

EXHIBIT 2

- Parcel 10 Parcel 11 Parcel 12 Parcel 14

DEPARTMENT OF FINANCE
PROPERTY ASSESSMENT DIVISION
TAX MAPS SECTION
TAX MAP
SCALE: 1" = 100'
DATE: 03/13/03

FOR PROPERTY ASSESSMENT PURPOSES
SUBJECT TO CHANGE
3 6 04

HAWAIIAN HEMA LARRE LOT SUBD. PLANS 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50

ROYAL PATENT.

KAMEHAMEHA IV., By the grace of God, King of the Hawaiian Islands, by this, His Royal Patent, makes known unto all men, that he has, for himself and his successors in office, this day granted and given, absolutely, in Fee Simple, unto *Scapah* *aplo*

his faithful and loyally disposed subject, for the consideration of *Two hundred and twenty Dollars* paid into the Royal Exchequer, all that piece of Land situated at *Waikanae* in the Island of *Maua*, and described as follows:

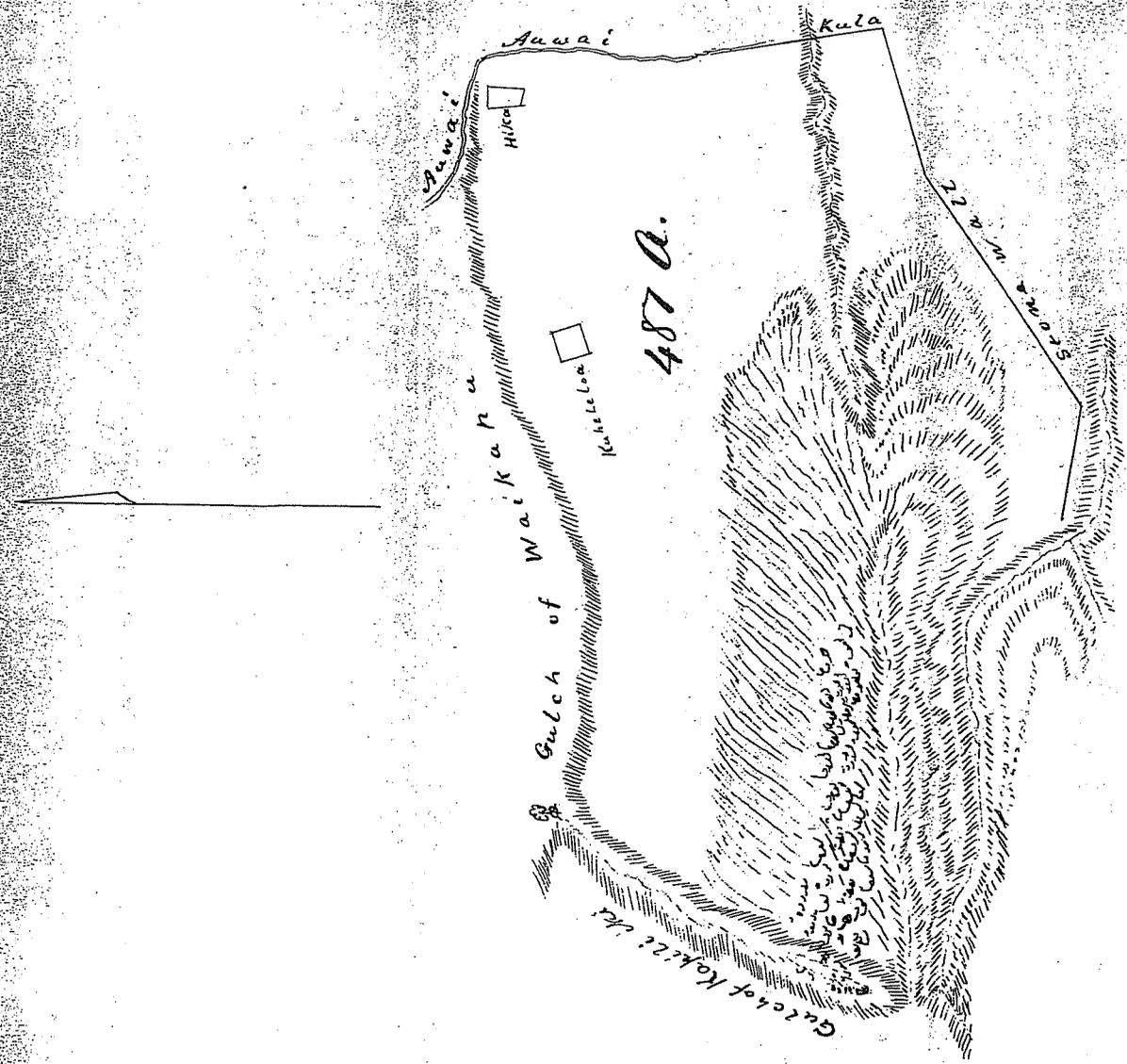
- No. 1. Beginning at the N. E. corner of this lot, which is also the S. W. corner of a lot of Kaliki's and running S. 60° E. 110 chains along lot of *Okunui*
- S. 60° E. 110 " " *Maua*
- S. 14° E. 112 " " *Katiki*
- N. 16° W. 2 " " "
- S. 7° W. 110 " " *Water course + Kula*
- S. 75° E. 14 " " *" to gulch*
- N. 12° E. 120 " " *iron of " to Kapaelo*
- N. 4° E. 62 " " *Kapaelo*
- S. 23° E. 162 " " "
- S. 14° E. 104 " " "
- S. 24° W. 115 " " "
- N. 77° E. 170 " " *Gulch to corner of Mahoe*
- N. 64° E. 180 " " *Mahoe*
- N. 14° W. 170 " " *Kapaelo*
- S. 77° E. 202 " " "
- N. 47° E. 50 " " *Kahi*
- N. 147° E. 202 " " "
- N. 41° W. 184 " " "
- N. 64° E. 116 " " "
- N. 77° E. 126 " " *Papee*
- N. 147° E. 180 " " "
- N. 77° E. 170 " " *Open ground*
- N. 147° E. 180 " " *Katiki*
- N. 14° E. 115 " " "
- N. 14° E. 115 " " "

to amount of Commencement *22 1/2 Acres*

No. 2. Beginning at stone wall S. E. corner of this lot adjoining the lot of *Ahuakoa* and running

State of a survey of a lot of land in the
 Kapuni division, with an intention to furnish to the
 the same the sum of dollars, which has been paid
 in full
 Beginning at the top of the aialua ridge in
 a line with the peak of Uluhiki, etc. and in
 a line with the gulch to a large rock and
 thence to the mouth in the water course
 by the sea along the bottom of the water course
 of the Kapuni valley bounded on the north by
 the mountain of the north East corner of
 the lot at a bearing in the water course towards
 the south at the top of the bank, thence along
 the water course having the above corner on the
 East South East 16 1/2 degrees & South 30 1/2 feet
 387 thereon, thence South 8 1/2 East 23 1/2 feet
 along water course and the lot line at the South
 West of the above thence South 72 1/2 East 112
 the lot & with 30 1/2 feet 31 1/2 feet 1 1/2 feet
 16 1/2 feet 13 1/2 feet always along water
 course made to it had marked at the corner
 of two gulches, thence along the water course
 to point of commencement of water course
 my an corner of 487 there
 Exclude part of two water courses
 One for the hill land containing 16 1/2 acres
 One for the land containing 16 1/2 acres
 W. L. L. L.
 Dec 22 1844

1848



Scale 20 Ch. to 1 inch

Notes of a survey of a lot of land situated in Waikapaue, Maui, which was sold at Auction to Joseph Sytna for Seventy dollars, which he has paid in full.

Beginning at Stone wall South East corner of This lot adjoining the ili of Ahuickalea and surrounding

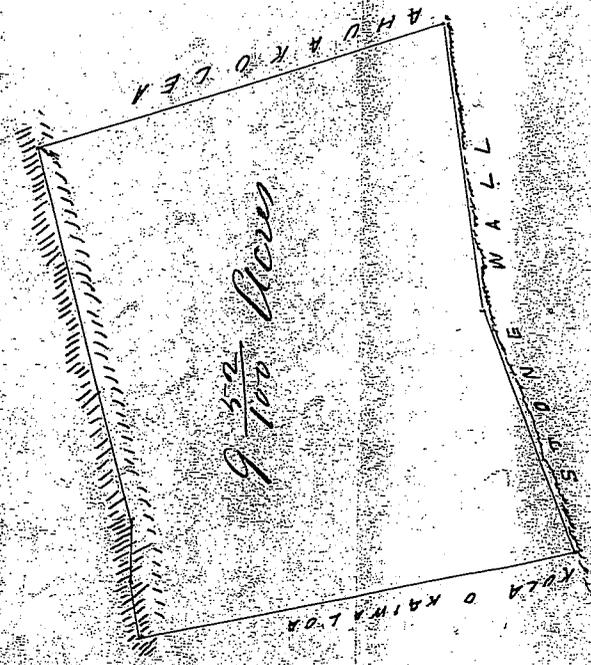
N. $15\frac{1}{4}^{\circ}$ W. 9.00 Ch, along the ili of Ahuickalea
 S. $78\frac{1}{4}^{\circ}$ W. 8.10 " " gulch bottom
 N. 85° W. 1.24 " " lot of Napaili
 S. 82° W. 1.20 " " N. brink of gulch
 to N. W. corner of this lot a S. side of his pasture
 Hence S. $8\frac{1}{2}^{\circ}$ E. 9.42 Ch, along his pasture lot
 to above said wall, thence Eastward along
 the wall to point of commencement
 and containing an area of 9.52 Acres

Maui, H.
 Apr. 10, 1857

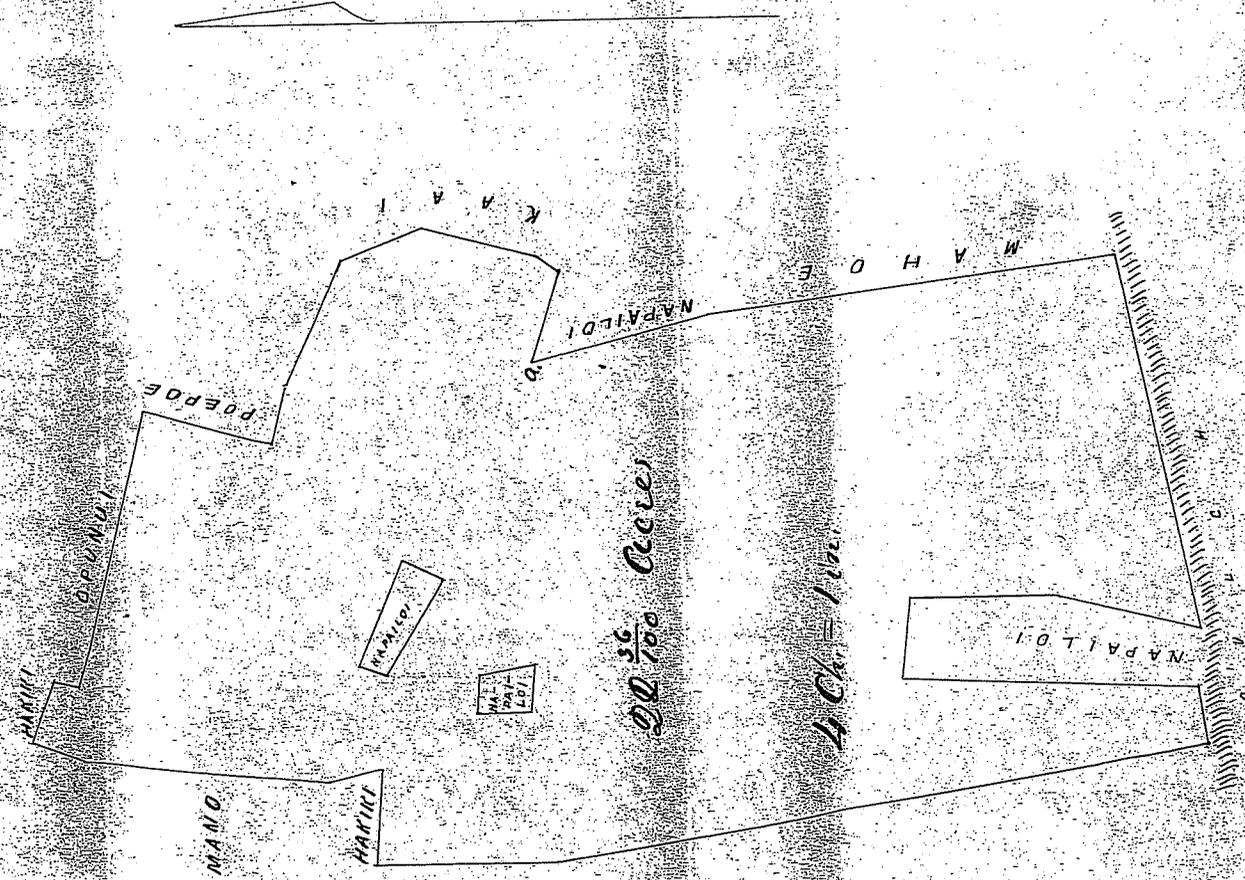
E. Bailey
 Surveyor

1844

to the 10



31 88
~~48 88~~
51



NO. 3152

ROYAL PATENT.

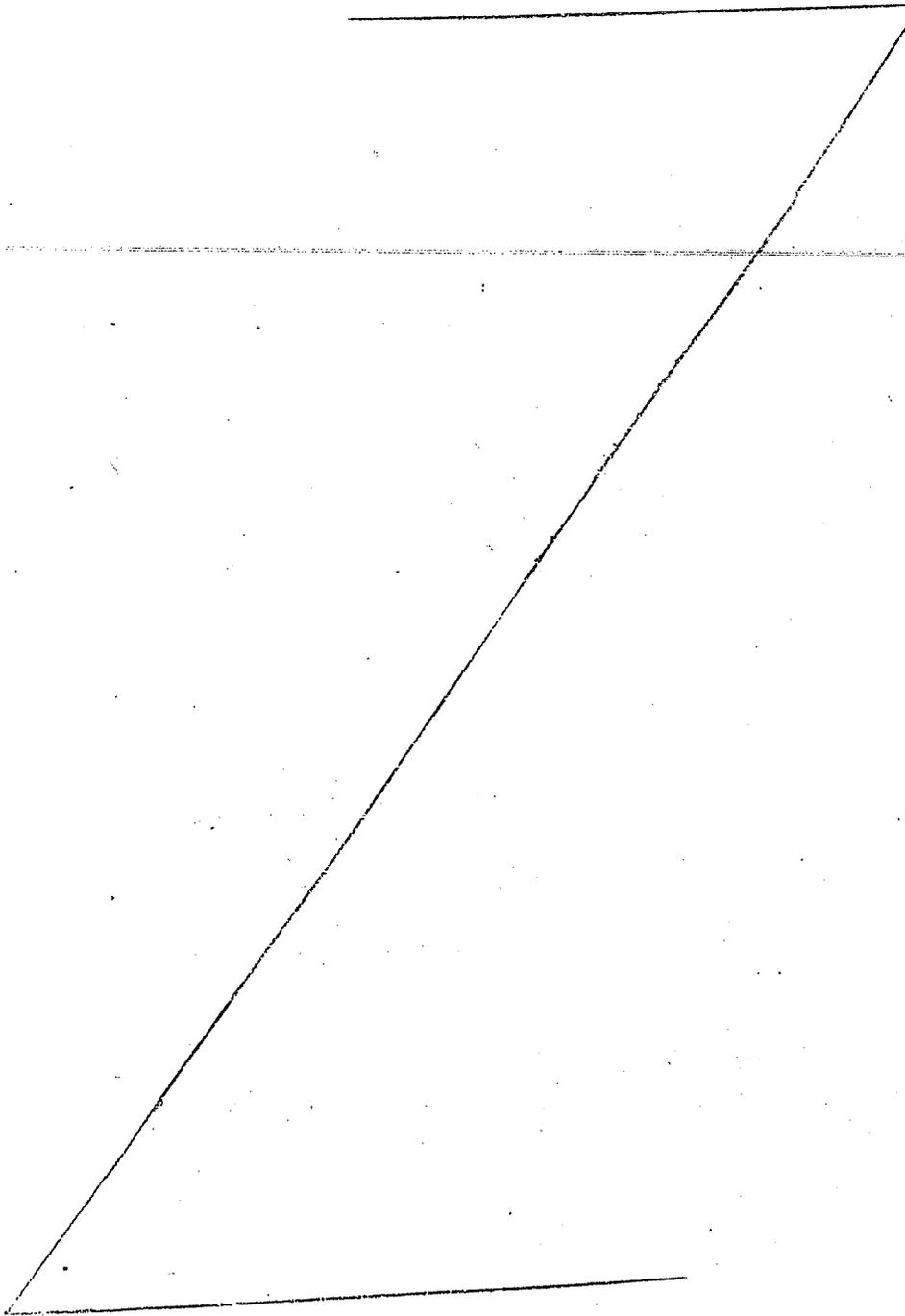
Kalakea

~~KAHUNA~~ By the grace of God, King of the Hawaiian Islands, by this His Royal Patent, makes known unto all men, that he has, for himself and his successors in office, this day granted and given, absolutely, in Fee Simple, unto Henry Cornwall

his faithful and loyally disposed subject, for the consideration of Fifteen Thousand and Fifty Dollars (\$15,050.00) paid to the Board of Education ~~Proprietors~~, all that piece of Land situated at Waikapu, in the District of Waikuku in the Island of Maua and described as follows:

the land known as the Ahupuaa of Waikapu, saving and excepting grants hitherto made within the said Ahupuaa by the Government, or sales made by the Board of Education

Native rights reserved.



Containing _____ Acres, more or less :
 excepting and reserving to the Hawaiian Government, all mineral or metallic Mines of every description.

To have and to hold the above granted Land in Fee Simple, unto the said _____
Henry Cornwell, his Heirs and Assigns forever, subject to the
 taxes to be from time to time imposed by the Legislative Council equally, upon all landed Property held in Fee Simple.

In Witness whereof, I have hereunto set my hand and caused the Great Seal of
 the Hawaiian Islands to be affixed, at Honolulu, this eighteenth
 day of November 1875.

By the King
 the Minister of the Interior
William L. Blackman

Kalaka'aua B.

3152

Patent 3152 is the Grant of the Shipman of
Kauai, Hawaii, sold at auction for \$15,050.
to Henry Conwell. No survey made.

Jos E Bush
the Clerk of Office.

HOUSE RESOLUTION

167.

WHEREAS, the original kuleana grants to the lands of Waikapu, District of Wailuku, County of Maui, entailed the water rights of said lands: and

WHEREAS, the Wailuku Sugar Company has diverted the waters formerly flowing upon and through these lands to its flumes and pipe lines for commercial purposes; and

WHEREAS, the residents and owners of said lands are now compelled to pay certain water rates to said Sugar Company for the water they use for domestic purposes; now therefore, be it

RESOLVED, by the House of Representatives of the Territory of Hawaii, Regular Session 1925, that the Commissioner of Public Lands be and he is hereby directed to report to this House under what authority the said Wailuku Sugar company obtains the right to divert to its own use for commercial purposes said waters and charge said residents of Waikapu, District of Wailuku, County of Maui, for the water they use for domestic purposes; and be it further

RESOLVED, that a certified copy of this Resolution be forwarded to the Commissioner of Public Lands.

INTRODUCED BY:

Thomas Holstein
Representative, Third District.

Honolulu, T. H.

March 24, 1925.

711

April 17, 1925.

Hon. A. C. Macaulimo,
Chairman, Agricultural Committee,
House of Representatives,
Honolulu, Hawaii.

Dear Sir:

In regard to House Resolution No. 167, requesting information as to under what authority the Waiiuku Sugar Company is diverting waters appurtenant to the Waikapu lands for its own use and charging residents of Waikapu for the use of water for domestic purposes, please be informed that all the lands referred to and the waters flowing thereon are privately owned.

Since the Government has no interest or ownership in the lands and waters in question, the adjudication of the rights involved does not come within the jurisdiction of this office.

Respectfully yours,



C. T. Bailey,
Commissioner of Public Lands.

CTB/O'S



STREAM

**Archaeological Data Recovery Excavations
Waikapu Mauka Partners
Golf Resort Project Area**

**Land of Waikapu, Wailuku District
Island of Maui**

PHRI

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

Archaeological • Historical • Cultural Resource Management Studies & Services

305 Mohouli Street • Hilo, Hawaii 96720 • (808) 969-1763 • FAX (808) 961-6998
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**Archaeological Data Recovery Excavations
Waikapu Mauka Partners
Golf Resort Project Area**

**Land of Waikapu, Wailuku District
Island of Maui**

by

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Supervisory Archaeologist

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Prepared for

Waikapu Mauka Partners
c/o Wilson Okamoto & Associates
P.O. Box 3530
Honolulu, Hawaii 96814

January 1991

PHRI

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SUMMARY

At the request of Wilson Okamoto & Associates, for their client Waikapu Mauka Partners, Paul H. Rosendahl, Ph.D., Inc. (PHRI) recently conducted archaeological data recovery work within Waikapu Mauka Partners Golf Resort project area, located in the Land of Waikapu, Wailuku District, Island of Maui. The work had been recommended based on the findings of an archaeological inventory survey of the project area (Haun 1989).

One objective of the project was to provide further functional interpretations for features. Another objective was to recover further data from nine sites, and to evaluate the sites further. In order to accomplish the latter, the sites were recorded in detail and excavation units were placed at the sites. Accomplishment of the former involved extensive recording in order to study feature patterning: selected transects were surveyed and recorded in detail. The transect surveys confirmed that a variety of agricultural features were more or less continuously distributed throughout the project area, and that the variable relevant to predicting their density and distribution was primarily geomorphological setting: relatively more features were present in relatively steep areas containing abundant rock. The distribution of features also indicated that two culturally significant feature clusters might be present, and that each might represent separate social units occupying contiguous land units, each having made use of a variety of residential and special-purpose activity areas and features. If two clusters are present, then the age determination results for the current project suggest that the occupation at the clusters was concurrent, while the stratigraphic record supports the notion that two prehistoric episodes may be represented.

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INTRODUCTION

PROGRAM BACKGROUND

General

At the request of Mr. Gary Okamoto, vice president of Wilson Okamoto & Associates, for their client Waikapu Mauka Partners, Paul H. Rosendahl, Ph.D., Inc. (PHRI) conducted archaeological data recovery excavations for archaeological resources located within the Waikapu Mauka Partners Golf Resort project area, situated in the Land of Waikapu, Wailuku District, Island of Maui (Figure 1). The recommendation for data recovery work derived from findings of an archaeological inventory survey of the c. 600-ac Waikapu Mauka Partners Golf Resort project area conducted December 5-16, 1989 by PHRI (Haun 1989). The archaeological inventory survey had been required by the Maui County Planning Department in view of proposed golf course and other developments which could adversely affect significant cultural resources within the area.

Findings of the 1988 and 1989 PHRI Inventory Survey Work

In 1988, PHRI undertook a preliminary field inspection of the Waikapu Mauka Partners Golf Resort project area (Haun 1988). A review of historic documents and cartographic sources indicated that no Land Commission Award (LCA) parcels had been claimed or awarded within the project area. A search of the files maintained by the Department of Land and Natural Resources-Historic Preservation Program/State Historic Preservation Office (DLNR-HPP/SHPO) also produced negative results for the project area, indicating that no previous archaeological work had been undertaken within the immediate area. However, the 1988 field inspection did reveal the presence of numerous prehistoric agricultural as well as probable temporary habitation features, in addition to several historic period cattle walls. On the basis of these preliminary findings it was recommended that additional reconnaissance survey work be undertaken prior to any development or ground disturbing activities (Haun 1988).

In late 1988, a variable-coverage, high-intensity surface inventory-level survey was undertaken within the entire project area (Haun 1989). The results of the survey field work confirmed that the cultural features observed during the 1988 field inspection appeared related either to historic period ranching, as evidence by cattle enclosures and associated walls, or to extensive aboriginal dryland agriculture. The

evidence for aboriginal agriculture existed in the form of extensive terracing, cleared areas, walls, walled enclosures, modified outcrops, mounds, and excavated depressions. In some areas above about 500 ft elevation, such features were discovered to be essentially continuously distributed throughout parts of the project area. Limited evidence of habitation was also present among the aligned boulders, excavated planting pits, irregular-shaped terraces, and other modifications, while occasional C-shaped walls and other temporary habitation features containing accumulated cultural deposits suggested the possibility that at least portions of the agricultural field system might themselves be dated through extrapolation. Few habitation sites were discovered below the approximate 500 ft contour. Table 1 summarizes all of the sites and features identified during the inventory survey work.

In consideration of the survey findings, summarized in Table 1, and as one component of the survey report, general significance assessments and recommended general treatments were offered for all identified sites (Haun 1989). These assessments and recommended general treatments are detailed below in Table 2. Significance categories used in the site evaluation process were based on the National Register criteria for evaluation, as outlined in the Code of Federal Regulations (36 CFR Part 60). The DLNR-HPP/State Historic Preservation Office (SHPO) uses these criteria for evaluating cultural resources. Sites determined to be potentially significant for information content (Category A, Table 2) fall under Criterion D, which defines significant resources as ones which "...have yielded, or may be likely to yield, information important in prehistory or history." Sites determined to be potentially significant as excellent examples of site types (Category B) are evaluated under Criterion C, which defines significant resources as those which "embody the distinctive characteristics of a type, period, or method of construction,...or that represent a significant and distinguishable entity whose components may lack individual distinction" (36 CFR Sec. 60.4).

Sites with potential cultural significance (Category C) are evaluated under guidelines prepared by the Advisory Council on Historic Preservation (ACHP) entitled "Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review" (ACHP 1985). The guidelines define cultural value as "...the contribution made by an historic property to an ongoing society or cultural system. A traditional cultural value is a cultural value that has historical

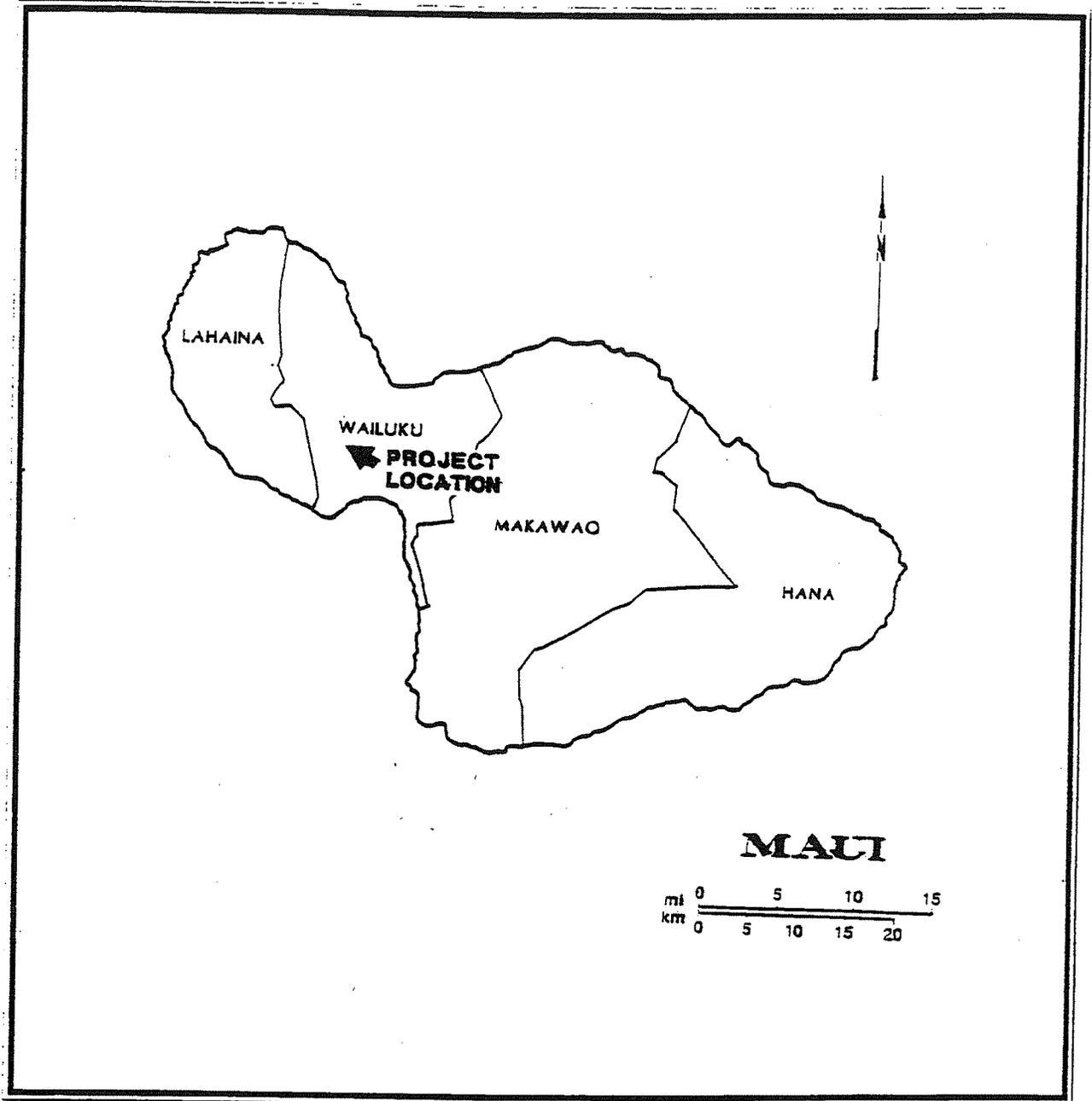


Figure 1. PROJECT AREA LOCATION MAP

**ARCHAEOLOGICAL DATA RECOVERY EXCAVATIONS
WAIKAPU MAUKA PARTNERS GOLF RESORT PROJECT AREA**

*Land of Waikapu, Wailuku District
Island of Maui*

PHRI Project 88-525

March 1990

Table 1.
SUMMARY OF IDENTIFIED SITES AND FEATURES
(FROM HAUN 1989)

PHRI Temp. Number	Formal Site/Feature Type	Tentative Functional Interpretation	#CRM Value			+Field Work		
			Mode Assess.			Tasks		
			R	I	C	DR	SC	EX
T-2 (2019)	Wall and ditch	Agriculture (water control)	M	L	L	+	-	-
T-4 (2020)	Complex (4)	Agriculture	M	L	L	+	-	+
A	Terrace							
B	Terrace							
C	Terrace							
D	Terrace							
T-5 (2021)	Double terrace	Agriculture	M	L	L	+	-	+
T-7 (2022)	Wall and ditch	Agriculture (water control)	M	L	L	+	-	-
T-9 (2023)	Complex (19+)	Temporary habitation; agriculture	H	M	L	+	-	+
A	Enclosure							
B	C-shape							
C	Enclosure							
D	C-shape							
E	C-shape complex							
E-1	Enclosure							
E-2	L-shape							
E-3	Enclosure							
E-4	Terrace							
F	Double C-shape							
G	U-shape							
H	C-shape							
I	Terrace complex							

#Cultural Resource Management

Value Mode Assessment —Nature: R = scientific research, I = interpretive, C = cultural;
—Degree: H = high, M = moderate, L = low

+Field Work Tasks: DR = detailed recording (scaled drawings, photographs, and
written descriptions),
SC = surface collections,
EX = test excavations.

Table 1. (cont.)

PHRI Temp. Number	Formal Site/Feature Type	Tentative Functional Interpretation	CRM Value Mode Assess.			Field Work Tasks		
			R	I	C	DR	SC	EX
I-1	Triple terrace							
I-2	Triple terrace							
I-3	Mound							
I-4	Mound							
I-5	Mound							
I-6	Mound							
	Plus numerous agri. features							
T-10 (2024)	Complex (16+)	Temporary habitation; agriculture	H	M	L	+	-	+
A	U-shape							
B	Enclosure							
C	Enclosure							
D	Enclosure							
E	Enclosure complex							
E-1	Enclosure							
E-2	Enclosure							
E-3	Enclosure							
F	Enclosure complex							
F-1	Enclosure							
F-2	Terrace							
F-3	C-shape							
F-4	Terrace							
F-5	C-shape							
F-6	Mound							
F-7	Mound							
	Plus numerous agri. features							
T-12 (2025)	Complex (1+)	Temporary habitation; agriculture	M	L	L	+	-	+
A	U-shape							
	Plus several surrounding agri. features							
T-18 (2026)	Complex (1+)	Temporary habitation; agriculture	H	M	L	+	-	+
A	U-shape							
	Plus numerous surrounding agri. features							
T-20 (2027)	Complex (2+)	Temporary habitation; agriculture; historic ranching; poss. religious (heiau/shrine?)	H	M	L/H	+	-	+
A	Enclosure							
B	Wall							
	Plus surrounding agri. features							

Table 2.

**SUMMARY OF GENERAL SIGNIFICANCE ASSESSMENTS
AND RECOMMENDED GENERAL TREATMENTS (FROM HAUN [1989])**

Site or Feature No.	Significance Category				Recommended Treatment			
	A	X	B	C	FDC	NFW	PID	PAI
T-2	+	-	-	-	+	-	-	-
T-4	+	-	-	-	+	-	-	-
T-5	+	-	-	-	+	-	-	-
T-7	+	-	-	-	+	-	-	-
T-12	+	-	-	-	+	-	-	-
Subtotal:	5	0	0	0	5	0	0	0
T-9	+	-	+	-	+	-	+	-
T-10	+	-	+	-	+	-	+	-
T-18	+	-	+	-	+	-	+	-
Subtotal:	3	0	3	0	3	0	3	0
T-20	+	-	+	*	+	-	-	*
Subtotal:	1	0	1	1	1	0	0	1
Total:	9	0	4	1	9	0	3	1

*Provisional assessment; definite assessment pending further data collection

General Significance Categories:

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

Recommended General Treatments:

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

depth" (1985:1). The guidelines further specify that "[a] property need not have been in consistent use since antiquity by a cultural system in order to have traditional cultural value" (1985:7).

To further facilitate client management decisions regarding the subsequent treatment of these resources, sites were further evaluated in terms of three PHRI Cultural Resource Management (CRM) value modes which are derived from the previously mentioned state and federal evaluation criteria. The archaeological sites were thus evaluated in terms of potential scientific research, interpretive, and/or cultural values. Scientific research value refers to the potential of archaeological resources for yielding additional information useful in the understanding of culture history, past lifeways, and cultural processes at the local, regional, and interregional levels of organization. Interpretive value refers to the potential of archaeological resources for public education and recreation. Cultural value refers to the potential of archaeological resources to preserve and promote cultural and ethnic identity and values. Value mode assessments for each of the sites are contained in Table 1.

As indicated in Table 2, five of the total of nine sites and site complexes identified within the Waikapu Mauka project area were assessed as being significant solely for information content (Sites T-2, -4, -5, -7 and -12). For these five sites, further data collection (i.e., detailed recording and test excavations) was recommended (Haun 1989). For these sites, the recommended level of data collection was considered sufficient mitigation of potential project effects, and physical preservation of these five sites would most likely not be essential assuming the absence of any particularly unusual findings.

Three of the total of nine sites and site complexes were assessed as being significant for information content and as excellent examples of site types (Sites T-9, -10, -18). For these three sites, further data collection was recommended. For most of the site features present, further data collection could be adequately accomplished through detailed recording and limited excavations. Following further data collection (and any subsequent areal excavations that might be appropriate), preservation of select representative features or portions of sites, with possible interpretive development, might be considered appropriate.

The one remaining site (T-20) was assessed as being significant for information content and as an excellent example of a site type; it was also assessed as potentially significant for cultural value if Feature A were discovered,

through additional data recovery, to have functioned in a religious context. For this site, therefore, the recommended level of further data collection involved detailed recording and limited excavation. Following data collection, preservation with some level of interpretive development for Feature A, if it were discovered to represent a heiau or shrine, would be appropriate and would be recommended.

One of the principal findings of the inventory-level survey (Haun 1989) was that the area's extensive agricultural modifications and features were repetitive across the project area. In consideration of this discovery, it was clear that detailed site recording at all of the identified site locales would require a monumental effort, yet would not significantly enhance our understanding of the prehistoric resources of the project area. Consequently, it was decided that detailed recording could effectively be based upon a sample of the agricultural features present within the overall project area. After in-depth review of the results of the inventory survey work, it was concluded that detailed recording of the resources encountered within c. 20% of that portion of the project area containing agricultural features (i.e., above c. 500 ft) would be sufficient for accurately characterizing the full range of agricultural and habitation complexes actually present within the overall project area. It was further concluded that this detailed recording should be coupled with data recovery at, and preservation of, select complexes and features, depending on specific findings. Collectively, these measures would ensure adequate mitigation of potential impacts which would accompany construction of the proposed Waikapu Mauka Golf Course project.

These findings and conclusions of the 1989 inventory survey are reflected in the general significance assessments and recommended general treatments which were finally developed for project area sites and which are summarized in Table 2.

Recommendation for a Comprehensive Mitigation Program

Based on the findings of the 1989 PHRI survey, as outlined and discussed above, a phased archaeological mitigation program was recommended as the most appropriate means for preservation and evaluation of the significant cultural materials which remained within the project area. The basic purpose of the mitigation program was to meet the requirements of the Maui County Planning Department and DLNR-HPP/SHPO in connection with the proposed development of project area lands. The general objectives of the mitigation program were to:

1. Summarize previous archaeological findings and recommended treatments for identified cultural resources located within the Waikapu Mauka Partners project area; and
2. Conduct further data collection, including detailed recording and excavations, sufficient to recover the significant information from five of the total of nine sites located within the project area for which continued physical preservation would not be required. Included in this category were Sites T-2, -4, -5, -7 and -12 (see Table 2, above).

In February of 1989, the Mitigation Program was prepared and submitted to Waikapu Mauka Partners (Jensen 1989). The Mitigation Program was developed around the above primary tasks, and included a detailed Data Recovery Plan and an Interim Site Preservation Plan. The Program was found to be acceptable, and field and laboratory work were subsequently implemented by PHRI. The present report constitutes the Final Report for this Mitigation Program, and includes a project area description, a summary of relevant previous research in the immediate area, a presentation of specific findings on a site-by-site basis, and conclusions derived from these specific findings.

PROJECT AREA DESCRIPTION, PREVIOUS RESEARCH, AND GENERAL RESEARCH TOPICS APPROPRIATE TO THE PRESENT PROJECT AREA

Project Area Description

The Waikapu Mauka Partners project area consists of gently to moderately sloping terrain located on the eastern escarpment of the West Maui Mountains, immediately southwest of Waikapu town. The project parcel is a roughly rectangular piece of land containing c. 600 ac and is dissected by several major gulches which discharge their soil- and rock-laden runoff waters onto a series of major fans which spread out across the project area and onto the margins of the plains below. Substantial available water along the escarpment apparently fostered extensive and intensive agricultural development of this area in prehistoric and perhaps into early historic times.

Prior to the present project much of the project area had been intensively cultivated for sugarcane (*Saccharum officinarum* L.) and pineapple (Bromeliaceae). Adjacent parcels continue to be cultivated intensively, with numerous haul roads and irrigation features transecting the general

area. That past cultivation and other developments have involved deep plowing and extensive surface modifications, as is attested to by the presence of field clearing debris piles located at several points within and immediately adjacent to the present project area. Most of this clearing, however, has been undertaken below about 500 ft elevation, which accounts for the density of intact prehistoric agricultural and other features concentrated above this elevation zone.

According to Foote et al. (1972: Sheet 100), the soil throughout most of the project area consists of stony alluvial land. The beds and banks of the gulches which dissect this parcel contain rough, broken, and stony land, although even these areas were suitable for limited agricultural activities if properly prepared for soil control and water retention.

Annual rainfall in the project area is estimated to be about 20-30 inches (Armstrong 1973). The available water supply, combined with the abundance of deep rich soils, ensured that dense stands of native vegetation would be supported and also that traditional agricultural activities could be successfully undertaken. At one time, modern agricultural activities probably resulted in removal of virtually all of the original native vegetation cover and replacement with sugarcane and other cultivated species. However, pockets of relatively undisturbed terrain containing stands of both native as well as a variety of introduced species are represented within about 15% of the project area, although such areas are restricted primarily to the steep-sided, non-arable (by today's standard) gulches which dissect the project area.

Previous Archaeological Research

Although formal archaeological survey work was initiated relatively early on Maui (e.g., Emory 1921; Walker n.d.), the island's prehistoric resource base remains much less intensively studied than is true for either Hawaii or Oahu. Emory's early work on Maui involved an inventory of archaeological sites located in Haleakala Crater, and is not directly relevant to the present project area. Winslow Walker's Bishop Museum-commissioned study involved a partial assessment and inventory of larger sites and heiau around the island. However, many of these features, particularly those located along the western coasts, had been completely, or nearly completely destroyed by the 1930's with a concomitant loss of significant information. Moreover, the kinds of features represented within coastal zones did not appear to be duplicated within upland environments such as the present project area, so that these upland areas received considerably less attention by the early researchers.

Maui archaeology was largely ignored during the 1950s, at a time when research elsewhere was establishing important local and regional artifact chronologies and frameworks for categorizing major Hawaiian site-types. Some productive research was undertaken on East Maui during the 1960s (Soehren 1963, Pearson 1970), and Chapman's intensive survey and excavation work in Kahikinui contained Island-wide implications for prehistoric patterns of settlement and land use (Chapman and Kirch 1979). For the most part, however, relatively little research was undertaken within Maui during this period.

During the succeeding decade and through the 1980s, West Maui began to receive increased attention, as the pace of urbanization and resort development within this area demanded intensive contracted survey and excavation projects. However, a thorough search of existing records failed to substantiate any previous archaeological work within, or immediately adjacent to the present project area. For the most part it appears that relatively little research was undertaken within upland zones, in large part because the coastal areas were the areas being selected for intensive development, but also because the coastal margin was considered "more productive" than upland environments. Although the examination of existing records failed to document previous research within or immediately adjacent to the present project area, it was nevertheless clear that the types of sites and features identified within the project area had not previously been clearly delineated nor studied anywhere on the island. The present project thus offered an opportunity to examine what appeared to represent an important aspect of traditional Hawaiian settlement and land use which had not previously been investigated.

General Research Topics Appropriate to the Present Project Area

Although there had been no previous research within the immediate or general project vicinity, and despite the lack of specific information related to dating and use of the site types which appeared to dominate the project area, it was nevertheless possible to develop a number of general research topics for the Waikapu Mauka Partners Golf Resort project area. The following general research topics were eventually developed on the basis of what was generally known concerning Island prehistory, and these were incorporated within the Data Recovery Plan prepared for the Mitigation Program, as follows:

1. It was clear that additional detail was needed concerning the ages and functions as well as settlement pattern definition for project area sites and features;

2. Equally important was the need to evaluate the functions of, and relationships among, the several habitation feature types present within the project area, as well as the relationship between these habitation features and the extensive agricultural field system with which they all appeared to be associated;
3. Finally, it was concluded that some effort should be made to determine whether specialized socio-political controls existed over the extensive agricultural activities which had been undertaken within the area; this objective was to be accomplished by attempting to determine whether or not specialized ceremonial features actually existed at any of the project area sites.

As well, the scope of research outlined in the Mitigation Program's Data Recovery Plan was also designed to recover data sufficient for developing appropriate interpretive themes for select sites/features. In this regard, it was concluded that sites specifically related to agriculture might be enhanced by an interpretive theme which demonstrates how and for what purposes these fields were exploited, the range of feature variability which occurred within different areas, and the affects of this agricultural system on the natural environment. Subsidiary interpretive themes might focus on historic versus prehistoric use patterns. The data requirements for these objectives were considered more or less equivalent to the data requirements which had been developed for further scientific (archaeological/anthropological) evaluation, so that it was not necessary to develop either specialized data recovery methods and techniques or specialized approaches to analysis and evaluation.

DATA REQUIREMENTS AND RESEARCH METHODS

Data for addressing the research topics outlined above were to be secured from additional archaeological survey data, test unit and areal excavations, and laboratory analyses of recovered cultural materials. Archaeological survey data includes (a) information on site/feature types and distributions, (b) information on amount and types of surface artifactual and ecofactual materials, and (c) environmental data. Excavation data consist of artifacts, ecofacts, materials for absolute dating, and stratigraphic information. Laboratory data include age determination analyses, artifact and ecofact analyses, soil studies, and specialized studies of floral and faunal materials.

Based on the site assessments achieved on the basis of the inventory survey data (Haun 1989) and the general research goals and objectives, as outlined above, site-specific data recovery field work tasks were developed and presented in the Data Recovery Plan of the Mitigation Program. These site-specific work tasks are summarized in Table 3.

Having specified the field work tasks on a site-by-site basis, we may now examine more precisely what the additional work tasks involved and the objectives and expected results at particular types of features.

Further Data Collection Survey Field Methods

During the initial inventory survey it was discovered that a dense concentration of various agricultural complexes and associated temporary habitation features existed above the approximate 500 ft contour. Features related to agriculture included extensive terraces, cleared areas, walls, walled enclosures, modified outcrops, mounds, and excavated depressions. As previously noted, it was also observed that

the distribution of these features appeared to be repetitive across the project area. In consideration thereof, it was concluded that detailed recording of the individual features encountered within c. 20% of the land area within which such agricultural and habitation features were concentrated would result in an accurate characterization of the full range of site components actually present within the entire project area.

In order to implement this proposed level of sampling, it was recommended that detailed agricultural feature recording be accomplished within seven 50-meter-wide transects evenly spaced at 200 meter-wide intervals. This number of transects would ensure that sample size was maintained at c. 20% of the entire project area. The first transect was to be established so as to maximize the greatest range of elevation zones within which agricultural features had been observed during the inventory survey work. This required establishing "alpha" transect through recorded Site T-12. All other transects would then be aligned along east-west baselines and established at 200 meter intervals on either side (north or south) of this first transect. Again, the objective of the

Table 3.

SUMMARY OF SITE-SPECIFIC ARCHAEOLOGICAL DATA RECOVERY FIELD WORK TASKS

Field Work Tasks	Site Number (T-)								
	2	4	5	7	9	10	12	18	20
Limited Test Excav.	-	-	-	-	-	-	-	-	-
Define extents of cultural deposits	-	+	+	-	+	+	+	+	+
Obtain C-14 dates and soil samples	-	+	+	-	+	+	+	+	+
Detailed recording	+	+	+	+	+	+	+	+	+
Areal excavations	-	*	*	-	*	*	*	*	*
Documentary/ informant research	-	-	-	-	-	-	-	-	+

*Tentative, with actual need for and final scope of excavations to be determined on the basis of the results of limited test excavation field work.

east-west alignment was to ensure that the 20% sample controlled for any elevation-conditioned variation in feature type within the project area.

Actual implementation of the proposed procedure proceeded as follows. Once a transect centerline had been brushed and staked, the clearing crews were brought in to remove all brush and grass. Not removed were the deciduous trees, such as the *koa-haole* (*Leucaena glauca* [L.] Benth.), *kiawe* (Algaroba, *Prosopis pallida* [Humb. and Bonpl. ex Willd.] HBK), and *wili-wili* (*Erythrina sandwicensis* Degener). The ground cover below the trees was primarily tall thick grasses and *'ilima* (*Sida fallax* Walp.) brush. This lower cover was always thick and the predominate species on each transect varied primarily with elevation—upslope, *'ilima* brush was predominate, while within downslope areas tall grasses were most pronounced. Removing this vegetation entailed the use of hedge clippers, cane knives, and gasoline-powered weed whips. The vegetation was then raked into piles and removed from the transect.

The next step involved detailed mapping of all features thus exposed within the transect. This was accomplished by laying a 50 m tape along the transect centerline (baseline). From this centerline, additional 25 m tapes were placed at right angles and measurements were taken above and below this transecting line utilizing 5 m tapes. When all features encompassed by this 10 m wide strip had been plotted the tape was relocated an appropriate distance along the baseline, and the process was repeated.

Since there were so many agricultural features within each cleared transect, no attempt was made to draw each individual rock comprising particular features. Rather, the primary objective of these maps was to illustrate the spatial distribution of and relationships among the various feature types present. Therefore the transect maps should be considered as accurate schematics illustrating the distribution of features within a large area rather than precisely accurate individual feature maps.

Within identified features, surface collection of all diagnostic artifacts was undertaken, and the locations of all recovered cultural materials were identified on the appropriate site and feature maps. As well, ecofactual remains were also described, and representative samples of these remains were collected and returned to the laboratory for further analysis.

The level of detailed recording and surface collection at all previously identified sites located outside of the transects was to be the same as that specified above for sites/features encountered within the transects.

Limited Test Excavations and Aerial Excavations

Excavations were to be conducted at select sites and features that had cultural deposits. Included among these sites were all previously recorded sites (see Table 2), as well as a representative sample of agricultural and other features encountered during vegetation clearing along the seven transects. The primary objective of such excavation was to secure dating samples from various habitation features which would allow estimating the age of the associated agricultural features.

Following vegetation clearing and mapping of features to be excavated, individual units (for test excavations) or larger areas to be excavated (for aerial excavations) were to be identified and excavation would then proceed according to cultural/natural stratigraphic layers. If necessary, excavation by arbitrary 10 cm levels was to be employed for very thick or stratigraphically complex layers, although as it turned out none of the deposits had to be so excavated. All fill was to be screened through 1/8-inch screen (except for the duff layer which covered virtually all of the features, once it had been discovered that cultural materials were absent from these deposits), and a minimum 25% sample of the screened material was to be retained for laboratory analysis.

Subsurface features were to be numbered sequentially within excavations; i.e., the first horizontal feature encountered in each excavation would be designated HF-1, the second HF-2, and so on. The features would also be plan mapped, excavated, and sampled for laboratory analysis. When possible, given the confines of a one-meter-square excavation unit, subsurface features would be sectioned, and appropriate cross-section drawings prepared.

Cross-section drawings were to be prepared for a minimum of one unit face within each excavated site. Layer descriptions would be compiled through a combination of field examination and subsequent laboratory analysis of representative fill samples, in accordance with Munsell Color Notation and U.S. Soil Conservation Service guidelines. Excavations would be documented, a photographic record kept, and the locations of all test units plotted on the appropriate site/feature map.

Representative soil samples and bulk samples were to be collected for possible specialized analyses and, where possible, samples of datable materials (charcoal, volcanic glass) collected for age determination.

Actual implementation of excavation required only two minor modifications to the original excavation plan. The first modification consisted of abandoning use of 1-m-square excavation units, even during test excavation work, in favor of short trenches and expanded trenches. Excavation of a particular feature was often initiated by establishing a single 0.5 or 1-m-square unit in an appropriate locale; however, the decision was usually made that a better exposure would result from extending either a 0.50-, or 1.0-m-wide trench across a particular structure. Examination of the trench profile was then used to determine the depth and complexity of the associated subsurface cultural deposit, and for preparation of architectural cross sections of individual features. The initial trench was usually placed so as to bisect the feature; subsequently, the original trench might then be expanded by segments until 1/3 or 1/2 of the structure had been excavated, as in the cases of features which were to be subjected to aerial excavation procedures.

The second variation from the original excavation plan (both testing and aerial excavations) involved processing of recovered materials. Rather than returning all recovered materials to the laboratory for analysis, preliminary sorting was accomplished in the field. Artifacts were sorted and bagged by material type by basic categories such as bone, shell, coral, glass, and stone. This preliminarily sorted material was then shipped to the main lab in Hilo, where it was cleaned and further processed, as outlined below.

Laboratory Methods

All recovered artifacts and midden remains, most of which had been subjected to preliminary sorting in the field, were cleaned and further sorted in the laboratory. Artifacts were sketched (when appropriate), classified as to type and material, weighed, and were characterized in terms of metric attributes. Midden samples were also further sorted and weighed by major category (e.g., bivalves, gastropods, fish, mammal, etc.).

Dating analyses involved radiocarbon age determinations (with C-13/C-12 stable isotope ratio determinations) and volcanic glass age determinations by hydration-rind testing. Carbon samples were preliminarily sorted, weighed, and described prior to submission for dating. Volcanic glass was likewise processed in the laboratory before submission for dating.

Soil samples were analyzed according to established procedures, and floral and faunal samples were submitted for specialized analysis (see discussions of individual features for specific results).

Treatment of Recovered Materials

The recommended treatment for recovered materials is curation and storage at an institution or repository that can insure their preservation and make them available for research and public view. Section 66.3(b) of the National Park Service's "Recovery of Scientific, Prehistoric, Historic, and Archaeological Data: Methods, Standards, and Reporting Requirements" (36 CFR Part 66: Proposed Guidelines) stipulates that recovered materials "...should be maintained by a qualified institution or institutions as close as possible to their place of origin. While at present there is no officially designated repository on Maui Island, the University of Hawaii-Hilo Campus has agreed for the immediate future to hold all recovered materials within the Archaeological Materials Storage section of the Department of Anthropology-Archaeology Laboratory. Selected artifacts may be retained for display in interpretive exhibits at or near the new golf course facilities.

Mitigation Requirements

As outlined in the Mitigation Program's Data Collection Plan, determinations on the disposition of sites would be based on the results of the recommended levels of further data collection work and would be made on a site-by-site basis. Adequately documented sites would not require additional work, and their continued preservation would thus not be required. Prior to project implementation, it was considered possible that some sites may warrant additional investigation, and the scope of such investigation (mitigative work) was to be fully detailed and justified in the final report (the present document). Moreover, sites encountered during the further data collection work along the seven transects might also warrant inclusion in the proposed preservation/interpretive development plan list of sites, depending on specific findings within these areas. As it turned out, however, no recommendations were made for either additional mitigative work or for adding to the complement of sites proposed for preservation/interpretive development, as indicated below in the Findings section of this report.

FINDINGS

The discussion of project findings has been divided into three primary sections for ease of presentation. The first section provides descriptive information on the results of the detailed transect mapping work. The second section provides descriptive information on the results of the detailed recording at the nine previously identified sites located within the project area. The third and final section details the results of test and areal excavation work at 20 separate features located within seven residential site clusters, including a discussion of portable artifacts and midden remains recovered from, and dating results achieved at, the 20 excavated features.

DETAILED TRANSECT MAPPING

The rationale for this work, and the methodology employed in identifying and mapping cultural resources within each of the seven transects, has already been discussed in the previous section of this report.

Primary Agricultural Feature Types

As already noted, agricultural features represent the primary feature types encountered within the seven transects. Four general morphological types of agricultural feature were recognized:

1. Boulder Slope Planting Features: This was the most common agricultural feature found in the project area. Seventy-four percent of the total of 2,854 individual features identified within the transects represent small cleared planting areas. Since most of the project area is comprised of colluvial fan deposits, there appears to have been as much rock as there was soil for prehistoric farmers to contend with. As a consequence, in those areas where waterworn cobbles and boulders were particularly abundant (as along ridges and on slopes), farming space was apparently created simply by removing stones from relatively small plots of ground. These cleared areas seldom exceeded 2.0 meters in diameter, and average less than 1.0 meter. Once the stones from a small area had been removed, the soil was probably mulched and may then have received two or more plants. In addition to being found on rocky slopes or ridge tops, such features were also discovered to represent integral parts of farming terraces and to have been created inside walled enclosures as well.

2. Clearing Piles: As the name implies, these features represent rock piles created while clearing planting plots,

and comprised 404, or c. 14%, of the total number of individual agricultural features identified within the transects. These clearing piles were differentiated from natural stone piles on the basis of the following. Natural piles of stone are characterized by the smaller stones having settled to the bottom with the larger stones aggregating toward the top. The clearing piles, on the other hand, present just the opposite configuration. Human clearing apparently first involved removing the larger stones, followed by piling smaller stones on top. Moreover, the mulching process, which were the final step in building a planting feature, turned up additional small cobbles and pebbles which were then tossed on top of the growing pile of stones. In addition to representing the act of clearing itself, these mounds were probably also utilized to support the vines and foliage of sweet potatoes and yams and perhaps gourds as well. All of these cultigens would have been planted in the cleared areas surrounding the piles.

3. Hillside Terraces: A total of 263, or c. 9.2%, of the agricultural features were represented by hillside terraces. These frequently resembled a series of steps ascending the hillsides, and encompass from 10 sq meters to as much as 400 sq meters in land area. For the most part, these features were identified as flat, rock-free expanses of tillable ground bounded on one or more sides by a stone-faced bank. These features normally occur in clusters rather than as isolated examples, and they vary from low, non-distinct rock alignments to elaborately constructed, well-faced walls.

4. Gully Bottom Terraces: These features were the least common of all the agricultural feature types, represented by only 63, or less than 3%, of the total. Constructed in gully bottoms so as to establish a leveled, well-watered planting area, these features may also have helped to control heavy erosion by forcing incoming water to spread out over a much wider area and thereby slow down and minimize down-cutting. The features are somewhat more difficult to distinguish from natural phenomena than some of the other agricultural feature types, a fact which may have resulted in their underrepresentation in the existing sample. In addition, their location at the bottom of the gulches clearly suggests that many have probably been destroyed by flooding.

In addition to the agricultural feature types noted above, a limited number of architectural components were observed along the transects in association with these four primary types of agricultural component. These associations, and the distributions of the different agricultural feature types

within the seven transects, are discussed below. Figure 2 identifies the overall location of the seven transects within the project area, while Appendix C provides detailed illustrations of the agricultural and other components actually observed within each of the transects.

Description of Individual Transects

Transect 1 - Transect 1 is the most southerly of the seven transects and is also the shortest, as it was located within an area which had already been partially disturbed by construction activity. Within this transect, a total of 6,250 sq meters of surface area was cleared and mapped. The land within the transect and its immediate vicinity was broad and generally flat with only a slight downhill slope to the east. In addition, the surface was relatively free of rock except for scattered occurrences where boulders had been purposefully piled. Not unexpectedly, 81 small agricultural plots were found within this transect, while two gully terraces were identified in the single shallow drainage which dissects this particular area. Elevations within the transect range between 425 and 500 ft above sea level, and no architectural features were encountered.

Transect 2 - Transect 2, only 150 m in length, was located 250 meters north of Transect 1. The southern (lower) terminus extends to the 445 ft contour while the upper end extended to nearly 500 ft in elevation. Like Transect 1, the terrain is fairly flat within this area, although two streams courses meander in and out of the transect and there are numerous areas containing large piles of colluvial boulders. A total of 91 agricultural features were plotted within Transect 2. The small planting plots accounted for 74% of the total and most of these were found within an area of boulder piles. In addition, this transect contained 16 hillside terraces, most of which were found on a rocky slope in the southwestern corner of the transect. Many of the small planting plots were incorporated into or set against these terraces. The terraces were generally curvilinear in plan view, and were constructed of single-course alignments. A relatively large gully terrace was observed in the northernmost drainage which dissects this area, and a second, much smaller example was observed at the head of a small drainage not noted on project area topographic maps.

Transect 3 - Transect 3, also 150.0 m in length, extends between c. 475 and 550 ft in elevation. Several large features were observed within the transect's upper segment, including Features A, B, and C of Site 2024. Features A and B are both habitation areas, while Feature C represents a series of gully bottom terraces. These terraces are at the head of a gully which cuts diagonally across the transect from the northwest to southeast. Besides the Feature C

terraces, three additional examples were observed in this drainage during the transect survey work, as well as one additional example located approximately 30 meters to the south. While gully bottom terraces were prominent cultural features within this area, most of the agricultural features observed within this transect were observed along the ridge flanking both sides of the two ephemeral drainages which dissect this area. This ridge is very rocky and steeply inclined, but nevertheless contained a total of 59 boulder slope planting features as well as 26 hillside terraces. Also present in the upper half of this transect were large, linear wall segments that may or may not be contemporaneous with the prehistoric agricultural and small habitation features. The lower portions of Transect 3 contain much flatter land and less rock, and only a few boulder slope planting features in addition to a single gully terrace located at the bottom of a small swale.

Transect 4 - Transect 4, at 750 meters in length, represents the longest of the seven transects. The transect extends from approximately 415 ft elevation to slightly more than 700 ft above sea level. Numerous features were observed within this area, which are described below in 100 m long increments of transect length.

The first 100 meters of this transect (the lower portion) is dissected east to west by a deep gully containing numerous *wili-wili* trees. Immediately south of the gully is a massive boulder field composed of large stones and very little soil. There were very few agricultural features in this area.

Beginning immediately north of the gully, however, are numerous boulder slope planting features (79 were observed) and hillside terraces. These terraces and the associated planting features increase in number with elevation, and achieve greatest density within the second 100 meter-long increment of Transect 4. Within this segment of the transect, hillside terraces and boulder slope planting features form a nearly continuous "mat" of features along the top and sides of the ridge bordering the north side of the drainage. Only a single gully bottom terrace was observed within the second 100 meter-long segment of Transect 4, although this same general area also contained a C-shaped habitation structure, Feature H of Site 2024, as well as a single upright slab.

The third 100 meter-long segment of this transect is characterized by fairly open terrain with a gentle slope toward the east. An old farm road has been cut across the west side of this transect from north to south, below which were observed 40 planting plots, six hillside terraces, and a single gully bottom terrace at the head of a small drainage.

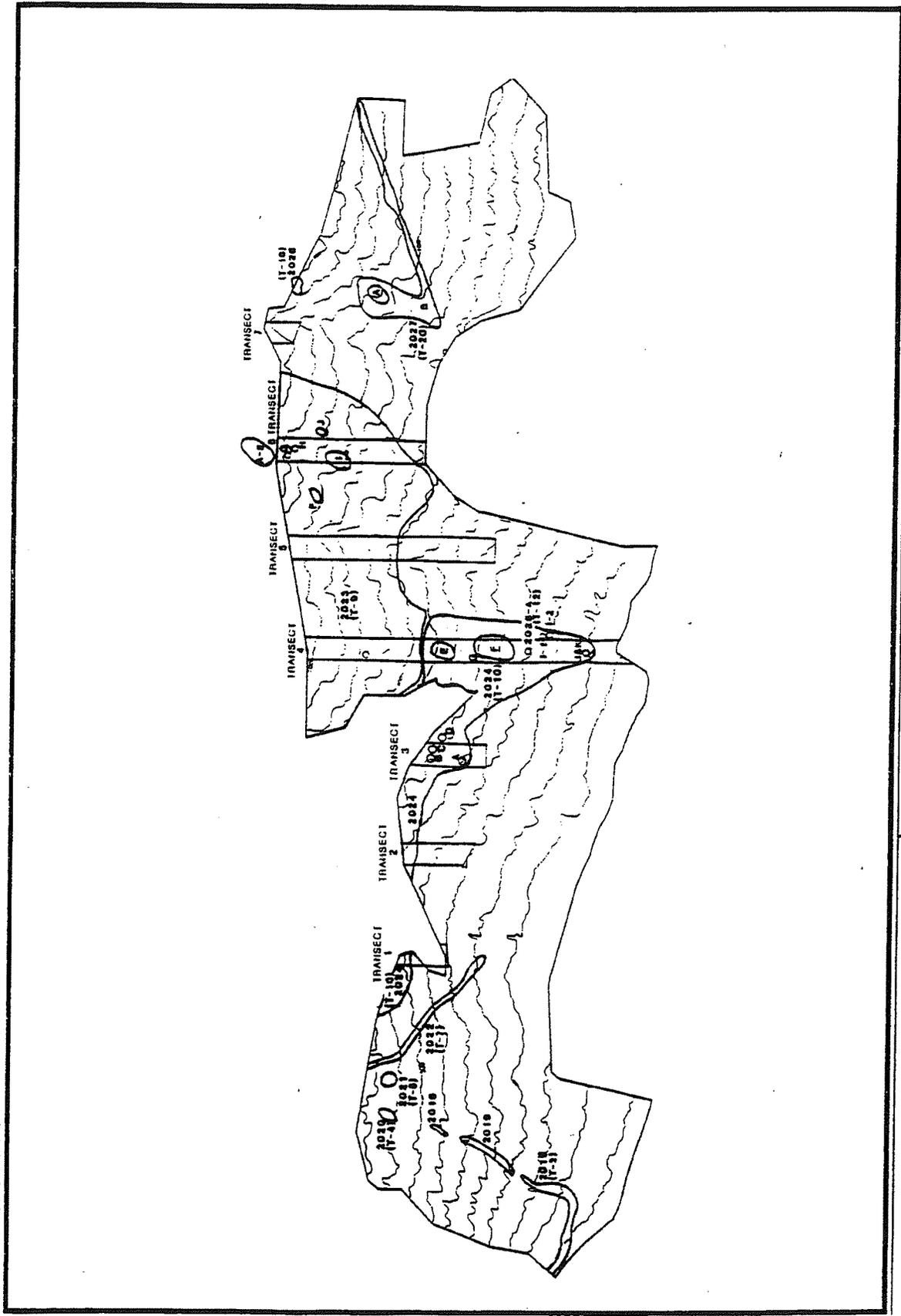


Figure 2. SITE AND TRANSECT LOCATION MAP

The fourth 100 meter-long section of Transect 4 is situated within steeper terrain and contains Feature E of Site 2024. Feature E consists of a large enclosure which occupies the entire southern half of Transect 4 within this area. Immediately north of the enclosure is a boulder field containing a few planting features, additional examples of which have probably been destroyed by ongoing construction activities. Within Feature E enclosure are numerous well-defined hillside terraces and occasional small planting units. While Feature E appears to represent historic-era use/occupation, it is not clear whether the associated terraces and planting features also date to this time period, or whether they were pre-existing at the time of construction of the enclosure.

The fifth 100 meter-long segment of Transect 4 incorporates a second farm access road that crosses the transect from north to south. This entire 100 meter-long segment is comprised of Feature F of Site 2024 which represents an agricultural/habitation complex characterized by numerous well-defined hillside terraces, gully bottom terraces, small planting plots, and a C-shaped structure (Feature G of Site 2024). In the center of this complex is a single upright slab.

The sixth 100 meter-long segment of this transect is comprised almost entirely of boulder slope planting areas. A total of 81 such features were observed among the large boulders and cobbles scattered about the area and which are concentrated along both sides of a drainage which proceeds through this area. A single gully terrace was observed within this section of the transect, as well as Feature A of Site 2025.

The seventh 100 meter-long segment of the transect is a rather flat area without well-defined drainages. Large basalt cobbles and boulders dominate the landscape, particularly along the northern edge of the transect where they have been naturally windrowed into elongated piles. Agricultural features within this area are restricted to a single type—boulder slope planting plots, of which 218 examples were identified. Structural features were also represented, including a C-shape (Feature I of Site 2024) and a low-walled enclosure (Feature J of Site 2024). One additional feature was also observed in this area, consisting of a possible shrine—Feature K of Site 2024. The feature was photographed and mapped, but was bulldozed before it could be subjected to any additional evaluative work. Lastly, an upright slab was observed along the northern edge of this section of Transect 4.

The final segment of Transect 4 was only 50 meters in length and contained only a few scattered planting plots.

Transect 5 - This transect achieved 550 meters maximum length and extended from c. 500 ft to 760 ft in elevation.

The initial (lower) 250 meter-long segment of Transect 5 is characterized by a gentle easterly slope lacking a dense concentration of stones and dominated by a series of shallow swales containing several boulder slope planting areas and two gully bottom terraces. In addition, two paired upright slabs were observed, each marking the face of a clearing pile and set 4.0 meters apart from one another.

The second 100 meter-long segment contains the same gully which proceeds through the initial segment, although the gully splits into north and south halves about midway through this second segment. An old farm access road as well as 107 planting plots were observed within this section, although no hillside terraces were noted.

The third 100 meter-long segment of Transect 5 is drained by a single gully which begins in the northwest corner and exits just above the southeast corner. The area north of this drainage consists of steep, rocky lands containing numerous hillside terraces and planting plots as well as a single upright slab located adjacent to one of the planting plots. The area to the south of the gully is rocky but relatively flat and contains only a few planting plots. A single gully terrace was observed at the head of the gully.

The final segment of Transect 5, 100 meters in length, is fairly steep and is drained by a single gully which fans out across the area into a series of shallow swales. The segment is also quite brushy, but nevertheless contained 45 hillside terraces concentrated along both sides of the shallow drainage, and 85 boulder slope planting areas located primarily below the point at which the drainage channel becomes poorly defined. In addition to these features, two gully bottom terraces were observed along the drainage, one located near the head of the system, and the second located near the bottom of the system, just above the point at which a distinctive drainage channel disappears. Lastly, there is an upright slab located within a cluster of planting plots near the bottom of this 100 meter segment of Transect 5.

Transect 6 - Transect 6 was 390 meters in length and extended from 525 to 760 ft above sea level. A total of 438 agricultural features was observed within this transect, in

addition to Features G, H, and I of Site 2023, all of which represent components of a more encompassing agricultural/habitation complex.

The initial (lower) 100 meter-long segment of the transect is characterized by gently sloping lands containing only a light scatter of surface rock. Five gully terraces and two planting plots were observed within this segment.

The second 100 meter-long section is also relatively flat but contains 40 widely-dispersed planting plots. At the eastern end of this segment are several massive wall segments which are believed to have been constructed so as to funnel the slope wash entering this area into a single channel. This channel in turn contains numerous gully terraces, six of which are in this segment and five in the initial segment of transect (located immediately downslope).

The third 100 meter-long segment of Transect 6 is dominated by Feature I of Site 2023, comprised of a complex of large hillside terraces (19 examples), 132 planting plots, and a small rectangular habitation enclosure containing a paved "front porch." Additional information concerning this agricultural complex is provided in the description for Feature I of Site 2023 (below).

The uppermost 90 meters of the transect is characterized by fairly rocky landscape drained by numerous small and shallow drainages. Most of the transect's agricultural features are found within this area, particularly along the slopes which divide the small drainages. A single gully bottom terrace was observed within this upper segment, situated on the north side of the transect where a larger gully enters the transect and then fans out. There were also 21 hillside terraces within this first 100 meters of the transect, as well as 151 planting plots scattered along the rocky ridges.

Transect 7 - Transect 7 is only 182 meters long, extending from about 725 to 795 ft above sea level. The entire segment is characterized by a series of deeply-etched drainages which meander back and forth across the area. The ridges and swales separating the drainages are very rocky with steep sides. Except for the gully bottom terraces (of which 15 were observed within the transect), all of the agricultural features occur on the slopes above the gullies, or along the ridge tops. Within these latter areas, 15 hillside terraces and 165 planting plots were observed. Feature A of Site 2026 is located at a point approximately 200 meters

north of Transect 7. Feature A is a rectangular enclosure that was subjected to test excavation work during the present project. A short distance from Feature A is another rectangular enclosure (Site 2028). All of these features appear to be part of what might be considered a "mega"-complex of agricultural and habitation features centering on the upper portions of Transects 6 and 7.

Discussion

One of the primary objectives of the present project was to attempt further functional interpretation of the types of features and feature complexes which had been observed during the initial inventory survey. One aspect of this objective was to evaluate whether or not there might be some consistent patterning in feature distribution which was itself linked with elevation or some other variable(s). In order to implement these objectives, morphological categories (i.e., the Agricultural Feature Types 1-4, above) were selected which appeared to be compatible with available ethnographic information. As well, a sampling strategy for feature identification and recording was implemented which would ensure that comparable data was recovered from all terrain types and elevation zones within the project area.

The morphological categories selected to describe the primary agricultural features within the project area are (1) boulder slope planting features, (2) clearing piles, (3) hillside terraces, and (4) gully bottom terraces. In order to simplify further evaluation, the two terrace types were combined into a single designation (both feature types were morphologically equivalent), and the names of all of the features were shortened. The following categories resulted:

Boulder Slope Planting Features	-	Garden Plots (Plots)
Clearing Piles	-	Mounds (Mnds.)
Hillside and Gully Bottom Terraces	-	Terraces (Terr.)
Habitation Features	-	Habitations (Habs.)

Feature Density and Horizontal Distribution

The occurrence of these feature types within individual survey transects was converted to a CAD mapping data file at the conclusion of field work. It was thus possible to readily recover information concerning the surface area consumed by each of the feature types in relation to the total area examined within the survey transects. The surface area thus determined was normalized, and the results by transect are indicated in Table 4:

Table 4.

**PERCENTAGE OCCURRENCE OF AGRICULTURAL
AND HABITATION FEATURES BY TRANSECT**

	Plots	Terr.	Mnds.	Habs.	Unmod.*	Tot. Area in Cult. Feat.
Transect #2	0.7	0.7	0.1	0.00	98.50	1.50
Transect #3	4.8	3.7	4.7	3.67	83.13	16.87
Transect #4	3.1	3.0	1.0	0.80	92.00	7.90
Transect #5	3.1	2.6	1.0	0.00	93.30	6.70
Transect #6	3.2	5.6	1.6	0.60	89.00	11.00
Transect #7	3.7	2.0	2.2	0.00	92.10	7.90

* Unmodified is used here to designate lands within which no constructed features were observed during field work; however, this does not necessarily mean that these lands were unutilized. In fact, it is likely that some significant percentage of these lands supported crops or were being utilized for agricultural-related activities of some type.

These data from Table 4, above, are displayed in bar graph form in Figure D-1 (Appendix D). This figure indicates the approximate equivalence of the density of agricultural and habitation features of all types within the six transects which yielded analyzable data. The only apparent exception exists in the case of Transect #3, which contained a slightly higher percentage of constructed features (agricultural as well as habitation-related) in relation to "unmodified" lands than any of the other transects.

Having tentatively concluded that feature density per unit of surface area among all transects (i.e., horizontally across the project area) was roughly equivalent, further evaluation involving just agricultural features was undertaken by excluding the land areas categorized as "unmodified" and containing habitation features. The data representing frequency of occurrence of each of the three classes of agriculture-related feature was normalized, and the relative proportion of agriculture feature types by transect number was displayed in bar graph form in Figure D-2 (Appendix D). Although the presentation of data by transect ignores elevational differences, the results here were utilized to further evaluate potential zonal differences which might be present. As with the previous results (Figure D-1), the findings re. agriculture features alone document approximate equivalence among all of the transects in terms of ratios of primary agricultural feature types present. There appears to be no significant difference in the horizontal distribution of agricultural features across the project area.

Vertical Distribution

In order to evaluate the potential for vertical stratigraphy in the distribution of agricultural and other feature types within the project area, additional detail for each of the transects was needed. This detail was obtained by segmenting each of the transects into smaller study units, each of which would isolate elevation as an independent variable. The CAD-based map data allowed segmenting each survey transect into approximate 75-meter-long "panels"; each of these panels, in turn, represented a discrete elevational range, differing from the adjacent panels on either side by approximately 25 ft elevation. A total of 29 separate study panels was thus created within survey transects 2-7, as follows: Transect 2 (Panels 1, 2); Transect 3 (Panels 1, 2); Transect 4 (Panels 1, 2, 3, 4, 5, 6, 7, 8, 9, 10); Transect 5 (Panels 1, 2, 3, 4, 5, 6, 7); Transect 6 (Panels 1, 2, 3, 4, 5); Transect 7 (Panels 1, 2, 3).

The initial requirement in this portion of the study involved calculating the percentage of occurrence within each of the 29 panels of the three primary agriculture feature types present. These results are presented in Table 5. The next step involved normalizing the data, and then plotting these results in order to attempt to determine whether several individual panels shared similar proportions of these three feature types (i.e., whether "groups" could logically be defined), and whether other such "groups" of panels

Table 5.

**WAIKAPU TRANSECTS,
AGRICULTURAL FEATURES PRESENT BY PANEL NUMBER**

Mapped Panels by Transect No.	Plots	Terr.	Mnds.
Transect-2, Panel-1	43	47	10
T-2, P-2	49	38	13
T-3, P-1	46	41	13
T-3, P-2	76	21	3
T-4, P-1	37	57	6
T-4, P-2	36	55	9
T-4, P-3	31	61	8
T-4, P-4	21	40	39
T-4, P-5	37	0	63
T-4, P-6	21	64	15
T-4, P-7	41	43	16
T-4, P-8	91	8	1
T-4, P-9	88	0	12
T-4, P-10	88	0	12
T-5, P-1	16	75	9
T-5, P-2	52	19	29
T-5, P-3	62	28	10
T-5, P-4	74	0	26
T-5, P-5	72	0	28
T-5, P-6	77	0	23
T-5, P-7	16	0	84
T-6, P-1	33	41	26
T-6, P-2	26	65	9
T-6, P-3	32	66	2
T-6, P-4	31	0	69
T-6, P-5	1	0	99
T-7, P-1	34	46	20
T-7, P-2	44	20	36
T-7, P-3	38	21	41

which displayed consistently different proportions could be identified. Plotting the raw data in bar graph form yielded the results indicated in Figure D-3 (Appendix D). These results suggested the presence of several discrete "clusters" of panels which closely resembled one another in terms of the proportions of agricultural feature types present, and each one of which seemed to differ significantly from several other groups or clusters present among the population of 29 study panels.

The next step in the evaluation involved re-sorting the panels into these apparent "groups" or clusters on the basis of shared attributes. The resorting was accomplished by application of seriation techniques, and, when the results were plotted, resulted in the arrangement of study panels as depicted in Figure D-4 (Appendix D). Extracted from the rearranged sequence of panels were the following "groups" or clusters of panels (Table 6) which shared the greatest level of similarity in the proportion of agriculture feature types present:

At this point, five separate panel clusters had been identified, each defined as a range of proportional representation of the three major types of agricultural features which had been identified at Waikapu. It was necessary to attempt to determine whether these clusters or groups might covary with some other variable(s), and whether such covariation might subsequently be accounted for in terms of the interaction among various components of the social and natural environment. Only a limited number of variables were thought to be relevant to the research issue at hand—principally, elevation and the presence of habitation features, with the latter perhaps also dependent (at least in part) on elevation.

The evaluation thus proceeded by assigning appropriate elevation values to each of the 29 study panels. This data was incorporated into a new table (Table 7) which also contained the rearranged sequence of panels as well as additional calculations relevant to each of the five identified clusters. The elevation means for all five of the clusters were then calculated and plotted (Figure D-5, Appendix D). Statistical evaluation was undertaken in order to determine whether the differences in cluster elevations evident in Figure D-5 were significant, with negative results. In short, those separate areas of the project area defined as clusters of panels do not appear to covary with elevation in a patterned, predictable way. Elevation does not, therefore, appear to represent the variable which accounts for the fact that within some areas agricultural plots comprise less than 50% of the agricultural features present while mounds comprise less than 15% (i.e., Cluster 1), compared to other areas within

which agricultural plots consistently comprise more than 50% of the agricultural features present while terraces are absent (i.e., Cluster 5). Moreover, based on the mixing of panels from separate transects, it is clear that these "clusters" do not represent discrete blocks of land located within particular portions of the overall project area. On the contrary, the clusters document that the land units which most closely resemble one another in terms of shared proportions of agricultural features are widely scattered both horizontally as well as vertically throughout the project area.

The procedures outlined above re. elevation were then undertaken utilizing data for habitation features. Correlating panel clusters with habitation features proceeded simply by summing all panels within each of the five clusters which contained any type of habitation feature, and assigning this number as the "habitation feature presence value".

The basic data for the analysis had already been incorporated into Table 7. When plotted by cluster number (see Figure D-5, on which elevation by cluster has also been plotted), the results again suggested that there was virtual equivalence among the five clusters of panels in terms of the likelihood that habitation features would also be present.

Although there seemed to be no elevation-conditioned segregation of agriculture feature types, it was clear that the overall density of both agricultural and habitation features may have been conditioned by variables related to elevation, although in opposite directions. Evaluation of these possibilities involved taking the assigned elevation values for each of the 29 transect panels, and calculating the gross percentage of each of these land units which contained agricultural and habitation features. Elevation was arbitrarily segmented into "clusters" on the basis of 100 ft increments. Thus, Cluster #1 represents all survey transect panels located between 401 and 500 feet; Cluster #2 includes all panels located between 501 and 600 feet, etc. The average percentage of land surface area devoted to agriculture and habitation use for each of the four elevation-based clusters was then calculated (Table 8), and these results were plotted (Figure D-6). The results indicate an increase in density of all types of agricultural-related features with elevation, and an inverse relationship between agriculture- and habitation-related features with respect to elevation between 500 and 700 feet. The trend toward a decrease in the percentage of land area devoted to habitation use with increasing elevation reverses itself between 700 and 800 feet (Figure D-6), although this may be a function of lumping historic-era features with prehistoric components. This variable could not be adequately controlled due to the absence of sufficient dating results.

Table 6.
REARRANGED MAPPING PANELS,
CLUSTERING INDIVIDUAL PANELS
WITH ROUGHLY EQUIVALENT PROPORTION OF
AGRICULTURAL FEATURE TYPES

	Defining Attributes	Cluster Membership
Cluster 1	Ag. Plots <50% Mnds <15%	T-5, P-1 T-4, P-6 T-6, P-2 T-6, P-3 T-4, P-3 T-4, P-1 T-4, P-2 T-2, P-1 T-3, P-1 T-2, P-2
Cluster 2	Ag. Plots >50% Mnds <15%	T-5, P-3 T-3, P-2 T-4, P-8
Cluster 3	Ag. Plots <50% Mnds >15%	T-4, P-4 T-6, P-1 T-7, P-1 T-4, P-7 T-7, P-3 T-7, P-2 T-5, P-2
Cluster 4	Ag. Plots <50% No Terraces Present	T-6, P-5 T-5, P-7 T-6, P-4 T-4, P-5
Cluster 5	Ag. Plots >50% No Terraces Present	T-5, P-5 T-5, P-4 T-5, P-6 T-4, P-9 T-4, P-10

In summarizing the distributional analysis of the Waikapu data, the following tentative conclusions seem justified:

1. Throughout the project area there are small land areas (mapped during the present project as transect "panels") which vary in the proportional representation of the three major agricultural feature types present within them;
2. For analytical purposes, these small land areas were assembled into five clusters based upon shared proportions of feature types; each of these clusters was evaluated for covariation with several variables which it was believed might vary independently. In evaluating the distributions among the membership of the five clusters, as well as cluster covariation with select variables, several observations were made and tentative conclusions reached:

(a) Each of the five clusters was discovered to be composed of survey panels from widely spaced locales across the project area. This indicated that horizontal provenience was probably not a determining factor in the level of shared attributes which defined the five clusters in the first place;

(b) None of the five clusters appeared to covary with elevation in a patterned, predictable way. Statistically, the elevations for the 29 separate study panels did not differ significantly from the mean elevations of the five clusters. Elevation was thus probably not in itself a determining factor in the level of shared attributes observed among the five clusters;

(c) The frequency of occurrence of habitation features among the five clusters was also discovered to be essentially equivalent— all of the agricultural feature cluster types exhibited a nearly identical probability that habitation features would also be present; and

(d) The overall density of agricultural and habitation features within the project area may be inversely related to one another as regards elevation. Agriculture-related features appear to increase at higher elevation zones, while the overall density of habitation features is greatest at lower elevation zones—the ratio of habitation features between 4-600 and 6-800 feet is 23.3/5, or nearly 5-to-1.

At the very least, the transect survey work has confirmed that agricultural features are more or less continuously distributed between about 400 and 800 ft elevation. Unfortunately, this elevation range also happens to coincide with the total elevation range of the project area, and thus provides little insight into potential minimum-maximum ranges for these feature types. Geomorphologically, the higher elevation zones tend to be characterized by much steeper terrain and rockier formations, while flat to gently sloping land containing much less rock dominates a higher percentage of the lower elevation zones. There seems to be some variation in the density of particular feature types within these two contrasting topographies, and to this extent there appears also to be some differential distribution in feature type by elevation. However, the root causes of the different geomorphologies are only coincidentally related to elevation. The natural "sorting" of boulders and cobbles has left the larger examples along the bottom of swifter flowing streams and within steeper terrain, both of which generally occur at higher elevations. On the other hand, there are in fact several lower elevation zones within which "highland type" geomorphology predominates, due to a number of factors of local topography and gulch formation. Within these areas, the density of agricultural features closely approximates the pattern typical of the higher elevation zones with similar geomorphological settings. The critical variable relevant to predicting the density and distribution of agricultural features does not, therefore, seem to be elevation per se (at least within the range represented within the present project area), but rather the presence of a particular geomorphological setting— specifically, relatively steep areas containing abundant surface rock. Wherever such areas occur (whether at "high" or "low" elevations), gully bottom terraces, hillside terraces, and boulder slope planting features seem to be tightly clustered and numerous. In less rocky terrain, more frequently but not always located on gentler slopes and at lower elevations, agricultural features of all types tend to be less numerous and more widely dispersed.

This pattern suggests that the distribution of agricultural features within the present project area does not appear to reflect farming practices which were employed to take advantage of differential rainfall availability. Rather, all of the project area appears to be located within an area averaging 20-30 inches of rainfall annually, and with respect to this single variable all of the project area would have been more or less equally valued. However, extension of agricultural activities into areas which were dominated by dense boulder fields—i.e., extension of agricultural practices to higher

elevation zones—is another matter. Such extension required increasingly higher energy outlays in constructing terraces and preparing plots, and suggests a concomitant increase in the demand for arable land. It is therefore hypothesized that habitation features constructed within these areas are more likely to date to the height of the Expansionist Period in Hawaiian prehistory, or to between about AD 1100 and 1650, and that dates secured on habitation features located at lower elevation zones within areas not characterized by steep, rocky terrain, will typically pre-date the higher elevation examples.

One final point concerning differential preservation should be made concerning the apparent differences in agricultural feature density and clustering between the lower and higher elevation zones within the project area. Past farming and access road construction activities have been more concentrated within the lower elevation zones than the upper areas, a factor simply related to problems associated with equipment access and use. It is quite probable that archaeological features located within lower elevation areas have suffered relatively greater impacts and losses from these activities than features located within the higher elevation areas.

DESCRIPTIVE INFORMATION RESULTING FROM DETAILED RECORDING AT NINE PREVIOUSLY IDENTIFIED SITES

One of the objectives of the present project was to both further evaluate as well as recover specific classes of data from the nine sites which had been previously identified during the inventory survey work. The evaluation and data recovery was to be accomplished through a combination of additional detailed recording and excavation work, including both testing and aerial excavations (see Table 2). The present subsection of this report provides the additional descriptive detail, concerning these nine sites, which was acquired through the detailed recording process. The third and final subsection of this report details the results and findings of the test and aerial excavation work at seven of these nine sites.

Site 2019 (T-2)

Site 2019 consists of two components, one of which (Feature A) represents a wall measuring 457 m in length. The lower (downslope) end of the alignment proceeds roughly north to south, is 183 m in length, and traverses

lands which are located between about 325 ft and 350 ft above sea level. At the north end of this segment, the wall is realigned and proceeds upslope for its remaining 274 m length. A ditch (Feature B) is associated with the wall, paralleling the feature along its south and west face. Large waterworn basalt cobbles have been stacked to form a vertical face along the downslope side of the wall, with the intervening space filled by smaller rocks and earth. The wall and associated ditch may represent historic-era construction in conjunction with what were essentially modern agricultural activities in the area.

Site 2020 (T-4)

This site covers an area of approximately 1,596 sq m and consists of a series of stepped agricultural terraces and small garden plots. Two shallow drainages which flow roughly west to east define the north and south limits of the site area. Prior to vegetation clearing associated with the present project, one of these terrace features appeared to represent a possible house platform (Feature A). However, this could not be confirmed on the basis of closer inspection, and the feature has been reclassified as agricultural in function.

Site 2021 (T-5)

This site is comprised of two well-defined agricultural terraces located 122 north of Feature A of Site 2020. This site, which at one time extended 9.5 m north-south by 5 m east-west and encompassed approximately 47 sq m, was destroyed by construction activities before detailed recording and further evaluation could be completed at the one terrace (Feature A) which possibly represented a small habitation feature.

Site 2022 (T-7)

Site 2022 includes a linear water diversion wall (Feature A) with an associated ditch system, generally similar in design, construction and other details to Site 2019. The wall extends approximately 400 meters along the hillside, averaging 1.2 m in height and 2.4 m in width. Portions of the alignment have been "rebuilt" with a bulldozer. This fact, combined with the discovery that the wall appears also to be associated with an historic corral which is still in use, has led to the conclusion that this site as well as the Site 2019 wall and ditch are probably both historic to recent in age.

Site 2023 (T-9)

This site consists of a complex of features related to agriculture and short-term habitation. Several of these were subjected to excavation work, as detailed in the subsequent section of this report.

Feature A is a kidney-shaped enclosure, constructed from both rough as well as waterworn vesicular basalt cobbles and boulders, which encompasses 46.75 sq m of surface area. The feature extends 8.5 m east-west by 5.5 m north-south. The interior wall faces are vertical and well-constructed, with heights ranging from 15 to 85 cm. The exterior walls tend to be irregular and rough, and slope away from the interior.

Feature B is a C-shaped structure with an interior width of 2.2 m and an interior length of 2.0 m which encloses approximately 3.5 sq m of surface area. The feature is open to the southeast. Wall heights range from a low of 0.40 m to a high of 1.1 m. Interior wall faces are near vertical, while the exterior faces slope down and away from the structure. All walls are composed of stacked vesicular basalt cobbles, most of which are waterworn.

Feature C enclosure, located 4.0 m northeast of Feature B, exhibits an oval-shaped exterior perimeter which encloses a rectangular-shaped interior space. These differences in plan view relate to the stacked cobble construction which involved near vertical interior walls combined with sloping exterior walls. Interior floor space encompasses 4.5 sq m.

Feature D is the second of eight C-shapes observed at Site 2023. In plan view, the feature resembles a capital "D" with the straight edge oriented north-south. A narrow entryway, located in the southeast corner, leads into the interior of the enclosure which is rectangular in plan view and encompasses 4.6 sq m of surface area.

Feature E is distributed over approximately 320 sq m of surface area, and incorporates three small, contiguous enclosures, one of which may be classified as a C-shape. Also present in the immediate area are several few well-defined terraces and numerous small garden plots.

Feature F represents two contiguous C-shapes, both of which are open to the southeast and both were constructed from waterworn vesicular basalt cobbles and boulders. The northernmost structure encloses a floor area of 5.5 sq m while the southernmost example encloses 8.5 sq m. The highest portion of existing wall shared by both structures measures 0.75 m in height, while the northwest wall on the

southern C-shape reaches 1.05 m maximum height. Typically the walls on the windward side of these C-shape structures are the highest. While the interior wall faces are near vertical, the exterior walls slope down and away from the structures.

Feature G is a C-shaped enclosure which encloses 7.0 sq m of space; the structure is abutted by two additional peripheral walls. The east wall of the C-shape is only one course high and constitutes an "entry." A terrace wall, 4.0 m long, abuts the eastern end of the features's north wall, while a linear clearing pile of 5.0 m in length abuts the C-shape at its northwestern corner.

Feature H is another C-shaped enclosure, open to the south and constructed from local basalt cobbles and boulders. The enclosed space totals 9.0 sq m. The interior wall faces are vertical while the exterior walls slope down and away from the structure. The highest portion of wall is located at the east end and measures 0.5 m in height, while the lowest is situated at the south end and measures 0.3 m. The structure appears to have been partially excavated into the hillside, as there is a 10 cm difference in elevation between the uphill ground level and the feature's interior ground surface.

Feature I, distributed over an area of 140 sq m, consists of a series of agricultural terraces and a rectangular room with an adjoining paved terrace. The terraces step downslope from east to west as well as north to south, while a shallow drainage proceeds along the southern margin of the terraces. The rectangular room and associated paved terrace are found at the northeast corner of this series of agricultural terraces. This feature was extensively tested during the present project, and additional detail concerning the feature, including subsurface cultural materials, are presented in the next section of this report.

Feature J is a small C-shaped enclosure located between Survey Transects 6 and 7. The presence of historic bottle glass on the surface document historic-era use, but not necessarily historic-era construction of the original feature which may predate the historic period.

Feature Z represents an isolated hearth identified during the transect survey work, located immediately south of Transect 6. The feature, which measures 0.45 m north-south by 0.39 m east-west, is rectangular in plan view and lined on all sides with vertically placed basalt slabs. Located 0.60 m to the east is a large flat-faced, but unmodified basalt boulder.

Site 2024 (T-10)

As with Site 2023, this site consists of a complex of features related to both agriculture and short-term habitation. As well, several of these features were subjected to excavation work, as detailed in the subsequent section of this report.

Feature A represents a small C-shaped structure identified along Transect 3. As with all other C-shapes identified within this area, the entryway is located on the southeast side. Interior walls are nearly vertical, while the exterior walls slope down and away from the structure, thus forming a "skirt". The enclosure is oval in plan view with interior dimensions of 3.6 m east-west by 2.5 m north-south enclosing a space of 7.0 sq m.

Feature B is a small enclosure located at the western end of Transect 3. In plan view it is generally oval, but with a bulge on the north side which gives it a pear-shaped appearance. The east-west interior dimension is 8.0 m and the greatest north-south dimension is 8.25 m, so that the enclosed interior space is approximately 49.0 sq m. A raised terrace is located at the west end, extending an average of 1.2 m above the rest of the structure. The walls of the enclosure are composed of basalt cobbles originally stacked so as to produce vertical faces inside and out.

Feature C was originally recorded as a possible habitation enclosure believed to generally resemble Feature B at this site. Following vegetation clearing in conjunction with the present project, however, it was determined that the alignments are in reality components of a gully bottom terrace, and the feature has been reclassified as agricultural in function.

Feature D, located along the project area's property line at a point c. 50 m north of Feature C, consists of a room enclosing 16.9 sq m. The feature is located on the eastern face of a natural fan of colluvially deposited basalt boulders and cobbles; construction involved removing and stacking stones from the toe of this fan. The interior shape of this room is rather amorphous in plan view. The interior wall faces are near vertical in aspect, whereas the exterior walls blend into the natural boulder field. The walls are highest (1.0-1.5 m) along the north, west and east faces, and lowest (avg. 0.50 m) across the south end of the enclosure.

Feature E is a large, oval-shaped historic enclosure with massive vertical walls which are generally faced. The structure extends 78.0 m east-west by 32.0 m north-south. Within the enclosure are several well defined terraces as well as two rooms (Sub-Features E-1 and E-2) which are

both contiguous to the enclosure's primary wall. Sub-Feature E-3 represents a detached room just to the north of the enclosure's primary wall. E-1 is rectangular in plan view, is connected to the exterior face of the large compound wall, and has a doorway at the south end of its east wall. E-2, located at the opposite end of the enclosure's primary wall from E-1, is entered from the west along a narrow, 3 meter long walkway which generally resembles a cattle chute. E-3 is a detached room, also rectangular in plan view but smaller than E-1 and E-2, located 4.0 m north of the large enclosure.

Feature F is a large agricultural and residential complex distributed over 3,950 sq m. Included in this complex are two C-shaped habitation structures, numerous garden plots, and terraces (most of which are found inside the confines of a large, amorphously-shaped enclosure). The C-shaped structures are located to the south of this enclosure.

Feature G C-shape is part of the greater site complex discussed above. It is roughly circular in plan view, has an entryway in its southeast wall, and provides a sheltered space of c. 3.8 sq m. Maximum wall height is 1.0 m at the north end of the structure, while minimum wall height is 0.6 m at the south end. The interior wall faces are near vertical whereas the exterior wall slope down and away from the structure forming a skirt around most of the structure. The rocks used in construction were all waterworn basalt cobbles.

Feature H is a C-shape enclosure located on Transect 4 at a point about 100 meters upslope of Feature E. The opening in the "C" is oriented roughly south. Oval in plan view, this structure encloses approximately 5.5 sq m of surface area. The interior wall faces are vertical and the exterior faces slope down and away from the structure.

Feature I-1 is a small C-shaped enclosure located at the lower end of Transect 4. The structure was partially "excavated" into the south face of a natural boulder pile by removing unwanted cobbles and restacking them along the sides and on top of existing stones. The structure encloses only 2.0 sq m of floor space; low south and southeast walls identify the entryway. As with other C-shapes within the project area, interior wall faces are near vertical while the exterior faces slope down and away.

Feature I-2 was originally recorded as a possible C-shaped habitation enclosure. Following vegetation clearing in conjunction with the present project, however, it was determined that the alignment was in reality a small garden

plot, semicircular in plan view. The feature has been reclassified as agricultural in function.

Feature J is a small enclosure, roughly oval in plan view, with the long axis oriented east-west and an opening located in the feature's southeast corner. Maximum wall height is 0.4 m which was achieved by stacking local cobbles and boulders 1-2 courses high. The enclosed space totals 83 sq m.

Feature K, located 7.0 m north of Feature J, appears to represent a specialized structure, perhaps a shrine with religious significance and/or a ceremonial or ritual function. The feature is comprised of a centrally located large flat-faced boulder. In front (east) of the boulder is a rectangular block of basalt against which a prominent upright, phallic-shaped stone had been placed. Behind, or west of the large boulder, was a mound of basalt cobbles and pebbles which encircled the boulder in a "crescent". The feature was cleared, photographed, and mapped, but not subjected to data recovery work.

Site 2025 (T-12)

Feature A at this site represents a U-shaped structure segmented into two halves by a low wall. The feature is believed to have functioned as a small habitation area, and may represent two low-walled C-shapes placed adjacent to one another.

Site 2026 (T-18)

Feature A at this site is comprised of a small rectangular enclosure containing approximately 7.5 sq m of floor space. The maximum wall height of 1.5 m is found along the north side, while a minimum wall height of 0.75 m occurs around the southern perimeter. A portion of the feature has collapsed downslope, suggesting that the enclosing walls were at one time from 0.2 to 0.5 m higher. The walls were vertically faced, and the interior "paved" with small cobbles.

Site 2027 (T-20)

Feature A at this site is comprised of a large enclosure containing approximately 186 sq m of enclosed space. The southwest corner of the feature is consumed by a raised terrace which in turn is bisected by a stone-lined pathway. A much smaller raised terrace is also located within the northwest corner. A small cupboard is located in the central portion of the west perimeter wall. All of the perimeter walls appear at one time to have been vertical and faced on

both sides, although much of the alignment has collapsed and been disturbed by cattle grazing in the immediate area. Numerous historic wine bottles (c. 1850-1900) were recovered on the surface of this enclosure, documenting historic use, but not necessarily initial historic-era construction, of the feature.

TEST AND AREAL EXCAVATIONS AT SEVEN RESIDENTIAL SITE COMPLEXES

General

In addition to detailed recording work, the evaluation of project area sites was to involve excavations at select sites and features which possessed, or appeared to possess, cultural deposits. This work was undertaken during the winter of 1989 and involved twenty individual features at seven of the nine previously recorded sites. All of these sites are located within an upland belt ranging in elevation from 400 to 800 ft above sea level. This section of the report details this excavation work, and includes detailed analyses of the cultural materials and dating samples recovered. As noted, this work was considered integral to achieving the primary goals of the present project, which involved further evaluation of project area sites for the presence of information categories important to an understanding of local and regional prehistory, as well as mitigative-level data recovery of such information categories once identified at select sites and features.

The final selection of individual sites/features for excavation was based on several interrelated considerations. First, an effort was made to identify and concentrate on prehistoric as opposed to historic residential features in order to secure a body of data which could be compared and contrasted with similar data sets from other previously excavated sites on Maui and elsewhere. Secondly, it was deemed important to evaluate at least one example of each of the residential unit types which had been identified within this upland agricultural area. This goal was in fact achieved, and by the conclusion of the excavation program at least one, and in most cases two or more of each residential type had been either wholly, or partially excavated.

Table 9 identifies the sites/features which were finally selected for excavation. Included in this listing of sites is information on the residential feature type involved, the term of occupation, and an estimate of the general time period represented. The last two categories of information represent hypotheses which were based on the specific findings of the detailed survey recording work as well as the excavation of subsurface deposits. These judgements are,

Table 9.

SITES/FEATURES SELECTED FOR EXCAVATION

Site/ Feature	Feature Type	Term of Occupation	Period of Avail. Evidence
2020			
A	Ag terrace	—	—
2024			
I-1	C-shape	Temporary	Prehistoric A
I-2	Garden plot	—	—
2023			
I	Rect. enclosure & paved pltfm.	Permanent	Prehistoric A
I	Terraces	Permanent	—
J	C-shape	Temporary	Prehistoric A
Z	Hearth	—	—
2024			
A	C-shape	Temporary	Prehistoric A
B	Enclosure	Permanent	Prehistoric A
C	Ag. terrace	—	—
D	Rect. enclosure	Permanent	Prehistoric A
E	Large enclosure	Unknown	Historic/Prehis. A
E-1	Rect. enclosure	Unknown	Historic A
E-2	Rect. enclosure	Unknown	Historic A
E-3	Rect. enclosure	Permanent	Prehis./Historic A
G	C-shape	Temporary	Prehistoric A
H	C-shape	Seasonal	Prehistoric A
2025			
A	L-shape	Temporary	Prehistoric A
2026			
A	Rect. enclosure	Permanent	Prehistoric A
2027			
A	Enclosure	Permanent	Prehistoric A

KEY:

E=Structural Features, A=Portable Artifacts, M=Midden Remains,
B=Basaltic Glass Hydration Determination, CD=Radio Carbon Estimate

of course, further documented and discussed in the presentation of material culture remains recovered from, and dating results achieved at, the individual site/features.

Site Specific Presentation of Excavation Results

Site 2020, Feature A - Feature A, located approximately 400 m south of Transect 1 at 525 ft elevation, consists of stone terracing and associated planting plots which collectively encompass c. 1,596 of surface area (Figure 3). The feature area has been "isolated" by two ephemeral stream channels, one of which proceeds around the feature's north side, with the second proceeding to the south. The feature incorporates a flat grassy knoll, generally oval in plan view, with numerous basalt boulders and cobbles from a natural outcrop establishing the perimeter around the west and south sides. The land surrounding this area drops steeply away to the north, northwest, and east, and is "paved" with waterworn basalt cobbles and boulders.

Based on the information collected during initial site recording, Feature A was believed to represent a stone platform that may have supported a wooden residential structure on its flat, grassy surface. This feature was evaluated on February 2, 1989 by placing a single 1.0 by 1.8 m test trench (Figure 3) at the feature. The first excavation layer produced no cultural material, and the decision was made to reduce the excavated area by concentrating on a 0.5 m by 0.5 m area at the trench's north end. Although dense cobbles and boulders were encountered within this area, no cultural materials were recovered. Excavation was finally terminated within solid cobbles and boulders representing natural rather than cultural deposition.

Stratigraphy - Layer 1: This is the organically-stained A Horizon soil, comprised of dark brown silty loam containing organic debris and roots. This layer contained no cultural inclusions and reached a maximum depth of 0.1 m.

Layer 2: This is a silty tan loam containing rootlets and small gravels. This layer averaged 15 cm in depth.

Layer 3: This layer was composed primarily of waterworn basalt cobbles and boulders. The interstices between the large stones were filled with the Layer 2 soil type.

Conclusion - It appears that Feature A represents but one of numerous prehistoric garden areas located within the immediate and general vicinity. Based on extrapolation from other generally similar features for which dating

results were forthcoming, Feature A probably represents prehistoric activities. This conclusion could not, however, be corroborated on the basis of recovered artifactual materials or dating results achieved at this specific locale.

Site 2023, Feature I - This site is located on Transect 6 at approximately 700 ft above sea level. The feature consists of a series of agricultural terraces, garden plots, clearing piles, and a rectangular habitation enclosure associated with a paved platform. Evaluation involved both the rectangular room and associated pavement, as well as some of the associated terraces and clearing piles.

Enclosure at Feature I - Excavation of the enclosure, undertaken between February 9-14, 1989, proceeded by excavating a 1 m-wide trench across the feature from north to south in order to determine the depth and content of any associated cultural deposit (Figure 4). This initial trench was eventually expanded to include the feature's west wall and, when completed, involved nearly all of the west half of the rectangular enclosure. The cultural deposit, which averaged 20 cm in depth, capped a very rough and uneven "floor" which itself was comprised of basalt cobbles and boulders which had extruded into and sometimes completely through the overlying cultural deposit. All recovered material except the surface duff was passed through 1/8" mesh. Concurrently with excavation of the enclosure, the interior of the south half of the paved terrace was being dismantled in order to determine its internal structure. This terrace adjoins the rectangular enclosure along its east face and extends north beyond the room a total of 3.5 m. The most obvious area of pavement was found on this north extension and covered a total of 6.5 sq m.

The rectangular structure is much delapidated from weathering and cattle disturbance. Enough remained, however, to determine that the walls were originally vertical on both faces and that the stones forming the interior and exterior faces had been stacked in rough courses and involved stones of unequal size. The core fill between the faces involved use of generally smaller stones which were piled rather than stacked. Upon completion of vegetation clearing and excavation, it was discovered that the total enclosed space of this structure encompassed approximately 10.25 sq m. The original shape of the room appears to have been oval rather than rectangular, and was without an obvious door or entryway. The highest wall segment, standing at 1.0 m, was along the north side, while the highest point on the south wall was 0.60 m. The east and west walls achieved maximum heights of 0.55 m and 0.45 m, respectively. The abundance of loose rubble around the structure's perimeter suggests

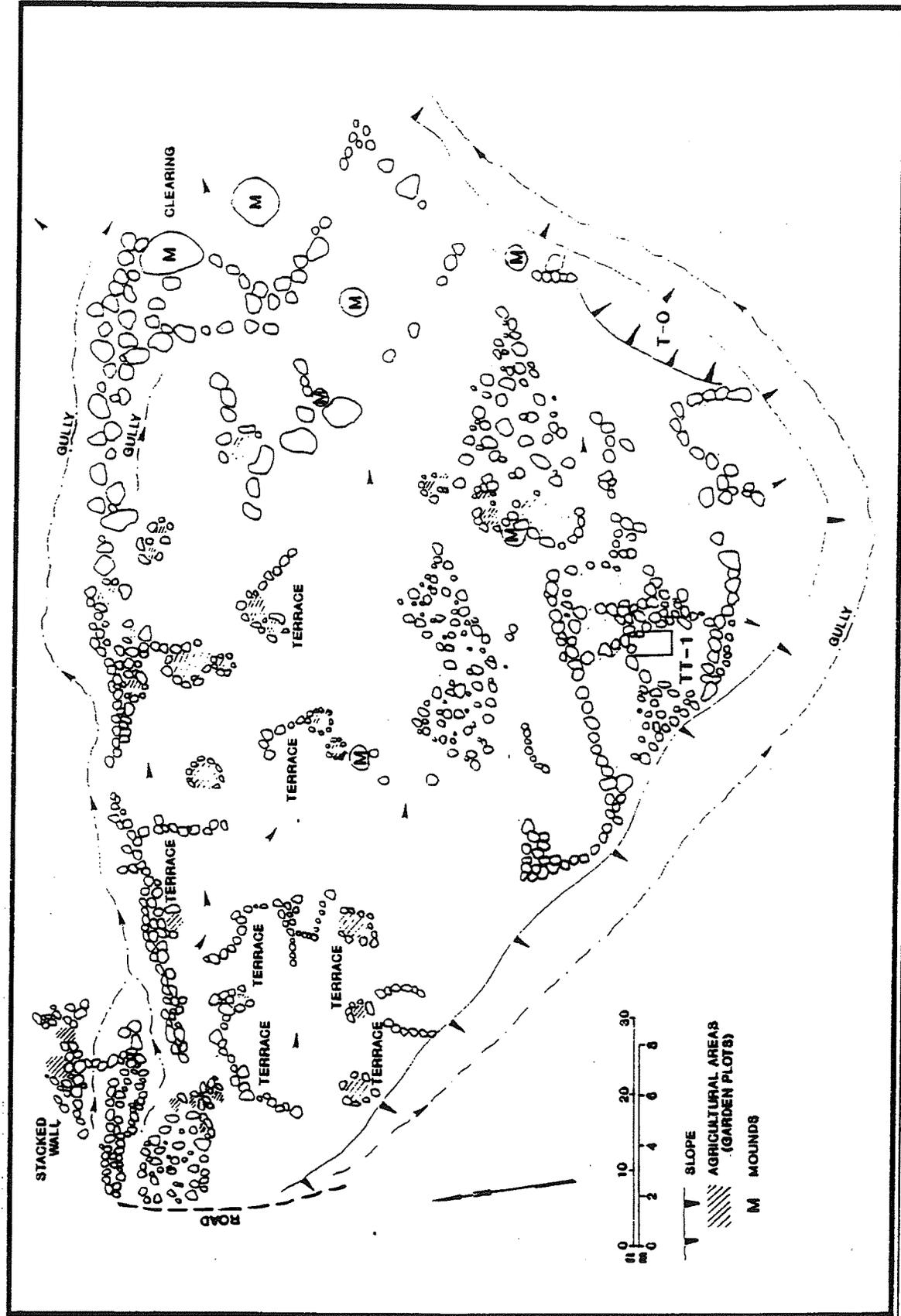


Figure 3. SITE 2020, FEATURE A

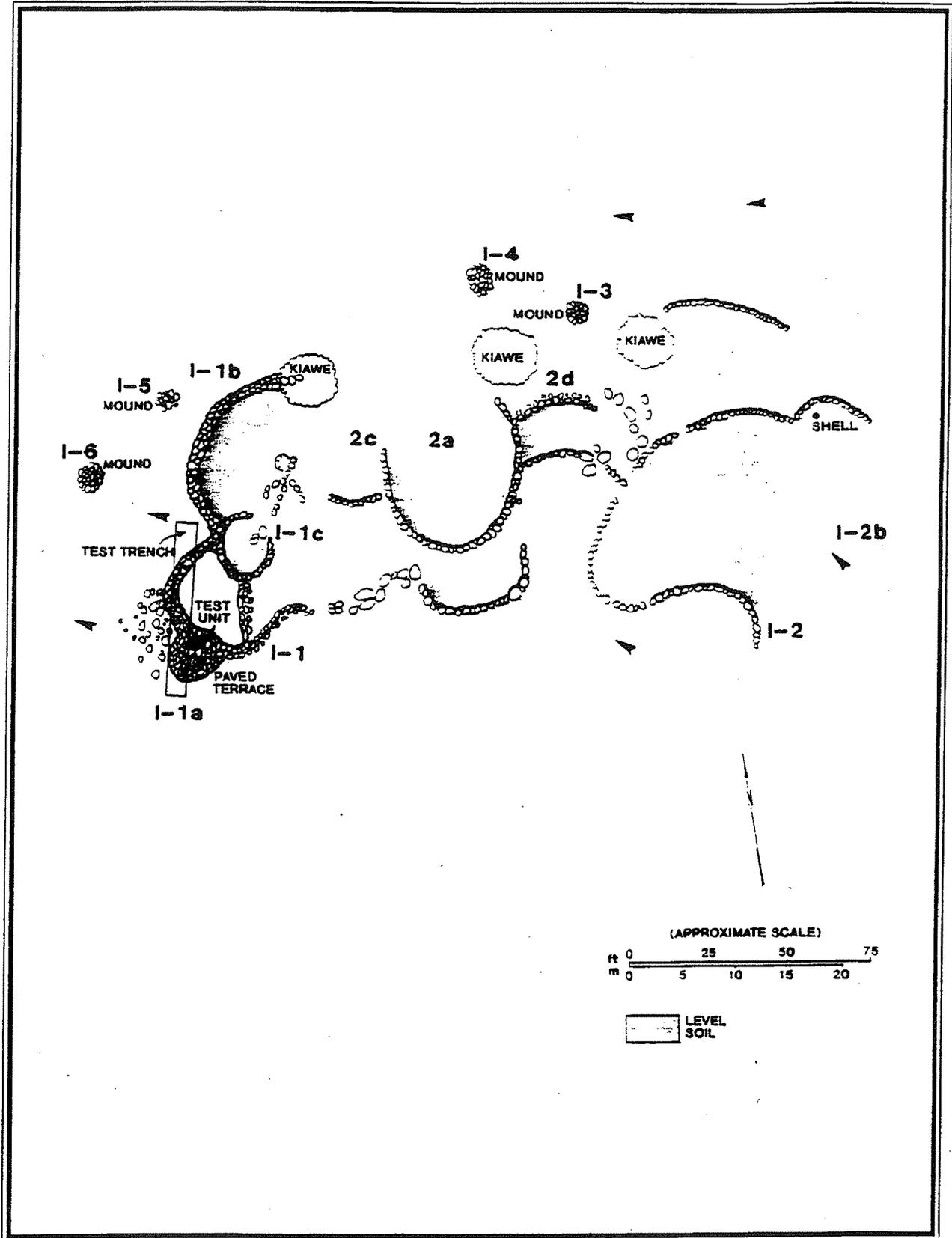


Figure 4. SITE 2023, FEATURE I, ENCLOSURE

that all of the walls may at one time have been considerably (i.e., + 20-40 cm) higher than at the time of recording.

The floor located within the west half of the enclosure was particularly uneven and dipped down in those areas where large stones and boulders had extruded from below. The dark cultural deposit within this area (Layer II) was quite distinct and could be followed visually.

The paved platform associated with the rectangular enclosure was also excavated by locating a single 1.0 m sq test unit within this area. The feature was flat on top, paved with fairly even waterworn basalt pebbles and cobbles, and had been constructed by placing the feature's west side against the hillside. The east and north faces of the platform sloped downhill, with maximum height along these two sides of 0.60 m above current ground surface. The test pit, located within the northern portion of the surface area, revealed an internal structure composed of dirt and rocks, with the latter ranging from gravel- to boulder-sized. The paving stones capping the platform were more uniform in size (avg. 10 cm in diam.) and seem to have been selected more carefully than those deposited as "fill". The soil recovered from the interior of the platform was a dark brown, silty loam containing cultural material including cowrie shell fragments, basalt flakes, charcoal bits, and a fragment of basalt adze. The natural soil underlying the cultural deposit was a tan-colored silty loam containing gravels and cobbles. An east-west architectural profile was drawn at the conclusion of excavation, revealing this structure in cross section and composition (Figure 4).

Stratigraphy of the Enclosure/Platform - The stratigraphy of the paved terrace/platform has already been described. Following is additional detail concerning the soils found within the rectangular enclosure.

Layer I - This was a thin layer, not exceeding 4 cm and averaging about 3 cm in thickness, composed of light brown silty loam lying directly below the duff zone and on top of Layer II. The layer contained cultural inclusions such as charcoal bits, basalt flakes, and a single cowrie shell fragment.

Layer II - Layer II soil is the same as Layer I except that it is darker in color and has more of a clay content. The slight color difference between Layers I and II, combined with the increasing clay content with depth, were interpreted as related to the leaching effect of water. A few small pieces of faunal bone were identified within this layer, although the contents of Layers I and II were otherwise more or less identical in terms of cultural materials recovered. Layer II reached a maximum depth of 0.28 m with a minimum of 0.08 m. As can be seen in Figure 4, the north half of the floor

was consumed by rocks protruding up from the sterile underlayment. No subsurface features were encountered during excavation.

Material Culture Remains - The portable artifacts recovered from the two architectural units of Feature I include only a narrow range of types, including basalt flakes, marine shell fragments, kukui nut fragments, a few fragments of small animal bone, and a radiocarbon sample.

Dating Results - The amount of carbon recovered from this pair of architectural units was very small, apparently contaminated with bomb C-14, as its age was calibrated as "modern." However, occupation of a similar site (Site 2026, Feature A), located north of Transect 7 and Site 2023, was dated to the latter half of the seventeenth century. In consideration of the structural and artifactual similarity between these two structures, it seems reasonable to suggest that Feature I at Site 2023 may also have been in primary use during this same time period.

Discussion - The rectangular enclosure and paved terrace/platform have been interpreted as prehistoric on the basis of similarities in structure and artifact content to other dated features within the project area, combined with the complete absence of any associated historic materials. Unfortunately, analysis of the recovered radiocarbon sample did not yield results helpful in confirming an absolute date for primary use/occupation of the feature. Both of these features appear to represent integral parts of a larger complex containing stone-faced terraces, garden plots, planting circles, and various wall alignments. Based on size and workmanship, the Feature I enclosure and associated platform appear to represent a considerable expenditure of labor which in turn suggests that this component may document permanent habitation within this area. On the other hand, the absence of a doorway into the rectangular enclosure, coupled with the generally rough and uneven nature of the floors within both the enclosure and the platform and the absence of interior floor features (i.e., a fire hearth), are not at first consistent with this interpretation. It is possible, however, that the thick stone walls simply supported a superstructure of organic material which itself has long since deteriorated. In this context, the enclosure formed by the stones would represent a second, lower room or large "cupboard," perhaps for storage of food and various other household items.

Testing of Terraces Associated with Site 2023, Feature I - In addition to the enclosure and associated terrace, Feature I of Site 2023 contains numerous clearing piles, garden plots, and raised farming terraces. A total of seven farming terraces and three clearing piles were cross-sectioned and profiled. The purpose of these excavations

was to gather information on construction methods as well as to attempt to secure additional dating results. Soil samples were also taken from the strata found on both sides of the terraces and the clearing piles and examined for macro-botanical remains.

Excavation of agricultural terraces proceeded by locating seven test trenches at right angles to the stone-faced features; these trenches were then extended across the features so as to expose both uphill and downslope sides. Excavation was performed with hand tools and involved 0.5 m exposures of variable in length. The matrix removed during excavation was not screened since stratigraphic cross-sections and soil sampling were the primary goals of this work. The spatial relationship among the trenches is shown in the map for Transect #6, Figure 2).

Test Trench 1 - This trench, inclusive of the terrace wall, was 5.7 meters in length and reached a maximum depth of 0.58 meters. The present ground surface on the west side of the terrace face was flat, whereas the ground surface on the east side sloped downhill toward the east. From the base of the wall on the downhill side the terrace wall was 0.9 meters high. On the uphill side, or west face, the terrace averaged c. 0.4 meters in height.

Similar stratigraphic layers observed on either side of the wall were assigned the same layer designation. Further, it was assumed that the generally flatter, uphill side of each terrace was the focus of farming activity while that the sloping downhill sides contained generally unmodified, natural soils. This assumption led to the prediction that more layers would be encountered on the uphill sides of the terraces, as these areas would have been subjected to mechanical introduction of soils, rock removal, and tilling. In fact, the expectation was corroborated on the basis of specific observations. Nine layers were identified within the uphill sequence, while only three were identified on the downhill side. Layer I, the duff zone, was common to both sides of the wall, as were Layers 6, 7, and 8. However, Layers 2, 3, 4 and 5 were found only on the uphill side, all of which have been interpreted as lenses representing culturally introduced soils and/or agricultural activities of one kind or another.

The following specific observations were made within Trench 1:

Layer I - This is the duff zone that is almost entirely organic in composition, containing leaves, twigs, dead grass and the root zone immediately below the surface. This zone is common to all of the excavation trenches, and indeed the entire project area.

Layer II - Layer II represents a discontinuous lens of water-deposited sediments found only on the west (uphill side) of the terrace face. The material consists of a fine, light brown silt and differs from Layers IV and VI, below, only in that it contains more rootlets and is slightly lighter in color.

Layer III - This layer is undulating lens of silty loam, grayish-brown in color and containing many pieces of angular gravels ranging from 1 to 4 cm in diameter. Layer III may represent an intentionally deposited gravel-bearing soil introduced to facilitate drainage.

Layer IV - Layer IV is identical to Layer II except that it is continuous across the entire uphill side of the trench and contains fewer rootlets.

Layer V - As with Layer III, this lens of brown silt contains angular gravels and, like Layer III, may not be natural but rather culturally introduced to facilitate drainage or for some other undetermined function.

Layer VI - This lens consists of a fine, homogeneous brown silt. It differs from Layers II and IV only in that it is slightly darker in color. The homogeneity of this soil (as with Layers II and III) may relate to mechanical tilling.

Layer VII - This is a homogenous, brown silty loam containing angular gravel inclusions.

Layer VIII - Layer VIII is characterized by increased clay intermixed with small gravels.

Layer IX - This is a grayish-brown clay layer containing quantities of fine gravel. It differs from Layer VIII primarily in that it contains fewer gravels.

Discussion of Test Trench #1: The terrace wall itself begins at the south wall of the rectangular enclosure at Feature I. From this point the terrace follows the elevation contour in a southwesterly direction for 23 meters. The uphill side of the terrace wall is relatively flat, supporting approximately 50 sq meters of good planting soil with a southeasterly exposure. Along the east (downhill) side of the terrace face are over twenty small boulder slope planting areas, none larger than 4.0 meters across. On average, these latter features are located c. one meter below the uphill side of the terrace wall itself. Test trench 1 was positioned so that the downhill portion of this trench would dissect one of these small planting features.

The terrace wall was constructed of stacked, water-worn basalt cobbles and boulders. Naturally occurring

boulders were incorporated into the wall when encountered in the correct location. The base of this wall originates in Layers 8 and 9. Since both of these layers appear to represent non-cultivated (i.e., non-cultural) soils, the lowest course of stone comprising the terrace wall may have been set into a shallow trench to provide additional wall stability. Layers II, IV and VI consist of homogenous loamy soil, generally separated by Layers III and V which contain coarser loam and a larger number of angular basalt gravels. This overall sequence has in effect created an average of 47 cm of well-drained soil on the uphill side of the terrace wall. On the downhill side of the wall, Layer VI begins directly beneath the forest duff and rests on top of Layer VII. The presence of large natural boulders and cobbles has had the effect of separating the downhill layers of soil into a series of pockets. Since the downhill side of Trench 1 falls within the boundaries of a small planting feature, it was not unexpected that the trench would expose some tillable soil within this area as well, although this soil component was not as well structured as that observed on the uphill side of the terrace wall.

In attempting to interpret the observed sequence, it is also necessary to consider post-abandonment erosional processes. On the uphill side of the terrace wall, fluvial action with moderate down-cutting has in fact altered the otherwise regular, horizontal sequencing of Layers II through VII. It is possible that some of the Layer VI soil found at the base of the wall on the downhill side originated on the uphill side and was transported through the loosely stacked wall by post-abandonment water action.

Conclusion for Test Trench #1: The natural landscape in this area consists primarily of colluvial deposited cobbles and boulders with small patches of tillable soil between. Since the 50 sq meters of soil uphill from the terrace wall is virtually free of stone, both on the surface as well as within the subsurface matrix, it seems reasonable to conclude that this feature represents a cultural construct which involved removal of rocks and moderate to extensive soil preparation. Assuming that Layers III, V, and VII may have been deliberately placed beneath Layers II, IV, and VI for drainage purposes, then it is possible that perhaps as many as three distinct periods of use are represented in the cross section of Test Trench #1. On the downhill side of the wall, by way of contrast, the lower portions of Test Trench #1 suggest only a single episode of use for the small garden plot. Extending this argument to its logical conclusion, it is possible that the other small garden plots found on the downhill side of this and other terraces in the area represent a period of intensification of agricultural activities which occurred during the final phase of prehistoric occupation of this area.

In other words, the uppermost layers of tillable soil (represented by Layers II and III on the uphill side of the terrace wall) may be contemporaneous with the numerous small planting features found on the downhill side of the terrace wall.

Test Trench 2 - Located 17 meters west of Trench #1, Trench #2 dissects the southern perimeter of a low terrace wall which in plan view is roughly circular and which encloses c. 26 sq meters of arable soil. This arable soil has built up behind the terrace wall to a depth of 0.30 m higher than the surrounding ground surface. This terrace wall also defines the western edge of the lower terrace wall through which Trench #1 was excavated. The overall effect of this flat farmed terrace is that of an amphitheater with a southerly exposure.

Test Trench #2, oriented north to south and placed near the southern edge of this circular feature, was established at 0.5 meters in width and 3 meters in length. As with Test Trench #1, Trench #2 was excavated by shovel and trowel, and none of the recovered material was screened. Once the various layers had been identified and defined, a cross section was prepared (available in the permanent records on file at PHRI in Hilo), yielding the following results.

Layer I - This layer represents 3 to 5 cm of forest duff encountered within all excavation units and trenches excavated throughout the project area.

Layer II - Layer II consists of a thin lens of fine, silty, light brown loamy soil, pockets of which were located just beneath the duff zone on both sides of the wall.

Layer III - This layer, found on both sides of the terrace wall, is identified on the basis of its gravelly composition. The gravels (0.005 to 0.05 m diameter) and occasional cobbles (0.06 to 0.15 m diam.) are imbedded in the same soil matrix which defines Layer II.

Layer IV - This layer, also found on both sides of the wall, is the same as Layer II except it is generally thicker and slightly darker in color.

Layer V - Layer V is a coarse-grained loam containing small gravels which differs from Layer III in that it contains less gravel and no cobbles.

Layer VI - This is a brown silty loam containing some small waterworn pebbles generally less than 1.5 centimeters in diameter. This layer is present within the agricultural "enclosure" formed by the terrace wall, but is absent in front—outside—of the wall.

Layer VII - This is a brown silty clay lens found only within the enclosure formed by the terrace wall.

Discussion of Test Trench #2: Test Trench #2 revealed a sequence generally similar to that described above and illustrated for Test Trench #1. That is, the sequence consists of a series of homogenous soil lenses resting on top of layers containing considerably more gravel and occasional cobbles. Layers II and IV represent the fine-grained, homogeneous silty loams each of which is underlain by gravelly loam deposits. Layer VI is also a band of fine loamy soil which rests on sterile, undisturbed native clay soil.

Had the interior face of the terrace wall been found to extend down to the top of Layer VII (sterile clay), the obvious conclusion would be that all of the subsequent layers represent cultural activities. As with Trench #1, three distinct periods or episodes of use/activity appear to be represented. However, the lowest stone on the interior wall face extends only to the bottom of Layer III, which is represented by a 0.25 m thick lens of gravel and cobbles contained within a loamy matrix. If the base of the interior wall represents the greatest depth to which farming activities penetrated, then a single episode of farming is indicated and all layers below the wall face (IV, V, and VI) are non-cultural. The problem with this interpretation, however, is that the lower levels appear themselves to represent different episodes of soil preparation as few to no rocks are present within these layers. The soil profile on the exterior, or downhill side of the terrace wall exhibits the same general layering as that exhibited on the interior, with facing stones extending down to Layer V. One possible explanation for these findings is that the uphill segment of the test trench was underexcavated and that the interior face of the terrace was never actually reached. Whether artificially truncated or not, however, the difficulty of segregating cultural from non-cultural layers within these features is compounded by the absence of diagnostic cultural elements such as portable artifacts, charcoal flecks, fire-fractured rock, and other cultural indicators.

Conclusion for Test Trench #2: The general appearance of the soil layers observed both within and outside the terrace wall, coupled with the possibility that excavation may have been terminated before reaching culturally "sterile" subsoils, Layers II, III, IV, V, and VI may all represent culturally manipulated soils. The overall similarity between these soils and the layered sequence observed within Trench #1 lends support to this hypothesis. If true, then three distinct use episodes are seen on the terrace side of the wall. However, in contrast to Trench #1's downhill garden plot area where only a single episode of use was indicated, up to

two episodes of use are indicated for Trench #2's "exterior" side.

Test Trench #3 - This two meter-long test trench is located 40 meters northwest of Trench #2 within a relatively flat area situated away from the edge of the drainage. The trench was positioned so as to span a low rubble-strewn, curvilinear, 54 meter-long wall alignment which had been observed in this area. Averaging 0.5 meters in width and reaching a maximum depth of 0.5 m below the current ground surface, five stratigraphic layers were defined within Trench #3.

Layer I - This is the layer of decomposing forest litter without evidence of prehistoric use or activities.

Layer II - Layer II is a light brown silty loam containing numerous cobbles ranging from 5 to 15 cm in diameter, most of which are water worn and appear to have derived from the feature wall.

Layer III - This layer consists of silty loam, slightly darker than Layer II and containing a greater number of, and slightly larger, cobbles and small boulders.

Layer IV - This layer differs from Layer III in that the stones are larger and the matrix contains fewer small pebbles.

Layer V - Layer V is similar to Layer IV although it contains a higher clay content.

Discussion of Test Trench #3: The soil sequence observed on both sides of the alignment appears to be the result of natural rather than cultural deposition. None of the layers exhibit the type of homogeneous, rock-free characteristics of soils observed within Trenches #1 and #2 and which are believed to have resulted in part from mechanical tilling and mulching. In the present case, it appears that the natural fluvial process built up rock-laden soil on the uphill side of the wall, and that the flow subsequently went over the top where identical deposition then occurred on the wall's opposite side.

Conclusion for Test Trench #3: The low (c. 0.50 m maximum height) U-shaped wall comprising this sub-feature may represent a minor water diversion device engineered to check downslope erosion and/or slow the force of slope-wash in order to protect the large number of planting features in the area.

Test Trench #4 - Test Trench #4 was established at 1.6 m long by 0.5 m wide and positioned 10 meters northeast

of Trench #2 and 0.15 m northwest of Trench #1 so as to further evaluate the same large agricultural terrace through which Trench #1 had been excavated. Four separate strata were identified.

Layer I - Duff zone comprised of forest litter in various stages of decomposition.

Layer II - This is a thin lens of dark brown, homogenous silty loam. A charcoal-stained pocket was found in this layer at its interface with Layer III.

Layer III - This is a dark, grayish-brown silty loam layer interspersed with angular gravels.

Layer IV - This layer is a light to medium brown silty loam which is 80% gravel by volume.

Discussion of Test Trench #4: While Layer I is non-cultural in derivation and Layer IV appears to represent an undisturbed sterile gravel lens, Layers II and III do appear to be cultural. The charcoal-stained pocket which originated in the lower portions of Layer II may represent a single event that took place while this planting plot was in use, while Layer III may represent the gravel-laden component placed at the time of initial construction so as to enhance drainage.

Conclusion for Test Trench #4: This small garden plot contains only about 2.0 sq meters of soil. Nevertheless, it was established at the intersection of two much larger terraces and is sheltered by the walls of these terraces which reach maximum heights of 0.6 to 0.7 meters. This arrangement would have provided shelter for young plants and afforded them a southern exposure. The soil layering observed within Trench #4 duplicates in an abbreviated sequence the type of sequence more clearly identified within Trench #1—namely, tillable loam placed over a loamy layer containing gravel for drainage.

Test Trench #5 - This trench was extended 1.4 meters in length by 0.5 meters in width, and is located at the east end of a kidney-shaped garden plot containing roughly 15 sq meters of tillable soil. This garden plot is located adjacent to the west side of the terrace in which Trench #2 was placed, and in cross-section revealed four identifiable layers.

Layer I - This is the thin layer of decomposing forest duff.

Layer II - This layer is a homogeneous, loosely compacted light brown silty loam.

Layer III - This layer is much like Layer II except that it has a high density of basalt pebbles and cobbles.

Layer IV - This is a light to medium brown loamy clay containing large quantities of basalt pebbles and cobbles.

Discussion of Test Trench #5: The sequence within Trench #5 essentially duplicates that observed in Trench #4 (see discussion above).

Conclusion for Test Trench #5: Trench #5 appears to have documented the fact that this kidney-shaped area does in fact represent a small elongated garden plot. A rock wall to the south raises the garden area by about 0.7 meters above the surrounding ground surface, while a second wall forms a portion of the northern perimeter of this area and is comprised of a tiered arrangement built against the slope of a low hill. The low terrace wall on the south and the higher wall around the north would have provided necessary shelter and perhaps erosion control within a manageable space, while the two layers of intentionally deposited fill (Layers II and III in the sequence) would have provided the final ingredient for optimizing agricultural productivity—a fertile, well drained soil.

Test Trench #6 - A small drainage enters the project area from the north near the upper end of Transect 6. Numerous simple terraces had been constructed across this drainage, and these terraces were in turn linked with one another by an encircling wall of coursed stone. The overall plan view of this complex is that of a large pear with chevrons across the interior. Test Trench #6 was situated on the uphill side of the last (downhill) terrace in the group, and was excavated to 0.5 meters in width by 3.0 meters in length. Five stratigraphic layers were identified within this trench, which is illustrated in Figure 5.

Layer I - This is the layer of decomposing organic matter commonly referred to as the duff zone.

Layer II - This is a layer of slightly compacted, homogenous, silty loam of medium-brown color.

Layer III - Layer III is generally similar to Layer II, but is darker in color and contains a higher percentage of clay and a higher density of basalt pebbles and cobbles (up to c. 20% by volume).

Layer IV - Layer IV is a silty clay, medium-brown in color, containing up to about 25% gravel.

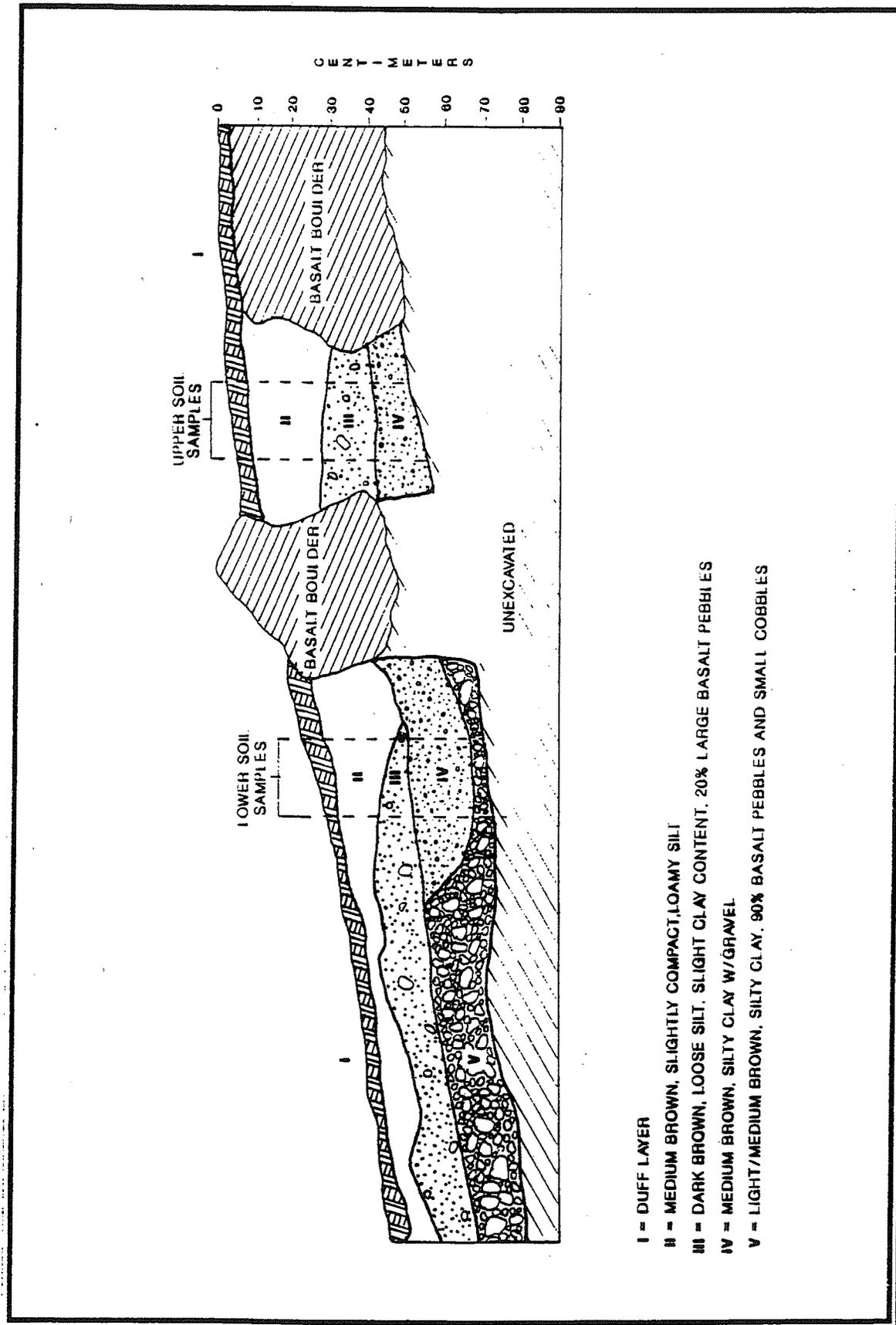


Figure 5. TEST TRENCH 6

Layer V - This is a light to medium brown silty clay with 90% of its volume represented by basalt pebbles and cobbles.

Discussion of Test Trench #6: Layers I (duff zone), IV and V in this sequence appear to be non-culturally deposits. However, the loose, homogenous loam of Layer II and the gravel-laden loam directly beneath it (Layer III) have been interpreted as cultural features representing past agricultural activities in this area. Also preserved in Test Trench #6, as indicated within Figure 5, is an example of fluvial action in which a hole was eroded on the downslope side of a large obstruction (in this case, a boulder), and subsequently filled in through siltation processes.

Conclusion for Test Trench #6: Test Trench #6 was excavated at the lower end of a series of agricultural terraces which had been constructed across a shallow drainage. These gully bottom terraces were designed to establish level planting areas and to pond or spread any available flowing water over a wider area. As a form of dryland irrigation, these terraces also acted as soil erosion control devices.

Test Trench #7 - This test trench proceeds east-west across a wall separating two small side-hill terraces. These terraces are found at the upper end of Transect 6 and are identified on the map for Transect 6— see Figure 5. Test Trench #7 was excavated to 0.5 m in width and a total of 3.0 meters in length. Six stratigraphic layers were identified, as illustrated in Figure 6 and described below.

Layer I - This is the duff zone composed of decomposing forest litter.

Layer II - This is a brown, silty homogeneous loam with no inclusions other than roots.

Layer III - This is a layer of silty loam containing small quantities rock ranging in size from 0.05 cm to over 0.10 cm, many of which, particularly on the downhill side, are coated with water-deposited clays.

Layer IV - This is a small pocket of gravel deposited at the foot of the terrace wall on the downhill side of the terrace.

Layer V - This is a lens of brown silty loam with a slight admixture of clay located on the downhill side of the terrace, and appears equivalent to Layer II located on the terrace's uphill side.

Layer VI - This is a loose brown grainy silty lens with a few pebbles and no clay.

Discussion of Test Trench #7: Layers II and III are present in both the uphill and downhill sides of the terrace wall. The homogeneous nature of Layer II, underlain by the gravelly loam of Layer III, duplicates the findings within other areas indicative of past cultural activity—prehistoric agriculture.

A layer of solid bedrock underlies Layer III on the terrace wall's uphill side, effectively preventing cultural manipulation of the soil in that area. However, on the downhill side of the terrace wall, Layers V and VI also appear to represent cultural phenomena—agricultural features. Layer 6 on the downhill side of the terrace wall also sits on the same bedrock base as does Layer III on the uphill side.

Conclusion for Test Trench #7: Two distinct agricultural terraces are separated by a wall through which Test Trench #7 was excavated. The elevational difference between the planting surfaces on the uphill and downhill sides averages about 0.2 m. The trench revealed two distinct bands of mulched soil in the lower terrace and only one such band in the upper terrace. The difference between the two sides of the terrace wall is clearly accounted for by fact that the underlying bedrock was closer to the surface in the upper terrace than in the lower terrace area.

Clearing Piles at Site 2023, Feature I - In addition to an enclosure with associated terrace and agricultural terraces, Feature I of Site 2023 also contained numerous stone mounds of irregularly piled pebbles, cobbles and boulders. In all cases, these piles were found to be associated with what were described as "planting circles," consisting of nothing more than small (avg. of 2.0 m in diameter) clearings in otherwise stony ground. It had been hypothesized that during the course of clearing a space within which to establish these small planting circles, unwanted stone would be tossed into a conveniently located pile. The larger cobbles, it was believed, might likely have been the first stones to be removed and hence would tend to cluster toward the bottom of the clearing piles. Smaller cobbles and pebbles would have been encountered later, when the soil was being mulched or otherwise worked, and would thus end up closer to the top of the clearing pile. In "natural" rock piles, on the other hand—that is, rock piles not associated with such planting circles— it had been observed that the larger rocks were found near the top, while the smaller examples occurred near the bottom of the pile where they have fallen naturally between the gaps in the larger stones.

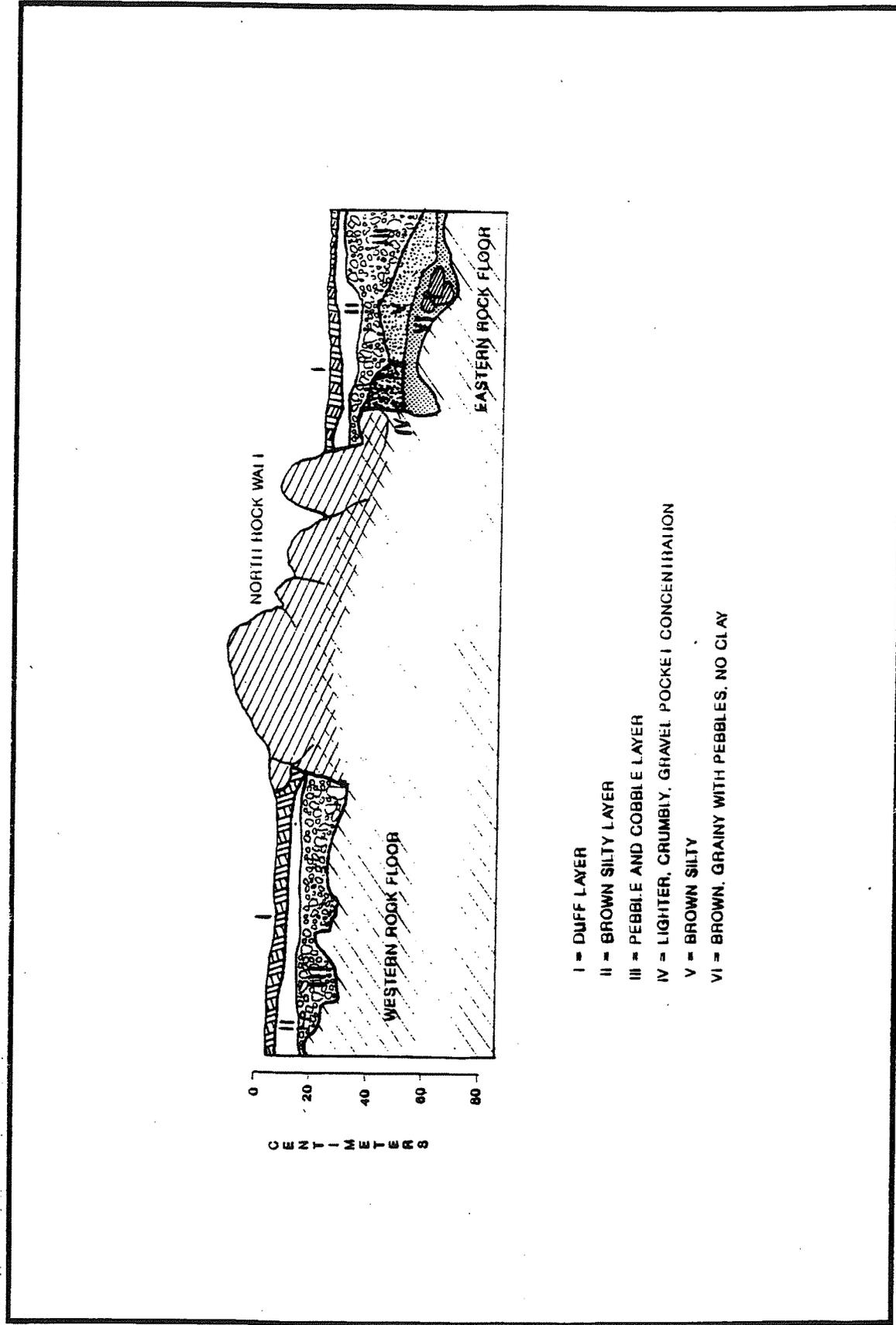


Figure 6. TEST TRENCH 7

In order to document these observations and interpretations, the decision was made to undertake detailed mapping and cross-sectioning of three randomly selected examples. The specific findings of this work, illustrated in Figure 7, in which sectional views of the structure and composition of two of the three examples are provided, tended to confirm the original hypotheses.

Overall Conclusion for Site 2023, Feature I- Feature I at Site 2023 is rather amorphous in plan view, encompassing approximately 25 hectares of land, and is believed to have been utilized primarily for occupation in conjunction with dryland farming. The current site boundary is recognized as wholly arbitrary—that is, features incorporated within the bounds of Feature I may not include all of the features, or alternatively may incorporate more features than, originally claimed or recognized by the particular occupants of this locale. Nevertheless, the site boundary does include nearly the entire range of feature *types* known to exist within the general vicinity, and to this extent the work which has been undertaken here has adequately identified the range of activities engaged in by the prehistoric occupants of the region.

Feature I's rectangular enclosure and adjoining paved terrace represent a moderate to large expenditure of labor, and on this basis alone (e.g., without reference to the extensive agricultural constructs within the immediate vicinity) suggest long-term seasonal, if not permanent, occupation of the area. Moreover, there are no obvious constraints to such a tenure of occupation, such as insufficient water supplies. Artifacts recovered from the rectangular enclosure and terrace include a fairly narrow range of domestic implement types, as well as evidence of contact or trade with coastal groups, or periodic (perhaps seasonal) trips to the coast designed to supplement food resources and undoubtedly to engage in a variety of socio-cultural activities.

Among the agricultural features identified at Feature I, walled terraces were consistently observed in association with a dark loamy homogeneous soil underlain by a loamy soil containing gravel. This co-occurrence represents an artifact of prehistoric agricultural activity which appears to have involved the purposeful laying of a lens of gravel-bearing loam beneath a high quality planting loam, the objective of which was presumably to ensure a well-drained micro-ecosystem conducive to cultivation of dryland crops such as the sweet potato and yam. In this context, the terrace walls would have provided necessary erosion control and soil retention. There is some evidence, as documented within Test Trench #'s 1 and 7, that there were multiple episodes of use of some of Feature I's agricultural features.

This evidence consists of encountering two layers of the loam-gravel-loam sequence at some of the features, and only a single such sequence at others. Unfortunately, the hypothesis could not be further evaluated on the basis of absolute dates recovered from any of the agricultural features which were excavated.

Lastly, some equivocal evidence was recovered in support of the hypothesis, advanced by others (e.g., Kirch 1985), that agricultural intensification occurred during the later prehistoric time periods. The upper end of Test Trench #1 revealed three layered strata, each of which appeared to document a separate episode of agricultural activity. However, the lower portion of this same test trench extended into an area of small planting circles; within these areas, only a single agricultural strata was observed. Further, this single strata within the planting circles was considered coeval with the upper-most agricultural strata observed within the terraced agricultural area containing multiple strata. The hypothesis has been advanced that the small planting circles were added to the total agricultural complex toward the end of prehistoric occupation in the area, thus tending to corroborate previous researchers' findings that the period between about A.D. 1400-1600 may have been one of agricultural intensification.

Site 2023, Feature J - Feature J at Site 2023 is a C-shaped structure located within the area between Transects 6 and 7, at an elevation of 725'. The feature had been constructed on a gentle slope between two ephemeral drainages, and during the present project was excavated in its entirety since it was located within an area which was to be extensively disturbed by construction activities.

Excavation was preceded by clearing the structure of all vegetation and preparation of an accurate profile (Figure 8). Subsequently, a 0.5 m wide test trench was excavated through the approximate center of the feature, with all recovered material passed through 1/8-inch mesh.

Vegetation clearing revealed that the feature had been constructed by stacking and piling local basalt cobbles and pebbles. This original curvilinear wall had been located so as to encompass a natural, flat-topped bedrock boulder that provided a natural bench at the north end of the enclosure. The highest portion, located immediately above this bench, was 1.1 meters in height, with the remainder of the wall averaging only about 0.4 m high. Walls are generally vertical and roughly faced on both the interior and exterior surfaces. The feature is "horse-shoe" shaped in plan view, and encompasses approximately 6.5 meters of floor area.

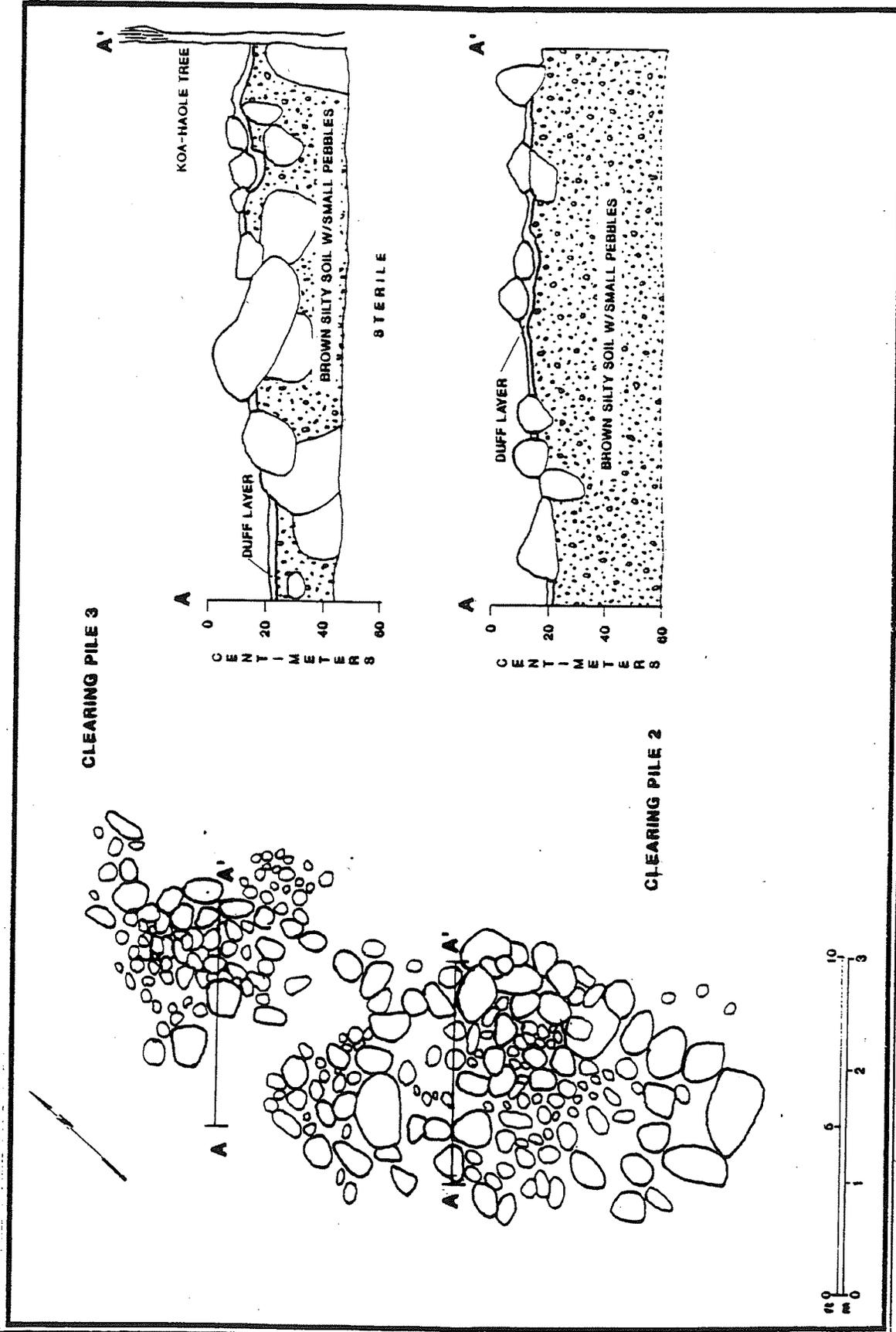


Figure 7. SITE 2023, FEATURE 1

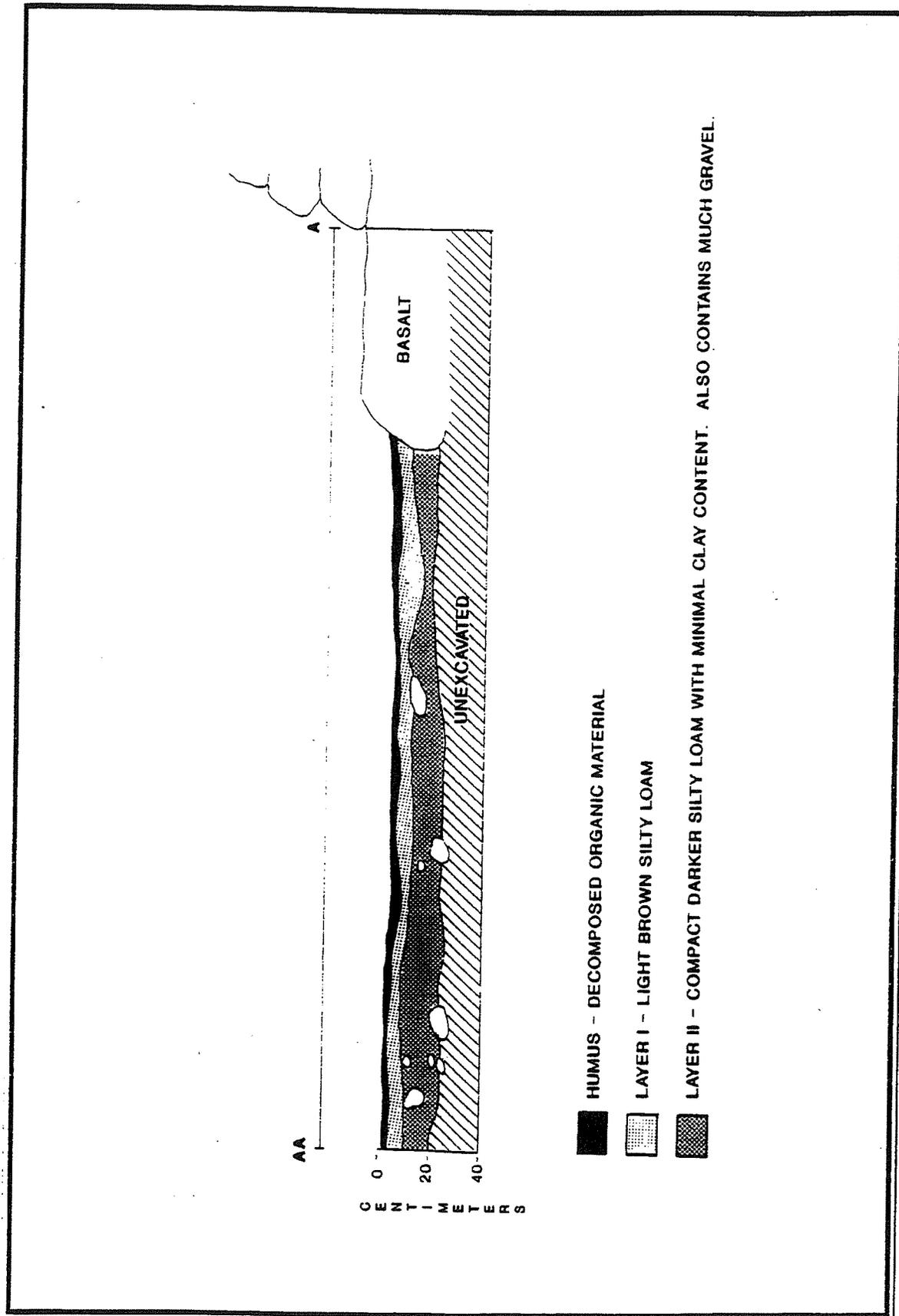


Figure 8. SITE 2023, FEATURE J, PROFILE

Excavation to bedrock documented the following stratigraphic sequence within the enclosed space.

Layer 1 - This is the organically rich soil horizon commonly referred to as the duff zone, and at Feature J averaged 4 cm thick and contained a few fragments of historic-era bottle glass.

Layer 2 - This layer represents the cultural layer comprised of a light brown silty loam ranging from 0.04 to 0.12 cm thick and which contained most of the cultural objects. This layer rests on culturally sterile soil which is slightly darker in color and contains slightly more clay than Layer 2.

No subsurface cultural features were encountered during excavation, which resulted in removal of all cultural deposits. Recovered cultural material included a pocket knife fragment, historic to contemporary bottle glass fragments, and non-diagnostic faunal bone fragments. No charcoal samples suitable for radiocarbon dating were recovered from the deposit, so that no absolute date is available. The numerous pieces of glass recovered appear to have come from two wine or champagne bottles with kick up bases. One of the bottles exhibited a hollow rod pontil mark which, in combination with glass color and base marks, suggest deposition some time between about AD 1800-1850. In view of the absence of prehistoric artifact types from the cultural deposit, it seems reasonable to conclude that the feature dates to early historic time periods and thus documents activities (of an unknown nature) within this specific locale during that time period. A single, transient episode of use/occupation is clearly a possibility.

Site 2023, Feature Z - Feature Z at Site 2023 consists of an isolated rectangular slab-lined hearth located a few meters south of the south edge of Transect 6. A total of five waterworn basalt slabs defined the feature's rectangular shape, all of which were visible on the surface. Adjacent to the east edge of the hearth was a small pile of cobbles.

Excavation of the hearth involved first clearing all grass and other surface vegetation, preparation of an accurate plan map as well as a stratigraphic cross section once excavation had been complete.

The hearth was rectangular in plan view as well as in profile. Each side was defined by a single basalt slab set vertically on edge. The cobble "pile" was amorphous in plan view and generally one-two stones deep. No artifacts or carbon were present within the feature, and neither the specific function of the hearth within this isolated setting,

nor the role of the associated pile of cobbles, could be ascertained. The overall configuration—involving construction by placing large slabs on edge—suggests late prehistoric- or early historic-era use/occupation.

Site 2024, Feature A - Feature A is a C-shaped stone-walled structure located at c. 515 above sea level on Transect 3 approximately 80 meters downslope from the southwestern corner of that transect. Numerous small planting features are located in the area immediately surrounding this structure, some of which in fact butt up against the feature's exterior wall. Feature A had been cleared of grass during transect clearing. Excavation work was preceded by detailed plan mapping and preparation of an architectural profile, followed by removal of surface duff and litter.

Upon completion of vegetation removal and surface clearing, the feature was observed to consist of a single curved wall, oval in plain view with a narrow (0.50 m wide) entryway in the southeast corner (Figure 9). Overall the structure occupied a space measuring 6.0 meters in length by 4.0 meters in width, with an interior floor space of approximately 7.0 sq meters. The curved wall was highest at the rear where it reached a maximum of 0.7 m above current ground surface, and sloped down at the two ends to c. 0.4 m in height. The wall was poorly constructed of basalt cobbles ranging from 0.15 to 0.60 m in diameter which were piled from three to six courses high and wide. Interior facing stones appear at one time to have been stacked in a more vertical aspect than was evident at the time of recording. The feature had been constructed against a natural rise with portions of the walls blended into the surrounding rocks, making it difficult to determine where the wall base actually terminated.

Excavation involved establishing a 0.5 m-wide trench through the approximate center of the feature. A second trench was subsequently excavated so as to intersect the first and recover most of the remaining cultural material which had accumulated within the feature. Excluding the duff zone, two stratigraphic layers were observed, as follows.

Layer I - The uppermost of the two layers consisted of a fairly soft dark brown loamy clay containing all of the cultural material recovered from the feature. Mixed into this matrix were rootlets, small pebbles, charcoal fragments, fragments of fire-cracked rock and non-human bone fragments.

Layer II - Layer II consisted of a compact strata of light brown clay containing numerous large cobbles imbedded in the clay and extruding into Layer I. This has been interpreted as non-culturally deposited soil.

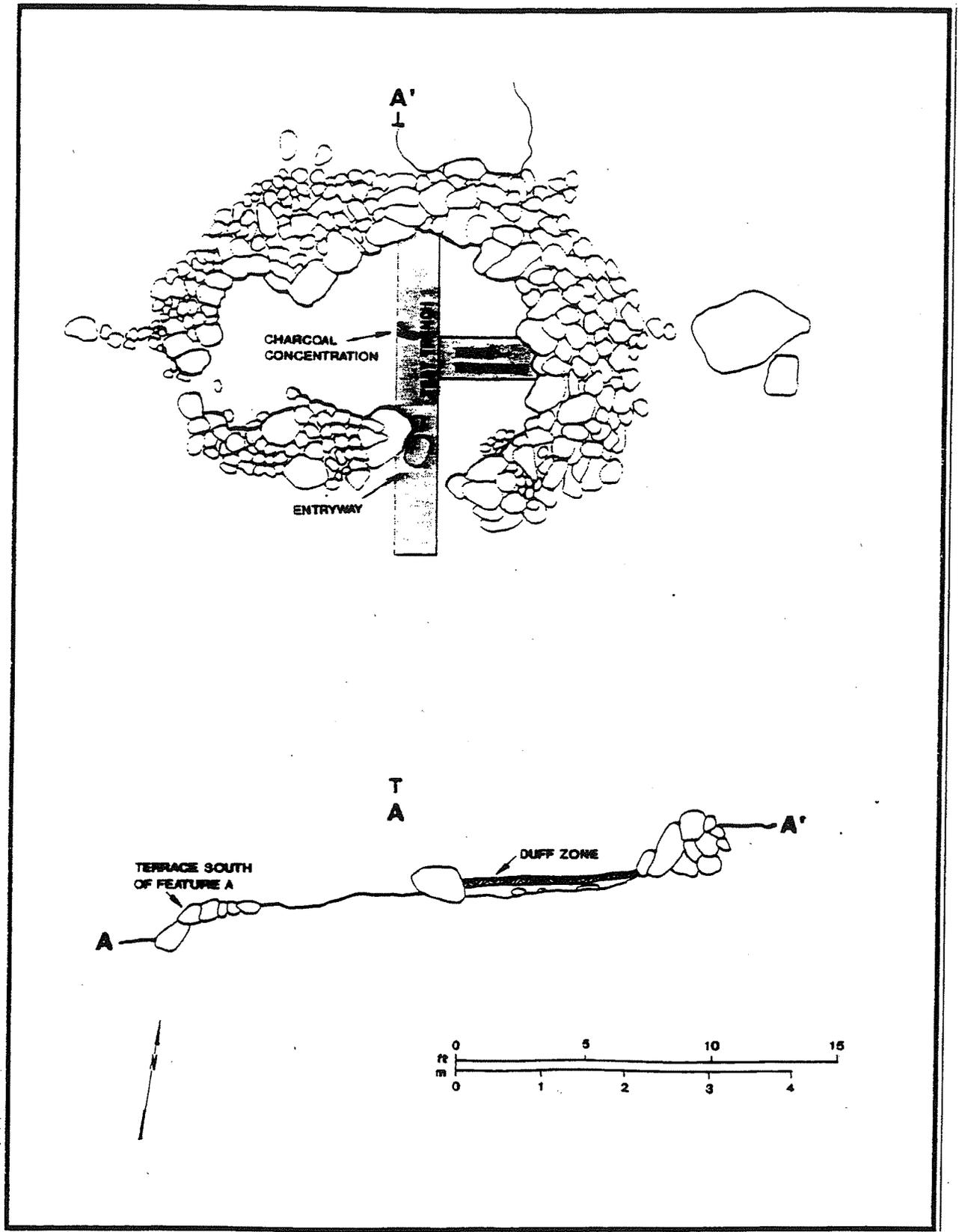


Figure 9. SITE 2024, FEATURE A

A concentration of charcoal was encountered near the west-center of the feature's interior; this material, in combination with fire-cracked rock, indicated the presence of a fire hearth to the west, in the unexcavated portion of the room.

A few portable artifacts consisting entirely of small unmodified/unworked flakes of basalt were recovered from Layer I. No formed tools, or implements manufactured from imported marine raw material, were recovered.

Three absolute date ranges were derived from carbon samples recovered during excavation, yielding the following results: AD 1944-1954, AD 1420-1670, and AD 1752-1796.

Since no historic-era artifacts were recovered, the date range of AD 1944-1954 has been dismissed as least likely to accurately date the deposit. This leaves two possible prehistoric ranges. Architectural similarities between this C-shape and others in the project area which have been dated to the late 17th century and the first half of the 18th century suggest that similar dating of the present feature is likely.

The few basalt flakes, the very small quantity of accumulated midden (consisting entirely of unidentifiable small faunal bone fragments), the small size and poor construction quality of the feature itself, and the proximity of numerous small garden plots all conspire to suggest short-term use/occupation by a person or persons tending gardens in the immediate area.

Site 2024 - Feature B - Feature B consists of an oval-shaped stone-walled enclosure (enclosing c. 49 sq m of surface area) containing a small terrace situated at the enclosure's west end (Figure 10). The feature is located at the uppermost limits of Transect 3 at an elevation of 520 ft above sea level, near the south bank of a perennial drainage. First observed during the inventory survey work, this feature was selected for additional evaluation work as no similar examples had been observed within the project area and it was therefore considered important to attempt to assign the feature type to a chronological period(s) and/or more accurately determine its function.

The interior and exterior stone walls which outline the feature are stacked, roughly-coursed cobbles. Naturally occurring boulders were incorporated into the wall at several locations around the perimeter. Many of the wall stones appear to have been recovered from the feature's interior as this area is nearly empty of large and medium-sized cobbles. The terrace area, located within the western 1/3 of the

enclosure, averages approximately 1.0 meter higher than the ground surface within the enclosure itself, and was created by piling small cobbles and pebbles until the elevated flat surface had been produced.

Prior to excavation, the feature was cleared of grass and brush and a detailed mapped prepared. Two 1.0 meter-square excavation units were placed within the feature, one within the terrace area (west end), and the other within the enclosure itself (north end). All recovered material except surface duff was passed through a 1/8-in mesh screen. Stratigraphic profiles were prepared for one face of each of the two excavation units (see Figure 10).

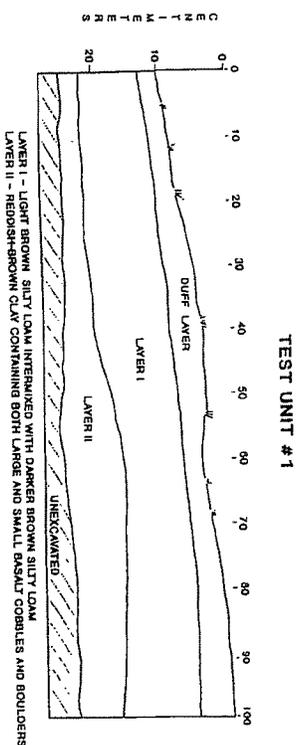
Test Unit #1: The two to three centimeters of organic forest duff was removed, exposing Layer I which consisted of a light to dark brown silty loam containing numerous small rocks and a few small cobbles. The darkest Layer I soil was observed at the southern end of this test unit and contained numerous bits and pieces of charcoal. In addition to charcoal, two cowrie shell fragments and several pieces of kukui nut shell were recovered from the screened matrix. As well, a poorly defined hearth-like feature was also exposed within this area.

Layer II immediately underlies Layer I and consists of a culturally sterile reddish-brown clay containing both large and small basalt cobbles and boulders.

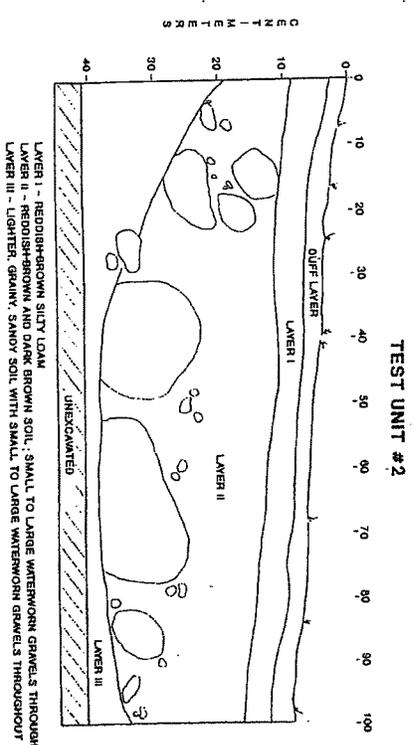
Test Unit #2: Three separate layers were identified within this unit below the duff zone. Layer I, encountered immediately below the duff, consisted of reddish-brown silty loam, ranging from 3 to 5 cm thick. This layer appears to represent post-abandonment alluvial deposits as the matrix was culturally sterile. Layer II represents a mottled deposit, from 10 to 20 cm thick, composed of reddish-brown silty clay. Intermixed throughout this layer were small to large waterworn basalt gravels, small quantities of charcoal (flecks only), and kukui nut shell fragments. All of this material derived from the initial 5 cm of Layer II; no cultural items were recovered below 5 cm depth within this layer.

Layer III is culturally sterile and consists of light brown sandy clay containing pebbles and small cobbles.

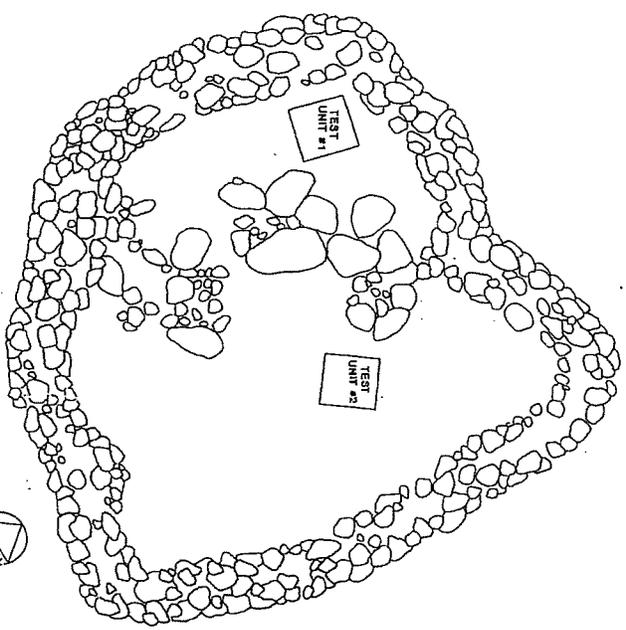
Based on the soil profiles as well as the very small quantity of cultural material recovered, Layer I from Test Unit #1 and Layer II from Test Unit #2 appear more or less equivalent and represent a single episode of occupation within this feature—all of the portable cultural materials and the single possible hearth feature were recovered from or identified within these layers.



NORTH FACE



NORTH FACE



One of the two charcoal-based C-14 dates obtained from a bulk dating sample recovered from Test Unit #1 indicated an age of AD 1907-1955. A second sample returned an age range of AD 1480-1890. Since no historic-era artifacts were recovered, the latter end of this second age range (and the wholly modern date obtained from the first sample) can be dismissed, leaving the estimated range for occupation at sometime between about AD 1480-1789. This still leaves a 300-year period during which use/occupation is most likely to have occurred. Nevertheless, the results conform with general expectations and provide useful information in the overall analysis of dating results obtained from this area.

Site 2024, Feature D - Feature D at Site 2024 consists of a rectangular enclosure with 16.9 sq m of floor space (Figure 11). This stone-walled feature was constructed against the toe of a large rubble pile composed of colluvial deposited basalt cobbles and boulders. The feature is located 50 meters north of the west end of Transect 3 at an elevation of 545 feet above sea level, along the crest of a narrow ridge that separates two deep drainages which flow roughly east to west.

Evaluation of the feature involved extensive vegetation clearing, detailed mapping, and duff removal. This was followed by dissecting the enclosure into approximate north and south halves, followed by complete excavation of the north half of the feature (Figure 12). Excavation involved removal of deposits in natural layers, all of which was passed through 1/8-in mesh.

Once cleared and upon completion of excavation, the feature was discovered to be more circular than rectangular in plan view. Initial construction appears to have involved removal of stones from the toe of a natural boulder outcrop and stacking some of these on top of the natural boulders around a portion of the periphery of what would become the enclosure. The north and south walls in particular were constructed in this manner, although the east ends of both the north and south walls were more free-standing and constructed by stacking cobbles so as to create two vertical faces. Wall height ranges from 0.45 to 1.10 m. The sequence of soil types observed within the excavation's sidewalls suggests that the east wall may have been rebuilt, or represents a later addition to the structure. This hypothesis is based on the fact that this wall was found to cover a portion of the cultural fill which was concentrated within the center of the enclosure. Excavation also exposed multiple floor features, one of which was discovered to be associated with a human burial.

Two cultural and one non-cultural layers were defined within Feature D, as follows:

Layer I - This is the non-cultural layer of decomposing vegetal matter which litters the surface of the entire project area.

Layer II - Layer two was composed of brown silty clay loam, 12 to 17 centimeters thick, which was found to extend across the entire structure. This matrix contained inclusions of charcoal and small marine shell fragments.

Layer III - Layer III was found only in the eastern 1/2 of the excavated area. This layer differed from Layer II only in the type and amount of cultural material present. Layer III, in contrast to Layer II, contained a large quantity of charcoal, a wider variety and higher density of marine shell fragments, and occasional unidentifiable fragments of faunal bone.

A total of five pit features were identified within the feature, and labeled D-1 through -5 for map reference. One of these (D-2) was eliminated once it had been determined that this particular example was the product of root intrusion. Two of the features—a fire hearth and a stone-filled pit—were associated with an upper occupation floor capping Layer III. The remaining two pits were associated with the lower living surface underlying Layer III (Figure 12).

D-1: This was a large basin-shaped pit identified within Living Floor 2 (LF-2) and containing a dark brown to black silty loam. The feature is generally circular in plan view but exhibited maximum measurements of 1.07 m in length by 0.74 m in width.

D-2: Voided.

D-3: This circular pit, also associated with LF-2, is basin-shaped in profile and extended 0.55 m by 0.36 m. The southernmost portion of this pit extended into the unexcavated portion of Feature D, so that the pit's maximum width is unknown. The pit contained a dark loamy soil interspersed with charcoal flecks and small chunks.

D-4: D-4 is a stone-lined hearth which, in plan view, is slightly oval measuring 0.50 m by 0.47 m with a maximum depth of 0.29 m below the immediately surrounding surface. The hearth contained a dark brown to black silty loam with a lens of compact ash at the bottom. Adjacent to the hearth was another basin-shaped pit measuring 0.45 m by 0.38 m by 0.25 m deep. This pit was filled with smoke-blackened

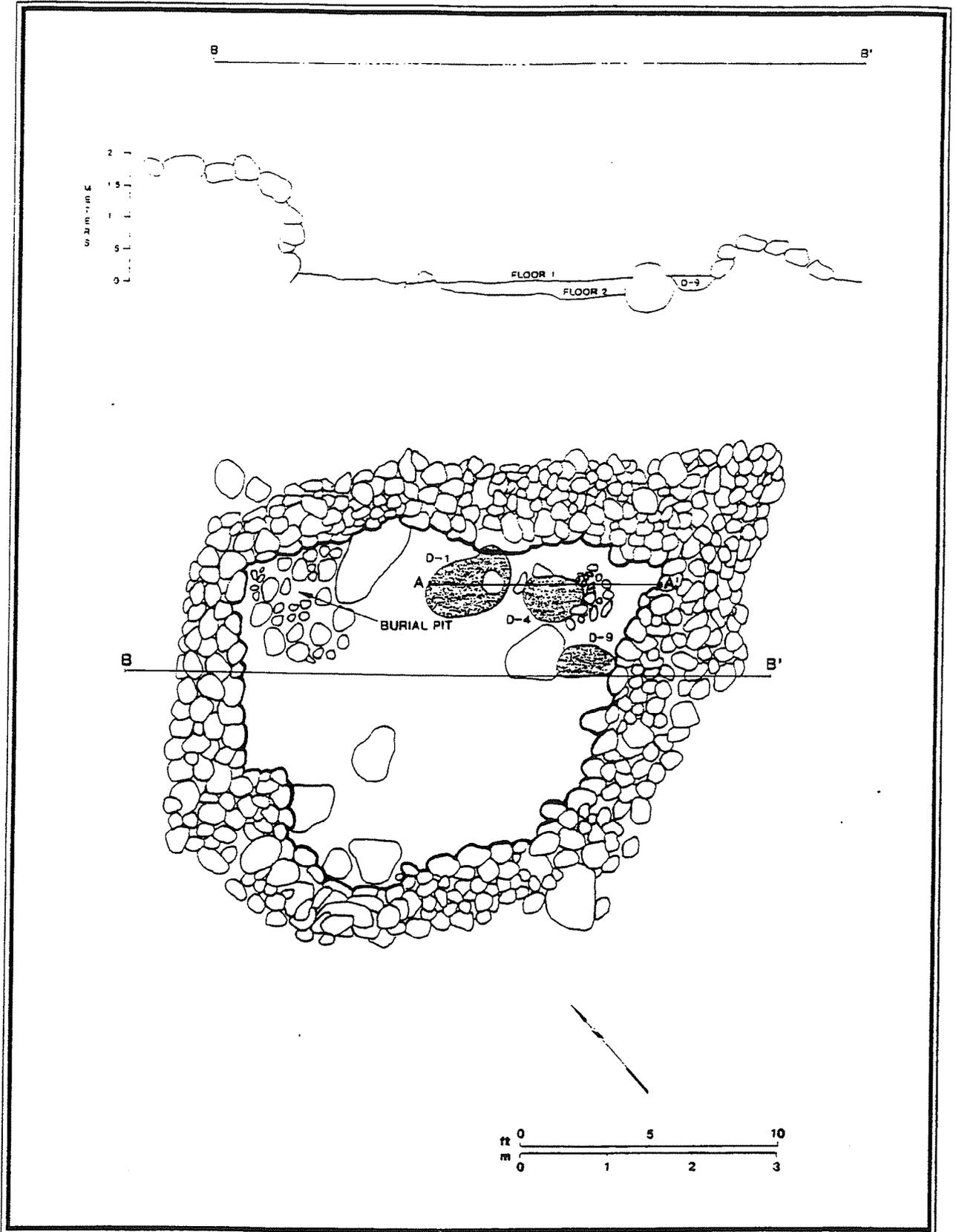


Figure 11. SITE 2024, FEATURE D

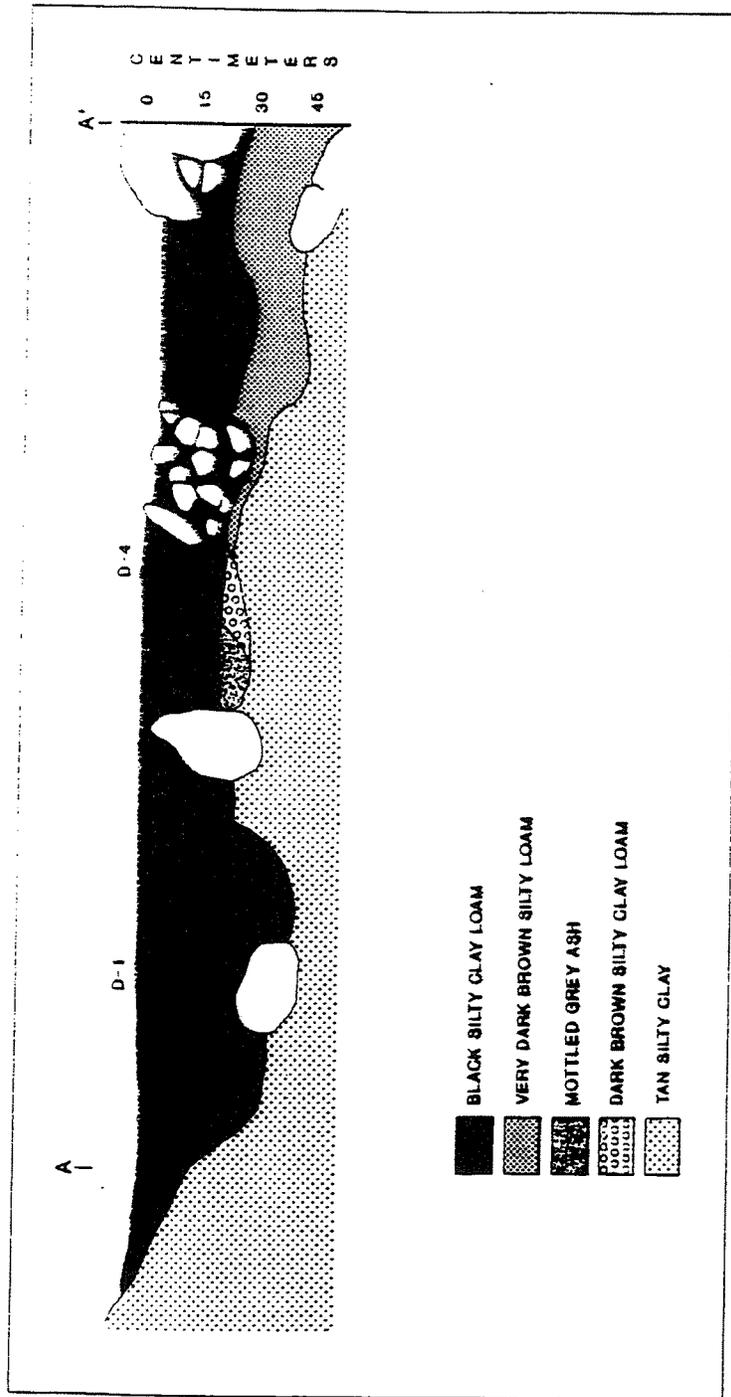


Figure 12. SITE 2024, FEATURE D, PROFILE

basalt cobbles, a dark loamy soil, and bits and flecks of charcoal.

D-5: D-5 represents a large, steep-sided pit measuring 0.97 m by 0.57 m by 0.38 m deep. This pit contained the tightly flexed remains of a sub-adult human of indeterminate sex (Figure 13). This individual was lying on the left side facing east. Further analysis was not conducted, and the remains were left in place and the grave backfilled with the matrix which had originally been removed from this area. This matrix consisted primarily of basalt cobbles and tan-colored silty loam. Based on stratigraphic sequence, this child appears to have been interred shortly before abandonment of the structure.

Material culture remains contained no formed or portable artifacts and consisted entirely of dietary remains including small marine shell fragments and unidentifiable fragments of faunal bone. Conspicuously absent were basalt flakes, examples of which had been recovered from other similar feature types within the project area.

A single dating sample was recovered from the eastern side of the structure within Layer III. This sample returned a date suggesting occupation between AD 1650-1955. Since no historic-era artifacts were recovered within or immediately adjacent to the feature, the historic component of this date range has been eliminated, resulting in a suggested range of AD 1650-1780 for occupation, considerably narrower than the 300-year range which had been indicated by the sample recovered from Feature B at this site.

The conclusions resulting from data recovery work at Feature D may be summarized as follows. During its initial occupation (which resulted in deposition of Floor 2), the feature may have been a three-sided structure open to the east. At this time, at least two basin-shaped pits were excavated, at least one of which appears to have functioned as a hearth. Considerable charcoal was recovered from the fill comprising this living surface, and the possibility exists that the other pit identified at this level may also have functioned as a hearth or some other feature related to food preparation activities. At some point the feature appears to have been abandoned, and then reoccupied. This resulted in deposition of Layer II, creation of Floor 1, and the addition of all or a portion of the east wall of the feature which resulted in enclosing an additional small space. Two additional pit features were also excavated at this time, one of which was utilized for interment of a deceased juvenile. It could not be determined whether this burial pit had earlier served a different function, or alternatively was excavated specifically for this burial. At the time of the burial, or

shortly thereafter, the feature appears to have been abandoned and not to have been re-occupied.

Feature D shares a number of construction and morphological details with Feature A of Site 2025. Site 2025 appears also to have been initially constructed with three sides, and to have been subsequently remodeled with an additional wall to enclose a separate food processing area. The interpretation provided for Site 2025 is that it functioned as a specialized "cook house" for a small agricultural residential complex. The same interpretation may therefore be warranted for Feature D at Site 2024. At both sites (2024 and 2025) additional habitation features are located in the immediate area, although most of these were identified within upslope areas outside of the present project area and were therefore not available for analysis in conjunction with the present project.

Site 2024 - Feature E - Feature E (Figure 14) is located near the upper end of Transect 4 at an elevation of 575 feet above sea level. The site occupies a rocky southeast-facing slope which descends toward an ephemeral drainage system located immediately south of the primary feature at this site. Numerous agricultural terrace features are located within and immediately outside of the walls of the main Feature E enclosure, primarily concentrated along the inner face of its north wall.

The primary structure at Feature E consists of a relatively large, oval-shaped enclosure containing approximately 320 sq meters of land. Extending east to west for a distance of 67.0 m and averaging 40.0 m in width, the enclosure's walls are faced with vertically-coursed stones with an interior core of piled cobbles. This wall ranges in width from 0.75 m to 1.12 m, and in height from a low at the east end of 0.60 m to a maximum of 1.65 m at the northwest corner.

Two smaller enclosures or rooms (E-1 and E-2) are situated adjacent to the larger Feature E enclosure, while a third example (E-3) is separated from the main enclosure by just 4.0 meters. Feature E-1 is a rectangular, stone-walled room attached to the southwest enclosure wall, as shown in Figure 14. Enclosing 5.64 sq meters, this room was constructed in the same manner as the primary enclosure feature although the average thickness of the walls is only 0.72 m. A 0.7 m-wide entryway is located within the southeast corner of this feature.

Feature E-2, located on the opposite side of the primary wall from E-1, represents a relatively long and narrow room with a curvilinear chute-like entryway 2.0 m in length and

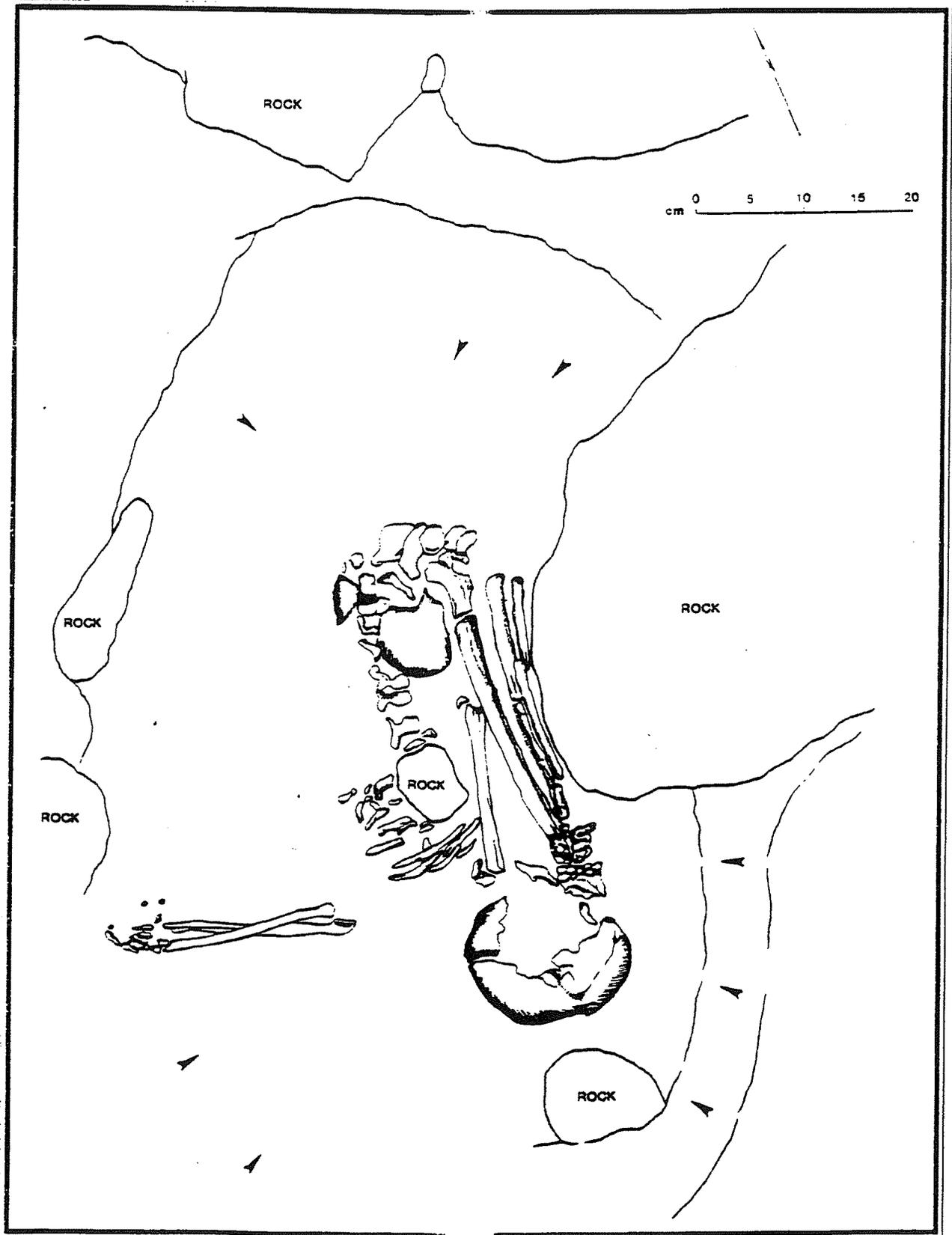


Figure 13. SITE 202 ATURE D, BURIAL

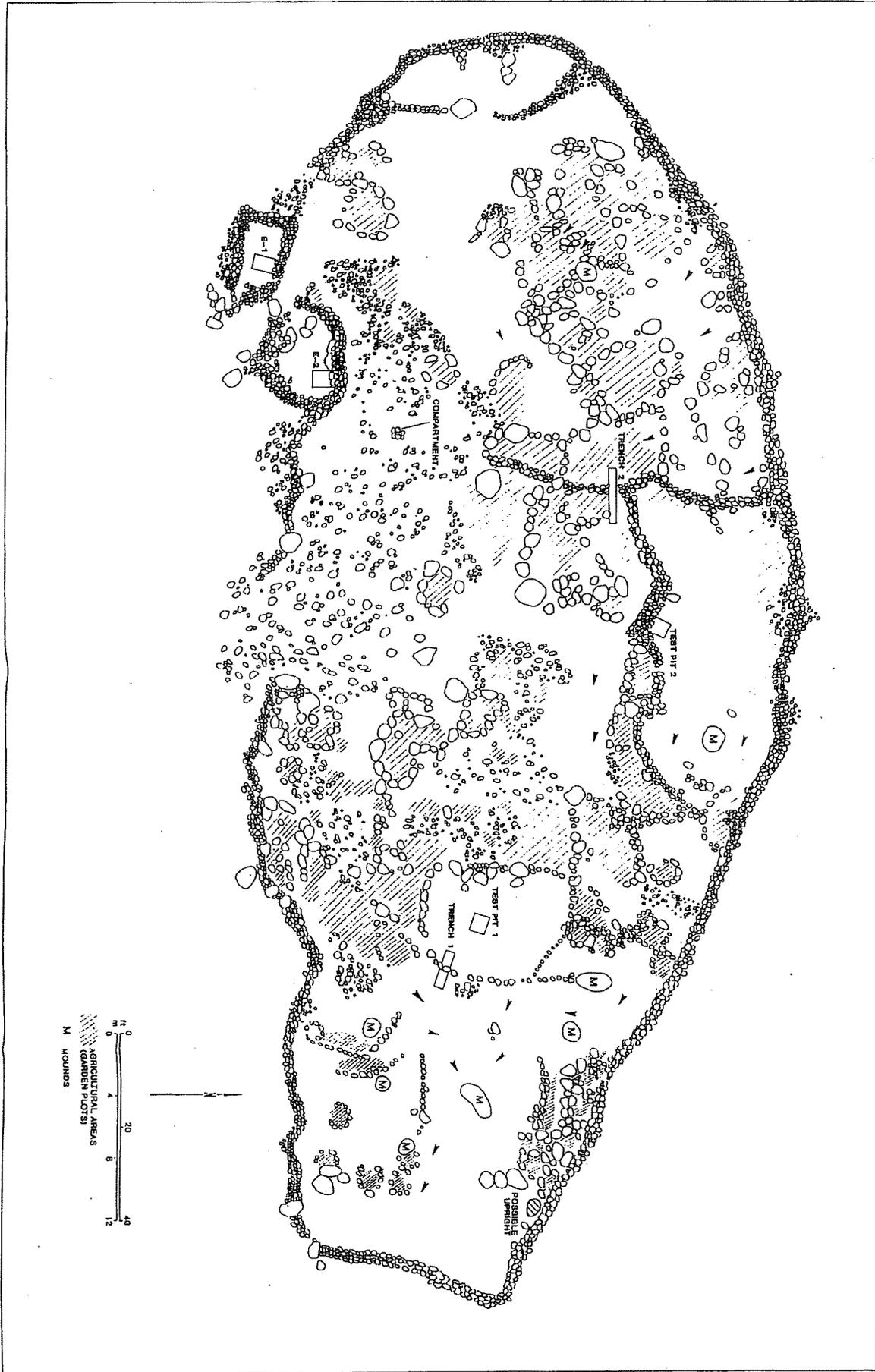


Figure 14. SITE 2024, FEATURE E

0.90 m in width. This "entryway" terminates upon encountering a large boulder, at which point there is a 0.75 m step-down into the room itself. The elongate room measures 3.7 m in length by 1.5 m in width, and encloses a floor space of approximately 4.0 sq m. The south wall of this feature is formed by the massive wall of the main enclosure feature at this site. The remaining three walls of E-2 were constructed in the same manner but on a less massive scale, with average widths being c. 0.8 m and average height being c. 1.0 m.

Feature E-3 is located 4.0 meters north of the main enclosure wall and consists of a rectangular room with an entryway in the southeast corner. This room measures 5.0 m in length (north-south) by 4.0 m in width (east-west), and encloses a floor area of approximately 12.0 sq meters. The walls of the small enclosure are similar in construction details and size to those of the primary enclosure wall at Feature E, reaching a maximum height of 1.5 m and a maximum width of 1.1 m. In contrast to the other two rooms at Feature E which were discovered to contain historic-era cultural materials only, this feature contained both prehistoric and historic components.

Test pits or trenches were excavated through portions of Features E-1, E-2, and E-3. As well, two of the hillside agricultural terraces located within the main enclosure were also partially excavated. The stratigraphic sequence observed within each of these areas is discussed below.

Feature E-1 - A single test pit extending 1 m by 1.5 m was excavated within E-1. The unit was positioned against the face of the north wall so that the base stones of the wall could be exposed. Three separate layers were observed, including two which one which was non-cultural and two which contained cultural materials.

Layer I - This was the 3 to 5 cm. of decomposing forest litter. Several fragmentary pieces of historic-era glass found in this layer.

Layer II - This was a layer of dark silty loam, 3 to 5 cm thick, which contained the bulk of the cultural material recovered from this feature, nearly all of which represented historic-era glass fragments.

Layer III - Layer III, culturally sterile, consisted of a tan to light brown silty clay containing basalt gravels, pebbles, and boulders.

Feature E-1 has been interpreted as an historic-era structure containing but a single cultural component most

likely constructed and utilized during the latter part of the 19th Century. More discrete bracketing of the time period of use cannot be achieved on the basis of existing evidence.

Feature E-2 - Feature E-2 exhibited a stratigraphic sequence virtually identical to that observed within E-1, and morphologically both features are equivalent. A single 1.0 m square test unit was located within E-2 and excavated to culturally sterile soil, with the following results.

Layer I - Layer I represents the organically-rich duff zone which averaged 5 cm thick. No cultural materials were recovered from this layer.

Layer II - Layer II was a dark brown silty loam containing gravels and basalt cobbles. This layer was 0.25 m thick, and, within the layer's upper 10 cm, yielded all of the cultural material recovered from the feature. This material consisted entirely of historic-era bottle glass fragments.

Layer III - This is a tan, silty clay soil containing basalt cobbles and boulders and no cultural materials. Excavation was terminated after excavating a total of 10 cm of this deposit.

As with Feature E-1, E-2 appears to represent an historic-era structure containing but a single cultural component consisting exclusively of fragments of bottle glass. The time period of initial construction and use is estimated at sometime during the latter half of the 19th Century.

Feature E-3 - A single 1.0 m-square test unit was located within Feature E-3, yielding evidence of three definable layers and a basin-shaped fire hearth.

Layer I - Layer I represents the organically-rich duff zone, averaged 4 centimeters thick and contained a few fragments of historic-era bottle glass.

Layer II - Layer II averaged 11 cm thick and was subdivided into two separate lenses. Both lenses consist of a brown, silty loam with a few inclusions of basalt pebbles. However, Layer II-A, the uppermost of the two layers, is lighter in color, less compact, and contained only historic-era artifacts. Layer II-B, on the other hand, is darker in color, more compact, and contained only prehistoric items including fragmentary marine shells and volcanic glass. A single fire hearth was observed on the surface of this prehistoric component. The feature was roughly circular in plan view, was basin-shaped in cross-section, and had been

slightly excavated into the top of the culturally sterile subsoil underlying Layer II-B. Construction involved utilization of five *in situ* basalt cobbles to define the hearth's perimeter. Overall, the hearth measured 0.45 m by 0.38 m by 0.06 m deep. The only bulk dating sample from Feature E came from this hearth, although upon cleaning and treating the bulk sample it was discovered that insufficient carbon had been retained to yield a reliable date.

Layer III - Layer III represents the culturally sterile sub-soil, comprised of a tan, silty compact clay layer containing numerous basalt cobbles and boulders but no cultural materials.

Based on stratigraphic observations and differential recovery of cultural material, Feature E-3 represents a small habitation area containing two separate cultural components—an uppermost historic component, and a lower prehistoric component. Associated cultural material, consisting of historic bottle glass fragments for the historic component and marine shell midden remains with occasional flakes of volcanic glass for the prehistoric component, were insufficient for clearly documenting feature function, although prehistoric short-term habitation is an interpretation compatible with the midden constituents recovered.

Dating results are inclusive at best. The historic component could only be evaluated on the basis of fragmentary bottle glass. An age range between AD 1700 and AD 1900 is indicated on the basis of several diagnostic attributes of recovered specimens. However, all typable and datable elements converge for the period between AD 1880 and AD 1890. Therefore, either the historic component of this site persisted more or less continuously for the entire 200 year period between AD 1700 and 1900, or alternatively, the site was occupied only during the decade between 1880 and 1890. The latter seems much more likely and is compatible with the available historic documentary research for the general project vicinity.

For the prehistoric component, insufficient carbon was recovered from Feature E-3 to allow for any estimate of the time period of occupation, although based on extrapolation to other dated sites within the project area the most likely period of use was between about AD 1600 and 1800.

Agricultural Terraces at Feature E - As noted above, Feature E contains numerous agricultural terraces within and immediately outside of the walls which comprise the main Feature E enclosure. Clearing of vegetation in connection with Transect 4 survey work revealed that these features were concentrated along the inner face of Feature E enclosure's north wall. During the present project, two test trenches

were excavated so as to expose narrow transects intersecting these terrace features and the enclosure wall at right angles. Soil profiles were thus exposed on both sides of two sections of terrace, with the following results.

Test Trench 1: This 2.5 meter long by 0.5 m wide trench was excavated in one of the lower terraces within Feature E (see Figure 14 for location) in order to define the stratigraphy on either side of the terrace wall and evaluate recovered matrix for possible macrofossils derived from prehistoric agricultural activities in the area. None of the recovered material warranted screening; however, two layers were identified.

Layer I - Layer I consists of a dark brown silty loam located immediately below the surface duff zone. This was a loose, homogeneous layer which averaged 0.20 m thick on the uphill side of the Feature E enclosure wall, and 0.12 m thick on the wall's downhill side. No inclusions were observed in this layer other than occasional gravels.

Layer II - Layer II is comprised of a gravel-bearing, gray to dark brown silty sand. The gravel ranged from pea-sized to walnut-sized.

Layer I appears to represent a layer of planting soil which has been culled of the basalt pebbles and cobbles that characterize the natural soil in this area. It is possible that Layer II had also been partially prepared by removal of stone, although this could not be determined on the basis of observations of trench profiles and other evidence recovered during excavation. No macrofossils indicating possible agricultural refuse were recovered from the trench.

Test Trench 2: This 3.0 meter long by 0.5 m wide test trench bisects the Feature E stone wall within a portion of the enclosure's east perimeter. The modern ground surface on the uphill side of the wall is 0.6 m above the wall's surface and 0.4 m on the downhill side. Four stratigraphic layers were observed on the uphill side while five were noted on the downhill side.

Layer I - This layer was found directly below the organic duff zone. It ranged from approximately 0.03 m to 0.05 m in thickness, and consists of a thin lens of dark brown, homogeneous, rock-free silty loam. The layer was present on both sides of the terrace face.

Layer II - This layer, also present on both sides of the facing, consisted of a thin lens (0.05 to 0.10 m thick) of fine, dark, silty loam containing gravels less than about 2 cm in diameter.

Layer III - Layer III was a band of dark charcoal-impregnated loam which ran through the profile on both sides of the terrace wall. This stratum represents a natural burn or perhaps a deliberate fire set by man to clear brush or otherwise prepare agricultural plots.

Layer IV - Also represented on both sides of the feature wall, Layer IV exhibited a higher clay content than the previous layers but contained less gravel and more natural basalt cobbles.

Layer V - This lens was observed underlying Layer IV on the downhill side of the terrace wall only. Similar to Layer IV, this layer appears to represent a natural deposit and was excavated to only 0.12 m below the current ground surface.

The stratigraphic sequence suggests two levels of planting soil on both sides of the terrace face. The lowest component of this planting soil contains gravels, presumably to enhance drainage, while the upper member is a gravel-free, finely mulched planting loam.

No portable artifacts or other cultural objects were observed during excavation within Trenches 1 and 2.

Overall Conclusion for Feature E - From the available evidence it would appear that all components at Feature E date to the historic period, with the exception of the lower layer of Feature E-3 which contains evidence of prehistoric use/occupation. Evaluation of the few diagnostic elements observed on glass bottle fragments suggests historic use during the decade AD 1880-1890. The walls of both Features E-1 and E-2 were integrated with the massive main wall of Feature E enclosure, suggesting that these three are contemporaneous and are all historic in age. E-3, consisting of a detached structure, represents an earlier construct within the immediate vicinity, although the feature was subsequently reoccupied during historic time periods, presumably in conjunction with use of E-1 and E-2 occurred. The prehistoric component at E-3 could not be directly dated, although extrapolation with similar features in the immediate vicinity which have been dated suggests that the most likely period of use occurred between about AD 1600-1800.

Functional interpretation of these various features is even more problematical than dating estimates. The function of E-2 is unknown, but this long room may have been utilized to pen animals, perhaps pigs or cattle. Room E-I, which is joined with the same section of enclosure wall as E-2 but which is located on the opposite side of that wall,

possessed a ground-level doorway and a feature-free floor. In combination with the lack of charcoal in the fill recovered from this room, it is possible that this room never possessed a hearth. Coupled with the absence of significant quantities of other cultural objects, it is suggested that this feature may have functioned as a storage, rather than a habitation facility. The same functional interpretation can be offered for Feature E-3 by applying these arguments to the specific findings from the upper levels of that feature. Lastly, the massive enclosure wall of Feature E may represent a large animal pen. If the low terraces within this area are in fact associated, it is possible that the feature functioned as a walled garden area where pigs were penned and various necessary items stored in Features E-1-3. It is also possible that incorporation of the low terraces within the bounds of Feature E enclosure was unintended, and that the enclosure and low terraces reflect, respectively, historic and prehistoric activities in this area.

Aside from the fact that the low terraces may represent prehistoric agricultural features, Feature E-3 represents the only documentable prehistoric feature within the boundaries of Feature E. Although subsequently utilized by historic residents of the area, the feature's walls do not appear to have been modified or disturbed, and the structure is believed to faithfully represent original construction details. The presence of a hearth within this feature suggests occupation on a seasonal or permanent basis in conjunction with intensive agricultural activities within the immediate area.

Site 2024 - Feature G - Site 2024's Feature G is a C-shaped stone-walled structure located at 525 ft above sea level on Transect 4 at a point approximately ten meters south of Feature I of this site. The feature was selected for testing in order to evaluate the contents of this particular feature type within this particular geographical context, and to yield comparative information by means of which to further evaluate additional examples being excavated elsewhere.

Evaluation was initiated with complete vegetation clearing and detailed mapping (Figure 15). Vegetation removal revealed a curved stone wall which nearly scribed a circle except for a 0.95 m-wide gap on the southeast side. Interior dimensions were 2.2 m east-west by 2.6 m north-south. The wall opposite the opening extended 1.05 m above the current ground surface, while the "side" walls reached maximum heights of approximately 0.75 m. All of the walls averaged c. 0.7 m in width, and had been formed by stacking waterworn basalt cobbles and small boulders from three to five courses high and from two to three courses wide.

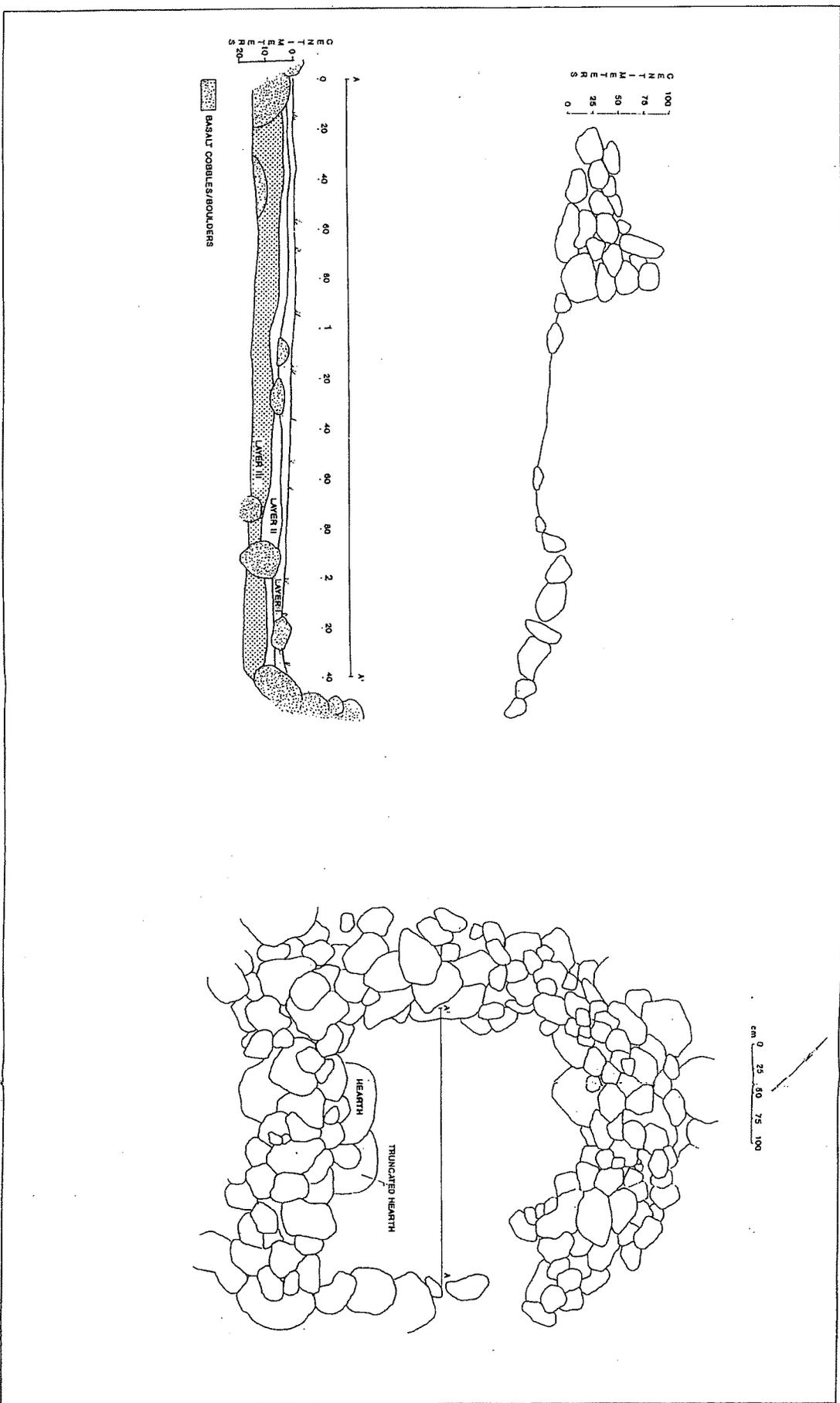


Figure 15. SITE 2024, FEATURE G

After completion of the plan map, test excavation was undertaken within the south half of the feature an involved complete excavation of an area measuring 1.4 m in length by 1.0 m in width. All recovered material, which was removed in natural layers rather than arbitrary levels, was passed through 1/8 inch mesh, except for the 2-3 cm thick duff layer, yielding the following results.

Layer I - This is the duff zone composed of recently deposited vegetal material in various stages of decomposition. No cultural materials were recovered from this layer.

Layer II - This is narrow band of light brown silty loam containing rootlets, small pebbles, and basalt cobbles which had fallen from the surrounding walls following abandonment of the feature. No cultural materials were recovered from this layer.

Layer III - This is a dark brown to black silty loam with inclusions of charcoal, small, unidentifiable fragments of faunal bone, marine shell fragments, and several basalt flakes. This layer averaged only 0.10 m thick, and yielded three of the total of five bulk dating samples recovered from this feature.

Two basin-shaped hearths were encountered along the west wall of the enclosure. Feature G-1, representing the first hearth constructed within the enclosure, had been partially truncated by construction of a second hearth (Feature G-2). Feature G-1 was oval in plan view and basin-shaped in profile, with a maximum depth of 0.12 m. Overall the hearth was constructed 1.0 m in length by 0.60 m in width. The fill within the interior of the hearth consisted of a dark brown to black "greasy" loam with a high charcoal content. At the time of last use of the feature, its size had been reduced to 0.73 m by 0.40 m, ascertained by tracing and mapping the distribution of oxidized soil and the most recently created basin visible. Feature G-2 was a much smaller hearth, extending 0.50 m by 0.30 m. Its construction destroyed a portion of G-1, indicating that it had been constructed subsequently. The fill recovered from the interior of this hearth was also a dark brown to black charcoal-laden loam, but unlike G-1 this hearth contained small quantities of midden in the form of very fragmentary faunal bone and marine shell fragments.

In addition to the midden (faunal bone and shell fragments) excavated from the hearth and from Layer III, two basalt tools (a unifacial scraper and a uniface) were also recovered.

Five dating samples were submitted for dating analysis. Three of these represent bulk samples and were recovered

without specific provenience from the excavated cultural layer (Layer III). Two additional samples were recovered from Hearth Feature G-1. These five samples returned the following results: three dates yielded "modern" results and evidence potential contamination; one date suggested occupation between AD 1678-1745, or AD 1800-1940; and one date suggested occupation between AD 1640-"modern."

Since there were no historic artifacts associated with Feature G, those ranges suggesting historic-era use/occupation were discounted. Therefore only a single date appears likely to reflect the actual period of occupation. This date, recovered from cultural Layer III, suggests use of the feature between AD 1674 and 1749. The date of AD 1650-1955, derived from charcoal recovered from the hearth, could be reduced to AD 1650-1800 by elimination of the historic-era range, and is thus generally in conformity with the sample from Layer III. The most likely period of occupation thus appears to have occurred between about AD 1650 and 1700. These results are generally compatible with the findings at Feature A of this same site where an estimate of occupation between either AD 1420-1670 or AD 1750-1800 was indicated; the results are particularly in conformity with the findings at Feature D, however, where dating suggested occupation between AD 1650-1780.

Feature G is believed to represent a fully prehistoric, single-component site utilized for temporary habitation in conjunction with the intensive agricultural activities documented for the immediate area. The general construction of the feature suggests that it may have functioned as a "field house" utilized by one or two persons. That this activity occurred sometime between about AD 1650 and 1700 is based on evaluation of two of the five radiocarbon dates obtained from samples recovered from cultural layers/components within the feature. The presence of at least two hearths within the small enclosure, coupled with the evidence that one or both of these features may have been "remodeled" or rebuilt, suggests re-current use of the feature over a number of years, perhaps on a seasonal basis.

Site 2024 - Feature H - Feature H represents another C-shaped structure (Figure 16) encountered within Transect 4 and located approximately 250 meters upslope from Feature G at c. 600 ft elevation. This structure occupies a boulder-covered slope and is surrounded by numerous agricultural features, including both terraces and small cleared areas. The structure is somewhat unusual in that it was partially excavated into the side of the hill, but otherwise resembles other C-shaped enclosures in being oval in plan view and open to the southwest. The initial step in constructing this feature apparently involved leveling the

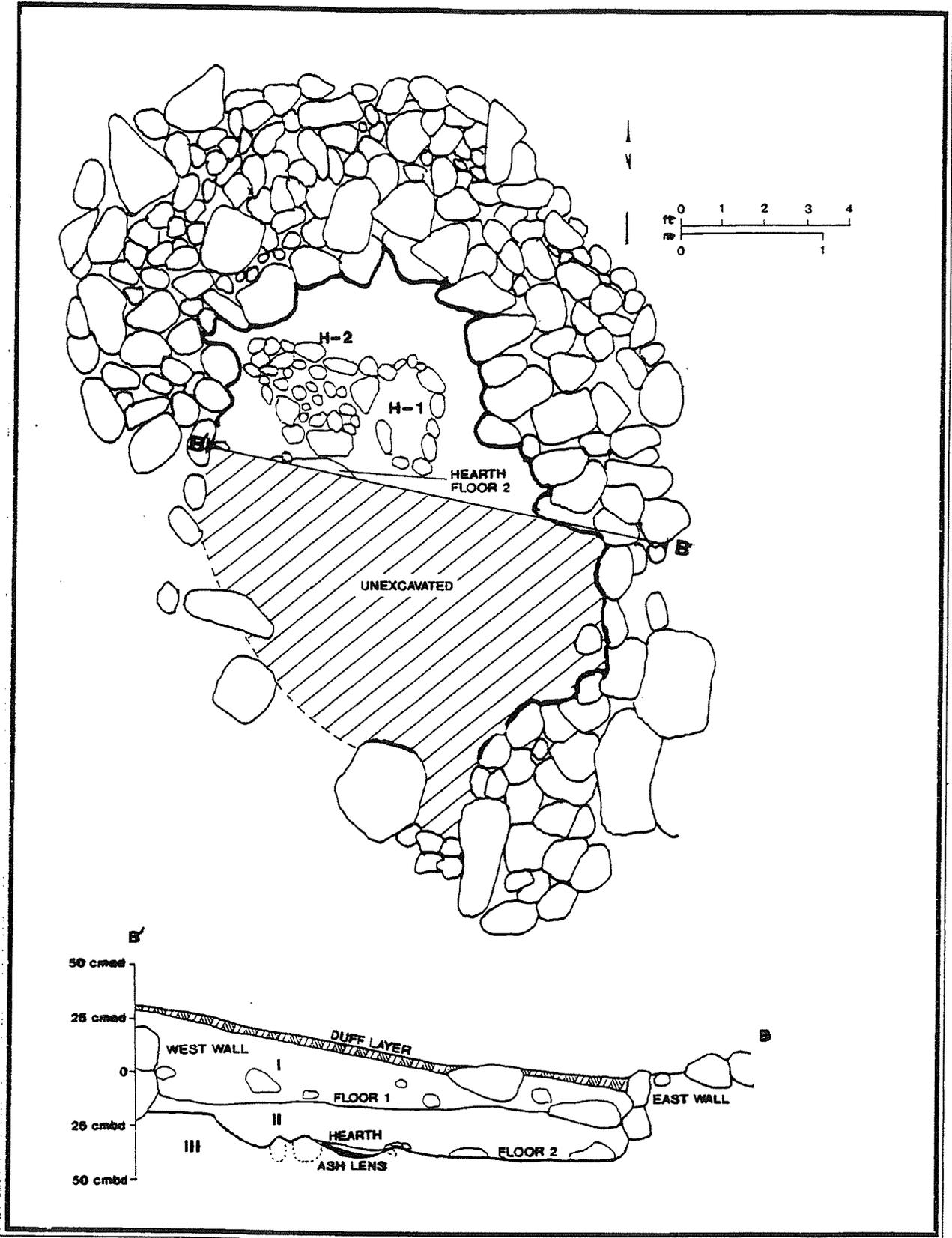


Figure 16. SITE 2024, FEATURE H

ground surface by excavating into the face of the hillside a maximum depth of c. 0.5 m. Waterworn basalt cobbles and boulders were then stacked and piled an average of 0.65 m high and 0.8 m wide around the entire perimeter of the enclosure except for a 1.0 m gap left in a portion on the feature's southwest side.

During the present project, the feature was cleared of vegetation and mapped. A single, 1.0 m sq test pit was then located within the feature's interior in order to define the cultural and/or natural layers present and to determine maximum depth of any deposits. The results documented the presence of both cultural and natural deposits to approximately 0.65 m below the current interior surface of the enclosure. The initial excavation unit was then expanded to include the entire northern 1/3 of the structure (Figure 16). All recovered material was passed through 1/8 inch screen except the duff layer which was troweled off and discarded.

The organic duff zone at this feature capped three identifiable layers, two of which were culturally sterile and one of which contained the bulk of the cultural materials recovered from the feature.

Layer I - This was a moderately compact layer of brown silty loam containing decomposed organic material, rootlets, and several basalt cobbles which had fallen from the walls of the feature. A very few pieces of shell midden fragments had apparently worked their way into this lens, although this deposit does not appear to be cultural and is believed to have accumulated subsequent to abandonment of the feature.

Layer II - This is a dark brown to black layer of silty loam with cultural inclusions of charcoal, occasional basalt flakes, coral fragments, kukui nut fragments, very fragmentary pieces of faunal bone, and marine shell fragments. An occupation floor (Floor #1, in Figure 16) was identified on top of this layer, which ranged in depth from 0.23 m to 0.07 m. A second occupation floor (Floor #2) was encountered at the base of this layer, capping Layer III below.

Layer III - Layer III was culturally sterile, composed of light brown sandy silt with basalt cobble inclusions. Floor #2 capped this layer.

Each of the two living surfaces, identified as compacted surfaces with a slight "glazed" appearance, was associated with a basin-shaped hearth. Hearth feature H-1 was encountered in direct association with the uppermost floor (Floor #1), and consisted of an oval-shaped, rock-lined, shallow basin measuring 0.70 m by 0.42 m by 0.09 m deep. The interior of the hearth contained dark brown, charcoal-

stained silty loam. Immediately west of this feature was a low pile of partially oxidized cobbles, containing approximately 30 stones. The second hearth feature (H-2) was identified during excavation of H-1, and was located adjacent to the west side of H-1. H-2 was also oval in plan view and basin-shaped in cross section, but appears to have been constructed in association with Floor #2, the original occupation surface at this feature. Measuring approximately 0.33 m in diameter and 0.05 m in depth, H-2 contained charcoal-stained fill virtually identical in color and texture to that which had been observed within H-1.

Basalt flakes and marine shell and kukui nut fragments represent the bulk of the cultural material recovered from Feature H. Small quantities of faunal bone were also collected, but none of this material contained sufficient diagnostic attributes to allow more discrete identification than to note that approximately 80% represented bird bone with the remainder representing small mammalian species.

The term C-shaped is often considered synonymous in Island prehistory with very short-term, ephemeral occupation. It is no doubt true that many such features may represent no more than a single episode of activity within a particular area. Feature H, however, exhibits clear evidence of more intensive utilization. Initial construction of the feature required a moderate output of labor during excavation of the floor area, while the interior of the feature contains multiple floors, two separately constructed fire hearths, and a fairly substantial accumulation of midden. Collectively, these findings suggest recurrent use on a fairly regularly basis, perhaps involving a fairly long period of time. Unfortunately, the bulk dating samples recovered from the midden and the hearths contained too little carbon for reliable results, and no age ranges can therefore be ascribed to Feature H. However, based on morphological similarities to other dated C-shapes within the project area which also contain similar hearth features and midden accumulations, initial construction may have occurred as early as the late 15th century and use may have continued periodically through about the middle of the 18th century AD.

Site 2024, Feature I-1 - Feature I-1 is a small C-shaped stone-walled structure located near the north edge of Transect 4 at an elevation of c. 455 ft above sea level. Constructed adjacent to the south side of an expansive boulder field, the feature's semi-circular wall reaches a maximum height of 1.05 m, an average width of approximately 1.25 m, and encloses approximately 2.0 sq m of surface area (Figure 17). The interior wall faces are near vertical in aspect and composed of roughly stacked courses of waterworn basalt cobbles and boulders.

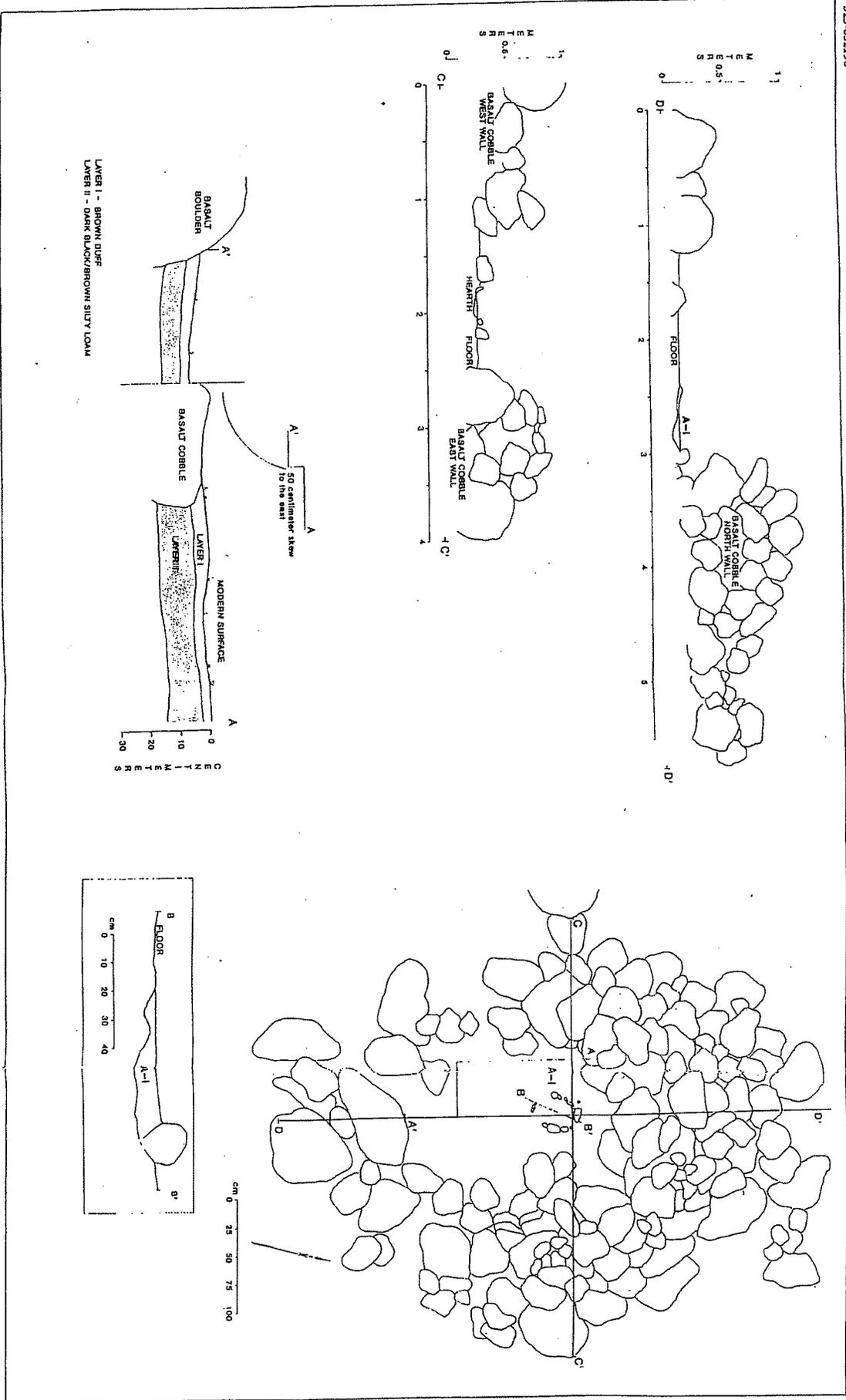


Figure 17. SITE 2024, FEATURE I-1

Evaluation of this feature involved complete vegetation clearing, detailed mapping, and excavation of the entire interior of the structure. In addition to the surface duff layer which averaged 5 cm thick, only one additional layer was encountered during excavation. This second layer (Layer II) represented cultural deposition and averaged 10 cm thick. The layer was dark brown to black in color, composed of a silty, loose loam, becoming more compact near the bottom of its 10 cm average thickness such that it was eventually identified as a possible compacted living surface or "floor". Cultural material was quite sparse within this deposit, but included a few basalt flakes, charcoal flecks and chunks, a few examples of fire-cracked rock, and one piece of a yellow mineral believed to be limonite which may have been collected for use as a pigment.

A single basin-shaped, rock-lined hearth was encountered within the north-central portion of the enclosure and was discovered to rest on the "floor" at the base of Layer II. This feature was oval in plan view, basin-shaped in cross-section, and lined with tabular basalt cobbles. Measuring 0.55 m long by 0.25 m wide, the maximum depth of the feature appears to have been approximately 0.1 m. The "fill" recovered from the hearth's interior consisted of a charcoal-stained loam with small but visible charcoal fragments scattered throughout. Portions of the bottom of the hearth had oxidized to an orange-red color.

Charcoal was relatively abundant in the shallow midden deposit and the hearth, and one of two bulk dating samples collected during excavation returned a radiocarbon date suggesting occupation between AD 1640 and 1955. Since no historic items were recovered from the feature, the historic portion of the date range was eliminated leaving the most likely time period of occupation at between AD 1640 and 1789.

Feature I-1 was judged to be prehistoric on the basis of the feature's morphological attributes, its midden content, the absence of historic items, and the radiocarbon dating results. Recurrent use is indicated on the basis of the presence of the fire hearth and the rather substantial size of the structure's walls. However, the feature does not appear to have been in use as long, or to have been re-visited as frequently, as Feature H at this site. The presence of additional residential features in the immediate vicinity (e.g., Site 2025's U-shaped food processing area, and Site 2024's Features A and G, each representing generally similar but larger C-shapes), suggests that Feature I-1 was part of a larger and rather extensive agricultural residential complex.

Site 2024, Feature I-2 - Feature I-2, located a few meters west of Feature I-1, consists of what at first appeared to represent a C-shaped habitation feature constructed against the south face of an expansive boulder field. The north wall of the structure reached a maximum height of 0.84 m, formed in part by natural boulders and cobbles, while the west and east walls reached only 0.3 m and 0.6 m in height, respectively. The south side of the structure was defined by a single row of stones and cobbles, none of which extended above the current ground surface more than 0.12 m.

In order to evaluate the feature for information content, vegetation was completely removed, the feature mapped, and a one meter-square test pit established near the center of the enclosed space. Excavation of this test unit revealed the following two layers.

Layer I - Layer I consisted of 4 to 6 centimeters of decomposing vegetation which has been referred to throughout this report as a duff zone. The material was removed with hand tools, but not screened.

Layer II - Layer II consists of a dark brown, compact silty loam containing a few bits and pieces of charcoal which were concentrated in the upper 3 cm. of deposit. This layer reached a maximum depth of 0.12 m below the current ground surface within the north half of the feature. Excavation proceeded until approximately 1/2 of this deposit had been removed to "bedrock", in this case consisting of large waterworn boulders. No cultural materials, either prehistoric or historic, were recovered.

Examination of the soil profile suggested the type of sequence which had been observed among several agricultural features within the project area (particularly at low-walled terraces and boulder slope planting clearings). Upon completion of the excavation work within this feature, the classification was changed from possible habitation enclosure to a large example of a boulder slope planting feature. No further work was conducted.

Site 2025, Feature A - Prior to excavation, Feature A at Site 2025 appeared to represent a U-shaped habitation enclosure segmented into halves by a low interior wall. It was also considered possible that the feature represented two low-walled C-shapes constructed adjacent to one another. Identified within the lower portion of Transect 4 at an elevation of 470 ft above sea level, this feature was constructed on a low east-west trending ridge which rises less than two meters above two nearby shallow swales. The feature is also surrounded by numerous agricultural components, particularly

small boulder slope planting plots, and is located but a short distance downslope from the Site 2025, Feature A C-shaped enclosure, and approximately 80 meters upslope from the expansive Site 2024 agricultural/habitation complex.

In consideration of its somewhat unusual shape, and with the objective of acquiring additional comparative information concerning small habitation features within this area, Feature A was selected for further evaluation, which involved vegetation clearing, detailed mapping, and excavation of subsurface deposits.

Excavation proceeded by establishing a one meter-wide trench parallel with the long axis of the feature (approximately north to south) (Figure 18). Since this trench crossed a low wall located within the interior of the feature, the excavated material removed from either side of the wall was screened and provenienced separately. The recovered material was also segregated vertically by natural, rather than arbitrarily defined, levels, and all excavated matrix, with the exception of the surface duff layer, was passed through 1/8-in mesh.

Upon completion of excavation of the initial trench, eight pit features had been partially exposed and three cultural levels identified. These findings led to the decision to expand that portion of the test trench located on the north side of the feature's interior wall. This area was eventually totally excavated (the interior of the "enclosure", see Figure 18), revealing four additional pit features and two hearths.

Three separate stratigraphic layers (not counting the surface duff zone) were observed and recorded during the course of excavation work. The non-cultural duff zone itself ranged from about 3 to 8 centimeters. Layer I was encountered immediately below the duff zone, and consisted of a light brown silty loam containing charcoal flecks and midden. Within the enclosed portion of the feature, Layer I ranged from 10 cm depth (along the west wall) to approximately 2 cm (along the eastern wall). This layer also extended beneath the south wall, but disappeared completely shortly after it emerged from beneath this wall into the "courtyard" area located immediately south and outside of the enclosed area. Layer I, which is fairly compact, appears to cap a more compact living surface labeled Floor 1 while that living surface was in use (see profile drawing in Figure 18, illustrating the relative position of the various layers and associated living floors).

Layer II represents a layer of dark brown silty clay loam containing charcoal bits and prehistoric midden. It ranged from 7 to 8 centimeters thick and represents a cultural

deposit equivalent to Layer I in that it was discovered to cap a more compact living surface labeled Floor 2, the original occupation surface at the feature. Layer II was encountered on both sides of and under the south wall which separates the enclosure's interior from the "courtyard" located immediate south.

Layer III represents a non-cultural tan silty clay containing natural basalt cobbles and pebbles. This layer was capped by Floor 1 and Layer II.

In addition to the stratigraphic observations detailed above, a total of fourteen structural features were identified and cleared within Feature A. These include four hearths, one possible post hole, one storage bin, and eight basin-shaped pits of unknown function. Nine of these features were located within the enclosed section of Feature A and could be assigned to a specific floor level (discussed below). The five remaining features were located outside the enclosed area, in the original test trench and the area referred to as the "courtyard." These five features were formally assigned to Floor 2 (the latter period of use/construction at the feature), although it is possible that one or more may have been in use during both the initial as well as later episodes of occupation. A brief description of each of these features is presented below, and a summary of dimensional information and assigned function is provided in Table 10.

Feature A-1: A-1 is a large basin-shaped depression associated with Floor 2. The pit contained a very dark brown silty loam containing a moderate quantity of charcoal.

Feature A-2: A-2 is an oval basin-shaped pit or depression associated with Floor 2, containing fill identical to that observed in A-1.

Feature A-3: A-3 is an oval basin-shaped pit associated with Floor 1 and apparently subjected to a single episode of remodeling through the addition of a stone lining which reduced the interior diameter by .25 cm. Whether or not the original feature was a hearth could not be determined, although this function has been ascribed subsequent to the adding the rock "liner." This latter hypothesis is based on extensively oxidized Floor 1 with which it was associated and fire-fractured faces of associated stones.

Feature A-4: A-4 represents another basin-shaped pit associated with Floor 2. This example was located within the "courtyard" area immediately south of the enclosure area, and the south wall of Feature A had been constructed across the north end of this pit. The fill consisted of a dark brown silty clay loam containing a few flecks of charcoal.

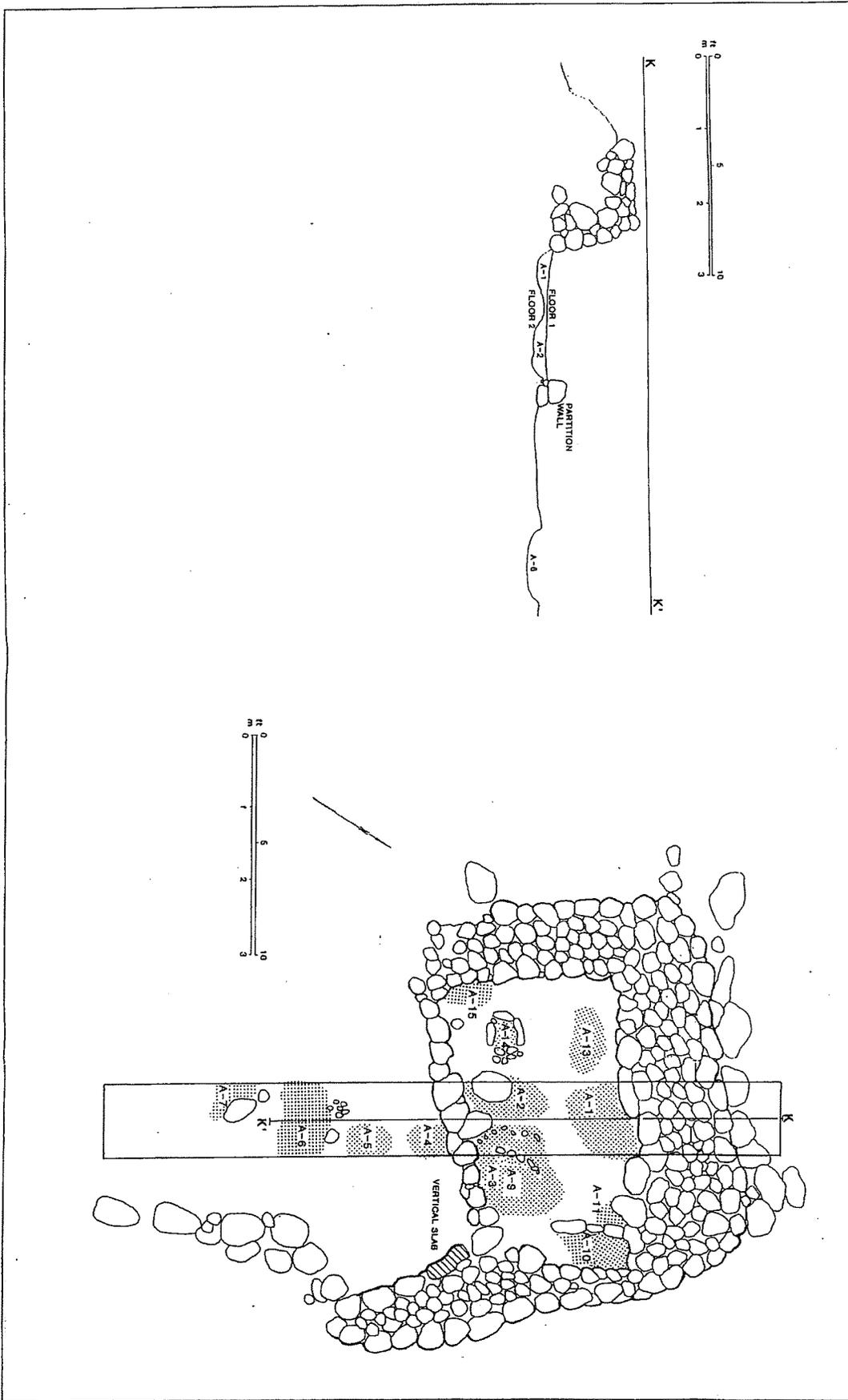


Figure 18. SITE 2025, FEATURE A

Table 10.

SUBSURFACE FEATURES ASSOCIATED WITH SITE 2025, FEATURE A

Feature	Length	Width	Depth	Function/Associated Floor
A-1	0.85	1.10	0.20	Unknown, Floor 2
A-2	0.80	0.64	0.15	Unknown, Floor 2
A-3	0.93	0.58	0.22	Hearth, Floor 1
A-4	63.00	0.61	0.07	Unknown, Floor 2
A-5	0.58	0.54	0.06	Unknown, Floor 2
A-6	1.70	0.97	0.17	Unknown, Floor 2
A-7	0.44	0.34	0.10	Hearth, Floor 2
A-8	0.70	0.33	0.13	Hearth, Floor 2
A-9	0.14	0.12	0.09	Possible Post Hole, Floor 2
A-10	0.80	0.55	0.45	Storage Bin, Floor 1
A-11	0.76	0.65	0.28	Unknown, Floor 1
A-12	—	—	—	VOID
A-13	1.05	0.73	0.15	Unknown, Floor 1
A-14	0.62	0.52	0.26	Hearth, Floor 1
A-15	0.70	0.42	0.25	Unknown, Floor 1

Note: In several instances, full length or width could not be determined due to truncation by later features or incomplete exposure during excavation.

Feature A-5: A-5 is a basin-shaped pit associated with Floor 2 and located 0.25 m south of Feature A-4. Both A-4 and A-5 contain the same fill.

Feature A-6: This is an oval basin-shaped pit located 0.25 m south of Feature A-5 and associated with Floor 2. The pit contained a dark silty loam interspersed with charcoal bits and small quantities of gravel.

Feature A-7: A-7 is a basin-shaped hearth which had been excavated into the sterile gravels and soil of Layer III and Floor 1. Some of the natural basalt cobbles of the sterile underlayment had been utilized to define the pits perimeter which contained a black, sandy silt with occasional small fragments of charcoal. The stones surrounding the feature were smoke-blackened and slightly oxidized.

Feature A-8: A-8 was an unlined basin-shaped hearth associated with Floor 2 containing a black silty loam intermixed with a large number of charcoal fragments. Subsequent construction of Feature A-3, which involved excavation into Floor 1, resulted in destroying approximately 1/2 of A-8.

Feature A-9: This is a possible post-hole associated with Floor 2. The feature was observed near the bottom of Feature 8, and was visible as a circular discoloration, lighter in color than the otherwise dark midden deposit in this area.

Feature A-10: The extreme northeastern corner of Feature A had been partitioned off from the rest of the room with the addition of three vertical slabs placed between the north wall and a large natural boulder. This addition effectively created an above-ground bin (Feature A-10) that appears to have been utilized for storage. A fragment of tabular, highly polished basalt was recovered from the floor of this bin.

Feature A-11: A-11 consists of an oval basin-shaped pit associated with Floor 1. The pit had apparently been deliberately filled with a homogeneous dark brown silty loam and capped with 3 to 4 cm of brown silty clay, an action which may have been undertaken in order to facilitate construction of Feature A-10. The west wall of Feature A-10 crosses the east end of A-11.

Feature A-12: This feature was deleted from the feature list upon discovering that it represented a channel created by natural root action.

Feature A-13: A-13 consists of an oval basin-shaped pit located in the northwestern quadrant of Feature A and associated with Floor 1. The pit contained a dark brown silty loam, interspersed with charcoal bits and occasional fragments of kukui nut shell.

Feature A-14: A-14 represents a well-constructed rectangular hearth associated with Floor 1 and containing a dark brown to black silty loam with a few fist-sized cobbles and occasional charcoal flecks and chunks. The north, west, and south sides of the hearth were constructed by placement of vertical slabs, while the east side was similarly formed by two slabs. The floor of the hearth was paved with small pebbles and slabs, with the latter having been added later as there is a compact layer of ash and charcoal beneath them.

Feature A-15: A-15 consists of a portion of a circular basin-shaped pit containing numerous charcoal flecks and chunks, and a dark silty loam. When the western wall of Feature A was extended to the south, it covered the approximate western 1/2 of this feature.

Only two formed artifacts were recovered from Feature A (one fragment of a bifacially polished basalt slab and one ulu maika), while the majority of the recovered artifacts consist of unmodified basalt flakes. In excess of 98% of the total recovered cultural assemblage is represented by prehistoric midden, composed of fragments of marine shell, occasional fragmentary faunal bone remains, and coral and kukui nut shell fragments.

Five radiocarbon samples were submitted for analysis, one of which indicated bomb contamination (#478) while a second (#482) retained insufficient carbon for a reliable reading. The remaining three samples yielded the following results: Sample #479, A-1 fill, indicating AD 1527-1557, 1630-1955; Sample #480, A-2 fill, indicating AD 1523-1566, 1629-1696, 1726-1818, 1857-1861, and 1921-1955; Sample #481, Feature A, indicating AD 1470-1955.

Since the deposits yielded no historic material, those ranges extending into historic time periods are least likely to reflect the actual period of occupation. The remaining dates suggest occupation sometime between about AD 1525 and 1700. Since two of the dates yielded nearly identical possibilities (between AD 1525 and 1565), this range may in fact represent the most likely period of use for Floor 2, the uppermost cultural layer (Layer I) identified at the feature.

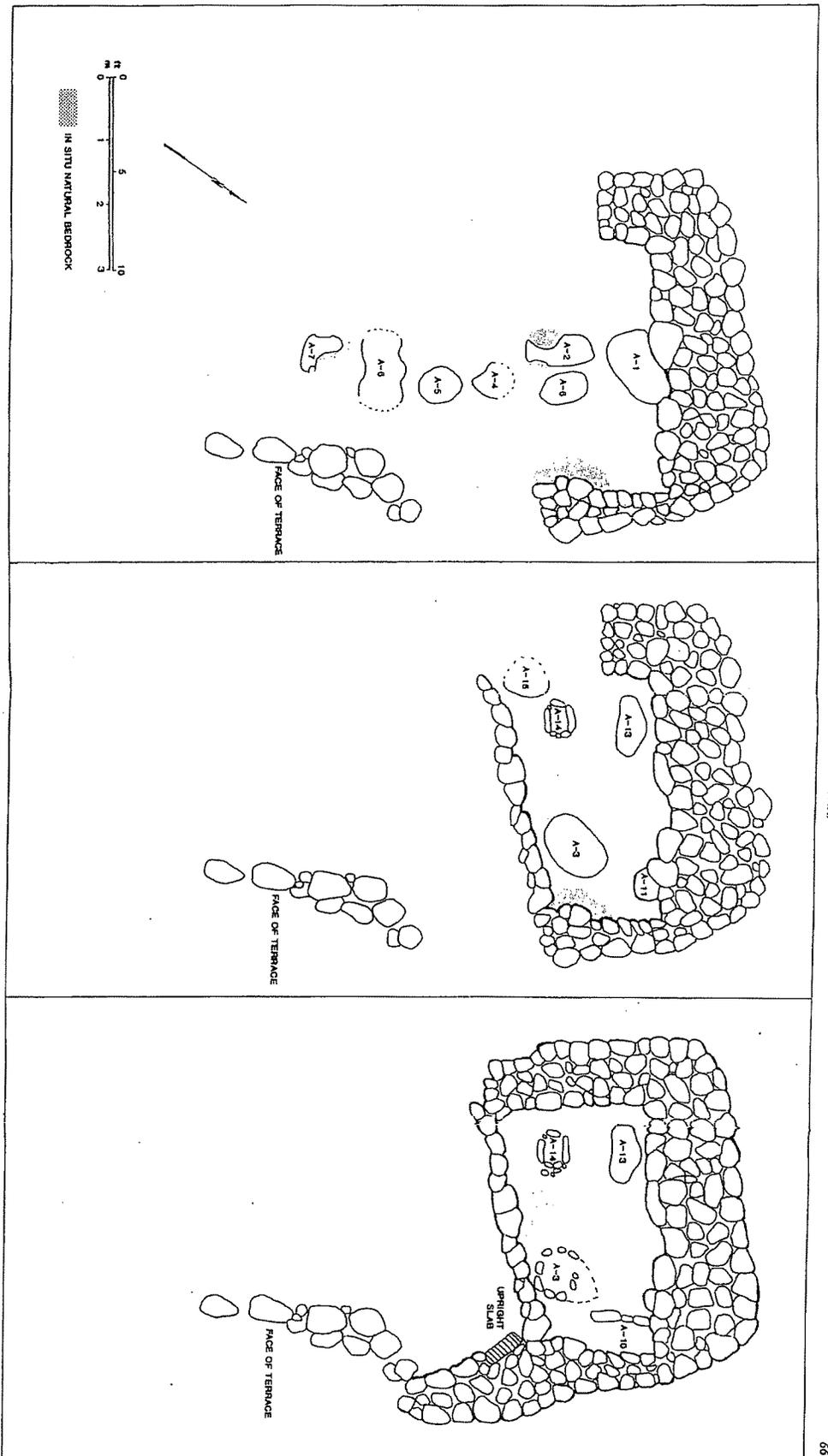
Whether or not Layer II and its associated Floor 1 date to significantly earlier time periods could not be determined on the basis of the present dating results.

An evaluation was undertaken of the horizontal distribution of the layers and floors in conjunction with the various types of wall joints exposed in profile and the sequence of construction and destruction of interior features (Features A-1 through -15). Collectively, these observations led to an attempt to interpret the construction sequence for Feature A. A three-phased construction sequence was hypothesized, as discussed below and depicted graphically in Figures 19a, b, and c.

Initial construction of Feature A appears to have involved setting and stacking the stones for the north and east walls, and a portion of the smaller west wall (c. 1/3 of this wall segment) (Figure 19a). All of the wall segments constructed at this time exhibit vertical faces on both interior and exterior sides, with a piled cobble core. The base of the north wall was fixed at 1.40 meters in width and the wall stands 1.15 meters high. The west wall is 1.20 meters wide at the base and ranges in height from 1.35 meters at the north end to 0.70 meters at the south end (prior to subsequent additions). The east wall was much narrower and ranged between 0.5 to 1.0 meters wide at the base. This first building episode created a high, vertically-faced east wall which had an exterior length of 10.25 meters. At this time, the resultant structure resembled an extremely well-constructed C-shape. Interior features associated with this wall segment are A-1, A-2, A-4, A-5, A-6, A-7, A-8, and A-9.

The second phase of construction involved the addition of a low (0.3 m high) single-coursed south wall constructed over the top of interior Feature A-4. This addition essentially converted the original C-shape into a rectangular enclosure, with an entry through the southeast corner (Figure 19b). Based on the fact that a layer of midden had accumulated around these additions, and that six new interior features were added to the originally constructed examples (Features A-3, A-10, A-11, A-13, A-14, and A-15), Feature A appears to have been occupied for a considerable time without substantial renovations or modifications.

The third and final episode of structural modification involved extending the west wall southward another 2.0 meters, effectively sealing the previous entryway. This extension also resulted in covering most of Feature A-15. At this same time, the east wall was also extended south an additional 2.0 meters until it reached the edge of a stone-faced terrace, and a vertical slab was set into the face of the



a. BUILDING EPISODE 1

b. BUILDING EPISODE 2

c. BUILDING EPISODE 3

Figure 19. a, b and c. SITE 2025, FEATURE A.

wall at the point where the new south wall joined the existing alignment (Figure 19c). The feature's final configuration, therefore, resembled that of a small rectangular enclosure containing 8.43 sq meters of surface area. A "courtyard" area was created in front (immediately south) of this enclosed area, and covered approximately 16.0 sq meters of surface area.

Perhaps the most unique attribute of this particular structure is represented by the fourteen interior features, the majority of which represent basin-shaped pits filled with dark, organically stained soil. Most of the pits exhibit no sign of fire (i.e., ash, charcoal, or oxidized soil) and are not believed to represent hearths. Rather, they appear to have been utilized for cooking, with hot stones being the heat source. The four hearths identified with this structure are all completely or partially rock-lined and contain substantial quantities of charcoal and, in two cases, exhibit oxidation of surrounding soil. Also recovered in or near the four hearths were numerous fist-sized basalt cobbles, many of which have been partially oxidized and/or fire-cracked.

Collectively, these several findings suggest that Feature A may represent a hale kahumu (oven shed) which was utilized for a number of years, most likely between about AD 1500-1600. This structure undoubtedly served the needs of a number of individuals occupying the nearby habitation features while engaged in intensive agricultural activities in the general area.

Site 2026, Feature A - Site 2026 is a relatively small, rectangular, stone-walled enclosure located north of Transect 7 along the western boundary line of the project area. The feature occupies the east end of a small ridge at an elevation of 785 ft above sea level, and was first identified during the intensive ground survey work. The enclosure extends 2.9 m north-south by 3.0 m east-west, and encloses approximately 7.4 sq meters of surface area. The east, west, and south walls were generally similar in size and construction, reaching a maximum height of 0.95 m and a maximum width at the base of 1.25 m. The north wall was somewhat higher and broader at the base, reaching a maximum of 1.50 m above current ground surface and averaging 1.35 m at the base. The interior wall faces appear originally to have been near vertical, based on an examination of the lower courses of stones; however, subsequent disturbance by kiawe trees nearly destroyed entire segments of perimeter wall. The core of the wall was comprised of loosely piled cobbles.

The additional work conducted during the present project involved extensive vegetation clearing, preparation of a

detailed plan map, and excavation of a 1.0-meter-wide trench encompassing approximately one-third of the interior space and located within the interior's western portion (Figure 20). All recovered material was passed through 1/8" mesh, and examination of the resultant trench profile revealed two cultural layers separated by an alluvial lenses of brown clay.

Layer I represents the non-cultural, organic duff zone which was removed with hand trowels but not screened. The deposit averaged 4 cm thick.

Layer II was encountered immediately beneath the duff zone and consisted of medium brown silty clay loam averaging about 12 cm thick. The deposit was homogeneous, moderately compacted, and contained a narrow range of cultural material including fragments of faunal bone, kukui nut shell, marine shell fragments, coral fragments, and occasional basalt flakes and charcoal flecks.

Layer III consists of an alluvial deposit of reddish-brown clay containing no cultural material. It has been hypothesized that water percolating through the north wall transported this soil into this area through a cut in the subsoil made by the original inhabitants at the time the feature was constructed.

Layer IV is a second layer of dark brown, moderately compacted silty clay containing cultural material virtually identical to that encountered within Layer II. With a maximum depth of 0.28 m, this deposit had accumulated on the original occupation floor within the feature.

No hearth or other features were encountered within the excavated portion of the enclosure. The compacted nature of the soil underlying both Layers II and IV suggest two separate living surfaces, a finding duplicated at most of the other habitation features examined during the present project.

Although no temporally diagnostic implements, and in fact no formed artifacts of any type were recovered, sufficient charcoal was collected to return two carbon-based age ranges. Both recovered from Layer II, one suggested occupation between AD 1900-1955, and is not substantiated on the basis of other lines of evidence. The second date suggested use/occupation sometime between AD 1640 and 1900. In view of the absence of historic cultural materials, the earlier end of this range is most likely to accurately reflect the actual time period of deposition, and thus the range can be narrowed to sometime between about AD 1640 and 1800.

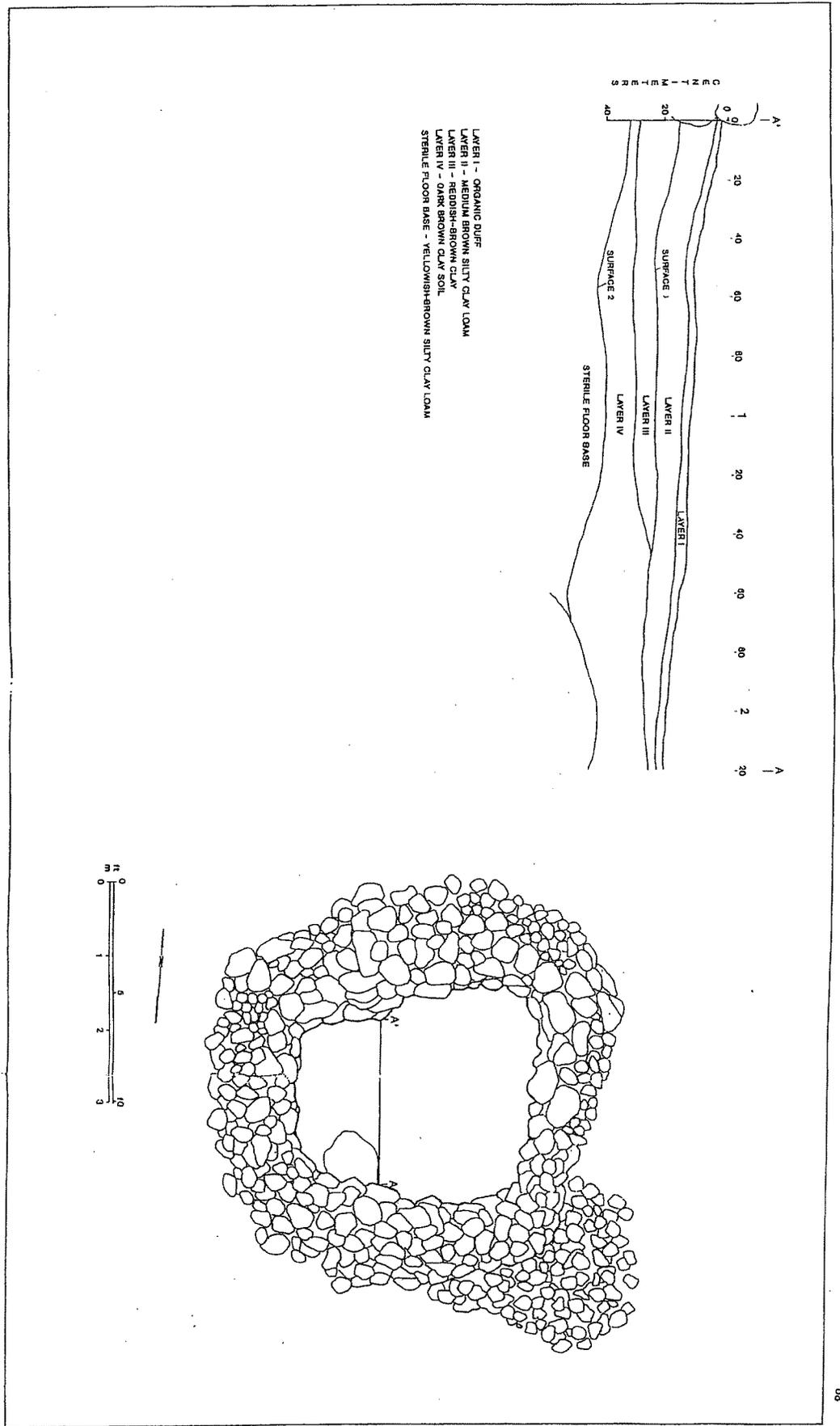


Figure 20. SITE 1026, FEATURE A

The depth of the midden which had accumulated above the two identified living surfaces (Floors 1 and 2 in Figure 20) indicates that this feature may have been utilized over a considerable period of time with but a single hiatus in occupation. During the period of abandonment, Layer III was deposited to an average depth of nearly 8 cm. Unfortunately, the dating results were not sufficiently discrete to establish age ranges for both episodes of occupation.

Site 2027, Feature A - Feature A at Site 2027 represents one of the larger habitation features identified within the project area. Consisting of a stone-walled enclosure encompassing an area of approximately 186 sq meters, the structure had been constructed north of Transect 7 on top of a low knoll at an elevation of 725 ft above sea level, at the east end of an east-west trending ridge that separates two ephemeral drainages. Numerous agricultural features, including in particular low terraces and small planting plots, are located in the immediate vicinity of this enclosure.

Somewhat amorphous but generally oval in plan (Figure 21), the primary walls of the enclosure appear originally to have been vertically faced on both interior and exterior surfaces. These faces were constructed by stacking waterworn basalt cobbles in uneven courses. The space between the faces was then filled with piled basalt pebbles and cobbles. In many places around the perimeter, natural boulders had been left in place to form part of the wall. This is especially evident along a portion of the west wall, where several natural boulders were utilized as the foundation for a raised platform or terrace. At the south end of this raised platform, a 3.0 meter-long, cobble-lined pathway was constructed, along both sides of which are small cleared areas which generally resemble planting plots. Near the center of the west wall is a cupboard, 0.7 m wide and 1.0 m deep. This cupboard feature separates the raised terrace into a smaller north segment and a larger south segment. Two small basin-shaped hearths were found on the prehistoric occupation surface directly in front of the cupboard. The occupation surface within the enclosure slopes gently to the east at the rate of approximately 5 cm per meter of lateral distance: thus, the surface at the base of the cupboard and along the west wall averages approximately 1.0 meter higher than the occupation surface at the base of the eastern wall. However, the rate of descent is not even, and the flattest areas within the enclosure are located within the feature's eastern third. For this reason, and on the assumption that a wider range of domestic activities might therefore have been undertaken within this area, most of the excavation work was concentrated here.

The initial step in evaluation involved complete vegetation clearing and preparation of an accurate plan map. Following this work, a series of test trenches and pits were excavated within the flatter, eastern portion of the enclosed space. This work was followed by excavation of a series of contiguous 2.0 meter-square test units (areal exposures), additional 1.0 meter-square test units at widely scattered locales, and finally by excavation of a 1.0 m by 9.75 meter-long trench roughly parallel with the long axis of the enclosure and extending from the foot of the terrace to the east wall (see Figure 21 for location). The objective of initial trenching and single 1.0 meter-square unit excavation was to attempt to expose stratigraphic sequences and evaluate midden and portable artifact content at different locations. Areal excavations, including the long east-west trench through the approximate center of the enclosure, were undertaken in order to expose entire features and/or to increase sample size in areas which initial trenching had identified as being most productive.

Stratigraphy: Two slightly different stratigraphic sequences were evident within unit and trench profiles. One of these can be said to characterize the eastern 1/2 of the enclosure within which a coarse surface pavement of stones was observed. The second sequence characterizes the remaining portion of the enclosure, which lacked evidence of surface paving.

Eastern Half of the Enclosure - Paved Area: The eastern half of the enclosure contained three separate layers, including a duff zone, a stone surface pavement containing cultural material, and a sterile substrate located immediately beneath the pavement, as follows:

Layer I is the layer of duff that has accumulated in and around Feature A since abandonment. The layer seldom exceeded 10 cm depth, and was composed of organic material in various stages of decomposition. Several historic-era bottle fragments were recovered from the surface of the duff, but were not associated with the remainder of the feature's cultural material—i.e., with the prehistoric component.

Layer II consists of waterworn pebbles and small cobbles which had been purposefully set and rough-sorted so that the larger examples were placed first followed by the smaller ones. This pavement ranged from 0.10 to 0.30 m thick and appears to have covered most of the area east of the southern terrace segment. Almost all of the portable artifacts and midden collected from this site were recovered from this

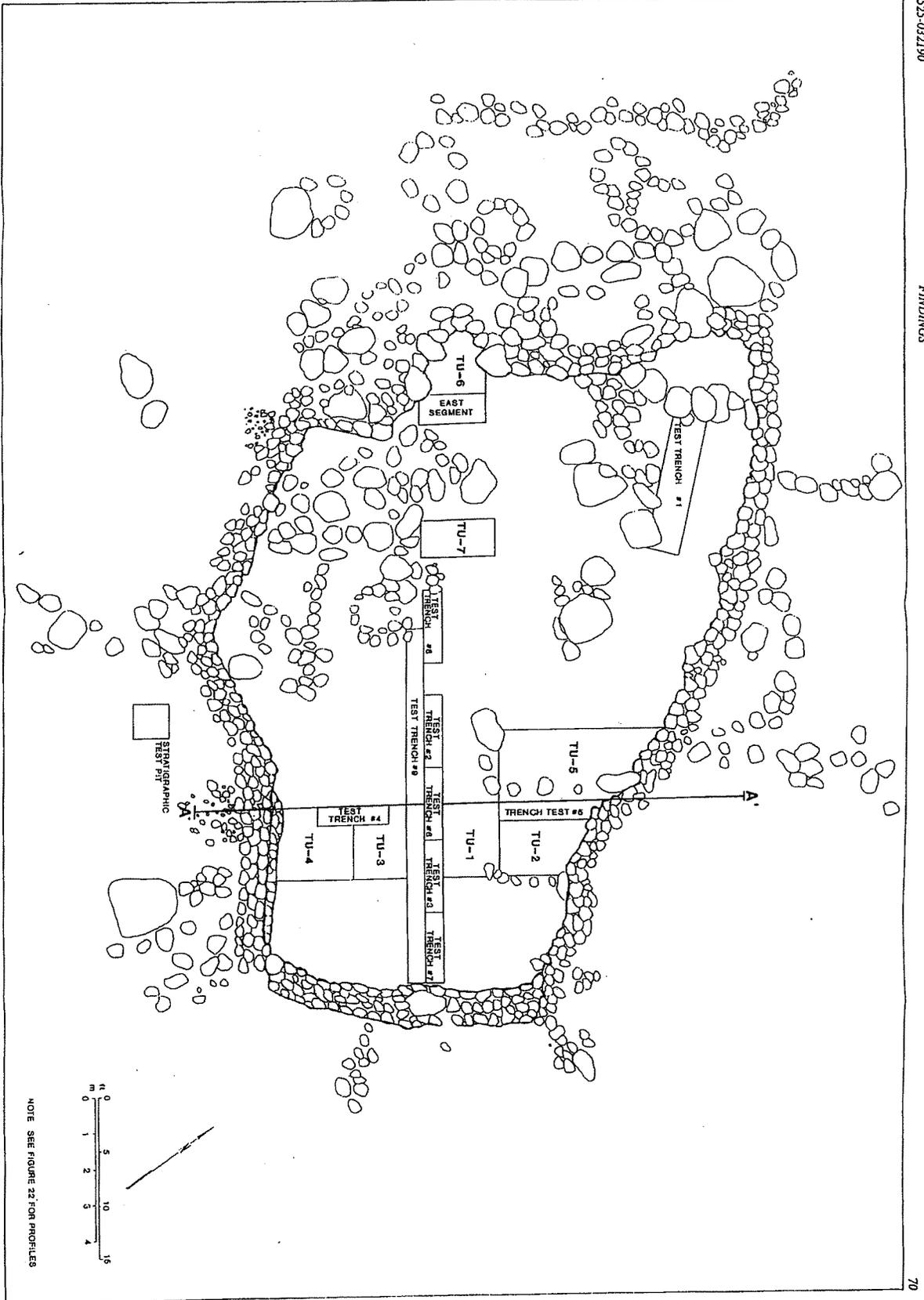


Figure 2. SITE 2027, FEATURE A, PLAN VIEW

layer. The soil matrix observed between the stones consisted of a light brown silty loam containing occasional midden items, including marine shell, faunal bone, and kukui nut shell fragments, and a few portable artifacts.

Layer III consists of a light brown, loosely compacted, silty clay matrix located between large and small cobbles of waterworn basalt. This material is non-cultural in derivation, and represents a natural colluvial deposit.

Western Half of the Enclosure - Non-Paved Area: In the northwestern quadrant of the enclosure (which incorporates approximately 38 sq meters of surface area) no paving stones were found. Here, three distinct layers were exposed, including a duff zone (Layer I), followed immediately by a cultural layer containing portable artifacts and midden remains (Layer II), and finally by the culturally sterile substrate (Layer III). The Layer II cultural component, which averaged 8 cm thick, lacks the paving stones identified within the eastern area, and instead is comprised of a dark brown, loosely compacted silty loam with a few basalt cobbles. Occasional midden remains were recovered from the layer, although the density of cultural material was quite low, averaging less than 1 item per 0.10 cubic meters of screened deposit.

Both stratigraphic sequences are illustrated in Figure 22.

Structural Features: Three subfeatures were identified within the enclosure, including two hearths and one cupboard located in the face of the west wall. Only the cupboard was observed prior to initiation of excavation, but excavation was utilized to further define and exposed all three. Figure 23 illustrates the relative position and configuration of stones comprising all three of these features, which were labeled A-1 through -3 for map and figure reference.

Hearth feature A-1 was oval in plan view, basin-shaped in cross section, and situated 1.1 meters east of the cupboard opening near the western end of the enclosure. The eastern and southern margins of the feature were defined by natural basalt cobbles, while the western and northern perimeters were defined only by discolored soil. The hearth measured 0.75 m in length by 0.28 m in width, and extended a maximum of 10 cm below the surrounding ground surface. Recovered fill consisted of a dark brown to black silty loam containing a small quantity of charcoal bits and fragments and slightly oxidized soil.

Hearth feature A-3 was located 0.40 m north of A-2, and was also oval in plan view and basin-shaped in cross

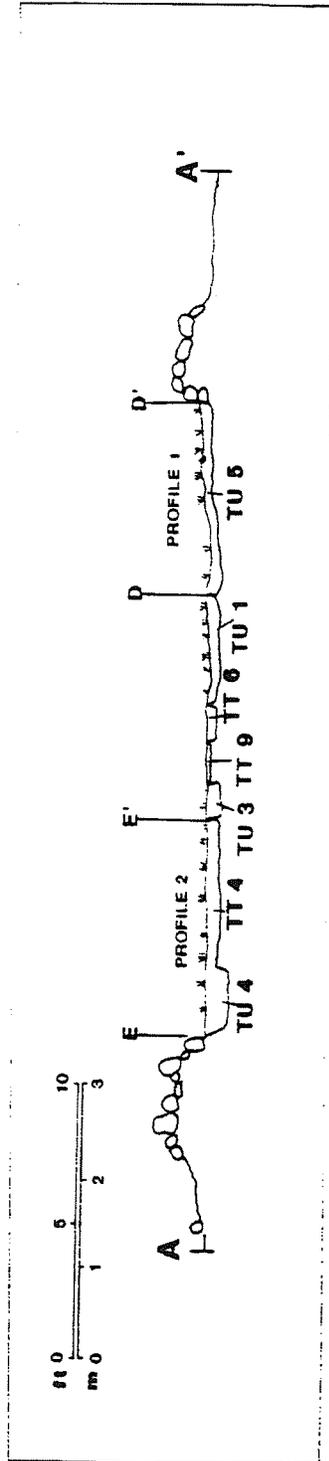
section. In terms of overall dimensions and recovered fill, this feature was essentially identical to A-1.

Feature A-2 represents the cupboard which had been constructed in the face of the west wall of the enclosure. Approximately 1 cubic meter of storage space had been created by eliminating rubble fill from a portion of the exterior enclosure wall. Three large, fairly flat stones were set over three natural boulders protruding from the culturally sterile substrate, and not filling in the irregularly shaped intervening space. The cupboard is exposed to the east, and was thus accessible from the interior of the enclosure from a point located near the elevated platform. The fill recovered from the interior of the cupboard consisted of a layer of dark brown silty loam 20 cm deep covered by a layer of forest litter ranging from 5 to 15 cm deep. The floor of the cupboard had been excavated to a depth of c. 10 cm below the occupation surface located immediately outside (i.e., to the east).

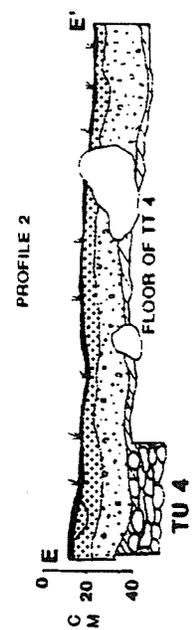
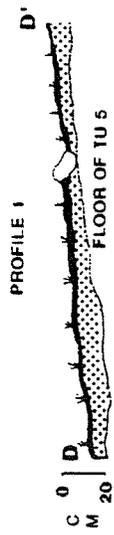
Radiocarbon Dates: Three dating samples were recovered during excavation and submitted for radiometric analysis. One of these contained insufficient carbon to yield reliable results [Sample #486], but the remaining two returned the following results: Sample #485 (Feature A enclosure, Layer II), indicating use/occupation between AD 1528 to 1556, 1630 to 1955; Sample #487 (Feature A-3, cupboard), indicating AD 1460 to 1955. In the absence of any evidence that Feature A and its associated subfeatures were initially constructed in or utilized through the historic era, the historic ends of the above ranges can be dismissed, resulting in the conclusion that Feature A was most likely occupied during the mid-16th century, and perhaps through the 17th century. These results conform generally with the findings at several of the other habitation features dated with radiocarbon techniques, as summarized more fully below in the Conclusion section of this report.

In contrast to some of the other habitation features excavated within the project area, Feature A at Site 2027 contained evidence of only a single episode of occupation. Contained in Layer II, this evidence consists of a pavement of pebbles and cobbles in association with occasional portable artifacts (primarily unmodified flakes of basalt) and midden remains in the eastern half of the enclosure. In the western and northwestern portions of the enclosure, evidence of occupation is also contained in Layer II, although here the recovered materials consist of very occasional basalt flakes and midden remains not associated with a surface paving.

As per the findings at other project area features, Feature A yielded only very small quantities and a very



- DUFF
- ▨ LAYER I - DARK BROWN LOAMY-CLAY WITH SOME ORGANIC DEBRIS
- ▩ LAYER II - DARK GRAYISH-BROWN LOAMY CLAY WITH 80-90% BASALT COBBLES
- ▧ LAYER III - LIGHT BROWN LOOSE SILTY-CLAY WITH 86% SMALL-MEDIUM BASALT COBBLES



NOTE SEE FIGURE 21 FOR LOCATIONS OF PROFILES

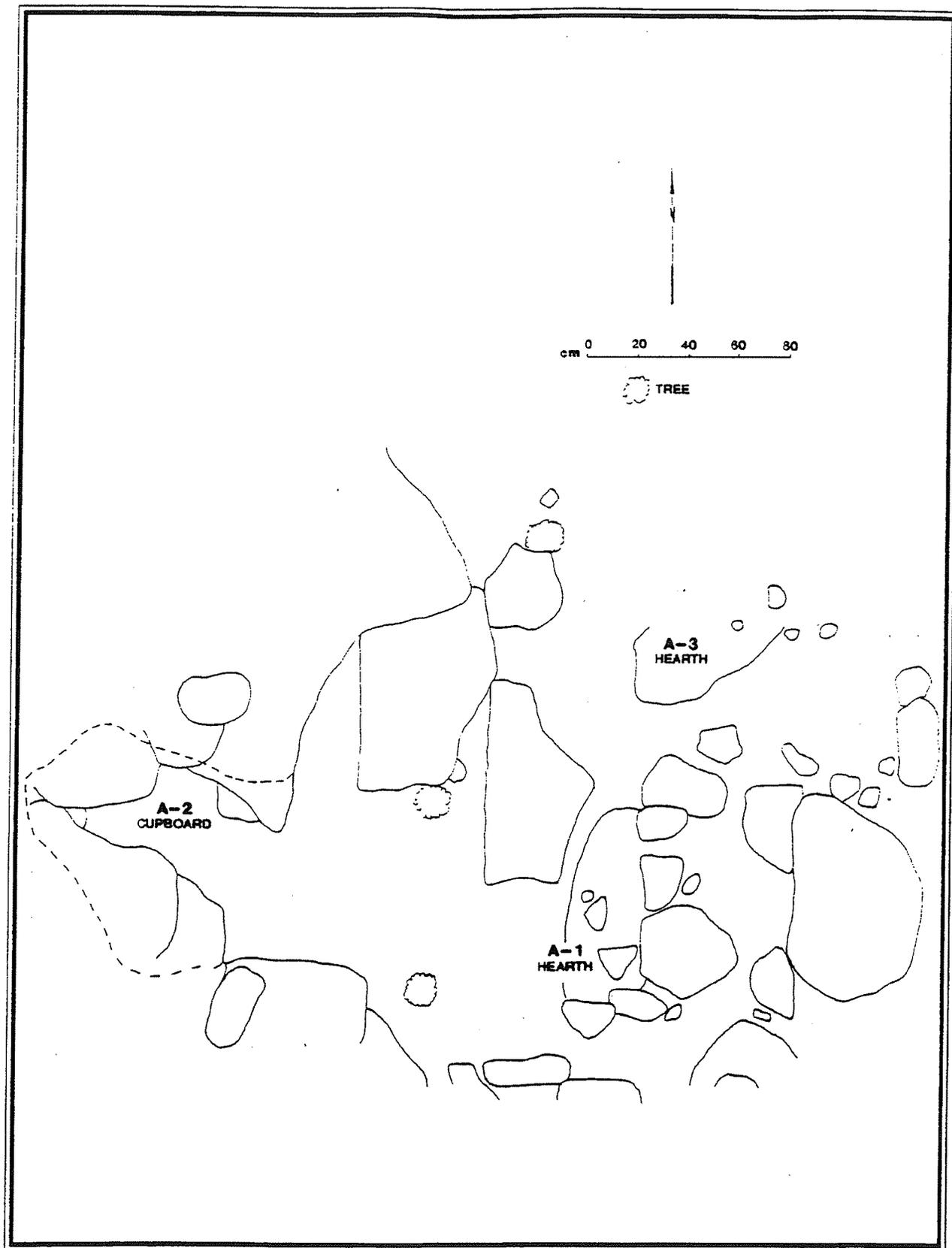


Figure 23. SITE 2027, FEATURE A, SUBFEATURES 1-3

narrow range of portable cultural objects and midden. Tabulated recovery results indicate that while all but one of the six excavated units and all but two of the nine excavated trenches yielded midden remains, the grand totals are striking in terms of the small quantities of material recovered in relation to the volume of material excavated. The total weight of recovered midden was only 52.24 grams, of which slightly more than 43% represented marine gastropods and an additional 5% marine bivalve remains (Veneridae), 34% represented fragmentary vertebrate bone (principally unidentified small mammal bone), and c. 18% represented kukui nut shell fragments. Recovered artifacts reflect equally low densities and restricted representation of type categories. Of the total of 26 artifacts recovered from all excavation units and trenches, eight (or c. 31%) represent whole or fragmentary bottles dating to the mid-1800s or later. All of these items were recovered from the duff zone and were not found in association with the prehistoric remains within Layer II. Their presence on the surface

indicates transient historic-era visitations to the site area, most likely by cattle herders and others periodically working in the vicinity. The remaining 18 items comprise the entire prehistoric artifact assemblage recovered during excavation, and are represented by unmodified basalt flakes (16 examples) and minimally worked basalt flakes, possibly representing adze fragments (two examples).

Collectively, these results contribute little positive data by means of which to further define the range of activities engaged in while occupying this site. Interpreted as "negative evidence", however, these same findings would seem to clearly establish that the prehistoric occupants were concentrating their efforts and focusing their attention almost exclusively on agricultural work activities with minimal embellishment of domestic life. This, of course, is also confirmed by the virtual "carpet" of non-occupied agricultural features which characterize the present project area.

DATA ANALYSES

A variety of ecofactual remains, indigenous and non-indigenous artifacts, and miscellaneous items, were recovered during excavation. In addition, several charcoal samples (some recovered in bulk) were submitted for radiometric dating analysis, and pollen collected from trench profiles was submitted for specialized evaluation. Summary information relating the general results of recovery and analysis of these classes of items has already been presented in the discussion of individual sites and features. The present section provides additional detail, as well as tabulated summaries and further analysis of this material.

ECOFACTUAL REMAINS

The ecofactual remains recovered during the present project consist of marine invertebrates (primarily gastropods and bivalves), vertebrates (fish, mammalian and avian specimens), and vegetal remains (primarily kukui and charcoal).

Distribution of midden was uneven throughout the project area. In all cases where midden was encountered, the absolute quantities were relatively low in relation to the level of excavation undertaken. As was expected, very little material was recovered from the test trenches and test units within the general site area, which was apparently utilized primarily for agricultural activities; a wider variety of items and in relatively larger quantities was encountered during excavation of individual features. Table 11 summarizes the variety and distribution of ecofactual remains for Trenches 1-9 and Test Units 1-6 (Site 2027).

With the objective of further evaluating feature function, the distribution of primary midden constituents among those features which yielded significant quantities of such remains (Site 2023 and 2024) was compared (Table 12). Included in the table are rows which present the percentage of occurrence of marine invertebrates, bird, fish, mammal, kukui nut shell, and coral and waterworn shell fragments. An examination of the Table 7 indicates a rather substantial disparity among features in terms of the percentages of midden constituents represented. In particular, two of eight features listed under "All Data" (Site 2023, Feature F, two contiguous C-shapes, and Site 2024, Feature A, a single C-shape) yielded mammal bone only; in both cases the material came primarily from the surface and apparently represents historic deposition.

These two features were then deleted from a second compilation of data. This latter grouping includes Feature I at Site 2023 (a rectangular enclosure with associated terrace), and Features B, D, E, G, and H at Site 2024 (consisting, respectively, of an oval enclosure, a rectangular enclosure, an oval enclosure, a circular to C-shaped enclosure, and a C-shaped enclosure). These features represent the range of habitation feature types identified within the overall project area, and yielded c. 90 percent of all portable cultural material (including midden and artifactual materials) recovered during excavation. The tabulated data for these six habitation features was then converted to bar graph form (Figure 24). Examination of the figure suggests that Features E and G of Site 2024 are most similar to one another (see arrows in Figure 24) in terms of shared midden constituents, and that Features E and G share more similarities with Feature D than Feature D shares with any of the others. All three of these features represent roughly equivalent-sized enclosures, ranging from C-shaped through oval or circular to approximately rectangular in plan view. In addition to similarity expressed in terms of percentages of occurrence of midden remains, all were discovered to be more or less equivalent in terms of the gross volumes of material recovered. Feature E (including all of this feature's subcomponents) had a very small quantity of midden recovered; the total weight of all marine invertebrate remains was 4.75 grams, while all of the ecofactual remains from this feature "complex" totaled only 10.7 grams. Both subcomponents at Feature G yielded nearly four times this quantity (in weight), but even with this multiplier the total weight is only 38.95 grams.

The midden yield at these temporary habitation feature at Waikapu seems to suggest that use of individual features involved a very small population for short durations, during which minimal contact was maintained with other major environmental zones, i.e., the coastal areas. That primary attention while occupying these small habitation areas was focused elsewhere is also documented by the immense array of agricultural features which surround each of these features; collectively, these agricultural features document substantial labor outlays by the resident population during periods of use/occupation within this locale.

RESULTS OF POLLEN ANALYSIS

With the objective of further evaluating feature function and economic activities undertaken within the area, the

Table 11.

DISTRIBUTION OF ECOFACTUAL REMAINS FOR SITE 2027

Midden Category	Site T-20 (2027)				Midden Total	Percent Total
	I	Percent	II	Percent		
MARINE INVERTEBRATES						
<i>GASTROPODS</i>						
Cypraeidae	4.29	21.17%	4.41	13.79%	8.70	16.65%
Turbinidae	0.38	1.88%	-	0.00%	0.38	0.73%
Thaididae	3.20	15.79%	4.40	13.76%	7.60	14.55%
Conidae	-	0.00%	5.89	18.42%	5.89	11.27%
SUBTOTAL GASTROPODS:	7.87	38.85%	14.70	45.97%	22.57	43.20%
<i>BIVALVES</i>						
Veneridae	-	0.00%	2.31	7.22%	2.31	4.42%
TOTAL MARINE INVERTEBRATES:	7.87	38.85%	17.01	53.29%	24.88	47.63%
VERTEBRATES						
Bird bone (eggshell)	-	0.00%	3.29	10.29%	3.29	6.30%
Fish bone	-	0.00%	0.31	0.97%	0.31	0.59%
Mammal bone	11.87	58.59%	0.01	0.03%	11.88	22.74%
SUBTOTAL VERTEBRATES:	11.87	58.59%	5.92	18.51%	17.79	34.05%
VEGETAL						
<i>Aleurites moluccana</i>	0.52	2.57%	9.05	28.30%	9.57	18.32%
TOTAL:	20.26	100.00%	31.98	100.00%	52.24	100.00%

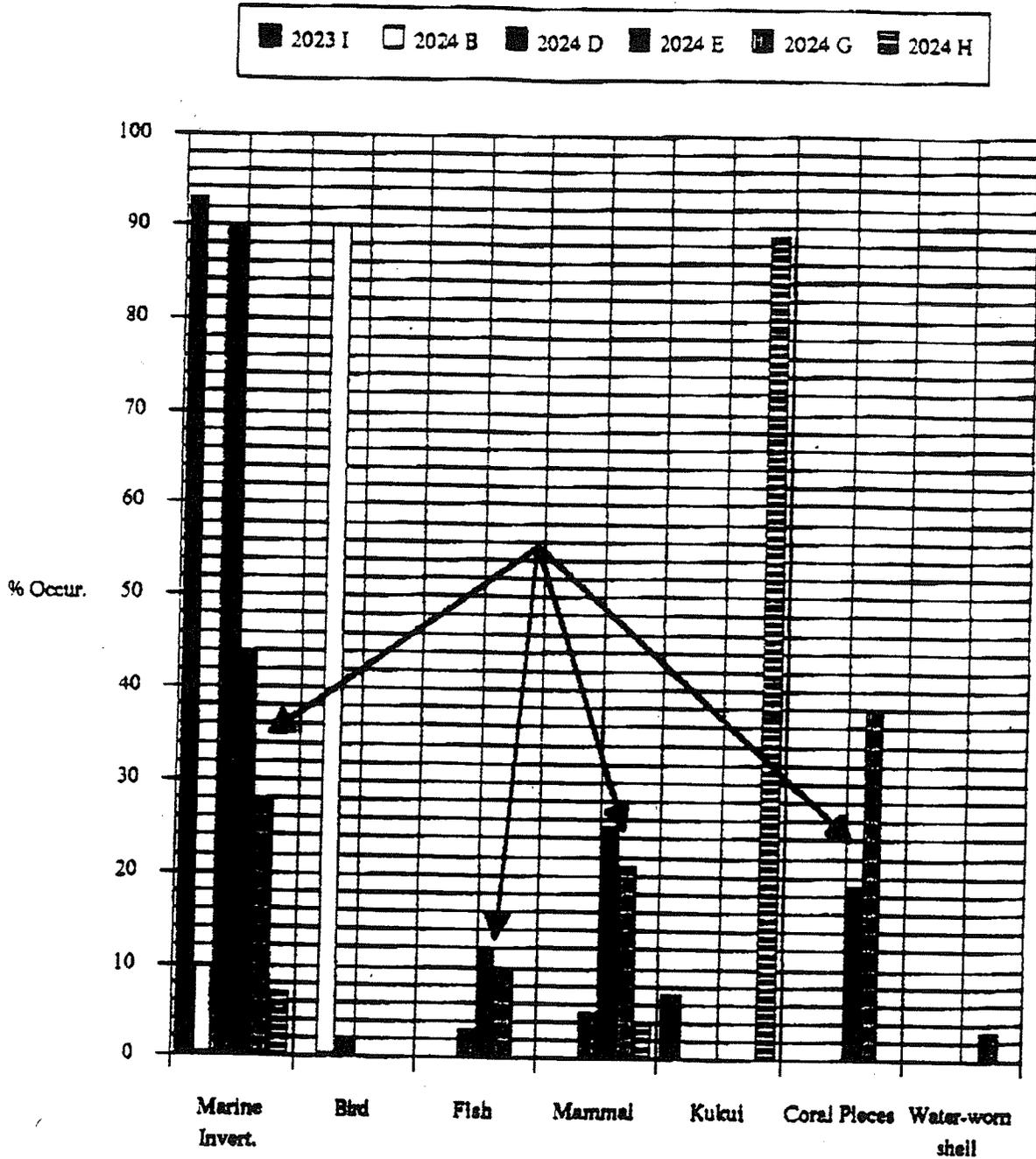
Table 12.

COMPARISON OF ECOFACTUAL AND
NON-ECOFACTUAL REMAINS BY FEATURE AND SITE

	Site 2023			Site 2024				Total	Total	Total	
	Feature			Feature				for Site	for Site	for	
	F	I	A	B	D	E	G	H	2023	2024	Trenches
ALL DATA											
Marine Invert.	0	93	0	10	90	44	28	7	6	50	50
Bird	0	0	0	90	2	0	0	0	0	1	7
Fish	0	0	0	0	3	12	10	0	0	6	2
Mammal	100	0	100	0	5	25	21	4	93	12	24
Kukui	0	7	0	0	0	0	0	89	1	15	20
Coral Pieces	0	0	0	0	0	19	38	0	0	15	0
Water-worm shell	0	0	0	0	0	0	3	0	0	1	0
	I	B	D	E	G	H					
GRAPH DATA											
Marine Invert.	93	10	90	44	28	7					
Bird	0	90	2	0	0	0					
Fish	0	0	3	12	10	0					
Mammal	0	0	5	25	21	4					
Kukui	7	0	0	0	0	89					
Coral Pieces	0	0	0	19	38	0					
Water-worm shell	0	0	0	0	3	0					
* Percentages rounded off to nearest whole integer. See text for discussion of "all data" and "graph data"											

Figure 24.

DISTRIBUTION OF ECOFACTUAL AND NON-ECOFACTUAL MATERIALS BY FEATURE



eight trenches excavated through agricultural feature areas were sampled stratigraphically for pollen by PaleoResearch Laboratories, Lakewood, Colorado. This research (Appendix B) yielded the following general results.

The greatest diversity of pollen spores was discovered within Trenches 1, 2, and 8; rather than necessarily indicating greater absolute deposition, it appears that there may simply have been more destruction of the original record within Trenches 3, 4, 5, 6, and 7. The pollen profile (see Table 2, Appendix B), indicates that the most likely crops grown along the agricultural terraces within the project area were tree crops. Pecans were planted and allowed to grow at least until they produced flowers and possibly nuts, while either breadfruit, paper mulberry, and/or related weedy plants appear to have been grown within the vicinity of Trenches 1 and 2. The presence of Myrtaceae pollen in Trenches 2 and suggests that areas upwind may have been the focus for planting guava or Java Plum. In addition, avocado trees appear to have been planted in the vicinity of Trench 2, although apparently on a small scale. Lastly, sweet potatoes were likely cultivated in the vicinity of Trenches 1 and 2, or alternatively, the spores reflect represented related agricultural weeds, such as morning glories. The latter seems least likely, however, as many of the stone agricultural features identified within the vicinity of Trenches 1 and 2, and elsewhere within the project area, are morphologically identical to features observed ethnographically and today for supporting and growing the vines of this important food crop.

While the pollen record documents a range of crops which may have been cultivated in this area, the types of crop being produced may help explain the absence of significant quantities of midden within the area's habitation features. It is likely that subsistence while occupying the area was derived at least in part from the crops being produced. However, many of these would not be easily detectable within the archaeological record. Thus, the estimate of short duration, ephemeral occupation, suggested on the basis of the paucity of "typical midden remains" (discussion above), may underestimate the extent to which agricultural crops were utilized within the area. In support of this contention are the rather extensive subfeatures, believed to represent cooking and storage facilities, documented at Feature A (Site 2025) and Feature I (Site 2026).

INDIGENOUS ARTIFACTS

Five project area sites yielded a total of 131 indigenous artifacts (Table 13). As with the results observed with

respect to midden, the density of these items was very low in relation to the level of excavation undertaken, while the range of tool types was quite restricted. In fact, the yield per excavated feature was so low that discussion of the distribution of this material within the context of individual features is essentially meaningless, except to note that the greatest productivity was achieved in Feature E-3 at Site 2024 where a total of 37 indigenous items were recovered. However, even in this instance, 36 of the 37 items represent unmodified flakes of basalt, while the remaining item is an unmodified flake of volcanic glass. The results at Feature E-3 generally reflect the overall findings for the project area. Examination of the column for "Grand Total" in Table 13 indicates that of the 131 indigenous items recovered, 122 (or c. 93 percent) represent either basalt cores or flakes, or unmodified flakes of volcanic glass. The remaining nine items include but a single non-utilitarian object (an *ulu maika* of coral recovered from Level 1 of Feature A at Site 2025), and eight utilitarian implements, each represented by a single item, four of which represent adze fragments or preforms, one a utilized flake of basalt, one a formed scraper of basalt, one a unifacially worked flake of basalt, and the final item a polished basalt whetstone.

These results conspire with the findings from midden analysis to suggest that occupation of the area was undertaken on short-term basis by a very small group of people. It is possible, however, that longer-term occupation of the area actually occurred, with the occupants attention being focused primarily on activities outside of and away from the small habitation features from which the above cultural material was recovered. Indeed, this latter interpretation seems likely, in view of the very extensive nature of the agricultural features distributed throughout the present project area. Moreover, primarily subsistence reliance on products being grown in the project area would have resulted in a diminished artifactual inventory and could as well have resulted in minimizing the accumulation of midden at habitation features.

NON-INDIGENOUS ARTIFACTS

In addition to the 131 items indicative of indigenous use and occupation, a total of 309 items were recovered which reflect historic-era activities and or presence. These items are also identified as to provenience within Table 13, which indicates that three separate features at two sites yielded most of this material. At Feature F of Site 2023, 65 fragmentary glass sherds were recovered from the surface/duff zone, representing approximately 21 percent of the total non-indigenous items recovered during excavation. Feature I at Site 2023 also yielded a significant historic component from Layer I only, consisting of 93 glass sherds,

Table 13. (cont.)

CATEGORY	SITE 2025		SITE 2026		SITE 2024			Grand Total
	Total		Total		Total			
	A	II	A	II	A	II	III	
INDIGENOUS								
RECREATION								
Ulumaika (coral)	-	1	-	-	-	-	-	1
TOOLS								
Adze (basalt)	-	-	-	-	-	-	-	1
Preform fragment	-	-	-	-	-	-	-	1
Adze fragment	-	-	1	-	-	-	-	1
Polished flake	-	-	1	-	-	-	-	1
Flake w/usewear (basalt)	-	-	1	-	-	-	-	1
Scraper (basalt)	-	-	-	-	-	-	-	1
Uniface (basalt)	-	-	-	-	-	-	-	1
Whetstone (basalt)	1	-	1	-	-	-	-	1
Subtotal Tools:	1	1	3	3				8
FLAKED STONE								
Core (basalt)	-	-	-	-	-	-	-	1
Flake (basalt)	3	1	4	2	1	3	4	16
Subtotal Flakes Stone:	3	1	4	2	1	3	4	16
VOLCANIC GLASS								
UNCERTAIN FUNCTION								
Modified basalt	-	-	-	-	-	-	2	2
TOTAL INDIGENOUS:	4	2	4	10	6	1	7	18
NON-INDIGENOUS								
GLASS								
Bottle -	-	-	-	-	-	4	-	4
Sherds -	-	-	-	-	-	3	1	4
Subtotal Glass:						7	1	8
CERAMIC								
Sherds -	-	-	-	-	-	-	-	2
PLASTIC								
Comb tooth	-	-	-	-	-	-	-	3
METAL								
Pocket knife fragment	-	-	-	-	-	-	-	1
Straight pin	-	-	-	-	-	-	-	1
Unident. fragments	-	-	-	-	-	-	-	4
Subtotal Metal:								6
TOTAL NON-INDIGENOUS :						7	1	8
TOTAL ARTIFACTS:	4	2	4	10	6	1	7	26

as well as a pocket knife fragment and four unidentifiable metal pieces. These 98 items represent approximately 32% of the non-indigenous assemblage recovered during the present project. Lastly, Layer I of Feature E-3 at Site 2024 yielded a total of 130, or c. 42 percent of the project area's 309 non-indigenous items. Combined, these three features (Features F and I at Site 2023, and Feature E-3 at Site 2024) yielded 301 of the total of 309 non-indigenous items recovered. The remaining eight non-indigenous items were distributed among the remaining excavated features, as indicated within Table 8.

Although most of the items recovered represent very small and non-diagnostic glass sherds, it was possible to further characterize, identify, and in some cases tentatively date several of the recovered specimens, as follows.

Site 2024, Feature E-3, Level Ia: At this locale, two ceramic bottle rim sherds were recovered (Artifacts 33 and 34) which were embossed "Tiger Whiskey" and have been linked with Chinese distribution during the period 1880-90 (Garland et al. 1985: Table 9). This same feature yielded two additional glass sherds (Artifacts 38 and 39), which represent hand-blown "cased" bottles, estimated to post-date 1860 but generally to have gone out of use shortly after the beginning of the 20th century (Karen Kempton, pers. comm.).

From Site 2027, Feature A, several bottle sherds provided the following tentative dating estimates:

Artifact 71, a green bottle glass sherd, indicates use of a three-part mold, and a bare iron pontil mark was observed on the base. The three-piece mold construction technique suggests manufacture between about 1810 and 1890, while the pontil mark suggests a narrow time frame—between about 1845 and 1870.

Artifacts 72 and 73 represent dark green beer bottle glass basal sherds with a pontil scar on the base. Mid-to late-19th century is suggested on the basis of the pontil mark (Karen Kempton, pers. comm.).

Artifact 74 is an amber-colored bottle with "M G Co." embossed on the base. This insignia indicates manufacture by the Modes Glass Company sometime between the period 1880 and 1904 (Elliot and Gould 1988:6).

Artifact 75 is an aqua-blue beer bottle fragment, with the letters "L G Co" embossed on the base. The artifact was produced in a two-piece mold. The embossing and the manufacturing techniques suggest manufacture sometime between about 1845 and 1913 (Carter 1978).

Lastly, Artifacts 76 and 77 are both glass sherds exhibiting a kick-up base, and appear to identify a wine bottle dating to the mid-to late-19th century (Karen Kempton, pers. comm.).

Collectively, these items suggest possible historic-era use of and/or activities within the vicinity of the project area between the middle of the 19th century through the first decade of the 20th century. As will be noted below, these findings generally support aspects of the radiocarbon dating results. The occurrence of these historic-era items within the upper levels of the deposits, however, does not support the notion that most or even a significant number of the project area's features were constructed during the historic era. Rather, it appears that two or more of the small habitation features may have been first constructed during the historic period, or reconstructed on Native Hawaiian foundations during this time period; most of the habitation features and associated agricultural components, however, appear clearly to represent indigenous and largely if not exclusively prehistoric use/occupation of the area. Again, this latter assertion is based on the results of radiocarbon analyses of samples recovered from several of the habitation features, and is further supported, in part, on the basis of observations of stratigraphic sequence.

DATING RESULTS

Although too few specimens of volcanic glass were recovered to warrant analysis of hydration rim thickness and evaluation of dating "trends" on this basis, several radiocarbon samples were recovered (some in bulk form) from several excavated features. The results of these analyses have already been presented on a feature-specific basis in the discussion of individual sites/features. In this section, the results may be summarized in the context of a broader frame of reference (Figures 25, 26, and Table 14.).

Figure 25 displays the results of 15 of the radiocarbon samples which contained charcoal sufficient to produce reliable readings. The site/feature from which a particular sample was collected is identified adjacent to each of the calculated age ranges. Overall, these ranges suggest initial occupation of the project area shortly after AD 1500, with occupation continuing into the historic era. The possibility of multiple, discrete episodes of site use is also indicated in the distribution displayed in Figure 25. In order to further clarify these results, and particularly the latter possibility, the date ranges were clustered into "groups," the members of which displayed statistically significant overlap; a new range was then calculated for the resultant groups. These results are illustrated in Figure 26. An "early" group or cluster of dates suggest initial occupation between AD 1585

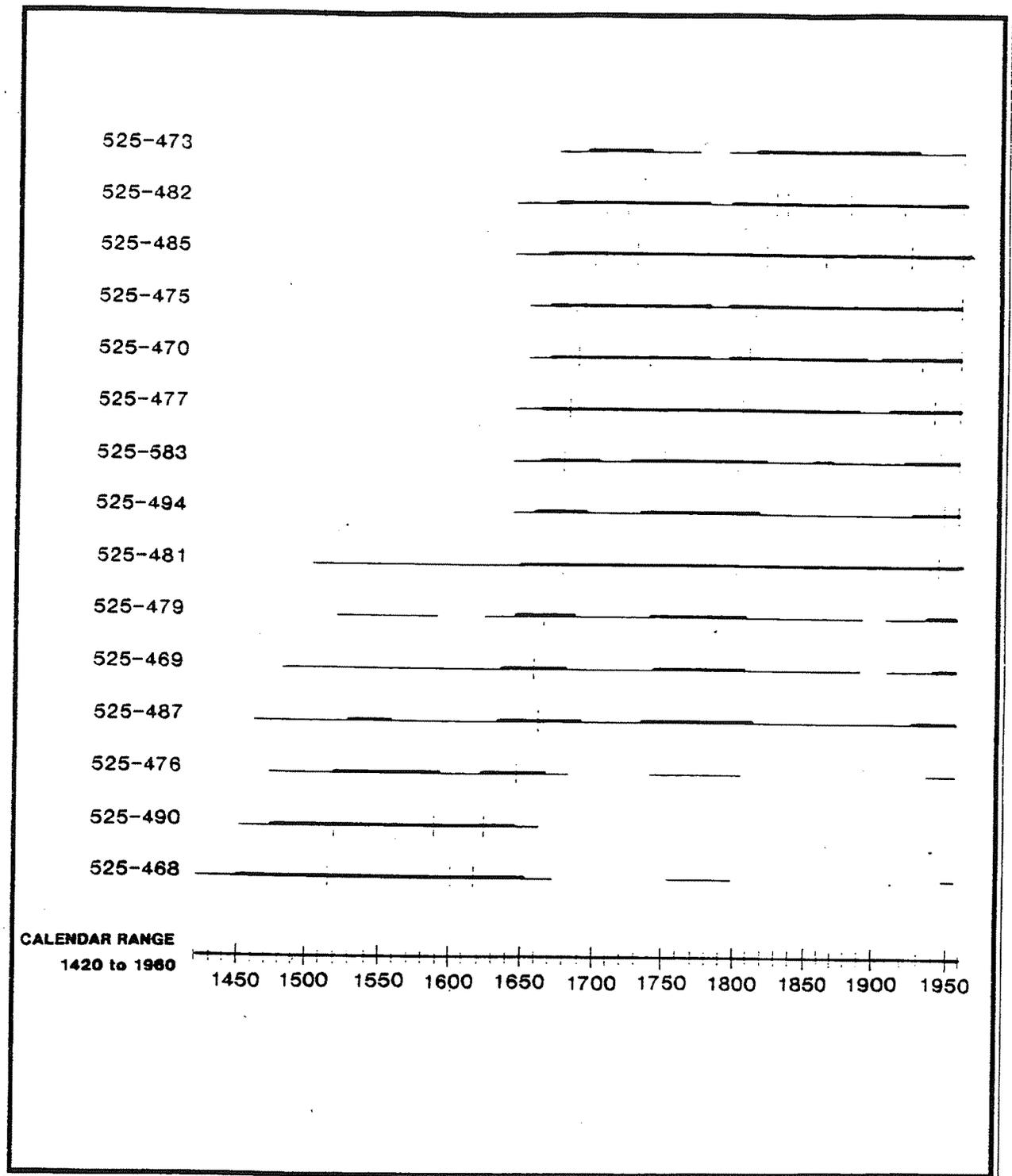


Figure 25. GRAPHIC DISTRIBUTION OF RADIOCARBON AGE RANGES

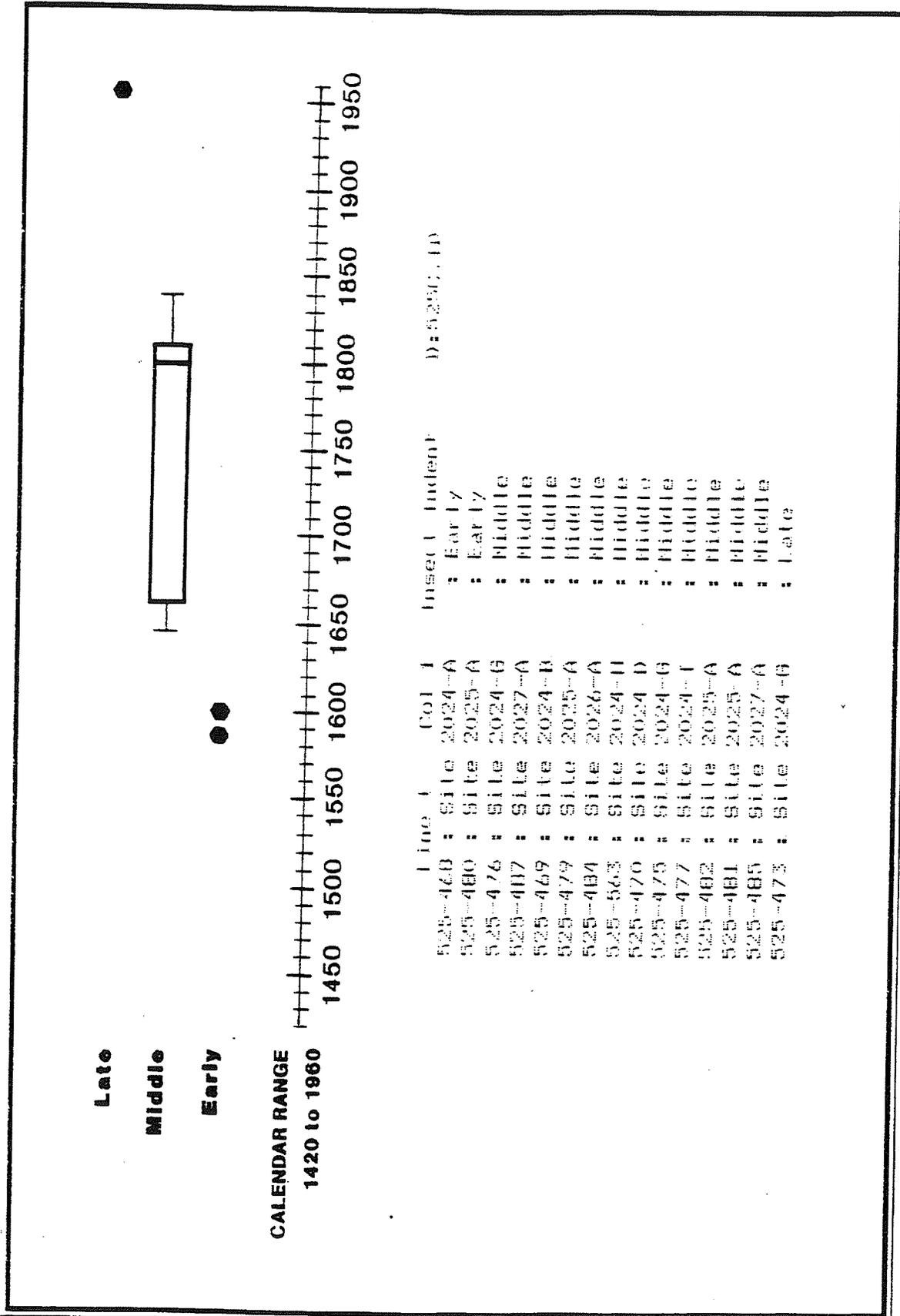


Figure 26. RADIOCARBON AGE RANGE CLUSTERS

Table 14.
SUMMARY OF RADIOCARBON AGE DETERMINATIONS

PHRI Lab.No. RC-	Lab. No. BETA-	Provenience	C-14 Age Yrs. B.P. (one sigma)	C-13/ C-12 Ratio	C-13 Adjusted C-14 Age Yrs. B.P.	*Calendric Range Yrs. AD
<i>SITE 2023</i>						
467	30711	Feature I, TT-1, Layer II	102.2±0.9% Modern	-20.2	101.2±0.9% Modern	----
<i>SITE 2024</i>						
468	30712	Feature A, TT-1, Layer I, 0-10 cmbs	340±80	-24.8	340±80	1420-1670 1752-1796 1944-1954
469	30713	Feature B, TU-1, Layer I	210±70	-23.9	230±70	1480-1890 1907-1955#
470	30714	Feature D, OS-2, NE quad, 40 cmbs	100±50	-22.6	140±50	1650-1955#
471	30715	Feature E-3a, Layer I	----	----	----	Insufficient Carbon
472	30716	Feature G, West 1/2, Layer III	100.3±0.7%	-24.2	100.2±0.7%	----
473	30717	Feature G, West 1/2, Layer III	60±50	-24.3	70±50	1674-1749 1800-1940 1955#
474	30718	Feature G, West 1/2, Layer III	140.8±0.7% Modern	-19.1	139.6±0.7% Modern	----
475	30719	Feature G-1, Layer I	30±60	-19.0	130±60	1650-1955#
476	30720	Feature G-1, Layer I	170±60	-19.2	270±60	1470-1680 1739-1805 1934-1955#
563	31109	Feature H, Layer III, 25-80 cmbs	200±50	-27.1	170±50	1640-1955#

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

Denotes influence of bomb C-14

Table 14. (cont.)

PHRI Lab.No. RC-	Lab. No. BETA-	Provenience	C-14 Age Yrs. B.P. (one sigma)	C-13/ C-12 Ratio	C-13 Adjusted C-14 Age Yrs. B.P.	Calendric Range Yrs. AD
<i>SITE 2024 (cont.)</i>						
477	30721	Feature I-1, Layer II, 5-15 cmbs	180±60	-26.0	160±60	1640-1955#
<i>SITE 2025</i>						
478	30722	Feature A, TU-1A, Layer II, 6-14 cmbs	100.6±0.7% Modern	-28.8	101.4±0.7% Modern	----
479	30723	Feature A-1, TU-1A, Fill, 26-45 cmbs	190±60	-23.6	210±60	1519-1588 1620-1890 1907-1955#
480	30724	Feature A-2, TU-1A, Fill, 15-25 cmbs	220±50	-18.4	330±50	1450-1660
481	30725	Feature A, TU-1A, Fill, 15-25	200±90	-26.8	170±90	1500-1955#
482	30726	Feature A, TU-1B, Layer II, 3-11 cmbs	100.0±1.0% Modern	-18.6	110±80 Modern	1640-1955#
<i>SITE 2026</i>						
483	30727	Feature A, TU-1, Layer II	101.6±0.7% Modern	-25.3	101.6±0.7 Modern	----
484	30728	Feature A, TU-1, Layer II	180±50	-25.1	180±50	1640-1900 1900-1955#
<i>SITE 2027</i>						
485	30729	Feature A, TU-6, Layer II	150±80	-26.6	120±80	1640-1955#
486	30730	Feature A-3, TU-6, Layer II/III	----	----	----	Insufficient Carbon
487	30731	Feature A-3, TU-6	180±90	-22.3	220±90	1460-1955#

and 1665; a second cluster, labeled "Late" in Figure 26, indicates occupation between about AD 1800-1825; the remaining clustered readings suggest possible contamination and/or contemporary activity, and have been labeled "Modern."

The 80-year span between AD 1585 and 1665 is without obvious internal breaks, suggesting that the observed multiple strata at two of the project area sites may represent (1) abandonment and reoccupation of particular features during this relatively short time interval, (2) perhaps a "catastrophic" event, such as localized flooding, which may have interrupted use of a feature for only a short time during which culturally sterile silts were deposited over the existing cultural layer, or (3) capping of the prehistoric layer by subsequently deposited 19th century cultural material in conjunction with historic cattle or sheep ranching in the area.

The two earliest dates were recovered from Features A at Sites 2024 and 2025. However, Feature A at Site 2024 yielded no evidence of layering in the cultural deposit, and thus the dating results at this feature provide no insight into the possible dating of the stratigraphic break which had been observed at Feature D at this site. Feature A at Site 2025 did, however, exhibit relatively complex stratigraphic layering and contained at least two "living" surfaces or "floors." Each of these was associated with small but separate midden accumulations; in addition, this feature also exhibited multiple episodes in the construction of the rock wall alignments comprising the feature. Unfortunately, the dates obtained from this feature were not secured from the two "living" surfaces or "floors," but rather from fill material located within Subfeatures A-1 and A-2. Thus, the stratigraphic break which occurs at this site could not itself be dated, and the suggested explanations for the stratigraphic observations, offered above, could not be further evaluated.

In addition to Features A at Sites 2024 and 2025, "early" use was also documented for Features B and G at Site 2024, and Feature A at Site 2027 (see Figure 26). Late period (i.e., historic era) use and occupation is indicated for Site 2024, Features H, D, G and I; Site 2026, Feature A; Site 2027, Feature A; and Site 2025, Feature A. Of the seven dates which thus appear to document historic-era use, only one was secured from a feature which also yielded historic, non-indigenous cultural objects (Site 2027, Feature A). While it is true that additional features within the project area yielded artifactual evidence of historic-era use and occupation, none of these other sites also yielded a radiocarbon sample which returned a date confirming occupation during this period.

The dating results, then, while inconclusive, support the following tentative conclusions:

(1) Initial occupation occurred sometime toward the end of the 16th century. This coincides generally with the Expansionist Period in Hawaiian prehistory, as discussed by Kirch (1985);

(2) This initial period of occupation may have brought a fairly sizeable group into the area, as at least six widely dispersed site components returned dates which link features to this time period;

(3) It is possible that during the c. 80 years of initial use of this area, many of the agricultural features presently observed were constructed. During this "early" period of use, occupation of the area may have been interrupted for a short time, perhaps due to some "catastrophic" event such as localized flooding;

(4) At some point around the middle of the 17th century, this initial ("early") episode of occupation appears to have ended, and the area may have been completely, or nearly completely, abandoned;

(5) During the early 19th century, the project area appears to have been re-occupied. At this time, several small habitation features were either newly constructed or preexisting structures were modified or enlarged. Several of the large walled enclosures in the area may also have been constructed at this time, although direct dating evidence in support of this contention was not secured during the present project; lastly,

(6) Historic-era use appears to have been most intensive during the initial 25-30 years of the 19th century, based on the results of the radiocarbon assays. However, evaluation of the few historic artifact fragments which could be dated suggests that the area may have been more or less continuously and routinely visited through the end of the 19th century and into the first decade of the 20th century. The primary focus of activity during the historic period would appear to have been short-term use of the area's habitation features in conjunction with ranching operations in the area.

CONCLUSION

The present project represents an initial effort to formally evaluate dense clusters of agricultural features and associated habitation structures within the uplands of the West Maui mountains. For reasons outlined in the discussion of previous archaeological research, most earlier studies have focused on coastal sites and features, while the few surveys involving upland parcels have usually encountered settings in which near total destruction of prehistoric sites has already occurred as a result of agriculture or other modern activities.

In consideration of the density of cultural features within the present project area, it was necessary to sample the universe of extant remains, first at the level of recording (selection of transects within which survey work was concentrated), and then again at the level of excavation and detailed recording (only select features were subjected to such work). It should also be recognized that the sample universe was from the beginning an arbitrarily defined dimension, stipulated by the contemporary concept of an Area of Potential Effect (APE). This latter fact became especially clear when, during the course of survey work, numerous agricultural and associated habitation sites and features virtually identical to those observed within the project area were observed to continue uninterrupted beyond the boundaries of the defined project area. This occurred both within the lower as well as higher elevations. The project area in short, does not appear to coincide with any discrete occupational unit or exploitation zone as defined by the prehistoric occupants of this area.

These caveats notwithstanding, it is possible to summarize the results of the present research, as follows.

Agriculture-Related Features - Four morphological categories were selected to describe the primary agricultural features observed within the project area.

Boulder slope planting plots comprise the most common type, representing approximately 74% of all individual features identified within the survey transects. The plots are small cleared planting areas which seldom exceed 2.0 meters in diameter and average less than 1.0 meter. Many of these features were located within walled enclosures, not far from habitation areas and other agricultural components.

Clearing piles represent rock piles created while clearing planting plots and represent approximately 14% of all features identified within the survey transects. These features, differentiated from natural piles of stone on the basis of

several morphological attributes, were likely utilized to support the vines and foliage of sweet potatoes, yams and perhaps gourds as well.

Numerous agricultural terraces were observed throughout the project area. Hillside terraces, frequently resembling a series of steps ascending the margins of steep to gentle hillsides, were discovered to encompass from 10 to 400 square meters of relatively flat, rock-free, tillable ground bounded on one or more sides by a stone-faced bank. These features represent approximately 9% of all features identified within the project area. Along gully bottoms and the lower margins of several of the area's guiches, numerous additional terraces were observed. These features appear to have been constructed in order to create a well-watered planting area and to control erosion by forcing in-flowing water to spread out over a wider area, thereby reducing down-cutting. These features were the least common of all the agricultural feature types, represented by less than 3% of the agricultural-related features identified.

Evaluation of distribution data suggested that all of the survey transects through the project area were roughly equivalent in terms of the ratios of primary agricultural feature types present. In other words, there appears to be no significant difference in the horizontal distribution of agricultural features across the project area. However, in undertaking these evaluations, five "types" of agricultural feature clusters were identified for analytical purposes. Each of these types was defined as a range of proportional representation of the three major types of agricultural feature which had been identified within the project area (i.e., plots, mounds, and terraces). The feature cluster "types" were defined as follows: (1) agricultural clearing plots represent less than 50% of the membership of the cluster, mounds represent less than 15%, and the remainder of the features consist of terraces; (2) agricultural clearing plots represent greater than 50%, mounds less than 15%, and terraces the remainder; (3) agricultural clearing plots comprise less than 50%, mounds greater than 15%, and terraces the remainder; (4) agricultural plots represent less than 50%, mounds the remainder, with no terraces present at all; and (5) agricultural plots represent greater than 50%, mounds the remainder, and no terraces present. Attempts to determine whether these agricultural feature clusters might covary with some other variable(s) produced generally negative results. Specifically, the clusters did not appear to covary with elevation in any patterned, predictable way. On the contrary, examination of the membership of the five clusters suggested

that individual land (study) units which most closely resemble one another in terms of shared proportions of agricultural features are widely scattered both horizontally as well as vertically throughout the project area.

Although there seemed to be no elevation-conditioned segregation of agricultural feature associations, it was clear that the overall density of both agricultural and habitation features may have been conditioned by elevation. Evaluation of these possibilities produced results which suggest an increase in the density of all types of agricultural-related features with elevation, and an inverse relationship between the density of agriculture- and habitation-related features between 500 and 700 feet.

Habitation and Other Architectural Features - In addition to the agricultural feature types noted above, a limited number and restricted range of habitation and non-agricultural-related architectural components were observed along the seven survey transects.

C-shaped Enclosures: This feature type, which represents approximately 42% of all identified architectural features, is most prominent between about 455 and 535 ft AMSL, and 700 to 800 ft AMSL, but are present within all areas and at all elevations within the project area. Excavation results suggest temporary, perhaps seasonal use of these features as "field houses," most likely involving from one to three persons engaged in agricultural activities in the immediate vicinity of the structure. In all cases, these features were located within dense concentrations of agricultural components.

Rectangular Enclosures: Rectangular enclosures comprise approximately 20% of the architectural features identified within the project area. Based on the midden constituents recovered and portable artifacts identified within such features, they are believed to represent prehistoric habitation, although perhaps on a more permanent basis and/or by a slightly larger group than is indicated for the C-shaped enclosures. Most of the rectangular enclosures were identified along exposed, windy ridges, typically at elevations above about 700 ft. Only a single example was identified at a lower elevation (575 ft), and in this particular instance was associated with a larger, historic-era enclosure and had itself been occupied during the historic era as well as during prehistoric times.

Medium to Large Enclosures: With one exception, all of the examples of this feature type occur above 545 feet AMSL. Excavation and detailed recording work failed to yield data sufficient to assign a specific function to these

features. Functional interpretation was also obfuscated by the substantial size range exhibited by these features—the smallest of the type encompassed only 49 square meters of surface area, while the largest enclosed nearly 2,000 square meters. Clearly, construction and use of at least some of these features occurred exclusively in historic time periods, and this dual period use represents the primary source of confusion surrounding functional interpretation.

U-Shaped Enclosures: U-shaped enclosures appear to be concentrated between about 480 and 540 ft elevation, although one example exists within the higher elevation zone (above 700 ft). These features were never observed in isolation, all cases being located near clusters of other architectural features and usually also in association with dense concentrations of agricultural components. Three of these (12.5% of the total identified) were recorded during the present project, two of which were subjected to detailed recording and subsurface testing. In both of these latter two examples, numerous pits and hearths were discovered to have been excavated into living surfaces, in contrast to the findings at other habitation features (such as C-shapes). For this reason, all of the U-shaped structures are believed to represent prehistoric equivalents of ethnographically documented "cook houses."

Upon closer examination of the distribution of architectural and associated agricultural features throughout the project area, it appeared that two culturally significant feature "clusters" might be present. Each of these in turn, it was hypothesized, might represent separate social units occupying contiguous land units, each having made use of a variety of residential and special-purpose activity areas and features. Subsequently referred to as Group 1 and Group 2, these hypothesized feature "clusters" may be further described as follows.

Group 1 is an aggregation of features located within the northwestern portion of the project area, between about 700 and 800 feet above sea level and involving portions of Sites 2023 and 2026. The upper portions of Transect 6 and areas outside of the present APE seem to represent a core unit of occupation. Within this area, a total of thirteen architectural features had been observed, including six C-shaped enclosures, four rectangular enclosures, two medium to large enclosures, and one U-shaped enclosure. Of this total, four were discovered to be located within the project's APE and could thus be further evaluated, which resulted in being able to assign a tentative function to the morphological types represented. Applying the functional interpretations to the morphological categories, it was concluded that the total of thirteen features could represent six temporarily or seasonally

occupied field houses (C-shapes), four permanent or semi-permanent occupation dwellings (rectangular enclosures), one fairly substantial cookhouse (U-shaped enclosure), and two large enclosures without a more specific functional assignment (medium to large enclosures).

Group 2 is located at significantly lower elevation, primarily between about 400 and 635 feet above sea level, and is distributed diagonally across the southwest and lower portion of Transect 4 and including portions of Site 2025. Included within this group are four C-shapes, one rectangular enclosure, three medium to large enclosures, and two U-shaped enclosures. Functionally, this can be interpreted as evidence that Group 2 may have been composed of at least four temporarily or seasonally occupied field houses, one permanently or semi-permanently occupied dwelling, two cookhouses, and three large enclosures.

Clearly, the functional assignments discussed above are speculative, as already noted. This derives in part from the fact that excavation and detailed recording involved only 23% of the representative feature types within Group 1, although nearly 80% of those within Group 2. Moreover, the paucity of midden and portable artifacts recovered from excavated features has already been noted and has made functional assignments more problematic. Nevertheless, as an initial hypothesis, it seems reasonable to suggest that within the present project's APE, two separate social groups may have been present, each of which might be described as occupying a dispersed residential complex. Each of the two complexes was comprised of a number of temporarily, perhaps seasonally occupied C-shaped enclosures which were scattered among the associated agricultural components. The temporarily occupied features occur in association with a fewer number of more permanently occupied features, consisting of larger enclosures which are typically rectangular in plan view. These latter habitation features appear to have been selectively positioned so as to take advantage of the cooling trade winds and/or to enhance the view of the valley and sea below. The residential clusters are further defined by the presence of one or more U-shaped cook houses, which are themselves always directly associated with agricultural features. Finally, the residential unit also built and maintained one or more medium- to large-sized, high-walled, irregularly-shaped enclosures which, like the U-shaped enclosures, were also associated with agricultural components but which also possess west-end terraces. The large enclosures may represent areas where prescribed food crops were produced and, in this context, the west-end platforms could well represent a *heiau* which may have been the focus of various prescribed ritual functions, analogous to Kirch's (1985) "agricultural temples."

If in fact two separate social units were responsible for the feature clusters described above, then the results of dating suggest that occupation was concurrent. Figures 27 and 28, and Table 14 (presented earlier) summarize the radiocarbon-based dating results for project area sites and features. Sites 2024, 2025, and 2027 all yielded date ranges suggesting occupation which may have begun as early as about AD 1450. The most common overlap in these six dates occurs between the period AD 1450 and about 1675. The probability is that this portion of the date range most accurately reflects the time period of use for the dated components of these three sites. These same three sites (Sites 2024, 2025, and 2027) are widely distributed throughout the project area and represent both Group 1 and Group 2, as discussed above. Therefore, since all three yielded evidence of having been occupied during the "initial" period of occupation in this area, then the area was in fact being utilized concurrently by these two separate groups if in fact the evaluation of the residential "clusters" is accurate. An alternative explanation for the apparent clustering in features does not depend on the simultaneous presence of two distinct social groupings. Establishing two or more sets of complementary habitation and support structures could well be related to a maximizing strategy applied to the selection of habitation locales. In simpler terms, at some point during the development of the extensive agricultural fields in this area, the effort needed to walk between habitation and work areas exceeded the labor required to construct and maintain additional residence/support stations. At that point one or more units would have been constructed.

If this is in fact an accurate characterization of what happened at Waikapu, then this project has likely accumulated additional evidence in support of the type of agricultural intensification which has been described for leeward parts of Hawaii Island (Rosendahl 1972) and elsewhere within the Hawaiian archipelago (e.g., Kirch 1985:215-236). With increasing population and political pressure being exerted on limited land resources, the cropping cycle may have become more and more compressed and the agricultural landscape could have acquired more of the aspects of permanent field cultivation. In this scenario, a second residential unit could have been established by additional occupational and residential assignments which were being made in response to an increasing demand for agricultural products and greater agricultural efficiency. At the very least, the data from Waikapu support the general trend which has been documented elsewhere in Hawaii toward development of large, densely settled populations between AD 1200 and about 1800, and the expansion and intensification of dryland field systems, particularly during the latter two centuries of this period. There is some support for this

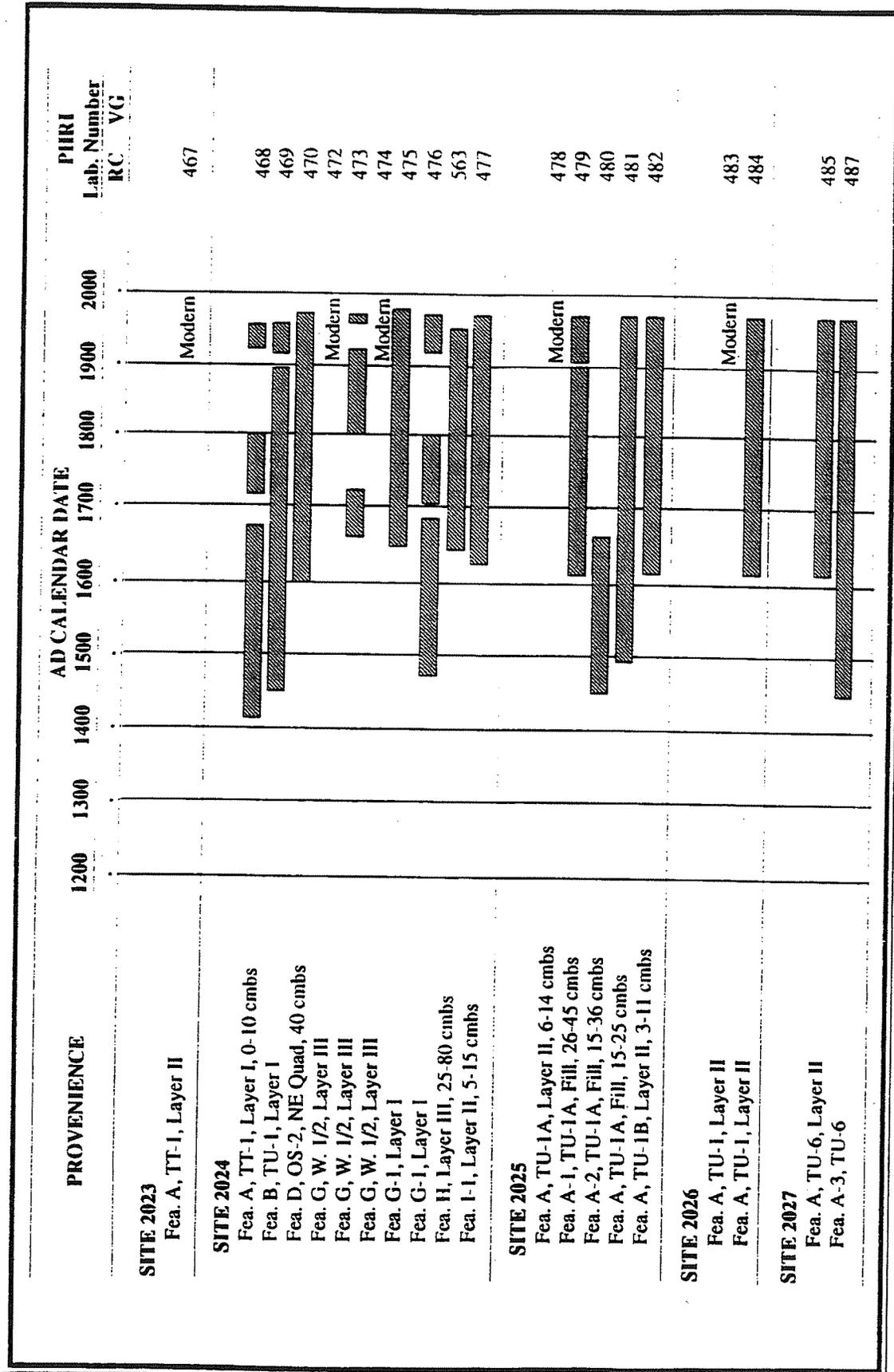


Figure 27. DATING GRAPH BY CHRONOLOGICAL ORDER

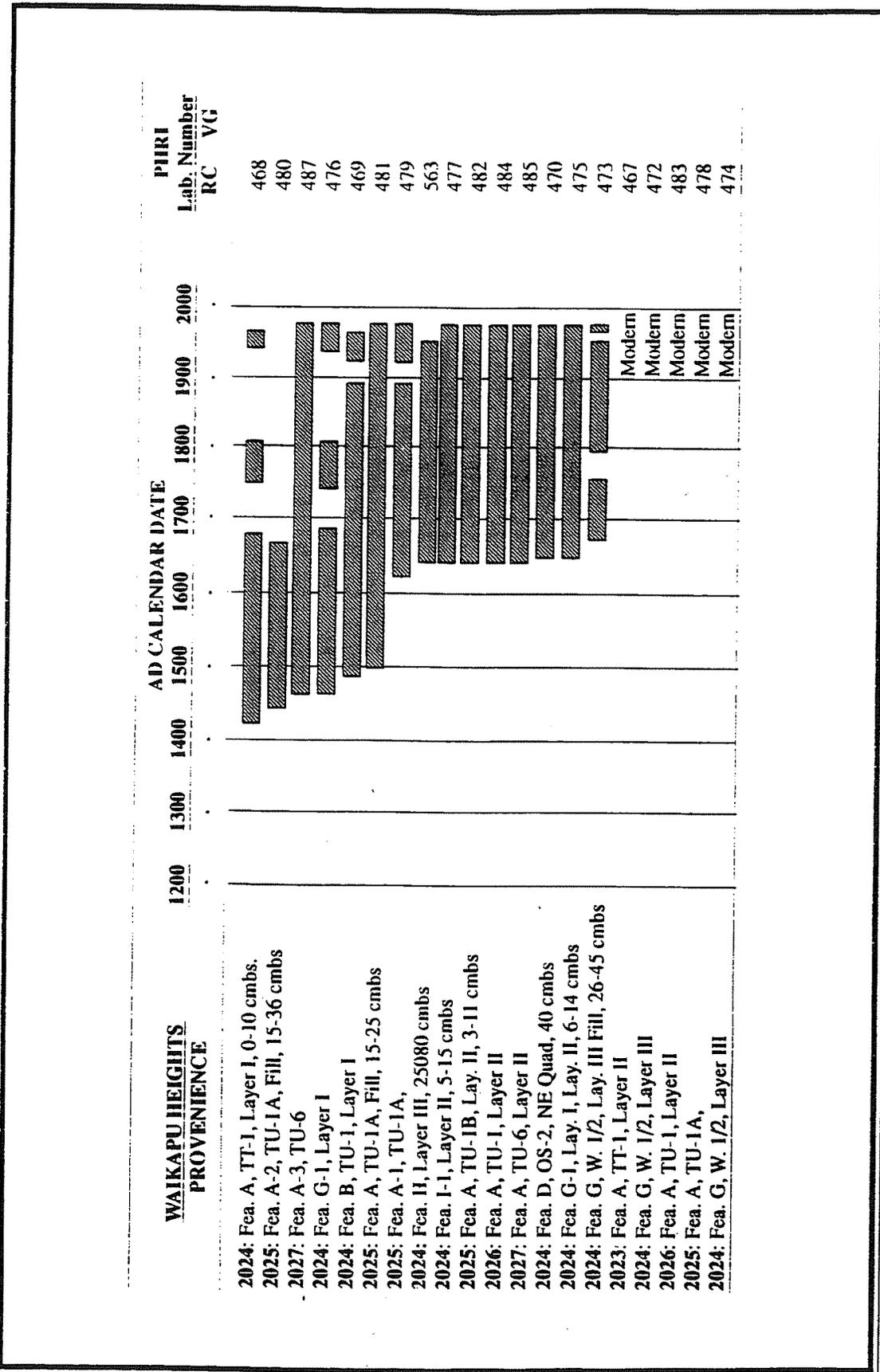


Figure 28. DATING GRAPH BY PROVENIENCE

contention in the form of an additional eight dates recovered from all four of the project area sites which returned useful dating results. In view of the absence of historic items from most of these dated occupation levels, and combined with an assessment of the time period most frequently shared among these ranges, this second episode, or period of intensification of occupation, may have occurred between about AD 1650 and the end of the prehistoric period, or about AD 1778. Unfortunately, most of these dates also suggest continued occupation through 1955, and thus exhibit varying levels of contamination. Clearly, the upper end of

these ranges is not supported by the artifactual and other evidence recovered during excavation. The dating results are fully summarized in Figures 27 and 28.

Lastly, the fact that two episodes of use may have occurred, or that intensification of occupation occurred during the last one-and-a-half to two centuries of use, is also supported by evidence from stratigraphy (discussed in conjunction with individual sites and features in the previous section of this report).

In 1776 Kalaniopuu embarked his forces and landed them without resistance in the Honuaula district, from Keoniioio to Makena. Plunder and spoilation marked his arrival, and the country people fled to the woods and mountain ravines for shelter. Taking part of this forces around by water, Kalaniopuu landed again at Kiheipukoa, near the Kealia or salt marsh between Kalepolepo and Maalea. The landing being effected early in the day, it was resolved to push forward at once, and "On to Wailuku!" where Kahekili was residing, became the warcry of the day. The detachment or regiment known as the Alapa, mustering 800 men, was selected for this hazardous expedition, and with high courage they started across the isthmus of Kamaomao, now known as the Waikapu common, determined, as the legend says, "to drink the waters of Wailuku that day."...Little did this gallant troop apprehend the terrible fate that awaited them...Kahekili distributed his forces in various directions on the Wailuku side of the common, and fell upon the Hawaii corps d'armee as it was entering among the sandhills south-east of Kalua, near Wailuku. After one of the most sanguinary battles recorded in Hwn legends,...the gallant and devoted Alapa was literally annihilated; only two out of the 800 escaped alive to tell Kalaniopuu of this Hawaiian Balaclava...This battle is called the "Ahulau ka piipii i Kakanilua" (Fornander 1969:153).

...And in the battle of Waikapu common when the Maui forces annihilated the invading army so that but two out of the 800 escaped alive, the only prisoner, a chief of Hilo, brought alive to Kahekili to be sacrificed at the heiau of Kaluli in honor of the victory, died of his wounds before he could be offered up to the gods. This was in 1776 (Thrum 1909:46).

...Moreover, the wartlike preparations of this brother-in-law, the Hawaii King Kalaniopuu, cautioned him against precipitating a rupture with so powerful an ally as the Oahu king; and Kahekili was but too glad to obtain the assistance of Kahahana and his chiefs in the war with Kalaniopuu, 1777-78, Kahahana's forces arrived from Moloka'i just in time to share the sanguinary battle on the Waikapu common [They arrived on the evening of the day that the famous "Alapai" regiment of Kalaniopuu was annihilated by Kahekili, and joined in the next day's general battles] (Fornander 1969:219).

A number of early accounts concerning Waikapu were written by seamen aboard ships which visited Maui. These accounts describe the general Waikapu area. The description by Corney (1817) focuses of Maalea, which is within Waikapu ahupua'a:

We now made sail towards Mowee, our ship, as usual, full of natives. Next morning we passed Morokenee (Molokini), and made sail up Mackerey [Ma'alaea] bay; here we lay until the 6th and took on board a great quantity of hogs, salt and vegetables. This bay is very deep and wide, and nearly divides the island, there being but a narrow neck of land and very low, keeping the two parts of the island together. There is good anchorage; and the only danger arises from the trade winds, which blow so strong at times as to drive ships out of the bay with two anchors down; it lies northeast and southwest and is well sheltered from every other wind. The neck of land is so low, and the land so high on each side, that the Northeast trade comes through like a hurricane. On this neck of land are their principal salt pans, where they make most excellent salt (Corney 1817:70-71).

The first village of any note on the way to Wailuku is Wai-kapu. It contains a population of about 500. Here the forces of Kamehameha the Great once assembled for battle at the sounding of the conch shell. Hence the name, Wai-ka-pu (water of the conch or trumpet)(Bates 1854:309).

It was at Kalepolepo that Kamehameha the Conqueror beached his canoes. If the oldest inhabitant of Ma'alaea claims this distinction for his port, believe him not. I have the facts, from an eye-witness. The sea was dark with victorious canoes; Kamehameha landed at Kalepolepo, and a kapu was put upon the nearest stream. It became sacred to royalty, as was the custom and is known as Waikapu to this hour-that it, forbidden water. (Stoddard 1894). [Note: According to Sterling (n.d.), Waikapu Stream is not the nearest stream to Kalepolepo; however, it drains into Kealia Pond, which is fairly near, and may have been the nearest running stream.]

Later accounts which concern Waikapu include those that mention Waikapu in connection with the Battle of Kepaniwai. Sara B. Cole, in her paper entitled "Iao Valley," relates the famed battle in which Kamehameha conquered

the Maui forces on his way to uniting the Hawaiian chain, and Penhallow in an article in the Maui News provides a further detail concerning the battle:

The battle at Iao Valley, is known also as the Battle of Kepaniwai (stopping the water), Kauau-Pali (battle of the precipice) or Ka'uwai i ka Pali (scratching of the cliffs). The last name refers to the frantic efforts of Kalanikapule's men to climb up the steep sides of the valley to escape the forces from Hawaii. One of the stories told of the battle concerns a sub-chief, Kepiainana. He had six warlike sons and a beautiful daughter, Kaleilehua. The sons were trained by their father in spear-throwing, boxing, wrestling and other manly sports. The daughter was to be married soon to a close friend of her brothers. During the battle, Kepiainana places his six sons plus his daughter's betrothed at the entrance to the valley while he and others climbed the mountains to Waikapu, hid, and prepared to throw boulders down on the advancing enemy. His sons fought well but died in battle, their bodies damming the waters of the stream. His daughter's future husband fled into the valley to Kaleilehua who had climbed to the top of Iao Needle when the enemy entered the valley. Moments before he reached her he was fatally shot. She died of a broken heart the following day and both of their bodies were placed in a cave in the walls of the valley (Paradise of the Pacific, Jan. 1903:15).

Waikapu...was the first to receive the onslaught of Kamehameha the Great on his march of conquest which culminated in the Battle of Iao Valley at Kapaniwai. Grim reminders of this first visit to Waikapu are still to be found in the shifting sands below the foothills where Kamehameha first assembled his army (Penhallow IN Maui News, February 3, 1926).

Two writers, Ashdown (1971) and Thrum (1917), mention religious structures in Waikapu. "Waikapu had many temples and sites, as did the other valleys of Na Wai 'Eha, the four waters" (Ashdown 1971). "Two heiau one large, one below the Catholic Church, small structure-working probably in conjunction with larger one. Portions of larger said to be still seen - small was destroyed. Names forgotten." (Thrum 1917:52-61).

Ashdown, along with Kelsey (IN Sterling n.d.), also mentions Pu'u Hele, which was a Waikapu hill situated outside of the present project area:

Pu'u Hele, once a pu'u honua area at the juncture of Wailuku, Lahaina and Kihei roads and now a deep hole in the ground, was a very sacred area in Pohakea near Ma'alaea. The ancient prophecy said that the Moving Hill, Pu'u Hele, would "cover all Maui when the foreign tide envelopes our land and people" but that was almost forgotten. During World War II when the U.S. Navy built Naval Air Station Pu'unene; the Sea Bees [Seabees] took the hill away by using its cinders for road building. Hele and Kali were a chief and chiefess of antiquity who ruled all that area and the hills were named for them (Ashdown 1971:58).

Puu-hele, is a hill at Waikapu, Maui. You can not claim a circuit of Maui unless after you have been all around, you circle the hill of Puu-hele, then climb to the top and proclaim, "Ua puni o Maui ia'u." ("I have overcome Maui.") [T. Kelsey Collection - HEN Place Names Vol. 1:819 IN Sterling n.d.).

The quality of life and general life-style within Waikapu in early and relatively late times are described by various writers:

Waikapu, a district known for its majesty and splendid living, whose native sons gather flowers in the dew and weave wreaths of ohelo berries... (unidentified writer, Ke Au Okoa No. 6, 1865).

All of Waikapu is a pleasant place to live but the plants grow half as well because of insufficient supply of water, due to the drought these days. Taro patches have dried up, the earth has cracked. The sugar cane belonging to the plantation here in Waikapu has not dried up because they have a little water. Only a few places do they dry...

The life of the people is pleasant and there are no frequent deaths as there were before. Men and women are all working together for the white men. In the past days death among infants were frequent because the parents did not give the proper care...In the month of June and July, the native dance called the hula pu'ili came in and many of the church members have indulged in this filthy past time of an ignorant period. The officers and pastor have tried hard to quench this worthless activity but no attention was paid to them. It has grown less and today this benighted activity has ceased, but it has a substitute, the dance of the white people,

under the leadership of a half-white person. Some of the members are sticking around in this occupation that is not becoming to a Christian. Pleasure seeking is something much desired by certain persons of this church. It is a work that is improper. The church is weak in carrying on with the work of the Lord now because some go after pleasure and other rely on man. There was strength here once but now, only a portion desire to do God's work. Mostly children attend Sunday School but the parents are very negligent. If the conch still continues to sound, it will sound for Christian righteousness in this church. No, Puapualenalena took it, so it sounds no more (W.K. Kauilililehua, Kuokoa 1872 HEN Vol.1:3104).

...Formerly, all four valleys supplied waters and contained not only lo'i, but plots of other vegetables and fruits. Waikapu village remains a plantation area having St. Joseph's Catholic Church; the Kalawina or Protestant church which was used as a partial headquarters by the U.S. Army in WWII and its steeple was then removed. It stood south of the old home of "Billy" Cornwell and that house was used by the plantation overseer later and it has been torn down. There are a few stores and several plantation and privately owned homes (Ashdown n.d.).

Spreading north and south from the base of Waikapu to a considerable distance below the valley are the vestiges of extensive wet-taro plantings, now almost obliterated by sugar-cane cultivation; a few here and there are preserved in plantation camps and under house and garden sites along the roads. Among these gardens were, in 1934, a few patches of dry Japanese taro. Far on the north side, just above the main road and at least half a mile below the entrance to the canyon, an extensive truck garden on old terrace ground showed the large area and the distance below and away from the valley that was anciently developed in terraced taro culture. On the south side there are likewise several sizable kuleana where, in 1934, old terraces were used for truck gardening. In the largest of these a few old patches were flooded and planted with Hawaiian wet taro, and there was some dry Japanese taro. Several terraces were used as ponds planted with lotus for their edible seed. There were probably once a few small terraces on the narrow level strips of valley bottom in the lower canyon. (Handy and Handy 1972:497).

LAND USE INFORMATION

During the Great Mahele a number of LCAs were awarded in Waikapu. The following LCAs are within the project area; the award texts provide information on agriculture and other activities that took place in the ahupua'a (Board of Commissioners):

LCA 455 - Claimant Haa, Native Test. 2:176, Book 6:119. I have the right to a lot at Waikapu called Kaaikanaka, being the lot of Aiona Pake (Chinese). 1. This is my thought—let my lot be returned. The agreement made previously between us two was that Aiona would completely fence the lot and plant cane on the dry land inside of this enclosure, and after 5 years his occupation would end and the land would be returned to me—that was our oral agreement in 1837...However, the lot was not yet completely fenced, only some acres. I forget the year, (40 perhaps or 49) [sic] when this lot was leased. 2. He completely took the water source for his cultivation only and did not return it for us both. Therefore my portion of cultivation, which is the place entitled to the water source, is damaged.

LCA 460 - Puupahoehoe, Waikapu, 'ili of Ohia bounded by salt pans, fishery, kula, 5 kuleanas; taro...

LCA 5228 - Claimant H. Kuihelani, Wahineomaili, Waikapu. Native Test. 9:622. Parcel 2 from Hoapiliwahine in 1837. The people on the land at Waikapu and their land claims: 1. Naiwi-32 lo'i, 2 kula. 2. Kanehailua-8 lo'i, 1 kula. 3. Molokini-17 lo'i, 1 kula. 4. Laa- 19 lo'i, 2 kula. 5. Pinai-13 lo'i, 1 kula. Kapau sworn I know of 3 parcels of land at Kula. #1 - 2 mala of sweet potato, house lot. Kaauwai sworn, I know his kula parcel planted in sugar.

LCA 71 - Claimant Kimo M.I. Nowlein, Native Test. 2:56, 12-21-1846. Kaweka's sworn testimony: Kimo asked Kaahumanu for a piece of property at Waikapu. She consented to his request but because she didn't want people to know that she had land, she directed me to give approval and to grant a piece of property, so I asked Napuupahoehoe, "You, give a piece of property for the haole Kimo. Our chief has asked us to do this and I have consented." Kimo gave me the money which I took and found the chief at Kamakapelapela's

place. I gave him, to Keahonui, a part of the money. Then he asked how much it had cost. \$8 was received from Kimo and he wanted to know who owned the document. This document is not mine, I have not made any contracts or agreements because I have had problems in the past months. Q: was there any other people who had hear this? A: other foreign women only. PAU.

LCA 225 - Claimant James Louzada, Native Test. 2:163. Puupahoe sworn. I have known these lands, for they were ours (2) under Keeaumoku and Kaahumanu the chiefs, and at that time of Kekauloahi it was taken by Louzada in the year 1844. Food was growing on the land at that time. It was enclosed with fence and was cultivated. No one has ever objected to the present time.

Clark Makapaa sworn. I was at Waikapu when that land was given away and I had heard at that time that it was Kekauloahi who had given those lands of Aoahamau and Pualinapao and I have seen him (Louzada) talking with Kekauloahi. The water lands were bad at that time in that the disadvantage was greater than the advantage and the lot was not enclosed as it is at the present time. The land has been cultivated and it looks good. The expense for the materials for the fence and the building of it was great. The houses, too were in bad condition whereas they are now in good shape. We lived close to each other which accounts for my knowing these things.

LCA 236 I - Claimant Charles Copp, Native Test. 5:300 Z. Kaauwai sworn. He has seen 1 section, 2 sections he has not seen in the ili of Kaluapuaa in Waikapu. Land from Mrs. Hoapili in 1836. He has not heard of objections however Kaauwai has heard how Charles Copp had received this land from Mrs. Hoapili. Mr. Charles Copp was Lota's friend, he was also Lota's tailor and because of the hardships of living in Lahaina, Mrs. Hoapili gave him this land. He has not known whether Nalei has interest in Wailuku.

Kalua sworn. He has seen Charles Copp's lands, and Nalei's land no. 10460. Nalei's patches are in Charles land and he had received it from Makole in 1846. He had not wanted this land he had felt he would received the land of Kaluapuaa permanently which would leave the poalima only for Charles. Charles disapproved of this and asked Nalei to

remain on his own interest. Nalei lived on his own 14 patches at the time Charles went to Hana and he worked 4 days at a time for the poalima at the request of Kuihelani. Later Nalei lived under that foreigner J. Louzada. After I had left Joe, took my interest for Charles because he had felt, Nalei wanted all the land for himself. Nalei has no land at this time.

William Humphreys sworn. He has known this: Charles had come to Lahaina and he asked me for a suitable land in Waikapu. Charles: Where is a good land in Waikapu here? Humphreys: Palama is a good land. Charles: The land of a foreigner adjoins the Palama, is it not? Humphreys: It adjoins Atoni's land. Charles: It is not separated by Wahapaa? Humphreys: It turns until Kalaupuaa is reached. Go home and come back again. He did go back home and had talked with Mrs. Hoapili. When he returned, Kaluapuaa was then conveyed to him.

LCA 8882 - Claimant Kekua, Native Test. 5:299, 7-27-1849. Keawe sworn. He has seen 3 sections in the ilis of Waikapu and Kula. The first two sections in Waikapu from William Makaena in 1820. Section 3 from Kamoia in 1843. Kamoia's land from Kalanao, no objection. 1 Poalima in section two at Kapalaalaea.

Section 1 - House lot at Awahamau

Mauka	Akoni Cakalina's land
Waihee	Land enclosure
Kula	Government road
Maalaea	J. Lonzada

Section 2 - Taro pauku in Kapalaalaea

Mauka	Konohiki
Waihee	Kuihono
Kula	Moo
Maalaea	Kohelaulau

Section 3 - Potato patch at Kamaole in Kula

Mauka and	
Honuaua	Keawe
Makai	Kamalana
Makawao	Mamaki

LCA 4284-G - Claimant Kamaka, Native Test. 5:299, 7/27/1849. Waikapu and Kula: Kamaka's land from Kahune in 1845. Kahune's land from Kuakamauna. Kaukamauna's land from M.

Kekuanaoe. No objections to Kamaka.

Mauka	Big ditch
Kahakuloa	Kalaauala
Makai	Poalima
Wailuku	Keaka

Following the Mahele, lands in Waikapu apportioned to the Government were in dispute. The following text, entitled Opinion of the Court and written by J. McCully, is found in Sterling (n.d.):

The land of Waikapu, belonging to the Government, was set over to the Dept. of Education. There is in the office of the Dept. a map of Waikapu, and survey notes on separate paper taken to refer to it. The notes and the names written on the map were in the handwriting of one J.W. Marsh, deceased, who had been a clerk in this department...

In 1875 the Board of Education sold at auction the "Land known as the ahupua'a of Waikapu, saving grants hitherto made with said ahupua'a, or sales by the Board of Education," to Henry Cornwell, the Government issuing a royal patent in the above terms without survey or statement of area. Mr. Cornwell afterward sold to Claus Spreckles and others the part known as Waikapu Commons. [In the matter of the Boundaries of Pulehunui, Hawaiian Reports, 1879 Vol. IV:248 Early Ownership].

As one can surmise, Waikapu land has been cultivated from prehistoric times. In modern times, plantation crops have been planted in the area and the area has been used for cattle ranching. According to Ching (1985), Thrum reports that "around 1823, Antone Catalina...[founded] the industry of making syrup [sugar syrup] at Waikapu..." In 1847, mention is made of coffee being raised on Maui, at Wailuku and Waikapu (news article, Polynesian, February 27, 1847). The following excerpt, from a paper by D.P. Penhallow presented to the Study Department of the Maui Woman's Club (Maui News, February 3, 1926), summarizes sugar cultivation in Waikapu, from the time of Catalina's endeavors to the development of large-scale sugar cultivation by Wailuku Plantation, and also provides a bit of information on cattle ranching in the area:

As with much of early Hawaiian History, so it is with Waikapu. Definite dates of events are hard to fix and the sequence of them [is] not always clear, but, as Waikapu was first of this section of Maui in war[,] so, evidently, was it the first to produce sugar and cattle. A Spaniard named Antone Catalina

made cane syrup at Waikapu in 1823, which was apparently the beginning of the sugar industry in the Wailuku District. James Louzada came over from Waimea, Hawaii, a number of years later, established a cattle business, opened a store and began cultivating cane on a large scale. The date is not definite but he erected a stone mill with oxen for motive power on the premises known as Halepa-laha-laha at the entrance to Waikapu valley, located on its northern slope. It is reputed that Louzada's Hawaiian wife, Kapu, lost an arm while tending the mill.

Following this mill a steam driven one was erected in 1862 near the present road to Lahaina, just north of the stream crossing. It was at this time that Henry Cornwell, Louzada's brother-in-law, became interested and Waikapu became one of the larger (for that period) plantations. The mill was made by James Hughes' Hoolulu foundry and was one of the first to be steam driven. The first sugar was sent to market in 1863.

The store referred to was the first in the district, people going from Wailuku to make purchases there. The store building was located on the lower corner of the Pia Cockett premises and remained as a land mark until a few years ago.

The cattle industry flourished and, also, many fine horses were produced, horse racing being a feature of Waikapu for years. The plantation changed ownership a number of times, the Macfarlanes becoming interested, eventually, and a corporation was formed which finally passed into the control of Wailuku Sugar Company in 1894.

Aside from its commercial aspect, there was much of romantic interest attached to Waikapu. Kalakaua spent some of his leisure time with the Cornwalls, who kept open house, and it has been featured in song and story. Its romance was of the past, which belonged to its day and age. Of this there are but slight reminders evident only to those who can picture it as it was.

C.E. Speakman, Jr. confirms the above historical account of Wailuku Sugar Co. in his book Mowee. Speakman writes, "...Waikapu Plantation was started by James Louzada and his brother-in-law, William H. Cornwell. A mill was erected at the entrance to Waikapu valley. The Waikapu Plantation changed hands a number of times, finally passing

into the control of Wailuku Sugar Co. in 1894" (Speakman 1978).

A few additional details concerning Waikapu Plantation are provided by the following two excerpts, taken from articles published in the Maui News:

The old smoke-stack which marked the site of the original Waikapu sugar mill, and which has for many years been a conspicuous and picturesque landmark, topped over in the kona gale last Monday night. The mill of which it once formed a part, was one of the first sugar mills on Maui, and had a capacity of 40 tons of sugar per year. The Waikapu plantation is now a part of Wailuku Sugar Co. holdings (11-29-18).

Waikapu Plantation "Wailuku(?), two miles from Wailuku. P.O. address, Wailuku, Wailuku Roads; Proprietors. W.H. Cornwell and G.W. Macfarlane. Own 20,000 acres, 600 under cultivation; suitable for planting (providing artesian wells prove to be a success on the island of Maui, which it is confidently expected that such will be the case) or at least 15,000 acres...estimated yield for season 1880, 900 tons, capacity of mill, 8 tons, men employed 130; oxen 200 yoke. This plantation, there is every reason to believe, will turn out to be one of the richest and most valuable on the Hawaiian islands (12-4-26).

During the 1940s, the U.S. Army conducted military operations in the southern half of the project area. Land set aside for these activities included a live grenade course, a 50-calibre machine gun range, and two anti-tank ranges (letter dated 8 February 1989 from Char, Sakamoto, Ishii & Lum to Wilson Okamoto & Associates).

As part of the present project, maps at the State Survey Office were consulted. A map by F.S. Dodge (1885) showed that the Waikapu District was held by the Waikapu Sugar Co., Grant 3152 to H. Cornwell. Two maps by M.D. Monsarrat included the project area. One map (dated 1882) provided locational information on LCA 455, described in this report. The same map showed the area surrounding the

LCA to be planted in cane. The other map (dated 1875) is included in this report (Figure A-1).

Conclusion and Recommendations

Although sugar was cultivated in large areas within Waikapu, based on the evidence, it is not likely that it was cultivated on a large scale within the present project area. Apparently, the water supply in the area was inadequate to sustain large-scale crops. Preston Barnes, a former C. Brewer employee who resided in Waikapu some 25 years ago, when shown aerial photos of the project area pointed out that an irrigation ditch (probably Waikapu Ditch) ran below the project area, thus prohibiting productive large-scale sugar cultivation in the project area. In addition, Barnes did not recall the plantation utilizing the project area for cane cultivation (pers. comm. April 1989). Further evidence includes the fact that LCA 455 testimony states that there was a rock quarry within the project area. Evidently, the project area was more intensively cultivated during pre-contact years and up to the time of large-scale sugar cultivation.

In regard to Thrum and Ashdown's contention that there numerous religious structures in the project area, it is not likely that these structures remain, especially given the lack of historical references to them and the fact that large-scale sugar operations, and thus attendant land modifications, took place in the general vicinity.

Further historical research should include examining Wailuku Agriculture Business' records. Such an examination would likely yield maps and other pertinent information regarding land alterations. A request to look at such records was denied by Gaylord Kubota, the curator at the A & B Sugar Museum. Also, a more extensive archival check should be conducted; the check should include Boundary Commission Books as well as the file on the Department of Public Instruction. A title search for the Grant 3152 to Henry Cornwell may yield information on changes incorporated by him and the plantation. Lastly, oral history interviews should be conducted. These interviews would most likely yield information concerning modern changes within the project area, and would likely provide tales concerning Waikapu.

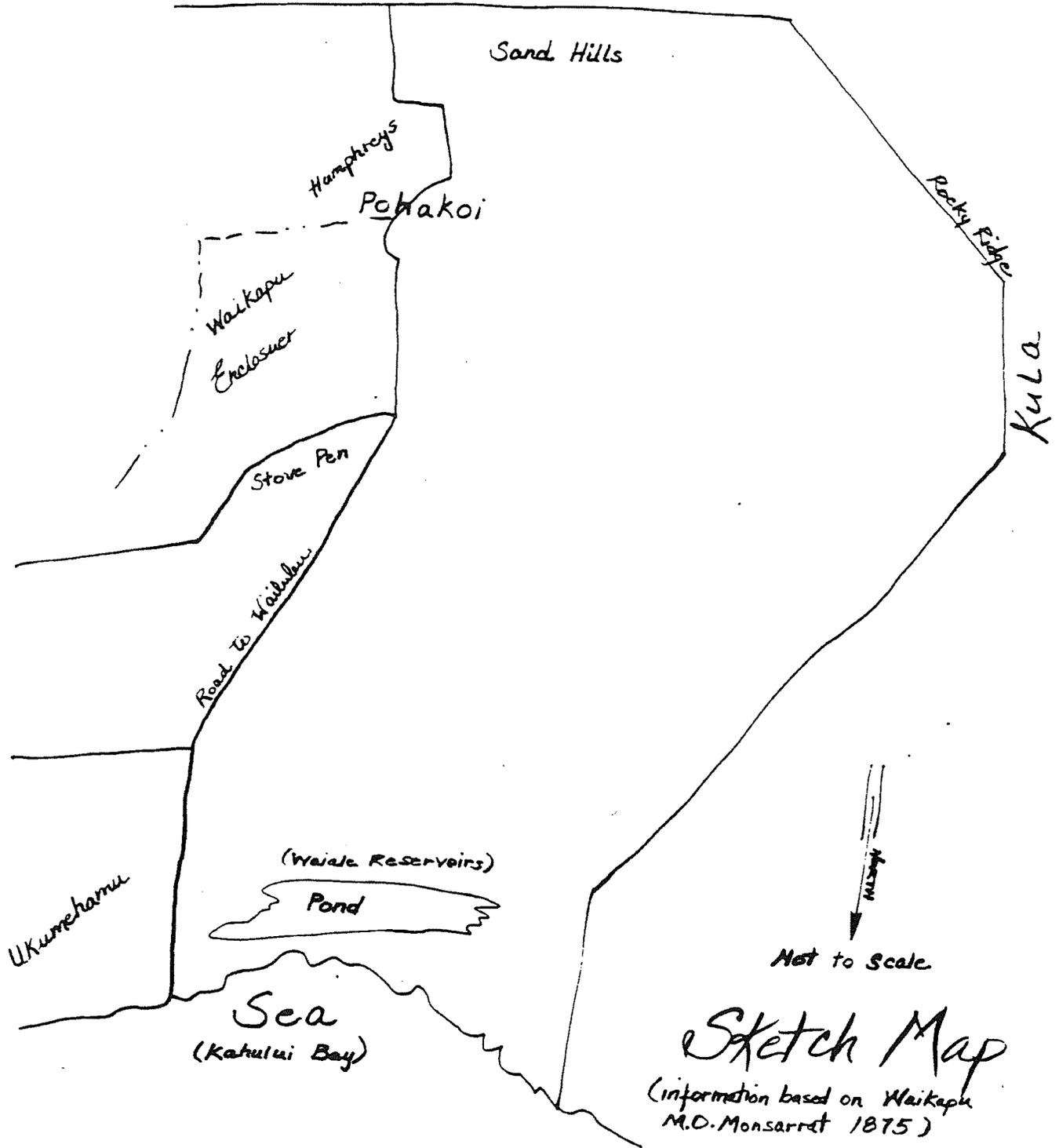


Figure A-1. 1875 MAP BY M.D. MONSARRAT

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APPENDIX B

POLLEN ANALYSIS

by Linda Scott Cummings, Ph.D.
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INTRODUCTION

Dryland agricultural features were noted during the current archaeological investigations. Located on the leeward slopes of the West Maui Mountains, the project area receives drainage from the inlands. Eight trenches were sampled stratigraphically for pollen to examine evidence of agricultural activity.

METHODS

A chemical extraction technique based on flotation is the standard preparation technique used in this laboratory for the removal of the pollen from the large volume of sand, silt, and clay with which they are mixed. This particular process was developed for extraction of pollen from soils where preservation has been less than ideal and pollen density is low.

Hydrochloric acid (10%) was used to check for calcium carbonates present in the soil. None were noted. *Lycopodium* tablets were added to the samples at this stage, after which the samples were screened through 150 micron mesh. Zinc bromide (density 2.0) was used for the flotation process. The samples were mixed with zinc bromide while still moist, immediately after centrifugation to remove the dilute hydrochloric acid and water. All samples received a short (10 minute) treatment in hot hydrofluoric acid to remove any remaining inorganic particles. The samples were then acetolated for 5-10 minutes to remove any extraneous organic matter. The samples were processed at an elevation of 5,400 feet above sea level, where the acetolysis reaction is considerably slower than at sea level.

A light microscope was used to count the pollen up to a total of 100 to 200 pollen grains at a magnification of 430x. Pollen preservation in these samples varied from good to poor. Comparative reference material collected at the Bishop Museum in Honolulu, as well as material from Peru, was used to identify the pollen to the family, genus, and species level, where possible.

Pollen aggregates were recorded during identification of the pollen. Aggregates are clumps of a single type of

pollen, and may be interpreted to represent pollen dispersal over short distances, or the actual introduction of portions of the plant represented into an archaeological setting. Aggregates were included in the pollen counts as single grains, as is customary. The presence of aggregates is noted by an "A" next to the pollen frequency on the pollen diagram. A "T" on the pollen diagram indicates that the pollen type was observed outside the regular count while scanning the remainder of the microscope slide.

Indeterminate pollen includes pollen grains that are folded, mutilated, and otherwise distorted beyond recognition. These grains are included in the total pollen count, as they are part of the pollen record.

DISCUSSION

Local vegetation has been disturbed through agricultural activity and modern plant introduction. Modern vegetation includes such exotics as *kiawe* and *koa-haole*. Therefore, no sample was collected from the present ground surface. Pollen samples were collected stratigraphically from eight trenches that were excavated through agricultural terraces at Waikapu (Table B-1).

The pollen record was dominated by Cheno-am pollen (Table B-2; Figure B-1) throughout much of the interval represented. Cheno-ams include weedy herbs and shrubs that produce abundant quantities of readily wind-transported pollen. Low-spine and High-spine Compositae also represent weedy plants that may grow in response to soil disturbance. Liguliflorae-type Compositae pollen represents a sub-family of composites that includes dandelion and chicory. Again, many of these plants respond to soil disturbance and are considered to be weeds. Gramineae and Cyperaceae pollen probably represent natural grasses and sedges.

Several pollen types represent agricultural crops, or plants that produce fruit or other parts that have been exploited for food or other commercial or utilitarian purposes. These plants include Moraceae, Myrtaceae, *Persea*, *Leucaena*, Malpighiaceae, Caesalpinaceae, Cruciferae, Ipomoea, and Solanaceae. A brief review of these plants follows.

Table B-1.

PROVENIENCE OF POLLEN SAMPLES FROM WAIKAPU

Sample Number	Trench Number	Trench Stratum	Pollen Counted
1	1	V Upper	100
2	1	VI Upper	100
3	1	VI Upper	100
4	1	VI —	Insuff
5	1	VI Lower	200
6	1	VII Upper	100
7	1	VII Lower	100
8	1	VIII Upper	150
9	2	II North	100
10	2	II South	100
11	2	III North (1 <u>kukui</u> , 1 pc. lava, no soil)	—
12	2	III South (also contained <u>kiawe</u> seeds)	100
13	2	IV North	100
14	2	IV South	100
15	2	V North	100
16	2	V South (no soil)	—
17	2	VI North	100
18	8	II East	100
19	8	II West	100
20	8	III East	100
21	8	III West	100
22	8	IV East	100
23	8	VI East	100
24	3	II East	100
25	3	III East	200
26	3	III West	200
27	3	IV West	200
28	4	I	100
29	4	II	100
30	4	III	200
31	5	III	200
32	5	IV	200
34	6	I Upper	100
35	6	I Lower	100
36	6	II Upper	100
37	6	II Lower	200
38	6	III Upper	200
39	6	III Lower	100
40	6	IV	100
41	7	I	100
42	7	II	200
43	7	III	200

Table B-2.

POLLEN TYPES OBSERVED IN SAMPLES FROM WAIKAPU

Scientific Name	Hawaiian/Local Name	English Name
TREES:		
<i>Acacia</i>	---	Acacia
<i>Antidesma</i>	hame	Bignay
Araliaceae	---	Panax family
<i>Broussaisia</i>	kanawao	---
<i>Casuarina</i>	---	Australian pine
<i>Ilex</i>	---	Holly
Moraceae	---	Mulberry family
Myrtaceae	---	Myrtle family
<i>Osmanthus</i>	kwai-fah, pua, olopuu	---
Palmae	---	Palm family
<i>Persea</i>	---	Avocado
<i>Prosopis</i>	kiawe	Mesquite
Rhamnaceae	---	Buckthorn family
Rubiaceae	---	Coffee family
<i>Gouldia</i>	---	---
Rutaceae	---	Rue family
<i>Xanthoxylum</i>	wu-chu-yu, san-sho	---
SHRUBS:		
Ericaceae	---	Heath family
Euphorbiaceae	---	Spurge family
<i>Leucaena</i>	koa-haole	---
Liliaceae	---	Lily family
<i>Cordyline</i>	ki	Ti, Cordyline
Malpighiaceae	---	Malpighia family
Malvaceae	---	Mallow family
<i>Abutilon</i>	ko-oloa-'ula	Flowering maple
<i>Rauwolfia</i>	---	Rauwolfia
<i>Sesbania</i>	'ohai	Egyptian rattlepod
<i>Wilkstroemia</i>	'akia, false 'ohelo	---
HERBS:		
Caesalpiniaceae	---	Senna sub-family
Cheno-ams	---	Includes amaranth and pigweed family
Low-spine	---	Includes ragweed, cocklebur, etc.
High-spine	---	Includes cosmos, beggar tick, etc.
Liguliflorae	---	Includes dandelion and chicory
Convolvulaceae	---	Morning glory family
Cruciferae	---	Mustard family
<i>Eriogonum</i>	---	Wild buckwheat
<i>Hillebrandia</i>	pau-maka-nui, aka 'aka 'awa	---
<i>Ipomoea</i>	pohuehue	Sweet potato or morning glory
<i>Portulaca</i>	---	Purslane
<i>Ricinis</i>	koli, pa'aila, la'au-'aila	Castor bean
Solanaceae	---	Tomato/potato family
SEDGES AND GRASSES:		
Cyperaceae	---	Sedge family
Gramineae	---	Grass family

The Moraceae (fig family) include a number of trees producing edible fruits. Among these are breadfruit (*Artocarpus*), mulberry (*Morus*), and figs (*Ficus*). Figs are not expected to have introduced pollen into the record. Tapa and paper are produced from the bark of paper mulberry (*Broussonetia*). Mulberry fruits may be eaten, and the leaves provide food for silkworms. The bark of paper mulberry was manufactured into a tough, durable paper or cloth (tapa, or *kapa* in Hawaiian) that had many uses. Breadfruit was brought to Hawaii by early Polynesians from Tahiti. The fruit usually ripens between June and August, although a small crop is also available in the winter. Breadfruit tree bark was also once used to make tapa, and the wood is light and suitable for making canoes. The fruit was usually baked or boiled, and the sweet, starchy pulp was sometimes pounded like poi. Breadfruit contains a high amount of carbohydrates, as well as vitamins A, B, and C (Neal 1965:299-314).

Myrtaceae (myrtle family) includes both native and cultivated trees that produce edible fruits. *Eugenia* (Java plum) produces an edible fruit. *Psidium* (guava) is cultivated for its fruit. Another common member of this family is the 'ohi'a-'ai, or mountain apple, also of the genus *Eugenia*. The fruit may be eaten either raw or pickled, and the tree grows in shady valleys up to approximately 1,800 feet (Neal 1965:630-636).

Persea (avocado) was introduced to Hawaii from tropical America. These fruits are high in oil, carbohydrates, vitamins, and proteins. The fruit is usually eaten raw. Trees bear in summer, fall, winter, or spring depending on the variety (Neal 1965:363-364).

Leucaena glauca (*koa-haole*) is a leguminous small tree or shrub that may form dense thickets in the lowlands or the lower mountain slopes, up to an altitude of approximately 2,500 feet. *Koa-haole* may be planted as a shade tree for coffee, although it may also be considered a pest. In Hawaii the seeds are strung for leis, while in the West Indies both seeds and pods are eaten. Cattle and goats relish *koa-haole*, and dairymen in Hawaii grow it for cattle fodder. Horses, swine, rabbits, and chickens may lose hair or feathers when fed *koa-haole* as a reaction to its mimosine content. Soluble iron salts added to the feed counteract this poison (Neal 1965:411-412).

Prosopis (*kiawe*) is a related leguminous tree. *Kiawe* pods have also been used as fodder in Hawaii (Neal 1965:413-414). This tree is common in leeward areas.

Malpighiaceae (malpighia family) includes trees, shrubs and climbers, but was arbitrarily listed in the shrub category

in this study. While fruits of this family are edible, they have been of minor importance in Hawaii. The small red, cherry-like fruits have a thin skin and an acid pulp. Acerola cherries are produced by *Malpighia* and are very high in vitamin C. Many acres of acerola were planted in Puna, Hawaii and the fruits were harvested and exported to the mainland (Neal 1965:494-497).

Caesalpiniaceae is a sub-family of legumes that includes numerous genera, some of which are edible or otherwise useful. Use of the pods is most often noted. The pollen recorded as Caesalpiniaceae was most like *Caesalpinia*, a bush or small tree that may be planted as a hedge or found as a large weedy bramble in dry lowlands. The seeds have been strung as leis, and children frequently play with the large seeds. The seeds were also ground and used medicinally (Neal 1965:417-429).

Cruciferae (mustard family) includes a wide variety of weedy plants, as well as edible crops, such as radish (*Raphanus*), cabbage (*Brassica*), and mustards (*Brassica*). Pollen recovered was most similar to radish.

Ipomoea, which includes the weedy morning glory as well as the cultivated sweet potato, is a member of the Convolvulaceae. Sweet potatoes may be planted in ridges, in individual mounds, or on flat ground. Most of the sweet potato crop is grown on the islands of Hawaii and Maui, up to elevations of 1,500 feet. *Ipomoea* pollen is insect-transported, and good modern commercial varieties are noted not to bloom (Neal 1965:706). Therefore, this pollen type is expected to be very rare in the pollen record.

Solanaceae (tomato family) includes many genera of herbs, shrubs, small trees, and vines. The pollen reported is most similar to *Physalis* and *Solanum*. *Physalis* was introduced to Hawaii from South America and is noted to grow best on open mountain slopes between altitudes of 1,500 and 4,000 feet. Some *Solanum* are natives of Hawaii and certain species have long been considered as weeds. This genus includes eggplant and potato, which are cultivated. Pollen of this family is insect-transported, and therefore expected to contribute very little to the pollen record (Neal 1965:748).

Two weeds, *Portulaca* and *Ricinis*, also deserve review. *Portulaca* is a common weed in gardens of Hawaii. This pollen type is insect-transported, and so is expected to be very rare in the pollen record. A few purslanes are native to Hawaii, but are rarely seen. Purslane is said to be cooked and eaten in many countries (Neal 1965:342). *Ricinis communis* (castor bean) is a weed that grows in waste places throughout the tropics. In Hawaii the seeds are strung on

leis. Oil expressed from the seeds is used as a lubricant, for lighting, medicinally, as a cathartic, in soap, and to preserve leather. The seeds are, however, poisonous (Neal 1965:509-510).

DATA

The pollen is particularly diverse in Trenches 1, 2, and 8. Trenches 3 through 7 did not yield as much diversity in the pollen record, perhaps through more severe destruction of pollen in the soils.

Moraceae pollen (Figure B-1, Table B-2) recovery was confined to Trenches 1 and 2. Recovery was greatest in Trench 1 in Strata VIU and VIUU. It was also noticed in Trench 2, Stratum VN. It was not possible to classify this pollen further than family. Therefore, identification of the actual crop was also not possible. The crop grown may have been breadfruit, paper mulberry, or possibly others.

Small quantities of Myrtaceae pollen were recovered in Trenches 2 and 8 from Strata II, VI, and VN in Trench 2 and IIE, IIW, and VIE in Trench 8. The small quantities of Myrtaceae pollen attest to the presence of one or more members of this family in the vicinity of the agricultural terraces. If the trees had been grown directly in this garden area, higher pollen frequencies would have been expected. Therefore, any members of Myrtaceae, such as guava, that may have been grown were likely grown outside of the areas sampled for pollen. It is also possible that *Eugenia* (Java plum) grew on the mountain slopes in the general area and the pollen was transported into these agricultural features.

Persea pollen was confined to samples from Strata IIIS and IVN in Trench 2. The largest frequency was recovered from Stratum IIIS, suggesting that avocado trees were grown in this area.

While not producing a food crop edible by humans, *kiawe* (*Prosopis*) and *koa-haole* (*Leucaena*) were noted in the pollen record. *Kiawe* apparently grew in the vicinity of Trenches 2, 3, and 8. *Koa-haole* was most abundant in Trenches 2, 3, and 8, and was observed in Trenches 4, 6, and 1. The most abundant frequencies were noted in Strata IIS and IIIS in Trench 2, Stratum IIE in Trench 3, and Strata IIE and IIW in Trench 8. It is possible that this shrub or small tree was used as shade for another crop in this area, or more probably that it grew as a weed.

Malpighiaceae pollen was recorded only in Sample 40, representing Stratum IV in Trench 6. This may either

represent the growth of a member of this family as part of the weedy or natural vegetation in this area, or possibly the intentional planting of acerola cherries. If this is the case, it does not appear that the crop thrived.

Caesalpiniaceae pollen was reported only in Trenches 2 and 1, being most abundant in the upper levels of Trench 2, Strata IIN and IIS, and IIIS.

Cruciferae pollen was noted throughout the record in all trenches. It is quite possible that the Cruciferae pollen represents a weedy plant, although it must be considered that radishes or a similar crop may also have been grown.

Ipomoea pollen is noted only in Trenches 1 and 2, occurring in Stratum VIUU in Trench 1 and IIS in Trench 2. This pollen may represent the cultivated sweet potato, or the weedy morning glory.

Solanaceae pollen was recorded only in Trenches 1 and 2, suggesting that a crop of potato, ground cherry, or eggplant may have been grown, or possibly that weedy solanaceous plants invaded these areas.

Portulaca occurred as a weed in Stratum IL in Trench 6, while *Ricinis* (castor bean) was noted in Stratum VIII in Trench 1. Both plants were probably present as weeds.

SUMMARY AND CONCLUSIONS

The pollen record indicates that the most likely crops grown on the agricultural terraces at Waikapu were tree crops.

A member of the Moraceae family (breadfruit, paper mulberry, or other) also appears to have been grown, at least in the vicinity of Trenches 1 and 2. A member of the Myrtaceae (*Eugenia* or *Psidium*) may have been grown in the vicinity, although probably not directly in any of the areas of agricultural terraces sampled. Myrtaceae pollen was recovered in Trenches 2 and 8, suggesting areas upwind or upslope from these agricultural terraces as probable locations for guava or Java plum.

Avocado trees were planted in the area of Trench 2. There appears to have been a relatively small investment in avocado trees, as this pollen is restricted to a very small area (Strata III and IV). It is possible that acerola cherries were attempted as a crop in this area, as well. If they were, it does not appear to have been successful, as Malpighiaceae pollen does not continue in the record.

Sweet potatoes may have been grown in the vicinity of Trenches 1 and 2, or morning glories may be represented as agricultural weeds. Potatoes, groundcherries, or eggplant may also have been grown in the vicinity of Trenches 1 and 2, or again, members of this family may be present as agricultural weeds.

Kiawe grew in the vicinity of Trenches 2 and 8, while koa-haole appears to have been more common, particularly in the upper levels near Trenches 2, 3, and 8. A member of the Caesalpiniaceae was also common in the upper strata of Trench 2, where koa-haole was most abundant.

REFERENCE CITED

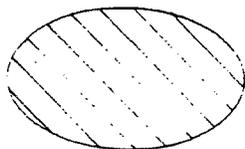
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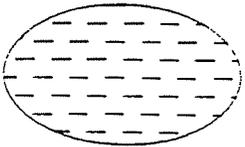
APPENDIX C

TRANSECT MAPS

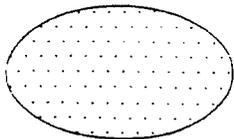
KEY TO TRANSECT MAPS



AGRICULTURAL AREAS
(GARDEN PLOTS)



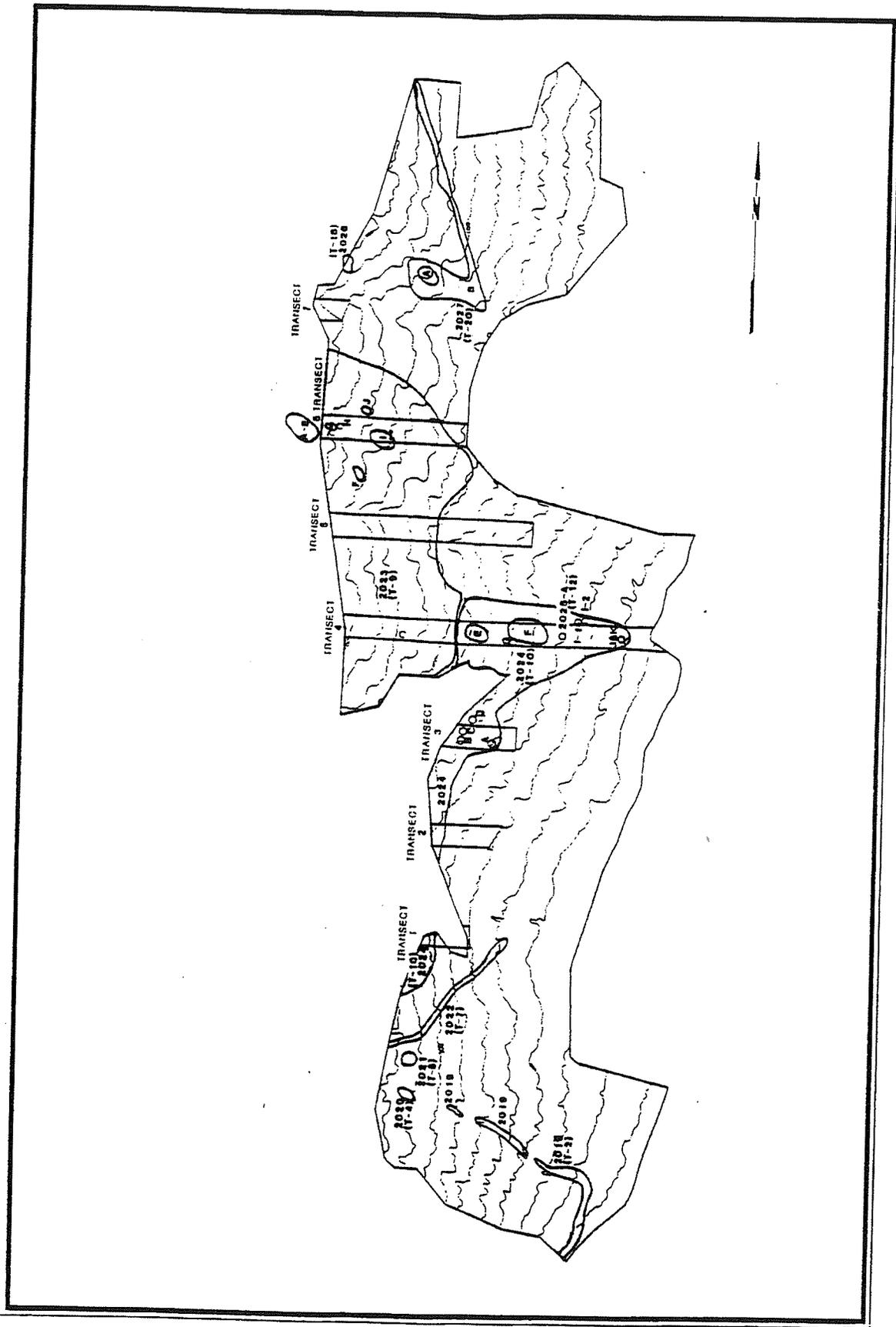
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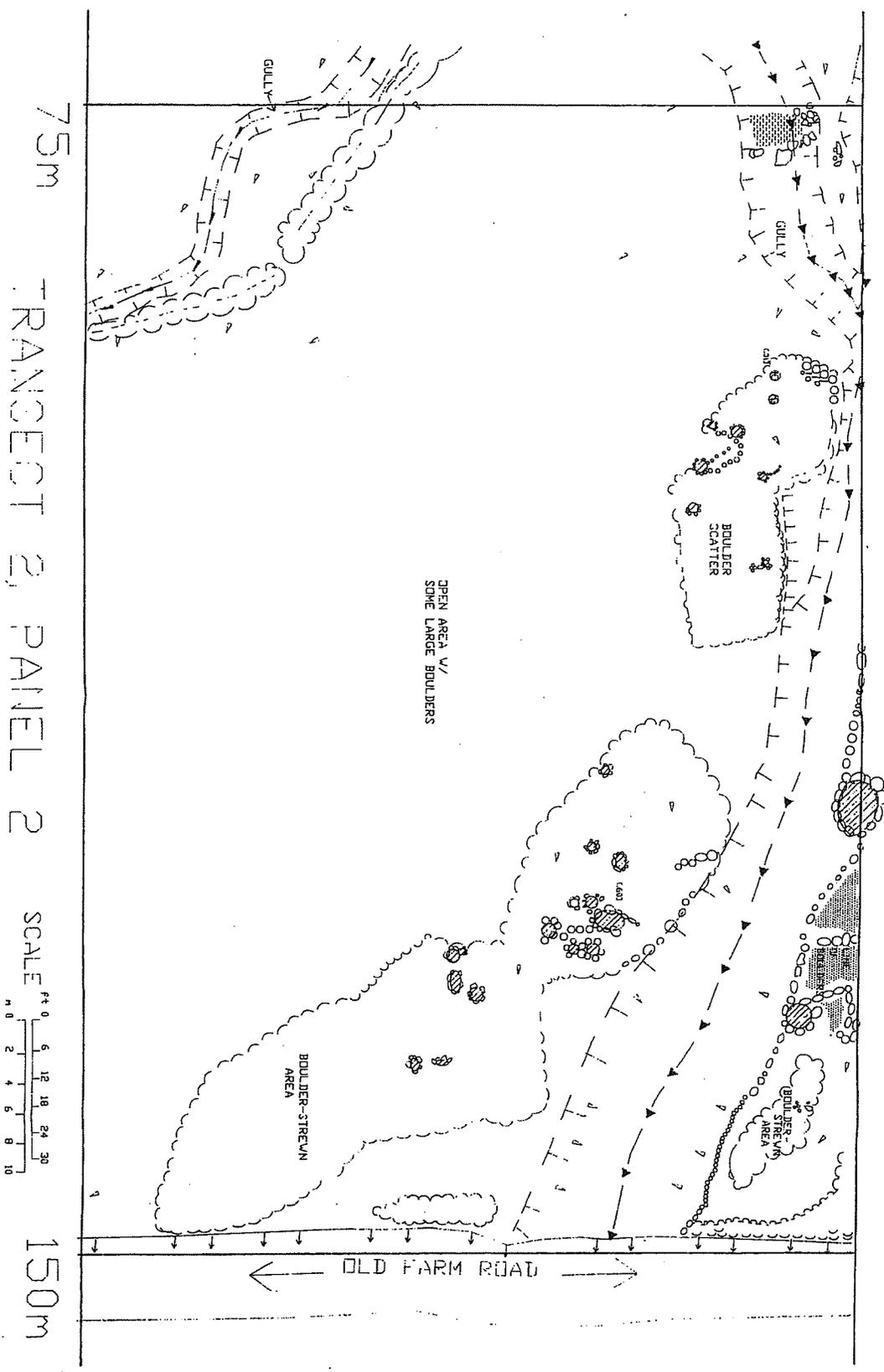
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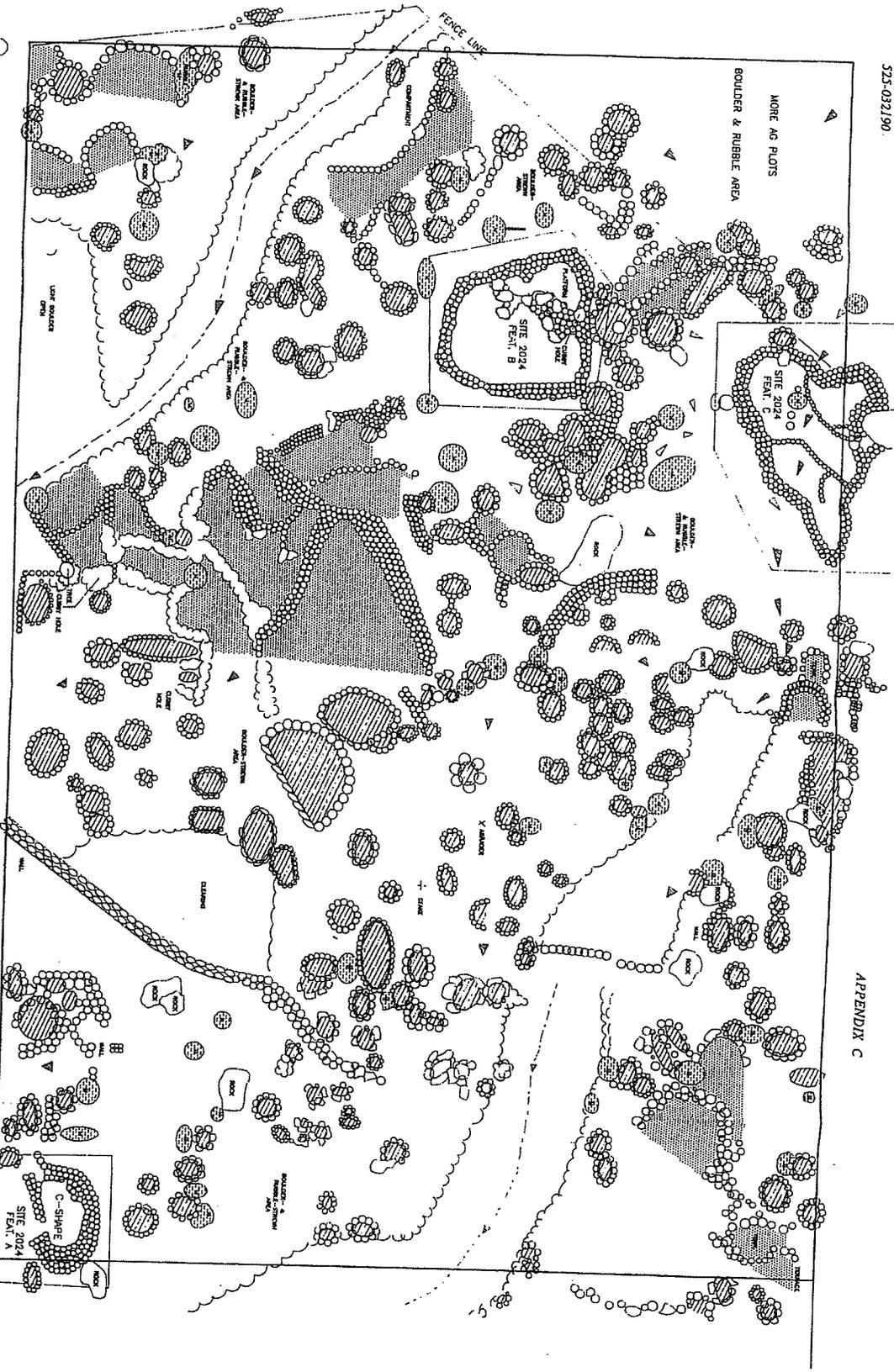


True north on all panels is at 0°.



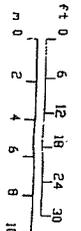
TRANSECT LOCATION MAP

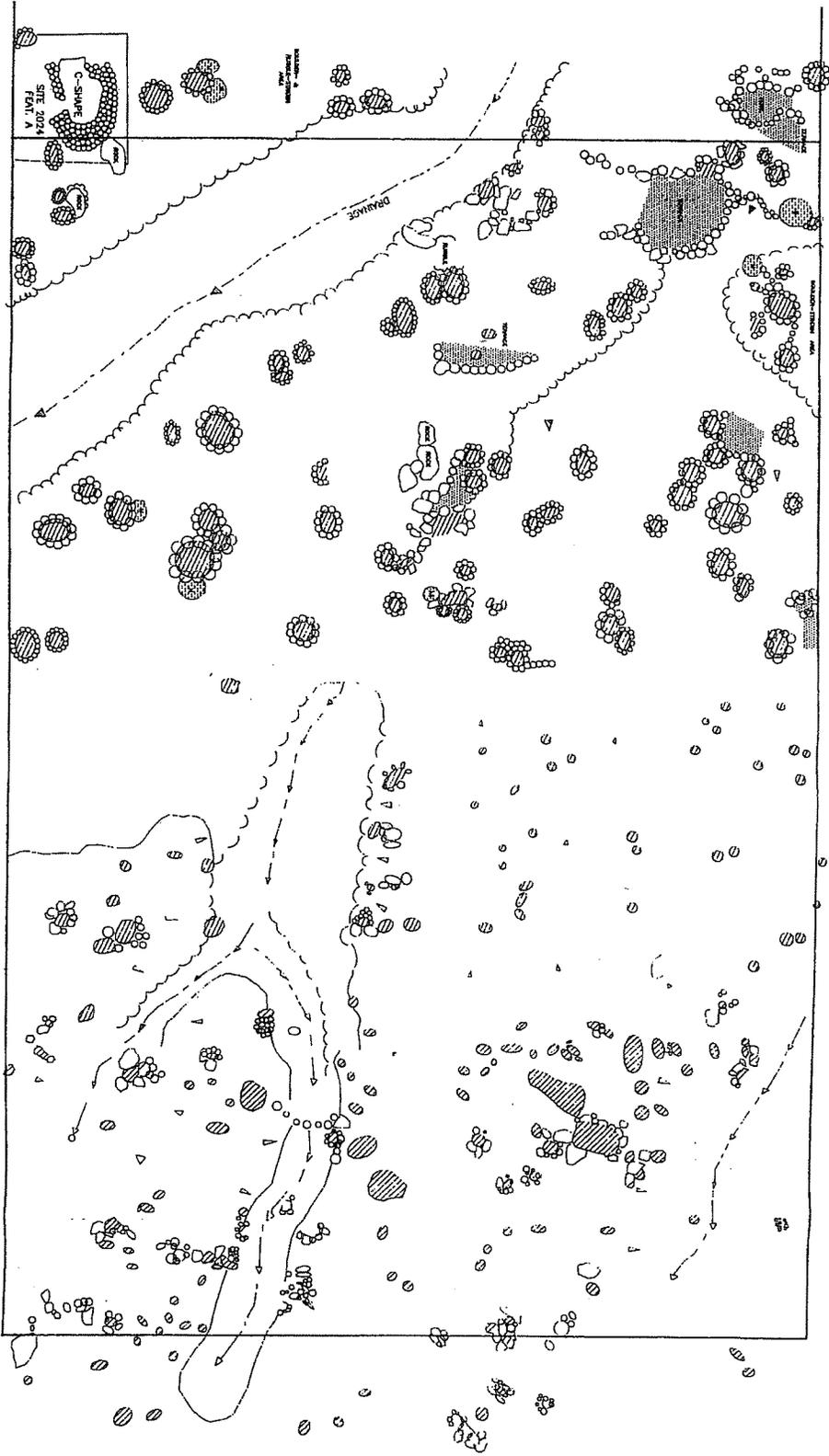




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TRANSECT 3, PANEL 1 SCALE 1:75m



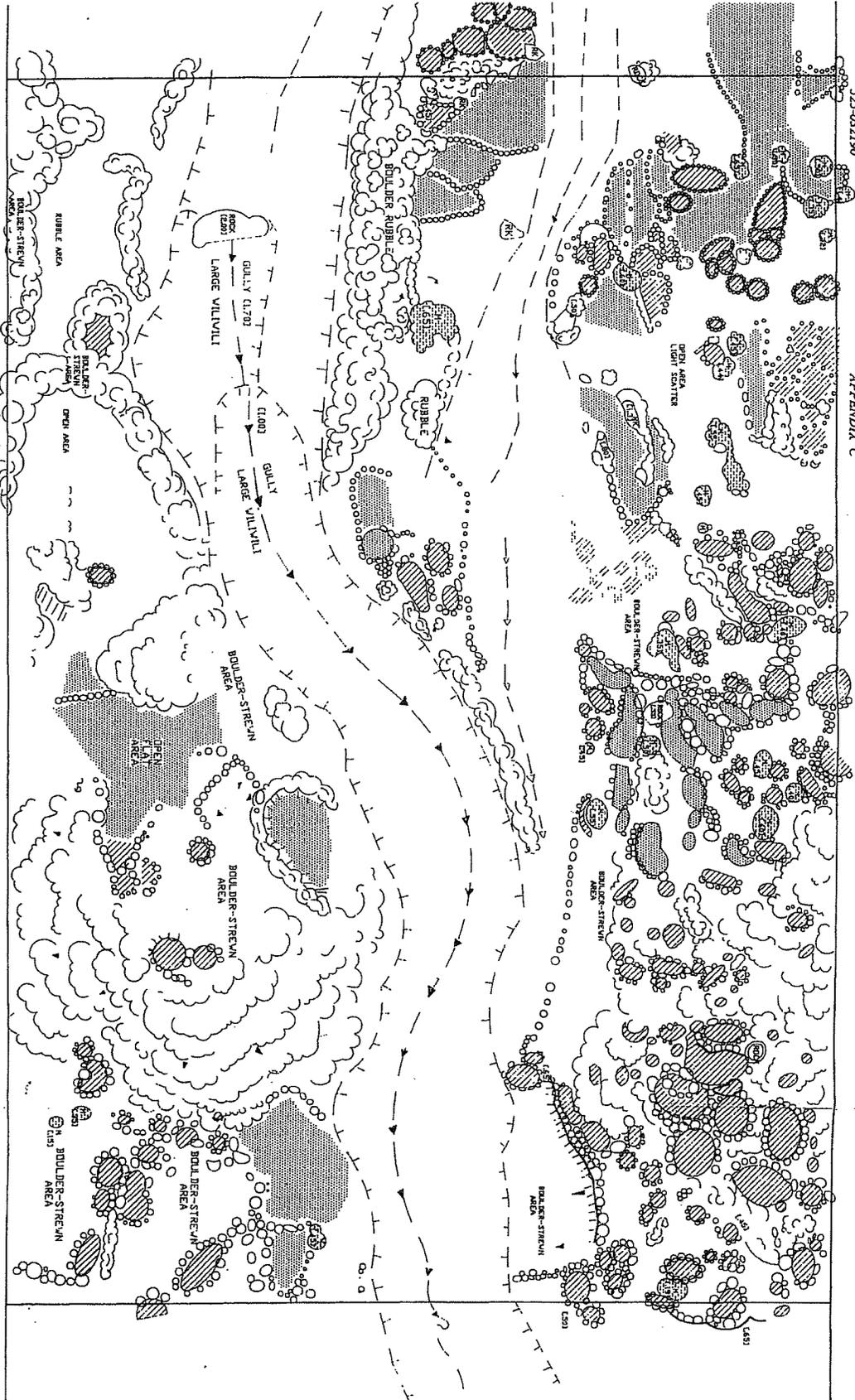


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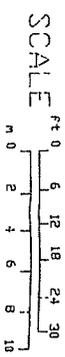
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SCALE

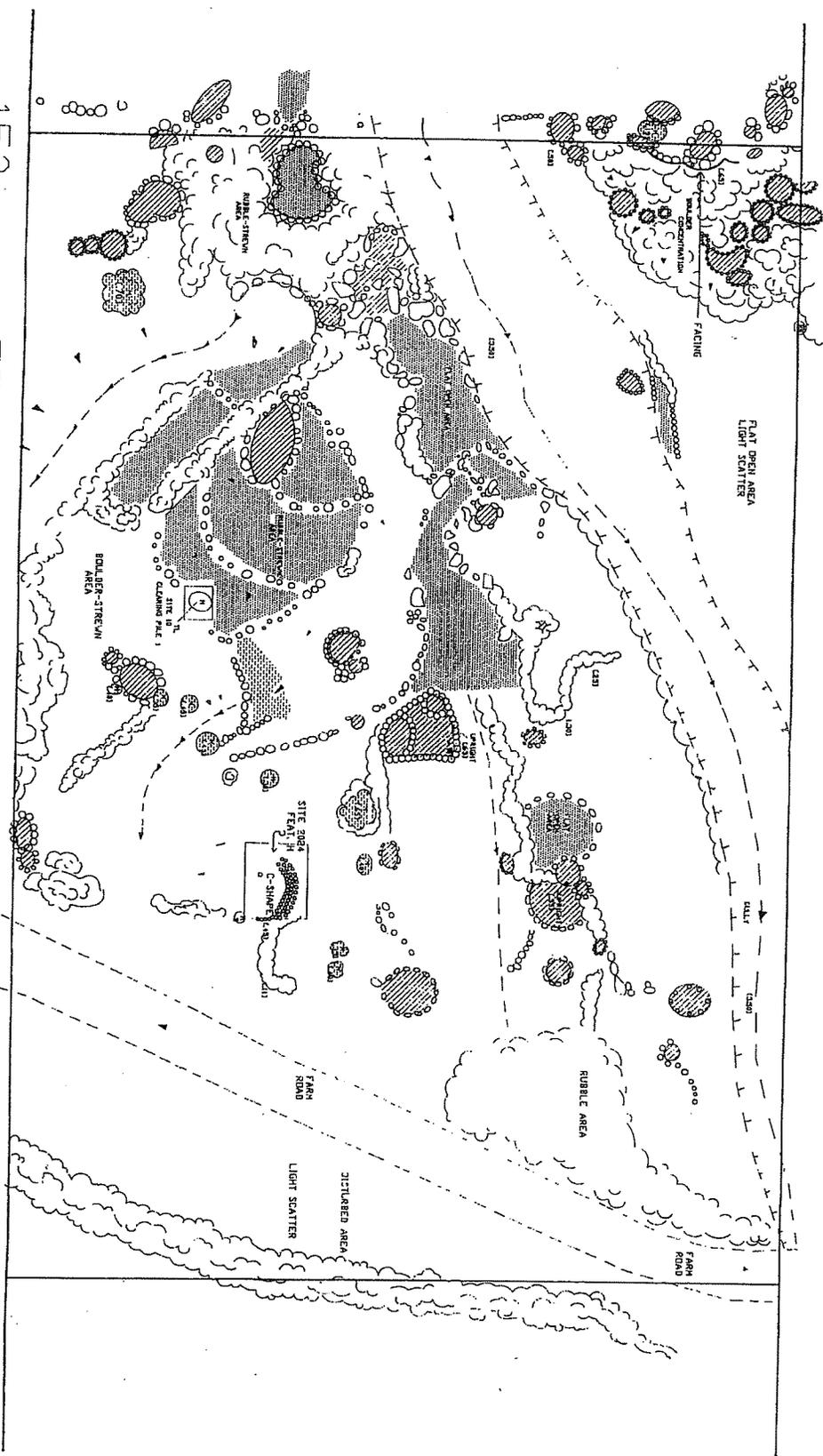
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75m TRANSECT 4, PANEL 2



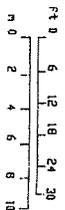
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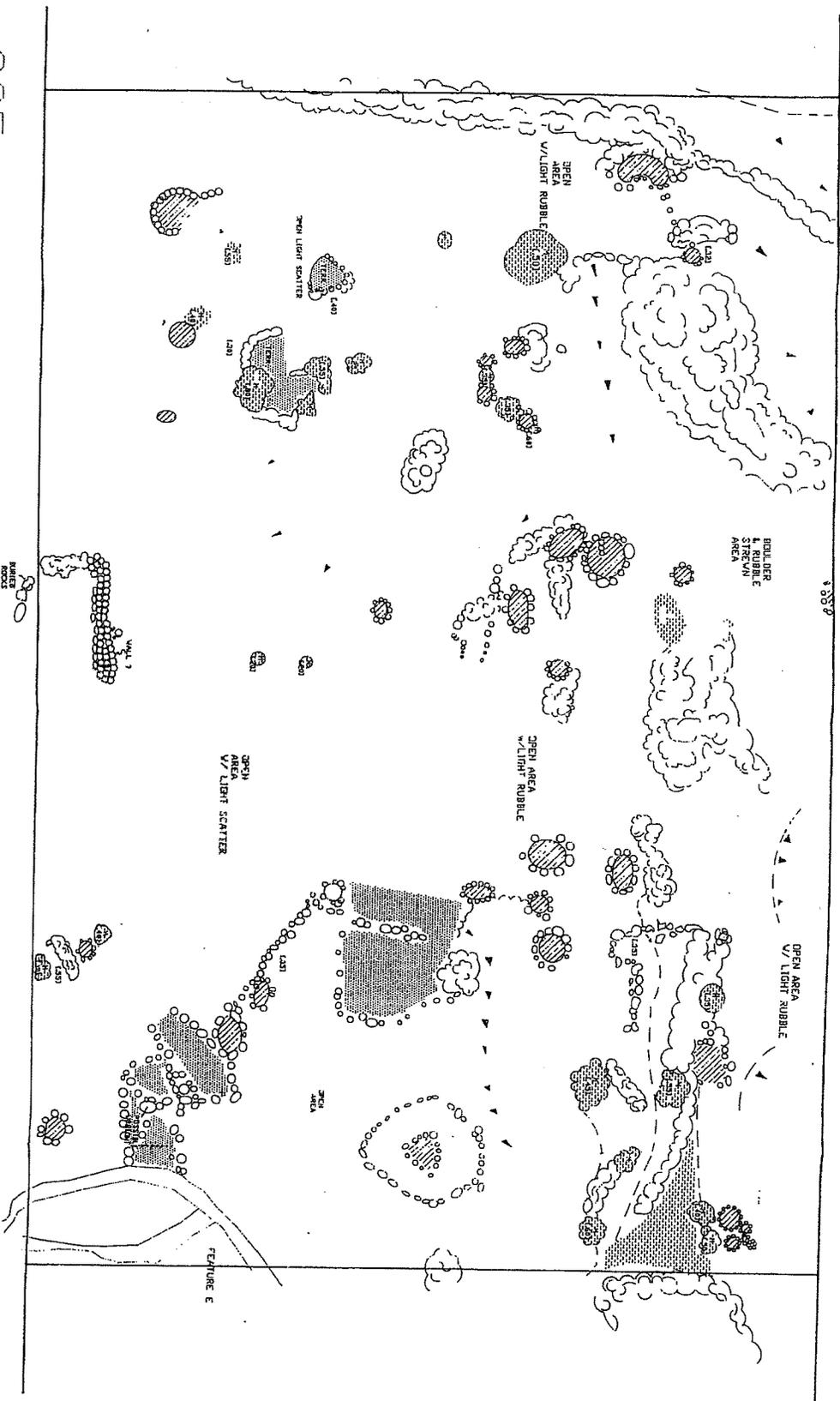
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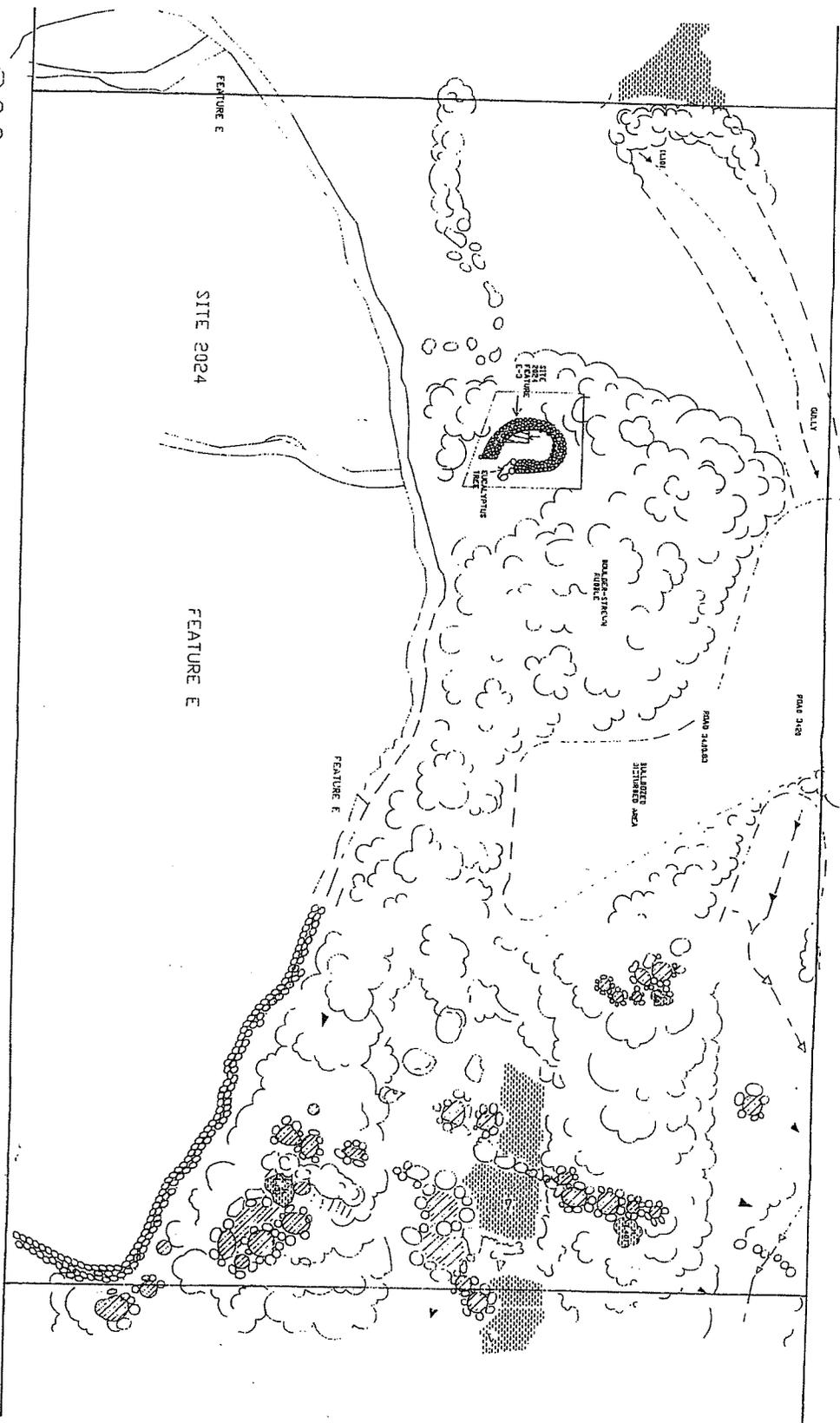
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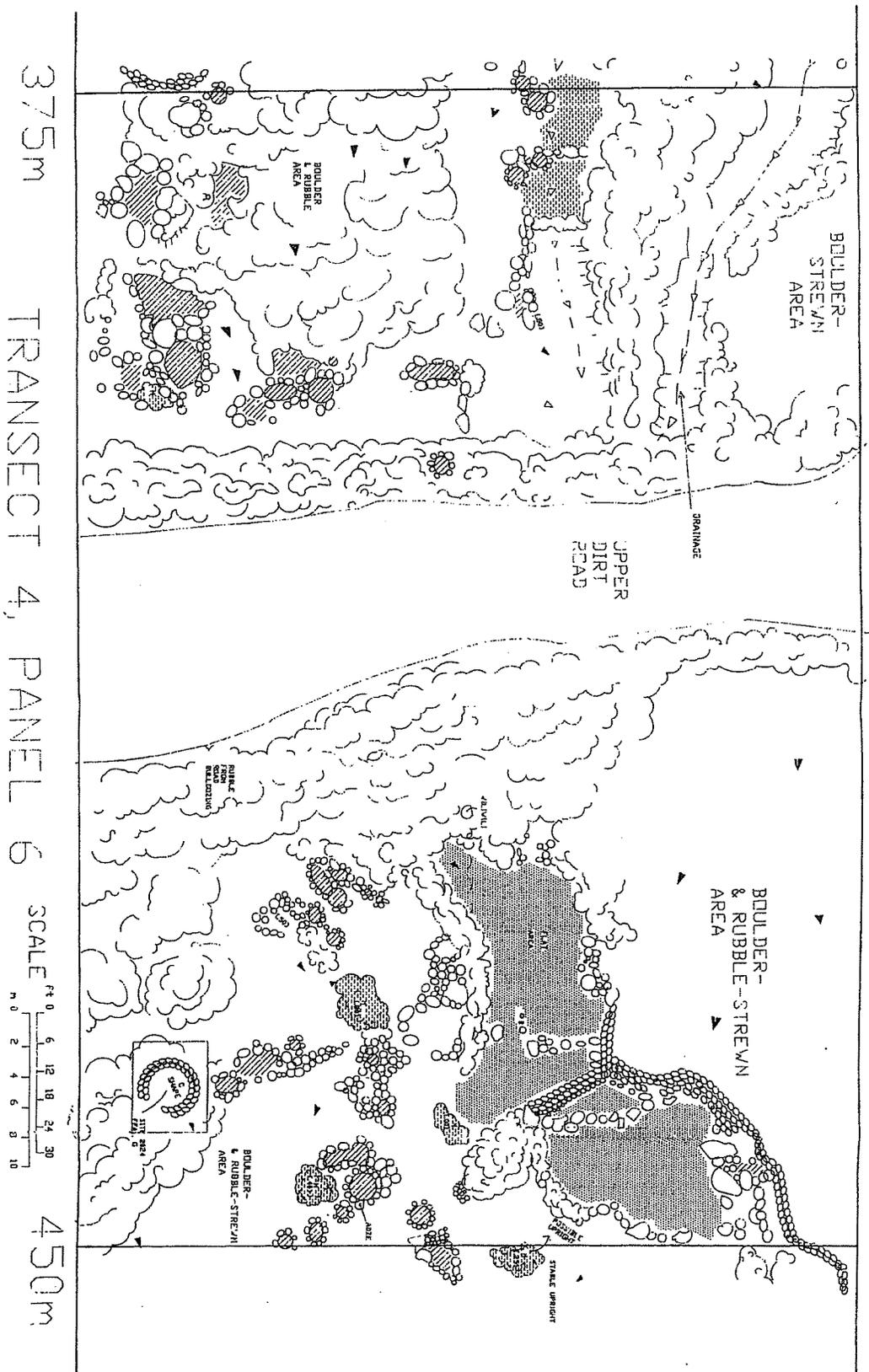
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225m
 TRANSECT 4, PANEL 4
 SCALE
 300m

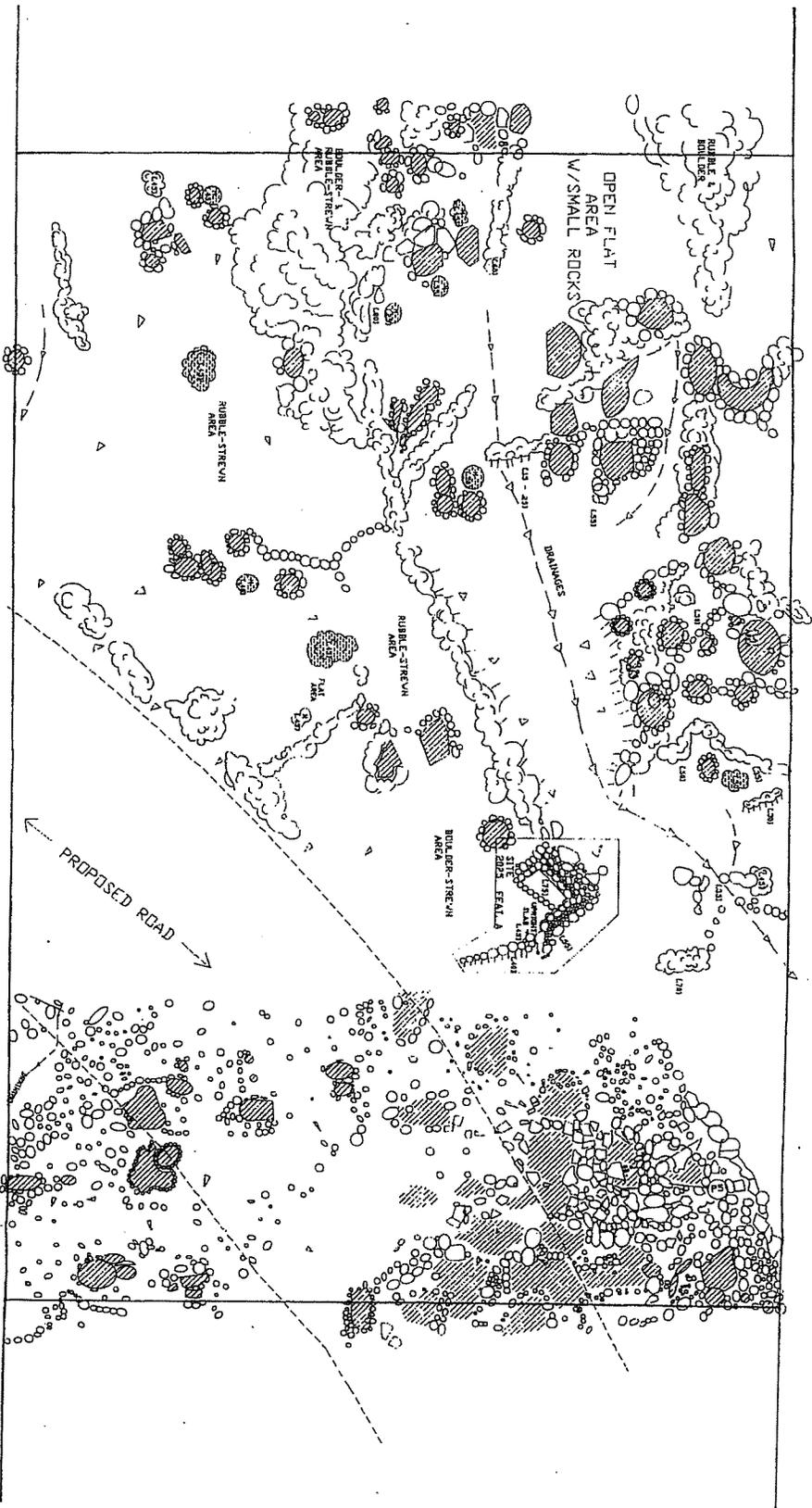


300m TRANSECT 4, PANEL 5 SCALE 1" = 37.5m





450m TRANSECT 4, PANEL 7 SCALE 0 3 6 9 12 15 18 21 24 27 30 525m

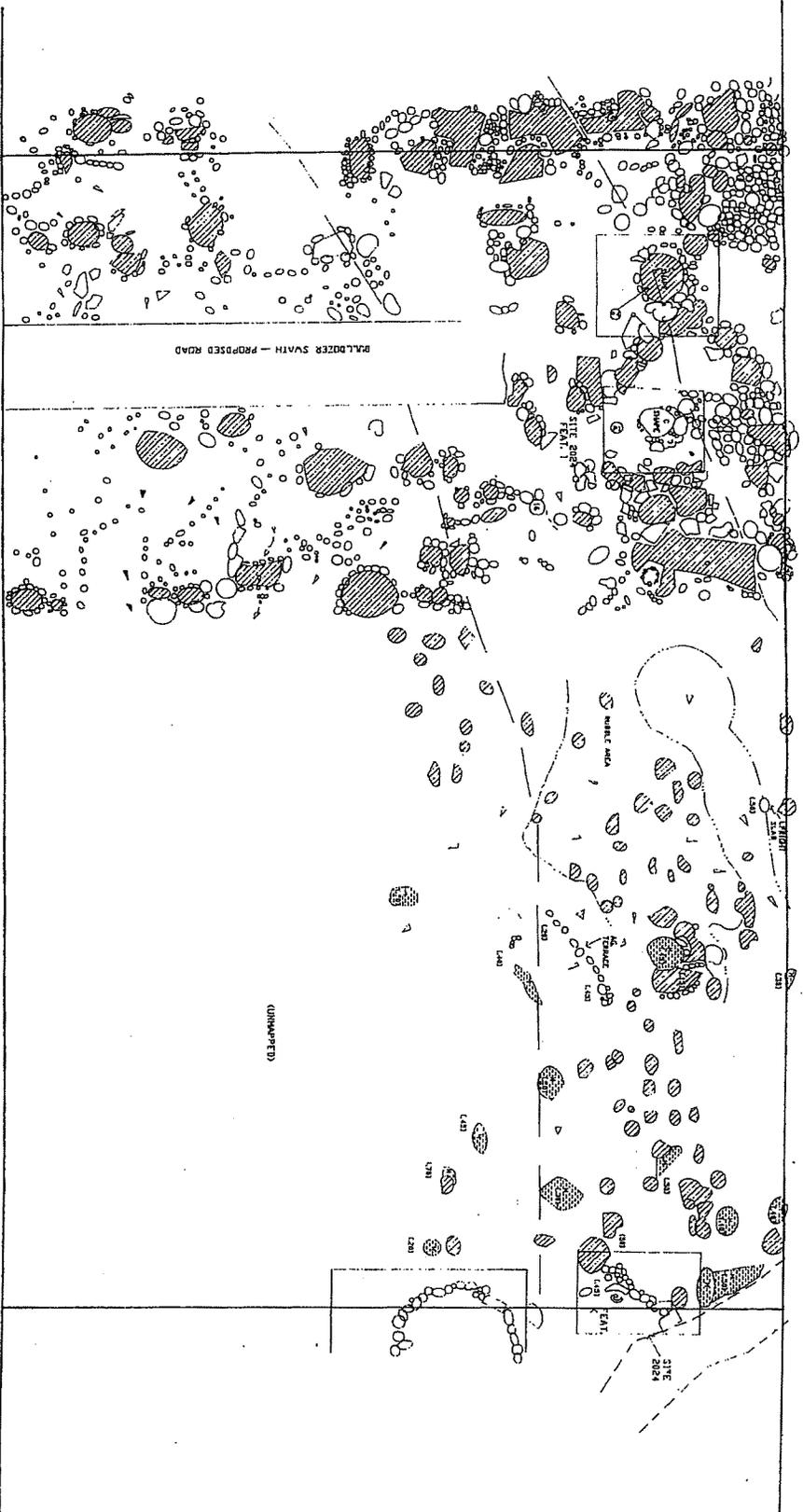


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TRANSECT 4, PANEL 8

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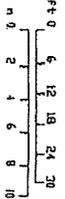
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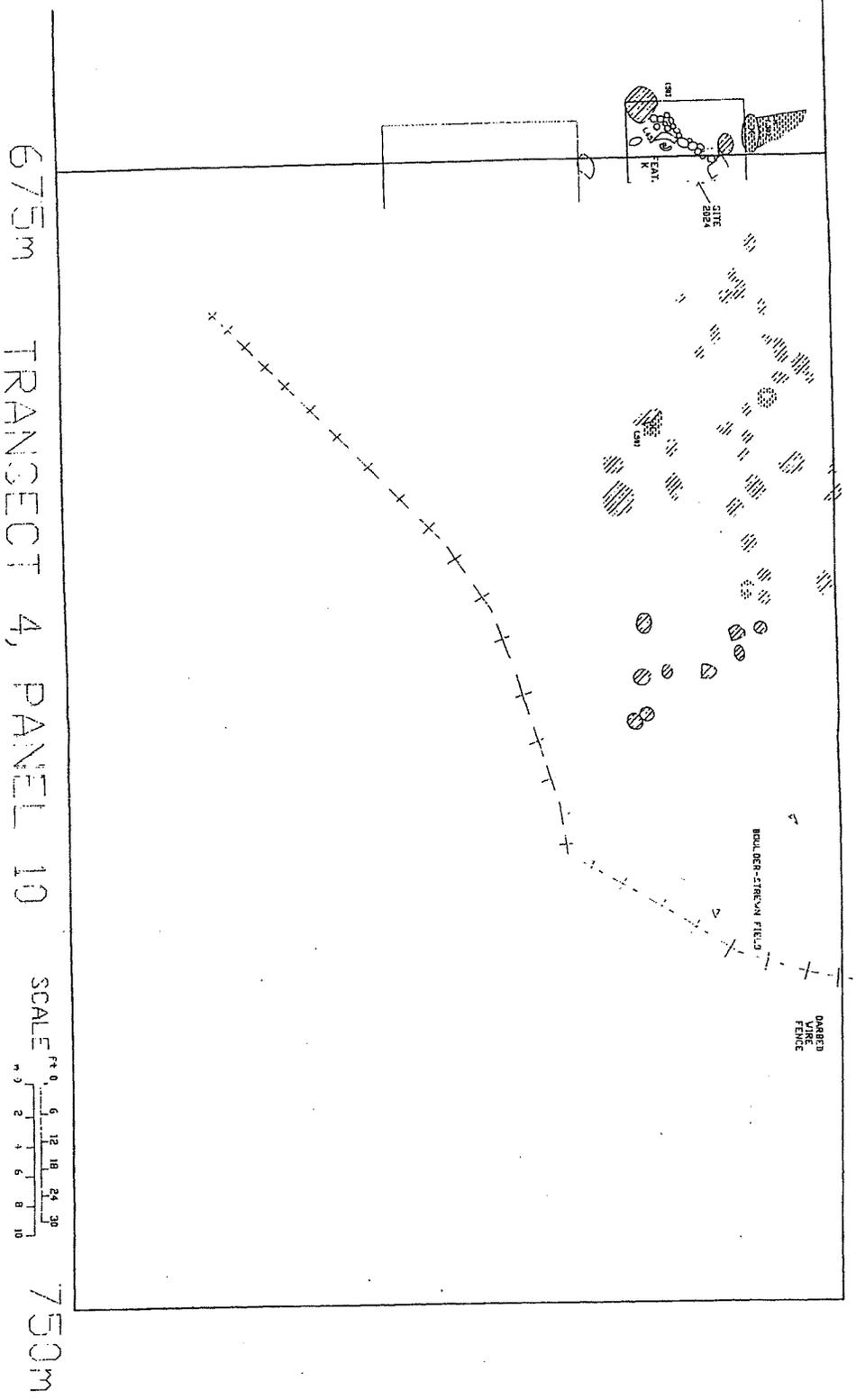
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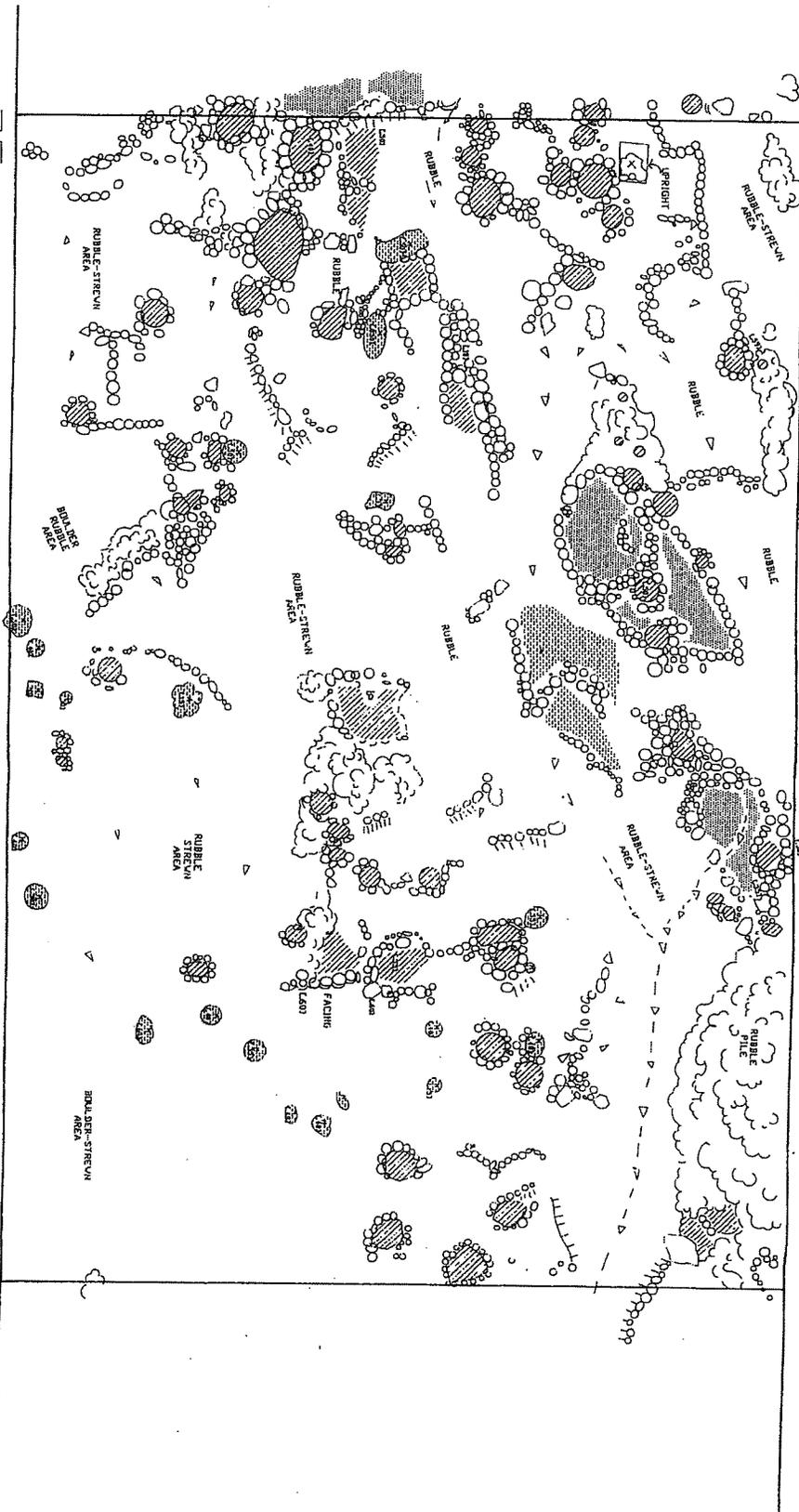
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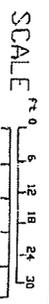
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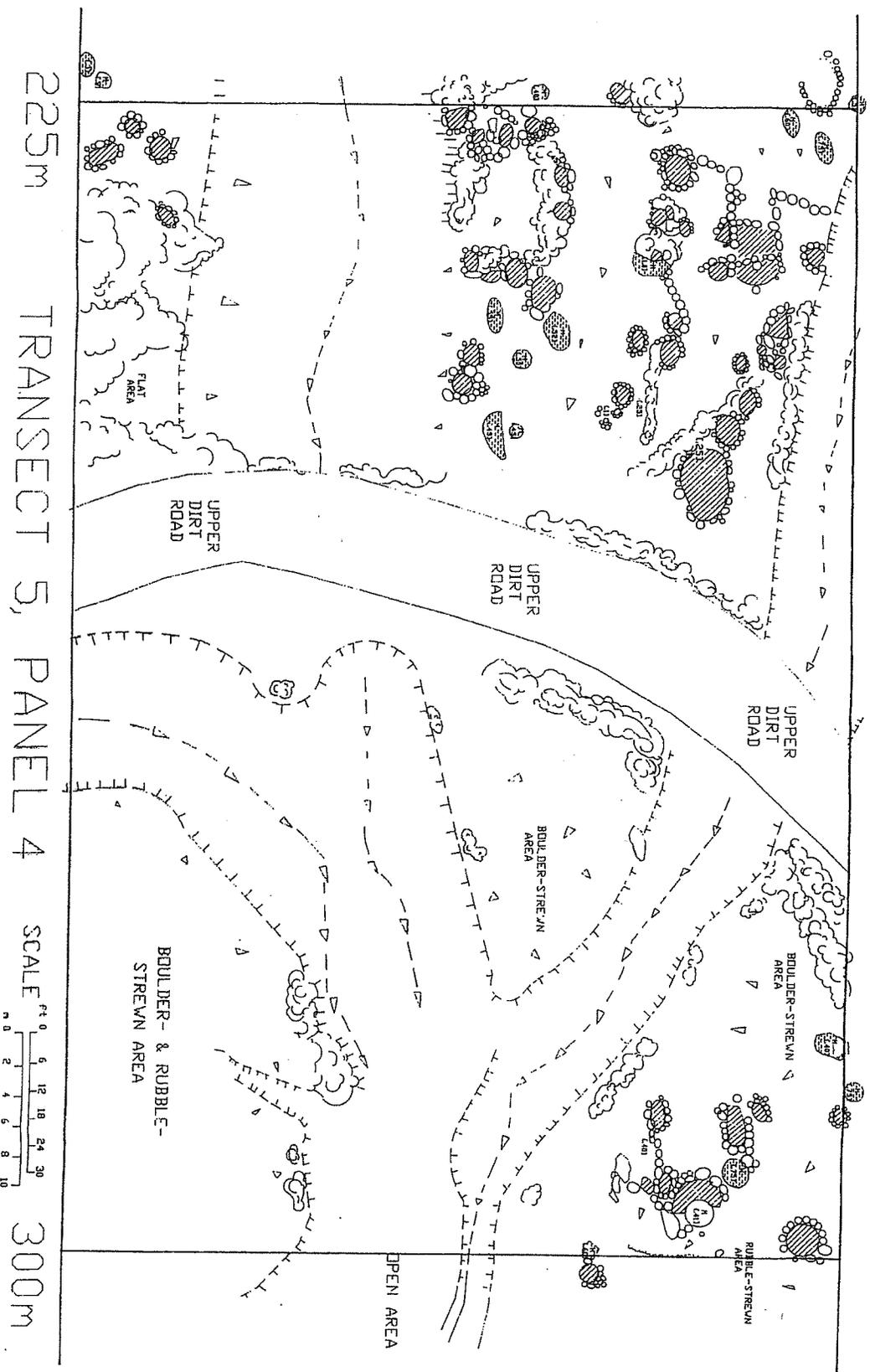


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TRANSECT 5, PANEL 2

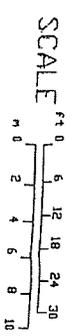
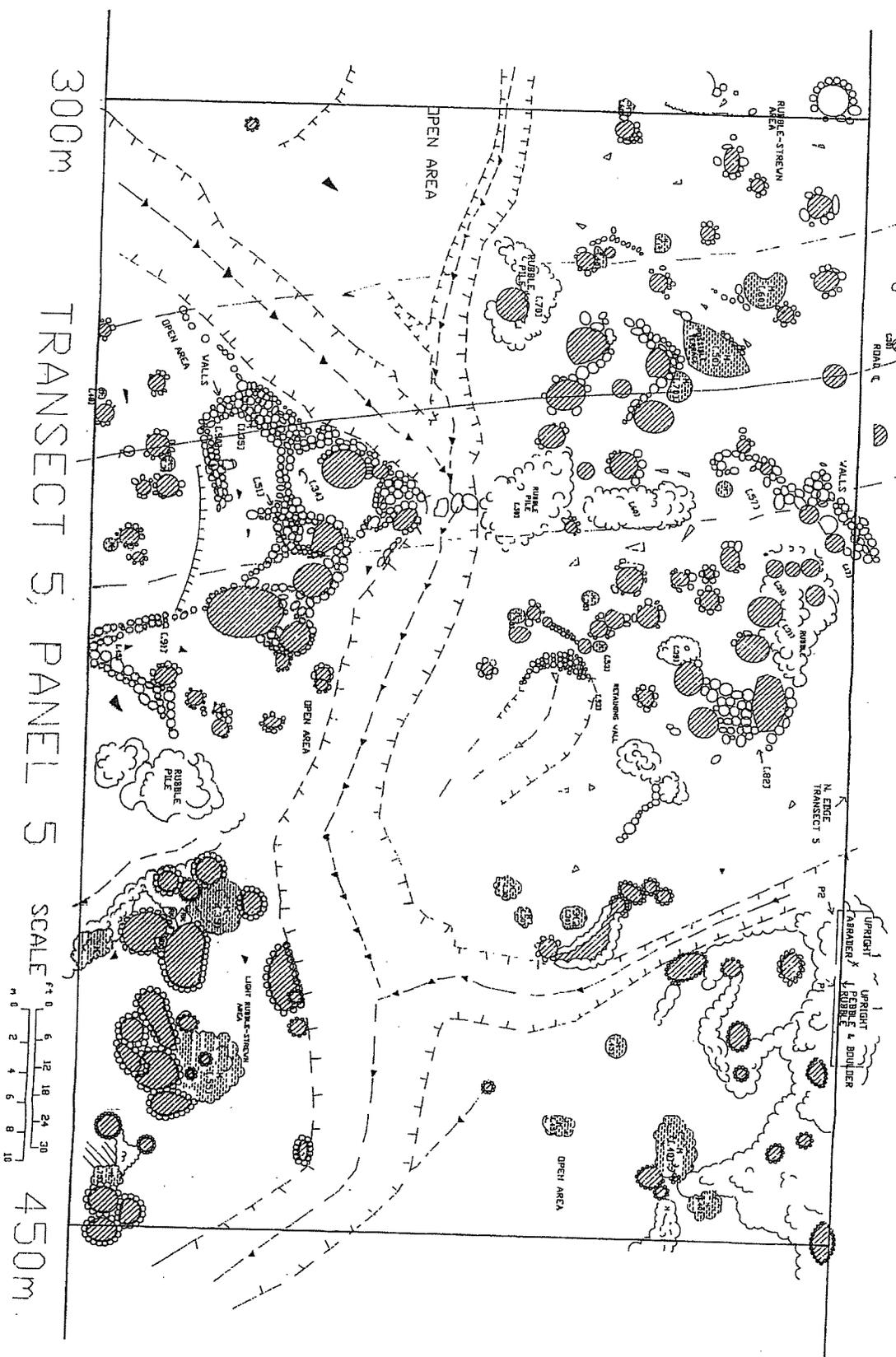


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525-032190

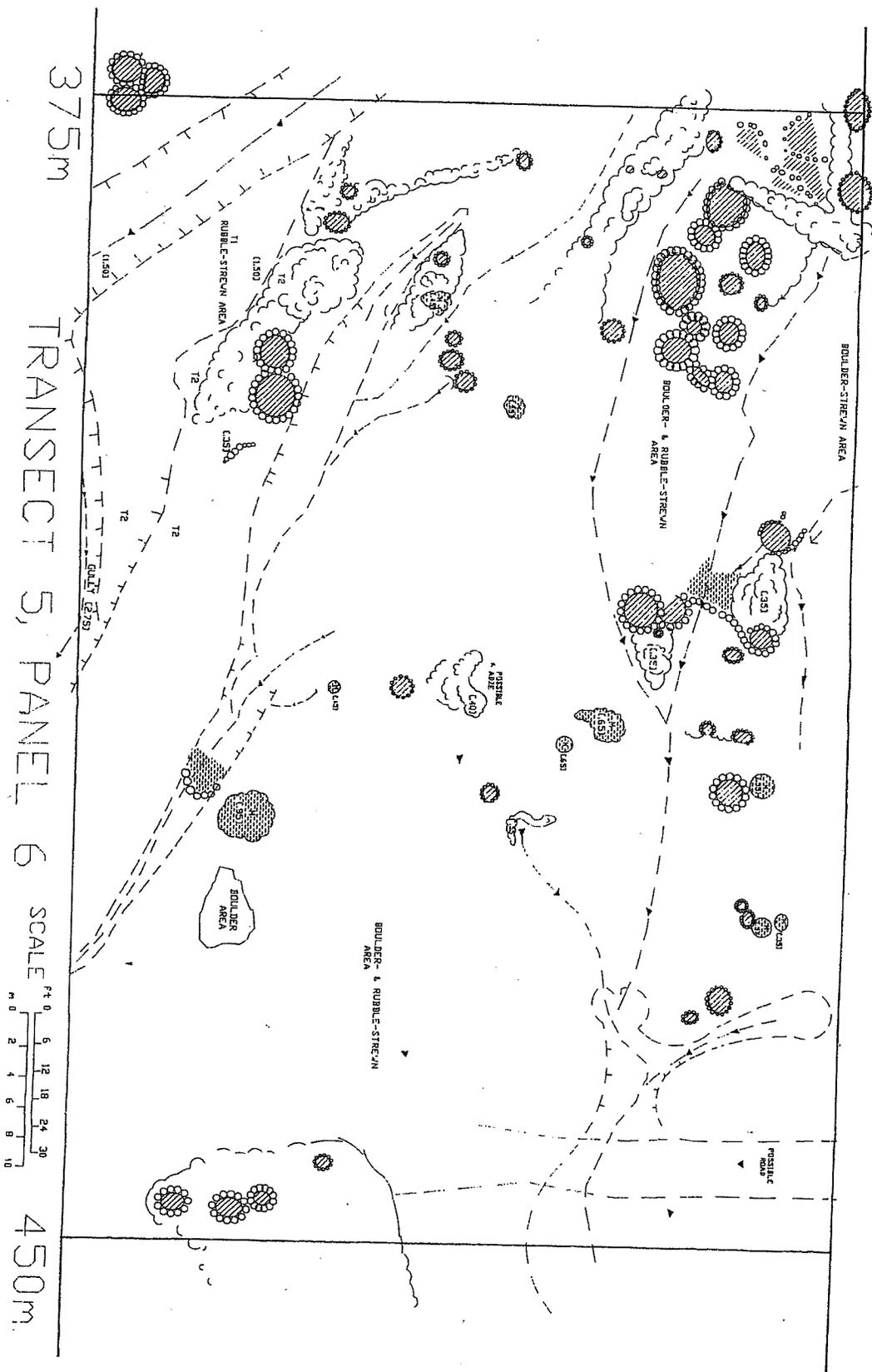
APPENDIX C

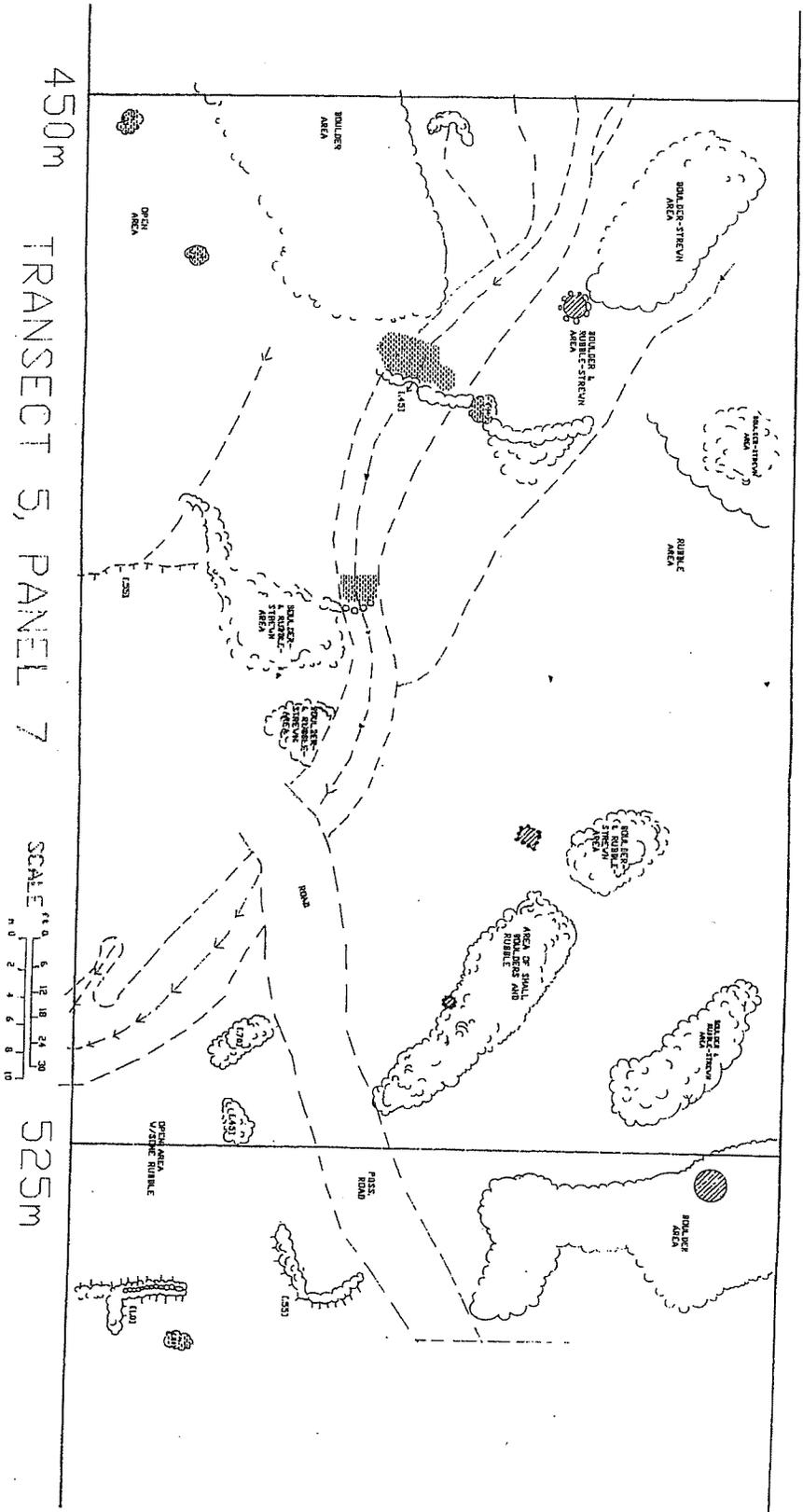


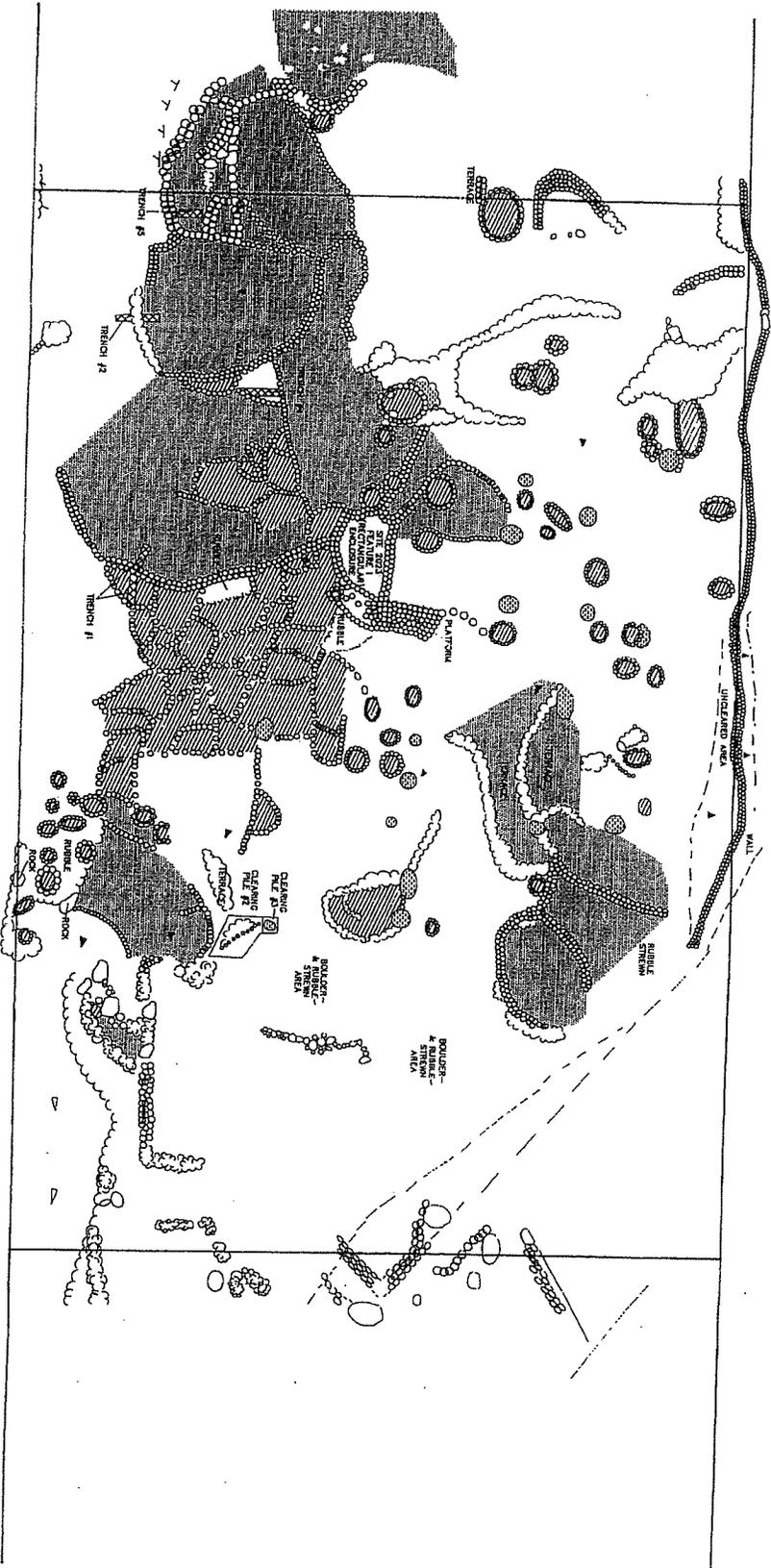
450m

300m

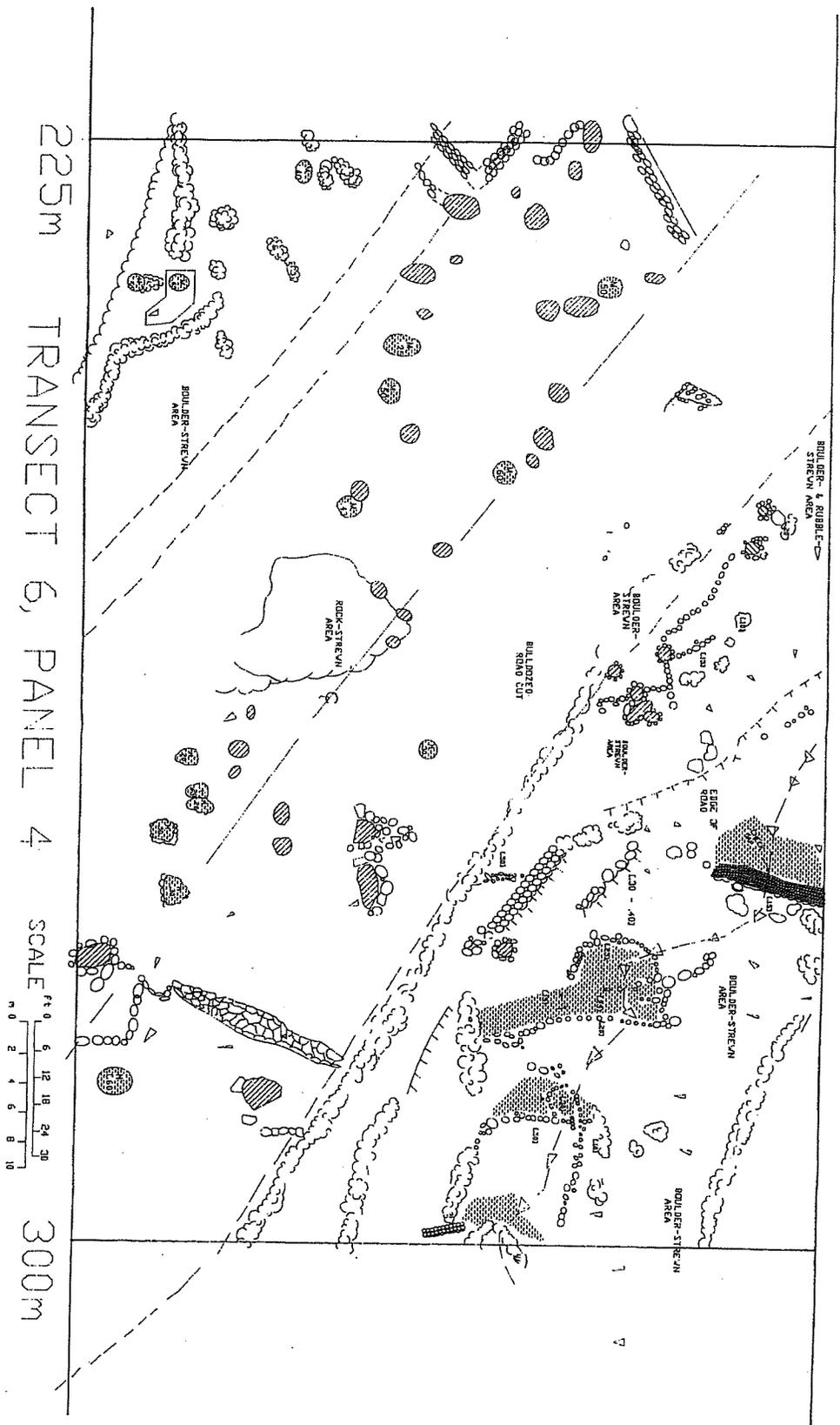
TRANSECT 5, PANEL 5







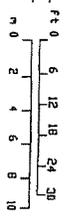
150m TRANSECT 6, PANEL 3 SCALE 1:1000 225m



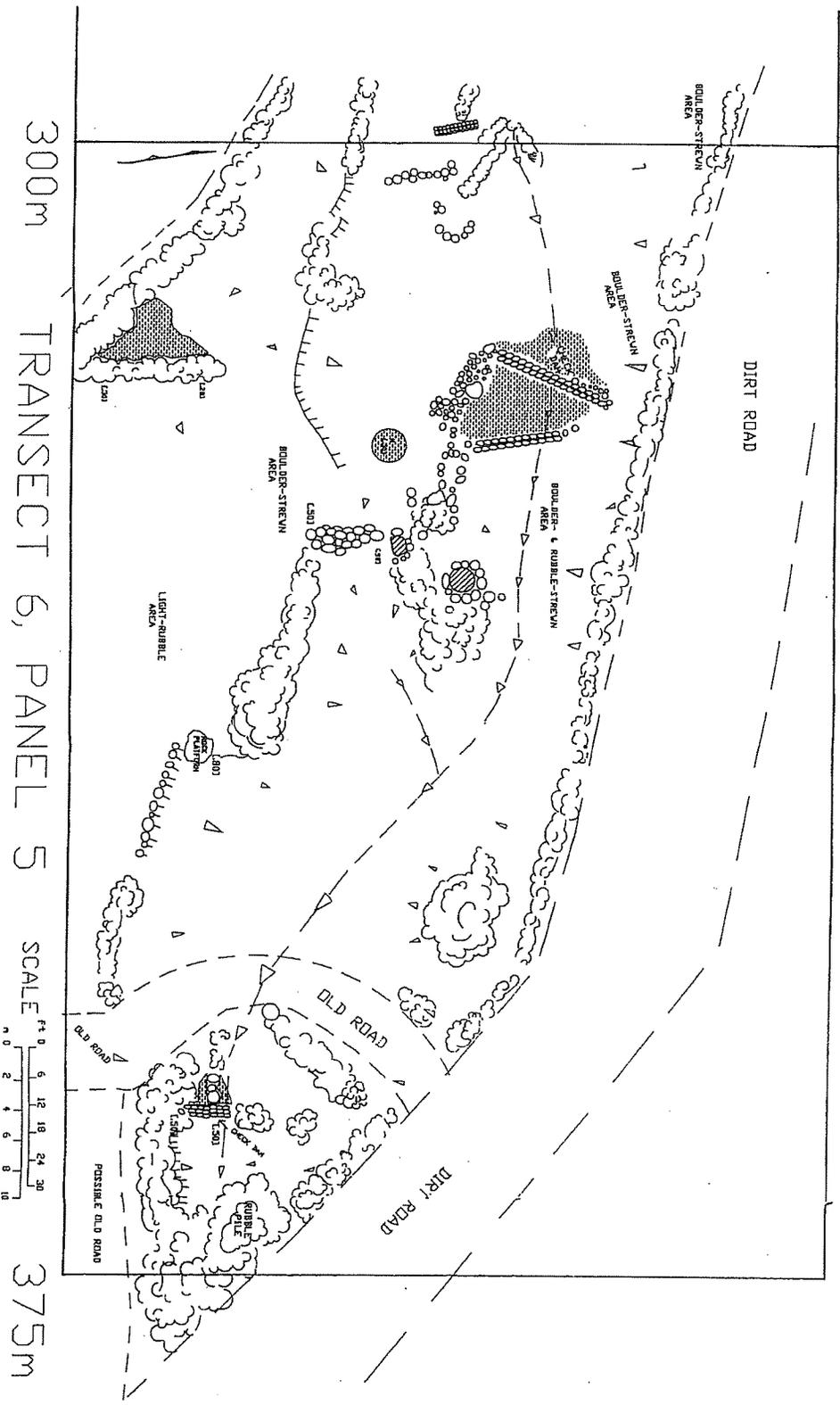
225M

TRANSECT 6, PANEL 4

SCALE



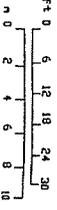
300m



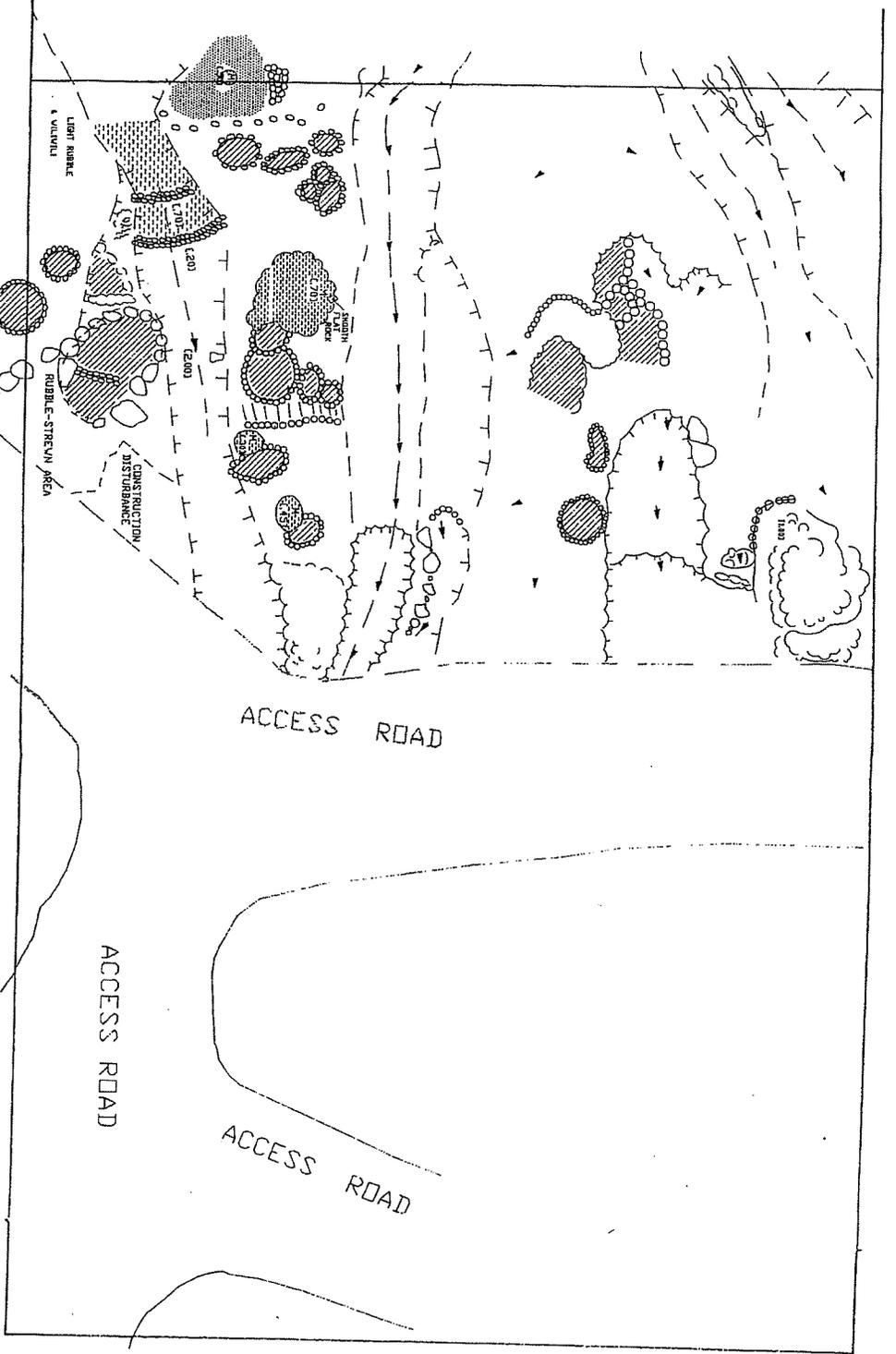
300m

TRANSECT 6, PANEL 5

SCALE



375m



150m

TRANSECT 7, PANEL 3

SCALE

0	6	12	18	24	30
0	2	4	6	8	10

225m

APPENDIX D

ADDITIONAL FIGURES

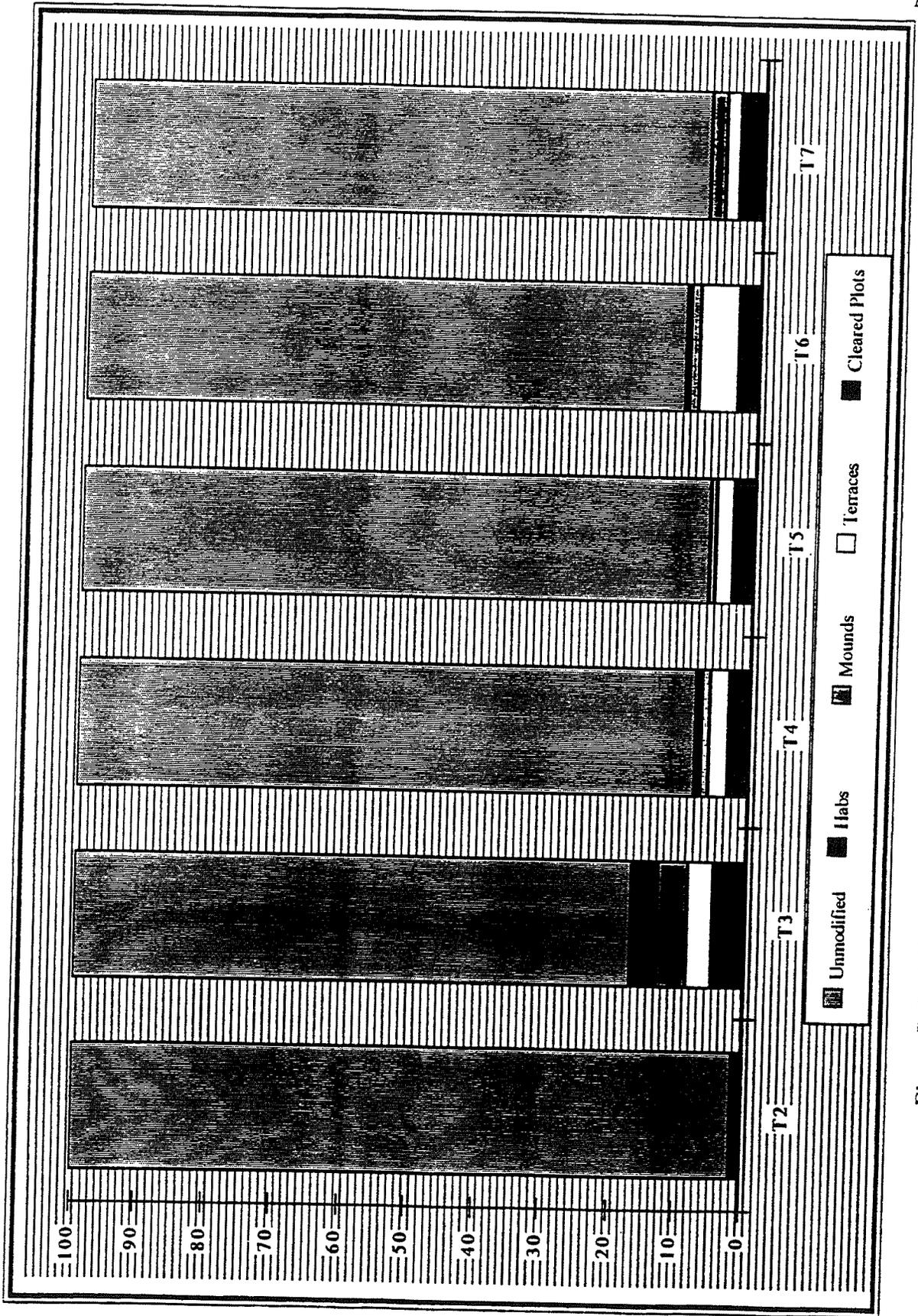


Figure D-1. OVERALL FEATURE DENSITY BY TRANSECT NUMBER

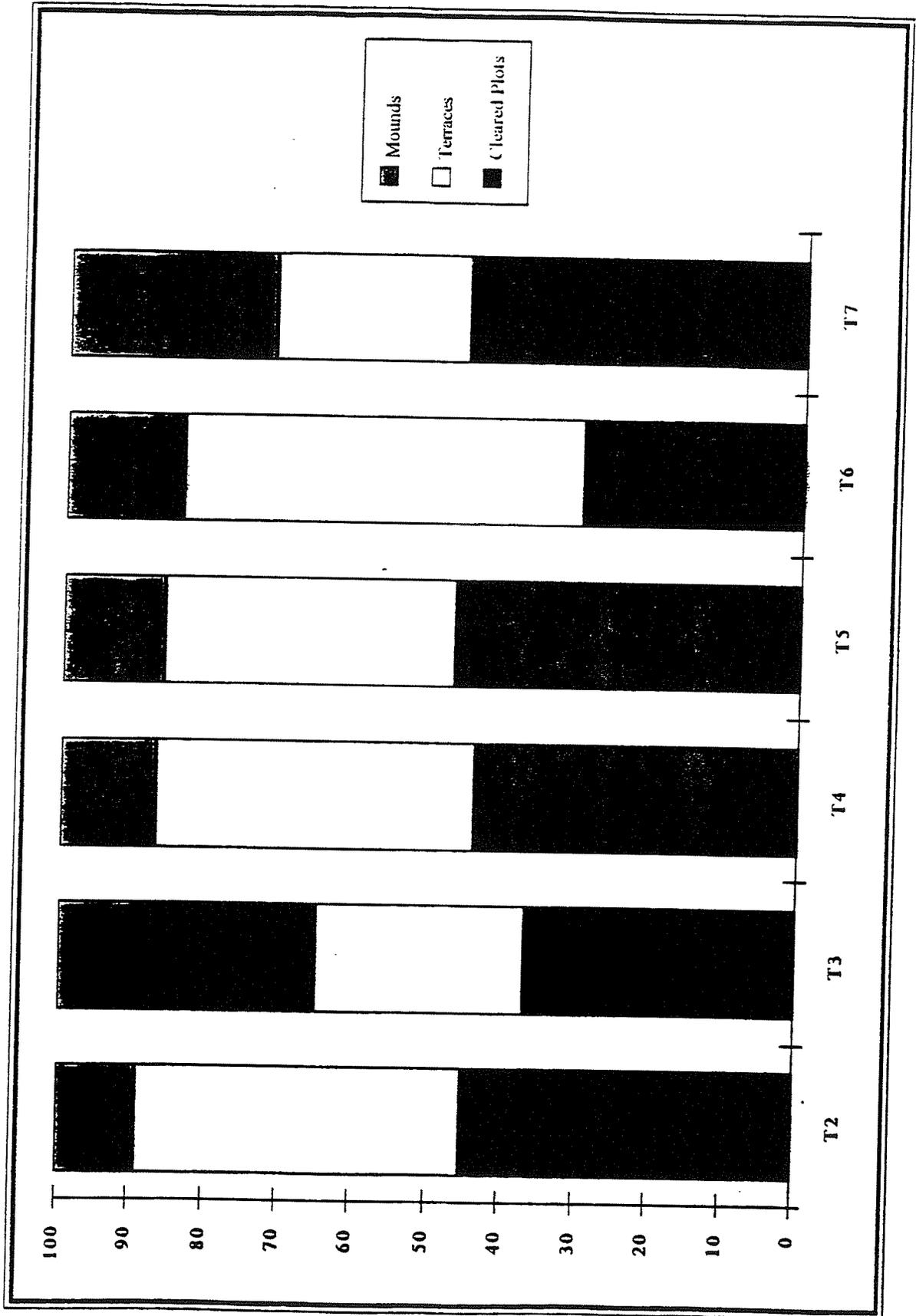


Figure D-2. RELATIVE PROPORTION OF AG. FEATURE TYPES BY TRANSECT

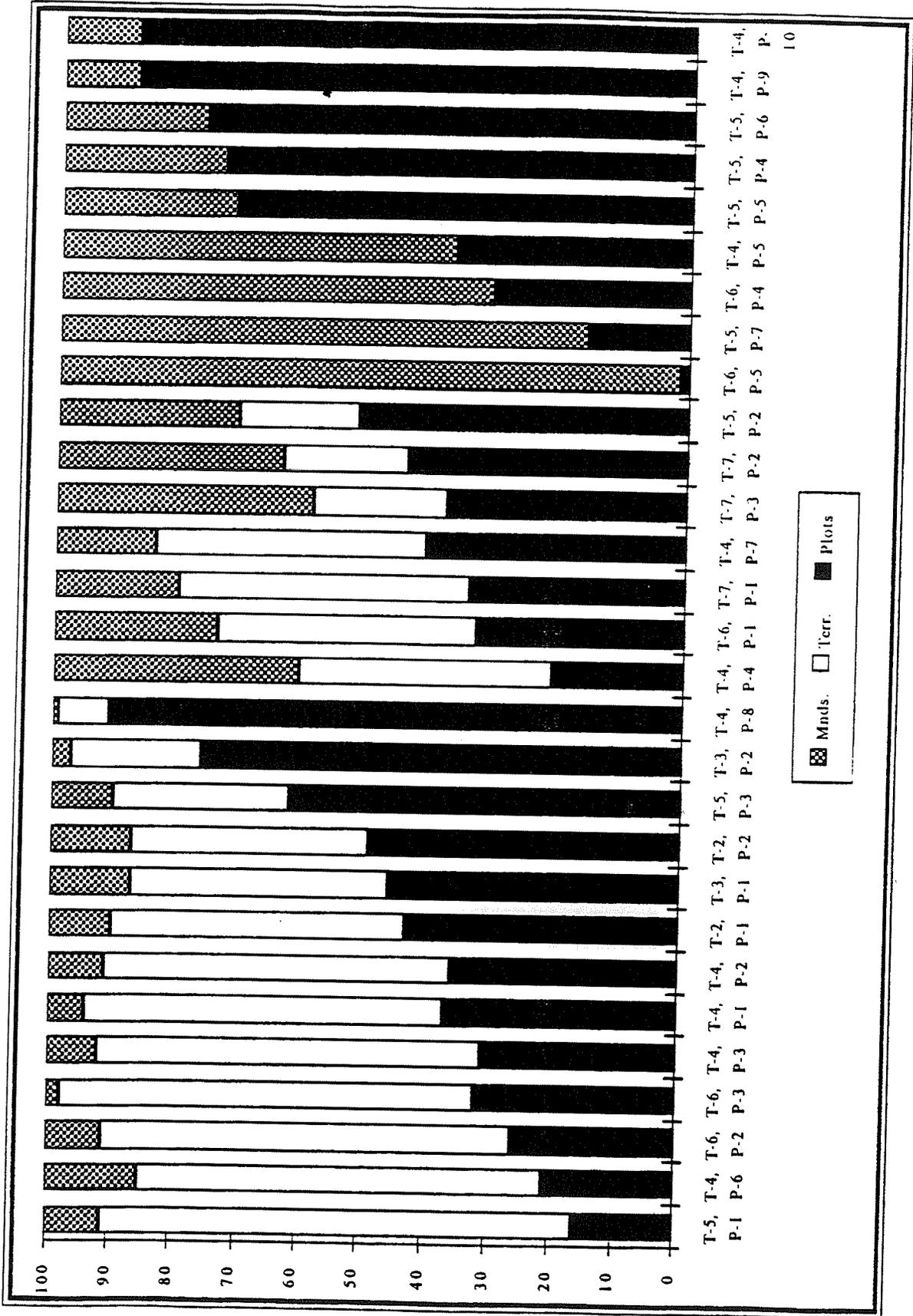


Figure D-4. FEATURE CLUSTERS, SERIATED

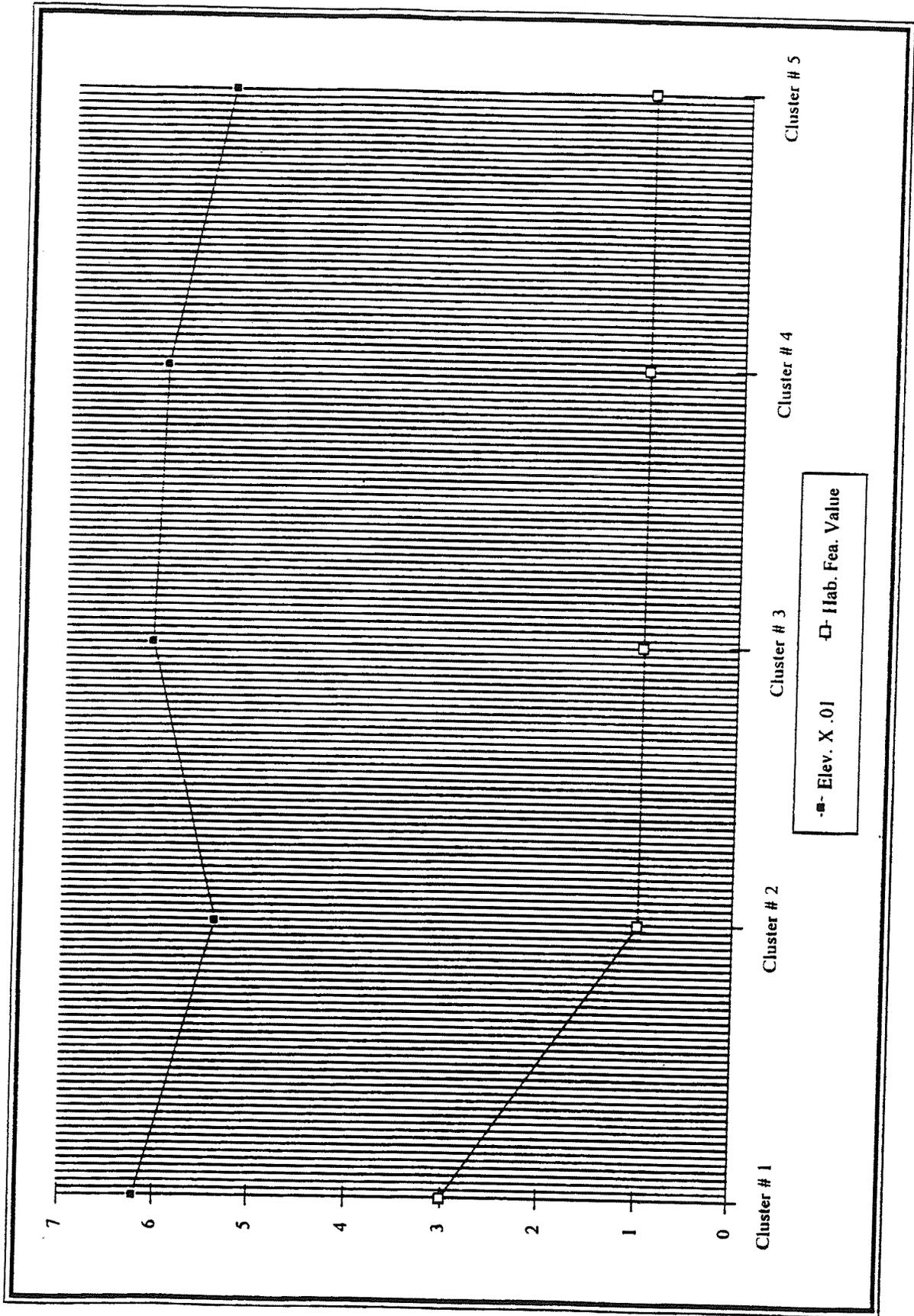


Figure D-5. MEAN ELEVATION COMPARED WITH HABITATION FEATURE PRESENCE VALUE BY CLUSTER

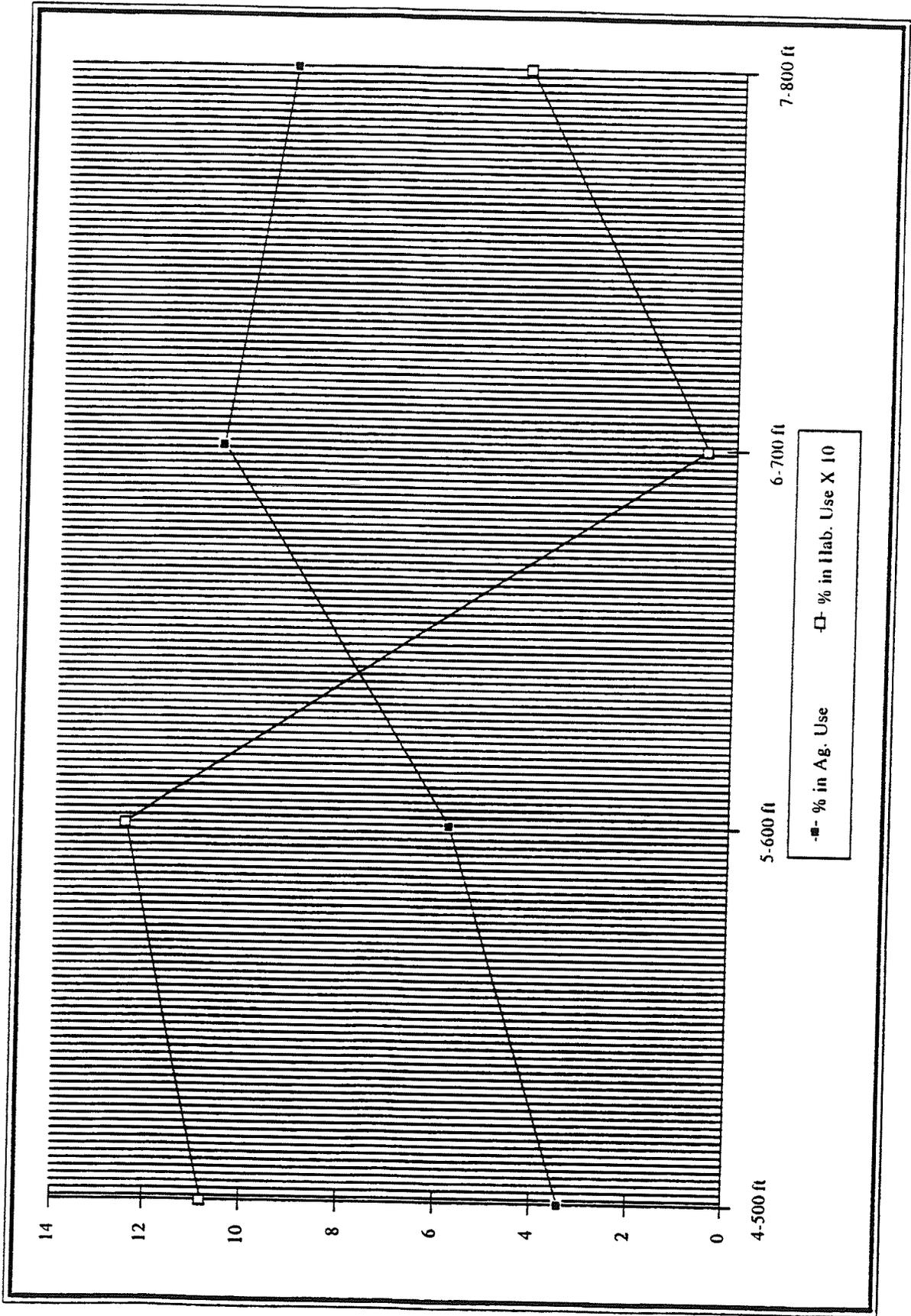


Figure D-6. ELEVATION-BASED CLUSTERS ILLUSTRATING COVARIATION BETWEEN AG. AND HABITATION FEATURES