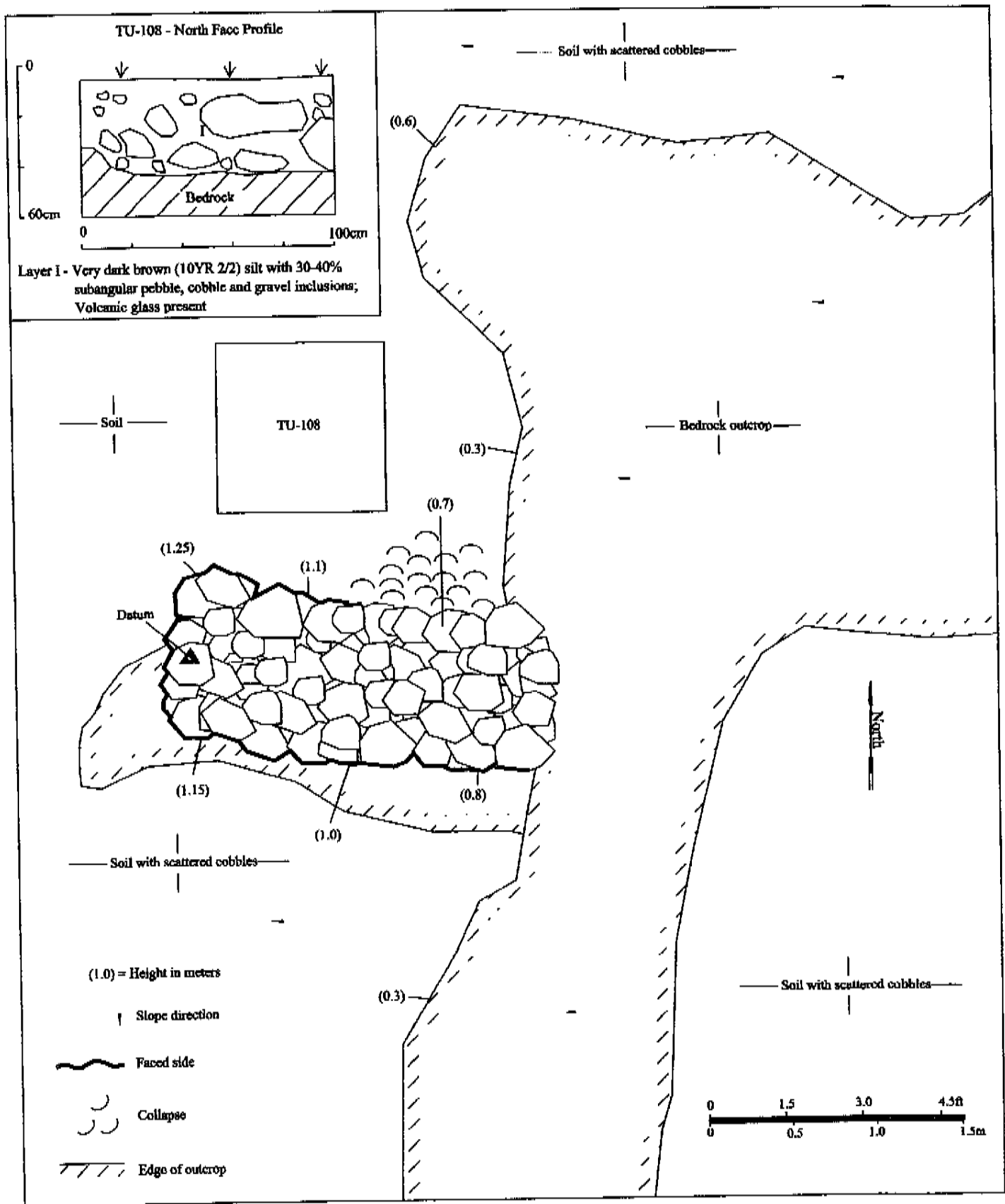


Figure 39. Site 24397. Feature DD Plan Map and TU-108 North Face Profile

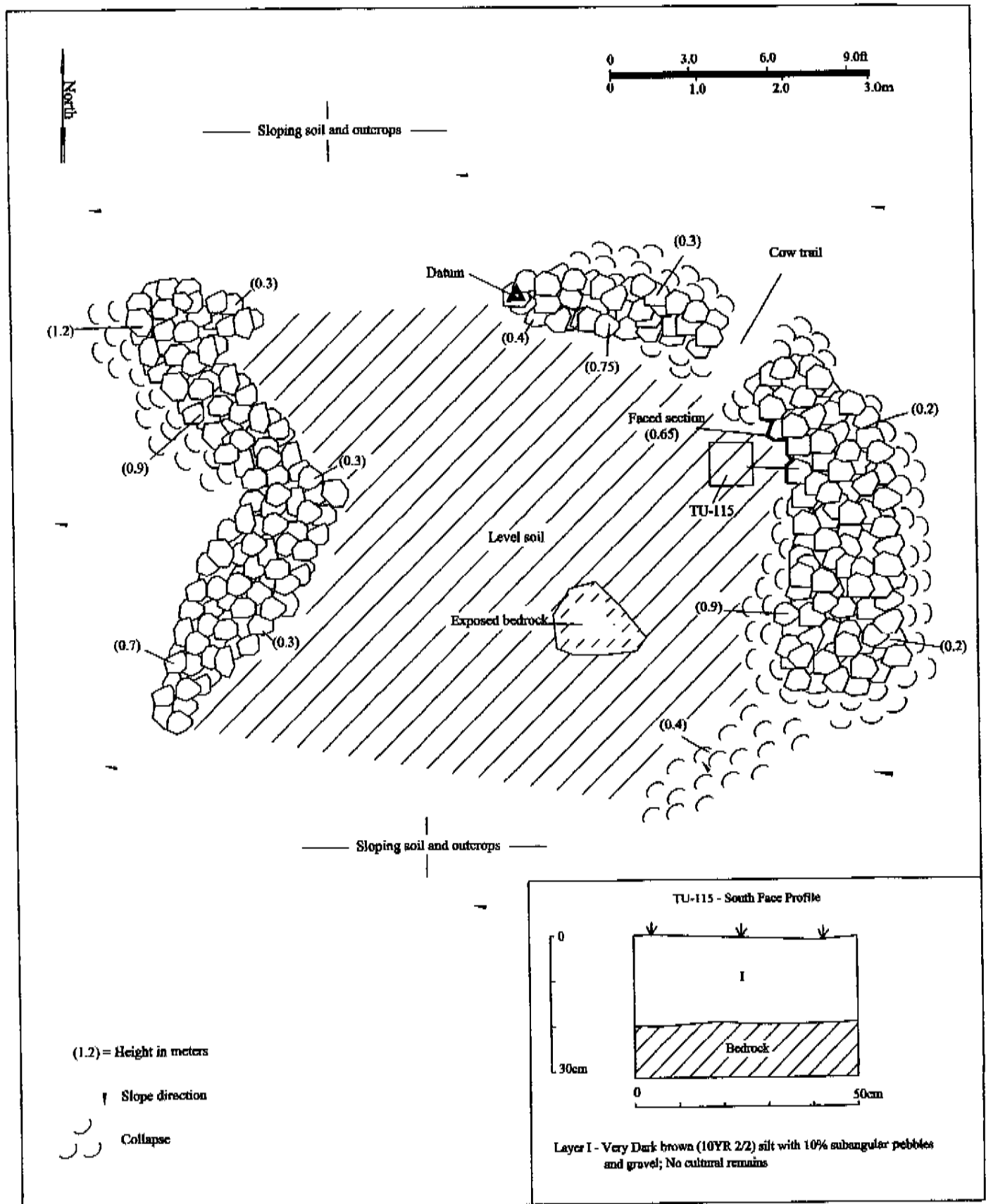


Figure 40. Site 24397, Feature DA Plan Map and TU-115 South Face Profile

## CONCLUSION

### Discussion

The survey results generally conform to the expectations derived from historical and archaeological background research. The identified sites and features conform to the traditional Hawaiian site/feature types expected in the Upland-Forest Zone (Cordy et al. 1991). As expected, agricultural features and scattered habitations were identified. The temporary habitation sites consist of five lava tubes (Sites 24379-24383) containing sparse marine shell and charcoal. All except one of the sites are part of a lava tube system that parallels the north project area boundary. Site 24383 is a small lava tube situated in the west central portion of the project area. Three tubes have rock rings on the floor that were used to support gourds used to collect water from seeps in the cave ceiling. A clay pipe stem fragment at Site 24382 indicates potential early historic use in the later 1700s to early 1800s. One tube has evidence of a later historic episode of use. Site 24379 contains a deposit of c. mid-1900s bottles, jars, and other debris.

The four permanent habitation sites consist of an enclosure (Site 24387), platform (24388), a terrace and enclosure (24384), and a complex of two terraces, two enclosures, and a platform (24390). Three of the four sites are clustered in the south-central portion of the project area between 1,110 ft and 1,070 ft elevation. The fourth site is situated in the west central portion of the project area at 1,150 ft elevation. Test excavations at these sites produced moderate amounts of marine shell midden, charcoal, and, with one exception, a few artifacts, primarily volcanic glass flakes. The excavation at a terrace, Feature B of Site 24390, produced 340 volcanic glass flakes indicating probable specialized use for some plant processing activity requiring extensive cutting or scraping.

The project area is situated within the *'apa'a* zone of the Kona Field System between 1,000 and 2,500 ft elevation (Cordy 1995, Newman 1970, Schilt 1984). This zone traditionally was used for dryland cultivation of taro, sugar cane, sweet potato, and ti. Permanent habitations are present in the *'apa'a* zone, but are infrequent (Cordy 1995, Burchard 1995). Dwellings were observed by early historic chroniclers, but most were probably for temporary use in conjunction with agriculture, bird hunting, and collecting of plant resources.

Agricultural clearing features are the most common evidence of agricultural activity. These features consist of mounds of stones piled on soil and areas of exposed bedrock that were created by clearing adjacent areas for planting. Over 500 clearing features were identified. The density of these features decreases markedly with elevation. The majority are situated in the seaward half of the parcel 1,150 ft elevation where the density of the features is nearly 15 per acre. This contrasts with the density of less than 3 features per acre above 1,265 ft elevation.

The soil throughout most of the parcel consists of Punaluu extremely rocky peat with a small area of Kaimu extremely stony peat located in the southeastern corner of the project area (see Figure 32). As the decrease in clearing piles in relation to elevation was generally consistent throughout the parcel, the density of these features does not seem vary with soil type. A large concentration of historic agricultural walls and enclosures is present in the southwestern portion of the parcel and relatively few clearing piles were present in the vicinity of these historic features. The lower density of clearing features in this area may be due to the presence of more soil deposited along a shallow swale that traverses the area and probably channels water after heavy rains. This may explain the presence of formal walled fields in this area that continued to be used historically. Alternatively, this area formerly may have had clearing features that were used to construct the network of historic walled fields.

In the Kona Field System *kua'iwi* are prominent agricultural features. These broad, linear piles of rocks built from stones cleared from the adjacent slopes served as field boundaries. *Kua'iwi* are oriented inland-seaward often interconnected with perpendicular, soil-retaining walls and terraces forming rectangular grid pattern of fields. *Kua'iwi* also served to control rainfall runoff (Kirch 1985). These formal fields contrast with more informal garden areas characterized by scattered agricultural features in very rocky areas, such as young lava flows. The *kua'iwi*, walls and terraces in the project area define at least 88 formal fields. The physical characteristics and associated features of the fields are summarized in Table 8, and the field locations are illustrated in Figure 41. These fields consist of level or slightly sloping planting surfaces that range from 42.5 sq m to 4754.8 sq m in area with an average area of 672.0 sq m.

**Table 8. Summary of Site 24397 Agricultural Fields**

Field	Area (sq m)	Elevation (feet)	Associated Features/Sites				Probable Age	Comment
			Downslope side	Upslope side	Other 1	Other 2		
1	223.5	1,015-1,025	BU	BS	BT	18115	Historic	
2	234.3	1,020-1,025	BU	BS/BV	BT	BL	Historic	
3	230.5	1,023-1,028	BV	BW	BL	BP	Historic	
4	192.2	1,025-1,033	BW	BX	BL	BP	Historic	
5	140.7	1,024-1,028	BS	BR	BP	18115	Historic	
6	223.0	1,026-1,030	BR	BQ	BP	18115	Historic	
7	887.7	1,028-1,046	BQ	BO	BP	18115/ 18728	Historic	
8	180.0	1,030-1,034	-	BY	BY	BL	Historic	
9	478.3	1,033-1,046	BY	BZ	BL	-	Historic	
10	1037.5	1,029-1,058	BX	BM	BL	BA/BP	Historic	
11	361.3	1,043-1,052	BO	BN	BA/BP	18726	Historic	
12	1260.7	1,050-1,086	BN	BJ	BA/BP	18726	Historic	
13	1199.1	1,068-1,087	BM	BK	BL	BA	Historic	
14	383.9	1,045-1,056	BZ	CA	BL	-	Historic	
15	1461.3	1,053-1,076	CA	CM	CA	BL	Historic	
16	937.8	1,085-1,110	BJ	BB	BA/BP	18115	Historic	
17	1055.1	1,083-1,102	BK	BI	AY	BA	Historic	
18	909.7	1,102-1,117	BI	BC	AY	BA	Historic	
19	484.4	1,117-1,128	BC	AZ	AY	BA	Historic	
20	1455.7	1,128-1,155	AZ	Site 24374	AY	BA	Historic	
21	1729.0	1,110-1,148	BB	-	BA/BP	18115	Historic	
22	90.0	1,037-1,039	CB	-	-	-	Prehistoric	Bordered by slope on upslope side
23	80.1	1,045-1,047	CD	-	-	-	Prehistoric	Bordered by slope on upslope side
24	206.1	1,042-1,044	CE	CH	-	-	Prehistoric	Bordered by slope on upslope side
25	240.7	1,030-1,041	CF	-	CG	-	Prehistoric	Bordered by slope on upslope side
26	711.4	1,032-1,068	-	-	CQ	CG, CK	Prehistoric	Bordered by slope on upslope side
27	719.9	1,050-1,067	CH	CI	CK	-	Prehistoric	
28	112.8	1,065-1,068	CI	CJ	-	-	Prehistoric	
29	213.8	1,067-1,075	CJ	CP	-	-	Prehistoric	
30	218.7	1,071-1,076	CP	-	CL	-	Prehistoric	Bordered by slope on upslope side
31	178.8	1,074-1,082	CM	-	CN	-	Prehistoric	Bordered by slope on upslope side
32	173.7	1,077-1,082	CM	-	CN	-	Prehistoric	Bordered by slope on upslope side
33	202.4	1,100-1,110	-	BF	BH	AY	Prehistoric	
34	393.2	1,110-1,113	BG	BF	BH	-	Prehistoric	
35	735.1	1,108-1,119	BF	BD	AY	-	Prehistoric	
36	555.6	1,119-1,132	BD	AX/AT	BE	AW	Prehistoric	Feature DD in Field 36
37	202.7	1,121-1,132	-	AX	AW	AY	Prehistoric	
38	293.1	1,132-1,142	AX	-	AW	AY	Prehistoric	Bordered by slope on upslope side
39	841.0	1,127-1,142	AX/AT	-	AS	AW	Prehistoric	Bordered by slope on upslope side
40	1416.1	1,108-1,129	BF	AR	BE	AT	Prehistoric	Partially bordered by slope on upslope side
41	432.5	1,124-1,138	-	AP	AR	AS	Prehistoric	Partially bordered by slope on upslope side
42	60.5	1,151-1,154	AO	-	-	-	Prehistoric	Bordered by slope on upslope side
43	45.0	1,159-1,162	AN	-	-	-	Prehistoric	Bordered by slope on upslope side - Feature DC upslope of Field 43
44	790.1	1,198-1,214	AE	AF	AD	-	Prehistoric	Partially bordered by slope on upslope side

**Table 8. Summary of Site 24397 Agricultural Fields (cont.)**

Field	Area (sq m)	Elevation (feet)	Associated Features/Sites				Probable Age	Comment
			Downslope side	Upslope side	Other 1	Other 2		
45	342.3	1,210-1,219	AF	-	AD	AG	Prehistoric	Bordered by slope on upslope side
46	337.1	1,228-1,238	AH	-	AI	-	Prehistoric	Bordered by slope on upslope side
47	438.7	1,224-1,238	-	-	AI	AK	Prehistoric	Bordered by slope on upslope side
48	372.2	1,224-1,230	-	AL	AK	Site 24374	Prehistoric	
49	513.3	1,228-1,240	AL	Site 24374	AK	Site 24374	Prehistoric	
50	4754.8	1,244-1,280	-	-	Z	AY	Prehistoric	Bordered by slope on upslope side
51	304.8	1,216-1,221	AB	AA	-	-	Prehistoric	
52	538.7	1,209-1,216	AC	AB	AD	-	Prehistoric	
53	326.2	1,199-1,209	-	AC	AD	-	Prehistoric	
54	272.0	1,148-1,157	AM	-	-	-	Prehistoric	Bordered by slope on upslope side
55	580.0	1,135-1,158	AP	AN	-	-	Prehistoric	
56	342.9	1,130-1,140	AQ	AP	AR	-	Prehistoric	
57	3581.3	1,087-1,137	-	AQ	AR	-	Prehistoric	
58	512.3	1,057-1,074	CO	CW	-	-	Prehistoric	Partially bordered by slope on upslope side
59	304.0	1,092-1,110	CW	-	-	-	Prehistoric	Bordered by slope on upslope side
60	1299.4	1,068-1,090	CU	CO	CV	-	Prehistoric	Bordered by slope on upslope side
61	1144.1	1,058-1,080	CT	CU	CQ	CV	Prehistoric	
62	814.1	1,059-1,065	CS	CT	CV	CQ	Prehistoric	
63	637.0	1,032-1,050	-	CS	CR	CQ	Prehistoric	
64	1594.9	1,032-1,080	-	CS	CR	-	Prehistoric	Feature DB in Field 64
65	1231.0	1,059-1,099	CS	-	CX	CV	Prehistoric	Bordered by slope on upslope side
66	1275.0	1,058-1,102	CS	CY	CX	-	Prehistoric	
67	533.4	1,094-1,106	CY	-	CX	-	Prehistoric	Bordered by slope on upslope side
68	153.0	1,124-1,129	CZ	-	-	-	Prehistoric	Bordered by slope on upslope side
69	272.0	1,100-1,103	X	-	-	-	Prehistoric	Bordered by slope on upslope side
70	52.1	1,103-1,105	W	-	-	-	Prehistoric	Bordered by slope on upslope side
71	76.5	1,109-1,113	V	-	-	-	Prehistoric	Bordered by slope on upslope side
72	946.4	1,087-1,125	U	-	S	-	Prehistoric	Bordered by slope on upslope side
73	387.1	1,087-1,101	-	T	S	-	Prehistoric	
74	675.5	1,100-1,123	T	R	S	-	Prehistoric	
75	441.5	1,123-1,132	R	Q	Q	-	Prehistoric	
76	408.9	1,132-1,139	Q	P	Q	-	Prehistoric	
77	303.8	1,139-1,150	P	-	Q	-	Prehistoric	Bordered by slope on upslope side
78	801.3	1,145-1,169	N	-	M	-	Prehistoric	Bordered by slope on upslope side
79	273.1	1,189-1,204	-	-	L	-	Prehistoric	Bordered by slope on upslope side
80	923.4	1,232-1,270	-	-	H	K	Historic	Bordered by slope on upslope side
81	397.1	1,226-1,239	J	G	-	-	Historic	
82	828.3	1,238-1,270	G	I	C	H	Historic	Partially bordered by slope on upslope side
83	373.6	1,257-1,273	I	-	C	H	Historic	Bordered by slope on upslope side
84	582.8	1,238-1,250	F	D	E	C	Historic	
85	820.1	1,250-1,273	D	B	E	C	Historic	
86	311.9	1,267-1,282	B	-	C	-	Historic	Bordered by slope on upslope side
87	42.5	1,293-1,298	A	-	-	-	Prehistoric	Bordered by slope on upslope side
88	4250.3	1,229-1,280	Y	-	Z	-	Prehistoric	Bordered by slope on upslope side



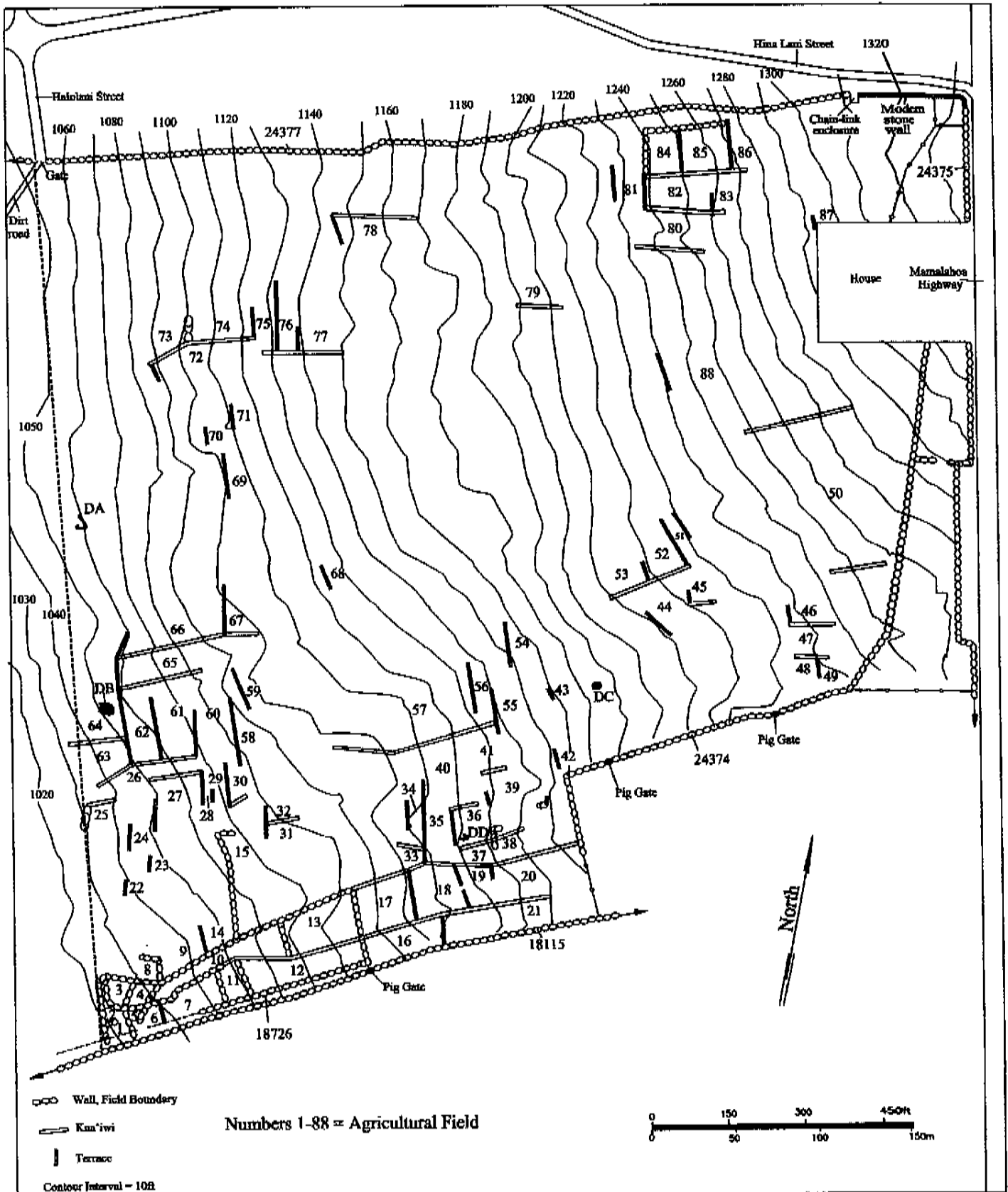


Figure 41. Distribution of Agricultural Fields within Project Area

The total area of the fields is 5.9 hectares (14.6 ac). The fields extend over most of the southern half of the project area, with scattered fields to the north, east and west. No fields are present in the central portion of the parcel though it is likely that this gently sloping area was also cultivated though with no surface remains. There is one concentration of probable historic agricultural fields in the southwestern corner of the project area. At least seventeen walls in this area are probably historic in age based on their well-preserved condition and association with historic residential features. The complex was probably used for historic coffee cultivation and incorporated preexisting features (terraces and *kua'iwi*) of the Kona Field System. Oral historical information indicates that this was an area used by Japanese coffee farmers in the early to mid-1900s.

Also as expected, historic features include dwelling and ranch-related features. Other historic features consist of a cart road (Site 18276) and two charcoal ovens (24392 and 24394). Five sites (24385, 24391, 24393, 24395, and 24396) consist of historic habitation features based on the presence of glass shards, ceramic fragments, and metal artifacts including hardware. Surviving wooden structural remains at Site 24395 indicate a relatively recent period of use. Oral historical accounts document residential use that continued until the mid-1900s. These accounts also indicate use of the project area for cultivating cotton and cattle ranching. Indigenous artifacts, primarily volcanic glass flakes, were found mixed with historic artifacts in test excavations at Sites 24385 and 24396 indicating potential early historic occupations.

## Significance Assessments

Pursuant to DLNR (1998) Chapter 275-6 (d), the initial significance assessments provided herein are not final until concurrence from the DLNR has been obtained. Sites identified and relocated during the survey are assessed for significance based on the criteria outlined in the Rules Governing Procedures for Historic Preservation Review (DLNR 2003; Chapter 275). According to these rules, a site must possess integrity of location, design, setting, materials, workmanship, feeling, and association and shall meet one or more of the following criteria:

1. Criterion "a". Be associated with events that have made an important contribution to the broad patterns of our history;
2. Criterion "b". Be associated with the lives of persons important in our past;
3. Criterion "c". Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value;
4. Criterion "d". Have yielded, or is likely to yield, information important for research on prehistory or history; and
5. Criterion "e". Have an important traditional cultural value to the native Hawaiian people or to another ethnic group of the state due to associations with traditional cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts--these associations being important to the group's history and cultural identity.

Based on the above criteria, all 26 sites are assessed as solely significant under Criterion "d" (*Table 9*). These sites have yielded information important for understanding prehistoric to historic land use in project area.

## Recommended Treatments

The mapping, written descriptions, photography, and test excavation at 16 sites adequately documents them and no further work or preservation is recommended. The ten remaining sites retain the potential to yield information important for understanding prehistoric and early historic land use and are recommended for data recovery. These sites consist of five temporary habitation lava tube caves, four permanent habitation sites, and the agricultural complex. Data recovery at these sites would entail excavation and surface collection to obtain a larger sample of portable remains and dating samples. The data recovery work would be guided by a Data Recovery Plan prepared for DLNR-SHPD review and approval.

**Table 9. Site Significance and Recommended Treatment**

<b>SIHP Site No.</b>	<b>Type</b>	<b>Function</b>	<b>Significance Criteria</b>	<b>Recommended Treatment</b>
18115	Wall	Livestock control	d	NFW
18726	Cart Path	Transportation	d	NFW
24374	Wall	Livestock control	d	NFW
24375	Wall	Livestock control	d	NFW
24376	Wall	Livestock control	d	NFW
24377	Wall	Livestock control	d	NFW
24378	Enclosure/with cave	Livestock control	d	NFW
24379	Lava Tube Cave	Temporary Habitation	d	DR
24380	Lava Tube Cave	Temporary Habitation	d	DR
24381	Lava Tube Cave	Temporary Habitation	d	DR
24382	Lava Tube Cave	Temporary Habitation	d	DR
24383	Lava Tube Cave	Temporary Habitation	d	DR
24384	Complex	Permanent Habitation	d	DR
24385	Complex	Historic Habitation/ Livestock control	d	NFW
24386	Enclosure	Livestock control	d	NFW
24387	Enclosure	Permanent Habitation	d	DR
24388	Platform	Permanent Habitation	d	DR
24389	Enclosure	Flood control	d	NFW
24390	Complex	Permanent Habitation	d	DR
24391	Enclosure	Historic firepit	d	NFW
24392	Oven	Charcoal manufacture	d	NFW
24393	Complex	Historic Habitation	d	NFW
24394	Oven	Charcoal manufacture	d	NFW
24395	Complex	Historic Habitation	d	NFW
24396	Complex	Historic Habitation	d	NFW
24397	Complex	Agriculture	d	DR

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LINDA LINGLE  
GOVERNOR OF HAWAII



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION  
KAKUHIWEA BUILDING, ROOM 333  
KAPOLEI, HAWAII 96707

383 Rec'd 9/9/05  
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HAWAIIAN FISH AND WILDLIFE  
KAROLAN ISLAND RESERVE COMMISSION  
LAND  
STATE PARKS

August 30, 2005

Alan Haun, Ph.D.  
Haun and Associates  
HCR 1 Box 4730  
Keeau, Hawaii 96749

LOG NO: 2005.1885  
DOC NO: 0508MM28

Dear Dr. Haun:

**SUBJECT: 6E-42 Historic Preservation Review, Archaeological Inventory Survey  
(Report 383-022305)(Haun and Henry, March 2005) Replacement Page  
Revisions  
Honokohau 1<sup>st</sup>, North Kona, Hawaii  
TMK: (3) 7-4-008:047**

Thank you for submitting five replacement pages to revise this inventory survey as requested in our letter dated July 29, 2005 (Log No. 2005.1607, Doc No. 0507MM14). The revised pages were received on August 8, 2005.

In our previous review, we considered the historic background information, including summaries of LCA awards and testimony, oral history interviews, and previous archaeological research adequate to predict the types of historic properties that might be present and to evaluate their significance.

A total of 26 sites comprised of 651 features are documented within the 50-acre project area. The majority of these (504) are agricultural in nature, primarily mounds and modified outcrops interpreted as clearing piles. Of the remaining 147 features, feature types include 61 terraces, 28 *kuaiwi*, 27 walls, 15 enclosures, 8 lava tube caves, 2 charcoal ovens, 2 platforms, 2 walled terraces, a cart path, and a faced mound. A total of 14 test units, within 12 features at 7 sites were excavated, including two platforms, three terraces, five enclosures, and a walled terrace. No burials were identified as a result of the survey. Both pre-contact and historic period sites are described.

The revisions have adequately addressed our review comments. The discussion regarding the distribution of clearing mounds on the subject property and their relationship to soil conditions is an improvement. In future reports where repetitive agricultural features are encountered, we believe that the site maps should depict the spatial patterning of these features, where they cluster, and where they are absent. This would greatly enhance the written site description. This may be a step, for this particular study, that you will want to include in your data recovery report although we would prefer to see it addressed as a matter of inventory in future reports.

Alan Haun, Ph.D.

Page 2

All sites are assessed as significant for their information content, with data recovery investigations recommended for Sites 24379-24383, 24384, 24387, 24390, and 24397. We agree with these assessments and recommendations and accept the report as adequate to meet the requirements of HAR 13-276. We look forward to reviewing a Data Recovery Plan.

If you have any questions regarding our comments, please contact MaryAnne Maigret in our Hawaii Island office at 327-3690.

Aloha,



Melanie A. Chinen, Administrator  
State Historic Preservation Division

MM:jen

**Kona View Estates Subdivision**

**Environmental Assessment**

**APPENDIX 4B**

**ARCHAEOLOGICAL DATA RECOVERY PLAN  
AND RELATED CORRESPONDENCE**

**Report 420-052405**

**ARCHAEOLOGICAL DATA RECOVERY PLAN  
SITES 2437-4, 2438-88, 24390, AND 24397  
LAND OF HONOKOHAU 1  
NORTH KONA DISTRICT, ISLAND OF HAWAII  
(TMK: [3] 7-4-08:POR. 47)**

By:

Alan E. Haun, Ph.D.  
and  
Dave Henry, B.S.

Prepared for:

Mr. Thomas Smith  
4054 McKinney Avenue  
Dallas, Texas 75204

September 2005

**Haun & Associates**

Archaeological, Cultural, and Historical Resource Management Services  
HCR 1 Box 4730, Keaau, Hawaii 96749 Phone: 982-7755 Fax: 982-6343

## INTRODUCTION

This data recovery plan was prepared by Haun & Associates at the request of Mr. Thomas Smith. The objective of this plan is to mitigate impacts to Sites 24379, 24380, 24381, 24382, 24383, 24384, 24387, 24388, 24390 and 24397 in accordance with data recovery requirements of the Department of Land and Natural Resources-State Historic Preservation Division (DLNR-SHPD), as contained within Hawaii Administrative Rules, Title 13, DLNR, Subtitle 13, SHPD Rules, Chapter 278 (DLNR 2003).

Haun & Associates previously conducted an archaeological inventory survey of TMK: (3) 7-4-08:por. 47, a c. 50-acre parcel located in the Land of Honokohau 1, North Kona District, Island of Hawaii (Haun and Henry 2005; *Figure 1*). The survey of this parcel identified 26 sites consisting of 651 features (*Figure 2*). The features consist of 504 mounds and modified outcrops, 61 terraces, 28 *kua'iwi*, 27 walls, 15 enclosures, eight lava tubes, two charcoal ovens, two platforms, two walled terraces, one cart path and one faced mound. Functionally, the features include agriculture (612), livestock control (9), permanent habitation (9), temporary habitation (8), historic habitation (8), charcoal manufacture (2), flood control (1), firepit (1), and transportation (1).

In the inventory survey report (Haun and Henry 2005) all 23 sites were assessed as significant solely for their information content. Sixteen of the 26 sites were recommended for no further work and 10 were recommended for data recovery. DLNR-SHPD concurred with the significance assessments and recommended data recovery (Log No. 2005.1885, Doc. No. 0508MM28).

This plan is for the data recovery of five temporary habitation lava tube caves (Sites 24379, 24380, 24381, 24382 and 24383), two permanent habitation complexes (Sites 24384 and 24390), a permanent habitation enclosure (Site 24387), a permanent habitation platform (Site 24388) and an agricultural complex (Site 24397). This plan describes the data recovery sites and outlines research questions and methods for the data recovery effort.

## SITE IDENTIFICATION

### **Site 24379**

Site 24379 is a large lava tube with two entrances located in the northwestern portion of the project area. The inland entrance (Feature A) consists of an oval-shaped, rubble filled sinkhole that is 11.2 m long, 10.5 m wide and 1.9 m in depth (*Figure 3*). A chamber extends to the southwest from the sinkhole, with an entrance that is 8.6 m wide and 1.55 m in height. The chamber is 29.7 m long and from 1.3 to 9.3 m wide, with ceiling heights that range from 0.9 to 2.7 m. The floor of this chamber is comprised of bare lava with an area of sloping roof fall at the western end. Two fragments of *Cypraea sp.* shell are located 2.5 m west of the Feature A entrance, and a concentration of charcoal is

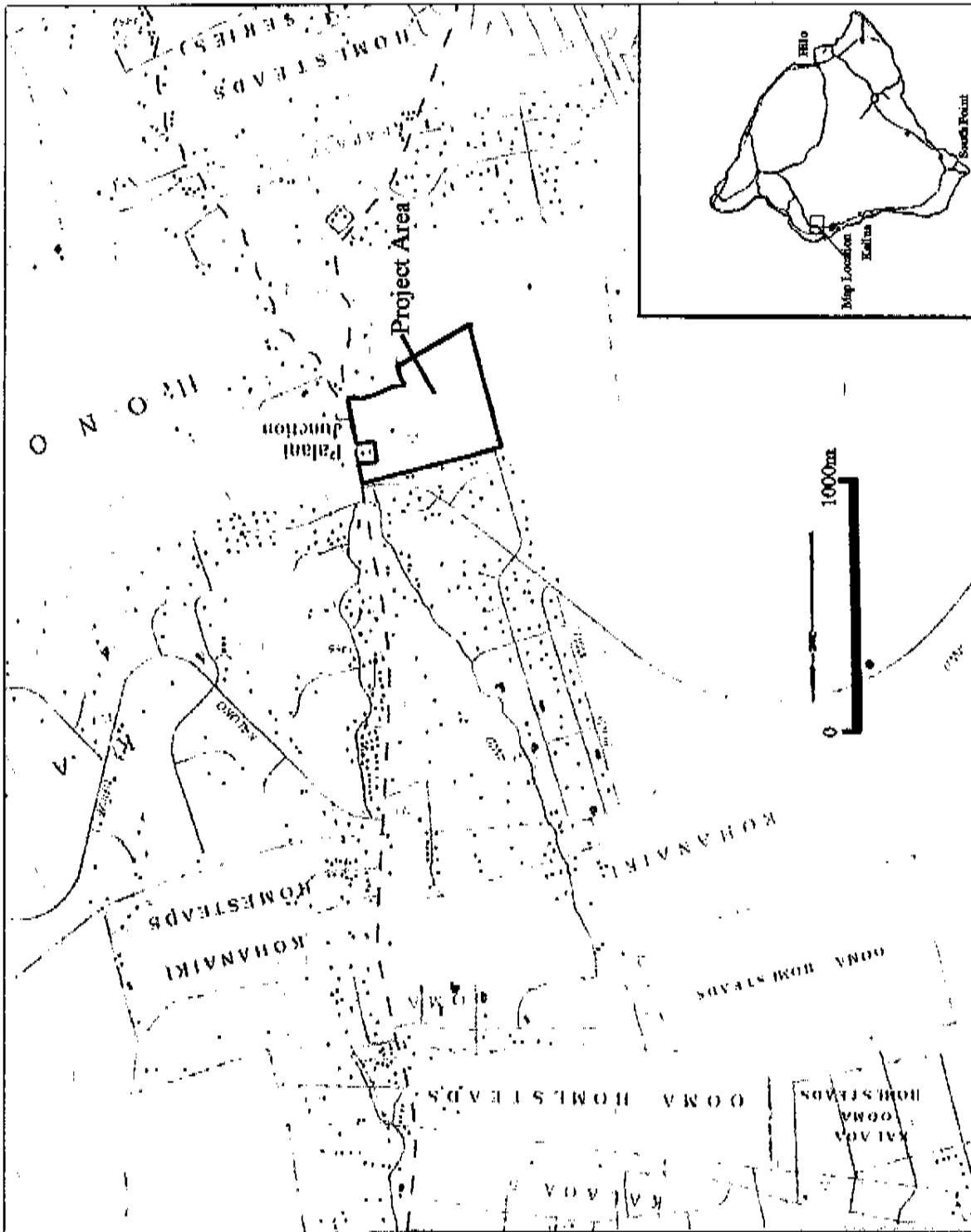


Figure 1. Portion of USGS Keahole Point Quadrangle showing Project Area



Figure 2. Site Location Map

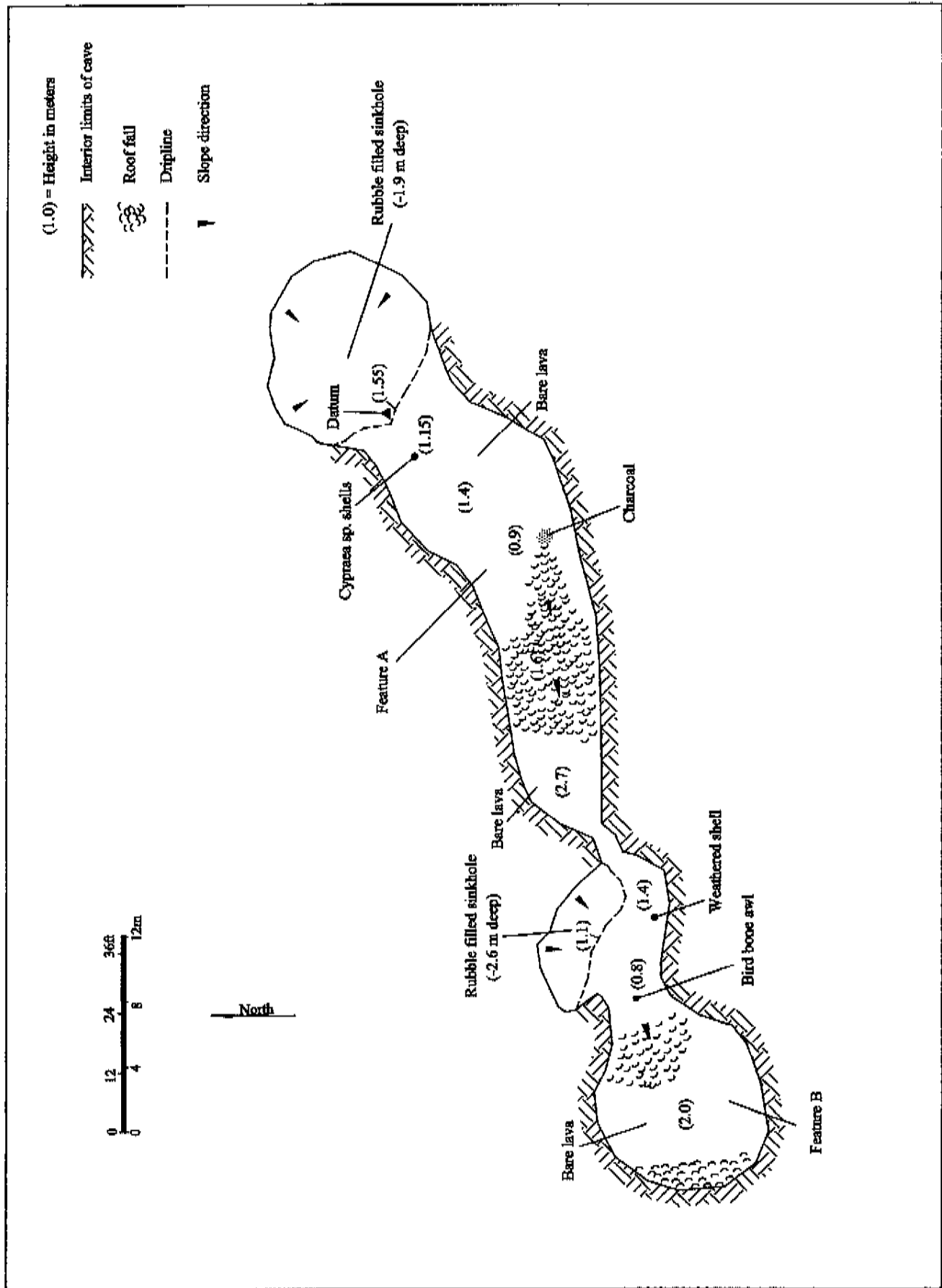


Figure 3. Site 24379 Plan Map



located on the cave floor 8.9 m to the southwest of the shells. No other cultural remains were present in this chamber.

The Feature B entrance is located at the western end of the Feature A chamber. The entrance consists of a rubble filled sinkhole that is oval in shape and is 9.3 m long, 3.5 m wide and 2.6 m in depth. The entrance into the Feature B chamber is located at the southern end of the sinkhole, measuring 8.9 m wide and 1.1 m in height. The chamber is irregular-shaped and is 20.8 m long and from 1.45 to 9.9 m wide, with ceiling heights ranging from 0.8 to 1.4 m. The floor of this chamber consists of bare lava with areas of roof fall in the center of the chamber and at the western end. A fragment of weathered marine shell is present on the cave floor 2.5 m south of the dripline and a small bird bone awl is located 5.1 m to the west-northwest. A fragment of *Cellana sp.* shell is present on the central pile of roof fall.

Site 24379 was interpreted as a temporary habitation site based on its formal type and the presence of the cultural remains. The site is unaltered and in good condition.

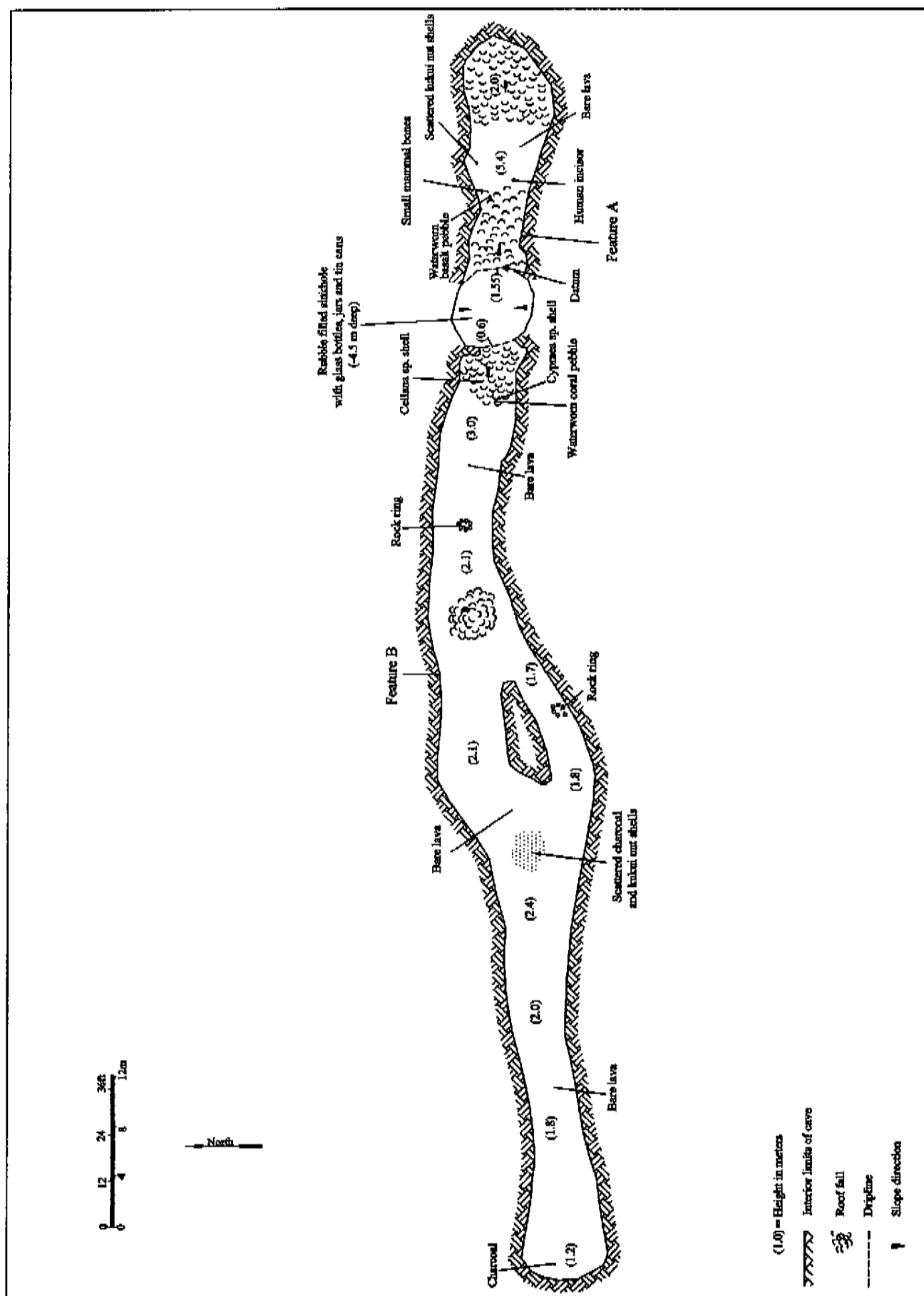
### **Site 24380**

Site 24380 is a large lava tube located in the northwestern portion of the project area. The entrance to the cave is comprised of a vertical sinkhole that is 6.5 m long and 6.1 wide (*Figure 4*). The floor of the sinkhole is 4.5 m in depth below the surrounding ground surface and is filled with rubble and historic debris. This debris is comprised of glass bottles and jars, an enameled pot lid, and a tin oil can.

Passages extend to the east (Feature A) and west (Feature B) of the sinkhole. The entrance to the Feature A passage is 4.4 m wide and 1.55 m in height. This chamber is 18.7 m long and from 4.2 to 6.7 m wide and the floor is comprised of sloping rubble roof fall and bare lava. The ceiling height within the chamber varies from 2.0 to 5.4 m. A waterworn basalt pebble and the bones of a small mammal are located along the northern edge of the chamber, 5.9 m east of the entrance. A single human incisor tooth fragment, snapped off at the root line was present on a small boulder 6.7 m east of the entrance.

The entrance to the Feature B passage is 2.7 m wide and 0.6 m in height. This passage is 74.9 m long, oriented in a roughly east-west direction. The passage varies in width from 4.0 to 12.4 m, with ceiling heights that vary from 1.2 to 3.0 m. The floor throughout the passage consists of bare lava. Sloping rubble is located just west of the entrance, sloping down into the interior. A fragment of *Cypraea sp.* shell and a waterworn coral pebble are located at the base of the sloping rubble.

A 0.8 m diameter rock ring comprised of cobbles is located in the center of the passage 14.3 m west of the entrance. An area of roof fall is situated 6.5 m west of the rock ring. The passage is divided into two chambers .5 m west of the roof fall by a floor to ceiling column. This column is 8.8 m long and 1.7 to 3.4 m wide. A 1.0 m long by 0.6 m wide rock ring is located within the southern chamber, against the south wall of the cave.



A concentration of scattered charcoal and *kukui* nut shells is situated in the center of the cave, 4.5 m west of the western end of the column. These remains are situated in an area 3.1 m long by 2.5 m wide. A fragment of charcoal is present at the extreme western end of the passage on the cave floor.

Site 24380 was interpreted as a temporary habitation site based on its formal type and the presence of the cultural remains. The *kukui* nuts, charcoal and rock rings suggest that the cave was used prehistorically, while the bottles and other debris within the sinkhole indicate an historic utilization. The rock rings indicate the cave was also used as a water source, with the rings used to support gourds in which drip water would accumulate. The site is unaltered and in good condition.

DLNR-SHPD Burial Sites Program staff were consulted on February 16, 2005 regarding the human tooth noted in the eastern passage. As the tooth was snapped off cleanly at the root line it was determined that it was likely deposited in its current location after someone fell down the sloping rubble entrance. The tooth was collected and is being temporarily curated by SHPD.

### **Site 24381**

Site 24381 is a lava tube located in the north-central portion of the project area. The entrance to the cave is comprised of a vertical sinkhole that is 14.8 m long and 14.4 m wide (*Figure 5*). The floor of the sinkhole is 2.5 m in depth below the surrounding ground surface and is filled with rubble. There is a small opening at the base of the sinkhole along the eastern side that is 3.0 m wide and 0.8 m deep. This opening leads to linear chamber with an overall length of 105.0 m, oriented in a roughly northeast by southwest direction. The chamber varies in width from 3.0 to 8.3 m and in height from 1.3 to 3.5 m. The majority of the tube floor is comprised of bare lava though several areas of roof fall were noted.

The western end of the chamber consists of an area of sloping rubble that angles down into the tube a distance of 12.0 m from the small opening. A small tube extends to the south, 2.2 m east of the opening. This tube is 2.1 m long, 0.8 to 1.0 m wide and 1.1 m in height. A second area of roof fall is located in the center of the tube 3.0 m further east. A 0.8 m diameter rock ring comprised of aligned cobbles is located on the bare lava floor against the north wall of the tube, 3.5 m northeast of the second roof fall pile. A concentration of surface charcoal is located in the center of the cave, 2.5 m northeast of the rock ring. This concentration is 4.0 m long and 3.5 m wide.

Two adjacent rock rings are located near the north wall of the tube, 17.5 m northeast of the charcoal concentration. These rings are 0.9 to 1.0 m long and 0.5 to 0.65 m wide. Another rock ring is situated against the south tube wall directly south of the two adjacent rings. This ring is 0.8 m long and 0.6 m wide and contains a large amount of charcoal, indicating it likely functioned as a hearth.

An area of sloping roof fall is located 4.0 m east of the hearth, angling down to the west. The area to the south and southeast of the roof fall consists of a surface scatter

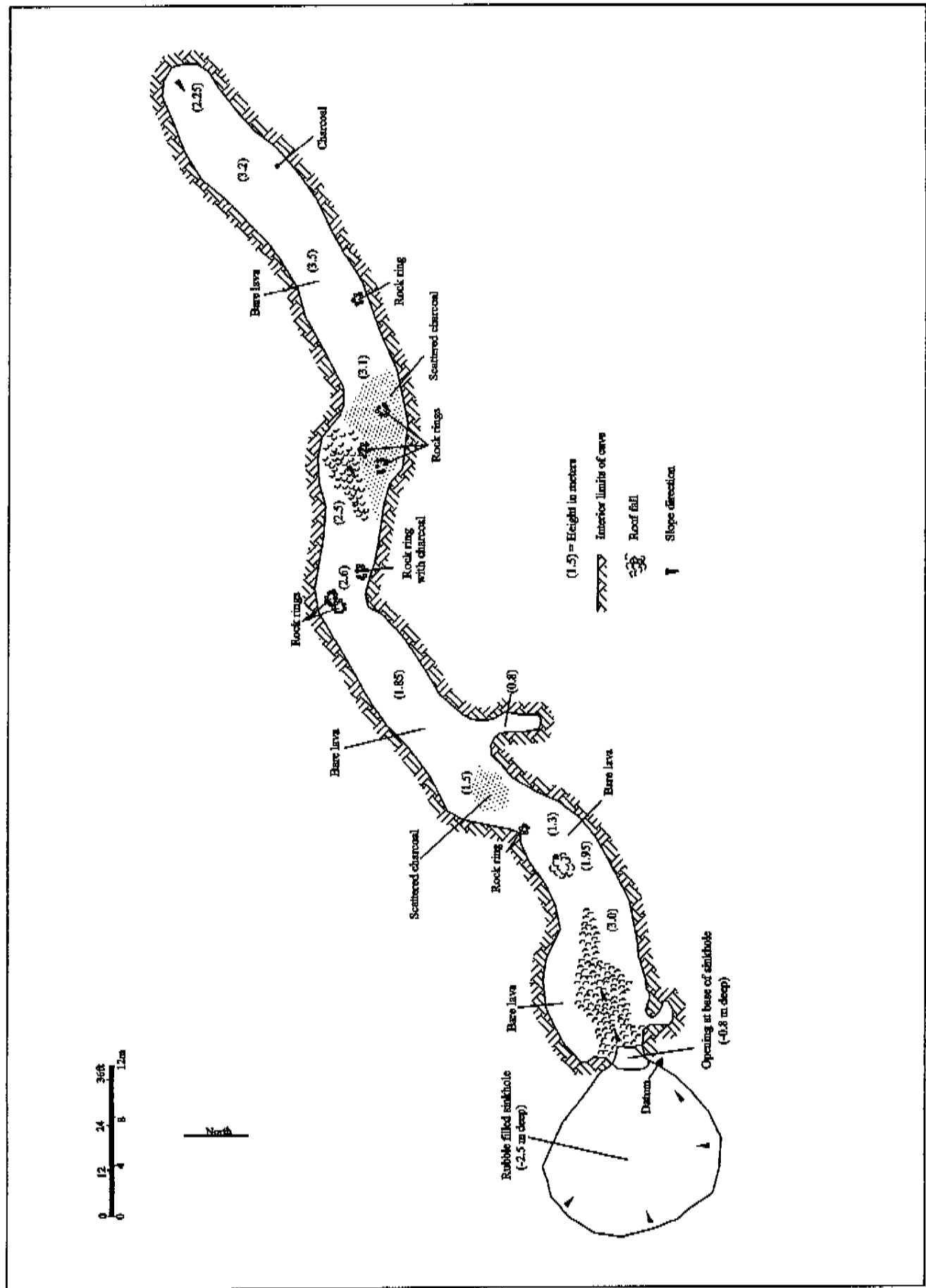


Figure 5. Site 24381 Plan Map

of charcoal. Three rock rings are situated on the surface of this charcoal scatter. These rings range in length from 0.6 to 1.0 m and in width from 0.4 to 0.6 m. Another rock ring is located adjacent to the south tube wall, 6.5 m east-northeast of the charcoal scatter on the bare lava floor. This ring is 0.5 m in diameter. An isolated fragment of charcoal was noted on the tube floor 12.6 m northeast of the rock ring. No other cultural remains were observed within the cave.

Site 24381 was interpreted as a temporary habitation cave based on its formal type and on the presence of the cultural remains and modifications. The charcoal and hearth feature suggest that the tube was used as a shelter and the rock rings indicate it also functioned as water source. Site 24381 is unaltered and in good condition.

### **Site 24382**

Site 24382 is a large lava tube located in the northeastern portion of the project area. The tube has two sinkhole entrances; one situated at the western end of the site (Feature A), and one located 43.5 m to the east-northeast (Feature B; *Figure 6*). The majority of the tube is situated within the project area, though the inland portion exits the parcel at the c. 1,265 ft elevation continuing to the east under Hina Lani Street.

The Feature A entrance is situated at c. 1,197 elevation. This rubble-filled sinkhole is 15.5 m long, 8.8 m wide and 3.5 m in depth. An overhang is located along the northern side of the sinkhole, with an entrance that is 10.6 m wide and 1.95 m in height. The interior of the overhang is 10.6 m long and 4.4 m wide, with a bare lava floor and no cultural remains.

There is a hole in the lava floor of the overhang that is 1.0 m long, 0.6 m wide and 2.5 m in depth, that opens a large chamber that extends between Features A and B. This chamber is irregular in shape and is 29.3 m long and from 4.4 to 16.0 m wide, with ceiling heights that range from 1.6 to 3.5 m. The Feature B sinkhole is situated at the eastern end of the chamber. An area of roof fall is located at the northwestern end of the chamber, with the remaining portion of the floor comprised of bare lava.

A rock ring is located on the cave floor 10.6 m northeast of the entrance hole. A concentration of unidentified small bird bones are located in the center of the cave floor 11.5 m southeast of the rock ring and a clay pipe stem is situated 4.0 m northeast of the bird bones. A concentration of *echinoid* and charcoal is located at the northeast end of the chamber, 3.5 m northeast of the pipe stem.

The Feature B sinkhole is rubble filled and is 18.6 m long (east-west), 11.5 m wide and 6.3 m in depth, with near vertical sides. A small, non-cultural cave is located at the southeast end of the sinkhole, with a 1.3 m wide by 0.8 m tall entrance, leading to an oval chamber that is 5.7 m long, 2.6 m wide, with a bare lava floor and an average ceiling height of 0.95 m.

A lava tube extends to the northeast from the Feature B sinkhole, accessed through an opening that is 8.8 m wide and 3.8 m in height. This tube evidences an overall



length of 202.5 m, oriented in a north-northeast and northeasterly direction. This tube varies in width from 1.75 to 6.2 m with ceiling heights that range from 1.0 to 4.0 m. The floor at the entrance to this chamber is comprised of sloping rubble that angles down to the northeast. With the exception of an area of roof fall at the northeast end of the tube, the floor is comprised of bare lava.

A concentration of pig bone is located in the center of the tube 5.3 m northeast of the entrance. A floor to ceiling wall is built across the tube 6.2 m to the north-northeast of the pig bones. This wall is partially collapsed and appears to have been breached in the past. The wall is 2.3 m thick with an 0.8 m wide and 0.8 m high opening in the center just below the cave ceiling. The sides of the opening are not faced and it appears to be the result of dismantling the wall to gain access to the formerly sealed portion of the tube. A concentration of charcoal is located just north of the wall and a concentration of unidentified small bird bone is located 2.6 m northeast of the charcoal. A second charcoal concentration is located 5.3 m north-northeast of the bird bones.

A small side tube extends to the east, 19.5 m north-northeast of the wall. This tube is 6.6 m long, 1.3 m wide with a 1.6 m tall ceiling that tapers down to 0.2 m at its eastern end. No cultural remains were present in this tube. Fragments of *echinoid* are located in the center of the main tube, 4.4 m north of the side tube entrance. A series of four rock rings are situated to the north-northeast of the *echinoid*, ranging in length from 0.8 to 1.6 m long and in width 0.6 to 0.8 m.

A second side tube extends to the south from the main chamber, 26.0 m north-northeast of the first. This tube is 5.3 m long, 3.0 to 3.5 m wide and 1.0 to 1.5 m in height. Two rock rings are present in this side tube.

A concentration of *echinoid* and charcoal are located along the east side of the tube 8.5 m north-northeast of the entrance to the side tube, with a second *echinoid* cluster located 4.8 m further to the northeast. Unidentified small bird bones are located 7.1 m to the northeast of the second *echinoid* cluster, and a concentration of *echinoid*, charcoal and bird bone are situated 14.6 m further east-northeast. The tube continues in a roughly east-northeasterly direction for 71.3 m from the bird bones, where the main tube divides into two chambers, one extending to the east and one to the north. Two clusters of charcoal on the bare cave floor were noted between the bird bones and the division.

The eastern passage is 19.5 m long, 2.6 to 3.0 m wide and 2.9 m high. A concentration of charcoal is present on the floor at the west end of this passage. The eastern end terminates in an area of roof fall. The northern passage extends in this direction for 4.5 m, then angles to the east-northeast for 26.6 m where it terminates. This passage is 1.7 to 6.2 m wide and 1.0 to 2.2 m in height. A concentration of charcoal was noted on the bare lava floor near the east end of this passage.

Site 24382 was interpreted as a temporary habitation cave based on its formal type and on the presence of the cultural remains and modifications. The rock rings indicate it also functioned as water source. The presence of the clay pipe stem indicates the

cave was used historically, with the remainder of the cultural remains suggesting a pre-historic occupation. Site 24382 is unaltered and in good condition.

### **Site 24383**

Site 24383 consists of a small cave located at the northern end of a sinkhole in the west-central portion of the project area. The sinkhole is oval in shape and is 12.4 m long, 4.75 to 7.4 m wide and 1.0 to 2.2 m in depth below the surrounding ground surface (*Figure 7*). No cultural remains were present inside the sinkhole.

The cave is situated at the north end of the sinkhole, accessed through an entrance that is 3.9 m long and 2.1 m in height. The interior is irregularly-shaped and is 3.0 to 5.9 m long and 2.7 to 5.1 m wide. The floor of the cave is comprised of a thin soil over bedrock with the ceiling heights ranging from 1.2 to 1.9 m. A single *Cypraea sp.* shell was present inside the cave at the northern end.

A stacked cobble and small boulder wall is located at the southern end of the sinkhole, built against the near vertical, exposed bedrock sides. The wall is 0.9 to 1.2 m wide, 0.8 to 1.7 m in height on the interior side and 0.2 to 0.4 m in height on the exterior side (above the surrounding ground surface). No cultural remains were found in association with the wall.

Site 24383 was interpreted as a temporary habitation cave based on its formal type and on the presence of the marine shell. The function of the wall at the south end of the sinkhole is uncertain though it is unlikely to have been built to prevent cattle from entering the sinkhole due to its low exterior height. Site 24383 is unaltered and in fair condition.

### **Site 24384**

Site 24384 is a complex of three features located in the western portion of the project area. The features are comprised of two enclosures (Features A and C) and a terrace (Feature B; *Figure 8*), located in an area of dense agricultural features. The site encompasses an area 18.0 m long by 12.5 m wide.

Feature A is comprised of a double enclosure that is 8.3 m in length and from 4.2 to 5.1 m with no apparent entrance. The northeastern compartment is 5.3 m long and 5.1 m wide with walls built of stacked cobbles and small boulders that range in width from 0.7 to 1.2 m and in height from 0.35 to 0.75 m. A vertical basalt slab is incorporated into the exterior wall of the enclosure along the southern side, measuring 0.45 m in height. The majority of the structure is intact, with some minor collapse along the north side.

The interior of the northeastern compartment is comprised of level soil with scattered cobbles with no cultural remains. A 0.5 by 0.5 m test unit (TU-110) was excavated within this compartment, revealing a single soil deposit over bedrock (see *Figure 8*). Layer I consisted of 0.12 to 0.15 m of a very dark brown silt with 20% subangular basalt pebble, cobble and gravel inclusions. A single *Cypraea sp.* shell was recovered from this deposit.



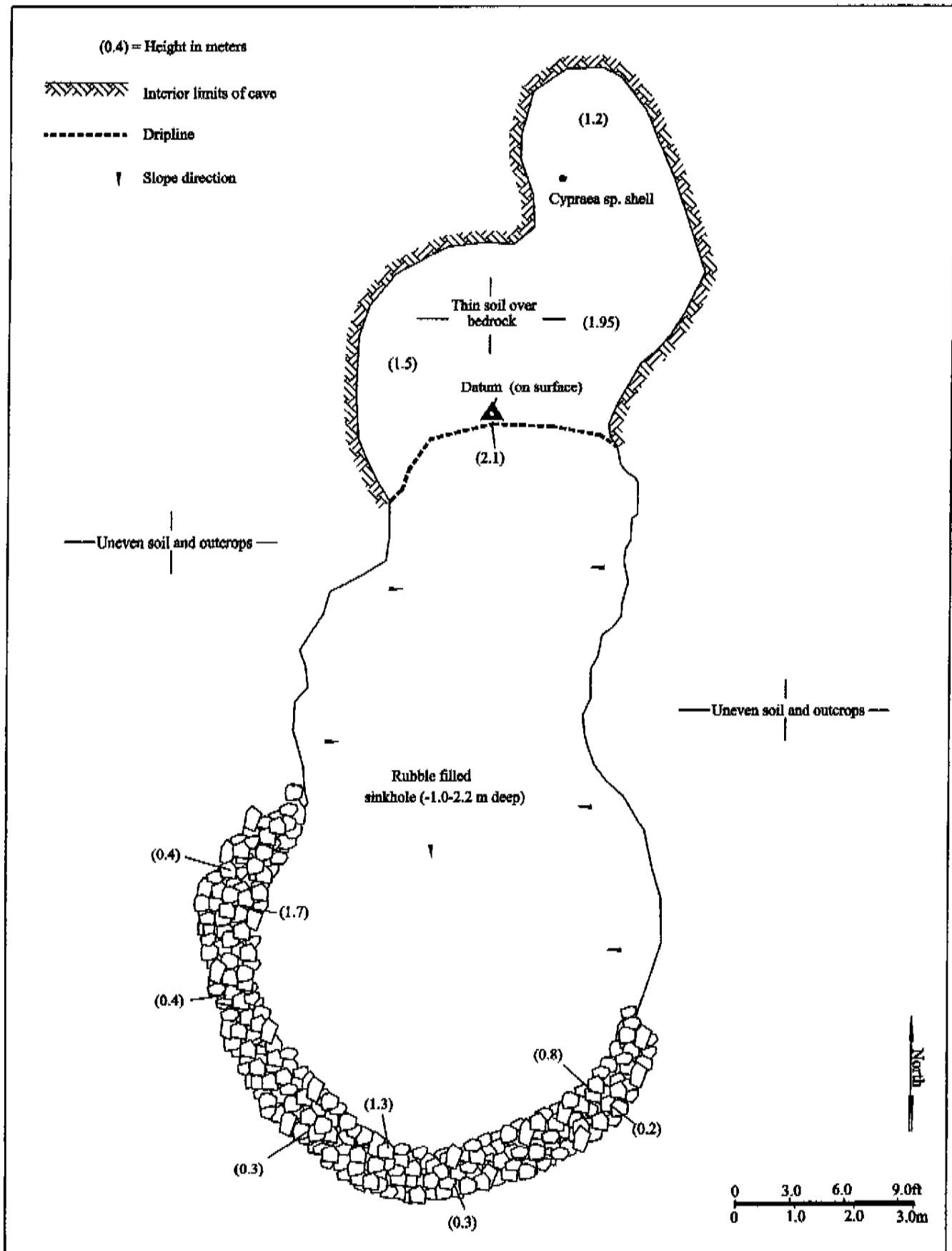


Figure 7. Site 24383 Plan Map

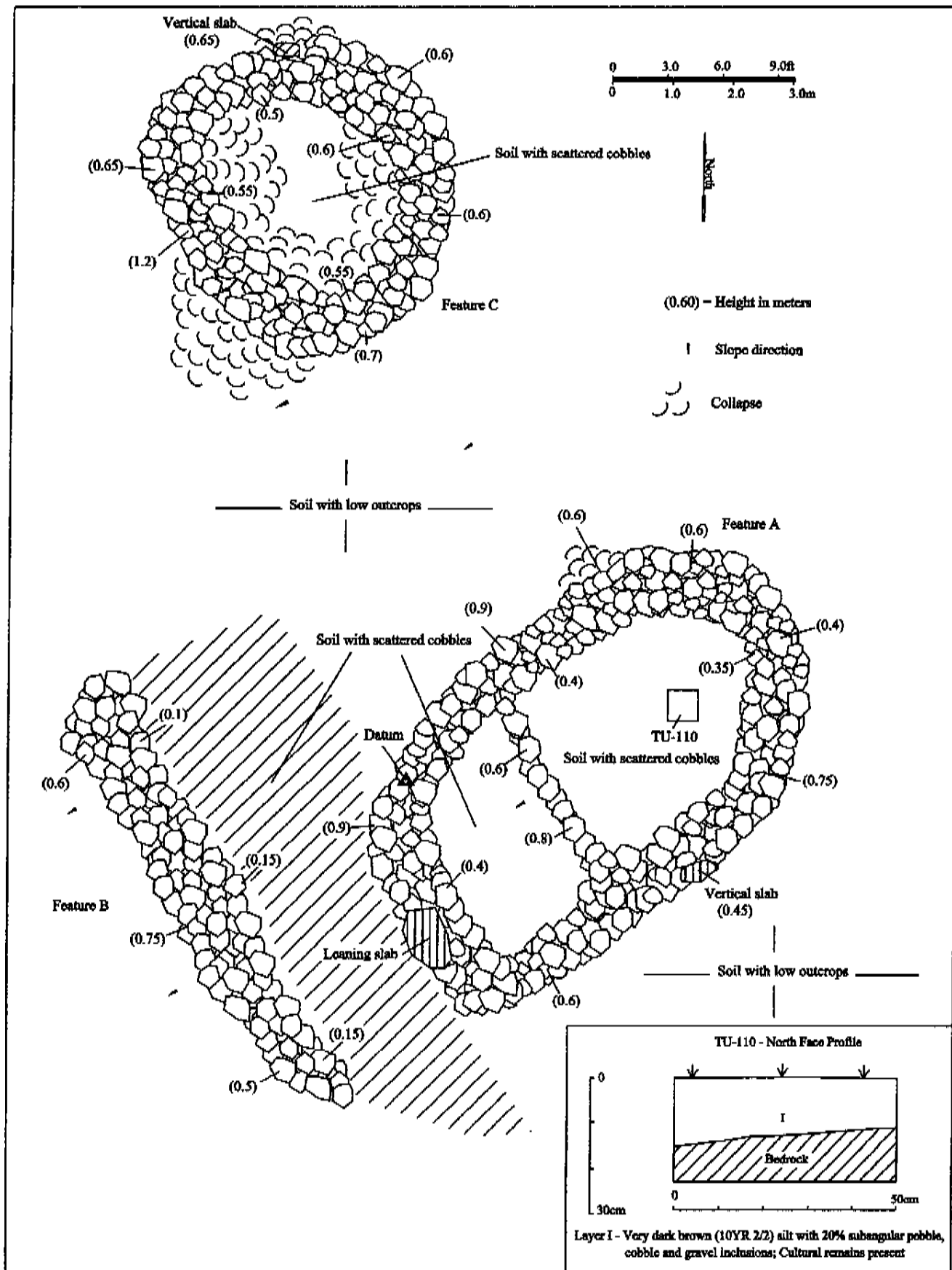


Figure 8. Site 24384 Plan Map and TU-110 North Face Profile

The southwestern compartment abuts the northeastern compartment to the southwest, separated by a stacked cobble and small boulder retaining wall. The surface of the southwestern compartment is 0.6 to 0.8 m below the surface of the northeast compartment, and is comprised of soil with scattered cobbles. The compartment is 5.0 m long (northwest by southeast) and 3.4 m wide with walls also built of stacked cobbles and small boulders. These walls range in width from 0.85 to 1.0 m and in height from 0.4 to 0.9 m. A leaning basalt slab is incorporated into the exterior side of the enclosure at the southwestern end. No cultural remains were present.

The Feature B terrace is located adjacent to the Feature A enclosure to the west. A piled cobble and small boulder retaining wall extends along the southwestern side of the feature, measuring 8.3 m long and 0.8 to 1.3 m wide. The southwestern, downslope side of the retaining wall is 0.5 to 0.75 m in height, with the upslope side ranging in height from 0.1 to 0.15 m. The surface of the terrace is comprised of level soil with scattered cobbles. No cultural remains were noted.

The Feature C enclosure is situated 6.0 m north-northwest of Feature A. The enclosure is roughly oval in shape and is 5.2 m long and 5.0 m wide, with walls built of stacked cobbles and small boulders. These walls range in width from 0.95 to 1.15 m and in height from 0.5 to 1.2 m. A vertical basalt slab is incorporated into the exterior of the enclosure at the north end. The majority of the structure is intact though wall collapse is present on both the interior and exterior sides. The interior of the enclosure is comprised of a level soil deposit with scattered cobbles. No cultural remains were present.

The Feature A and C enclosures were interpreted as the foundation for permanent habitation structures. The Feature B terrace likely functioned as an ancillary feature which may have served as an associated work area. The site is unaltered and in fair condition.

### **Site 24387**

Site 24387 is a well-built rectangular enclosure located in the south-central portion of the project area. The enclosure is 7.6 m in length and 7.15 m wide, with walls built of stacked cobbles and small boulders (*Figure 9*). The walls range in width from 0.8 to 1.25 m and in height from 0.25 to 1.2 m, with a 2.9 m wide opening in the center of the western wall. Large portions of the enclosure walls have collapsed though intact, faced sections are present on the exterior north side, on portions of the exterior west side and at the interior northwest corner. The ground surface slopes to the west outside the entrance.

The interior of the enclosure is comprised of a level soil deposit with scattered surface cobbles. No cultural remains were observed. A 1.0 by 1.0 m test unit (TU-107) was excavated within the interior of the structure, revealing a single soil deposit over bedrock (see *Figure 9*). Layer I consisted of 0.63 to 0.71 m of a very dark brown silt with 60% subangular basalt cobbles and small boulder inclusions. Cultural remains from this deposit consisted of charcoal, one *Cypraea sp.* shell, two pig teeth, three waterworn basalt pebbles and one fragment of waterworn coral.

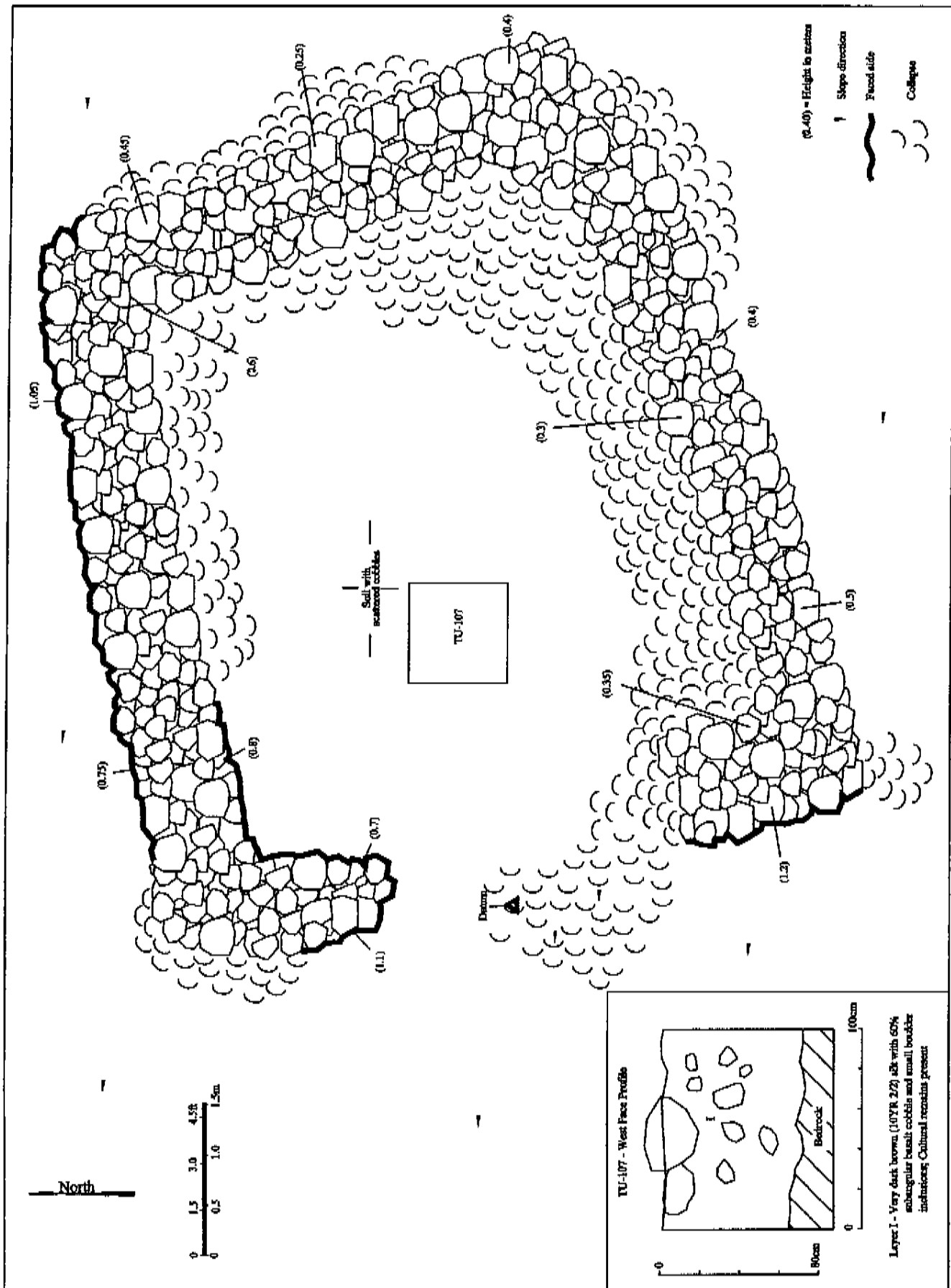


Figure 9. Site 24387 Plan Map and TU-107 West Face Profile

Site 24387 was interpreted as a permanent habitation, ancillary feature which functioned as a yard surrounding a pole and thatch roofed house. The site is unaltered and in fair condition.

### **Site 24388**

Site 24388 is a large roughly rectangular platform located on the side of a slope angling down to the west in the south-central portion of the project area. The platform is constructed on and around a large pahoehoe outcrop with overall dimensions of 11.5 m long and from 4.0 to 5.9 m wide (*Figure 10*). The sides of the structure are built of stacked cobbles and small boulders, ranging in height from 0.6 to 1.4 m. Portions of the platform have collapsed outwards though faced intact sections are present along the north, west and south sides.

The surface of the platform consists of a level, poorly sorted cobble and small boulder pavement. An area of exposed bedrock, representing the surface of the outcrop is present in the center of the platform. No cultural remains were noted on the structure. A sloping ramp is located at the southeastern corner of the platform, angling down to the east. The ramp is 3.35 m long and is constructed with stacked cobbles and small boulder sides and a level, unpaved cobble and small boulder surface.

Two 1.0 by 1.0 m test units (TUs 92 and 93) were excavated into the surface of the platform. TU-92 was situated at the western end of the structure. The excavation revealed a stone architectural layer (Layer I), over a soil deposit (Layer II), over bedrock (see *Figure 10*). Layer I consisted of 0.23 to 0.4 m of tightly packed subangular basalt cobbles and small boulders with no cultural remains present. The base of Layer I intrudes into the Layer II soil and no evidence was found to indicate that it had been built during more than a single construction episode. Layer II was comprised of 0.09 to 0.37 m of a black silt with 10-20% subangular basalt cobble and pebble inclusions. Cultural remains from this deposit consisted of marine shells, a shark's tooth, volcanic glass flakes, a basalt flake, waterworn basalt and coral pebbles and charcoal.

TU-93 was located in the eastern portion of the platform. The excavation of this unit revealed identical stratigraphy to that observed in TU-92 (see *Figure 10*). Layer I consisted of 0.1 to 0.13 m of tightly packed subangular basalt cobbles and small boulders with no cultural remains. Layer II was comprised of 0.07 to 0.19 m of a black silt with 10-20% subangular basalt cobble and pebble inclusions. Cultural remains from Layer II consisted of marine shell, a waterworn basalt pebble and charcoal.

Site 24388 was interpreted as the foundation for a permanent habitation structure. The site is unaltered and in fair condition.

### **Site 24390**

Site 24390 is a complex of four features located in the south-central portion of the project area. The site is surrounded by agricultural features and is comprised of an enclosure (Feature A), two terraces (Features B and C) and a platform (Feature D; *Figure 11*).

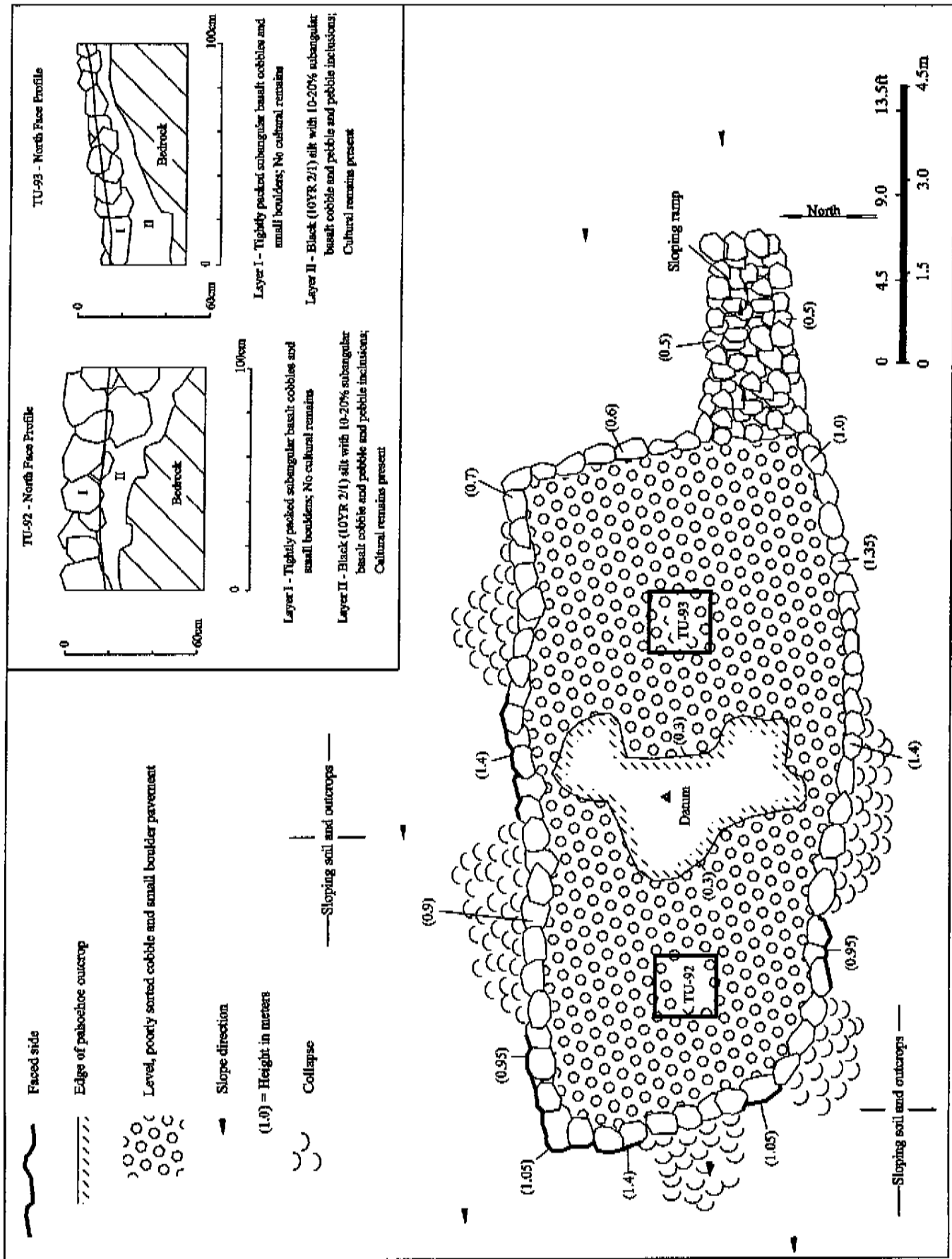


Figure 10. Site 24388 Plan Map and TUs 92 and 93 Profiles

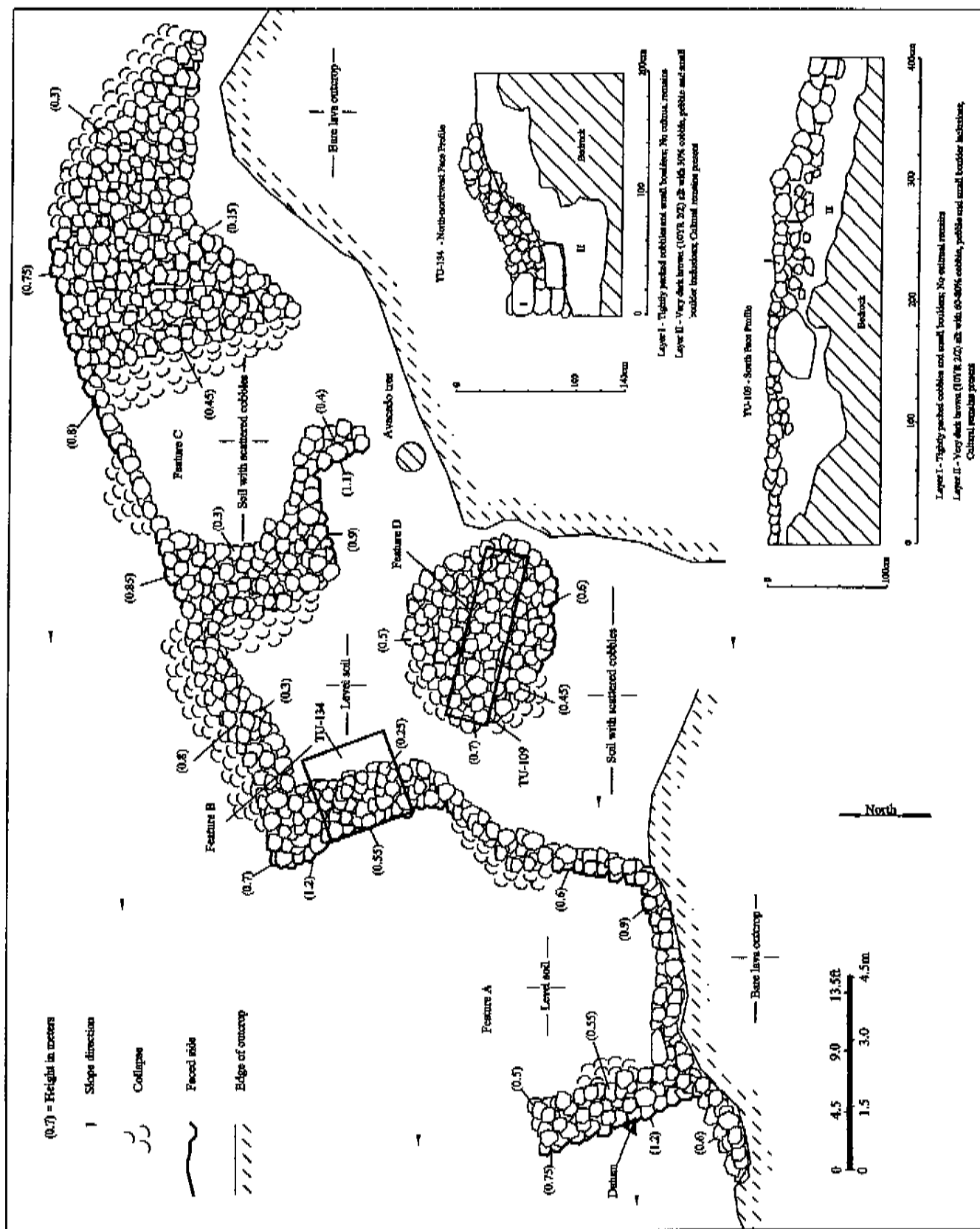


Figure 11. Site 24390 Plan Map and TUs 109 and 134 Profiles

The site is situated in an area of sloping soil and outcrops that angles down to the west and encompasses an area 29.5 m long and 9.0 m wide. It is unaltered and in fair condition.

The Feature A enclosure is located at the western end of the site. It is 5.85 m long and 4.2 m wide. The west side of the feature consists of a free-standing stone wall, and the south side consists of a wall built against a bare lava outcrop. The east side is formed by the west side of the Feature B terrace (discussed below) and the enclosure is open to the north.

The west wall is 4.3 m long, 1.0 to 1.35 m wide and 0.55 to 1.2 m in height. The wall is built of stacked cobbles and small boulders, faced on the western, downslope side, with minor wall collapse present on the east side. The south wall is comprised of stacked cobbles and small boulders, measuring 0.55 to 0.85 m wide and 0.6 to 0.9 m in height on the north side. The south side of the wall is level with an adjacent pahoehoe outcrop. The east end of this wall originates at the southwest corner of the Feature B enclosure and extends 7.25 m to the west, extending past the western wall 2.2 m. This wall is intact, with a faced section at the western end.

The interior of the enclosure is comprised of a level soil deposit with no surface cultural remains present. Feature A was interpreted as the possible foundation for a permanent habitation structure.

The Feature B terrace is located at the eastern end of the Feature A enclosure. The Feature C terrace is situated adjacent to Feature B to the east, and the Feature D platform is located on the surface of Feature B. This terrace is irregularly-shaped and is 10.4 m long and 5.7 to 11.2 m wide. A stacked cobble and small boulder retaining wall extends along the west and north side of the terrace, ranging in height from 0.6 to 1.2 m. Portions of this wall have collapsed outward, though intact, faced sections are present. The southern side of the terrace is bordered by a low pahoehoe outcrop. The surface of the terrace consists of a level soil deposit with scattered surface stones. No cultural remains were noted on the surface. An avocado tree is growing in the soil area at the southeast corner of the feature.

A 2.0 by 2.0 m test unit (TU-134) was excavated into the surface of the terrace at the northwestern end. This excavation revealed a stone architectural layer (Layer I), over a soil deposit (Layer II), over bedrock (see *Figure 11*). Layer I consisted of 0.09 to 0.55 m of tightly packed cobbles and small boulders, with no cultural remains present, located in the western two-thirds of the unit. The eastern one-third consists of the Layer II soil on the surface. The base of Layer I intrudes slightly into the Layer II soil deposit and no evidence was found to indicate that it had been built during more than a single construction episode.

The Layer II deposit is comprised of a very dark brown silt with 30% cobble, pebble and small boulder inclusions. This deposit varied in thickness from 0.17 to 0.83 m. Cultural remains from Layer II consisted of marine shells, volcanic glass flakes, basalt flakes, a waterworn coral pebble, a waterworn basalt cobble and charcoal. The excavation



of TU-134 was terminated on bedrock. Feature B was interpreted as the foundation for a permanent habitation structure.

The Feature C terrace abuts Feature B to the east. This feature is irregularly-shaped and is 13.1 m long and from 3.5 to 5.5 m wide. Stacked cobble and small boulder retaining walls extend along the north and west sides of the terrace, ranging in height from 0.75 to 0.9 m. Portions of these walls have collapsed outward, though intact faced sections are present. An area of level soil with scattered soil is present in the western portion of the terrace with an area of mounded cobbles (0.15 to 0.3 m in height) comprising the eastern portion of the terrace. No cultural remains were noted on the surface. Feature C was interpreted as the possible foundation for a permanent habitation structure.

The Feature D platform is located in the southeastern portion of the Feature B terrace. The platform is oval-shaped and is 4.3 m long and 3.9 m wide. The sides of the structure are built of stacked cobbles and small boulders that range in height from 0.45 to 0.7 m. The northwest and southwest sides of the structure have collapsed outward though an intact faced section is located along the south side. The surface of the feature is comprised of a level cobble and small boulder pavement with no cultural remains present.

A 1.0 by 4.0 m test unit (TU-109) was excavated through the center of the platform in a roughly east-west direction. This excavation revealed a stone architectural layer (Layer I), over a soil deposit (Layer II), over bedrock (see *Figure 11*). Layer I consisted of 0.09 to 0.4 m of tightly packed cobbles and small boulders. A small fragment of an abraded basalt tool with one smooth facet was recovered from Layer I.

Layer II consisted of 0.13 to 0.48 m of a very dark brown silt with 60-80% cobble, pebble and small boulder inclusions. Cultural remains from Layer II consisted of volcanic glass flakes, a basalt adze fragment, a waterworn coral pebble and charcoal. The excavation of TU-109 was terminated on bedrock. Feature D was interpreted as the foundation for a permanent habitation structure.

## **Site 24397**

Site 24397 is a complex of 612 agricultural features scattered throughout the project area. The site is comprised of 504 mounds/modified outcrops, one faced mound, 54 terraces, 28 *kua'iwi*, 22 walls, two enclosures and a walled terrace. The mounds/modified outcrops were not individually recorded but were counted during the transect survey of the project. The distribution of the remaining features is illustrated in *Figure 2*. The mounds/modified outcrops were interpreted as clearing piles that were created by consolidating surface stones from adjacent planting areas. Typically these features are comprised of informally constructed piles of basalt cobbles and small boulders, with uneven sides and surfaces and no cultural remains.

The majority of the terraces consist of linear features constructed on sloping terrain with a stone retaining wall situated on the downslope side. These features functioned to retain level or slightly sloping soil areas for planting. No cultural remains were found in association with any of these terraces. The *kua'iwi* are linear features generally ori-

ented in inland-seaward directions, which were likely created by clearing surface stones from adjacent areas. These features are interpreted as functioning to define the north-south boundaries of agricultural fields. The 22 walls are comprised of linear cross-slope and inland-seaward features that also function to delineate the boundaries of agricultural fields. The faced mound, the enclosures and the walled terrace were tested by Haun and Henry (2005), yielding no cultural remains.

## RESEARCH QUESTIONS AND METHODS

The research objectives for data recovery at the sites are:

1. To establish the age of the sites; and
2. To determine the function of the sites and the type and variety of activities conducted at each feature.

The data recovery effort will determine the age of sites. The data requirements for addressing Research Objective 1 include stratigraphic data, charcoal for dating, and chronologically diagnostic artifacts, faunal remains, and plant remains. These data will be obtained using controlled excavations.

The prior studies of sites in the Kona area provide limited functional interpretations of habitation features. These interpretations primarily consist of inferences concerning the duration and permanence of habitation. The interpretations include a simple dichotomy of temporary versus permanent using Cordy's (1981) criteria, which include formal type, structure size, and structural substantiveness. Variation in activities in individual dwelling structures is implicit in the model, but the specific types of activity are generally not defined.

The proposed data recovery effort will attempt to define specific activities associated with the occupation of the habitation features (Research Objective 2). Haun et al. (2003a, 2003b, 2003c) have done this for a number of sites in North Kona District where the results provided a basis for characterizing variation in habitation site occupations. Many activities are evident from structural remains, artifacts, and ecofactual remains. For example, the presence of a hearth indicates the activity of making fire for cooking, warmth, or light. Precursor activities associated with a hearth include construction of the feature and collection of firewood. While such activities appear obvious, the activities frequently are not explicitly enumerated.

The goal of the present effort would be to explicitly define the full range of potential activities engaged in by the occupants of the features based on the qualitative range of cultural remains. Quantitative data will be used to make inferences concerning the scope or intensity of the activities. The resulting constellations of potential activities can then be used to compare and contrast the nature of occupations associated with individual features or structures. It should be stressed that the effort will be limited to defining the range of potential activities based primarily on the qualitative range of cultural remains.

The relationship between cultural remains and activities is based on an interpretation of the activities associated with the use and production of the remains, which will be treated as site or feature "attributes". Activities can be grouped into craft and construction, subsistence, and other habitation-related or support activities. Craft and construction activities are activities that relate to the procurement and use of raw materials and to activities that convert the raw materials into usable items and structures. Subsistence activities relate to the procurement, production, preparation, and consumption of marine and terrestrial food resources. Other habitation, or support, activities include ritual, sleep, mortuary activities, recreation, and the provision of heat and light with fire.

Many of these activities can also be broken down into primary and precursor activities, and those that potentially occurred either on-site, off-site, or in an undetermined location. There is always a possibility that some raw materials may have been obtained through trade or exchange; however, with the exception of stone, this usually cannot be demonstrated archaeologically. Remote sources of volcanic glass or basalt that might indicate that the site occupants did not directly acquire the raw material can only be identified through petrographic and chemical analyses that are beyond the scope of the research. As mentioned previously, the present study is limited to potential activities in the broadest sense.

Data requirements for addressing Research Objective 2 include stratigraphic data, architectural features (i.e., hearths, post holes, etc.), and the recovery and analysis of artifacts and food remains. These data will be used to define the range of activities associated with the habitation features.

The data recovery efforts at the ten sites are as follows:

**Site 24379**

Data recovery at this site will consist of the surface collection of the bird bone awl and weathered shell in the western portion of the tube and the collection the marine shell and a sample of the charcoal from the eastern portion.

**Site 24380**

The data recovery at Site 24380 will be comprised of the surface collection of a charcoal sample from the charcoal and *kukui* nut scatter in the western portion of the tube.

**Site 24381**

Data recovery at this site will consist of the surface collection of a charcoal sample from one of the two surface charcoal concentrations within the tube.

**Site 24382**

The data recovery at Site 24382 will be comprised of the surface collection of a charcoal sample from the surface concentration in the area north of the restricted passage in the eastern portion of the tube.

**Site 24383**

The data recovery at Site 24383 will consist of the excavation of two 2.0 by 1.0 m excavation units; one located within the small cave at the north end of the sinkhole and one within the sinkhole.

**Site 24384**

Data recovery at this site will consist of the excavation of two 2.0 by 1.0 m units; one within the southwestern compartment of the Feature A enclosure and one within the interior of the Feature C enclosure.

**Site 24387**

Data recovery at this site will consist of the excavation of a 2.0 by 2.0 m unit within the interior of the enclosure.

**Site 24388**

The data recovery at Site 24388 will consist of the excavation of two 2.0 by 1.0 m units; one located in the eastern portion of the platform and one in the western portion.

**Site 24390**

The data recovery at Site 24390 will consist of the excavation of two 2.0 by 1.0 m units; one within the interior of the Feature A and one on the soil surface of the Feature C terrace.

**Site 24397**

Data recovery excavations at this site will consist of the mechanical sectioning of selected agricultural terraces and *kua'iwi* of the complex to obtain dating samples. Four terraces have retaining walls of 1.0 or more in height (Features AT, BF, BI and CE) and two *kua'iwi* evidence widths of 2.0 to 2.6 m and heights of 0.6 to 1.3 m (Features CK and CQ). These features offer the best potential to yield dating samples from stratigraphic contexts that can be reliably expected to date the period of the feature utilization. The trenches at the terraces will originate upslope of the terraces walls, and extend downslope through the features. The trenches at the *kua'iwi* will bisect the short axis of the features, parallel to the slope.

**Methods**

Excavation units dug during data recovery will be excavated in arbitrary levels within stratigraphic layers and will be excavated to bedrock. All excavated fill will be passed through 1/8 inch mesh screen. Standardized excavation records will be prepared after the completion of each stratigraphic layer. Portable remains collected will be placed in paper bags labeled with the appropriate provenience information. Recovered charcoal samples from either the excavations or from the surface of the sites will be deposited in aluminum foil pouches and placed in properly labeled paper bags. Following the excavations, section drawings depicting the stratigraphy will be prepared, and post-excavation photographs will be taken. Recovered cultural remains will then be transported to Haun & Associates' office for analysis.

The trench wall stratigraphy at Site 24397 will be documented graphically with line-drawn sections, described using standard USDA Soil Survey descriptions and Munsell colors, and photographed. The stratigraphy will be analyzed to identify strata associated with the terraces and pre-terrace deposits. Sample collection will focus on obtaining charcoal for radiocarbon dating from the exposed trench walls, or by screening strata fill. Ideally, samples will be obtained from multiple strata in each trench to permit dating the pre-terrace deposits and strata spanning the use of these features. A representative sample of any artifacts or food remains visible in the trench walls will be collected.

Laboratory analysis will consist of evaluating charcoal samples for dating and analysis of all recovered artifacts and food remains. Dating sample selection will emphasize single fragments of charcoal to minimize contamination by fragments of varying ages. Fragments representing intact sections of small tree and shrub stems will be used if available to minimize intra-sample variation in wood age. Charcoal samples will be submitted to Beta Analytic, Inc. for radiocarbon dating. Stable isotope ratios (C13/12) will also be determined. A maximum of 10 samples will be submitted for AMS dating.

A final report on the data recovery work will be prepared and submitted for DLNR-SHPD review and acceptance. The report will, at a minimum, contain all elements required in DLNR-SHPD Rules Chapter 13-278-4. The report will be submitted within two to three months after completion of fieldwork.

All recovered materials will be temporarily curated at the Haun & Associates office. Following completion and acceptance of the data recovery report, the materials will be submitted to DLNR-SHPD for permanent curation.

If human remains are encountered during data recovery investigations, then the remains will be treated following the procedures outlined in Hawaii Revised Statutes (HRS) Chapter 6E-43. Work in the area of the discovery will be halted, the remains stabilized if necessary, and DLNR-SHPD contacted for guidance.

## REFERENCES

DLNR (Department of Land and Natural Resources)

- 2003 Hawaii Administrative Rules, Title 13, Department of Land and Natural Resources, Subtitle 13, State Historic Preservation Division Rules.

Haun, A., and D. Henry

- 2005 Archaeological Inventory Survey, TMK: (3) 7-4-08:por. 47, Land of Honokohau 1<sup>st</sup>, North Kona District, Island of Hawaii. Haun & Associates report 383-022335 prepared for Mr. Thomas Smith.

Haun, A.E., J.D. Henry, D.M. Berrigan

- 2003a Archaeological Data Recovery, Sites 5748, 5749, 5750, 5753, 5755, 5756, 5761, 5762, 5764, 5771, and 5774, Pu'uhonua Subdivision Parcel, Land of Kalaoa 5, North Kona District, Island of Hawai'i (TMK: 3-7-3-10:Por 27).

Haun, A.E., J.D. Henry, and D.M. Berrigan

- 2003b Archaeological Data Recovery Sites 22946, 22949, 22951, 22952, and 22955, Lands of Hienaloli 2-5, North Kona District, Island of Hawai'i, TMK: 7-5-10:52, 65, 66. Prepared by Haun & Associates (Report 110-042503) for Bolton, Inc., Kailua-Kona.

Haun, A.E., J.D. Henry, and D.M. Berrigan

- 2003c Archaeological Data Recovery Sites 22764 and 22780 Land of Kahalui 1 & 2, North Kona District, Island of Hawai'i, TMK: 7-5-16:15, 16, 17, 29. Prepared by Haun & Associates (Report 109-060703) for Bolton, Inc., Kailua-Kona.

LINDA LINGLE  
GOVERNOR OF HAWAII



**STATE OF HAWAII  
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HISTORIC PRESERVATION  
KAROLAEWA ISLAND RESERVE COMMISSION  
LAND  
STATE PARKS

November 3, 2005

Alan Haun, Ph.D.  
Haun and Associates  
HCR 1 Box 4730  
Keaau, Hawai'i 96749

LOG NO: 2005.2424  
DOC NO: 0510MM05

Dear Dr. Haun:

**SUBJECT: 6E-42 Historic Preservation Review for Archaeological Data Recovery Plan  
(Haun and Henry, September 2005)  
Honokohau 1<sup>st</sup>, North Kona, Hawai'i  
TMK: (3) 7-4-8:47**

Thank you for submitting this plan for our review, which was prepared for Mr. Thomas Smith.

The plan presents data recovery research questions and proposed methodologies for 10 sites out of a total of 26 sites identified during an archaeological inventory survey of the subject property (Haun and Henry 2005). The ten sites include five habitation lava tube caves (Sites 24379, 24380, 24381, 24382, and 24383), two habitation complexes (Sites 24384, 24390), a habitation enclosure (Site 24387), a habitation platform (Site 24388) and an agricultural complex (Site 24397).


The research objectives are: 1) to establish the age of the sites and 2) to determine the function of the sites and the type and variety of activities conducted at each feature within the site. Dating will be accomplished through analysis of stratigraphy, charcoal, and chronologically diagnostic artifacts in the context of controlled excavations. The function of features within sites will be examined through both spatial and qualitative analysis of cultural remains.

The research questions and proposed methodologies are acceptable. However, we would like you to augment the existing site maps for the five data recovery cave sites with information about range of light, twilight and darkness in relation to the surface collection and excavation areas. This information may be useful in your analysis.

The plan meets the requirements under HAR 13-278 is and is therefore considered adequate. If you have any questions please contact MaryAnne Maigret on Hawai'i Island at 808-327-3690, or Branch Chief Mr. David Brown at 808-692-8015.

If you have any questions regarding our comments, please contact MaryAnne Maigret in our Hawaii Island office at 808-327-3690.

Aloha,

  
Melanie A. Chinen, Administrator  
State Historic Preservation Division

MM:jen