

# An Archaeological Investigation of Halawa and Waiapuka *Ahupua'a*, North Kohala District, Hawai'i Island

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## Abstract

This report describes research conducted between June 22<sup>nd</sup> and August 15<sup>th</sup> 2008 as part of an archaeological field school in windward North Kohala District, Hawai'i Island directed by Mark D. McCoy and Michael W. Graves and sponsored by the University of New Mexico and San Jose State University. This season of the long-term Hawaii Archaeological Research Project (HARP) included test excavations and intensive survey centered on sites located within Halawa and Waiapuka *ahupua'a*. In total, eight complexes and single features comprised of 115 total individual features were recorded. Most of these complexes were made up of irrigated agricultural terraces although the size, construction, and manner of irrigation varied widely. In sum, 24 test units (+40 m<sup>2</sup>) and 34 shovel test pits were excavated to recover charcoal for radiocarbon dating, soil samples, and other evidence of prehistoric settlement and agriculture. Excavation revealed an extraordinary example of a deeply stratified pondfield deposit with matching evidence of rebuilding (HLW-29L); definitive evidence for the movement of water out of natural gullies via canals (*'auwai*) to irrigate tablelands between drainages (WAI-4); and our first clear example of intact coastal habitation deposits (WAI-7).

## Acknowledgements

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We were fortunate this summer to host two meetings of scholars concerned with ancient and modern Hawai‘i. The first included a collection of ecologist, archaeologists, and demographers who have been working on a project aimed at modeling the relationship between people and the natural environment in the past. Thanks to Oliver Chadwick, Julie Field, Sara Hotchkiss, Pat Kirch, Thegn Ladefoged, Charlotte Lee, Cedric Puleston, and Peter Vitousek for a stimulating discussion on the development of traditional Hawaiian society. The second meeting included archaeologists, anthropologists, and scholars of Hawaiian history and centered on archaeological ethics. Thanks to Fred Cachola, Robin Connors, Tom Dye, Windy McElroy, Julie Field, James Flexner, Kathy Kawelu, Peter Mills, Sean Naleimaile, and Mark Oxley for their dedication to addressing core issues in the practice of archaeology in a critical but positive way.

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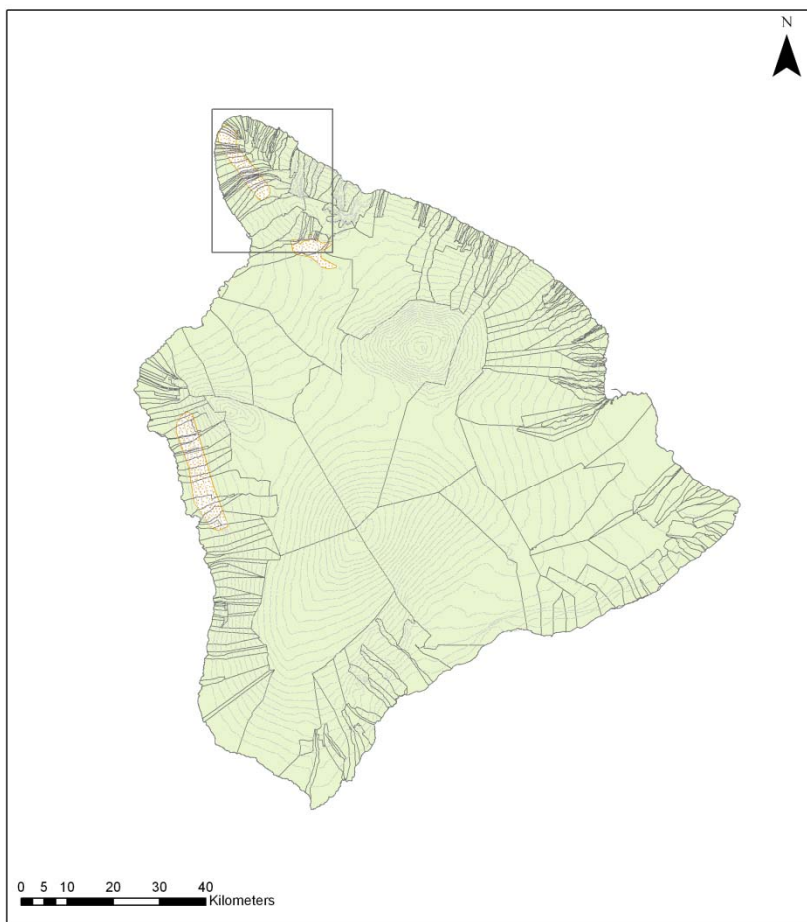
# Chapter 1. Background

## Introduction

This report describes the results of a research and training program conducted in the North Kohala District of Hawai‘i Island between June 22<sup>nd</sup> and August 15<sup>th</sup>, 2008. This archaeological field school centered on finding and recording sites, features, and artifacts in the community territories of Halawa and Waiapuka *ahupua`a*. This work builds on two previous field seasons focused on documenting the development of traditional Hawaiian agriculture in the windward portion of the district (Field and Graves in prep.; McCoy and Graves 2007).

In 2008, we found, mapped, and described 115 new features within eight complexes bringing our total database for this region to 48 complexes comprised of 493 features (see Appendix). Again, these surveys show the wide variety of strategies used by Hawaiian engineers to create an agricultural landscape. In addition, field school students participated in research on the leeward half of the district as part of a separate research project on the relationship between human social development and the natural environment.

Excavations uncovered evidence of ancient irrigated farming and habitation. Specifically, excavation revealed (1) an extraordinary example of a deeply stratified pondfield deposit with matching evidence of rebuilding (HLW-29L); (2) definitive evidence for the movement of water out of natural gullies via canals (*‘auwai*) to irrigate tablelands between drainages (WAI-4); and (3) our first clear example of intact coastal habitation deposits (WAI-7). In sum, 24 test units (+40 m<sup>2</sup>) and 34 shovel test pits were



**Figure 1 - Traditional Land Divisions and Documented Dryland Field Systems of Hawai'i Island. Inset box shows location of North Kohala District.**

excavated to recover charcoal for radiocarbon dating, soil samples, and other evidence of prehistoric settlement and agriculture.

The following report is simply a record of work completed and sites recorded this season. Many of the descriptions given are drawn directly from field notes and student papers. We have made an effort to standardize the language used, correct errors, and present it in a format that will be familiar to professional archaeologists.

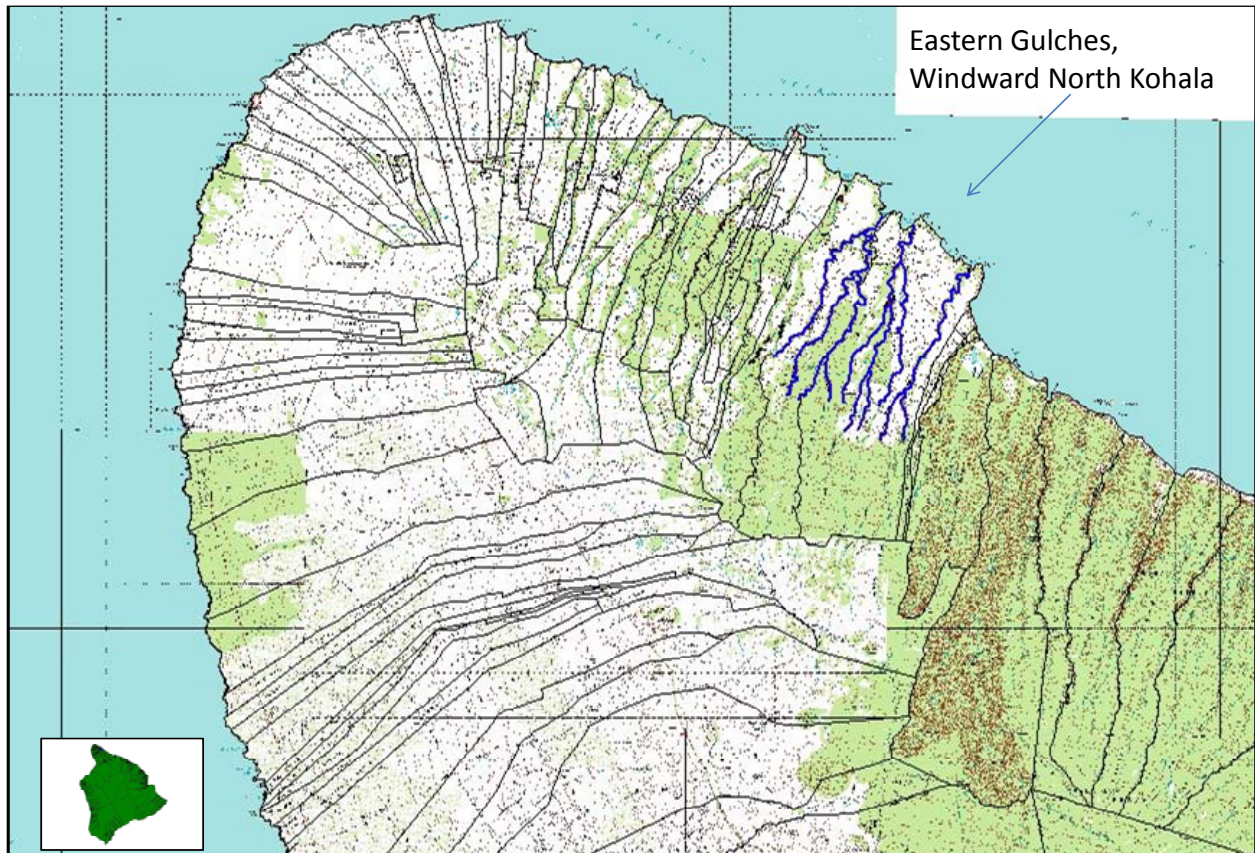


Figure 2 - Windward North Kohala District, Hawai'i Island.

## Overview of Study Area

Since this research is a continuation of work we reported on last year the following description of North Kohala's environment and our methodology is nearly identical to our previous work (McCoy and Graves 2007:7). We repeat it here for consistency's sake.

### *Windward North Kohala Environment*

There are several key environmental factors relevant to our study of traditional Hawaiian agricultural practices: rainfall, soils, slope gradient, stream flow and springs. Rainfall in the study area is high – 1,500 mm annually in coastal areas to +5,000 mm annually in the uplands – and varies seasonally with most rain in the winter months. In the study area, gulches that feed in to Hapuu, Kapanaiia (also labeled as Kapana on modern maps), Keokea, and Neue Bays –



referred to as the “eastern gulches” since these are the easternmost of a network of gulches on the windward slopes of the Kohala Mountains. The geologic age of the parent material for the

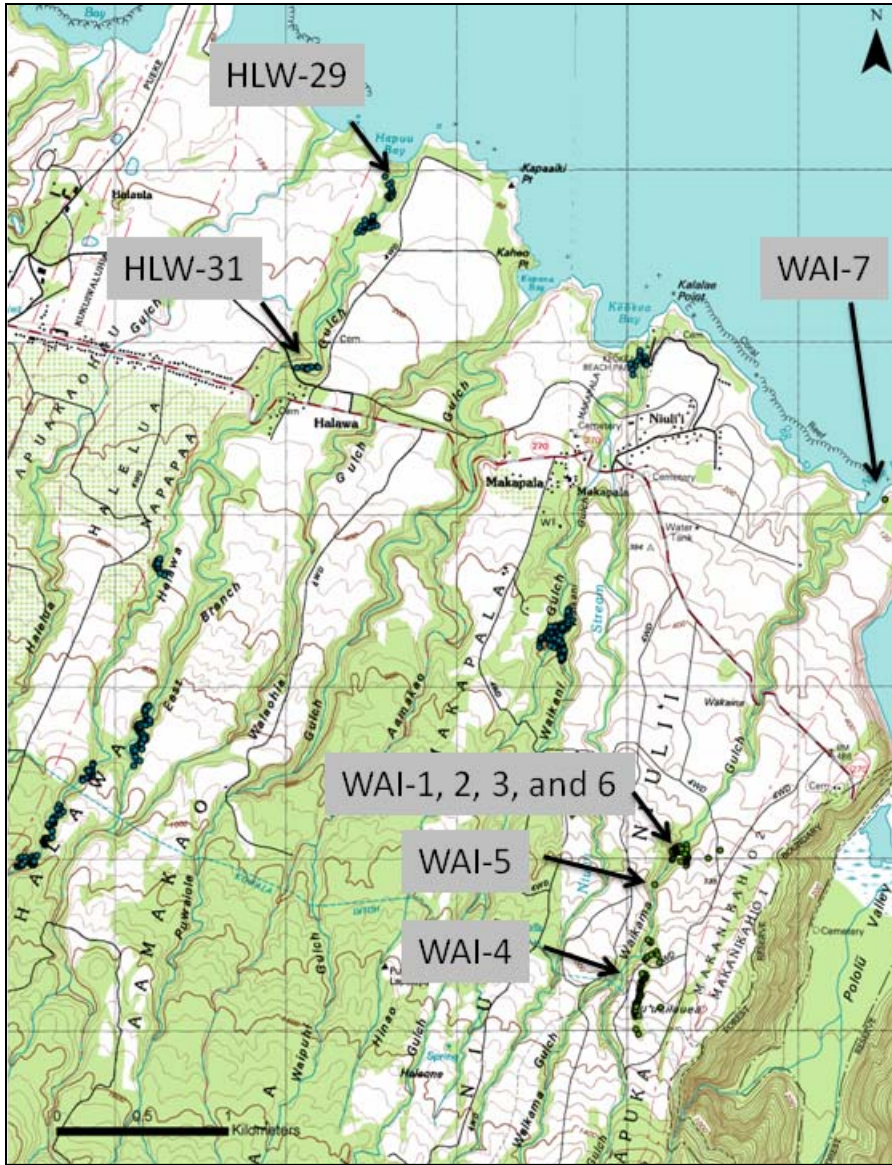


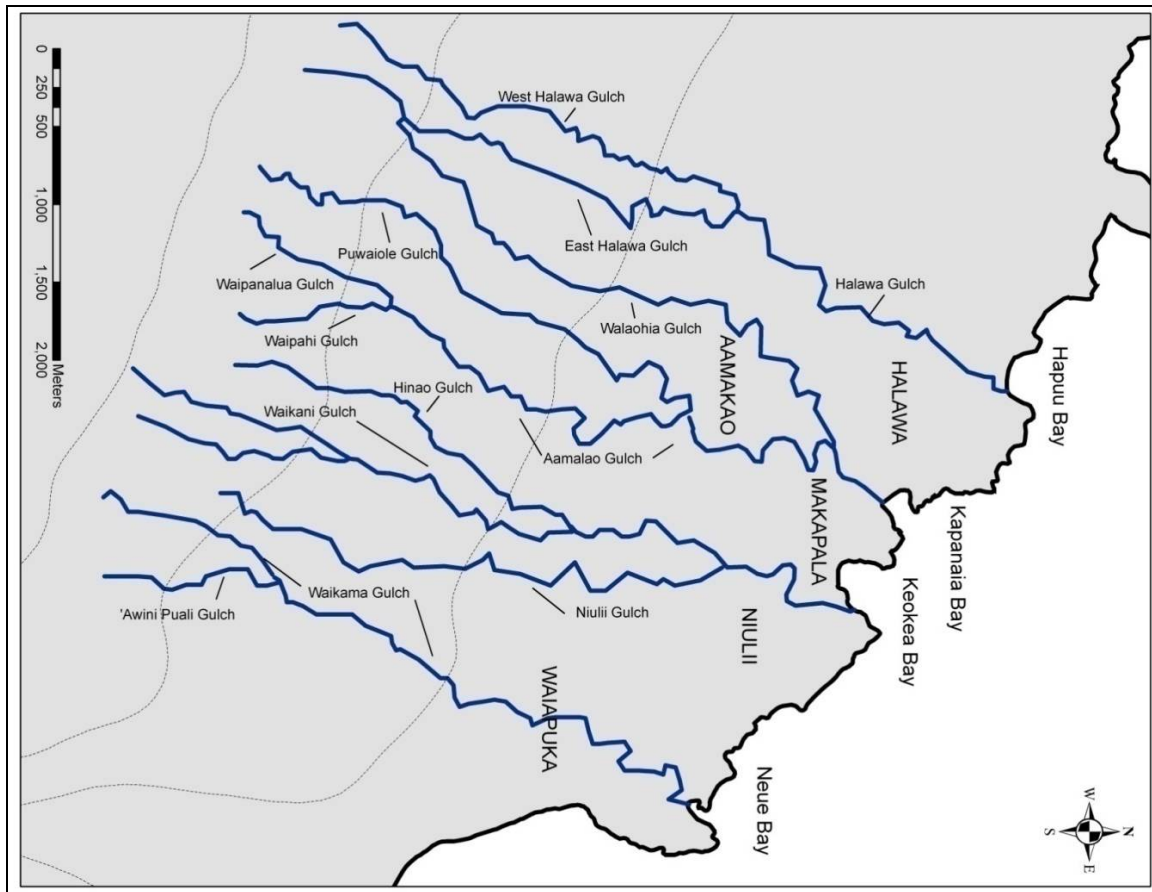
Figure 3 - HARP 2008 Study Areas, North Kohala District, Hawai'i Island.

volcanic soils has been identified as an important variable considered by ancient farmers in Hawai'i. Soils derived from relatively young volcanics such as the Hawi series (120 to 260 kya) are more likely to have high nutrients whereas soils derived from older series volcanics, such as Pololu (260 to 500 kya), are more likely to have been depleted over time. This pattern is reversed in cases where older soils are rejuvenated by colluvial processes, such as the geomorphologically active gulch network in the study area, or when made unfit for agriculture by dramatically high rainfall, such is the case with Hawi derived soils at the higher elevation range of the North Kohala Field System (Vitousek *et al.* 2003; Vitousek *et al.* 2004). Interestingly, the eastern gulches' watersheds are slightly different from one another with Hapuu and Kapanania Bay



drainages dominated by Pololu in the lower elevations (0-750 ft asl) and Hawi in upper elevations (+750 ft asl), while Keokea and Neue Bay consistently drain soils capped with Hawi derived deposits.

The slope gradient of the landscape varies across the study area with most falling in to a 6% to 11% grade but with some sections with a grade as low as a 4%. Not surprisingly, grade tends to increase in the uplands toward the crest of the Kohala Mountains. Although we have yet to test to relationship between grade and the density of irrigated fields construction over time, it is likely that the gentler grade, lower elevation sections of the gulches would have primary locations for cultivation.



**Figure 4 - Gulches and Community Territories of Windward North Kohala District, Hawai'i Island. 500' above sea level interval contours shown. Division between "upper" and "lower": 750' asl.**

Two factors make it difficult to assess individual streams in terms of intra- and inter-annual variation in flow, or the location and relative importance of springs, based on existing data. First, any measurements taken after 1906 may be influenced by the Kohala Ditch, or may in fact be giving statistics on ditch flow rather than the stream. It is important not to underestimate the ditch's impact on stream flow, indeed in its heyday the Kohala Ditch Company reported a flow of 4.96 million gallons a day with 1.0 million daily even in dry years (cited in Sterns and McDonald 1946:235). Second, natural springs in the area are likely the result of interbedded soils and thus do not follow a predictable spatial pattern. Major springs are noted on modern maps, but

smaller springs, or less predictable springs, that may have been important in the past for fresh water and irrigation are not represented.

### Previous Archaeology

The history of archaeology in North Kohala District begins with a turn of the century survey of ritual sites by J.F.G. Stokes of the Bishop Museum (Stokes 1991). This was followed in the 1960's and 1970's by a series of University of Hawaii, Mānoa archaeological field schools in leeward North Kohala at Lapakahi (Tuggle and Griffin eds. 1973) and windward North Kohala in Pololu Valley (Tuggle and Tomonari-Tuggle 1980). Unlike Stokes, later researchers recorded the full range of different types of sites encountered in their study areas. However, the windward half of the district has received much less attention compared with leeward Kohala academic research (Newman 1970; Ladefoged and Graves 2000; Ladefoged *et al.* 1996, 1998, 2003, 2005; Vitousek *et al.* 2004) and cultural resource management projects (Allen 1985; Barrera 1984, 1985; Burgett and Rosendahl 1991, 1993; Clark and Rechtman 2003, 2004; Corbin

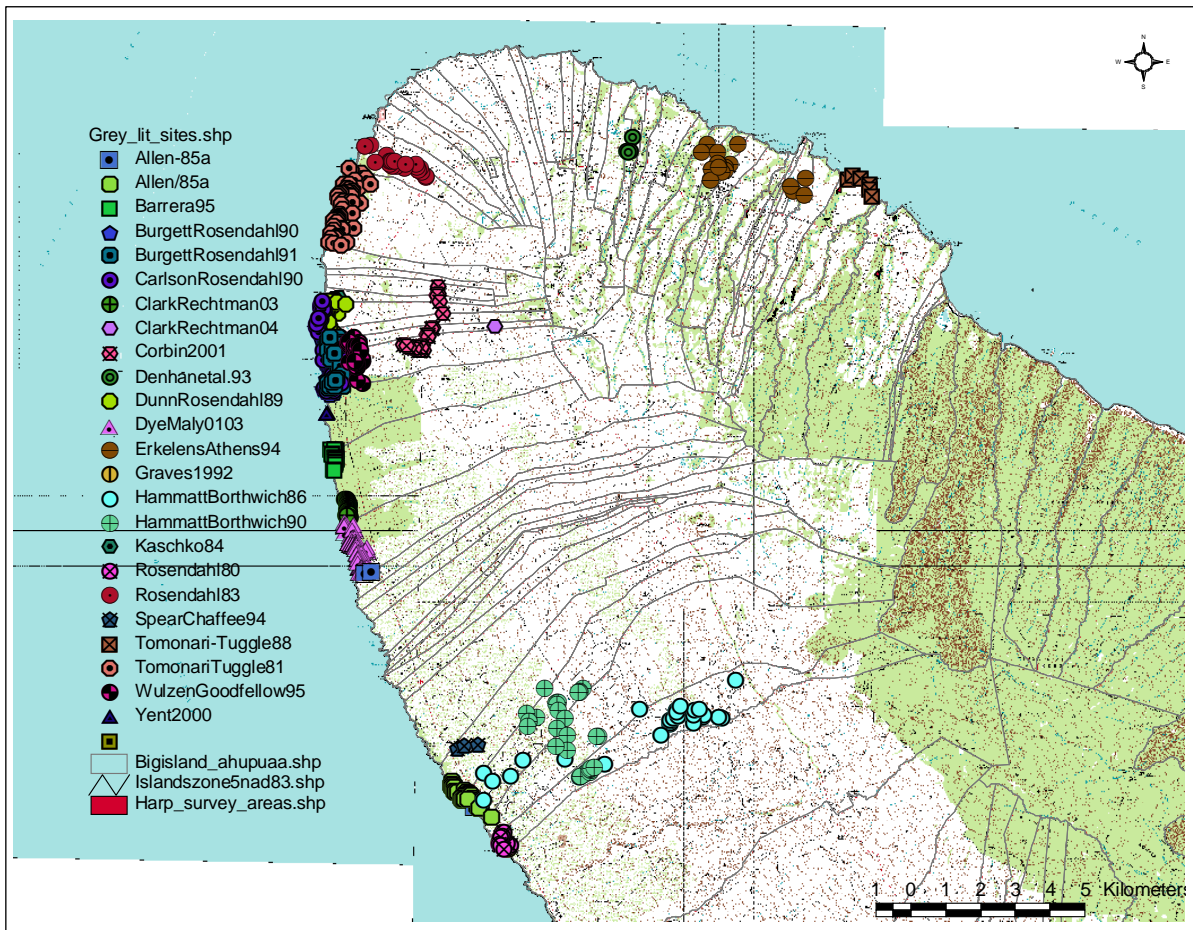


Figure 5 - Sites Recorded in Recent Archaeological Studies of North Kohala, Hawai'i.

2001, 2003; Denham *et al.* 1993, 1993; Dunn and Rosendahl 1989; Dye 2003; Dye and Maly 2001; D. Graves 1992; D. Graves and Franklin 1998; Hammatt and Borthwick 1986, 1990; Hammatt and Folk 1980; Kaschko 1982, 1984; O'Hare and Goodfellow 1994, 1995; Rosendahl 1980, 1983; Schilt and Sinoto 1980; Sinoto 1979; Spear and Chaffee 1994; Tomonari-Tuggle

2003; Wulzen and Goodfellow 1995; Yent 2000). Significant work in the windward area includes an in-depth regional overview completed by Tomonari-Tuggle (1988) as well as several other surveys (Erkelens and Athens 1994; Tomonari-Tuggle 1988; Wolforth 2003). Nonetheless, with few exceptions, windward Hawai‘i Island in general has seen much less research than leeward (see for example, see Cordy *et al.* 2005 on Waipi‘o Valley). Over the past few years, several new projects – including the one described here – have been initiated to help correct this by conducting new surveys and excavations that will give us a better notion of the complete history of Kohala (Field and Graves 2008, in prep.; Field and Kawelu 2008; McCoy and Graves 2007). This is especially important since North Kohala is one of the best preserved traditional districts (*moku*) in the Hawaiian Islands.

### ***Historic Era Kohala***

As the home of Kamehameha I, Kohala holds a unique place in the early history of the Hawaiian Kingdom and includes a variety of sites associated with the regent himself. In the years following the establishment of the kingdom, Kohala once again rose to prominence as a central place in the cultivation, processing, and export of sugar (see Schweitzer 2003). In this project we have found two lines of evidence remarkably useful in detecting how these changes may have impacted the daily lives and fortunes of Kohala’s residents: mid-nineteenth century records of the Great Mahele land division and historic period artifacts and sites found within our study areas. We will discuss the results of the analysis of each in future works.

### **Project Methodology**

Before we describe the results of this summer’s surveys and excavations it is necessary to define a few terms used throughout the report. First, when describing architectural remains we use the term “feature” to denote a single structure. Features are mostly found in clusters of related structures called here “complexes.” When a new complex was encountered on our survey it was given a designation according to the community territory (*ahupua‘a*) it is located within and a number doled out in the order it was recorded. For example, HLW-1 is the first complex recorded within Halawa *ahupua‘a* (see Appendix for a list of *ahupua‘a* name codes). Individual features are given letters, such as HLW-1A, HLW-1B, and so on. In the case of terraces – that is, architecture with three free-standing sides creating a flat surface – a feature designation includes both the retaining wall and the area behind it. Terrace complexes were lettered starting at the uppermost tier. When isolated features were encountered they were given the same kind of field identification designation as complexes (i.e., HLW-1), but no further lettering was necessary. Other common archaeological conventions are used as well, such as referring to arbitrary splits in excavations as “levels” and natural changes in deposits as “layers.”

Functional interpretations are given for virtually every complex encountered. In most cases, the use was likely agricultural and in the case of irrigated terrace complexes the Hawaiian terms *lo‘i* and *‘auwai* are used to denote pondfields and ditches, respectively. Sites of habitation are difficult to identify in the study area due to the poor preservation of material evidence indicators that signal domestic use like structures and food remains. Indeed, high rainfall and acidic soils mean artifacts made of bone, shell, or wood have little chance of surviving more than a few years in unprotected open-air sites. Thus, without extensive excavations to uncover *in situ*

charcoal and stone features, such as hearths, the designation of a feature as habitation is based on a generalization regarding its form and location.

Finally, in this report we use several landform terms that we have found useful in describing the network of drainages in the area. First, we use gulch names given on the most recent USGS maps to refer to individual drainages although we have taken some latitude with the names since it is not always clear what name is appropriate after two gulches have converged. There are also a number of smaller unnamed drainages that do not appear on modern maps; we sometimes refer to these as gullies. Second, we have arbitrarily used 750 feet above sea level to demarcate a “lower” and “upper” elevation on the landscape. In descriptions of study areas approximate elevations are given to further bracket what part of a drainage we are referring to. Also, maps indicate magnetic north which at the time was 9.8° east of true north.

## Chapter 2. Halawa Study Area

The lower and coastal portion of the Halawa Gulch has been the focus of intensive survey and test excavations for the past three years. In 2006, much of the large agricultural complex of HLW-29 (50-10-02-26086)<sup>1</sup> was mapped. Test excavations centered on habitation deposits (HLW-29A) and collecting datable material from agricultural soils (HLW-29B, HLW-29C, HLW-29D, and HLW-29H). In 2007, standardized feature forms were used to add the complex to our overall survey database on Halawa Gluch fields.

In 2008, we began by mapping features on the coastal end of the complex (HLW-29K, -29L, 29M, -29N and -29O) but spent the majority of our time conducting test excavations within a small section of HLW-29 in order to determine the site's construction history. Our excavations at HLW-31 (50-10-02-26088), a set of agricultural terraces upstream from HLW-29, had a similar goal. All test units were completely backfilled with the notable exception of a trench across HLW-29L where we exposed a remarkably deeply buried retaining wall (see cover photo). In this case, a permanent roofed display was built around the exposed architecture.

### **Survey Results: Coastal Halawa Gulch (0-100 fasl)**

*New Features Recorded:* HLW-29N and HLW-29O

#### ***Terrace Complex (HLW-29K to -29O)***

HLW-29 (50-10-02-26086) was originally described as part of our Lower Halawa Gulch survey area (McCoy and Graves 2007:34-35). This season we began with a new overall map of three irrigated terraces – HLW-29K, -29L, and -29M. This map represents a vast improvement over the hastily produced map from the previous season (McCoy and Graves 2007:Figure 29).

In addition we mapped two new features – HLW-29N and -29O – located downstream of the lower gulch in the coastal zone (i.e., within 100 feet above sea level). HLW-29N either represents the lowermost irrigated field on Halawa Gulch or a habitation terrace located just above the stream level. Natural erosion has made it difficult to determine definitively which is the more likely interpretation. However, judging by the terrace's proximity to the stream we suggest it was at one time an irrigated pondfield. HLW-29O, located halfway up the eastern slope of the gulch, is an historic period road cut.

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<sup>1</sup> State of Hawaii site numbers are given for previously recorded sites. Additional site numbers will be requested for the newly recorded complexes described in the following chapter.

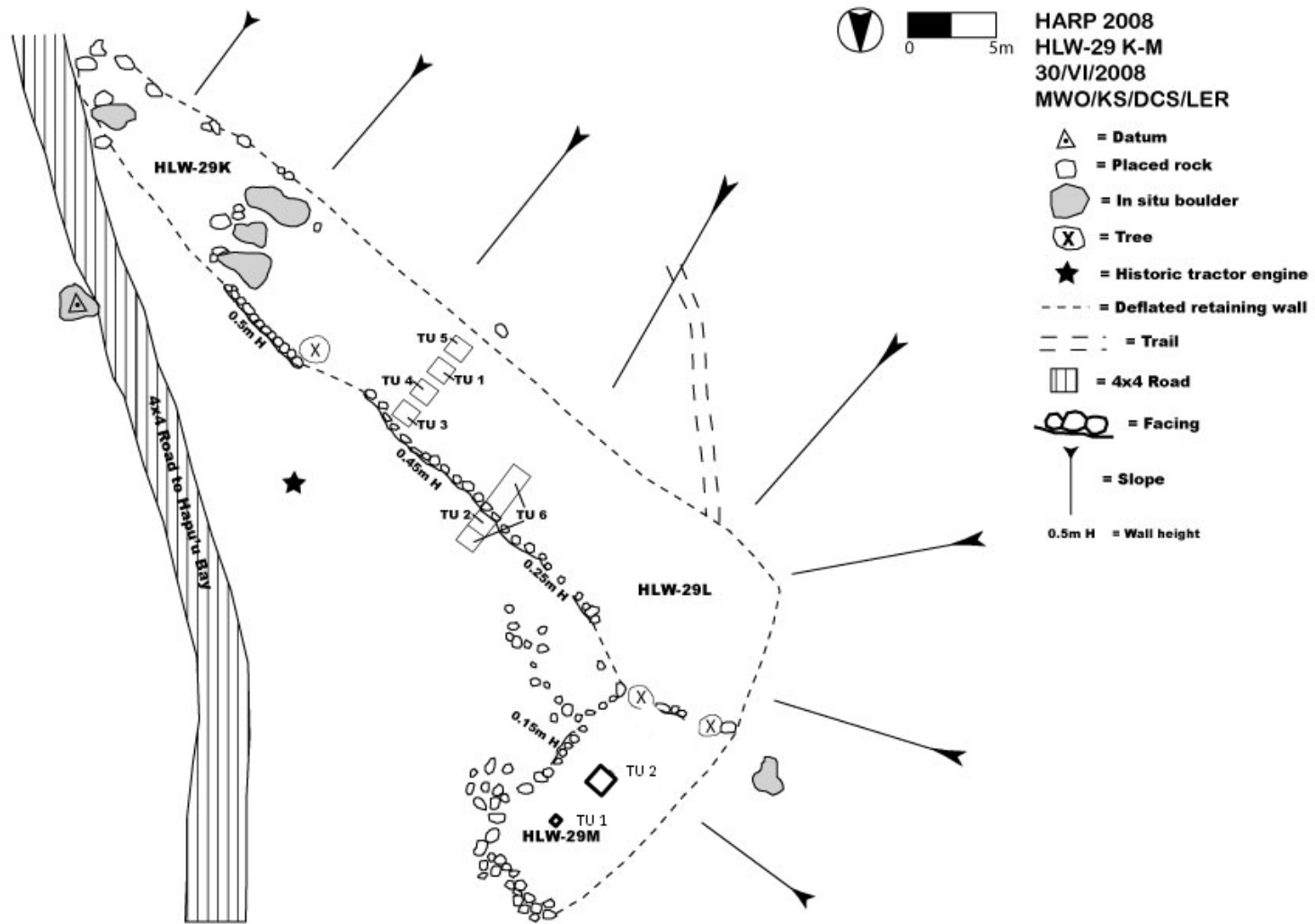


Figure 6 - Map of HLW-29K, -29L, and -29M.



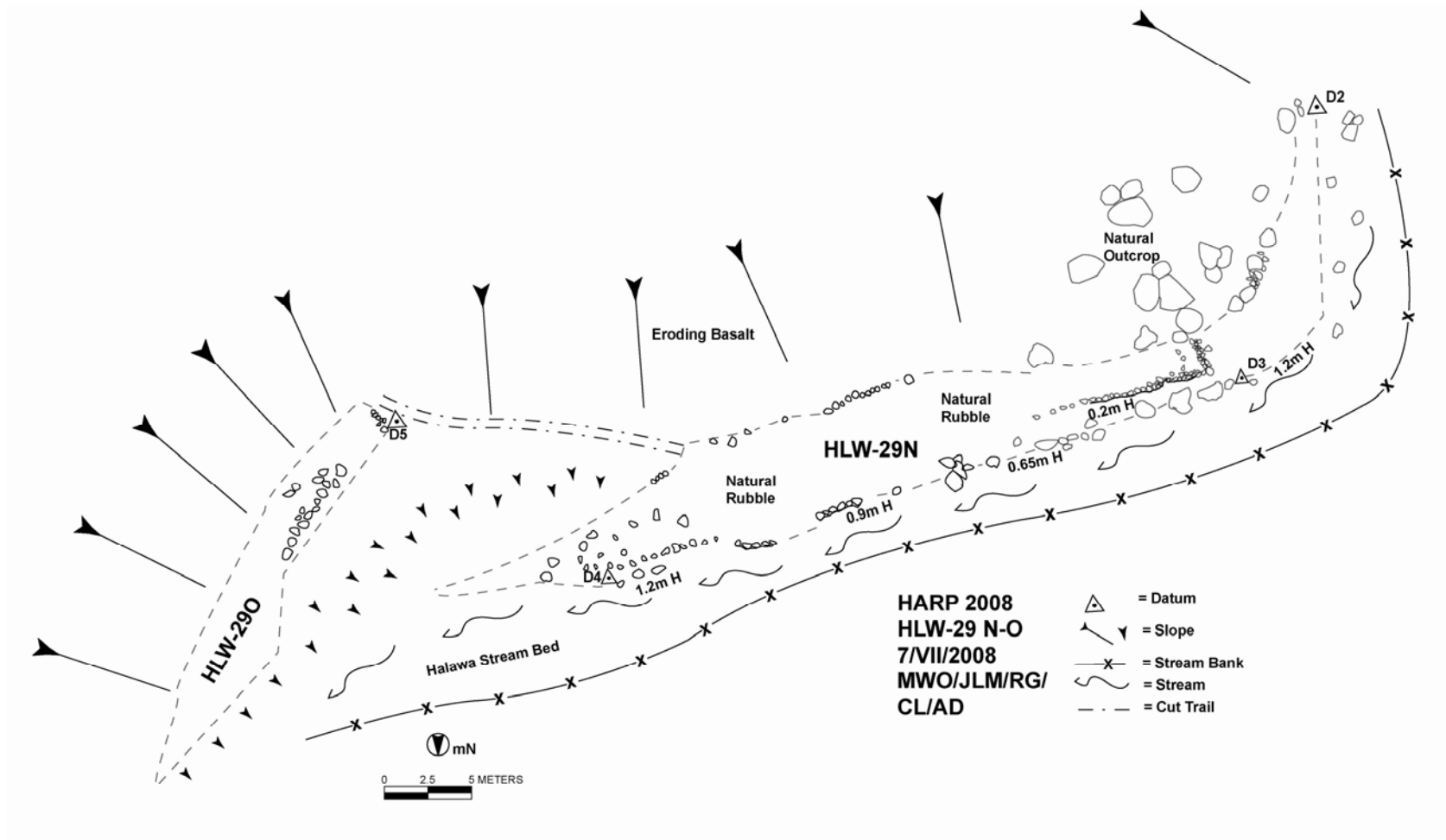


Figure 7 - Map of HLW-29O and -29N.

## **Excavation Results: Coastal Halawa Gulch**

*Test Excavated Sites:* HLW-29 (50-10-02-26086) and HLW-31 (50-10-02-26088)

### ***Test Units***

#### **Test Units: Halawa-29**

Excavations described here centered on three terraces across the stream and below the main terrace complex (HLW-29K, -29L, and -29M). While the results of formal test units are presented first, it is important to keep in mind that our excavations began with small shovel test pits, moved to small test excavation, then larger units, and finally a trench across the main retaining wall of HLW-29L. Each move up in the scale was both informed by the previous stage and aimed at uncovering progressively deeper buried architecture and garden soils. Overall, while at the start we could not have known that over two meters of cultural deposits lie below what was visible on the ground surface, through careful excavation we were in the end able to uncover and document a sequence of agricultural development that appears to begin with what may be one of the earliest examples of irrigated agriculture on Hawai'i Island. All sediments were sieved using 1/8<sup>th</sup> inch screens unless otherwise noted and artifacts encountered during excavation or in the screen were collected by material type and/or artifact class and soil samples were regularly collected for flotation and future soil nutrient analysis.

#### **HLW-29M-TU 1**

HLW-29M-TU 1 (0.50 m x 0.50 m) was placed in the southern portion of HLW-29M in our first attempt to test the depth of terrace deposits in this portion of HLW-29. Excavation was halted and the unit was backfilled when it was clear that the deposit depth went beyond what could be recovered in this small unit.

Layer I Level 1 (0-10 cmbd) was a dark grayish brown (10YR 4/2) sandy silt. Terrestrial shell, charcoal, flaked basalt and historic glass were collected.

Layer I Level 2 (10-20 cmbd) was excavated through a very dark grayish brown (10YR 3/2) sandy silt, which contained more clay inclusions and less organic root disturbance and few pebbles. A single piece of glass was collected.

Layer II Level 3 (20-40 cmbd) represented new layer of dark grayish brown (10YR 4/2) sandy loam soil. It contained little stone and yellowish red clay inclusions. Volcanic glass, charcoal, and a possible cobble hammer stone were collected. Again, excavations were abandoned due to our inability to go deeper in this small sized excavation unit.

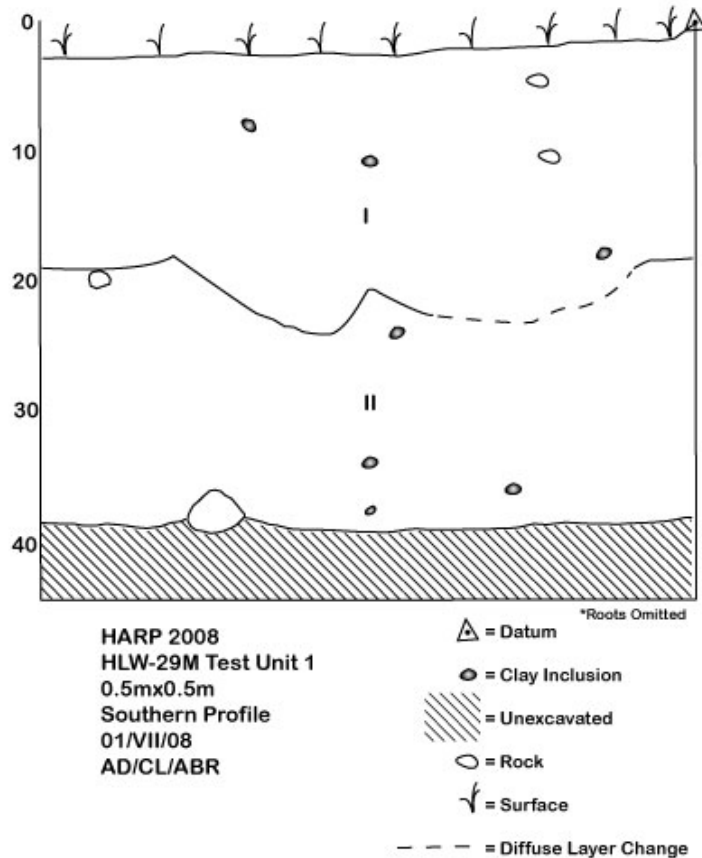


Figure 8 - HLW-29M TU 1 Profile.

## HLW-29M-TU 2

HLW-29M-TU 2 (1 m x 1 m) was placed on top of the terrace (HLW-29M), south of TU 1 and about 1 meter from the retaining wall. The purpose of TU 2 was to test the depth of cultural deposits beyond that reached in TU 1. As such, when again the test unit was too narrow to proceed we excavated a shovel test pit in the center and then used a hand auger to collect sediment from further below. In all, the discovery of such deeply buried deposits in this unit helped us decide to excavate a large, deep trench on the adjacent terrace (HLW-29L).

Layer I Level 1 (0-30 cmbd) was a very dark grayish brown (10YR 3/2) sandy loam. The matrix included less than 5% pebbles, some were water worn, and less than 1% cobbles. Artifacts collected through screening include flaked basalt, charcoal, coral, glass, and brick. Level 1 was excavated to bring the unit to the same depth as TU 1, which also corresponded with a layer change.

Layer II Level 2 (30-40 cmbd) was also a very dark grayish brown (10YR 3/2) sandy loam. Its matrix included streaks of strong brown (7.5YR 5/8), root casts, and more clay inclusions. During excavation a large piece of charcoal was uncovered and collected *in situ* at 36 cmbd. The only material collected from screens was charcoal.

Layer II Level 3 (40-50 cmbd) was excavated through a dark brown (10YR 3/3) sandy loam with clay inclusions and less than 5% pebbles. The only material recovered was charcoal.

Layer II Level 4 (50-60 cmbd) was a very dark grayish brown (10YR 3/2) sandy loam with 15% pebble and 5% cobbles and more compacted than previous levels. Only charcoal was recovered.

Layer II Level 5 (60-70 cmbd) was similar to previous levels. The sediment was a very dark grayish brown (10YR 3/2) sandy loam. The matrix included 15% pebbles and 5% cobbles, and was compacted. Charcoal was the only material found.

Due to the narrow excavating conditions, Layer II Level 6 (70-81 cmbd) was excavated as a shovel test pit in the center of unit to ascertain the depth of deposits. Deposits were very dark grayish brown (10YR 3/1) loam sediment similar to the previous level. Charcoal continued to be recovered from this level and a layer change was noted at 80 cmbd. Later, Layer II was subdivided to distinguish two bands of strong red oxidation (Layer IIa and IIc).

Layer III Level 7 (81-98 cmbd) was a continuation of the STP placed in center of the original 1 m x 1 m unit. The soil encountered was very dark grayish brown (10YR 3/1) clay loam; it was more compacted and contained small inclusions of pale yellow clay. Screening identified a large amount of charcoal.

At this stage the STP became too narrow to work in so the entire 1 m x 1 m unit was again excavated in Layer II Level 8 to the depth of the layer change noted at 80 cmbd. The sediment was similar to Level 6 (dark brown, 7.5YR 3/3, silty clay with pebbles, cobbles and yellow and red inclusions). A small amount of charcoal was recovered through screening.

In Layer III Level 9 (80-86 cmbd) we continued to excavate the entire unit to near the final depth of the STP. Sediment was a very dark brown (10YR 2/2) silty clay that was more compact than the previous level. A small amount of larger charcoal pieces were collected through screening.

Layer III Level 10 (86-96 cmbd) was excavated to the final depth of the STP. Its sediment was a very dark grayish brown (10YR 3/2) silty clay mottled with dark brown (7.5YR 3/3) and red (2.5YR 4/8) inclusions. Some pebbles were encountered. Sediment sieved revealed a flake of volcanic glass and charcoal; thus excavations continued to try and determine the depth of cultural deposits.

To continue the strategy of testing the depth of deposits with smaller excavations, Layer III Level 11 (96-136 cmbd) was excavated as a 20 cm x 20 cm square situated in the center of the unit. The soil encountered was very dark brown (10YR 2/2) silty clay with rich charcoal inclusions for 25 cm and yellowish red clay inclusions that were not as prevalent by the end of the level. Charcoal and flaked basalt were collected.

Here again the entire 1 m x 1 m unit was excavated in Layer III Level 12 to bring the excavation to the depth of 136 cmbd. The sediment was compact very dark brown (10YR 2/2) silty clay with charcoal.

Layer III Level 13 was a two phased excavation. In the first phase an STP was again placed in the center of the unit and then excavated from 136 to 165 cmbd. In the second phase a hand auger extended the bottom the unit to a depth of 323 cmbd. The sediment encountered in both phases was a very dark brown (10YR 2/2) silty clay with red and yellow inclusions. As excavation proceeded the sediment became more compact. Charcoal was discovered through screening and collected in the field in the first phase. The auger sediment was collected for flotation but no charcoal was recovered.

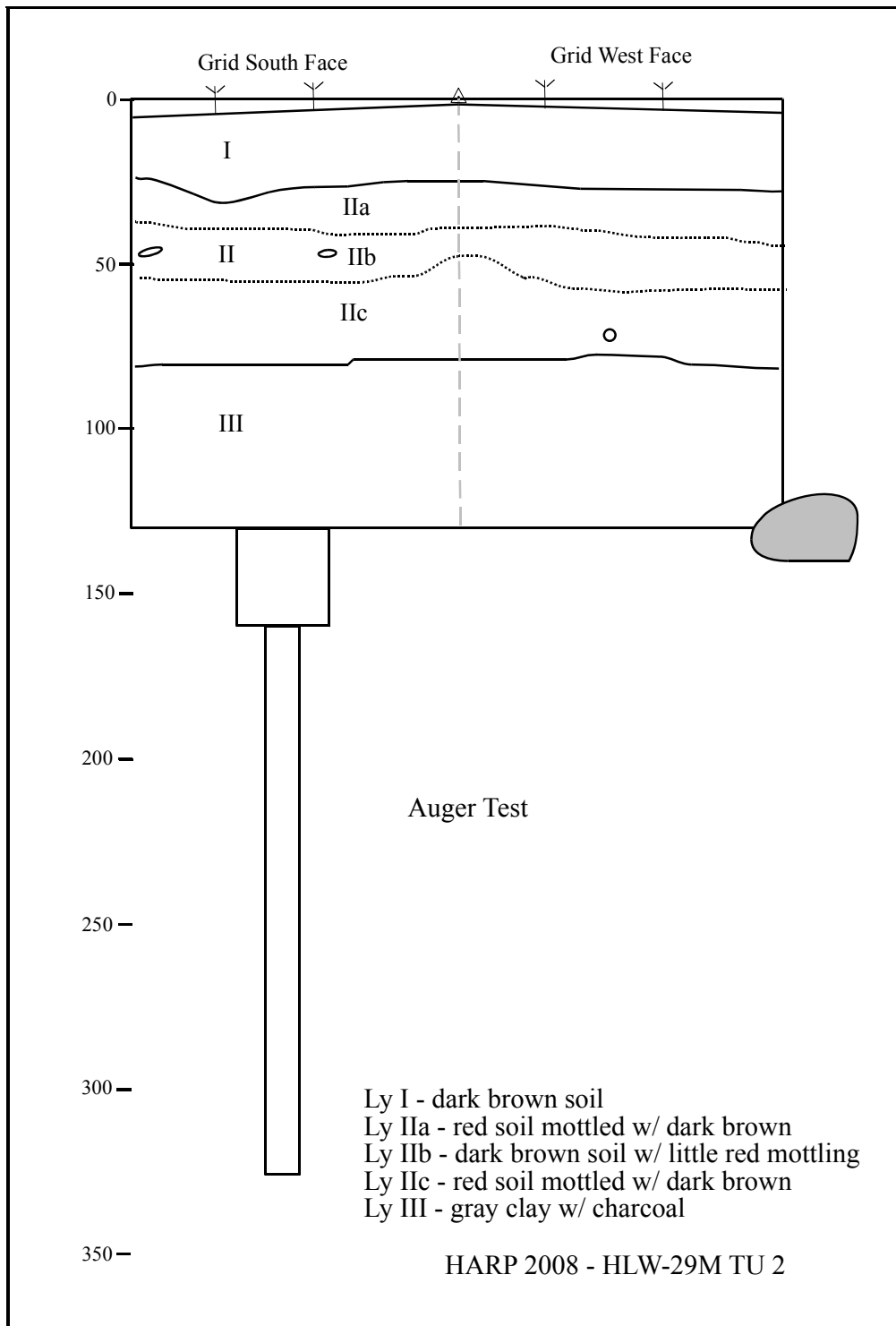


Figure 9 - HLW-29M TU 2 Profiles.



Figure 10 - Photo of HLW-29M TU 2 Base of Excavation.

## HLW-29L-TU 1A

HLW-29L-TU 1A (0.50 m x 0.50 m) was placed on top of a narrow, long terrace close to midway between the slope and retaining wall in the hopes of determining the feature's depositional history. It would eventually be expanded into a larger unit (TU 1B) due to the discovery of charcoal and other artifacts at a depth below that which could reasonably be reached in this small unit.

Layer I Level 1 extended from surface level to 10 cmbd and was excavated through a very dark grayish brown (10YR 3/2) silty loam soil. The soil was highly organic throughout the level, with small and medium sized roots, and contained less than 1% pebbles. Historic glass and charcoal was collected.

Layer I Level 2 extended from 10-20 cmbd through the same clay silt mix with few pebbles but some clay inclusions. Again, historic glass and charcoal were collected.

Layer I Level 3 extended from 20-27 cmbd through a very dark grayish brown (10YR 3/2) clay silt mix. The level contained less organic material but no charcoal or artifacts were discovered.

Layer II Level 4 (27-30 cmbd) was stopped arbitrarily due to the narrow size of the excavation unit. The layer itself appeared more reddish than previous deposits but nonetheless was assessed as a dark brown (7.5YR 3/2) clay silt. The sediment contained large clay inclusions and its reddish color became more prevalent with depth. Again, no charcoal or artifacts were recovered.



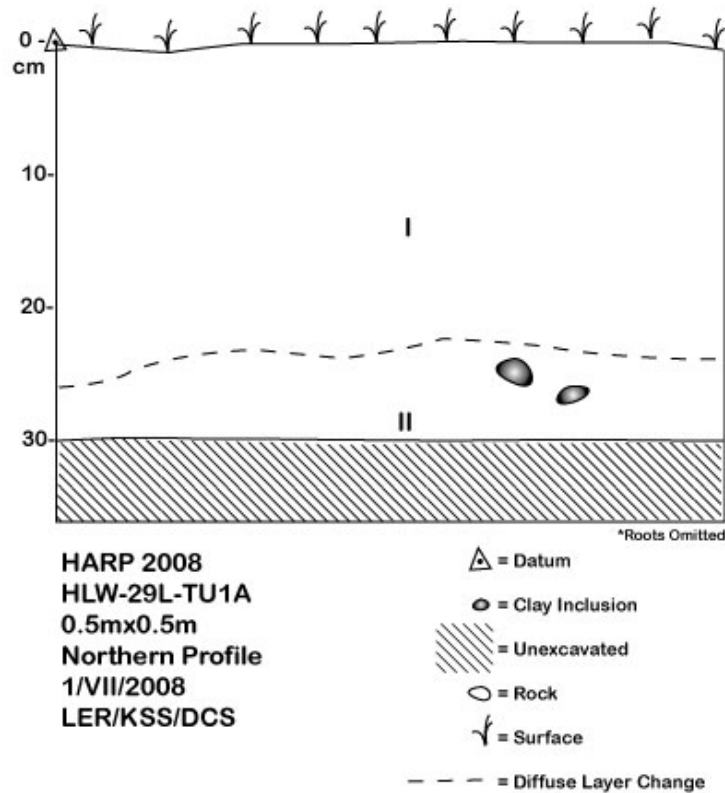


Figure 11 - HLW-29L TU1A North Profile.

## HLW-29L-TU 1B

HLW-29L-TU 1B (1 m x 1 m) represents an extension of TU 1A from a 0.50 m x 0.50 m unit to a 1 m x 1 m unit.

Layer I Level 1 of TU 1B was excavated to the transition to Layer II at a depth of 21 cmbd. The sediment encountered was a dark brown (10YR 3/3) clay sand mix. The soil contained few pebbles and some cobbles. A more diverse set of artifacts was collected from this excavation including charcoal, historic glass, basalt flakes, metal, ceramics, and coral. A circular feature of darker colored soil was exposed in plan view and labeled Feature 1. The excavation of Feature 1, as described below, centered on determining if it was created by a post or if it was the remnants of a natural feature such as a thick root. The latter was eventually determined to be the more likely interpretation.

Feature 1 Level 2 was excavated from a depth of 23-34 cmbd. The sediment type was determined to be very dark grayish brown (10YR 3/2) clay with red and black inclusions. We interpreted the red color as a sign of oxidation – common in pondfield deposits – and the black as small bits of decaying basalt probably redeposited from the slope above. The entirety of feature deposits was collected. However, excavation was temporary halted when it became difficult to follow in plan view.

In an effort to determine if we had reached to bottom of Feature 1, Layer II Level 3 (21-34 cmbd) was excavated to bring the entire unit to the same depth. At this stage, Feature 1 was again visible in plan view as dark brown (10YR 3/3) sediment.

Layer II Level 4 represents the second and final excavation of Feature 1 from 34-57cmbd. Again, all soil was collected. Pebbles began to appear at 52cmbd and charcoal was

found and collected *in situ* at 54 cmbd. The pebbles seemed to mark the bottom of Feature 1 – a common feature of post holes – however further excavations of the deposits of HLW-29L demonstrate that Feature 1 is a natural root cast.

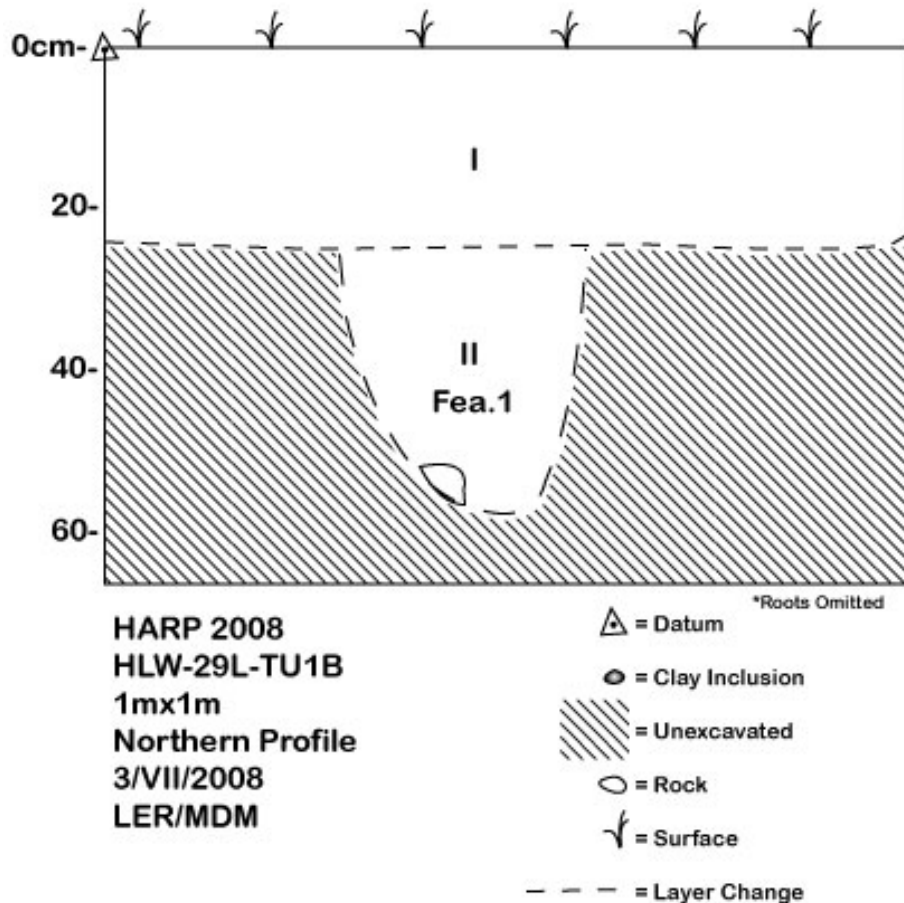


Figure 12 - HLW-29L TU 1B Feature 1, North Profile.

## HLW-29L-TU 2

HLW-29L-TU 2 is a 1 m x 1 m unit located on the outside, lower face of an agricultural terrace's retaining wall. The unit began as a shovel test pit (HLW-29L-STP 2) that unearthed multiple courses of stone. Similarly, the excavation unit described below would eventually be incorporated in to a larger trench (TU 6).

Layer I Level 1 was excavated from the surface to 30 cmbd to bring it to the same depth as a previously excavated shovel test pit. Sediment type was dark brown (10YR 3/3) clay loam. During excavation a remarkable amount of cobbles were removed – accounting for approximately 40% of the matrix – and were interpreted as wall fall stones that were later joined by eroded deposits accumulating in front of the terrace. Several artifacts were carefully collected *in situ* including: charcoal (21 cmbd), volcanic glass (26 cmbd), and branch coral (26 cmbd). Both historic and prehistoric materials were collected in the screen - charcoal, historic glass,

historic brick and metal, volcanic glass, coral, ceramic, flaked basalt, and material mistakenly labeled mortar. Uncollected material included terrestrial shell and unmodified volcanic glass.

Layer I Level 2 was excavated from 30 to 40 cmbd through a very dark grayish brown (10YR 3/2) clay silt loam. The sediment included 20% pebbles and cobbles that decreased in frequency during excavation. Coral, volcanic glass, historic glass, marine shell, flaked basalt, coal, metal, charcoal, and a possible hammer stone were collected. Excavation of Level 2 ended at a yellowish compacted soil.

Layer II Level 3 contained dark yellowish brown (10YR 3/4) silty loam soil that extended from 40-50 cmbd and was excavated through loose sediment containing organics and a few pebbles and cobbles. Excavators found this thin, mottled layer difficult to follow in plan view. Artifacts collected include volcanic glass, metal, coal, and coral.

Layer II Level 4 (50-56 cmbd) was a mixed dark brown (10 YR 3/3) and dark yellowish brown (10YR 3/3) silty clay loam. The sediment included only a few pebbles and some root disturbance. Only charcoal was collected. This marked the end of the yellowish compact soil first identified in Level 3.

Layer III Level 5 (56-62 cmbd) was again a mottled sediment - a silty loam with roughly 80% a very dark grayish brown (10YR 3/2) and 20% dark yellowish brown (10YR 3/4). The sediment contained root disturbance and only a few pebbles. As in Level 4 above, charcoal was the only material type collected.

Layer III Level 6 (62-84 cmbd) was a dark grayish brown (10YR 3/2) silty clay loam. The soil contained less root disturbances than previous levels and a few pebbles. The plan of this level revealed a cluster of unmodified cobbles along the south profile. Charcoal as well as volcanic glass and flaked basalt were collected. The end of this level marks the beginning the Layer IV and the end of excavations across the entire 1 m x 1 m unit.

Layer IV Level 7 (84-125 cmbd) was a STP placed within center of TU 2 to determine if this lowest layer represented cultural or natural deposits. Layer IV was a mottled silty clay composed of approximately 88% dark brown (10YR 3/3) and 12% red (2.5YR 4/6) sediment. Cobbles were also unearthed at the base of the STP that hindered further excavation. Charcoal was discovered throughout the level. At this stage, a total five courses of buried retaining wall were exposed.

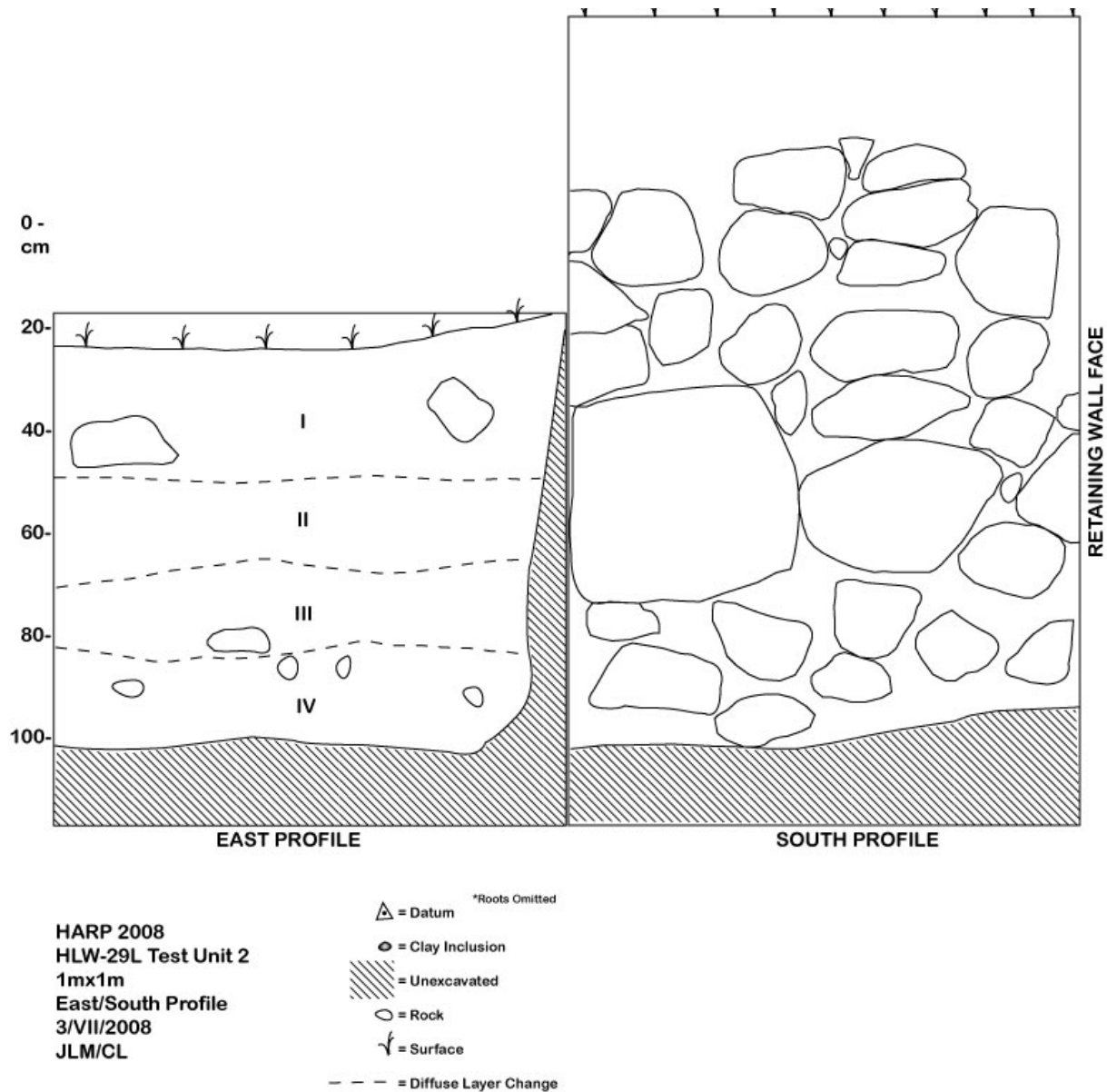


Figure 13 - HLW-29L TU 2 Profiles.

### HLW-29L-TU 3

Three units (TU 3, 4 and 5) were placed at equal intervals across the width of HLW-29L in an effort to uncover more features like the one exposed in TU 1 at the transition between Layer I and II. No such feature was found. HLW-29L-TU 3 (1 m x 1 m) was placed 2 meters south TU 1 and 50 centimeter north of the terrace's retaining wall.

Layer I Level 1 (0-10 cmbd) was excavated through dark yellowish brown (10YR 3/4) silty clay loam similar to the first layer of TU 1. Artifacts of the following materials were collected: historic glass, flaked basalt, volcanic glass, ceramic, charcoal, and coal. Kukui nut fragments were found but not collected since they were not carbonized.

Level 2 (10-35 cmbd) contained dark yellowish brown (10YR 3/4) silty clay loam. As the level was excavated root disturbances decreased and the sediment became more compacted. Excavation was halted at a mottled transition to Layer II. No signs of a posthole or other features were discovered. Historic and prehistoric artifacts were identified, including charcoal, volcanic glass, and metal.

#### **HLW-29L-TU 4**

Three units (TU 3, 4 and 5) were placed at equal intervals across the width of HLW-29L in an effort to uncover more features like the one exposed in TU 1 at the transition between Layer I and II. No such feature was found. HLW-29L-TU 4 (1 m x 1 m) was placed between TU 1 and TU 3, leaving a 50 cm baulk between units.

Layer I Level 1 (0-30 cmbd) was excavated through a dark brown (10YR 3/3) silty clay loam with clay inclusions. Excavation was halted at the transition to Layer II. No feature was encountered and little cultural material was identified: charcoal, volcanic glass, terrestrial shell and coal.

#### **HLW-29L-TU 5**

Three units (TU 3, 4 and 5) were placed at equal intervals across the width of HLW-29L in an effort to uncover more features like the one exposed in TU 1 at the transition between Layer I and II. No such feature was found. HLW-29L-TU 5 (1 m x 1 m) was placed just north of TU 1, leaving a 50 cm baulk between TU 1 and TU 5.

Layer I Level 1 (0-39 cmbd) was excavated through a dark brown (10YR 3/3) silty clay loam. There were heavy root disturbances near the surface that decreased with depth. The matrix contained few gray and yellow clay inclusions. Excavation was halted at the Layer II transition. Flaked basalt, terrestrial shell, charcoal and coal were collected.

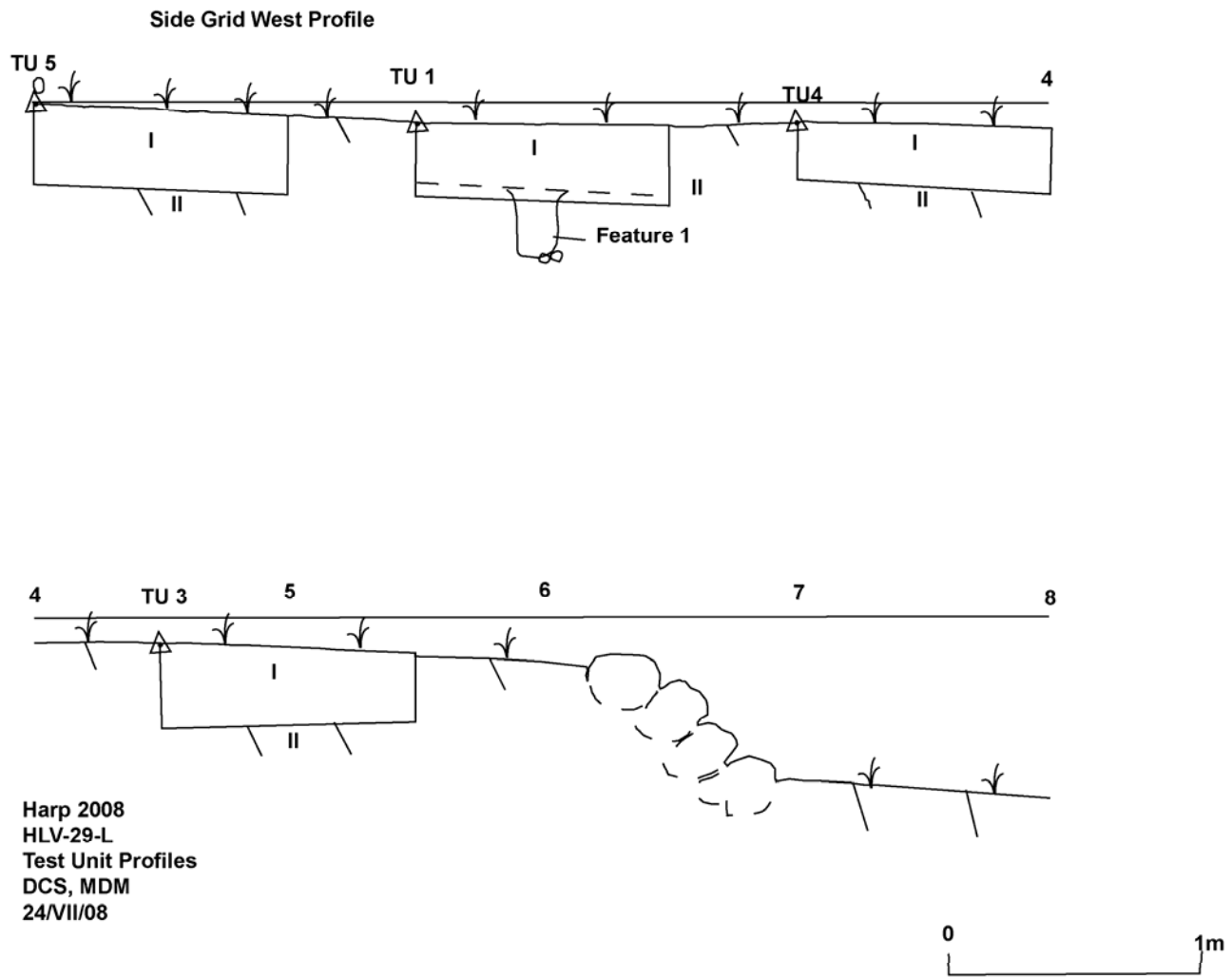


Figure 14 - HLW-29L TU 1, 3, 4, and 5 Profiles.





Figure 15 - Photo of HLW-29L TU 1, 3, 4, and 5.

## HLW-29L-TU 6

To our knowledge, TU 6 (HLW-29L) is the largest, deepest hand excavation of any agricultural feature in this part of the Hawaiian Islands. TU 6 began as a 3 m x 1 m trench placed on top of the terrace and directly behind the back of the terrace's retaining wall. The aim here was to expose garden deposits that would match the depth of TU 2 on the opposite side of the retaining wall.

In short, the reason we began such a large excavation is we had good reason to believe that deeply buried deposits lay below. In the adjacent terrace deposits (HLW-29M, TU 2) we found evidence of gardening (i.e., charcoal and red oxidation) nearly 3 meters below the modern surface of the terrace. Indeed the cultural deposits uncovered in the 3 m x 1 m trench were so deeply buried that near the end we increased the total trench size to 5 m x 1 m by continuing excavation of TU 2.

In the interest of exposing buried stratigraphy and architecture, and given the careful excavations that had already been completed, we chose not to sieve TU 6. Thus, in this case arbitrary levels rarely correspond to transitions between layers. Nonetheless, artifacts encountered during pick and shovel excavations were collected. In addition, the trench was subject to an intensive soil collection scheme that included sampling for flotation and nutrient analysis.

We must make one special note about the stratigraphy of the gardened soils of HLW-29L. While there are gross differences between layers described in profile, there are also finer distinctions that were noted in plan view during excavation. These were predictably, gray-to-red oxidation layers that developed in stable pondfield deposits and appeared to be only preserved in sections or pockets of the plan view. This is consistent with how the impact of rebuilding and gardening would cover and destroy some, but not necessarily all, of the previous era's deposits.

The best example of an intact gray-red transition is from the terrace's latest period of use (i.e., the transition from Layer I to Layer II in TUs 1, 3, 4, and 5). If, for example, the terrace were to go back in to production today that same Layer I-II transition - currently uniformly recognizable and preserved in plan view - would be churned over and only a few pockets left untilled.

One complicating factor to interpreting the feature's stratigraphy are long, deep root casts marked by red oxidation. Like Feature 1 (TU 1B), these roots cross-cut layers and have an irregular distribution. This pattern and their size is consistent with the invasion of thick roots during the abandonment of fields. We would expect human activity, such as digging stick holes, post holes, etc., to have left a more uniform, regular pattern.

Level 1 Layer I (0 -38 cmbd) was a very dark grayish brown (10YR 3/2) loamy sand that contained organic material, root disturbance, and a thin, gray-to-red oxidation level (ca. 30 cmbd) visible in plan view above the transition from Layer I to Layer II. Layer II, a dark grayish brown (10YR 4/2) mottled with strong brown (7.5YR 5/6) loamy sand, was encountered at roughly the same height as the top of the intact retaining wall.

Level 2 (38-129 cmbd) was excavated through several layers and oxidation-reduction transitions. At 60 cmbd a gray-to-red oxidation level was noted around the same level as the transition to Layer III. Layer III (64-90 cmbd) was a dark grayish brown (10YR 4/2) sandy loam that included more pebbles and clay inclusions. Near the bottom of the layer (85 cmbd) we uncovered another oxidation level. Just below this level, a small, thin charcoal lens (93-96 cmbd) was discovered at the boundary between Layer III and Layer IV (90-122 cmbd) - a new deposit of dark grayish brown (10YR 4/2) mottled with yellowish red (5YR 4/6) sandy loam and heavy

red oxidation throughout. Within Layer IV, just under the charcoal lens, we noted more oxidation levels at 101 and 122 cmbd.

Level 3 (129-190 cmbd) included the excavation of the remainder of Layer V (104-170 cmbd), a brown (10YR 4/3) sandy loam with several oxidation levels (at 135, 145, 152, and 162 cmbd), Layer VI, a very dark grayish brown (10YR 3/2) loamy sand with no visible signs of oxidation levels in plan view, and below this layer two more oxidation levels, one at the transition to Layer VII (175 cmbd), a very dark grayish brown (10YR 3/2) loamy sand, and one at 190 cmbd. Two artifacts were recovered in this level, a large basalt flake (152 cmbd, Ly V) and a volcanic glass flake (175 cmbd, Ly VI/VII).

Level 4 (190-286 cmbd) included the remainder of Layer VII (175-228 cmbd) and the entirety of Layer VIII (228-286 cmbd). In this level, steps were left unexcavated to allow for easier access to the test unit. The last two oxidation-reduction sequences were found in Layer VII at 215 cmbd and at the transition to Layer VIII at 240 cmbd. Layer VIII marked a change to a very dark grayish brown (10YR 3/2) sandy clay with few pebbles and without clear signs of charcoal or oxidation. This was the last level excavated in the original 3 m x 1 m trench behind the main retaining wall.

With the main excavation complete, Level 5 marked the incorporation of TU 2 into TU 6. Level 5 (125-176 cmbd) uncovered more courses of main retaining wall and the top of a buried cobble alignment 50 cm away from the front face of the main wall.

Level 6 (176-226 cmbd) involved first expanding the unit by 1 meter to the north so that the buried cobble alignment could be more easily excavated. Next, the unit was stepped to allow easier entry. Finally, we fully uncovered the second and lowest course of the buried alignment.

While future research will be aimed at developing an absolute chronology of development for the site, we present here a tentative single context construction history of the site. This 18 part chronology is based on a careful reading of soil composition, color, content, and artifact evidence: (1) deposition of Ly VIII (TU6); (2) deposition of Ly V (TU2); (3) first construction stage (Stage 1); (4) deposition of Ly VII (TU6); (5) first part of the second construction phase (Stage 2a); (6) deposition of Ly VI (TU6) and Ly V (TU2); (7) second part of second construction phase (Stage 2b); (8) deposition of Ly V (TU6); (9) first part of third construction phase (Stage 3a); (10) deposition of Ly V (TU6); (11) removal of a portion of Ly V at the Layer V/IV (TU6) interface; (12) deposition of Ly IV (TU 2), which may include fill made up of Ly V (TU6); (13) deposition of Ly IV (TU6); second part of third construction phase (Stage 3b); (14) deposition of Ly III (TU6 and TU2); (15) third and final part of third construction phase, unfortunately the stones from this latest construction phase have eroded and are thus missing from profile (Stage 3c); (16) deposition of Ly II (TU6 and TU 2); (17) deposition of Ly I (TU6 and TU2); and (18) the erosion of the top stones and Ly I (TU6) as well as deposits behind them. If we compare this single context chronology to excavations on HLW-29M it is possible to synthesize these in to generalized chronology corresponding to the historic, late prehistoric, and early prehistoric eras (see Chapter 4).

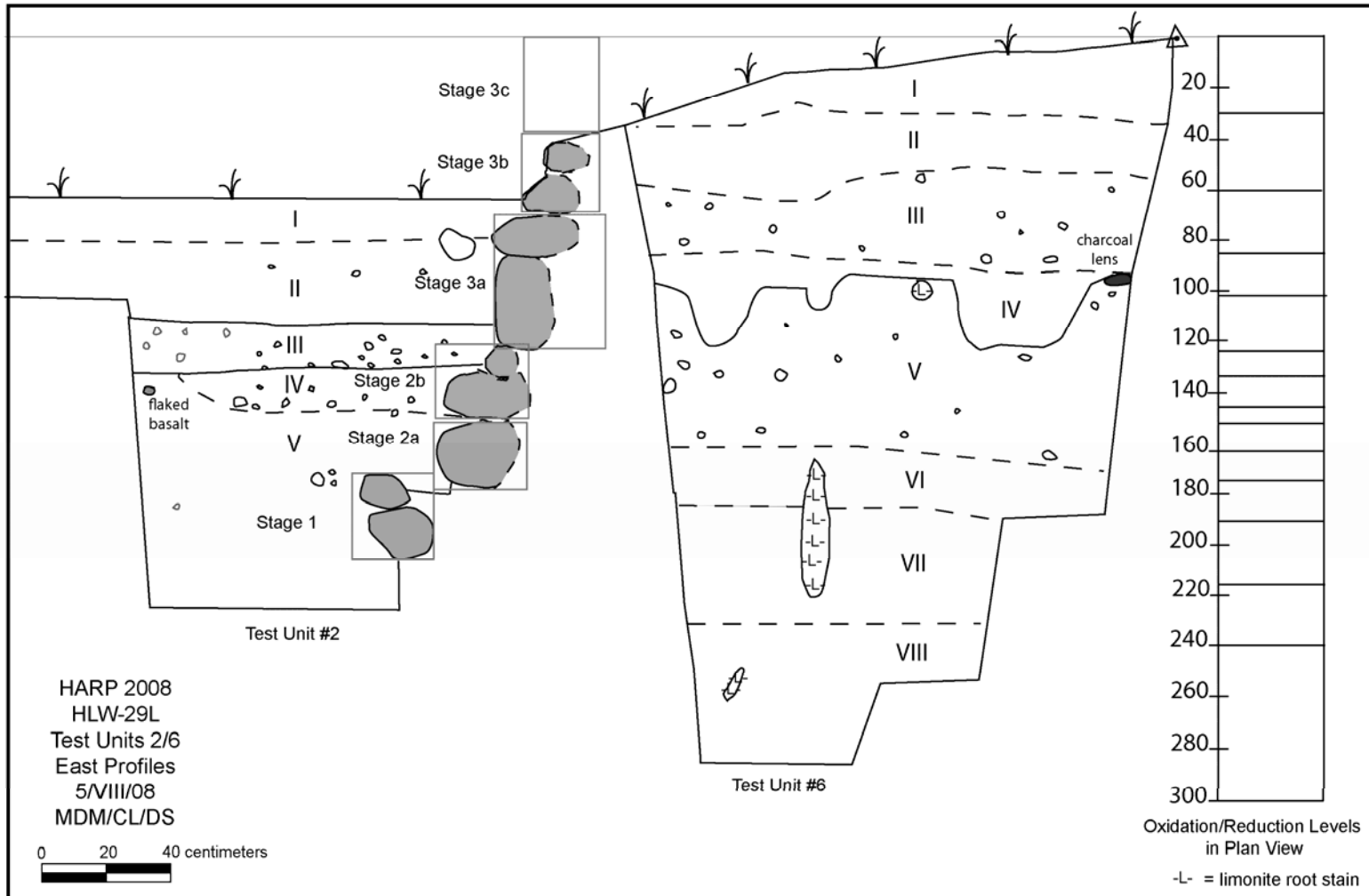


Figure 16 - HLW-29 TU 6 Profile.





Figure 17 - Photos of HLW-29L TU 6. Arrows show location of buried retaining wall.



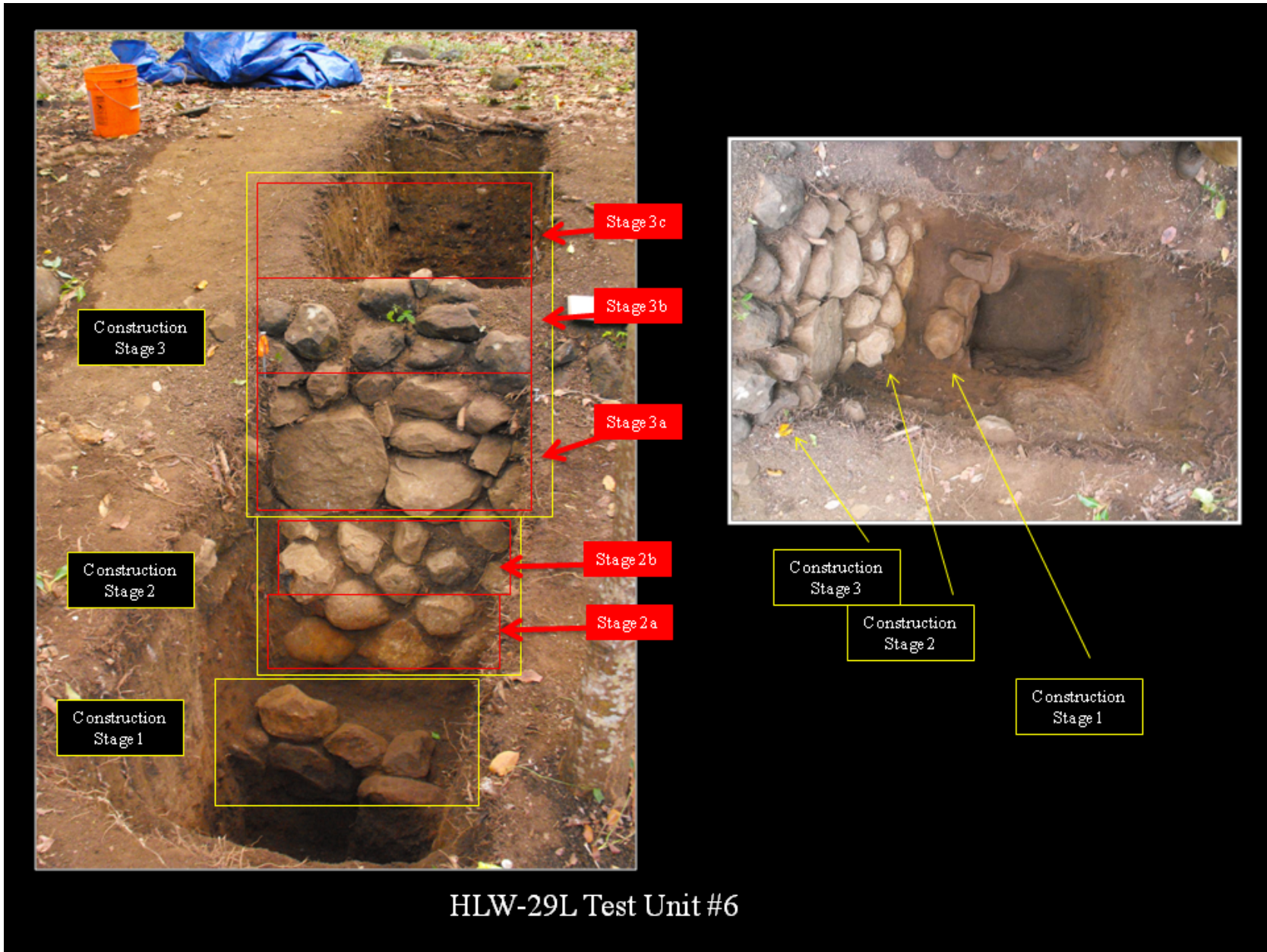


Figure 18 - Construction History of HLW-29L.





Figure 19 - Soil Sampling of HLW-29L TU 6.



Figure 20 - Interpretive Site at HLW-29. From left to right, K.S., J.M., C.L., A.D., B.G., L.D., J.H., S.T., A.B-R., P.L., J.F., and J.M.

## HLW-290-TU 1

HLW-290-TU 1 (2 m x 1 m) was located east of the current access road to Hapuu Bay, above a stream cut cliff. The purpose of the unit was to examine an alignment of stones near the top of the cut to see if it was the remains of a stone platform. The entire unit was excavated in two levels and no sediment was screened. The alignment of stone is clearly natural; no signs of cultural deposits or construction were encountered. In fact, it appears the unit was placed on an historic period road cut. This unusual road was created to give trucks access the coast from an elevated position in order to zip-line cargo to out to ships waiting below. A matching road is located on the western slope of the gulch.

Layer I Level 1 (0 to 23 cmbd) was dark brown (10YR 2/2) silt and pebbles. Glass, coal, ceramics and bone (likely cow) were collected. Uncollected material included coral and coal.

Layer II Level 2 (23-93 cmbd) was a dark yellowish brown (10YR 3/4) clay silt that was more compacted and included light colored clay inclusions, pebbles, and cobbles. Volcanic glass was collected. Excavation was stopped when it was determined that the feature was naturally deposited cobbles and boulders that most likely eroded from the slope directly to the east.

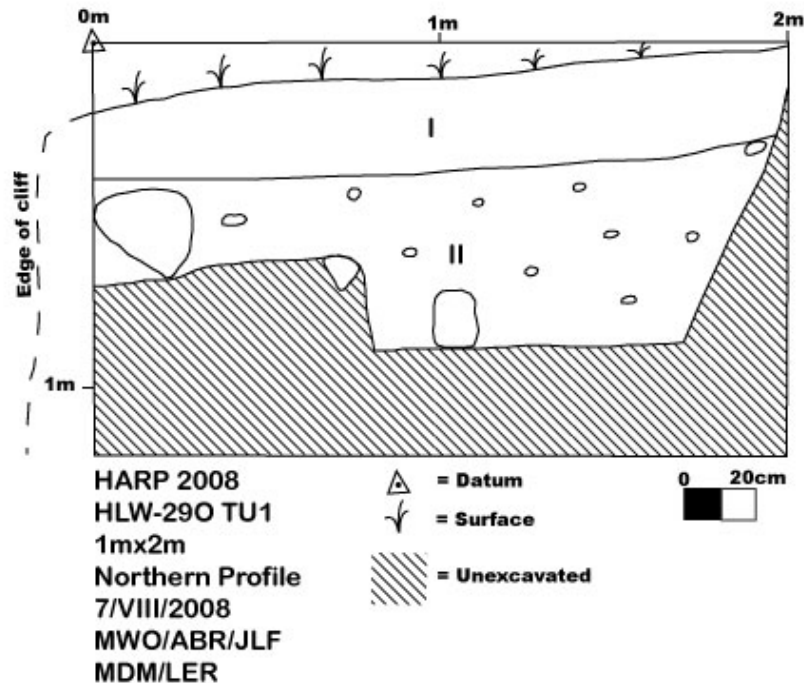


Figure 21 - HLW-290 TU 1 Profile.



## Test Units: Halawa-31

Two units were excavated this season at the agricultural complex HLW-31. The purpose of these excavations was to recover soil from gardened soils and from under a terrace retaining wall.

### HLW-31C-TU 1

HLW-31C-TU 1 (1 m x 1 m) was placed in an open grassy area on top of a terrace in order to collect gardened soil for nutrient comparison.

Layer I Level 1 (0-20 cmbd) was a dark yellowish brown (10YR 3/4) sandy loam. The sediment contained many pebbles, kukui nut, and clay inclusions. Historic materials were recovered including glass, ceramic, metal, and what was identified as a possible trade bead.

Layer II Level 1 (20-40 cmbd) was a dark yellowish brown (10YR 4/4) sandy loam with few pebbles and reddish yellow (7.5YR 6/8) clay inclusions. Artifacts collected include glass, charcoal, volcanic glass, flaked basalt, kukui nut and terrestrial shell.

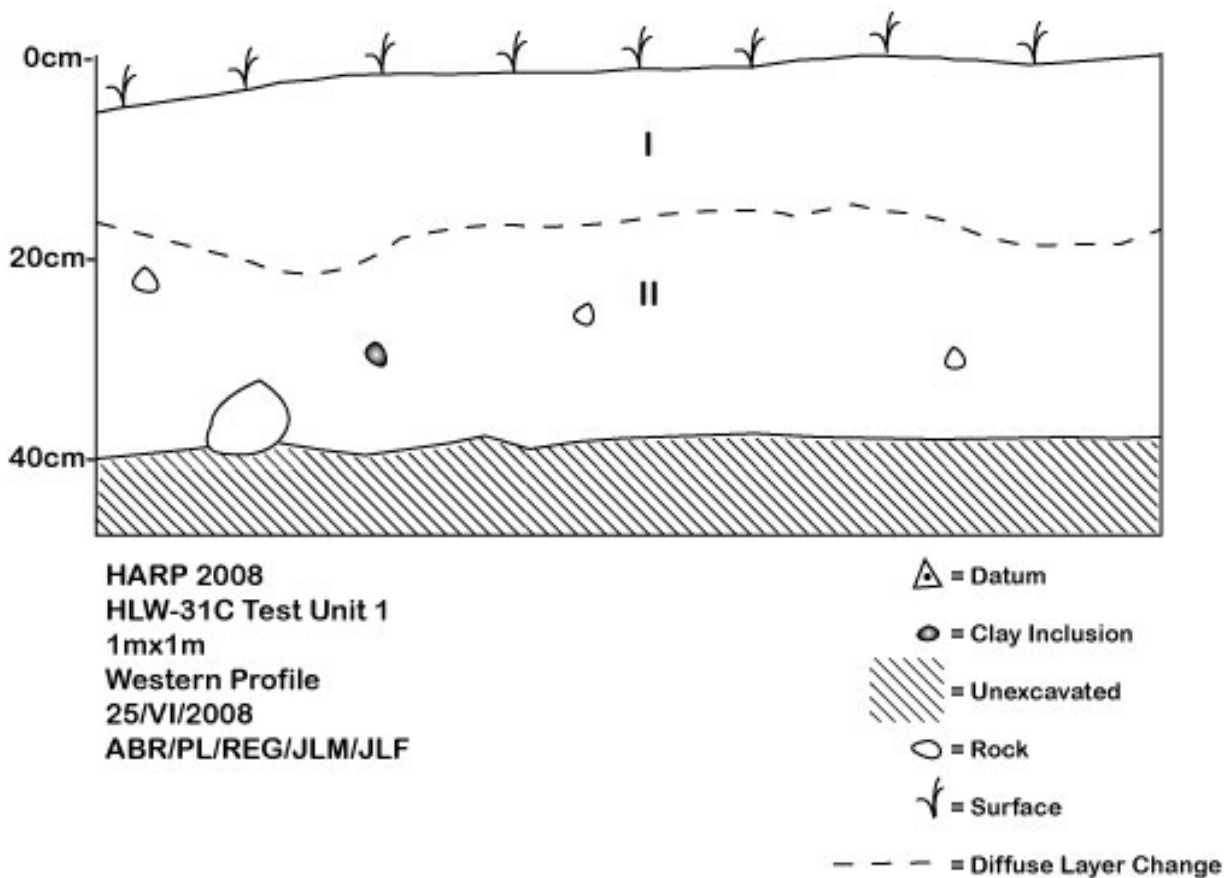


Figure 22 - HLW-31C TU 1 Profile.

## HLW-31D-TU 1

HLW-31D-TU 1 was located on the outside face of the terrace's retaining wall and excavated to collect charcoal and soil from under the feature's basal stones. We were successful on both counts however it is likely there was significant historic period use of the area.

Layer I Level 1 (0-20 cmbd) was a very dark grayish brown (10YR 3/2) silty loam with few pebbles. Ceramic, terrestrial shell, glass, charcoal, metal, volcanic glass and rubber were collected.

Level 2 (20-30 cmbd) was a dark brown (10YR 3/3) silty clay loam. Glass, flaked basalt, charcoal, metal, volcanic glass, brick and ceramic were collected.

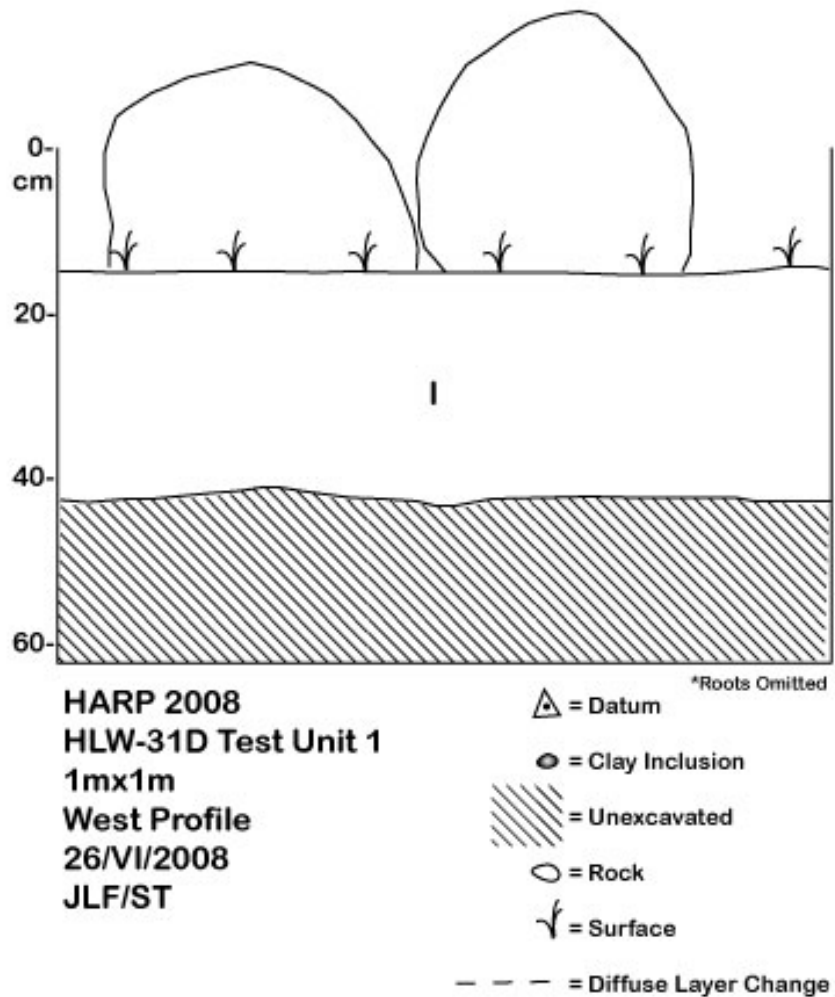


Figure 23 - HLW-31D TU 1 Profile.

## Shovel Test Pits

STP	Comments
HLW-29B-STP 1	Located on top, center of an agricultural terrace. Layer I was a brown sediment that extended from 0-45 cmbs; Layer II (45 to 55 cmbs) was a mixed deposit with heavy red oxidation.
HLW-29C-STP 1	Located on top, center of an agricultural terrace. Layer I extended from 0 to 20 cmbs, dark brown soil. Layer II (20 to 50 cmbs) mixed deposits with oxidation.
HLW-29D-STP 1	Located next to the basal stone of the retaining wall of feature HLW-29C; maximum depth of 35cm. Layer I, brown sediment with charcoal, flaked basalt, ceramic, historic glass and volcanic glass.
HLW-29D-STP 2	Located in the center of agricultural terrace; maximum depth of 35cm. Layer I (0-27 cmbs), brown sediment with glass. Layer II (28-35cmbs) had red and orange matrix.
HLW-29E-STP 1	Located against the basal stone of the retaining wall of HLW-29D; a maximum depth of 35cm. Layer I, brown matrix; charcoal, metal.
HLW-29E-STP 2	Located in the center of an agricultural terrace; maximum depth of 50 cmbs. Layer I (0-45 cmbs); brown matrix. Glass, ceramic, and charcoal. Layer II (45-50 cmbs) mixed orange, yellow and brown matrix with oxidation. Charcoal, terrestrial shell, volcanic glass.
HLW-29I-STP 1	Next to a retaining wall of feature HLW-29E; maximum depth of 45cm. Layer I, dark brown (10YR 3/3) loam. Charcoal collected including a sample from under the basal stone of the wall.
HLW-29I-STP 2	Center of the lowest terrace in the pondfield system; maximum depth of 55 cmbs. Layer I (0-45 cmbs), dark brown (10YR 3/3) silty loam. Charcoal, ceramic, and glass. Layer II (45-55cmbs), dark brown (10YR 3/3-3/4) silty clay loam. Charcoal collected.
HLW-29J-STP 1	Located at the base of the retaining wall of the lowest most terrace of the pondfield system; maximum depth of 50 cmbs. Layer I, dark brown (10YR 3/3-4/3) silty loam with charcoal, metal, volcanic glass, and historic glass.
HLW-29J-STP 2	Located in the center of an agricultural terrace; maximum depth of 55 cmbs. Layer I, dark brown (10YR 3/3) sandy silt. Charcoal, historic glass, and ceramic were collected.
HLW-29L-STP 1	Base of the retaining wall on terrace across the gulch from main pondfield system; maximum depth of 42cm. Layer I (0-27 cmbs), very dark brown (10YR 2/2) silty clay loam. Charcoal and volcanic glass were collected. Layer II (27-42 cmbs) dark yellowish brown (10YR 3/4) clay loam.
HLW-29L-STP 2	Located along the base of the main retaining wall; maximum depth of 26 cmbs. Layer I, dark brown clay loam matrix with charcoal. This was extended to later become HLW-29L-TU2 since base of wall was not found in initial excavations.
HLW-29 Offsite STP 1	Located midway between HLW-29M and the beach access road to Hapu'u Bay; maximum depth of 80 cmbs. Layer I (0-30 cmbs), dark brown (10YR 3/3) silty loam. Charcoal and volcanic glass collected. Layer II (30-80 cmbs), dark yellowish brown (10YR 4/4) silty loam with slight oxidation. Charcoal was collected.
HLW-29 Offsite STP 2	Located northeast of HLW-29L and 8 meters northwest of the beach access road to Hapu'u Bay; maximum depth of 135cm. Layer I (0-30 cmbs) dark yellowish brown (10YR 4/4) silty loam. Ceramic, historic glass, charcoal, shell, a glass bead, <i>kukui</i> nut, flaked basalt, and coral were collected. Layer II (30-80 cmbs) brown (10YR 4/3) silty clay loam matrix. Coral, shell, flaked basalt, charcoal, and volcanic glass were collected. Layer III (80-95cmbs) reddish brown (5YR 4/4) silty clay loam with heavy oxidation. Charcoal and volcanic glass collected. An auger was used to excavate from 95 cm to 135 cmbs; sediment uncovered had same characteristics as Layer III.
HLW-29 Offsite STP 3	Located at the coast of Hapu'u Bay in the center of the beach access road; maximum depth of 130 cmbs. Layer I (0-70 cmbs) brown (10YR 4/3) sediment. <i>Kukui</i> nut, ceramic, flaked basalt, and historic glass were collected. Layer II (70-110 cmbs) grayish brown (10YR 5/2) silty clay loam with slight oxidation. An auger was used to excavate an additional 20 cm; sediment was identical to Layer II.



## Chapter 3. Waiapuka Study Area

Waiapuka, a traditional Hawaiian community territory just west of Pololu Valley, represents the third major study area in windward North Kohala that we have investigated as part of the Hawai‘i Archaeological Research Project. Together with Halawa and Makapala/Nuilii, this sample gives archaeologists their first glimpse at Hawaiian agriculture and engineering in this part of the Hawaiian Islands.



Figure 24 - Photo of Upper Waiapuka Tablelands and Minor Drainage (center).

Perhaps more than any place we have examined thus far, Waiapuka stands as the best example of how we may learn about the prehistoric and protohistoric past from the archaeological record of an area that has been seriously impacted by the sugar industry. In short, the surveys and excavations described below demonstrate that not only are there well-preserved examples of irrigated pondfields within the region’s network of gulches, but that the tablelands between these drainages, as well as minor gullies, appear to have been utilized by Hawaiian farmers for generations. We have only begun to appreciate Hawaiian’s careful use of the natural landform to draw water out on to these lands, but in our minds the evidence of these works is strong and the history of their construction and use represents an exciting new avenue for documenting, understanding, and appreciating this aspect of the larger history of Hawai‘i.

As in the previous chapter, we begin with surveys conducted this season followed by a report on excavations aimed at (1) revealing more about the extent and type of irrigation used in the area, (2) collecting datable material in good archaeological context, and (3) taking soil samples for future nutrient analysis. Most of this work was conducted at Upper Waiapuka (800-1200 fasl; WAI-4) and the boundary between Upper and Lower Waiapuka (600-800 fasl; WAI-1, -2, -3, -5, and -6) with only a single habitation site investigated in Coastal Waiapuka (100 fasl; WAI-7). As in the investigation of HLW-29L, hand-trenching allowed us to document features unlike those previously known, including several examples of irrigation ditches that carried excess water out of a side gully and on to tableland (WAI-4) as well as what appears to be buried garden deposits under a bulldozer fill layer in a shallow gully (WAI-2).

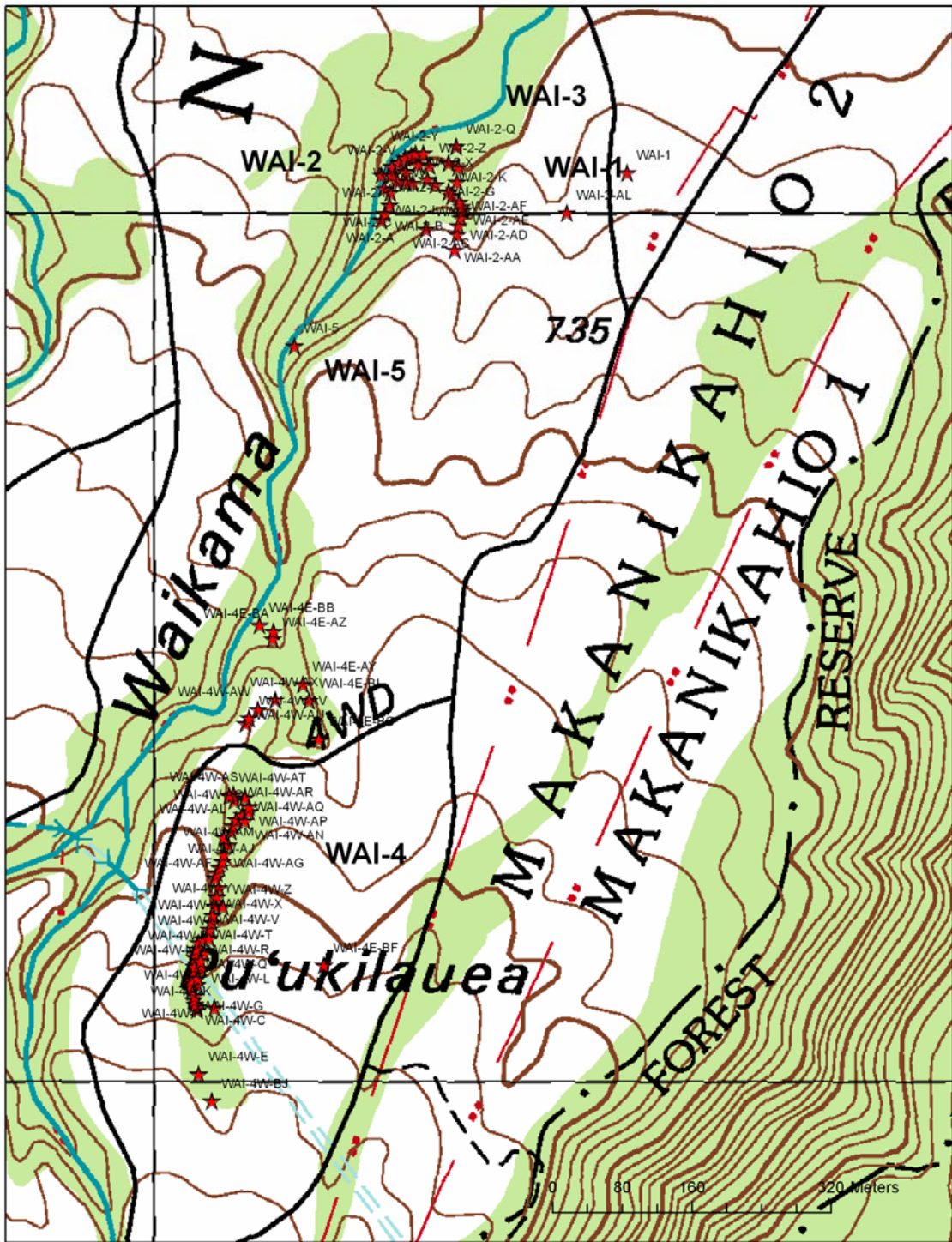


Figure 25 - Overview Map of Waiapuka Study Area.

## **Survey Results: Upper Waiapuka (800-1200 fasl)**

*Sites Recorded:* WAI-4

### ***Barrage Terrace Complex (WAI-4)***

WAI-4 is a “barrage” style (Kirch 1977:260) terrace complex located within minor drainages upstream of Waikama Gulch. The complex was first mapped at the turn of the century by Lobenstein (1904). We have broken this complex into two main components for ease of study: an east branch (WAI-4E) and a west branch (WAI-4W). The tablelands between tributaries were used for sugarcane farming during the historic period. In addition to impacting surface features in the tablelands access roads cross gullies at several key locations including where the east and west branches join.

The barrage terrace complex is comprised of 65 features including 52 barrage-style *lo‘i* terrace features built throughout the gully bottoms, the remains of at least five ‘*auwai* (irrigation ditches), three terraces near or connected to the barrage system but not actually in the streambed, four *ahu*, and a possible ritual garden on the side of the gully.

### ***East Gully Branch to Waikama Gulch (WAI-4E)***

This area has been heavily impacted by erosion with most walls showing at least some signs of disrepair or in some cases having been completely washed out often only recognizable by portions of retaining walls left intact on stream bank cuts. Nonetheless, the location of ditch sections found on the downstream end of this complex suggests water was carried out of this drainage as well. The main section of WAI-4E is located below the local access road however a few features were found above the road.

### ***West Gully Branch to Waikama Gulch (WAI-4W)***

The west branch is in much better condition, with the majority of visible features with only moderate impact from erosion. The highest terrace preserved in this barrage system, WAI-4W-A, is noticeably convex shaped and incorporates two large stone mounds that lie where water would have passed over the terrace. This appears to have been an adaptation to slow fast moving water from wreaking havoc on the terraces below. There are signs of sugar cane era use of the area at the top of the complex but no sign of the actual Kohala Ditch which modern USGS maps suggests runs through the gully. The main section of WAI-4W is located above the local access road however a few features were found below the road.

In addition to traditional tape-and-compass survey of this branch of the complex we also conducted a brief GPS-based topographic survey (see Chapter 4). Unlike more detailed micro-topographic GPS survey techniques we undertook at other sites in Kohala this season (see McCoy and Stephen 2008), our goal here was to rapidly record gross changes in topography. Ideally, this information will allow us to represent the relative changes in the slope and aspect of the landscape necessary to model what locations might have been the natural recipients of water diverted out of the gully. Our first attempts suggest this will be a fruitful avenue for future research.



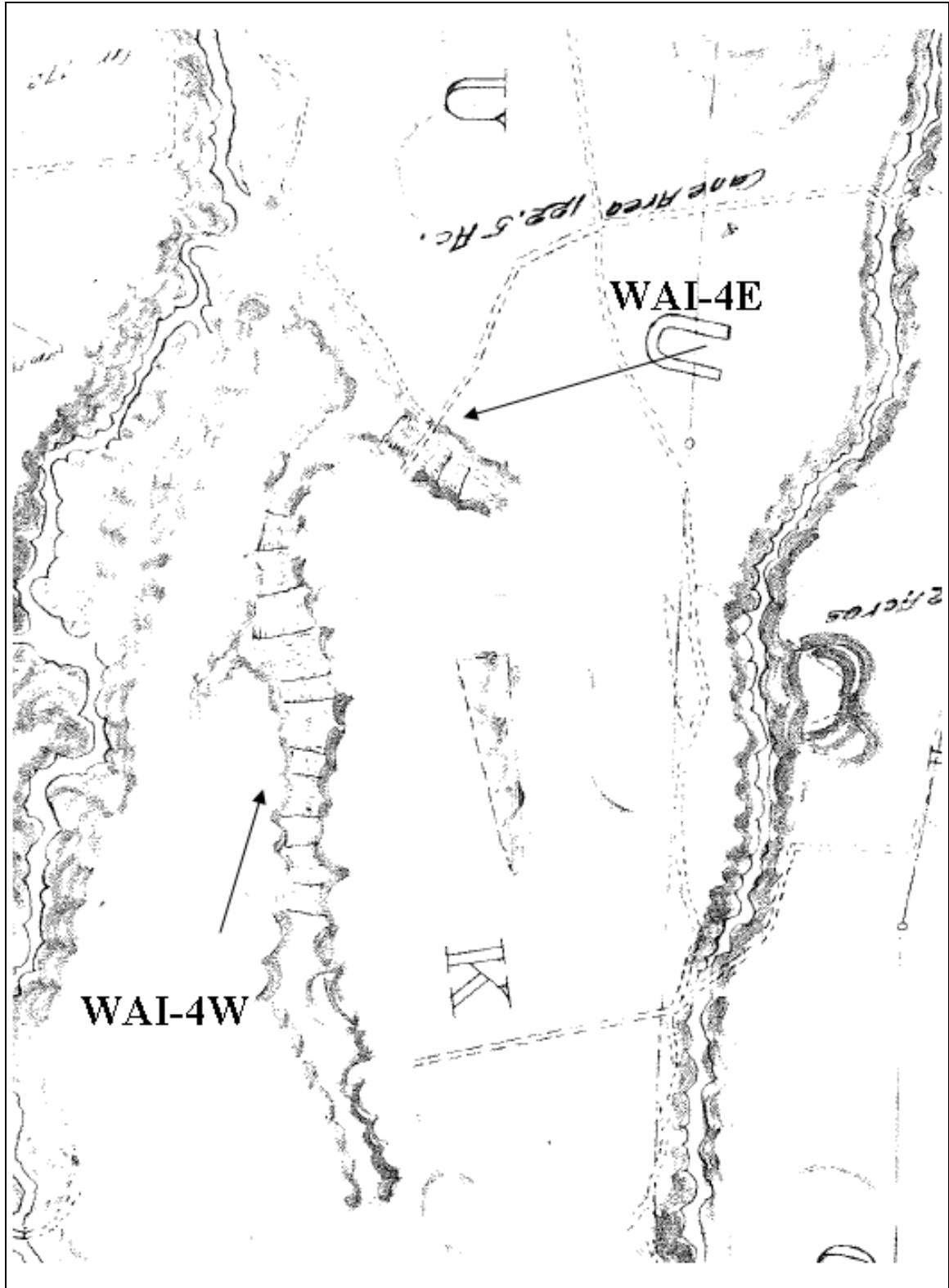


Figure 26 - Historic Era Map of WAI-4 (Lobenstein 1904).

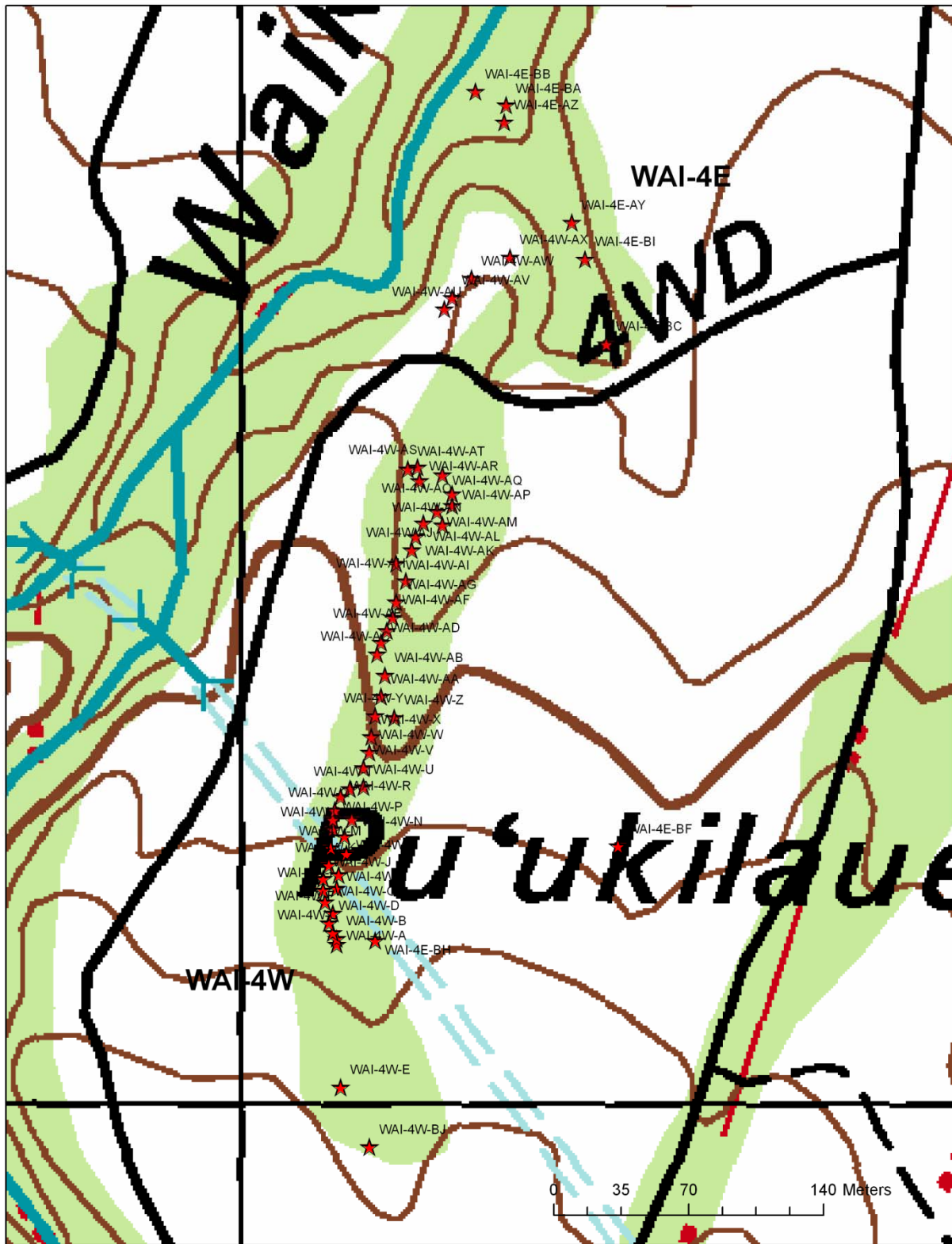
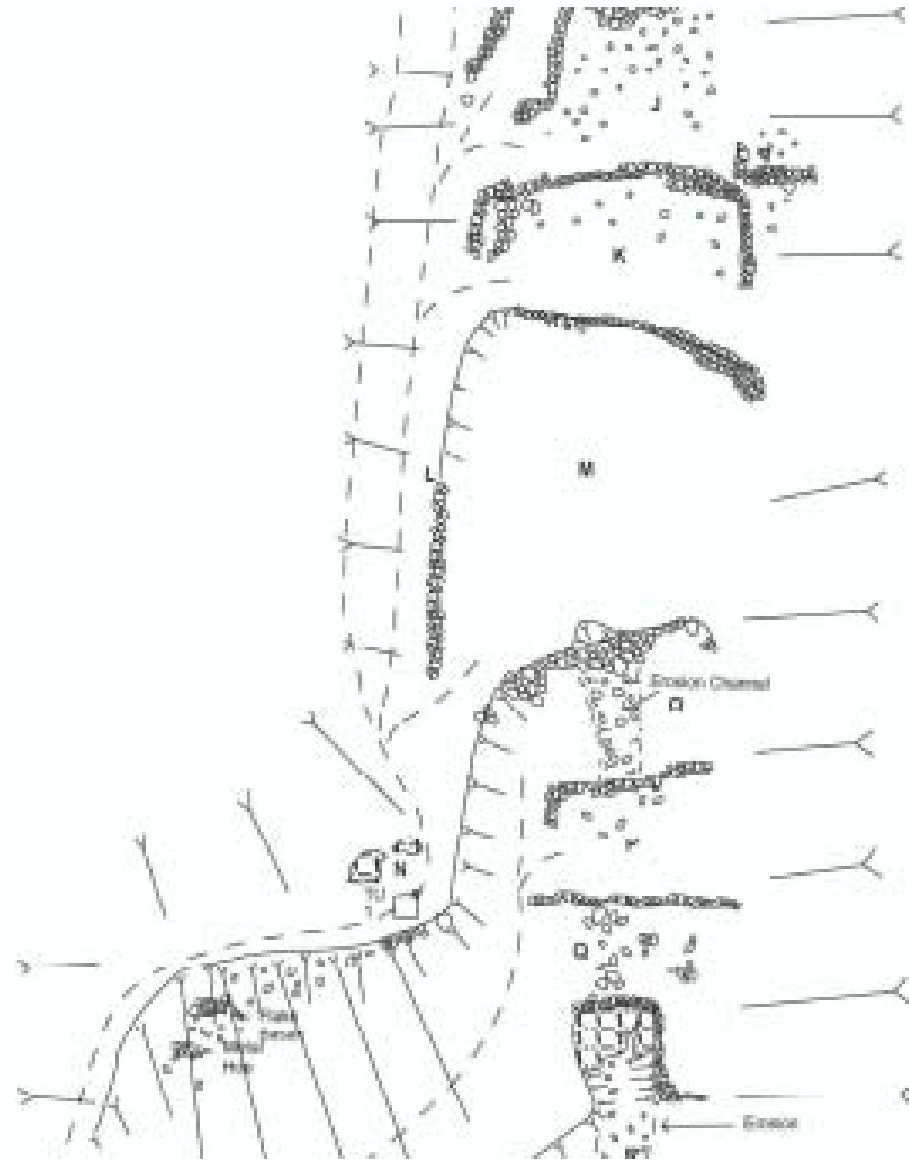
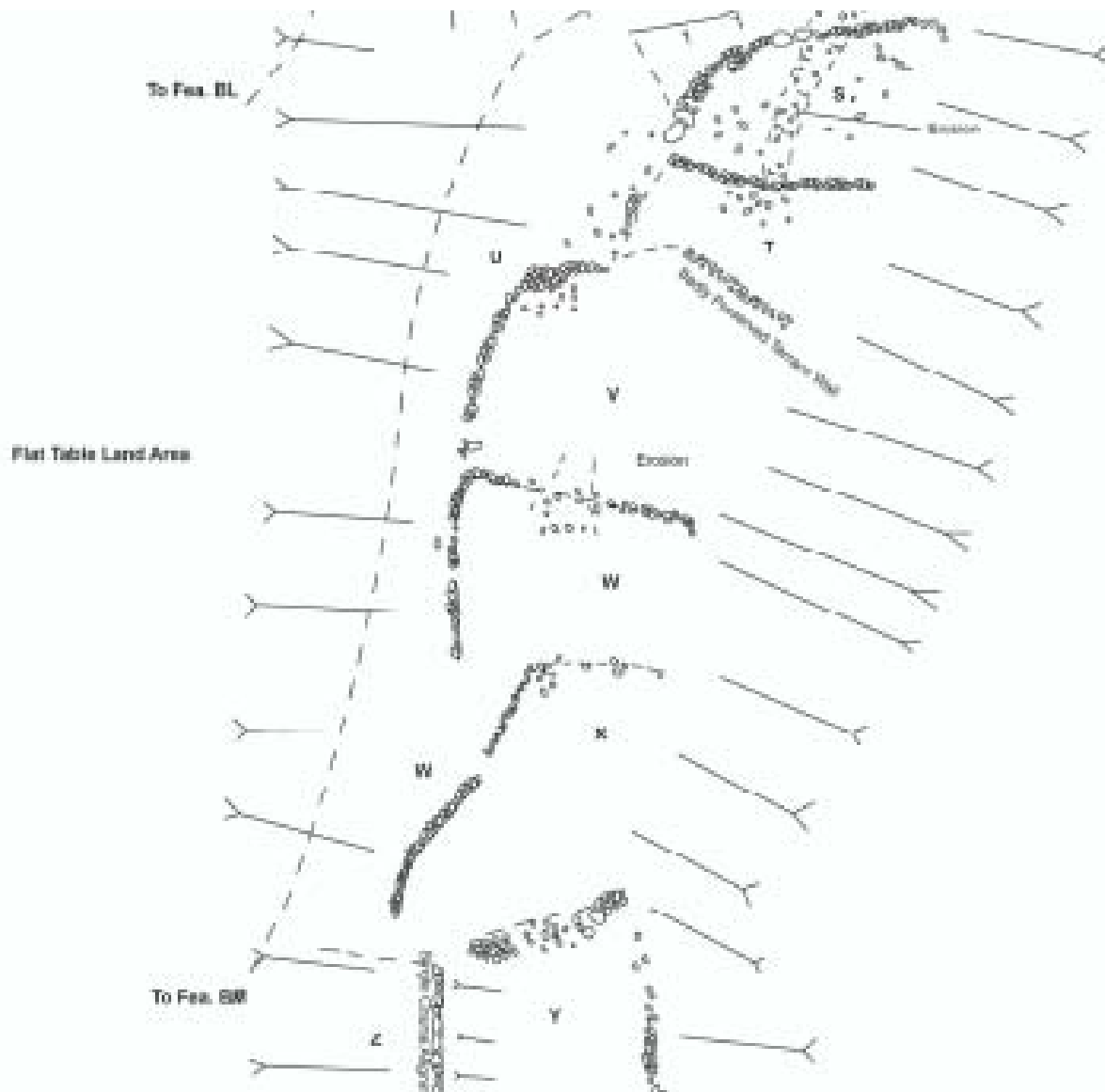


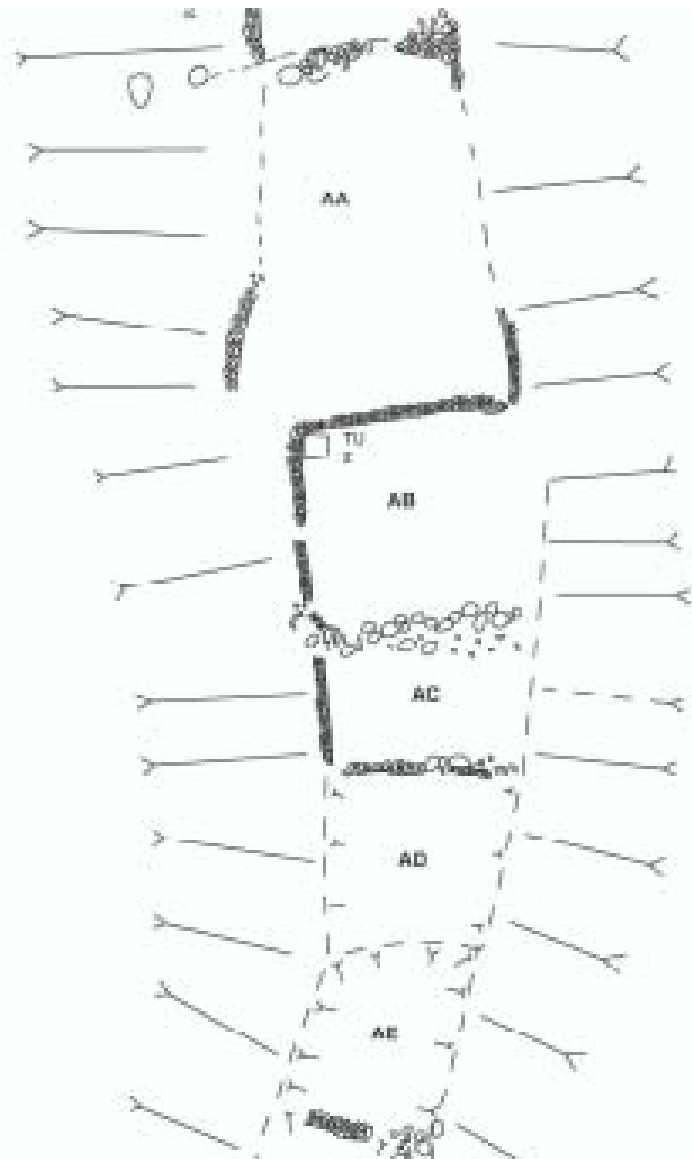
Figure 27 - Map of Upper Waiapuka Study Area.

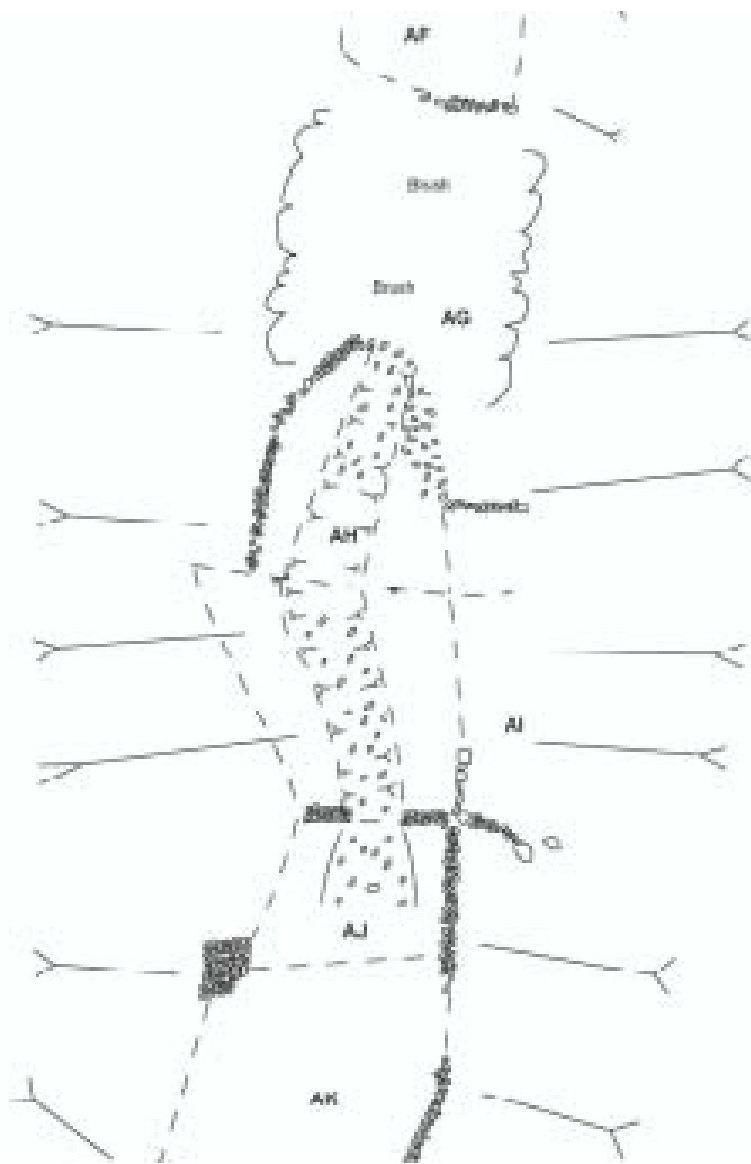












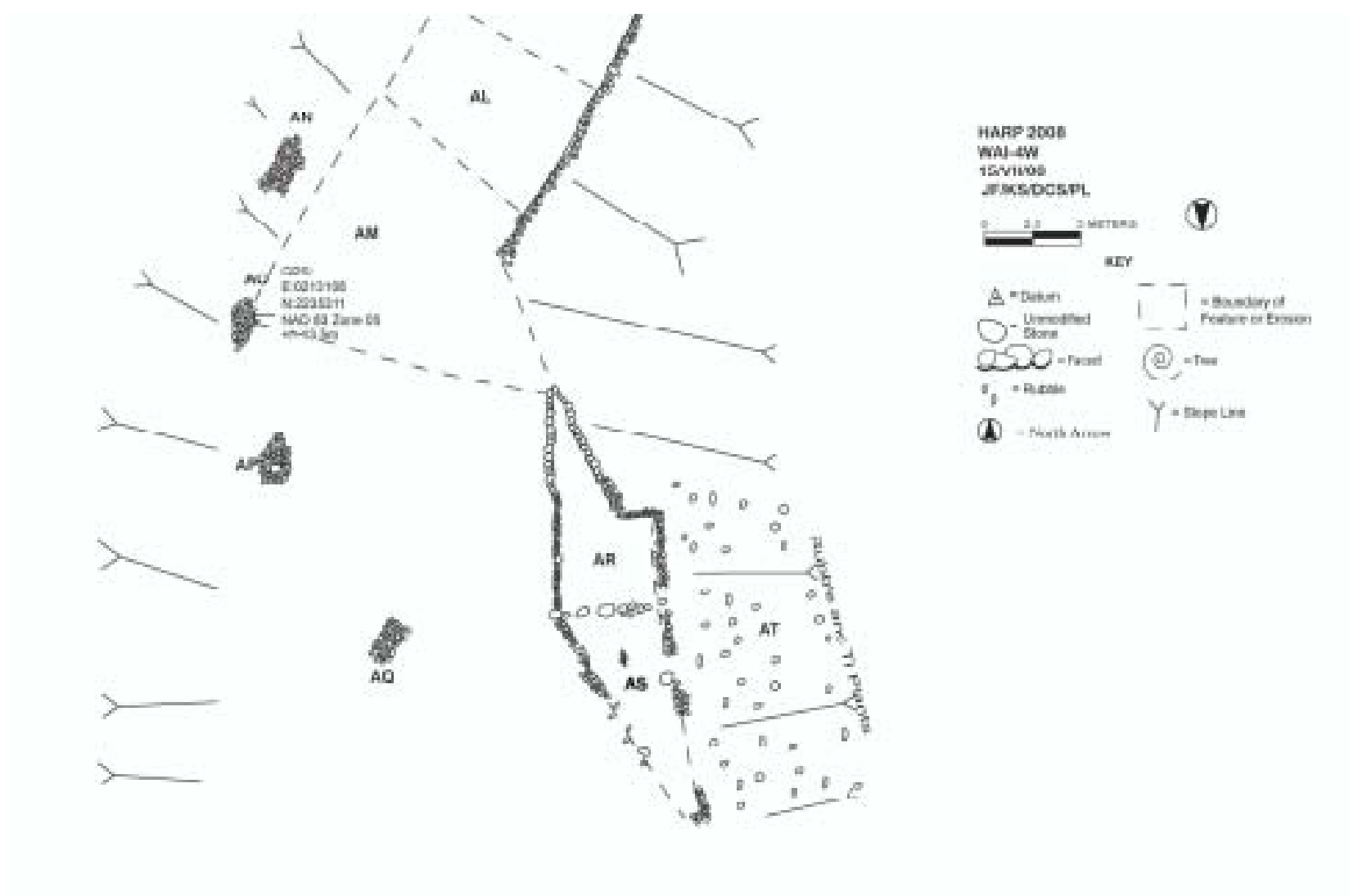


Figure 28 - Map of WAI-4W. Note: Locations of trenches WAI-4W-H/I-TU1 and WAI-4W-BM-TU1 not shown on this map.

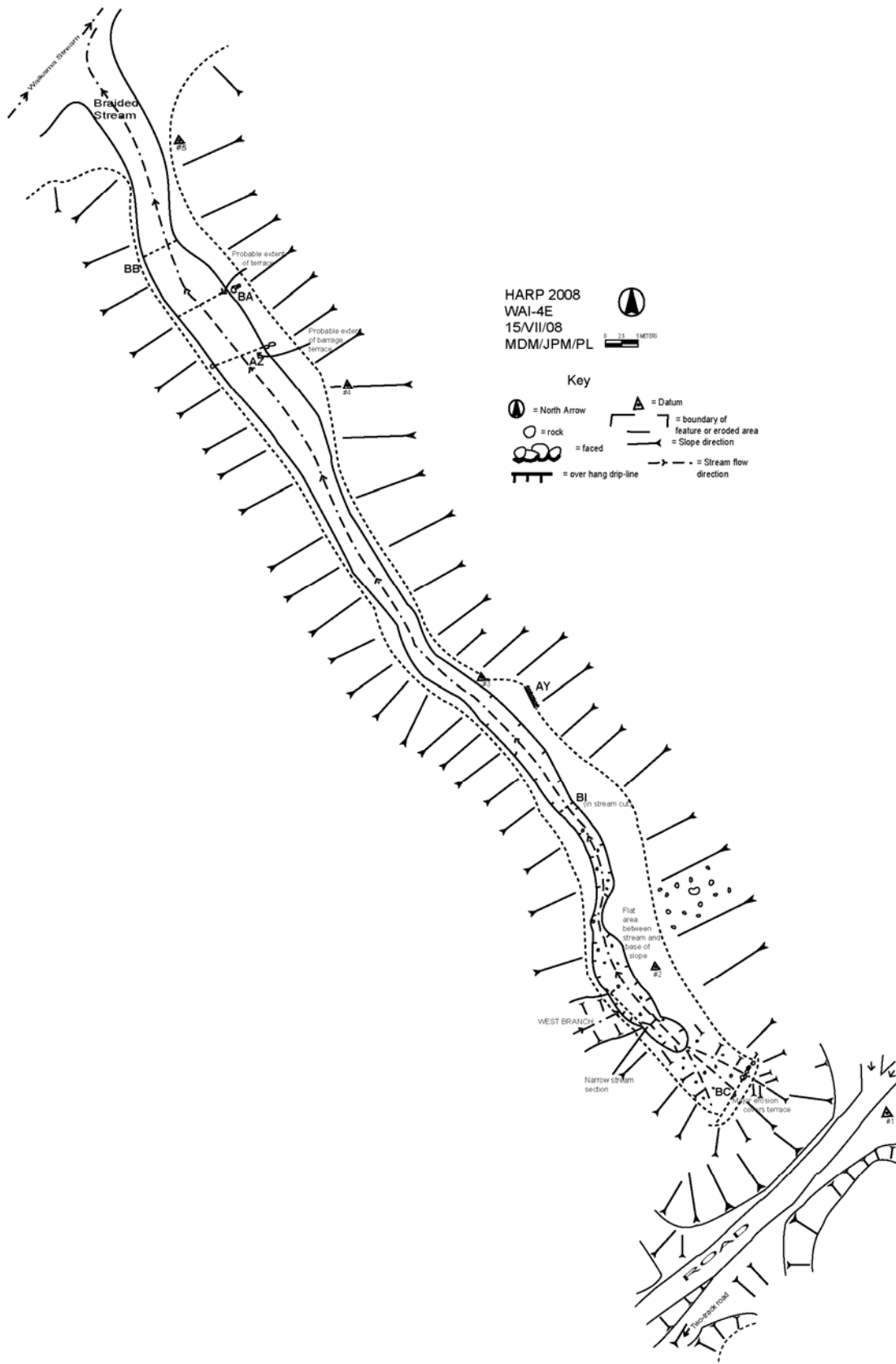


Figure 29 - Map of WAI-4E.



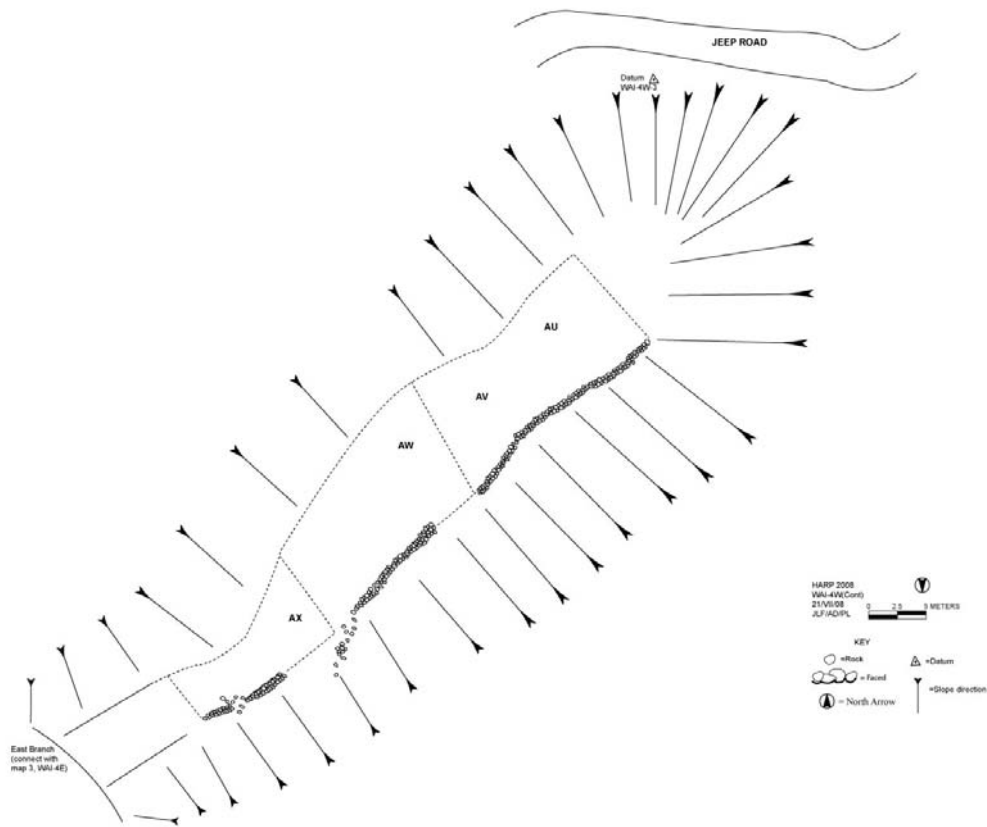


Figure 30 - Section of WAI-4W Below Access Road.

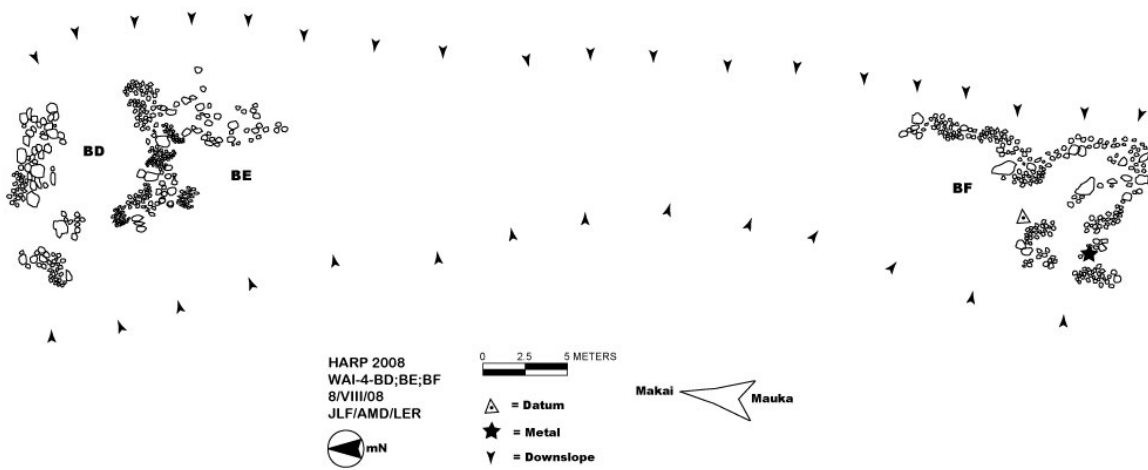


Figure 31 - Section of WAI-4E Located Above Access Road.

## Excavation Results: Upper Waiapuka

*Test Excavated Site: WAI-4*

### ***Test Units***

All excavations were conducted in the better preserved western branch (WAI-4W). This included five test units and six shovel test pits.

### **WAI-4W-H/I-TU 1**

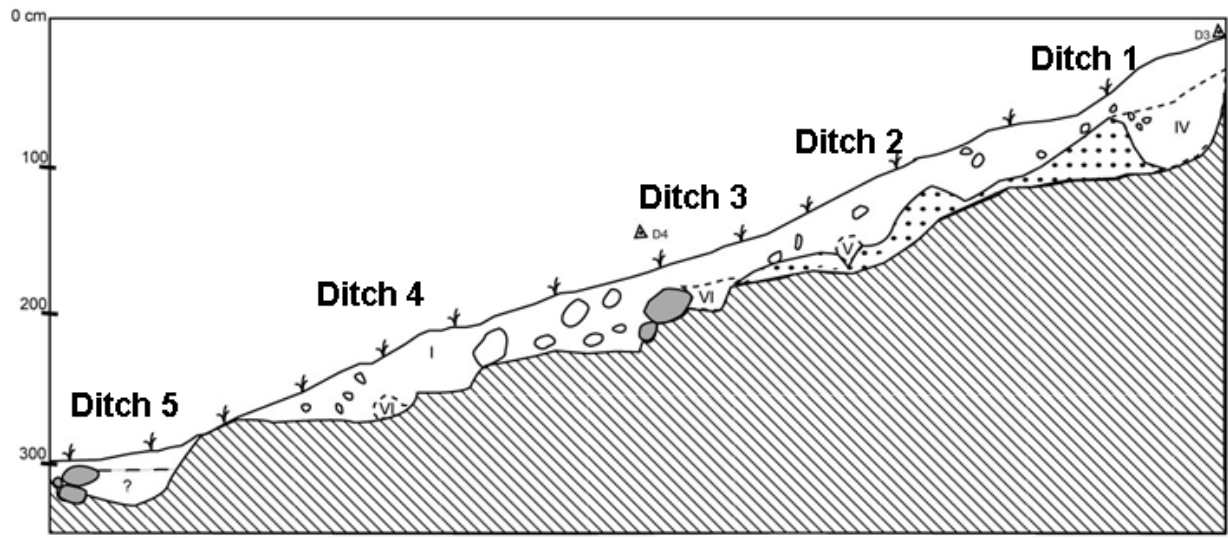
WAI-4W-H/I TU 1 was an 8 m x 0.75 m trench excavated on the eastern slope of WAI-4W through feature WAI-4W-I and WAI-4W-H in order to try and document where water might have been taken from the barrage terrace system via irrigation ditch ('*auwai*'). Sediment was not screened since the goal was to find the location of irrigation ditch deposits.

In the course of this shallow excavation we began to expose a layer of soft gray bedrock at depths of around 30-50 cmbs. More importantly, we exposed two stacked stone retaining walls – one in the center of the trench and the other at the lower end – and discovered the remains of five small '*auwai*' in plan view and profile. It appears these narrow ditches (ca. 30-40 cm wide; 20-50 cm deep) were originally dug in to the soft bedrock and the retaining walls – constructed along on the ditch's downslope edge – worked to help slow erosion.

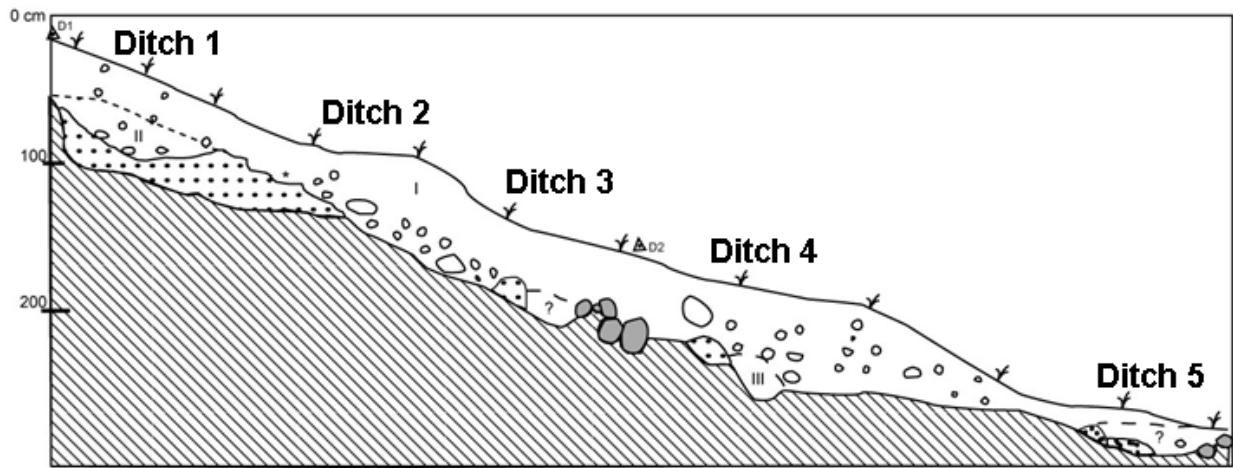
It would be unusual, but not impossible, that all five ditches were in use at the same time. In that scenario water would have been simultaneously drawn from adjacent barrage terraces. In an alternative, and in our view a more likely scenario, few of these would have been active at the same time. Rather, the ditches as we find them today are the product of re-working a water diversion system over the lifetime of the use of the area. There are good practical reasons to suspect reengineering would be required following activities like new terrace construction, natural silting of the irrigation infrastructure and fields, and failure of sections of the system as a results of natural flooding and erosion.

While future research should be aimed at testing these two scenarios, we believe the stratigraphy exposed is consistent with successive rebuilding. To begin, the uppermost layer, Layer I, is a dark brown loam (10YR 3/3) that appears to have accumulated after these features were abandoned. In the field, layer designations II, III, IV, and V represent fill deposits exposed in the north and south profiles. Below we offer a summary of these deposits relative to five ditch features numbered from the highest on the slope to the lowest.

Ditch No.	Relative position above gully bottom	Description
1	upper	This is the largest of the ditches exposed. It appears to be a U-shaped ditch entirely dug in to bedrock with no supporting architecture. Fill deposit is a dark grayish brown clay (10YR 4/2; Ly II, south profile; Ly IV, north profile) interpreted as a mix of silting while in use and erosion from above.
2	upper-middle	This is smallest of the ditches exposed. It appears to be a U-shaped ditch dug in to an L-shaped shelf in the bedrock. No supporting architecture was found. Fill deposit are only visible in the north profile and is a dark olive brown (2.5Y 3/3) silty clay mottled with dark brown loam (10YR 3/3) (Ly V) interpreted as a mix of silting while in use and erosion from above.
3	middle	This L/U-shaped ditch is one of two ditches exposed with a downslope retaining wall and upslope edge dug in to bedrock. Fill deposit are best seen in the north profile and is a dark grayish brown silty clay (2.5Y 4/2) (Ly VI) interpreted as a mix of silting while in use and erosion from above. Both the architecture and fill deposits are capped by Ly I.
4	lower-middle	This L/U-shaped ditch is one of the smaller of the ditches exposed. No supporting architecture was found. Fill deposits are dark olive brown silty clay (2.5Y 3/3) mottled with dark brown (10YR 3/3) loam (Ly VII in north profile) and a very dark gray clay silt (2.5Y 3/1) (Ly III in south profile) interpreted as a mix of silting while in use and erosion from above.
5	lower	This L-shaped ditch is one of the two ditches exposed with a downslope retaining wall and cut in to the bedrock on the upslope side. The fill deposit is very dark brown loam (10YR 3/3) mottled with dark gray brown (10YR 4/2) silty clay (Ly VIII). The upper courses of the retaining wall is exposed suggesting this feature was in use later than the others.



North Profile



South Profile

HARP 2008  
 WAI-4W-H/I Test Unit 1  
 8m x 1m  
 North/South Profiles  
 31/VII/08  
 JLF/PL/EAD/JLM

- ▲ = datum
- ↓ = surface
- = unmodified rock
- = architectural rock
- ▨ = unexcavated bedrock
- ▩ = exposed bedrock
- = diffuse layer change
- ⌒ = possible 'auwai
- \*

Figure 32 - WAI-4W-H/I-TU 1 Profiles.

## **WAI-4W-BM-TU 1**

WAI-4W-BM TU 1 was a 4 m x 1 m trench dug on the eastern slope of the gully downstream of WAI-4W-H/I. While this location is downstream and lower than WAI-4W-H/I in relative terms it is slightly higher on the slope and thus closer to the tableland. Again the goal was to try and find examples of where water might have been taken from the barrage terrace system out on to the tableland via an irrigation ditch (*'auwai*) therefore sediment was not screened.

In the course of this shallow excavation we again began to expose a layer of soft gray bedrock at depths of around 30-50 cmbs and exposed three stacked stone retaining walls – one at the top of the trench, one in the center, and the other at the lower end – and discovered the remains of three small *'auwai* in plan view and profile. Retaining walls appear to have been constructed along the downslope edge of ditches to help slow erosion. In other cases, ditches may have also had upslope edge walls.

We believe the sections of the slope immediate above and below our excavations have additional unexcavated ditches. In addition to the location of the retaining walls, the landform, density of ditches found, and number of ditches found in our earlier excavation suggests this is the case.

As in our previous excavation we believe that few of these would have been active at the same time and the ditches as we find them today are the product of re-working the water diversion system. However, the fill deposits found (Ly II to V) are uniformly dark grayish brown (2.5YR 4/2) silty clay which does not allow us to distinguish different periods based on sediments alone. Nonetheless, we note that again the topmost retaining wall was buried under a greater amount of sediment accumulated after these features were abandoned (Layer I, dark brown [10YR 3/3] loam).

In the field, layer designations II, III, IV, and V represent fill deposits exposed in the north and south profiles. Below we offer a summary of these deposits relative to the three ditch features seen in cross-section numbered from the highest on the slope to the lowest as well as two possible ditches we suggest exist based on landform and architecture present.

Ditch No.	Relative position above gully bottom	Description
-	upper	We suggest that above the uppermost retaining wall exposed there may be a ditch deposit yet to be uncovered. This interpretation comes from the fact that we have often found ditches immediately above retaining walls, a reading of the local landform, and the similar number and density of ditches found here and at the larger upstream excavation.
1	upper-middle	This is the largest of the ditches exposed. It was dug in to bedrock and supported on the upslope side by the uppermost retaining wall. On one profile it shows it was clearly carved in to bedrock in a U-shaped fashion (north profile), elsewhere it appears more L-shaped (south profile). Fill deposit are dark grayish brown (2.5YR 4/2) silty clay interpreted as a mix of silting while in use and erosion from above. Both the architecture and fill deposits are capped by Ly I.
2	middle	This U-shaped shallow ditch is curbed by retaining walls. Fill deposit are indistinguishable from deposits above which we interpret as evidence for little silting and/or major erosion from above.
3	lower-middle	This is U-shaped ditch was dug in to bedrock and supported on both the downslope and upslope edges by retaining walls. Fill deposit are dark grayish brown (2.5YR 4/2) silty clay and interpreted as a mix of silting while in use and erosion from above.
-	lower	We suggest that below the lowest retaining wall exposed there may be a ditch deposit yet to be uncovered. This interpretation comes from a reading of the local landform, the number of ditches uncovered upstream, and the similar density of ditches found here and at the longer upstream excavation.

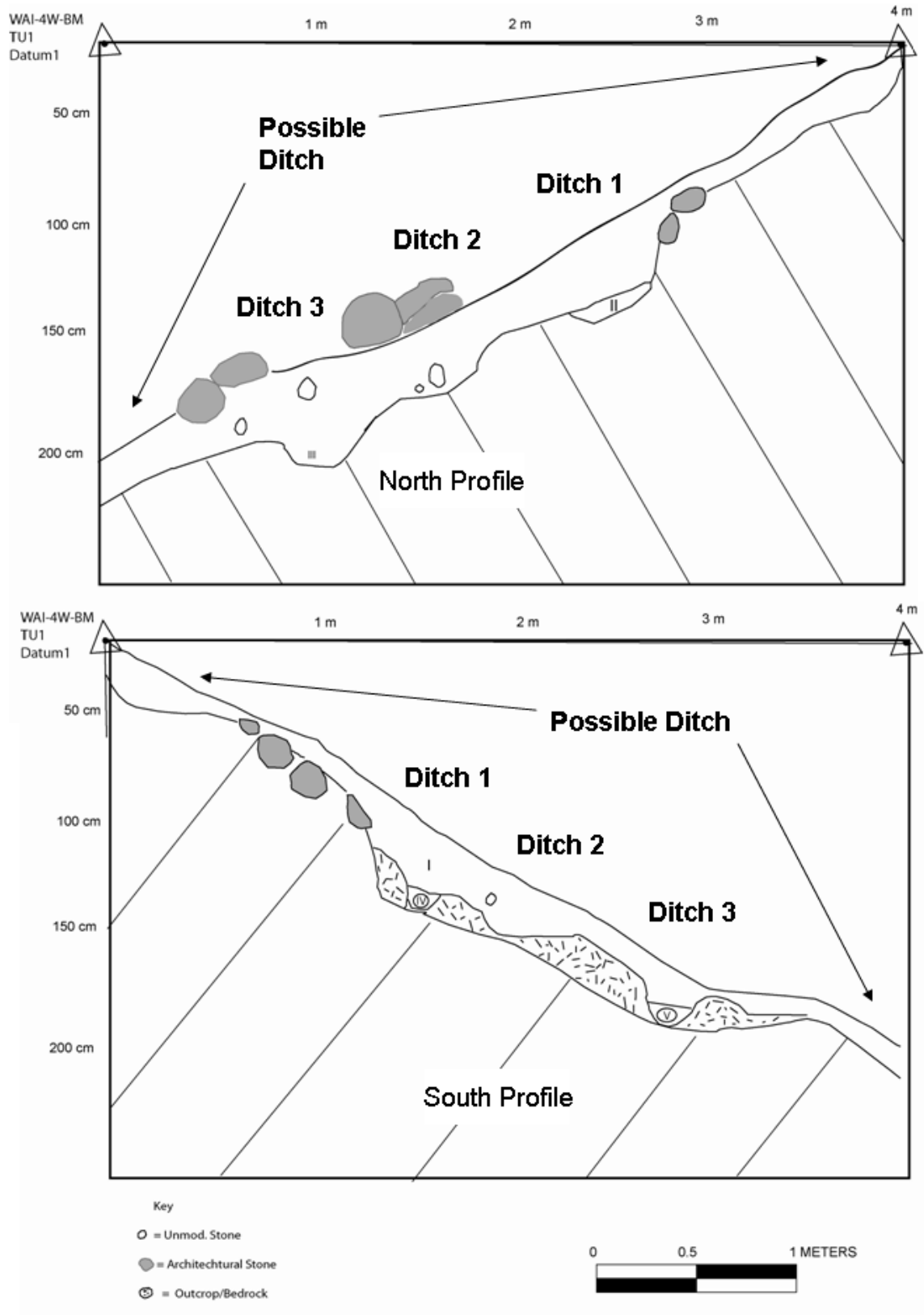


Figure 33 - Trench Profile of WAI-4W-BM-TU 1.





Figure 34 - Photo of Retaining Wall and Ditch Exposed in Plan View, WAI-4W-BM-TU 1.



Figure 35 - U-Shaped Ditch #1 of WAI-4W-BM-TU 1, north profile.

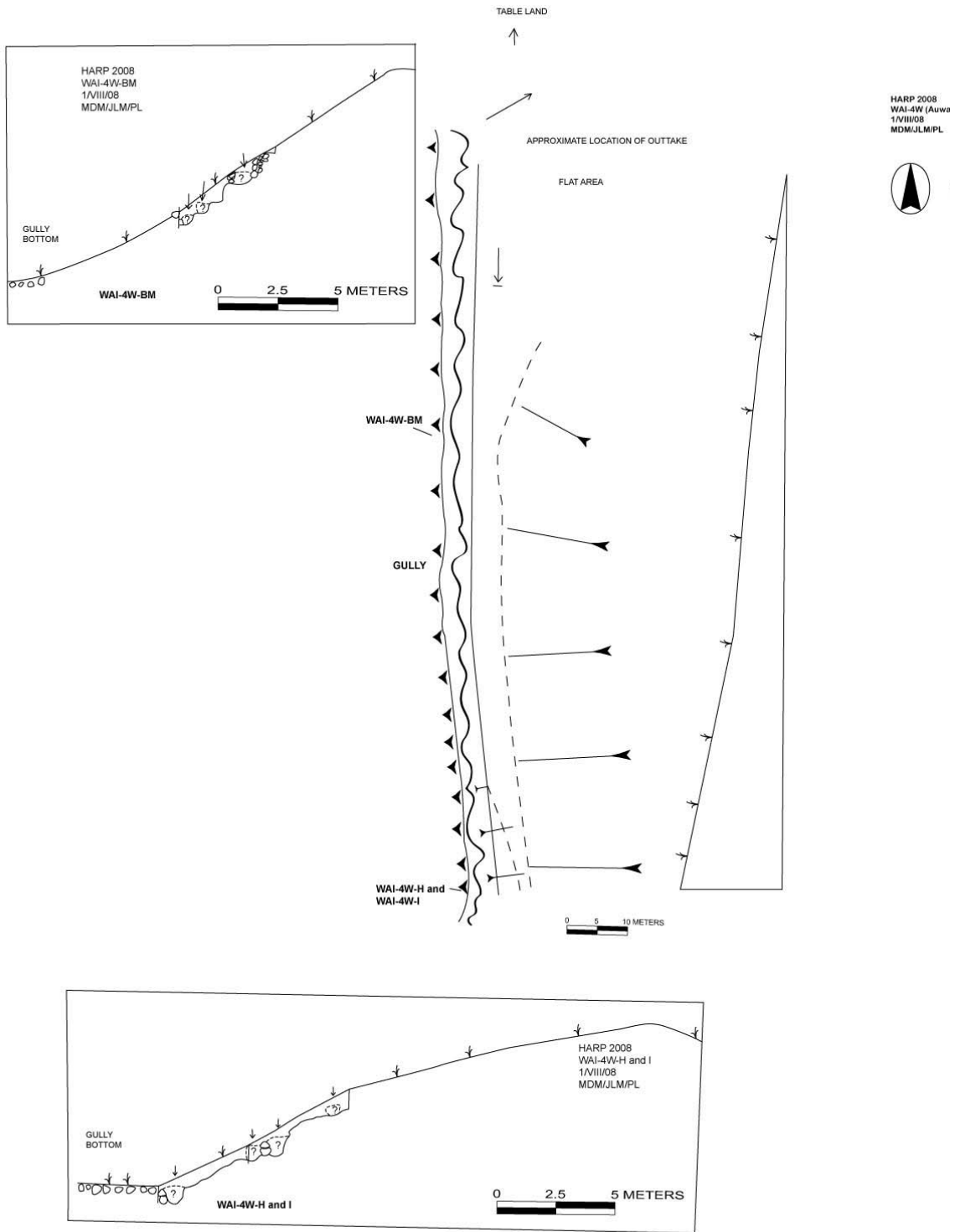


Figure 36 - Map of WAI-4W Irrigation System.

## **WAI-4W-N-TU 1**

WAI-4W-N TU 1 was a 1 m x 1 m unit placed on an earth-filled, stone-faced terrace located halfway up the eastern slope between the two trenches described above. We had originally hoped to find a habitation on this terrace due to its placement above the barrage system and the presence of lithics on the ground surface. However, instead what we found was a portion the system's irrigation network that may have taken some excess water from higher levels of the barrages and re-deposited it in lower barrages in a more controlled fashion. Specifically, we noted in profile a possible ditch that could only have diverted water to the barrage terrace below (WAI-4W-Q). We interpret this as evidence of the manipulation of irrigation water internally in addition to diverting water out of the gully itself. This excavation is further evidence the ditch system is a pre-contact era phenomenon. As we outline below, artifacts made of historic materials were not found just above or within fill deposits.

The first three levels (0-25 cmbd) were comprised of a dark brown soil (10YR 3/3) with an increasing amount of rock. Historic materials and one volcanic glass artifact were found. We interpret these deposits as historic period erosion.

In Level 4 (25-30 cmbd) a very dark grayish brown (10YR 3/2) loam layer was excavated that contained a greater frequency of precontact era artifacts - volcanic glass, charcoal, a water-worn pebble, and a basalt flake – as well as some historic metal. By Layer 5 (30-40 cmbd), no more historic material is found but excavators did collect charcoal, volcanic glass and a possible basalt flake. We interpret these as deposits spanning the late pre-contact and post-contact era. These may indeed be a purposeful fill deposit that covered up previous phases of irrigation however our limited investigation of the feature does not allow us to determine this for certain.

In Level 6, a dark gray compact clay was uncovered the northeast section of the unit while the northwest was comprised of a very dark gray brown loam. The only material collected was charcoal. In Level 7 the unit was excavated down to bedrock (about 50 cmbd). Only one small piece of charcoal was collected from this level. Later we interpreted a U-shaped deposit (Ly III) of an olive brown silty clay (2.5Y 4/3) in the north profile as evidence of a small ditch build to take water running parallel to the course of the drainage and turn it back toward the barrage system below.

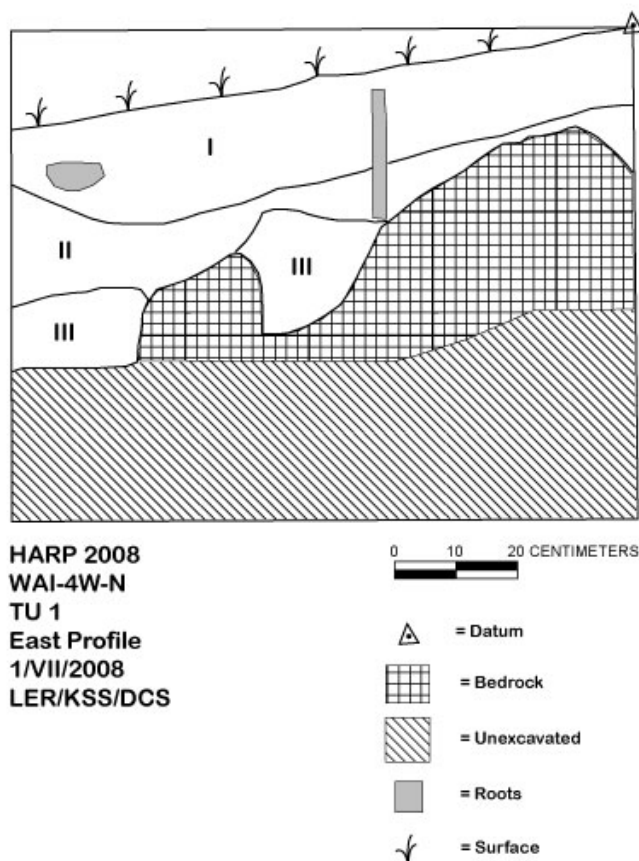


Figure 37 - WAI-4W-N-TU 1 Profile.

### WAI-4W-AB-TU 1

WAI-4W-AB TU 1 was a 1 m x 1 m unit placed against a terrace wall and excavated to collect gardened and uncultivated sediment from under architectural stone. Surprisingly, gardened soils were rocky and lacked clear signs of oxidation. Overall, artifacts uncovered are consistent with late prehistoric through post-contact use of the system.

Layer I (0-23 cmbd, Lvs 1 and 2) was a very dark brown (10YR 2/2) loam. Artifacts recovered include charcoal, flaked basalt, and volcanic glass. Layer II (23-52 cmbd, Lvs 3 and 4) was a dark brown (10YR 3/3) silt loam. Artifacts recovered include metal, historic glass, charcoal, flaked basalt, and volcanic glass. Layer III (52-112 cmbd, Lvs 5 to 8) was dark brown (10YR 3/3) silty clay loam mottled with olive brown (2.5Y 4/4) and dark brown (7.5YR 3/3) sediment. Layer IV was dark yellowish brown (10YR 4/4) sandy clay loam. Only charcoal was collected from this layer.



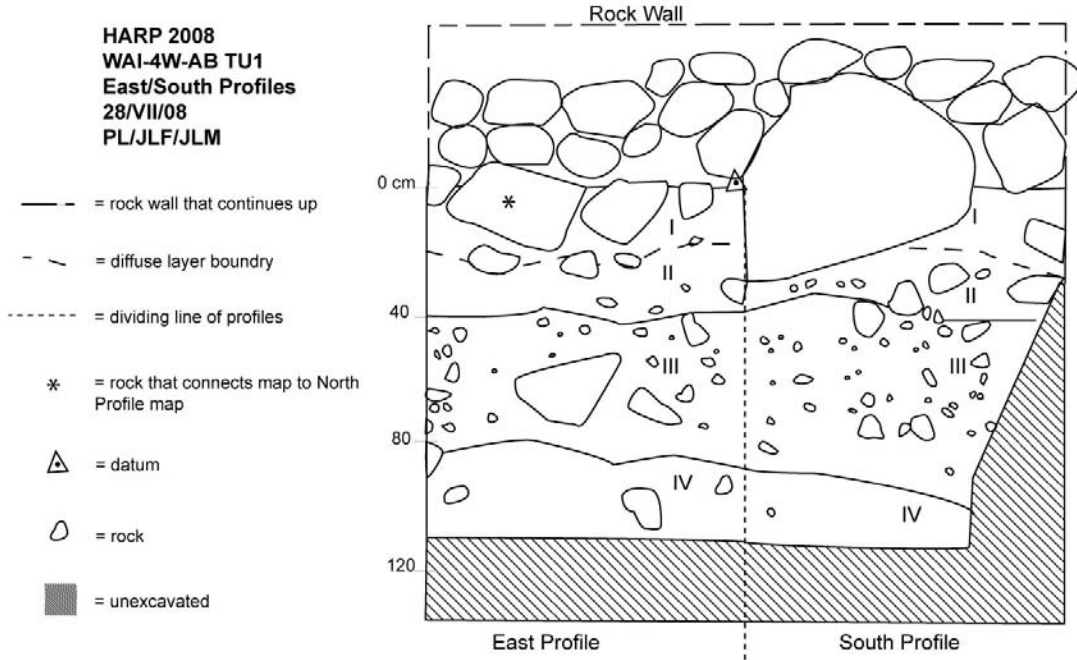


Figure 38 - East and south profiles of WAI-4W-AB-TU 1.

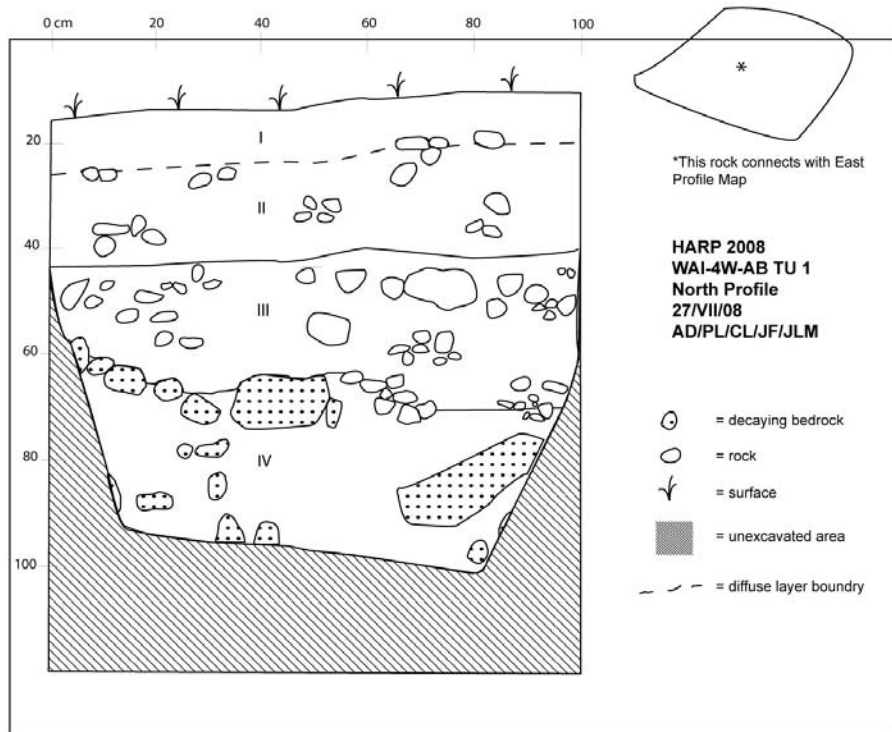


Figure 39 - North profile of WAI-4W-AB-TU 1.

## WAI-4W-AM-TU 1

WAI-4W-AM TU 1 was a 2.5 m x 0.75 m trench across a typical section of gardened soil. The trench – located between STP #1 and STP #2 in WAI-4W-AM – represents an effort to expose deeper stratigraphic and architectural elements than those exposed in WAI-4W-AB. Thus, the unit was not screened. Overall, it was excavated in two levels down to 135 cmbd where we uncovered decomposing bedrock. Layer I Level 1 (8-72 cmbd) was a very dark brown (10YR 3/3) silt loam. Level 2 (72-135 cmbd) included Layer II, a dark yellowish brown (10YR 3/6) silt loam, Layer III a dark yellowish brown (10YR 3/4) sandy clay loam, and Layer IV a dark yellowish brown (10YR 4/6) loamy clay. The only artifact encountered was a piece of historic metal wire about 20 cmbd.

Interestingly, our excavation uncovered what appears to be a shallow U-shaped drain evident at the lowest level (i.e., just above bedrock) as well in later deposits (i.e., at interface of Layers II and III). This drain would have been oriented *mauka-makai* and may represent the kind of internal feature on barrage terraces themselves that helped funnel water in to the ditch system documented elsewhere.

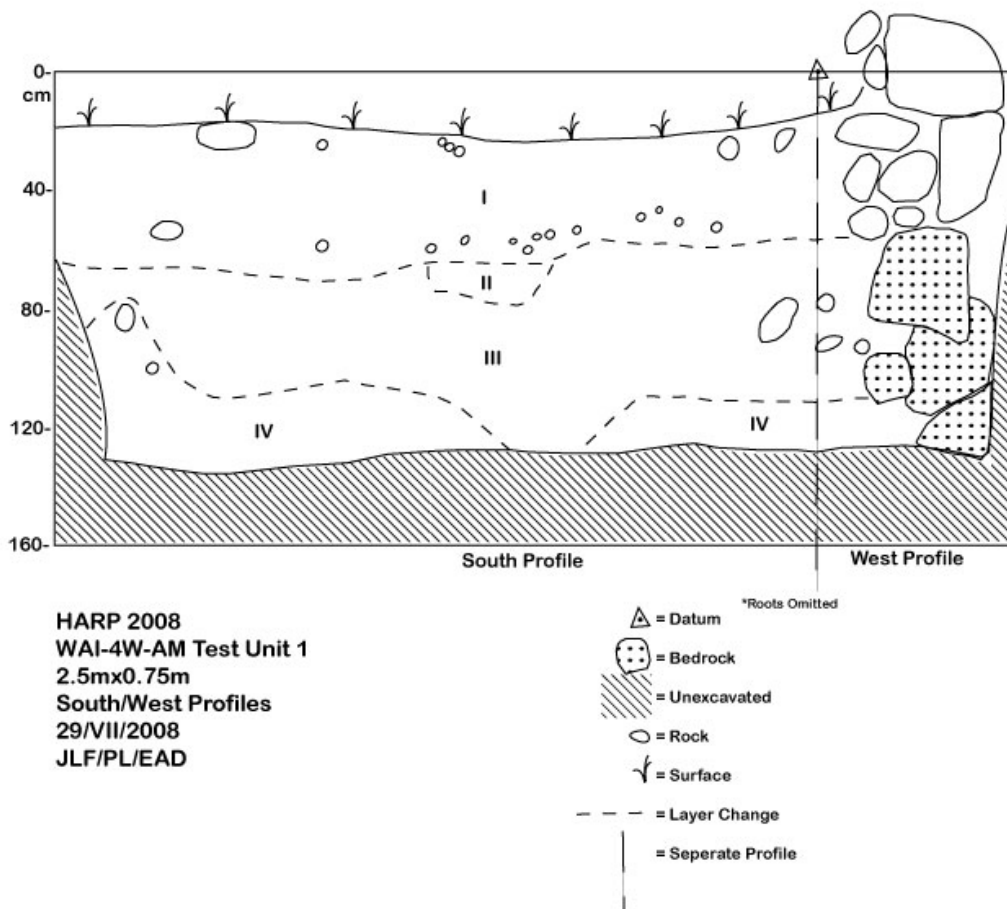


Figure 40 - WAI-4W-AM-TU 1 Profile.



## ***Shovel Test Pits***

Shovel test pits primarily focused on garden deposits.

WAI-4W-B STP #1	STP 1 is located in the middle of the terrace. E: 0213049 N: 2235079 +/- 12.8m Garmin 72. Lv. 1 Ly. I 0-50cmbs 10YR 3/3 Dark Brown Silt Loam, 70% unmodified stone. Excavation halted at 50cm, soil very rocky, no artifacts.
WAI-4W-C STP #1	STP 1 is located at the base of the retaining wall for WAI-4W-B, towards the western part of the feature under a large intact facing stone. E: 0213052 N: 2235075 +/- 16.6m Garmin 72. Lv. 1 Ly. I 0-30cmbs 10YR 3/3 Dark Brown Silt Loam; Lv 1 Ly I, Bag 1: Metal; Depth of wall basal stones very shallow; ca. 5cmbs.
WAI-4W-C STP #2	STP 2 is located in the middle of the terrace, about 4 m to the east of STP 1. E: 0213053 N: 2235058 +/- 17.6m Garmin 72. Lv. 1 Ly. I 0-50cmbs 10YR 3/3 Dark Brown Silty Clay Loam, Lv 1 Ly I, Bag 1: Charcoal (from 0-20cm).
WAI-4W-AS STP #1	STP 1 is located below large basal stones in a retaining wall on the western part of the feature. Lv. 1 Ly. I 0-30cmbs 10YR 3/3 Dark Brown Loam; Lv 1 Ly I, Bag 1: Metal; Bag 2: Land Snail Shell. Lv. 2 Ly II 30-40cmbs 7.5YR 4/6 Strong Brown Loamy Clay, no artifacts.
WAI-4W-AM STP #1	STP 1 is located below the retaining wall on the west side of the terrace. Lv. 1 Ly. I Bag 1: Historic; Lv. 1 Ly. I Bag 2: Charcoal; Excavation halted, WAI-4W-AM STP 1 and WAI-4W-AM STP 2 turned into TU 1.
WAI-4W-AM STP #2	STP 2 is located in the middle of the terrace, about 3m east of the STP 1; E: 0231383 N: 2235123 +/-30m Garmin 72. Lv. 1 Ly. I 0-50cmbs 10YR 3/3 Dark Brown Loam; Lv 1 Ly I, Bag 1: Charcoal. Lv. 2 Ly. II 10YR 3/6 Dark Yellowish Brown Silty Clay, Lv 2 Ly II, Bag 1: Charcoal. Excavation halted, WAI-4W-AM STP 1 and WAI-4W-AM STP 2 turned into TU 1.

## ***Summary of Irrigation at WAI-4***

The excavation of two trenches (WAI-4W-H/I, WAI-4W-BM), a terrace (WAI-4W-N), and deposits within barrage terraces (WAI-4W-AB, WAI-4W-AM, and STPs) suggests the following about WAI-4W:

- (1) Barrage terraces were built and used for gardening and to collect water that was then shifted out of the gully bottom. Good examples of terraces built with the latter function in mind include the convex retaining wall of WAI-4W-A and the internal drain in WAI-4-AM.
- (2) The preferred method for transporting water was artificial ditches created on the gully slope at a slightly higher slope than the natural course of the drainage. These would have raised irrigation water out of the gully as it flowed down.
- (3) There is limited evidence of ditches that moved irrigation water internally within the system (WAI-4W-N).
- (4) At least three ditch construction methods have been identified:
  - i. One construction method involves cutting a flat shelf in to the soft bedrock. This leaves behind an L-shaped cross-section in profile.

- ii. Another construction method – seen in the largest ditches exposed thus far – involves cutting a trough in the bedrock. This leaves a U-shaped cross-section in profile.
- iii. Finally, in concert with these methods of cutting, retaining walls were built at least on the downslope edge of ditches and in some cases curbing both edges.

(5) In terms of dating WAI-4, current evidence suggests

- a. This irrigation system was likely built and used in the late prehistoric era with some use after contact. Our excavations unearthed artifacts made of metal, glass, etc. in relatively shallow deposits. This should not have been the case if these features were first constructed in the historic era.
- b. The complex may be the result of five or more phases of construction. We believe these progressed in a serial fashion (i.e., sequentially) possibly progressing from the ditches highest on the slope to the lowest. Further testing is necessary to document the site's construction history.

Our best example of a similar irrigation system is the well-known Waiapuka Tunnel (-2336; a.k.a. WK-4 in Tonomari-Tuggle 1988) located in Lower Waiapuka on the eastern side of the Waikama Gulch. While an archaeological survey of this important site has yet to be completed, Tonomari-Tuggle (1988:38) reports:

...the site consists of 19 vertical shafts dug through bedrock to the level of the stream and connected by a horizontal tunnel. It carried water from Waikama Stream to a complex of taro fields situated in a low area of the kula slope. It is located in LCA 511 to Parker, in the 'ili of Makaanaka, in the ahupuaa of Waiapuka.

Its construction has been attributed in traditions and legends to the ali'i nui, 'Umi (AD 1650-1668), to menehunes, and to Kamehameha; it has also been credited to J.P. Parker, founder of Parker Ranch and claimant of LCA 511.

People in Kohala today say that it was constructed by Kamehameha and the fields which were watered by the tunnel are referred to as Kamehameha's taro patches (William Sproat, personal communication). However, Williams (1919) argued that modern technology was needed to for construction through bedrock and dated the tunnel to 1823 and 1849, when Parker occupied the land. Handy (1940:121) disagrees, saying that knowledge of cutting stone was available in prehistoric times.

Naturally, there are major differences between the Waiapuka Tunnel and WAI-4. The most obvious things that separate the tunnel from WAI-4 include the larger scale of bedrock excavation, tunneling to bring water out of a drainage, and the fact that this involves tapping the main gulch rather than a side gully.

These significant differences aside three common factors suggest the tunnel was indeed built in the prehistoric or protohistoric era. First, in WAI-4 there is evidence of limited bedrock cutting in order to create irrigation ditches. While these are shallow, they do not show any signs of modern tool markings and are consistent with traditional Hawaiian construction methods (i.e., digging stick). Second, both systems modify the natural watercourse in order to pool water that was subsequently drained for irrigation. Finally, both systems were created to pull water out of a natural drainage to water tablelands.

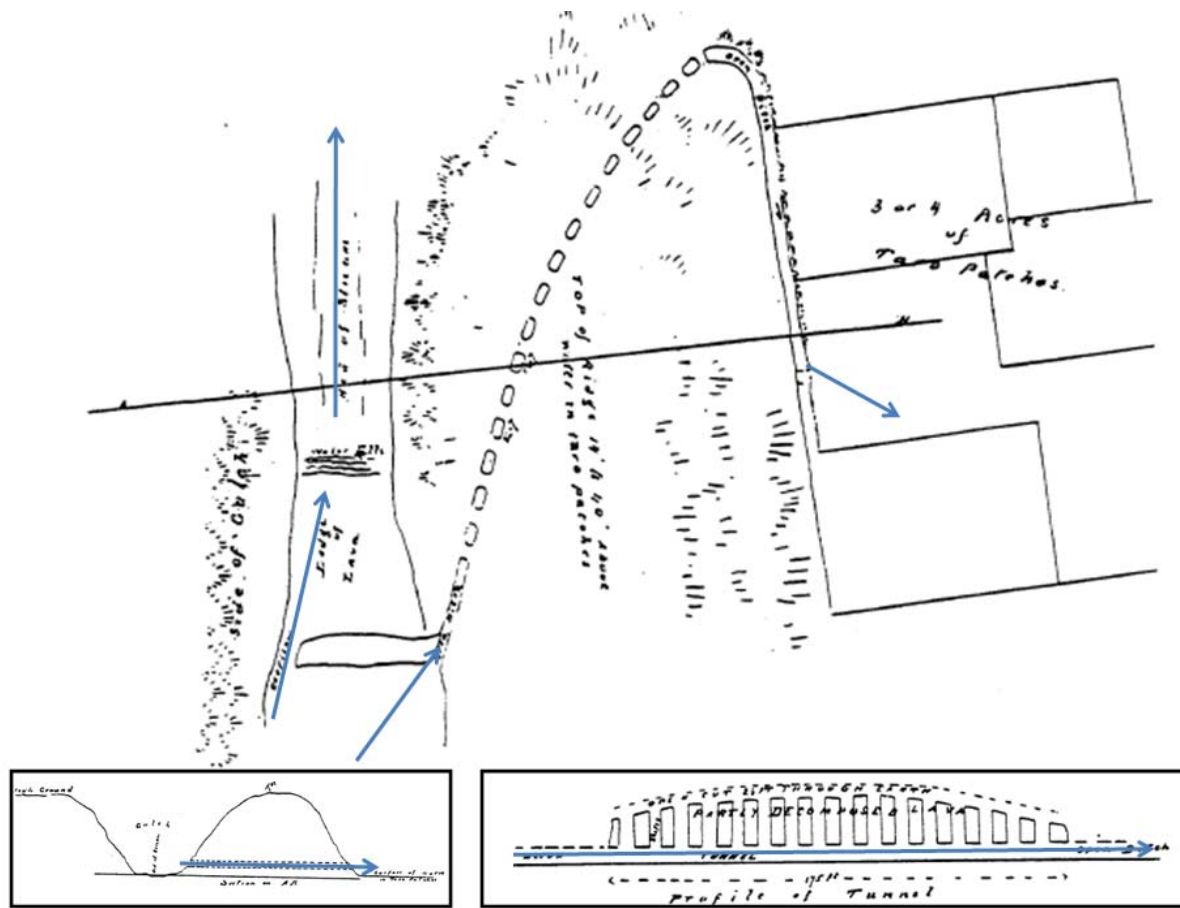


Figure 41 - Map and Cross-section of Waiapuka Tunnel (-2336) by Cabot (1888) (Tonomari-Tuggle 1988:Sec. II, Fig. 7).

## Survey Results: Upper/Lower Waiapuka (600-800 fasl)

Sites Recorded: WAI-1, WAI-2, WAI-3, WAI-5, and WAI-6

At the boundary between Lower and Upper Waiapuka, five sites were recorded in Waikama Gulch and on the tableland to the east of the drainage. Excavations were conducted at three of these sites – WAI-1, -2, and -5 – in order to collect datable material in good archaeological context and further investigate these unique agricultural complexes.

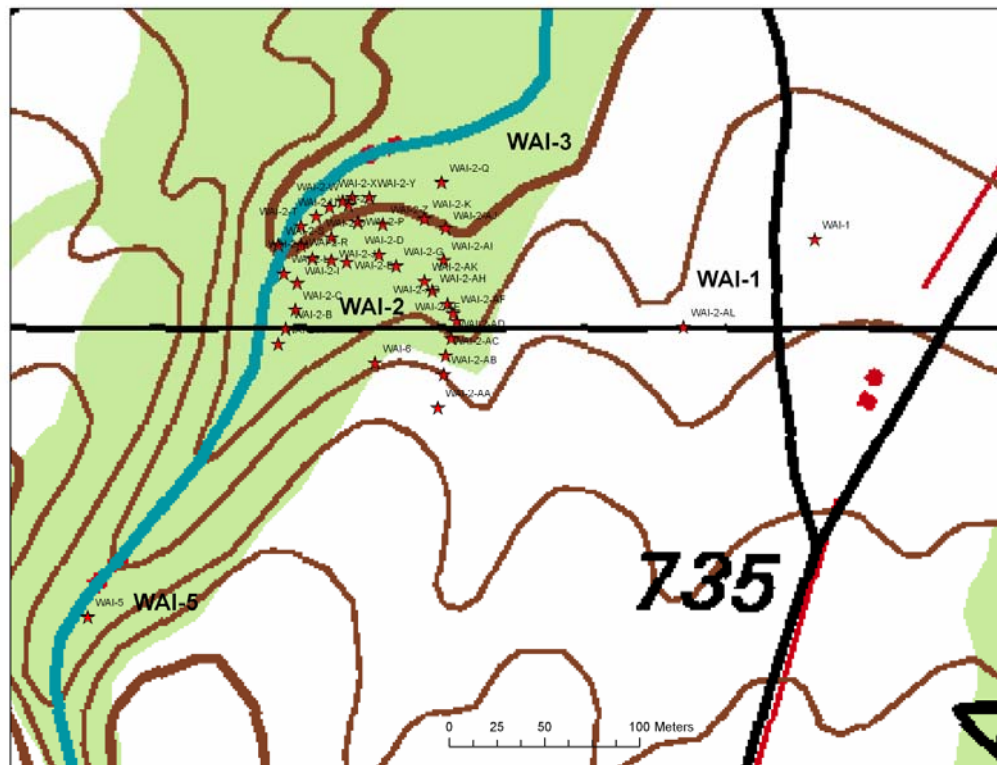


Figure 42 - Map of Upper/Lower Waiapuka Study Area.

### *Irrigated Terrace Complex on Tableland (WAI-1)*

At the turn of the century, Lobenstein (1904) mapped what appear to be irrigated fields on the tableland in several locations east of Waikama Gulch. In one of these locations, we recorded WAI-1 - a large terraced *lo'i* system defined by retaining walls on the *makai* and *mauka* sides. In the 1980s, Tonomari-Tuggle (1988:38) visited the site and reported that “sections of the compound wall remain in excellent condition. It is constructed of field rocks, 50-100 cm wide, up to 100 cm high.” Our assessment of the site likewise found the outer wall in good condition in sections. In addition, on the western side, there is an irrigation ditch (WAI-1G) that runs *mauka* to *makai*. The east side has a large bulldozer push-pile parallel to the present road that may mark a former north-south oriented exterior wall. Internal features are difficult to clearly define since they are primarily marked by subtle changes in elevation (WAI-1A, -1B, -1C, -1D, -1E, and -1F).

The historic era map of the site further indicates the area was at one time home to St. Louis Catholic Church (ca. 1860). When Tonomari-Tuggle (1988:38) visited the site in the 1980s she found:

The church foundation is of field rock, low, rubbly, and slightly terraced to the makai. It measures approximately 6 x 13 m; 10 to 25 cm high on the upper side and 25 to 50 cm high on the lower side. The graves are concrete slabs with concrete headstones, which have been broken. There is some coral around the graves. The church and graves are situated on a terrace marked now by a 50 to 100 cm high embankment along the makai side. A few pieces of glass and crockery, and a piece of galvanized tin, were found along the E side of the church foundation.

Today, high grass covers the location of the church foundation and a modern barbwire fence surrounds it and several marked graves.

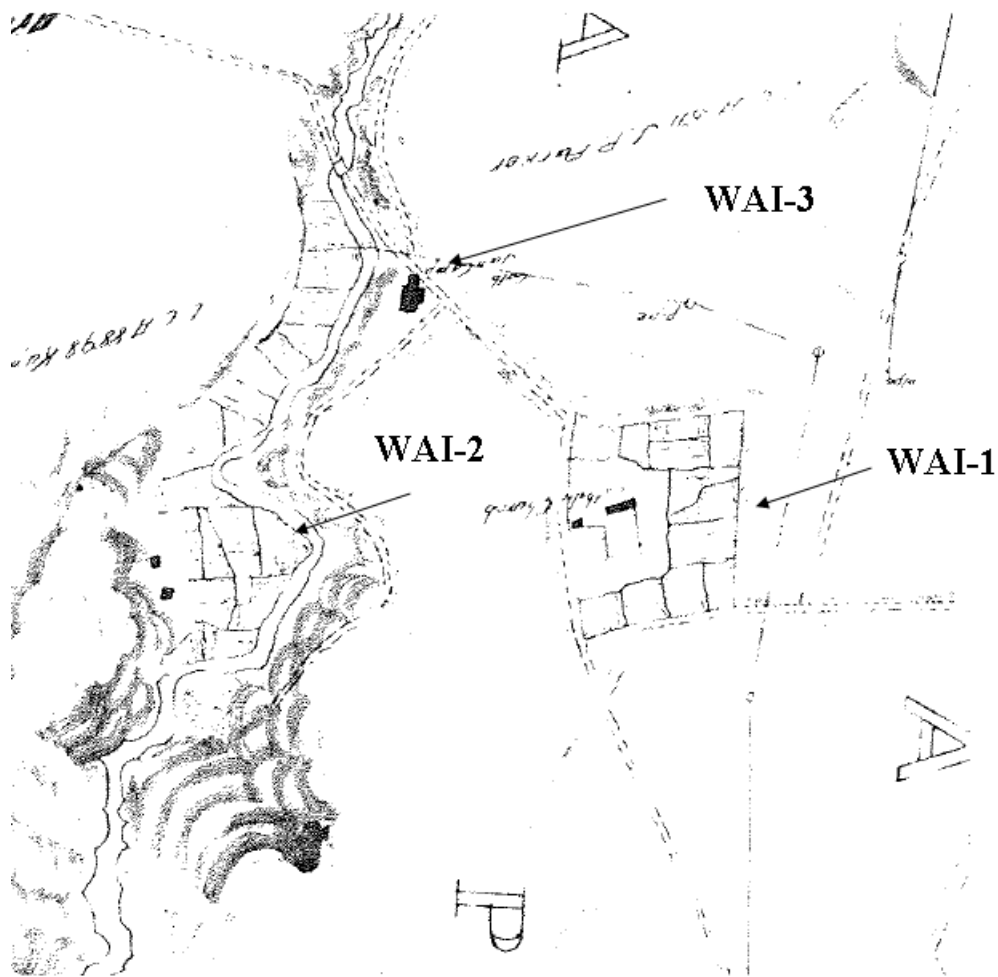


Figure 43 - Historic Era Map of Upper/Lower Waiapuka (WAI-1, -2, and -3).



Figure 44 - Map of WAI-1.



### ***Irrigated Terrace Complex in Gulch (WAI-2)***

WAI-2 is a large terrace complex that includes 37 features that stretch from within Waikama Gulch, up its eastern slope, and out on to the tableland immediately above. From the tableland down, it includes a barrage terrace built in a gully (WAI-2AL); an historic ditch (WAI-2AA) that diverted excess water and probably slowed erosion of tableland sugar cane fields; a set of barrage terraces (WAI-2AB to -2AK) fed by this ditch and built down the eastern slope of the gulch; and several tiers of terracing (WAI-2A to -2Z) on the eastern bank of Waikama Gulch. In addition to agricultural features the top tier (WAI-2A to -2J) includes a burial (WAI-2B) and two small historic era building foundations (WAI-2C and -2E).

### ***Historic Period Industrial Camp (WAI-3)***

Located downstream from WAI-2, WAI-3 is a series of terraces on the eastern side of Waikama Gulch that likely corresponds to the Japanese settlement camp shown on Lobenstein's 1904 map. We did not undertake a detailed mapping of the site. However, it seems likely that the historic period use of WAI-2 was probably associated with this camp.

### ***Non-Irrigated Terrace (WAI-5)***

Located 40 meters below a major waterfall, WAI-5 is a non-irrigated terrace built 160 meters upstream from WAI-2 on the eastern side of Waikama Gulch. Much of the feature is eroded. Indeed it is remarkable that any of its retaining wall is visible on this steep, active slope. Our initial interpretation of the site as a habitation seems unlikely due to three factors. First, we were unable to recover any signs of domestic rubbish in excavations. Second, after spending some time at this location it seems clear that in high rains the terrace would receive an unwelcome amount of natural spray from the nearby waterfall. Third, the steep slope above the terrace makes this a dangerous location in terms of natural erosion.

### ***Multiple Terrace Compound Structure (WAI-6)***

WAI-6 is a multiple terrace compound structure located on the eastern tableland ridge of Waikama Gulch above WAI-2. The structure is composed at least two stone-faced, earth-filled terraces. Due to the structure's placement in such a prominent location, with broad sweeping views, its overall large size and separation from other features, it may be a habitation site or a site of ritual. Unfortunately, these types of sites are so rarely preserved in the area it is impossible to further define the past use of these features without excavation data. No such excavations were conducted this season.

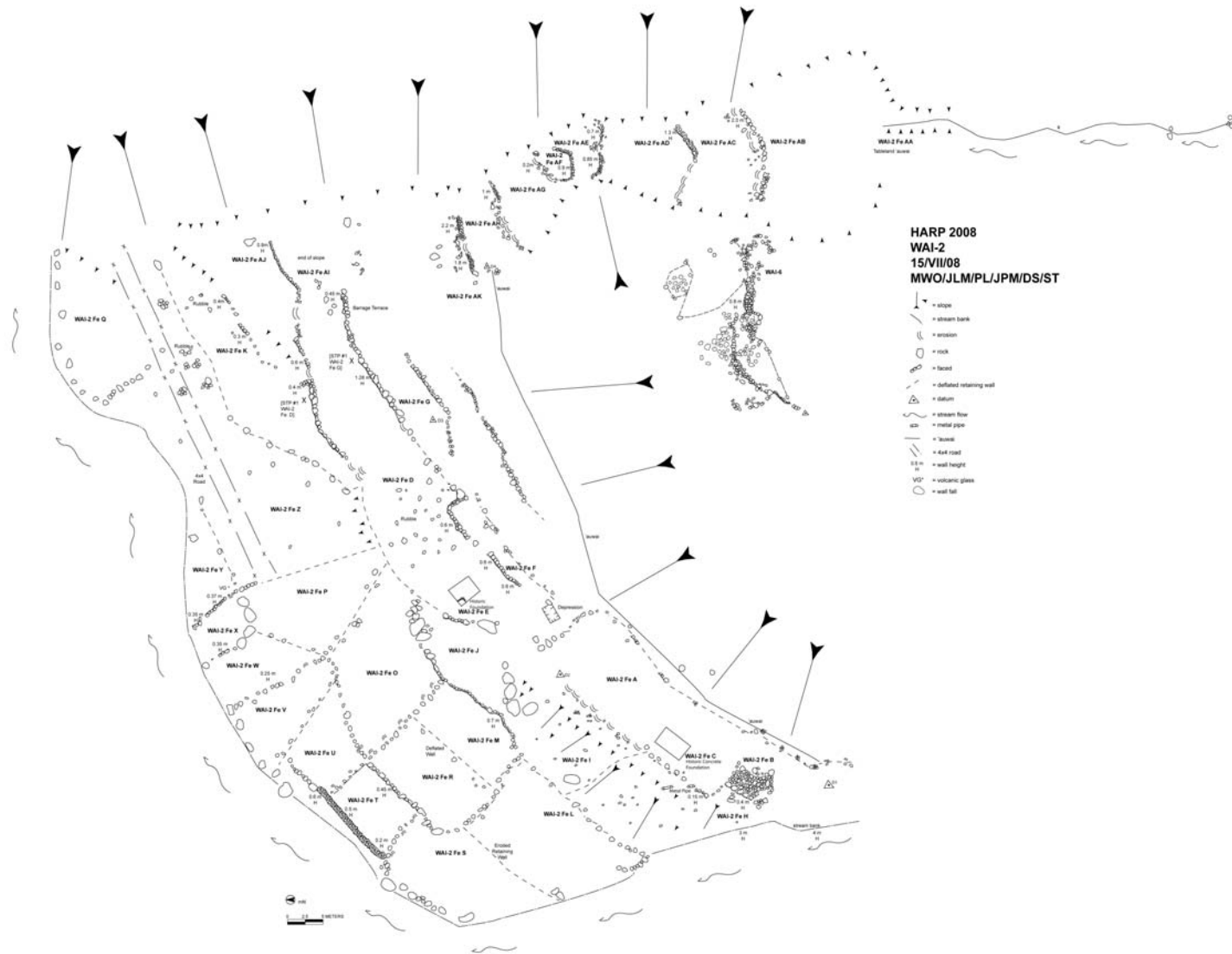


Figure 45 - Map of WAI-2.

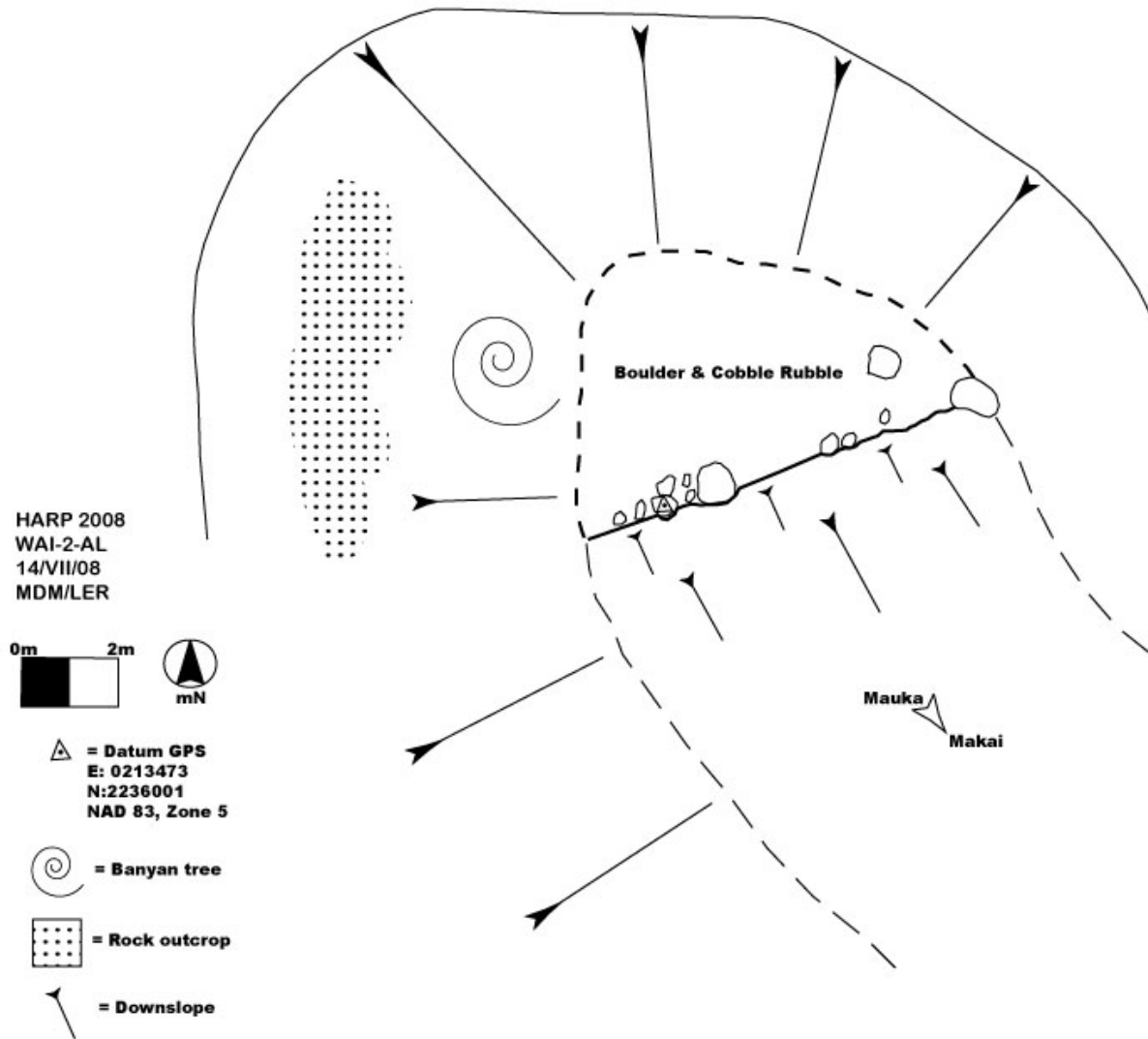


Figure 46 - Map of WAI-2AL.

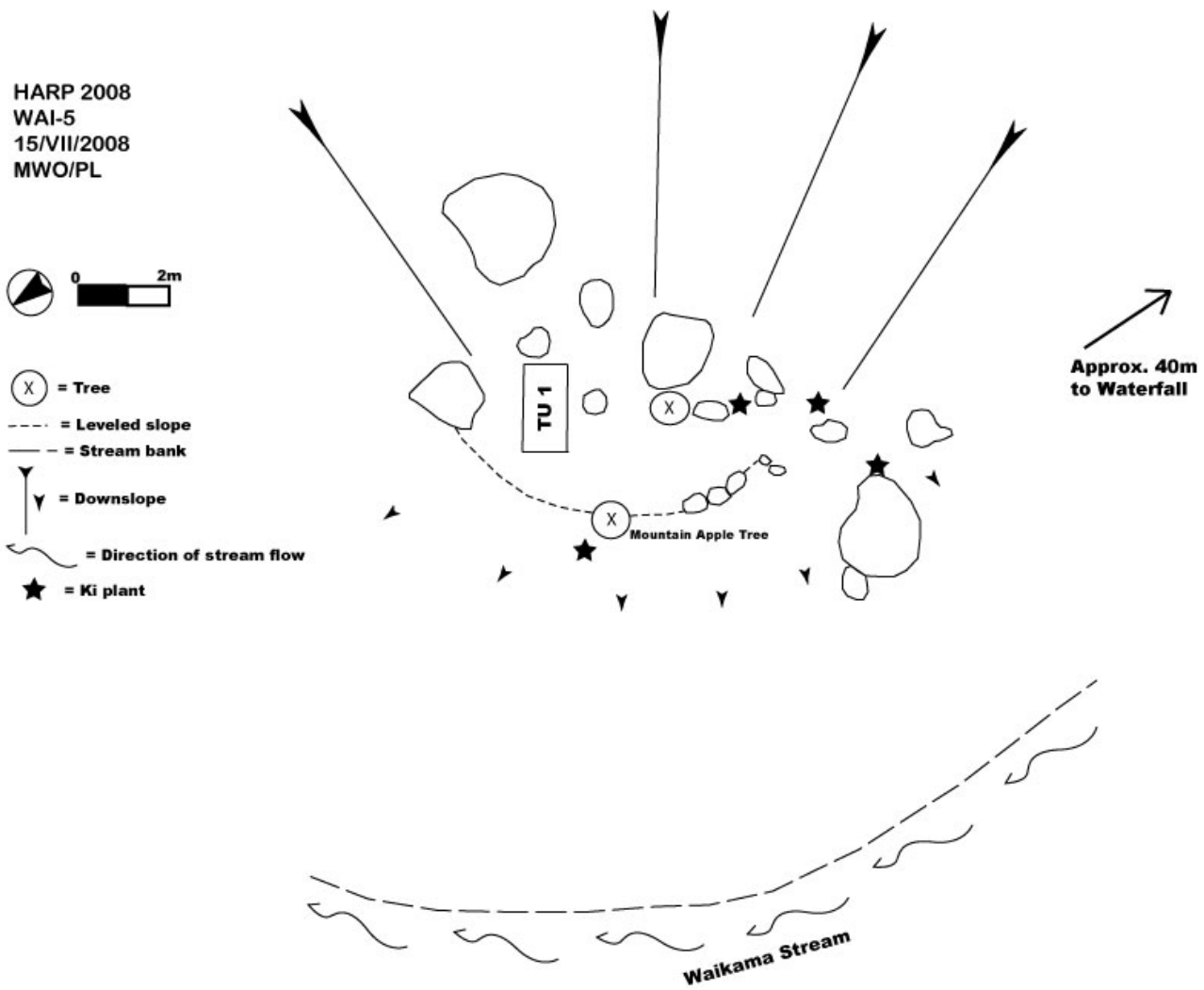


Figure 47 - Map of WAI-5.

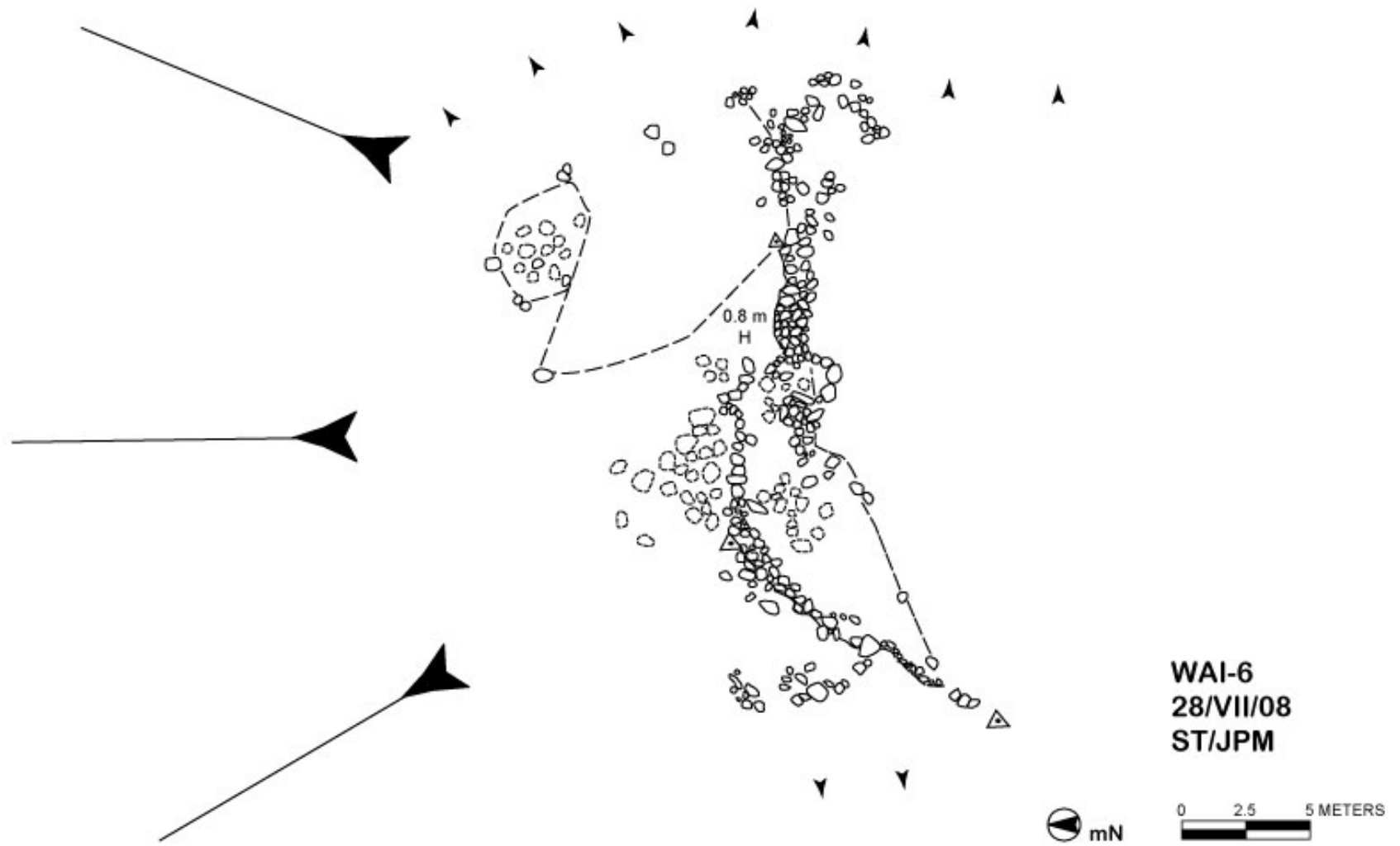


Figure 48 - Map of WAI-6.



## **Excavation Results: Upper/Lower Waiapuka**

*Test Excavated Sites:* WAI-2, WAI-5, and WAI-1

### ***Test Units***

#### **WAI-2AA-TU 1**

WAI-2AA TU 1 was a 1 m x 0.50 m unit placed over what was later determined to be an historic era ditch that drained excess water from the tableland in to the gulch.

Layer I Level 1(0-20 cmbd) was dark brown (10YR 3/3) silty loam with 5% pebble content. No artifacts were recovered. Layer I, Level 2 (20-40 cmbd) was dark brown (10YR 3/3) silty loam. Volcanic glass was collected.

Layer II, Level 3 (40-60 cmbd) was dark yellowish brown (10YR 3/4) silty, clay loam with red/orange inclusions. Charcoal was collected. Layer II, Level 4 (60-80 cmbd) was dark yellowish brown (10YR 3/4) silty, clay loam with red/orange inclusions and yielded no artifacts.

#### **WAI-2AA-TU 2**

To continue our examination of this tableland ditch (WAI-2AA), a 3 m x 1 m trench was set in across the feature and then dug by pick and shovel to uncover its stratigraphic history. Sediments were not screened. A second unit (TU 3) was excavated nearby to confirm the pattern of in-filling and cutting apparent in this trench.

Layer I soil was dark brown (10YR 3/3) silty, clay loam with 5% clay inclusions and was excavated to 60 centimeters below datum. The ditch is clearly shallow, dug only in to the top layer. Therefore, we interpret it as begin contemporary with sugar cane production. Layer II soil was a strong brown (7.5YR 3/4) clay loam with red/orange inclusions and 40% pebble, 20% cobble, and 20% boulder fill. It was excavated to 220 cmbd. We interpret this lower layer as an intentional fill that may have been mechanically aided (i.e., backhoe push). This would have probably covered a natural gully that would have flowed in to the Waikama Gulch at the same location as the eastern slope barrage terraces in WAI-2.

#### **WAI-2AA-TU 3**

WAI-2AA TU 3 was a 1 m x 0.75 m unit located two meters southwest of TU 2. It was excavated to 50 cmbd to confirm the presence of Layer I across the cross-section of the ditch. The dark brown (10YR 3/3) silty clay with pebbles was found that was identical to Layer I from TU 2. Volcanic glass and charcoal were collected.

#### **WAI-2AA-TU 4**

WAI-2AA TU 4 was a 3 x 1 m trench that revealed what appears to be a buried A horizon that pre-dates the sugar cane era. Since it was excavated by pick and shovel to uncover the stratigraphic history of WAI-2AA sediments were not screened.

Seven stratigraphic layers were uncovered: Layer I, dark brown (10YR 3/3) loam interpreted as dating to the same period as Layer I in TU 1, 2, and 3; Layer II, dark brown (10YR

3/3 silty clay loam; Layer III, brown (10YR 5/3) silty clay loam interpreted as bulldozer push fill probably from the same effort to fill a natural gully seen in TU 3's Layer II; Layer IV, dark yellowish brown (10YR 4/4) silt loam; Layer V, dark yellowish brown (10YR 4/4) clay loam mottled with a dark reddish brown (5YR 3/4) clay loam and interpreted as a buried A horizon with signs of oxidization; Layer VI, dark brown (7.5YR 3/4) silty loam interpreted as a mix of buried A and basal soil; and Layer VII, a small deposit half a meter wide of black silty clay first interpreted as a buried irrigation ditch but later more conservatively interpreted as simply decaying bedrock. The excavation ended at rocky, compact sediment interpreted as naturally decomposing bedrock and soil.

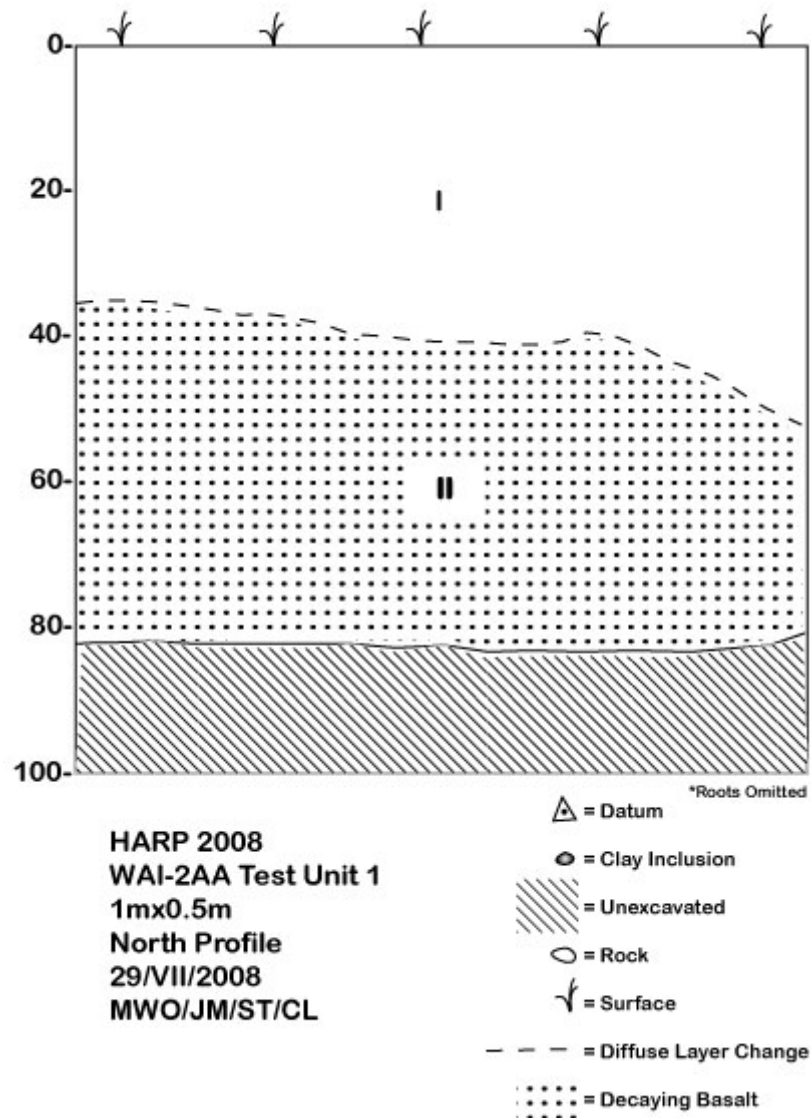


Figure 49 - WAI-2AA-TU1 Profile.

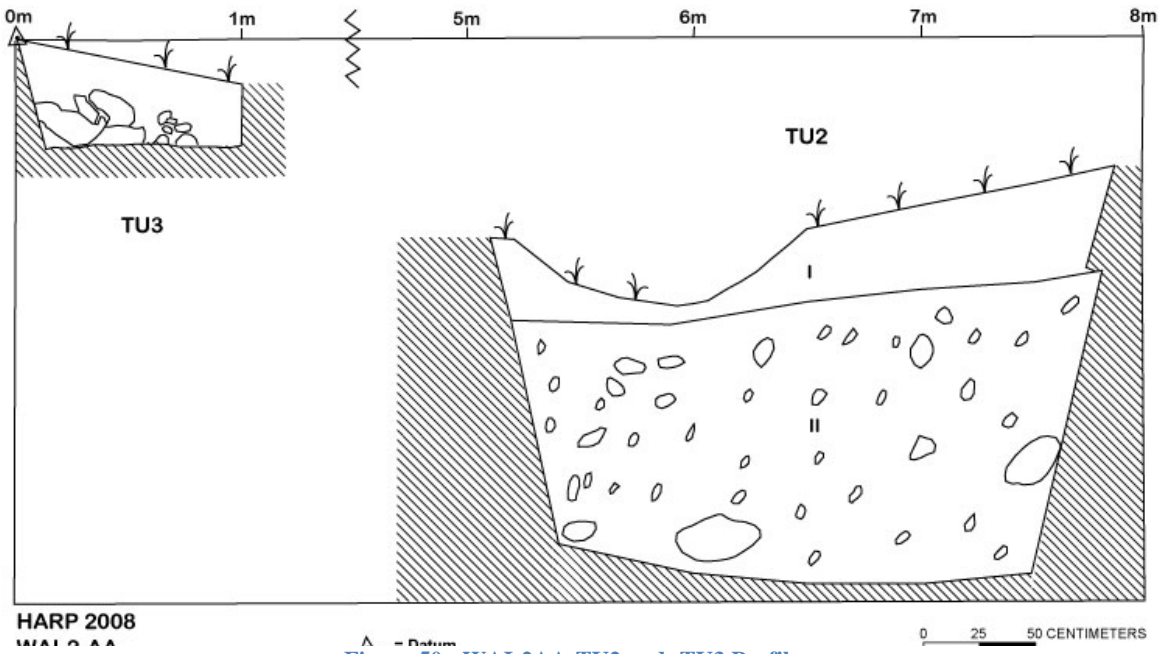


Figure 50 - WAI-2AA-TU2 and -TU3 Profiles.

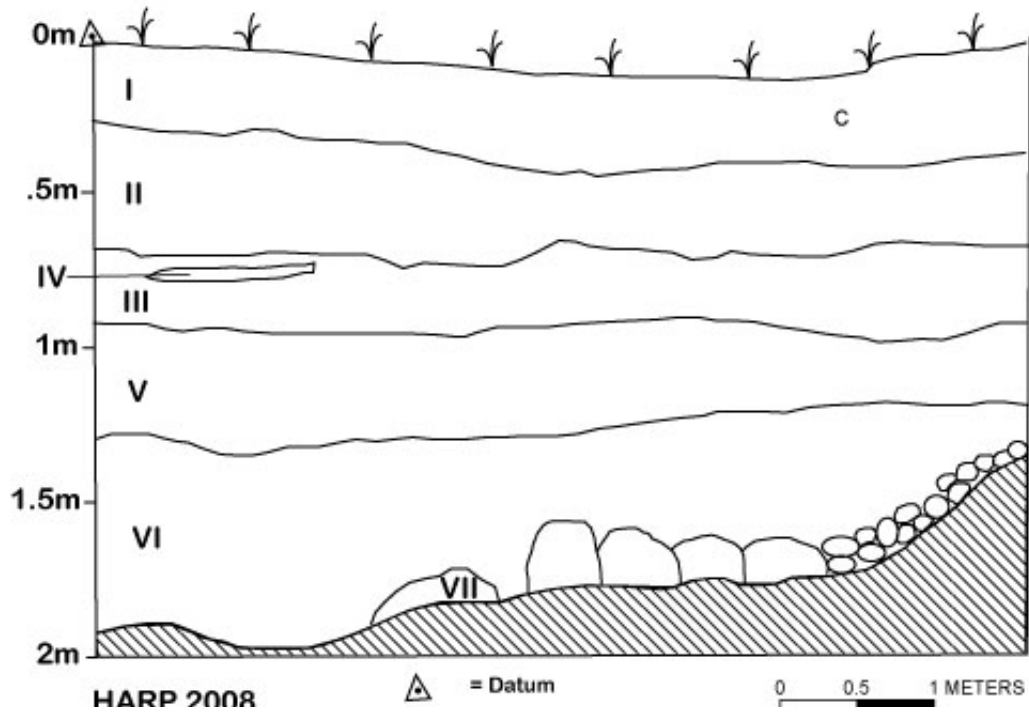


Figure 51 - WAI-2AA-TU4 Profile.

## WAI-2AB-STP #1

Moving on to the barrage terraces on Waikama Gulch's eastern slope, we find another case of excavations revealing multiple courses of buried, intact architectural stone. When WAI-2AB-STP #1 was placed at the base of a barrage terrace it had to be expanded to a 0.90 x 0.90 meter unit as excavators sought to expose a retaining face two meters tall, with at least ten courses. As noted in the records of STP #1, the bottom three courses were vertically set but later construction was angled slightly inwards.

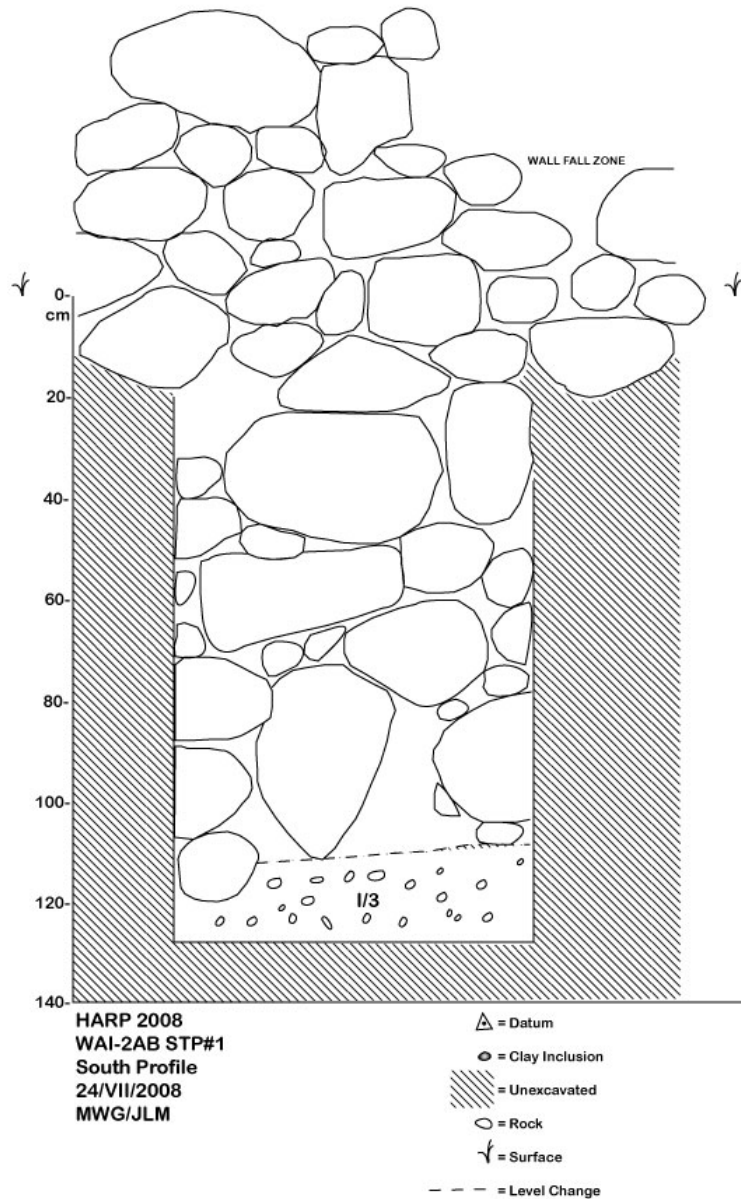


Figure 52 - WAI-2AB-STP #1 Profile.

## WAI-5-TU 1

WAI-5 TU 1 was 2 m x 1 m unit that was located on the *mauka* side of a terrace. It was excavated to try and determine the depositional history of this feature and to determine its use. Unfortunately, we were unable to make any finer grained interpretations as a result of this excavation.

Layer I, Level 1 (0-24 cmbd) was a dark brown (7.5YR 3/3) silty clay loam with clay inclusions. Charcoal was collected. Layer I, Level 2 (24-40 cmbd) was a dark brown (7.5YR 3/3) silty clay loam with clay inclusions. Charcoal was collected. Layer I, Level 3 (40-50 cmbd) was a dark brown (7.5YR 3/3) silty clay loam with clay inclusions. Charcoal was collected.

Layer II, Level 4 (40-60 cmbd) was a dark brown (7.5YR 3/2) clay loam with orange clay inclusions. Charcoal was collected. Layer II, Level 5 (60-92 cmbd) was a dark brown (7.5YR 3/2) clay loam with orange clay inclusions. Charcoal was collected. The excavation ended here due to lack of cultural material.

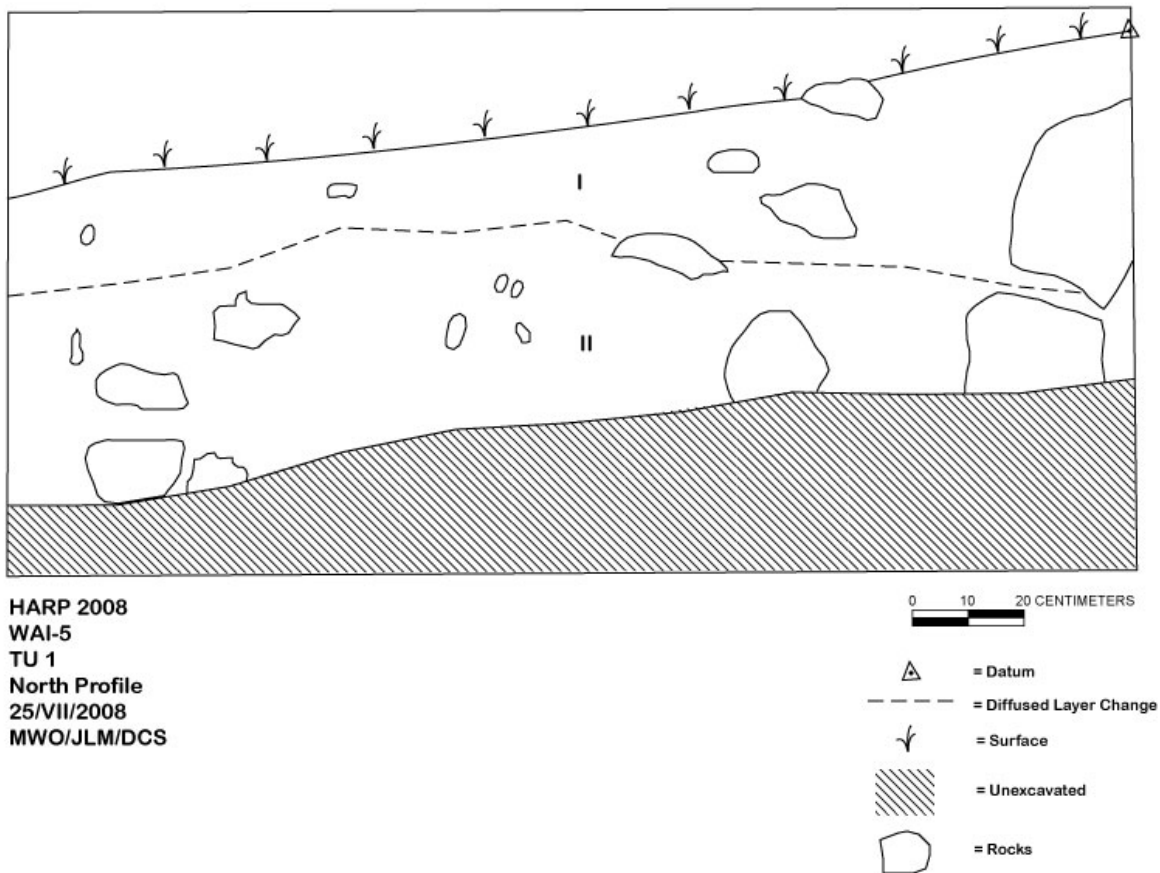


Figure 53 - WAI-5-TU5 Profile.

## Shovel Test Pits

WAI-1 STP #1	STP #1 was located on the interior of the site's eastern <i>mauka-makai</i> retaining wall at the bottom of two basal stones. Charcoal, metal, and a large metal rod were found. 10YR 3/4 dark yellowish brown silty loam (0-40 cmbs).
WAI-1 STP #2	STP #2 was located on the interior of the <i>mauka</i> most retaining wall beneath two basal stones. Layer I (0-30 cmbs) dark yellowish brown sediment (10YR 3/4) with historic glass and charcoal. Layer II (30-50 cmbs) dark yellowish brown silty clay loam (10 YR 3/4) with red inclusions and charcoal.
WAI-2AB STP #1	STP #1 was located at the bottom of the upper most barrage style terrace at the base of an intact retaining wall. Dark yellowish brown silty clay (10YR 3/4) (0-100 cmbs). At this point, STP #1 was expanded into a 90 x 90 centimeter unit. Retaining wall found to be two meters tall, with at least ten courses, four or five of which were buried. Bottom three courses vertically set; later courses angled slightly inwards.
WAI-2AD STP #1	Located at base of retaining wall. Ly I (0-50 cmbs) dark yellowish brown silt loam (10YR 3/3); Ly II (50-110 cmbs) dark yellowish brown silty clay loam (10YR 4/4); flaked basalt collected from nearby retaining wall.
WAI-2D STP #1	Located at base of retaining wall. Ly I (0-20 cmbs) dark yellowish brown silt (10YR 3/4), historic glass, charcoal, ceramic, metal, volcanic glass, a glass bottle, and a soil flotation yielded charcoal. Ly II (20-60 cmbs) dark yellowish brown silty clay loam (10 YR 4/4) with charcoal, ceramics, a pencil tip, historic glass, and charcoal from a soil flotation.
WAI-2G STP #1	Located at base of retaining wall at the west end of the feature. Ly I (0-20 cmbs) dark yellowish brown silt loam (10YR 3/4); charcoal, historic glass, and charcoal from two soil flotations. Ly II (20-40 cmbs), Layer II, dark yellowish brown silty clay loam (10 YR 4/4) contained only charcoal from a soil flotation.
WAI-2J STP #1	Located at base of retaining wall. Ly I (0-30 cmbs) very dark brown loam (10YR 2/2) contained charcoal and historic glass. Ly II (30-50 cmbs) dark yellowish brown clay loam (10 YR 3/4 ) with red/orange inclusions and charcoal. Ceramic artifact found under southern extension underneath wall demonstrating this feature as being constructed in the historic era.
WAI-2R STP #1	Located at base of retaining wall. Ly I (0-35 cmbs) dark brown loam (10YR 3/3) with historic glass, charcoal; Ly II (35-65 cmbs) dark grayish brown silty clay loam (10YR 4/2), charcoal. Ly III (65-80 cmbs) dark brown silty clay loam (10YR 3/3), charcoal.

## Survey Results: Coastal Waiapuka (100 fasl)

*Sites Recorded:* WAI-7

### **Stone Paving Complex (WAI-7)**

WAI-7 is an isolated small rectangular platform on a wide, flat point in Coastal Waiapuka surrounded by high sea cliffs. To the west of the features are cliffs, to the east a small group of *puhala* trees, and there is a grove of iron wood about 30 m to the south. The presence of a boulder paved surface, as well as flaked stone artifacts, leads us to believe WAI-7 is a rare example of a windward Kohala prehistoric habitation site. As we outline below, our test excavations have supported this initial interpretation and further suggest that more similar intact deposits are located in the area.





Figure 54 - Photo of WAI-7.

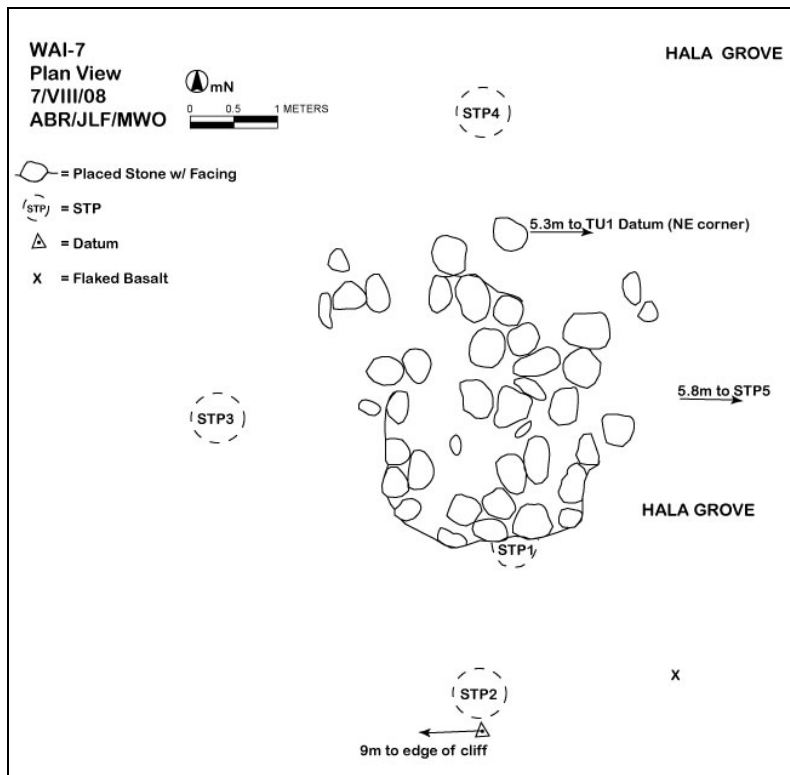


Figure 55 - Map of WAI-7.

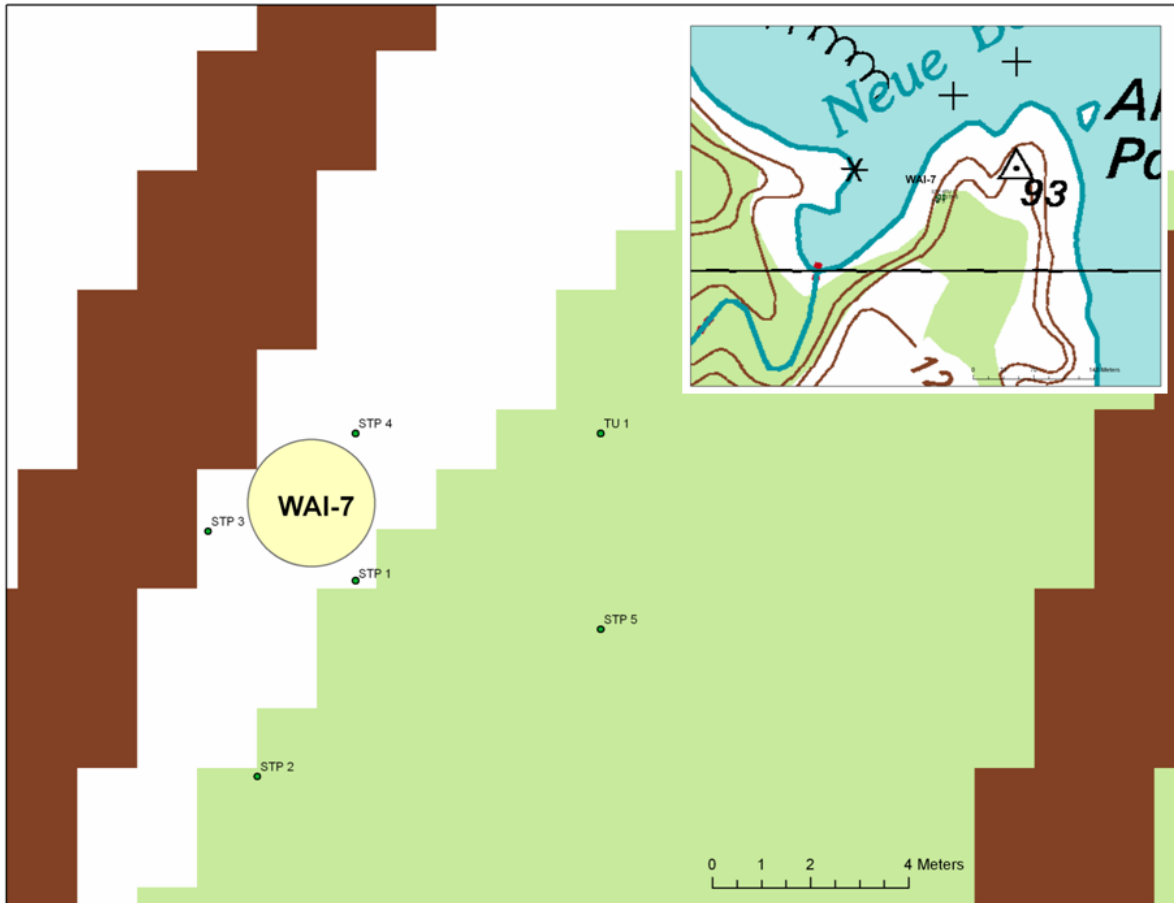


Figure 56 - Overall Map of Excavations at WAI-7.

## Excavation Results: Coastal Waiapuka

*Test Excavated Sites:* WAI-7

To test for intact habitation deposits (i.e., buried floor deposits, midden, etc.) we excavated four STPs around WAI-7's platform as well as a 1 m x 1 m test unit east of the platform where STP excavations had shown high artifact concentrations. An additional STP was excavated next to the platform's basal stones to collect charcoal for dating the site. Overall, the area east of the structure contains 'ili ili paving and midden consistent with house floor deposits.

### *Test Units*

#### **WAI-7-TU 1**

WAI-7-TU 1 was placed within an area east of the site's platform where high concentrations of lithic artifacts had been discovered.

Level 1 Layer I (0-10 cmbd) was dark grayish brown topsoil. Metal was found on the ground surface and within deposits. Below the deposits with metal artifacts, the frequency of water worn pebbles increased and we began to find volcanic glass, basalt flakes, and charcoal.



The level ended at a dense concentration of water worn pebbles, and lithics, which we interpret to be an *'ili ili* paving.



Figure 57 - Pebble Paving Exposed in WAI-7-TU 1 at Close of Level 1.

Level 2 Layer II (10-14 cmbd) appears to be the top of the *'ili ili* paved floor made up of large pebbles and small cobble water worn basalt. A significant amount of flaked basalt was found within this deposit along with charcoal found mostly toward the bottom of the layer. Volcanic glass was also discovered. The floor deposit varies in thickness from 2-5 cm and seems to be thicker and in a better state of preservation along the western edge of the unit. The unit at this level was riddled with roots.

Level 3 Layer III (14-20 cmbd) is a loose fill with some patchy small concentrations of *'ili ili* fill and a large number of artifacts, notably charcoal, smaller basalt flakes, volcanic glass, and one piece of chert. This appears to be an occupation layer immediately below the *'ili ili* paving.

Level 4 Layer III (20-26 cmbd) was a continuation of the occupation layer under the *'ili ili* pavement. It ends at a new layer with charcoal flecking and no stone. The new layer is dark yellowish brown silt loam (10 YR 3/4).

Level 5 Layer IV (26-40 cmbd) was a compact friable dark yellowish brown silty loam (10 YR 3/4) with a few water worn pebbles and small cobbles. Charcoal, large pieces of volcanic

glass, and some flaked or fire-cracked basalt were found. Excavation was arbitrarily stopped at 40 cmbd.

Level 6 Layer IV (40-48 cmbd) was a dark yellowish brown silt loam with some charcoal. As we reached the end of the level deposits shifted to a dark yellowish brown silty clay. This transition was interpreted as sign we had reached the bottom of occupation layers.

Level 7 Layer V (48-58 cmbd) was a compact dark yellowish brown clay with some evidence of root disturbance. We did find one small volcanic glass flake and a few pieces of charcoal, but roots appear to have brought these in from above. We interpret this layer as sterile clay subsoil.

The figures and tables below show how the concentration of flaked stone was used to help identify the location of occupation deposits. To re-cap, the high concentrations of artifacts in STP #5 lead us to excavate TU 1 east of the platform. The test unit in turn allowed us to identify pebble paved floor deposits in Levels 2-4. These deposits likely represent a palimpsest of activities from over the life history of the site. Nonetheless, this data will help guide future work aimed at determining the extent of intact habitation deposits across this coastal landscape.

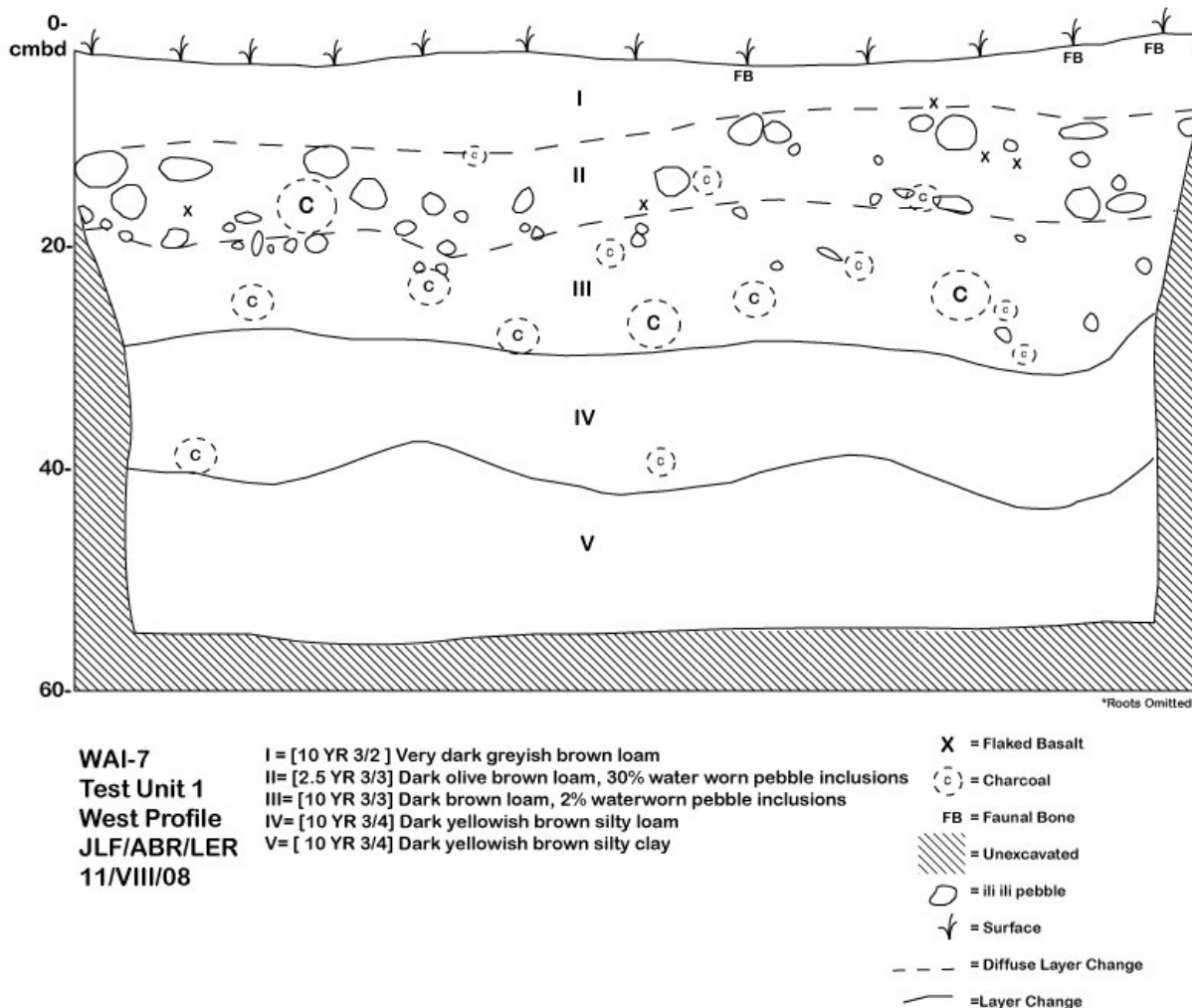


Figure 58 - WAI-7-TU1 Profile.

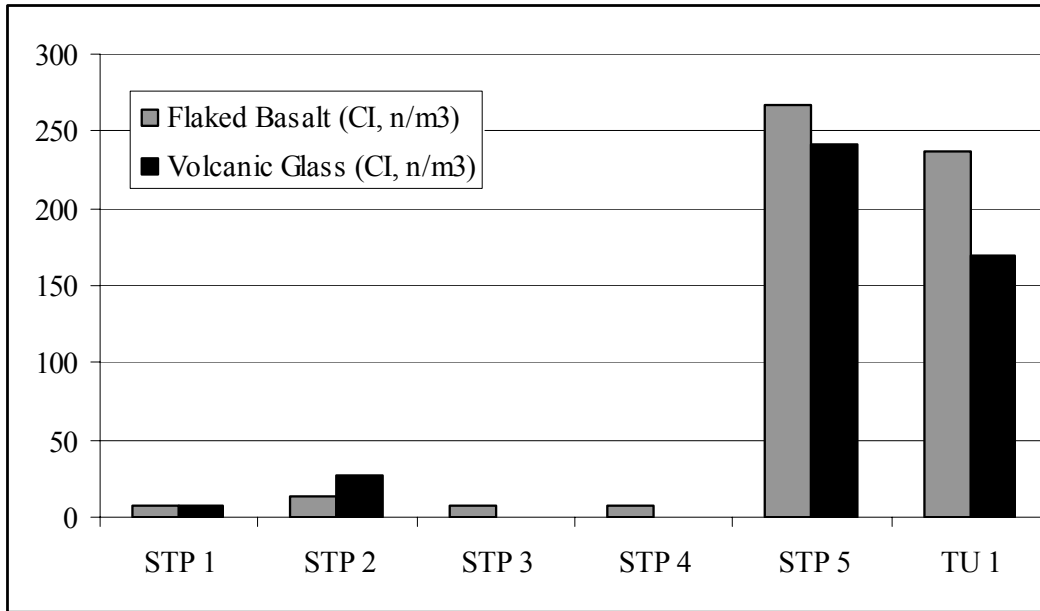


Figure 59 - Concentration of Flaked Stone (n/m<sup>3</sup>) in WAI-7 Excavations.

Table 1 - Artifacts Collected from WAI-7 Test Excavations.

	Flaked Basalt (n=)	Volcanic Glass (n=)	Charcoal	Marine Shell	Fauna	Pebbles	Depth (cm)	Size (m <sup>2</sup> )	Volume (m <sup>3</sup> )
STP 1	1	1	Present	Absent	Absent	Present	50	0.25	0.125
STP 2	1	2	Present	Absent	Absent	Present	30	0.25	0.075
STP 3	1	0	Present	Present	Absent	Present	50	0.25	0.125
STP 4	1	0	Present	Absent	Absent	Present	50	0.25	0.125
STP 5	32	29	Present	Absent	Present	Present	48	0.25	0.12
TU 1	135	97	Present	Absent	Absent	Present	57	1	0.57

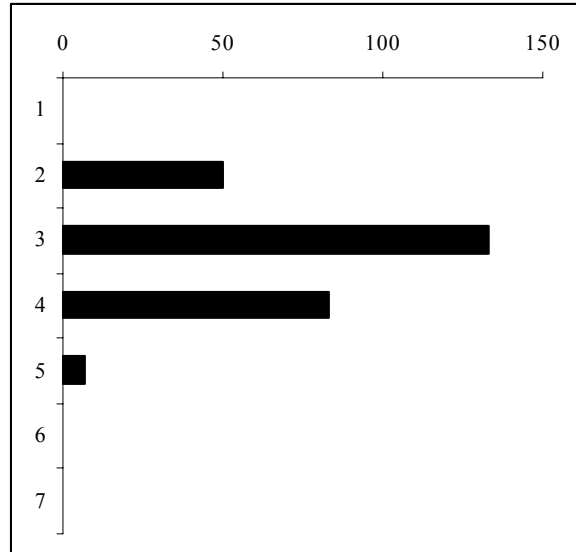


Figure 60 - Concentration of Volcanic Glass Greater than 1 cm in Size (n/m<sup>3</sup>) by Level, WAI-7 TU 1.

Table 2 - Number of Volcanic Glass Artifacts (>1cm) in WAI-7-TU 1 by Level.

TU 1

Ly	Lv	Depth	Volume (m <sup>3</sup> )	Volcanic Glass >1cm (n=)	Volcanic Glass >1cm (CI, n/ m <sup>3</sup> )
I	1	0-10 cmbd	0.1	0	0
II	2	10-14 cmbd	0.04	2	50
III	3	14-20 cmbd	0.06	8	133
	4	20-26 cmbd	0.06	5	83
IV	5	26-40 cmbd	0.14	1	7
	6	40-48 cmbd	0.08	0	0
V	7	48-58 cmbd	0.1	0	0



## *Shovel Test Pits*

WAI-7- STP #1	STP #1 is located at the exterior of the south end of the platform at the base of two basal stones. UTM 05 2238084/214506 Trimble; Main excavation: Lv. 1 Ly. I: 0-30cmbs. 10YR 3/3 dark brown loam: Loose peds dominate top 5 cmbs. 5% pebble; Bags: (1) Charcoal, (2) Flaked basalt; (3) VG; Lv. 2, Ly. II: 30-50cmbs. 10 3/4 dark yellowish brown clay silt loam. 2% ili ili pebble, Bags: (1) Charcoal; North Extension: two samples taken from level/layer 1/I (beneath basal stone) and 2/II (1 for float, 1 for layer)
WAI-7- STP #2	STP #2 is located 2m south of the south end of the platform/ STP 1. UTM 05 2238080/214504 Trimble ; Main excavation: Lv. 1 Ly. I: 0-30cmbs. 10YR 3/3 dark brown loam: Loose peds dominate top 5 cmbs. 2% ili ili pebble, Bags: (1) Charcoal, (2) VG, (3) Flaked Basalt. STP ended at 30cmbs due to large iron wood root.
WAI-7- STP #3	STP #3 is located 2m W of the W base of the platform. UTM 05 2238085/214503 Trimble Main excavation: Lv. 1 Ly. I: 0-32cmbs. 10YR 3/3 dark brown loam: Loose peds dominate top 5 cmbs. 5% pebble, Bags: (1) Charcoal, (2) Flaked basalt, (3) Marine shell, (4) Point plot charcoal; Lv. 2, Ly. II: 32-50cmbs. 10 3/4 dark yellowish brown clay silt loam. 2% ili ili pebble, Bags: (1) Charcoal; Two samples taken from level/layer 1/I and 2/II (1 for float, 1 for layer)
WAI-7- STP #4	STP #4 is located 2m N of the N end of the base of the platform. UTM 05 2238087/214506 Trimble; Main excavation: Lv. 1 Ly. I: 0-30cmbs. 10YR 3/3 dark brown loam: Loose peds dominate top 5 cmbs. 2% ili ili pebble, Bags: (1) Charcoal, (2) Flaked basalt; Lv. 2, Ly. II: 30-50cmbs. 10 3/4 dark yellowish brown clay silt loam. 2% ili ili pebble, Bags: (1) Charcoal Two samples taken from level/layer 1/I and 2/II (1 for float, 1 for layer).
WAI-7- STP #5	STP #5 is located 4m E of the E end of the platform (due to hala tree grove). UTM 05 2238083/214511 Trimble; Main excavation: Lv. 1 Ly. I: 0-48cmbs. 10YR 3/3 dark brown loam: Loose peds dominate top 5 cmbs. 10% ili ili pebble, Bags: (1) Faunal bone, (2) VG, (3) Charcoal, (4) Basalt flakes; Two samples taken from level/layer 1/I (1 for float, 1 for layer)

## Chapter 4. Summary

The features encountered on survey and in excavation this season have broadened our view of the nature of traditional Hawaiian irrigated agriculture as well as given us a new appreciation for the long-term history of North Kohala.

In the Halawa Study Area, we have uncovered deeply buried agricultural deposits that likely represent some of the earliest direct evidence of farming on the island. We are exceedingly fortunate to have come across such well-intact terrace walls and deposits. Our initial reading of HLW-29L and -29M stratigraphy is that it reflects three periods of gardening: (1) Earlier Prehistoric, (2) Later Prehistoric, and the (3) Historic Era. This assessment is based on the limited information we have at this stage and will certainly be revised as we bring together data from radiocarbon dating and soil studies.

In the Waiapuka Study Area, we again find the two types of complexes found last season – wetland *loi* built on curved sections of gulch streams and barrage terraces constructed directly in the drainage – but we can add to this a new type of complex: irrigated tableland fields. These rare features can be seen on turn-of-the-century maps of the region but it is indeed remarkable that we should find material evidence of how and where they operated. To begin to identify likely locations used for this type of agriculture we have begun to model the landform in windward Kohala. For example, this digital representation of a gully based on GPS survey data can be used to identify two relatively flat areas on the tablelands immediately adjacent to WAI-4W that would be ideal for irrigated farming.

Finally, it is hard to understate the importance of the confirmation of intact habitation deposits in Coastal Waiapuka. To our knowledge this is the only documented case of a prehistoric house site in windward Kohala that escaped complete destruction during the sugar cane era. Further, WAI-7 represents an opportunity to link changes in people's farming economies with changes in their daily lives.

## Generalized Depositional History of HLW-29L and 29M



### Historic Era Gardening

- \* Dark brown deposits usually found in top 50 cm below surface (Ly I) and ends at transition to red deposits (Ly II)
- \* Contains artifacts made of historic era material (metal, glass, ceramics)
- \* Includes: All shallow excavations: -29L TU 1, 3, 4, 5 and -29M TU 1; and top layers in deeper excavations: -29L TU 2 Ly I and II; TU 6 Ly I and II; -29M TU 2 Ly I; and Construction Stage 3c.



### Later Prehistoric Era Gardening

- \* Alternating dark brown/gray and red deposits
- \* Contains flakes stone artifacts, charcoal, and no artifacts made of historic era material
- \* Varied thickness; 115 cm in -29L (ca. 50-165 cmbd) as compared to 30 in -29M (ca. 50-80 cmbd)
- \* Includes: Middle layers in deeper excavations: -29L TU 6 III to V and -29L TU 2 Ly III to V?; -29M TU 2 Ly II; and Construction Stages 3b, 3a, and 2b



### Earlier Prehistoric Era Gardening

- \* Distinct change to more uniformly gray deposits (-29M at 80 cmbd; -29L at 165 cmbd)
- \* At lowest depths transition from clay to more sandy deposits probably representing early clearing or natural pre-agricultural layers
- \* Contains little charcoal, few artifacts, and few examples of intact gray-red transitions
- \* Includes: Deep deposits: -29L TU 6 VI to VIII and -29M TU 2 Ly III; and Construction Stages 2a and 1

Figure 61 - Three Phase Depositional History of HLW-29L and -29M.

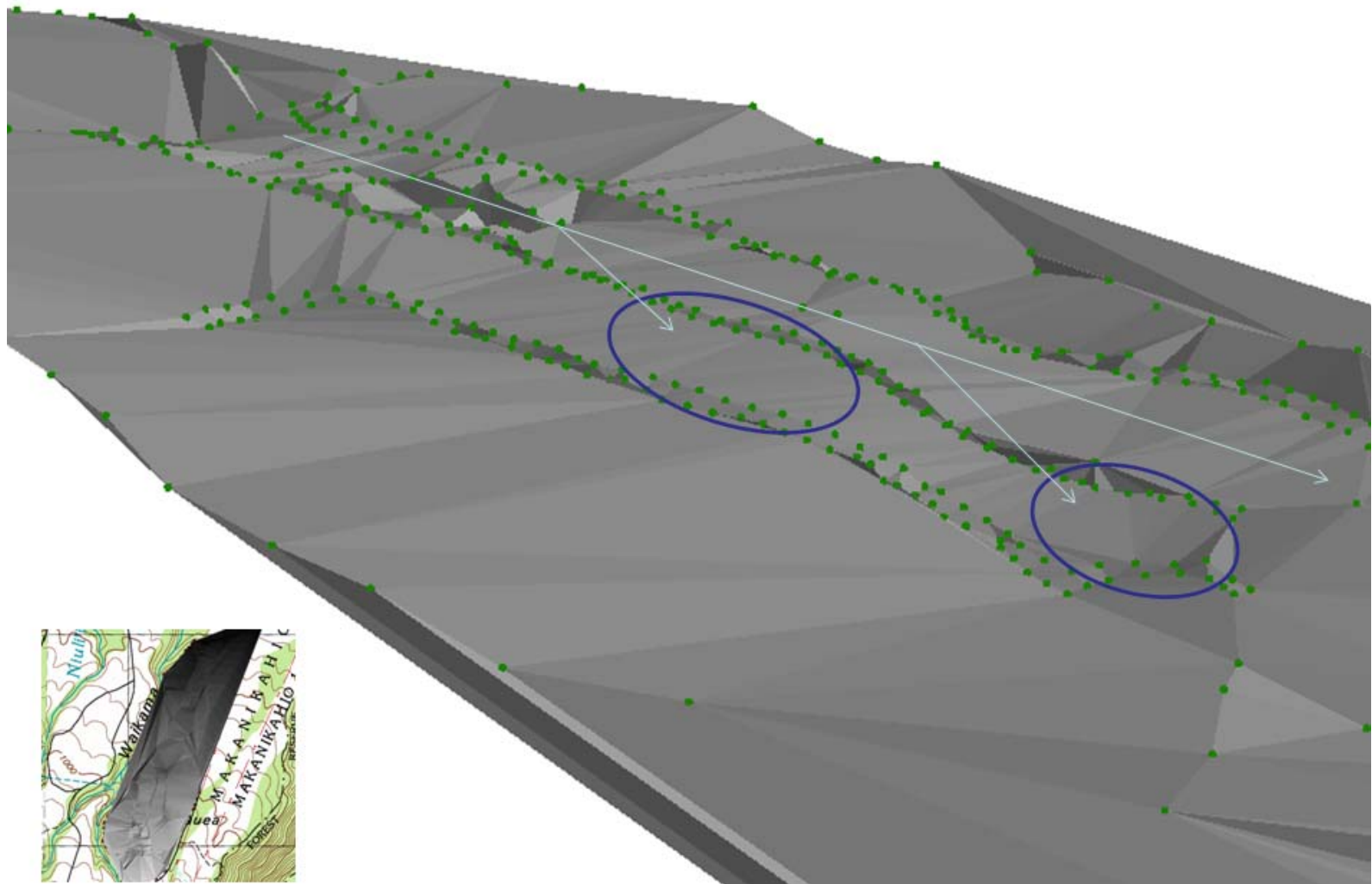


Figure 62- 3D Model of Waiapuka Landform Showing Possible Route of Irrigation to Tableland.

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## Appendix I. Survey Summary

<b>Field ID</b>	<b>Description</b>	<b>No of features</b>	<b>Acres</b>	<b>Hectares</b>
HLW-29	Complex	2	-	-
WAI-1	Complex	7	2.262	0.915
WAI-2	Complex	37	1.748	0.707
WAI-3	Complex	-	-	-
WAI-4	Complex	65	1.437	0.581
WAI-5	Single feature	1	-	-
WAI-6	Complex	2	0.089	0.036
WAI-7	Single feature	1	-	-
		115	5.54	2.24

## Appendix II. Excavation Summary

Complex	Feature	TU	Size
HLW-29	L	1A	0.5 x 0.5 m
	L	1B	1 x 1 m
	L	2	1 x 1 m
	L	3	1 x 1 m
	L	4	1 x 1 m
	L	5	1 x 1 m
	L	6	1 x 5 m
HLW-29	M	1	0.5 x 0.5 m
	M	2	1 x 1 m
WAI-2	AA	1	1 x 0.5 m
	AA	2	3 x 1 m
	AA	3	1 x 0.75 m
	AA	4	3 x 1 m
	AB	1	0.9 x 0.9 m
WAI-4W	H/I	1	8 x 0.75 m
	BM	1	4 x 1 m
	AM	1	2.5 x 0.75 m
	AB	1	1 x 1 m
	N	1	1 x 1 m
WAI-5	-	1	2 x 1 m
WAI-7	-	1	1 x 1 m

## Appendix III. Artifact Inventory

Site	Feature	Unit	Lv	Ly	Bag	Material
HLW-29	C	STP 1	1	1	1	Charcoal
HLW-29	C	STP 1	2	2	1	Charcoal
HLW-29	E	STP 1	south extension		1	Charcoal from under basal stone
HLW-29	B	STP 1	1	1	1	Charcoal
HLW-29	B	STP 1	1	1	2	Volcanic Glass
HLW-29	B	STP 1	1	1	3	Ceramic?
HLW-29	B	STP 1	2	2	1	Charcoal
HLW-29	D	STP 1	1	1	1	Charcoal
HLW-29	D	STP 1	1	1	2	Possible Flake
HLW-29	D	STP 1	1	1	3	Ceramic
HLW-29	D	STP 1	1	1	4	Historic Glass
HLW-29	D	STP 1	1	1	5	Volcanic Glass
HLW-29	E	STP 1	1	1	1	Charcoal
HLW-29	D	STP 2	1	1	1	Historic Glass
HLW-29	E	STP 1	1	1	2	Metal
HLW-29	E	STP 2	1	1	1	Historic Glass
HLW-29	E	STP 2	1	1	2	Ceramic
HLW-29	E	STP 2	2	2	1	Charcoal
HLW-29	E	STP 2	1	1	3	Charcoal
HLW-29	E	STP 2	1	1	5	Land Snail
HLW-29	E	STP 2	1	1	4	Volcanic Glass
HLW-31	C	TU #1	1	I	1	Glass
HLW-31	C	TU #1	1	I	2	Charcoal
HLW-31	C	TU #1	1	I	3	Porcelain
HLW-31	C	TU #1	1	I	4	mac. nut
HLW-31	C	TU #1	1	I	5	Terrestrial Shell
HLW-31	C	TU #1	1	I	6	Kukui nut
HLW-31	C	TU #1	1	I	7	Metal
HLW-31	C	TU #1	2	II	1	Historic Glass
HLW-31	C	TU #1	2	II	2	Charcoal
HLW-31	C	TU #1	2	II	3	Volcanic Glass
HLW-31	C	TU #1	2	II	4	Basalt Flake
HLW-31	C	TU #1	2	II	5	Kukui Nut
HLW-31	C	TU #1	2	II	6	Terrestrial Shell
HLW-31	D	TU #1	1	I	1	Ceramic
HLW-31	D	TU #1	1	I	2	Terrestrial Shell
HLW-31	D	TU #1	1	I	3	Glass
HLW-31	D	TU #1	1	I	4	Charcoal
HLW-31	D	TU #1	1	I	5	Metal
HLW-31	D	TU #1	1	I	6	Volcanic glass
HLW-31	D	TU #1	1	I	7	Rubber
HLW-31	D	TU #1	1	I	8	Basalt Flake
HLW-31	D	TU #1	1	II	1	Glass Shards
HLW-31	D	TU #1	1	II	2	Basalt flake
HLW-31	D	TU #1	1	II	3	Charcoal

HLW-31	D	TU #1	1	II	4	Metal
HLW-31	D	TU #1	1	II	5	Volcanic Glass
HLW-31	D	TU #1	1	II	6	Brick
HLW-31	D	TU #1	1	II	7	Ceramic
HLW-29	I	STP #1	1	I	1	Charcoal
HLW-29	I	STP South Extension			1	Charcoal (under Basal Stone)
HLW-29	J	STP #2	1	I	1	Charcoal
HLW-29	J	STP #2	1	I	2	Glass
HLW-29	J	STP #2	1	I	3	Ceramic
HLW-29	J	STP #2 E. wall			1	Charcoal
HLW-29	J	STP #2 N. wall			1	Charcoal (20cmbs)
HLW-29	J	STP #1	1	I	1	Charcoal
HLW-29	J	STP #1	1	I	2	Metal
HLW-29	J	STP #1	1	I	3	Volcanic Glass
HLW-29	J	STP #1	1	I	4	Historic
HLW-29	M	TU #1	1	I	1	Terrestrial Shell
HLW-29	M	TU #1	1	I	2	Historic Glass
HLW-29	M	TU #1	1	I	3	Possible Flake
HLW-29	M	TU #1	1	I	4	Charcoal
HLW-29	M	TU #1	2	II	1	Historic Glass
HLW-29	I	STP #2	1	I	1	Charcoal
HLW-29	I	STP #2	1	I	2	Ceramic
HLW-29	I	STP #2	1	I	3	Glass
HLW-29	I	STP #2	2	II	1	Charcoal
HLW-29	I	STP #2	2	II	2	Charcoal (46cbs)
HLW-29	L	STP #2	1	I	1	Charcoal
HLW-29	L	STP #1	1	I	1	Charcoal
HLW-29	L	STP #1	1	I	2	Volcanic Glass
HLW-29	M	TU #1	3	II	1	Volcanic Glass
HLW-29	M	TU #1	3	II	2	Charcoal
HLW-29	M	TU #1	3	II	3	Waterworn Cobble (possible hammerstone)
HLW-29	L	TU #2	1	I	1	Charcoal
HLW-29	L	TU #2	1	I	2	Charcoal (x-42, y-54, z-20.5)
HLW-29	L	TU #2	1	I	3	Historic Material
HLW-29	L	TU #2	1	I	4	Historic Glass
HLW-29	L	TU #2	1	I	5	Volcanic Glass (x-91cm, y-44cm, z-26cmbd)
HLW-29	L	TU #2	1	I	6	Mortar (x-54cm, y-31cm, z-25cmbd)
HLW-29	L	TU #2	1	I	7	Branch Coral (x-91, y-44, z-26cmbd)
HLW-29	L	TU #2	1	I	8	Coral
HLW-29	L	TU #2	1	I	9	Volcanic Glass
HLW-29	L	TU #2	1	I	10	Ceramic
HLW-29	L	TU #2	1	I	11	Basalt flake
HLW-29	L	TU #1A	1	I	1	Glass
HLW-29	L	TU #1A	1	I	2	Charcoal



HLW-29	L	TU #1A 2	I	1	Glass
HLW-29	L	TU #1A 2	I	2	Charcoal
HLW-29	L	TU #1B 1	I	1	Charcoal
HLW-29	L	TU #1B 1	I	2	Glass
HLW-29	L	TU #1B 1	I	3	Basalt Flake
HLW-29	L	TU #1B 1	I	4	Metal
HLW-29	L	TU #1B 1	I	5	Coal
HLW-29	L	TU #1B 1	I	6	Ceramic
HLW-29	L	TU #1B 3	II	1	Charcoal
HLW-29	L	TU #1 (fea.1)	4	1	Charcoal
HLW-29	L	TU #1B (fea.1)	4	2	Charcoal
HLW-29	L	TU #2 2	I	1	coral
HLW-29	L	TU #2 2	I	2	Volcanic Glass
HLW-29	L	TU #2 2	I	3	Historic Glass
HLW-29	L	TU #2 2	I	4	Marine Shell
HLW-29	L	TU #2 2	I	5	Basalt Flake
HLW-29	L	TU #2 2	I	6	Coal
HLW-29	L	TU #2 2	I	7	Metal
HLW-29	L	TU #2 2	I	8	Charcoal
HLW-29	L	TU #2 2	I	9	Hammer Stone
HLW-29	L	TU #2 3	II	1	Charcoal
HLW-29	L	TU #2 3	II	2	Glass
HLW-29	L	TU #2 3	II	3	Metal
HLW-29	L	TU #2 3	II	4	coal
HLW-29	L	TU #2 3	II	5	Coral
HLW-29	L	TU #2 4	II	1	Charcoal
HLW-29	L	TU #2 5	III	1	Charcoal
HLW-29	L	TU #2 6	III	1	Volcanic Glass
HLW-29	L	TU #2 6	III	2	Charcoal
HLW-29	L	TU #2 6	III	3	Flaked Basalt
HLW-29	L	TU #2 7	IV	1	Charcoal
HLW-29	M	TU#2 1	I	1	Flaked Basalt
HLW-29	M	TU#2 1	I	2	Charcoal
HLW-29	M	TU#2 1	I	3	Coral
HLW-29	M	TU#2 1	I	4	Historic Glass
HLW-29	M	TU#2 1	I	5	Brick
HLW-29	M	TU#2 2	II	1	Charcoal
HLW-29	M	TU#2 2	II	2	Charcoal (X=39 Y=51 Z=36)
HLW-29	M	TU#2 3	II	1	Charcoal
HLW-29	M	TU#2 4	II	1	Charcoal
HLW-29	M	TU#2 5	II	1	Charcoal

HLW-29	M	TU#2	8	II	1	Charcoal
HLW-29	M	TU#2	9	III	1	Charcoal
HLW-29	M	TU#2	10	III	1	Charcoal
HLW-29	M	TU#2	10	III	2	Volcanic Glass
HLW-29	M	TU#2	11	III	1	Charcoal
HLW-29	M	TU#2	11	III	2	Flaked Basalt
HLW-29	M	TU#2	12	III	1	Charcoal
HLW-29	L	TU#3	1	I	1	Glass
HLW-29	L	TU#3	1	I	2	Basalt Flake
HLW-29	L	TU#3	1	I	3	Volcanic Glass
HLW-29	L	TU#3	1	I	4	Ceramics
HLW-29	L	TU#3	1	I	5	Charcoal
HLW-29	L	TU#3	1	I	6	Coal
HLW-29	Off Site	STP#1	1	I	1	Charcoal
HLW-29	Off Site	STP#1	1	I	2	Volcanic Glass
HLW-29	Off Site	STP#1	2	II	1	Charcoal
HLW-29	Off Site	STP#2	1	I	1	Ceramic
HLW-29	Off Site	STP#2	1	I	2	Glass
HLW-29	Off Site	STP#2	1	I	3	Charcoal
HLW-29	Off Site	STP#2	1	I	4	Shell
HLW-29	Off Site	STP#2	1	I	5	Glass Bead
HLW-29	Off Site	STP#2	1	I	6	Kukui Nut
HLW-29	Off Site	STP#2	1	I	7	Basalt flake
HLW-29	Off Site	STP#2	1	I	8	Coral
HLW-29	Off Site	STP#2	2	II	1	Coral
HLW-29	Off Site	STP#2	2	II	2	Shell
HLW-29	Off Site	STP#2	2	II	3	Basalt Flake
HLW-29	Off Site	STP#2	2	II	4	Charcoal
HLW-29	Off Site	STP#2	2	II	5	Volcanic Glass
HLW-29	Off Site	STP#2	3	III	1	Charcoal
HLW-29	Off Site	STP#2	3	III	2	Volcanic Glass
HLW-29	Off Site	STP#3	1	I	1	Kukui Nut
HLW-29	Off Site	STP#3	1	I	2	Ceramic
HLW-29	Off Site	STP#3	1	I	3	Basalt Flake
HLW-29	Off Site	STP#3	1	I	4	Historic Glass
HLW-29	L	TU#3	2	I	1	Metal
HLW-29	L	TU#3	2	I	2	Charcoal
HLW-29	L	TU#3	2	I	3	Volcanic Glass
HLW-29	L	TU#4	1	I	1	Charcoal
HLW-29	L	TU#4	1	I	2	Volcanic Glass
HLW-29	L	TU#4	1	I	3	Land Snail Shell
HLW-29	L	TU#4	1	I	4	Coal

HLW-29	L	TU#5	1	I	1	Basalt Flake
HLW-29	L	TU#5	1	I	2	Land Snail Shell
HLW-29	L	TU#5	1	I	3	Charcoal
HLW-29	L	TU#5	1	I	4	Coal
HLW-29	M	TU#2	13	III	1	Charcoal
HLW-29	M	TU#2	6	II	1	Charcoal
HLW-29	M	TU#2	7	III	1	Charcoal
WAI-4W	N	TU#1	1	I	1	Historic Metal
WAI-4W	N	TU#1	2	I	1	Historic Metal
WAI-4W	N	TU#1	3	I	1	Volcanic Glass
WAI-4W	N	TU#1	4	II	1	Volcanic Glass
WAI-4W	N	TU#1	4	II	2	Charcoal
WAI-4W	N	TU#1	4	II	3	Historic Metal
WAI-4W	N	TU#1	4	II	4	Water Worn Pebble
WAI-4W	N	TU#1	4	II	5	Basalt Flake
WAI-5		TU#1	1	I	1	Charcoal
WAI-5		TU#1	2	I	1	Charcoal
WAI-5		TU#1	2	I	2	Charcoal X=29 Y=28 Z=41
WAI-5		TU#1	2	I	3	Charcoal X=13 Y=22 Z=40
WAI-5		TU#1	3	I	1	Charcoal
WAI-5		TU#1	4	II	1	Charcoal
WAI-5		TU#1	4	II	2	Charcoal X=106 Y=35 Z=63
WAI-5		TU#1	5	II	1	Charcoal
WAI-5		TU#1	5	II	2	Charcoal X=134 Y=90 Z=90
WAI-2	AB	STP#1	1	I	1	Volcanic Glass
WAI-2	AB	STP#1	1	I	2	Charcoal
WAI-2	AB	STP#1	2	I	1	Charcoal
WAI-2	AB	STP#1	2	I	2	Volcanic Glass
WAI-2	AB	STP#1	3	I	1	Charcoal
WAI-1		STP#2	1	I	1	Historic Glass (Top 10 cm)
WAI-1		STP#2	2			Charcoal
WAI-1		STP#2	2	II	1	Charcoal
WAI-1		STP#1	1	I	1	Large Metal Rod
WAI-1		STP#1	1	I	2	Charcoal
WAI-1		STP#1	1	I	3	Metal
WAI-4W	N	Surface collect			1	Basalt Flake

WAI-4W	N	Surface collect			2	Historic Metal
WAI-4W	N	TU#1	5	II	1	Charcoal
WAI-4W	N	TU#1	5	II	2	Volcanic Glass
WAI-4W	N	TU#1	5	II	3	Poss. Basalt Flake
WAI-4W	N	TU#1	6	II	1	Charcoal
WAI-4W	N	TU#1	7	III	1	Charcoal
WAI-4W	AB	TU#1	1	I	1	Charcoal
WAI-4W	AB	TU#1	1	I	2	Volcanic Glass
WAI-4W	AB	TU#1	2	I	1	Basalt Flake
WAI-4W	AB	TU#1	2	I	2	Volcanic Glass
WAI-4W	AB	TU#1	3	II	1	Metal
WAI-4W	AB	TU#1	3	II	2	Volcanic Glass
WAI-4W	AB	TU#1	3	II	3	Charcoal
WAI-4W	AB	TU#1	3	II	4	Historic Glass
WAI-4W	AB	TU#1	4	II	1	Charcoal
WAI-4W	AB	TU#1	4	II	2	Volcanic Glass
WAI-4W	AB	TU#1	Profile Walls		1	Charcoal
WAI-4W	AB	TU#1	5	III	1	Charcoal
WAI-4W	AB	TU#1	6	III	1	Charcoal
WAI-4W	AB	TU#1	7	III	1	Charcoal
WAI-4W	AB	TU#1	8	III	1	Charcoal
WAI-2 X	Surface				1	Volcanic Glass
WAI-2	G	STP#1	1	I	1	Charcoal
WAI-2	G	STP#1	1	I	2	Historic Glass
WAI-2	AB	Surface			1	Worked Basalt
WAI-2	D	STP#1	1	I	1	Historic Glass (top 5cm)
WAI-2	D	STP#1	1	I	2	Charcoal (top 10cm)
WAI-2	D	STP#1	1	I	3	Ceramics
WAI-2	D	STP#1	1	I	4	Metal
WAI-2	D	STP#1	1	I	5	Volcanic Glass
WAI-2	D	STP#1	1	I	6	Glass Bottle
WAI-2	D	STP#1	2	II	1	Charcoal
WAI-2	D	STP#1			2	Ceramics
WAI-2	D	STP#1			3	Pencil
WAI-2	D	STP#1			4	Historic Glass
WAI-2	D	STP#1	3	III	1	Charcoal
WAI-2	AD	Surface			1	Chopper

WAI-2	AD	STP#1	1	I	1	Charcoal
WAI-2	AA	TU#1	2	I	1	Charcoal
WAI-2	AA	TU#1	2	I	2	Volcanic Glass
WAI-4W	C	STP#1	1	I	1	Metal
WAI-4W	C	STP#2	1	I	1	Charcoal
WAI-4W	AS	STP#1	1	I	1	Metal
WAI-4W	AS	STP#1	1	I	2	Land Snail Shell
WAI-4W	AM	STP#1	1	I	1	Historic material
WAI-4W	AM	STP#1	1	I	2	Charcoal
WAI-4W	AM	STP#2	1	I	1	Charcoal
WAI-4W	AM	STP#2	2	II	1	Charcoal
WAI-2	J	STP#1	1	I	1	Charcoal
WAI-2	J	STP#1	1	I	2	Historic Glass
WAI-2	J	STP#1	2	II	1	Charcoal
WAI-2	J	STP#1			1	Charcoal
WAI-2	J	STP#1			2	Ceramic?
WAI-4W	H/I	TU#1		I	1	Charcoal 160cm West of Datum 1, 25cmBS
WAI-2	AA	TU#3	1	I	1	Volcanic Glass
WAI-2	R	STP#1	1	I	1	Charcoal
WAI-2	R	STP#1	1	I	2	Historic Glass
WAI-2	R	STP#1	2	II	1	Charcoal
WAI-2	R	STP#1	3	III	1	Charcoal
WAI-1		STP#2	1	I		flotation Charcoal
WAI-1		STP#2	2	II		flotation Charcoal
WAI-4W	AS	TU#1	1	I		flotation Charcoal From Below Wall
WAI-4W	AS	TU#1	1	I		flotation Charcoal East profile Soil Sample
WAI-4W	AB	TU#1		I		flotation Charcoal North Profile
WAI-4W	AB	TU#1		II		flotation Charcoal North Profile
WAI-4W	AM	TU#1		IV		flotation Charcoal South Profile
WAI-4W	N	TU#1		I		flotation Charcoal
WAI-4W	N	TU#1		II		flotation Charcoal
HLW-29	L	TU 6	nd	nd	nd	Basalt flake, east face 138 cmbd

HLW-29	L	TU 6	2	nd	2	Basalt flake, 100 cmbd
HLW-29	L	TU 6	1	I	1	Coral, 25 cmbd
HLW-29	L	TU 6	3	nd	1	Basalt flake, 151 cmbd
HLW-29	L	TU 6	2	I	1	Charcoal collected in lense C 93-96 cmbd SE corner
HLW-29	L	TU 6	3		2	Volcanic glass collected at 175 cmbd
WAI-2	AA	TU 1	3	II	1	Charcoal
WAI-2	AA	TU 4	nd	I	nd	Historic Glass
WAI-7		STP#1	1	I	1	Charcoal
WAI-7		STP#1	1	I	2	Flaked basalt
WAI-7		STP#1	1	I	3	Volcanic glass
WAI-7		STP#1	2	II	1	Charcoal
WAI-7		STP#2	1	I	2	Volcanic Glass
WAI-7		STP#2	1	I	3	Flaked Basalt
WAI-7		STP#2	1	I	1	Charcoal
WAI-7		STP#3	1	I	4	Charcoal from profile 27cmBS
WAI-7		STP#3	1	I	3	Marine shell
WAI-7		STP#3	1	I	2	Flaked Basalt
WAI-7		STP#3	1	I	1	Charcoal
WAI-7		STP#3	2	I	1	Charcoal
WAI-7		STP#4	1	I	2	Basalt Flake
WAI-7		STP#4	1	I	1	Charcoal
WAI-7		STP#4	1	I	3	P.P. Charcoal North Profile 14cmBS
WAI-7		STP#4	2	II	1	Charcoal
WAI-7		STP#5	1	I	2	Volcanic Glass
WAI-7		STP#5	1	I	3	Charcoal
WAI-7		STP#5	1	I	1	Faunal bone
WAI-7		STP#5	1	I	4	Basalt flakes
WAI-7		TU#1	West Profile			Charcoal 83cm N 27cmBD
WAI-7		TU#1	West Profile			Charcoal 25cm N 14cmBD
WAI-7		TU#1	West Profile			Charcoal 75cm N 18cmBD
WAI-7		TU#1	West Profile			Charcoal 52cm N 42.5cmBD
WAI-7		TU#1	1	I	5	Charcoal
WAI-7		TU#1	1	I	1	Historic metal
WAI-7		TU#1	1	I	4	Volganic Glass
WAI-7		TU#1	1	I	3	Basalt flakes
WAI-7		TU#1	1	I	2	Charcoal
WAI-7		TU#1	2	II	4	Charcoal
WAI-7		TU#1	2	II	6	Kukui nut
WAI-7		TU#1	2	II	3	P.P. Charcoal x=50 Y=70 Z=13
WAI-7		TU#1	2	II	1	Lithics; Basalt
WAI-7		TU#1	2	II	2	Volcanic glass
WAI-7		TU#1	2	II	5	
WAI-7		TU#1	2/3	II/III	5	P.P. Charcoal X=60 Y=38 Z=14



WAI-7		TU#1	3	III	1	P.P. Charcoal X=33 Y=70 Z=14
WAI-7		TU#1	3	III	5	Charcoal
WAI-7		TU#1	3	III	2	Volcanic Glass
WAI-7		TU#1	3	III	3	Basalt flakes
WAI-7		TU#1	3	III	6	Kukui Nut
WAI-7		TU#1	3	III	4	Chirt
WAI-7		TU#1	4	III	1	Charcoal
WAI-7		TU#1	4	III	3	flaked basalt
WAI-7		TU#1	4	III	4	Kukui Nut
WAI-7		TU#1	4	III	2	Volcanic Glass
WAI-7		TU#1	5	IV	3	Volcanic Glass
WAI-7		TU#1	5	IV	1	Charcoal
WAI-7		TU#1	5	IV	2	Basalt flake
WAI-7		TU#1	7	V	1	Volcanic glass
WAI-7		TU#1	7	VI	1	Charcoal
WAI-7		TU#1	6	IV	2	Basalt flake
WAI-7		TU#1	6	IV	1	Charcoal
HLW-29	O	TU#1	1	I	3	Ceramic
HLW-29	O	TU#1	1	I	1	Historic Glass
HLW-29	O	TU#1	1	I	2	Coal
HLW-29	O	TU#1	1	I	5	Volcanic Glass
HLW-29	O	TU#1	1	I	4	Bone
WAI-4W	BM	TU#1				
HLW-29	L	TU#6	North profile			Charcoal floated 125-140 cmbd
HLW-29	L	TU#6	North profile			Charcoal floated 250-270 cmbd
HLW-29	L	TU#6	East profile			Charcoal floated
HLW-29	L	TU#6	North profile			Charcoal floated 70-85cmbd
HLW-29	L	TU#6	East profile			Charcoal floated
HLW-29	L	TU#6	East profile			Charcoal floated 15-30 cmbd
HLW-29	L	TU#6	South profile			Charcoal floated 175-180 cmbd
HLW-29	L	TU#6	East profile			Charcoal floated
HLW-29	L	TU#6	East profile			Charcoal floated
WAI-7	STP#4			I		Charcoal floated
WAI-7	TU#1	West profile		II		Charcoal floated
WAI-7	STP#5		4	I		Charcoal floated
WAI-7	STP#5		4	I		Volcanic glass found in floatation

WAI-7	TU#1	West profile	V	Charcoal floated
HLW-29	L	TU#6	South profile 1	Flaked basalt 175-180 cmbd
WAI-7	TU#1	West profile	III	Volcanic Glass
HLW-29	L	TU#6	East profile III	Charcoal from floatation 70-80 cmbs
WAI-7	TU#1	West profile	I	Charcoal floated
WAI-7	STP#4		II	Charcoal floated
HLW-29	L	TU#6	North profile	Charcoal floated 90-110cmbd
HLW-29	L	East profile		Charcoal from floatation 92-102cmBD
WAI-7	STP#3	1	I	Charcoal from floatation
HLW-29	L	TU#6	South extension	Charcoal from 175-180cmBD
WAI-7	STP#1	2	II	Charcoal from floatation
WAI-7	TU#1	West profileIV		Charcoal from floatation
WAI-7	STP#3	2	I	Charcoal from floatation
WAI-7	STP#1	1	I	Charcoal from floatation
WAI-7	TU#1	West profile III		Charcoal from floatation

## Appendix IV. Codes for North Kohala District *Ahupua'a*

AAM	Aamakao	Windward
AIN	Ainakea	Windward
APU	Apuakohau	Windward
AWA	Awalua	Leeward
HAE	Haena	Leeward
HUL	Halaula	Windward
HLW	Halawa	Windward
HLL	Halelua	Windward
HAW	Hawi	Windward
HON	Honoipu	Leeward
HOK	Honokane	Windward
HOM	Honomakau	Windward
HOP	Honopueo	Windward
HU1	Hualua 1	Windward
HU2	Hualua 2	Windward
HUK	Hukiaa	Windward
IOL	Iole	Windward
KAA	Kaauhuhu	Windward
KAH	Kahei	Leeward
KA1	Kahei 1	Windward
KA2	Kahei 2	Windward
KA3	Kahei 3	Windward
KH1	Kahua 1	Leeward
KH2	Kahua 2	Leeward
KHL	Kaiholena	Leeward
KHO	Kaihoaa	Leeward
KAL	Kalala	Leeward
KAM	Kamano	Leeward
KP1	Kapaa 1-2	Leeward
KPN	Kapaanui	Leeward
KPU	Kapaau	Windward
KAP	Kapua	Windward
KPP	Kapunapuna	Leeward
KPL	Kaupalaoa	Leeward
KEA	Kealahewa	Windward
KE1	Kehena 1	Leeward
KE2	Kehena 2	Leeward
KOL	Kiiokalani	Leeward
KOK	Kokoiki	Windward
KKI	Kokoili	Leeward
KOU	Kou	Leeward
KPH	Kukuipahu	Leeward
KUK	Kukuiwaluhia	Windward
LAA	Laaumama	Windward
LAM	Lamaloloa	Leeward
LAP	Lapakahi	Leeward
MAH	Mahukona	Leeward

MA1	Makanikahio 1	Windward
MA2	Makanikahio 2	Windward
MKP	Makapala	Windward
MKE	Makeanehu	Leeward
MKI	Makiloa	Leeward
MAU	Maulili	Windward
NAP	Napapaa	Windward
NIU	Niulii	Windward
NUK	Nunulu-iki	Windward
NUN	Nunulu-nui	Windward
OHA	Ohanaula	Windward
OPI	Opihipau	Windward
PHH	Pahinahina	Leeward
PAH	Pahoa	Windward
PHK	Pohakulua	Leeward
PHA	Pohakulua Ahula	Leeward
POL	Pololu	Windward
PUI	Puaili	Leeward
PUK	Puakea	Leeward
PUN	Puanui	Leeward
PUH	Puehuehu	Windward
PAO	Pao	Leeward
PUK	Pueke	Windward
PU1	Puu Epa 1	Windward
PU2	Puu Epa 2	Windward
POK	Puu o Kumau	Windward
UNK	unknown	Windward
UPO	Upolu	Leeward
WAI	Waiapuka	Windward