FINAL ENVIRONMENTAL IMPACT STATEMENT

VOLUME 2 OF 3: APPENDICES

KULA NEI PROJECT

O‘oma, North Kona, Island of Hawai‘i

September 2007

Prepared by

Prepared for

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Prepared by Belt Collins Hawaii Ltd.

APPENDICES TABLE OF CONTENTS

VOLUME II

VOLUME III

Appendix A

MARKET ASSESSMENT

Kula Nei Residential Project, North Kona, Hawaii County

Prepared for

THE SHOPOFF GROUP L.P.

Prepared by

Belt Collins Hawaii, Ltd.

September 2006
Revised to include updated
project information, March 2007

TABLE OF CONTENTS

FIGURES

TABLES

1 INTRODUCTION

1.1 Proposed Project

The Shopoff Group L.P. proposes development of Kula Nei, a project with approximately 220 market residential lots, ranging from about 7,500 to about 20,000 square feet in size, on approximately 128 acres in North Kona (TMK 3-7-3-007:038, 3-7-3-007:039, and 3-7-3-009:007). An estimated 50 affordable housing units will also be located on the site, in conformity with Hawaii County Code. The project also includes a park and a wastewater treatment plant. Once permits are granted and initial infrastructure and lot construction proceeds, the first lots could be available for sale in 2010.

An initial concept plan is shown as Figure 1.

The project is located in North Kona district, Hawaii County, as shown in the location map (Figure 1).

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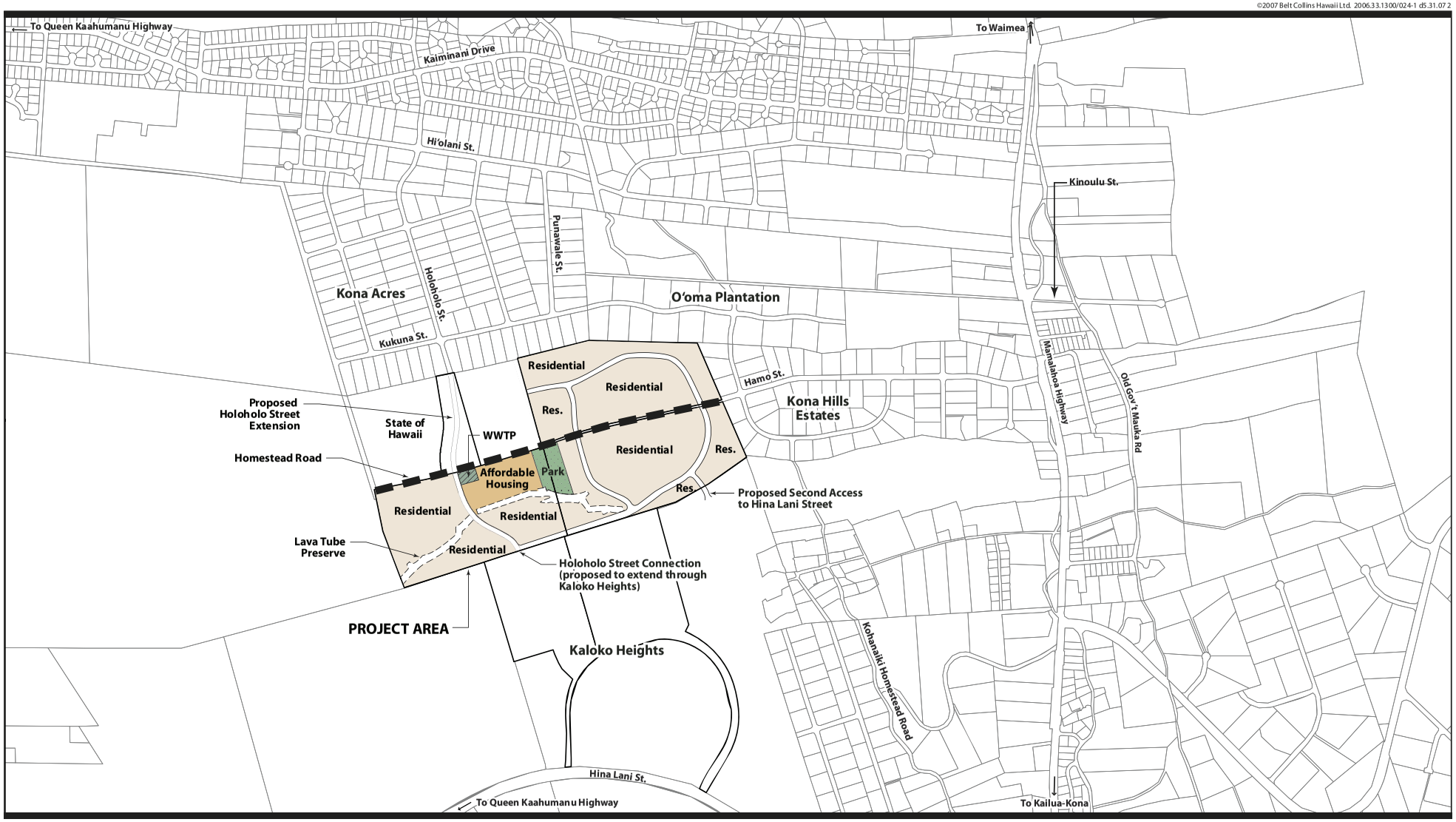


NORTH

0 500 1000

SCALE IN FEET

LEGEND

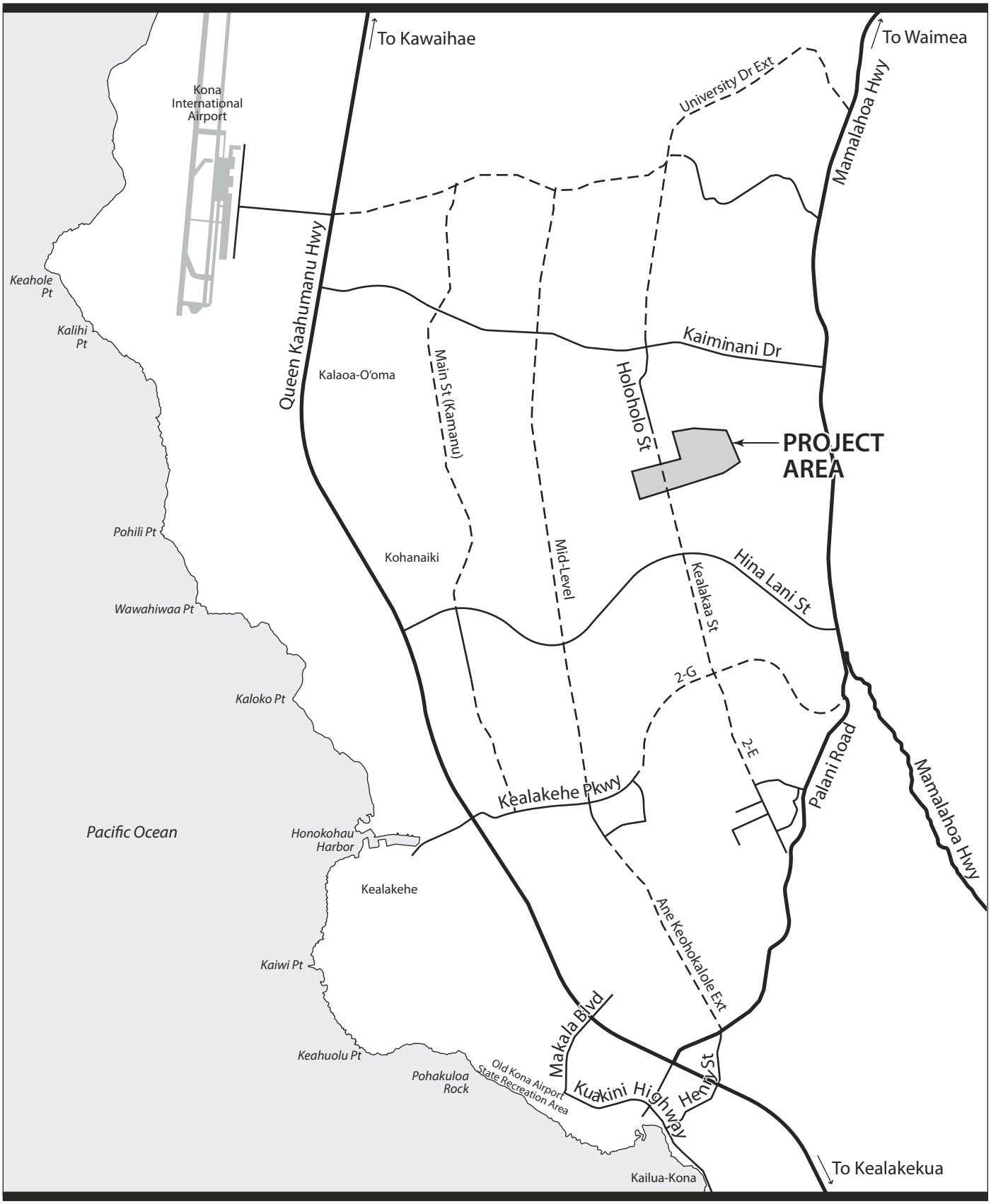
- Primary Market Residential
- Affordable Housing
- Park
- WWTP
- Petition Area
- Homestead Road

Area take offs (acres)

Primary Market Residential	94.0 ac	Lava Tube Preseerve	5.3 ac
Affordable Housing	6.0 ac	On-Site Reservoir	0.4 ac
Park (includes 1.3 acre leach field)	3.6 ac	Homestead Road	1.8 ac
WWTP	0.6 ac	Road Rights-of-Way	19.8 ac

KULA NEI CONCEPT PLAN

Kula Nei
North Kona, Hawaii
Environmental Impact Statement
Prepared for The Shopoff Group



NORTH

0 2500 5000

SCALE IN FEET

LEGEND

- Future Roads
- Minor Roads
- Major Roads

REGIONAL MAP

Kula Nei
North Kona, Hawaii
Environmental Impact Statement
Prepared for the Shopoff Group

1.2 Summary of Findings

This study assesses the market feasibility of the proposed Kula Nei development. It draws on historical data on housing sales, discussions with brokers and others in West Hawaii, and observation of the proposed Kula Nei site and competing projects.

Key findings are:

- West Hawaii's economy is based on tourism. It is currently prospering, and expected to grow at a modest pace over the coming decades. Population growth and housing demand are expected to continue. However, since tourism is dependent on consumer confidence, some year-to-year variation is likely.

- North Kona's housing market is characterized by continuing demand for both rental and for-sale units. Since 2000, demand has been strong and prices have climbed appreciably.

- In North Kona, some 231 vacant lots of an acre or less were sold in 2005. The median price was $489,000, for a median price of $35/square foot. These sales include lots in both resort and residential areas. Within the immediate area surrounding the Kula Nei site (TMK 3-7-3), 58 lots were sold. The median price was $265,000, $24.38 per square foot.

- In recent years, building permits for some 2,200 housing units were issued annually, on average, for North Kona.

- With lots ranging in size from 7,500 square feet to about a half acre, the Kula Nei development fits in the middle range of single family lot projects in North Kona, with land and ocean views, but without the large lots (of an acre or more) found in, for example, Kona Hills Estates, Makalei Estates. Existing areas with a similar range of lot sizes include Kona Palisades and the newer Lokahi Makai to seaward, and Kona Heights and Kona Coastview, near Mamalahoa Highway.

- In TMK district 3-7-3, makai (seaward) of Mamalahoa Highway, 80 or more home sales occurred annually in recent years. Since 2000, 20 new homes were built each year in the area.

- Buyers include both local residents and others. Offshore buyers, mostly California residents, may seek homes for vacation use, regular part-time residence, or retirement.

- As a rule, offshore buyers of single-family homes in Hawaii County tend not to place their homes in rental pools.

- While several projects in North Kona are currently selling, much of their competing product will be sold at the time that the proposed lots are brought to market. However, part of the Kaloko Heights development, which abuts the south side of the Kula Nei site, is expected to be selling a mix of single family and multifamily units. Lots at Kaloko Heights will probably be about 10,000 square feet or less, comparable to the smaller lots in the Kula Nei lot mix. The Palamanui and 327 Kona projects must also be considered as potentially competing product when the Kula Nei lots become available.

- New product may also be coming on the market in South Kohala, in Waikoloa Village and Waimea. However, the County's Waikoloa project – a major part of the inventory – will have restrictive sales agreements that deny buyers nearly all of the equity gained through increased housing prices. Consequently, those units will likely be less attractive to potential buyers than comparable units elsewhere, whether in North Kona or in South Kohala projects such as Castle & Cooke's Wehilani.

- Projections call for continuing growth in the Hawaii County population. Allowing for changing household sizes, demand can be expected for 280 or more new resident households annually in North Kona, in addition to offshore demand. The

total demand for North Kona single family homes could then reach 400 to 450 units.

- As many as 60 lots can be expected to sell in a year at Kula Nei. At that rate, the lot inventory would be exhausted by 2014. Home construction would proceed at a slower pace, but is anticipated to be completed by 2017.

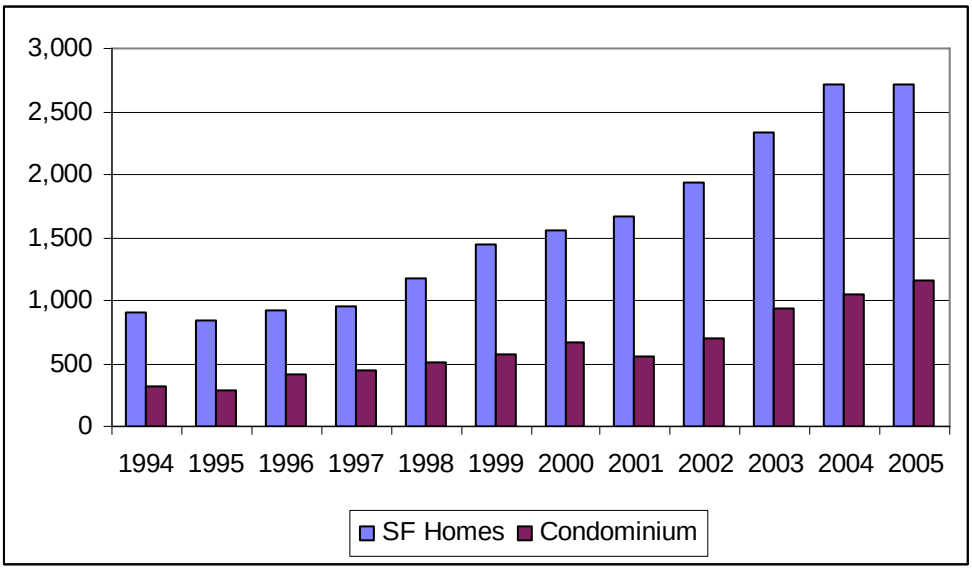
- Comparable lots in the immediate area are currently selling for about $25 to $30 per square foot. Prices for Kula Nei lots (in 2006 dollars) are likely to range from $250,000 to $750,000.

The market analysis was conducted in mid-2006. Since that time, real estate sales and prices throughout Hawaii have stabilized. The earthquake of October 15, 2006, led to some damage to existing property, but has not led to a marked change in real estate sales on the Big Island. The current slowdown can be viewed as a normal part of the real estate cycle, and in line with the trends discussed in this report. Projections developed in this report are based on multiyear trends, and hence allow for short-term changes in market volume.

2 MARKET CONTEXT

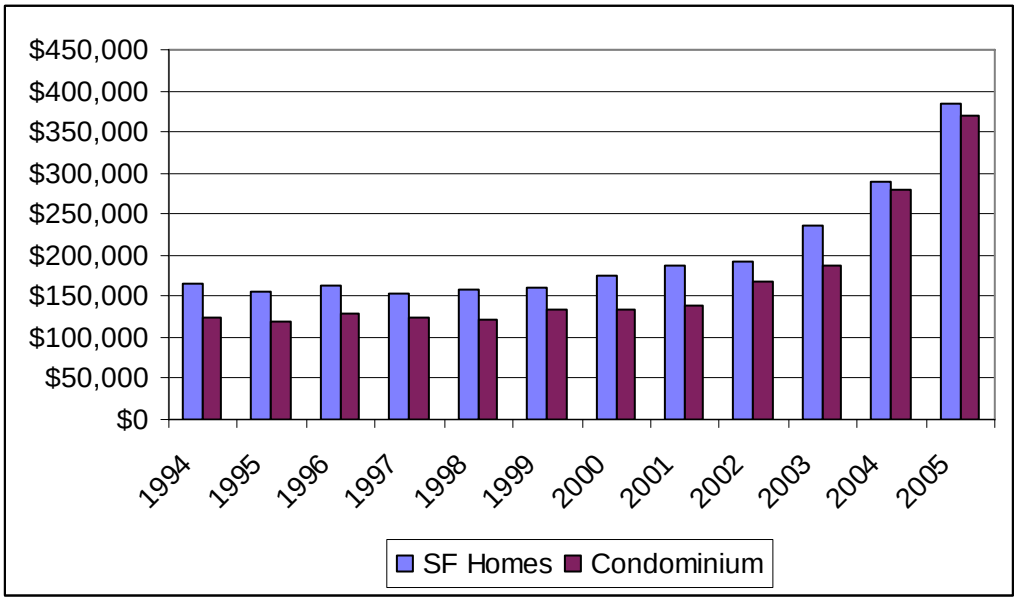
Hawaii County has seen steady demand for housing over the past decade. Both the number of homes sold and average prices have increased appreciably since 2001.

Figure 2-1: Residential Sales Trends, Hawaii County, 1994-2005



SOURCE: Multiple Listings Service (MLS) data compiled by Prudential Locations, Inc. and published in Department of Business, Economic Development & Tourism (DBEDT) 2005a and 2006.

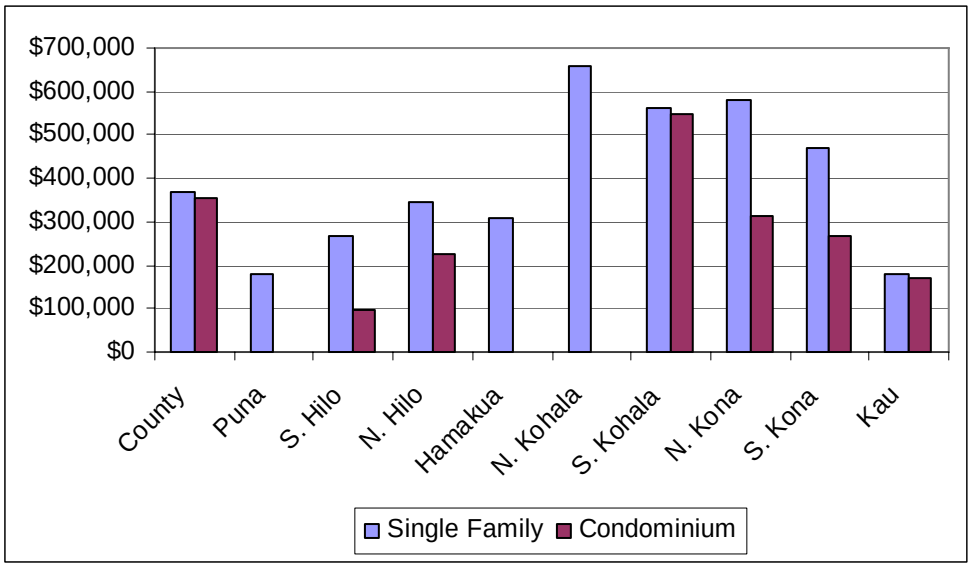
Figure 2-2: Median Price Trends, Residential Property, Hawaii County, 1994-2004



SOURCE: DBEDT, 2005a and 2006.

While condominium median prices are lower than single-family prices, the two are fairly close. This is largely due to the difference between these products across the island. Condominiums are largely resort products in North Kona and South Kohala. Single-family dwellings are found islandwide, ranging from modest homes in outlying areas to the most expensive homes in Hawaii County. Recent MLS data show the disparity in average housing prices in different districts, along with the concentration of condominium sales in West Hawaii.

Figure 2-3: Mean Housing Prices by District, 2004



NOTE: The district data are mean, not median, prices and are hence not comparable to the trend data in the last figure.
SOURCE: MLS data for 12/2003 to 12/2004, compiled by Clark Realty Corporation, and included in the Hawaii County Data Book (http://www.hawaii-county.com/databook_current/Table%2016/16.27.doc, viewed April 1, 2006).

Table 1: Housing Units Sold by District, 2004

	Hawaii County	Puna	S. Hilo	N. Hilo	Hamakua	N. Kohala	S. Kohala	N. Kona	S. Kona	Kau
Single Family	2,698	871	397	26	46	64	326	696	112	160
Condominium	1,076	0	132	1	0	0	313	610	9	11

SOURCE: Hawaii County Data Book (http://www.hawaii-county.com/databook_current/Table%2016/16.27.doc, viewed April 1, 2006).

Factors affecting the demand for housing include population growth, a strong economy, and the development of new resort residential products in West Hawaii.

2.1 Demographic Trends

The population of Hawaii County has been growing more quickly than that of the state as a whole. The areas with the highest rate of increase are Puna District, south of Hilo, and the West Hawaii districts of North Kona and South Kohala.

Table 2: Historical Population Increase, Hawaii County and Districts

County and district	April 1, 1980	April 1, 1990	April 1, 2000	Average Annual Rate of Change 1980 to 1990	Average Annual Rate of Change 1990 to 2000
State total	964,691	1,108,229	1,211,537	1.4%	0.9%
Hawaii County	92,053	120,317	148,677	2.7%	2.1%
Puna	11,751	20,781	31,335	5.9%	4.2%
South Hilo	42,278	44,639	47,386	0.5%	0.6%
North Hilo	1,679	1,541	1,720	-0.9%	1.1%
Hamakua	5,128	5,545	6,108	0.8%	1.0%
North Kohala	3,249	4,291	6,038	2.8%	3.5%
South Kohala	4,607	9,140	13,131	7.1%	3.7%
North Kona	13,748	22,284	28,543	4.9%	2.5%
South Kona	5,914	7,658	8,589	2.6%	1.2%
Ka'u	3,699	4,438	5,827	1.8%	2.8%

SOURCE: US Census, compiled in DBEDT 2005a.

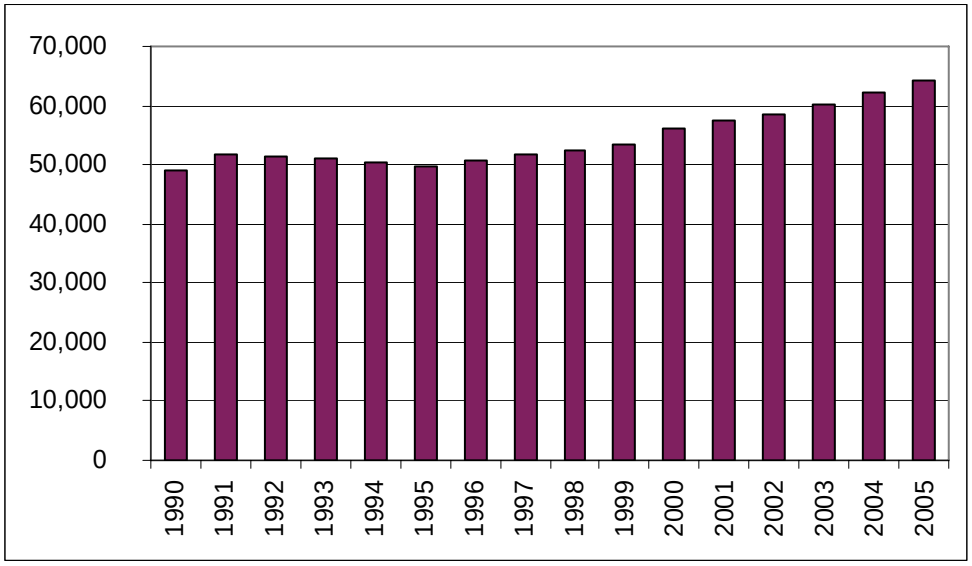
In recent years, Hawaii County has continued to grow to an estimated population of about 167,000 in 2005. Much of the population growth is attributable to in-migration. In-migration from other counties and states between 2000 and 2005 was higher than for any other county. (In the same period, the state as a whole saw net *out*-migration to other states. [Estimates available at State website, http://www.hawaii.gov/dbedt/info/census /population-estimate, viewed on July 3, 2006.)

2.2 Economic Trends

In most of Hawaii, the mid-1990s was a period of economic stagnation. Since then, the economy steadily expanded. As Figure2-4 shows, the job count in Hawaii County has grown to 64,250, about 30% higher than in 1990. Over that time, tourism has expanded, while plantation agriculture ended in Hawaii County.

Unemployment in Hawaii County is estimated as 3.9% of the labor force (as of July 2006). This is higher than in the other counties, but far lower than historic levels or even the current nationwide unemployment level. (State of Hawaii, Department of Labor and Industrial Relations (DLIR) website).

Figure 2-4: Jobcount, Hawaii County, 1990-2005



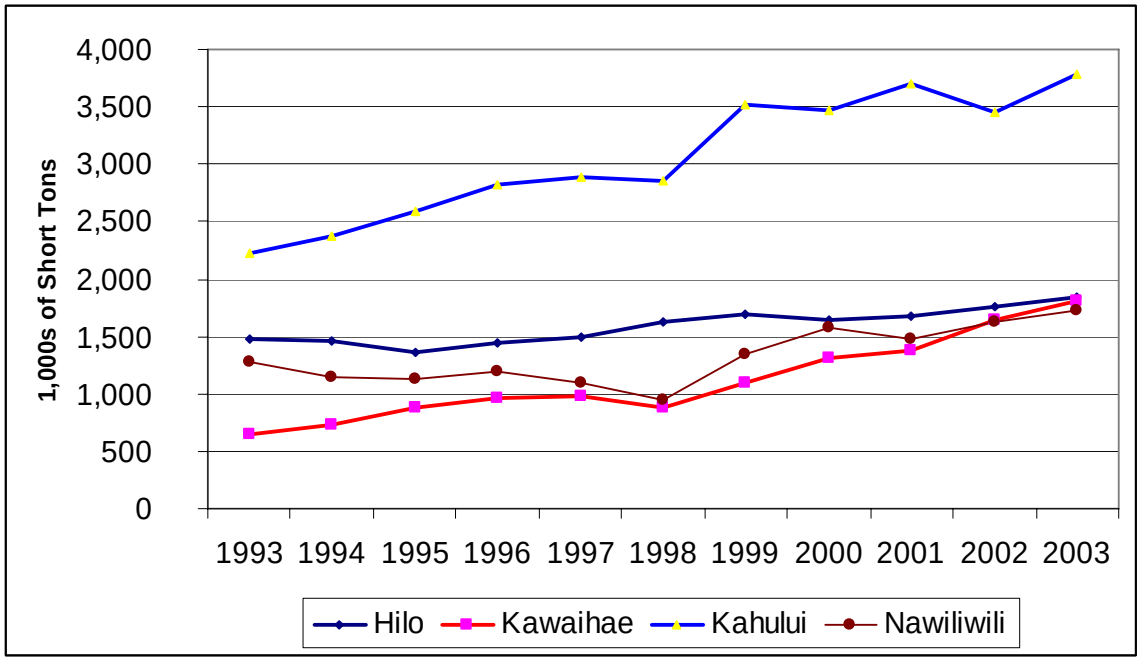
SOURCES: DBEDT, 2005a and DLIR website (http://hawaii.gov/labor/rs/)

In West Hawaii, unemployment claims averaged around 650 per week in 2000. After September 11, 2001, tourist arrivals and spending dropped, and unemployment spiked soon afterwards. In 2005 and 2006, new claims have dropped to averages below the 2000 level. (For 2006, the average is about 450 claims/week, through August 12, 2006 [DBEDT website]).

A key indicator of West Hawaii growth is the increasing importance of the port of Kawaihae. Between 1993 and 2003, cargo activity at Kawaihae increased at a rate of 10.6% per year, on average, nearly twice as quickly as for Honolulu and over four times as quickly as for Hilo. The amount of cargo passing through Kawaihae is nearly as great as through Hilo. Over this period, West Hawaii has seen major expansion of retail trade

(with big-box stores opening in Kailua-Kona) and growth of new residential resort areas, especially at Hualalai and Kukio, north of Kailua-Kona.

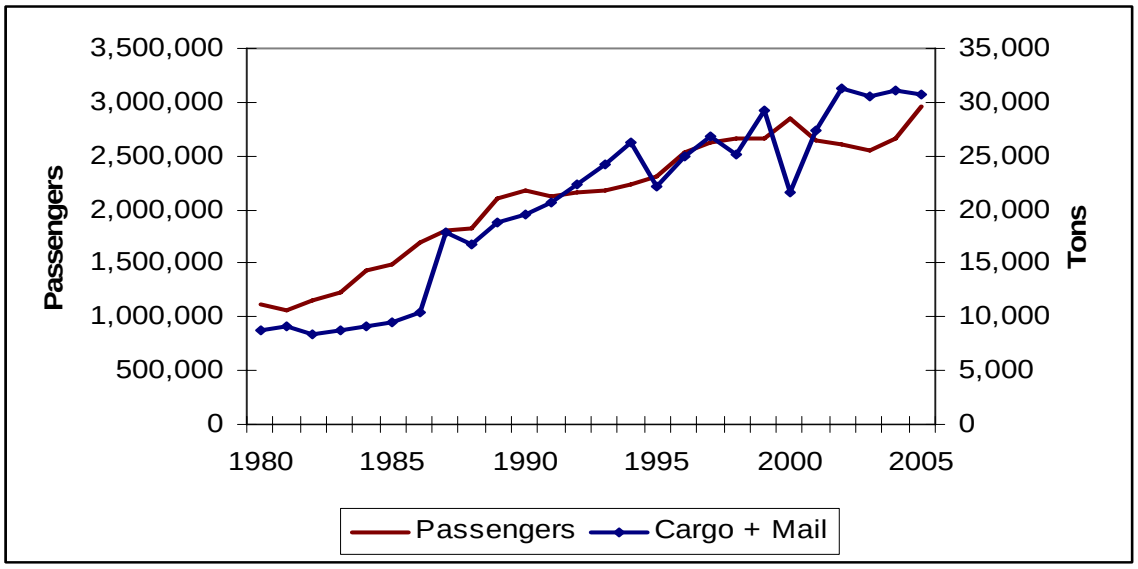
Figure 2-5: Waterborne Commerce at Neighbor Island Ports, 1993-2003



SOURCE: U.S. Army Corps of Engineers data, in DBEDT 2005a.

Airport statistics show that passenger and cargo activity at West Hawaii's airport has tripled since 1980.

Figure 2-6: Passengers, Cargo and Mail at Kona International Airport 1980 to 2005



NOTE: Annual data cover both emplaned and deplaned passengers and cargo. This table also combines overseas and interisland travel.
SOURCE: Hawaii State Department of Transportation, Airports Division, 2006.

Hawaii island's visitor industry is concentrated in West Hawaii. (The single most important visitor attraction is Volcanoes National Park, south of Hilo, but few visitor units are located nearby.) Kailua-Kona was long the center of the industry, but the resorts along the South Kohala coast have expanded, so now the Kohala region contains more visitor units than Kona.

Table 3: Hawaii County Visitor Plant Inventory, 2004

	Hotels and Condos	All Visitor Units
Kohala	20	4,234
Kona	35	4,144
Kau	1	75
Puna (including Volcano)	4	284
Hilo and Hamakua	9	1,300
County		10,037

SOURCE: DBEDT, 2005b.

2.3 Forecast Economic Growth

The State of Hawaii has forecasted continuing slow growth in population, jobs and income throughout Hawaii. Hawaii County's population and jobs are expected to increase slightly more quickly than Honolulu's. Over the long term (2000 to 2030) Hawaii County resident population is expected to grow at an average annual rate of 1.4%, wage and salary jobs at a rate of 1.3%, and per capita income at a rate of 1.7% (over inflation). The fastest-growing segment of the population will be seniors: the population 65 and over is expected to increase by 2.6% annually, on average.

Table 4: Population and Jobs Forecast for Hawaii County to 2030

	2000	2005	2010	2015	2020	2025	2030
Total resident population	149,261	163,000	176,750	190,300	203,050	216,150	229,700
School age children: 5 to 11 years	15,722	14,850	16,450	18,700	20,200	20,950	21,750
School age children: 12 to 13 years	4,662	5,000	4,550	5,250	5,700	6,200	6,400
School age children: 14 to 17 years	9,457	10,200	9,950	9,800	11,250	12,250	13,000
Population: 18 to 64 years	90,058	100,400	109,000	113,500	115,900	121,000	129,250
Population: 65 years and over	20,195	21,500	24,300	29,600	36,150	41,350	44,000
DeFacto population	166,446	180,800	196,500	212,250	226,800	241,800	257,700
Average Visitor Census	21,831	23,562	25,479	28,219	30,328	32,740	35,479
Total civilian wage and salary jobs	55,900	60,733	64,607	68,608	72,619	76,825	81,258
Dependency ratio (1)	0.56	0.51	0.51	0.56	0.63	0.67	0.66
Per capita personal income (in 2000 $s)	$20,991	$23,331	$25,084	$27,382	$30,142	$32,846	$35,215

NOTE:
(1) Dependency ratio calculated as the ratio of children and elders (ages 0 to 17 and 65 or more) to persons of working age (18 to 64)
SOURCE: Hawaii State Department of Business, Economic Development and Tourism, 2005c.

This is a slow- to moderate-growth scenario. Its average growth rates are not as high as those found in boom periods. However, over the long term, the forecast extends the growth that Hawaii County has seen over the past decades. It is a strong basis for anticipating continuing demand for both new and existing housing.

3 DEMAND FOR HOMES

3.1 Overall Demand

Demand for new housing in West Hawaii is strong. Realtors called in the course of this study report that a mix of residents and offshore buyers are showing interest in North Kona homes. After housing prices have increased appreciably over the last two years, the available inventory has also grown. Local experts characterize current conditions as less of a "sellers' market" than in 2005, but still very active. [1]

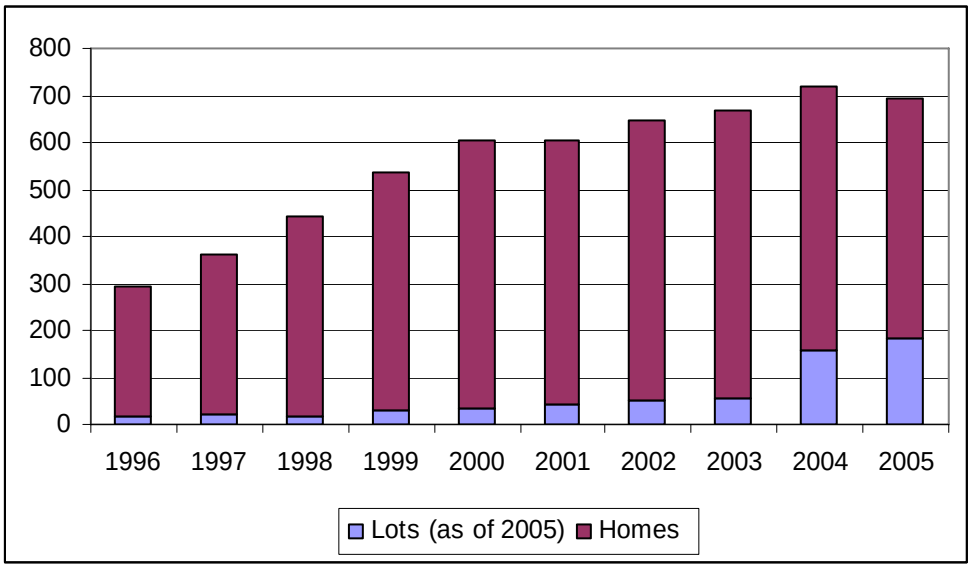
New units at D.R. Horton developments are being sold by lottery. Similar procedures are being used by Castle & Cooke for affordably priced townhomes in Waikoloa. These procedures testify to strong buyer interest.

Historical data and trends provide a quantitative basis for these impressions. Figure 3-1 shows that sales of homes and lots with lot areas from 7,000 to 22,000 square feet have increased from about 300 per year in 1996 to about 700. Within the TMK 3-7-3 area surrounding the Kula Nei site, annual sales figures have similarly grown from less than 100 to about 250 sales per year. Nearly all the properties sold before 2004 are already built out, indicating that the demand is for homes, rather than a market speculating in lots.

An analysis of 2004 property data by SMS Research & Marketing Services, Inc. indicated a significant share of residential units are owned by parties outside Hawaii (SMS 2005). Of the residential condominiums sold in the five-year period from 2000 through 2004 in Hawaii County, 76% were owned by offshore buyers. For single-family homes, 35% of the owners had offshore addresses.

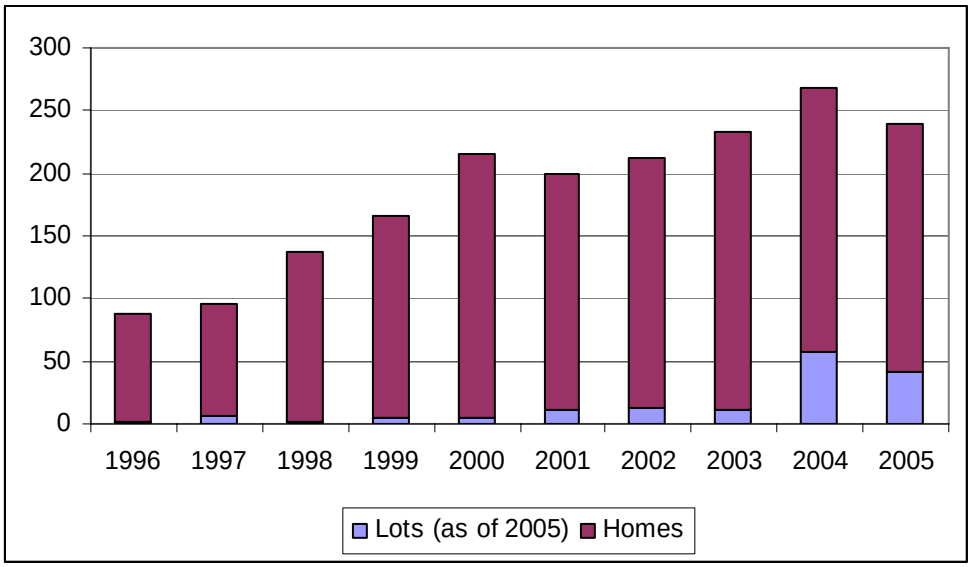
[1] In East Hawaii, many lots have been brought back on the market, so buyers now appear outnumbered by sellers (Sur 2006). This trend is to be expected in areas with large acreage of land that can be used for home sites, i.e., Puna and Kau. It is not likely in North Kona, where the supply of residential land and homes is much more constrained. The cost and difficulty of commuting make lots in Puna or Kau non-competitive with product in North Kona. The impact of inventory in distant areas is pressure to lower prices islandwide, rather than direct competition.

Figure 3-1: North Kona (TMK 3-7) Sales, Residential Lots and Homes 1996-2005



NOTE: This figure counts sales of properties from 7,000 to 22,000 square feet in area, with homes built as of 2005. Listings with homes built by 2005 may have originally been sold as lots, so the "lots" listing is a minimum, not the total number of lots sold in a given year.
SOURCE: TMK files downloaded from Hawaii Information Service.

Figure 3-2: Home and Lot Sales, TMK Zone 3-7-3, 1996-2005

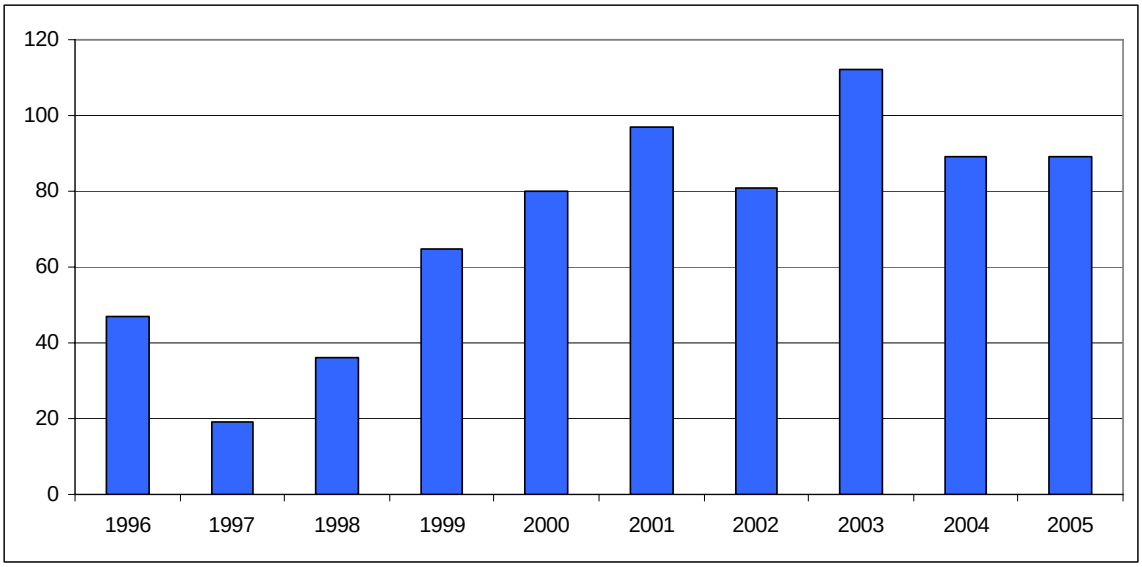


NOTE: This figure counts sales of properties from 7,000 to 22,000 square feet in area, with homes built as of 2005. Listings with homes built by 2005 may have originally been sold as lots, so the "lots" listing is a minimum, not the total number of lots sold in a given year. The sudden increase in lot sales in 2004 can be reasonably read as indicating that lots are likely to be built out within two years: most 2003 sales of lots would, by 2005, appear in the records as lots with homes in place.
SOURCE: TMK files downloaded from Hawaii Information Service.

Within the 3-7-3 subarea, 78% of the homes sold since 1996 have Hawaii tax addresses. This suggests that at least 20%, and perhaps many more, of the homes near the Kula Nei site are owned by part-time residents or absentees.[2] In the Lokahi Makai subdivision, 77% of 107 lot owners have out of state addresses.

Homebuilding provides a different perspective on demand. In recent years, new home construction in the 3-7-3 subarea has grown and continues at a steady pace of about 90 units per year.

Figure 3-3: Annual New Home Construction, TMK Zone 3-7-3 1996-2005



SOURCE: TMK files downloaded from Hawaii Information Service.

3.2 Demographic Projections

The state forecast for Hawaii County calls for continuing, if moderating growth islandwide. Table 5 shows projections derived from combining the official projections for the County (shown in Table 4) with straight-line growth projections for the individual districts.

[2] Some offshore owners may have property handled by a local agent, with tax bills sent in care of the agent, rather than directly to the owner. Hence, the tax address provides a minimum estimate of offshore ownership, not a full count.

Table 5: District Population Projections to 2030

	Historical			*Projected*		
	1980	**1990**	**2000**	**2010**	**2020**	**2030**
Puna	11,751	20,781	31,335	40,873	50,665	60,457
South Hilo	42,278	44,639	47,386	49,876	52,430	54,984
North Hilo	1,679	1,541	1,720	1,688	1,708	1,729
Hamakua	5,128	5,545	6,108	6,574	7,064	7,554
North Kohala	3,249	4,291	6,038	7,315	8,710	10,104
South Kohala	4,607	9,140	13,131	17,483	21,745	26,007
North Kona	13,748	22,284	28,543	36,320	43,718	51,115
South Kona	5,914	7,658	8,589	10,062	11,400	12,737
Ka'u	3,699	4,438	5,827	6,783	7,847	8,911
Hawaii County	92,053	120,317	148,677	176,973	205,285	233,597
Average Annual Rate of Change		**1980s**	**1990s**	**2000s**	**2010s**	**2020s**
Puna		5.9%	4.2%	2.7%	2.2%	1.8%
South Hilo		0.5%	0.6%	0.5%	0.5%	0.5%
North Hilo		-0.9%	1.1%	-0.2%	0.1%	0.1%
Hamakua		0.8%	1.0%	0.7%	0.7%	0.7%
North Kohala		2.8%	3.5%	1.9%	1.8%	1.5%
South Kohala		7.1%	3.7%	2.9%	2.2%	1.8%
North Kona		4.9%	2.5%	2.4%	1.9%	1.6%
South Kona		2.6%	1.2%	1.6%	1.3%	1.1%
Ka'u		1.8%	2.8%	1.5%	1.5%	1.3%
Hawaii County		2.7%	2.1%	1.8%	1.5%	1.3%

NOTES: District projections were obtained by extending linear trends from historical (1980-2000) ones. The result was a total slightly larger than the official population projection. All district population estimates were then adjusted downward so that the total population for the districts equals the County total.
SOURCE: DBEDT, 2004, adapted by Belt Collins Hawaii.

While the official projections do not include estimates of future housing units, future demand can be estimated easily from the population projections and projected household sizes. Based on a half-century trend (found throughout Hawaii and the mainland U.S.), household sizes are likely to continue to shrink. As a result of both population growth and declining household sizes, the North Kona resident population can be expected to generate demand for more than 300 additional units annually, as shown in Table 6. Also, purchase of second homes in West Hawaii has become an important, continuing element in the local real estate market. Based on North Kona sales over the period since 2000, a conservative estimate of the non-resident share of new demand in the coming decades is that 30% of total demand for for-sale units will come from outside Hawaii. Hence total

market demand for new for-sale units can be expected to amount to about 320 units annually.

Table 6: Projected Housing Demand, North Kona District

		2000	2010	2020	2030
Population, North Kona		28,543	36,320	43,718	51,115
Average household size (1)		2.75	2.66	2.6	2.55
Resident household demand		10,379	13,654	16,814	20,045
			2000s	2010s	2020s
New household demand			3,275	3,160	3,231
Share aiming at for-sale market (2)	70%				
New resident demand for for-sale housing			2,292	2,212	2,261
Non-resident share of housing sales (3)	30%				
Non-resident demand			982	948	969
Total demand for units for sale			3,275	3,160	3,231
Total annual demand			327	316	323

NOTES:
(1) Average household size projected to change at rate based on statewide data for 1950 to 2000.
(2) Based on SMS survey (2003) showing share of North Kona resident population with incomes of 100% of median or higher. [3]
(3) Non-resident share of housing demand estimated from out-of-state tax addresses for residential property in North Kona, as analyzed by Belt Collins Hawaii for this study and, more generally, by SMS Research (2005).

3.3 Competing Supply

For much of the 1990s, new housing development in North Kona was limited to individual homes and small projects. Pualani Estates, announced as a major new subdivision by 1995, had no homes for sale until 2004. Currently, lots and homes are being sold there, at Alii Heights, Kona Vistas, and Lokahi Makai (off Kaiminani, makai of the Kula Nei site). A total of about 400 additional lots or homes could be built in the next few years in these developments.

[3] The recent rise in housing prices makes the move to homeownership very difficult for many families in North Kona unless they can count on support from parents. Over time, the share of units affordable for much of the population is likely to change, as incomes catch up to housing prices, and then housing prices rise again. Typically, the combination of market and government pressures makes housing available to a wide share of the population in the middle of the housing cycle.

Stanford Carr Development is anticipated to begin construction on Kaloko Heights, covering 402 acres along Hina Lani Street. (This project area abuts the south side of Kula Nei.) Total buildout of Kaloko Heights could reach as high as 1,500 units (including both market and reduced-price units). While much work is to be done on infrastructure, the developer plans to have homes of several sizes available in 2007.

Other projects likely to offer lots and homes on lots of sizes similar to those found in Kula Nei are Palamanui (approximately 850 units), on Queen Kaahumanu Highway, just north of the Airport entrance, and 327 Kona LLC, with a planned 1,000 units. The former has obtained state and county permits; the latter has neither state nor county permits yet.

For the market lots in the Kula Nei project, competing products consist of lots of a half-acre or less, or homes on similar lots. The subdivisions mentioned above, plus infill development in existing areas such as Kona Palisades, offer such products. Larger lots are also available in the region, notably at the ʻOʻoma Plantation site, where 19 two-acre lots currently have been announced, and soon will be on offer (http://www.koarealty.com/pages/ooma.php).

Some consideration must be given to new housing development in the Waikoloa Village area. The County and private developers will be offering homes and lots aimed in large part at the local resident market. These projects could draw off some of the demand now evident in North Kona, but the impact will likely be small, for three reasons:

- The largest project, sponsored by the County of Hawaii, will be sold to buyers who qualify under income restrictions, and will involve stringent restrictions on buyers' reselling their homes. Hence, buyers will not be able to amass equity quickly, even while market prices are rising.

- Private developments are expected to appeal strongly to offshore buyers as well as residents; the resident share will hence tend to be smaller than in North Kona projects with similar pricing.

- North Kona remains the urban center of West Hawaii. Waikoloa homes will be convenient for some residents with jobs in South Kohala, but this is a small part of the resident market. For most, the Waikoloa developments will be approximately 30 miles from jobs, stores, and urban services.

Also in South Kohala, Parker Ranch has plans to have additional homes developed in Waimea. This town has appealed to professionals working in Kailua and on the South Kohala coast.

In addition, proposed new multifamily developments (by Suffolk Investment and Puaa Development) near Kuakini Highway could add another 500 units of market and affordable housing if approvals are granted and the proposed projects are feasible. These projects may be important in meeting demand for affordable units.[4]

At the upper end of the market, resort lots have been developed and sold at a steady pace since 2000, notably in the Hualalai and Kukio resort areas. Since the North Kona lot and single-family markets include both resort properties, and those appealing to residents and in-migrants with limited assets, it is important to separate the two. This can be done heuristically by focusing on the TMK 3-7-3 zone, which does not include any resort development. It accounts for well over a third of the district sales.

Table 7 identifies North Kona developments potentially in competition with Kula Nei for market home buyers in the next few years. It excludes large-lot and resort projects.

[4] The State Department of Hawaiian Home Lands (DHHL) has plans to develop homes and lots for Native Hawaiians at Lalamilo, outside Waimea, and in the Villages of La‘i‘opua, in the Kealakehe area of Kailua-Kona. Because DHHL leases are restricted to their beneficiaries, these are not considered to be product competing with Kula Nei.

Table 7: Competition for Kula Nei Market Homes

Project	Section	2005 Sales Vol.	2005 Sales NR Share	Market Units Available 2010 +	Current Listings Lot Price per sq. ft. land	Current Listings Home/Lot per sq. ft. interior	Notes:
Kaloko Heights	3-7-3			800	NA	NA	Includes both market and affordable units; has zoning. Infrastructure now being built.
327 Kona LLC	3-7-4			800	NA	NA	Excludes 50 larger lots; no SLUC or zoning
Palamanui	3-7-2			600	NA	NA	Has SLUC approval, zoning
Lokahi Makai	3-7-3	62	34%	0	NA	$391.52	
Pualani Estates	3-6-5	61	36%	0	NA	$356.55	Price reduction (08/06)
Kona Vistas	3-7-6	28	32%	Few	$23.44	$413.62	Lots of 15,000 sq. ft or more.
Alii Heights	3-7-7	54	43%	25	$34.73	$408.15	Lots of 15,000 sq. ft or more.

NOTES: Current listings from websites, *West Hawaii Today*. Availability based on calls to developers and planning experts. List does not include large lot subdivisions or multifamily properties in region.

As noted earlier, the Kaloko Heights project is expected to have units available for sale before 2010. Work on Palamanui must start by mid-2011 according to the project's zoning agreement. The single-family residential units (shown in Table 7) are scheduled to be built in the second project phase – perhaps from 2012 to 2015 – and multifamily market units are to be part of a later phase. The 327 Kona project has no land use approvals, and is hence likely to come to market after Kula Nei.

3.4 Net Demand for Market Homes at Kula Nei

As of 2010, new market units will be available north of Kailua-Kona, off Hina Lani Street above the airport. New units in other parts of North Kona will largely consist of resort units (e.g., in Hualalai) and perhaps units in affordable projects south of Kailua-Kona. The majority of new lots and units will be in Kaloko Heights, Palamanui, Kula Nei, and perhaps the 327 Kona developments. With annual demand for these competing projects estimated as 75% of total North Kona market demand, the total demand for this segment would come to 240 units a year. This demand would exhaust the total supply of lots and single-family homes in these developments (including both permitted and potential projects) by 2020.

When Kula Nei lots become available around 2010, they will likely be in competition mainly with Kaloko Heights. As with Kaloko Heights, Kula Nei lots will offer access to all areas of North Kona. They will also offer distinctive views. Lots will likely be attractive both to those expecting to build immediately and to others who hope to build in a few years. Lot sales could account for 20% to 25% of total demand each year in their market segment, or 50 to 60 sales. Lot sales could hence be achieved over a period of five years or less.

Another approach to estimating demand focuses on the recent housing construction data in Figure 3-3. New home production in the 3-7-3 TMK area has been steady at 90 units or more per year, so by 2010, this figure could easily grow to 100 units. Of those units, most will be within the Kaloko Heights and Kula Nei developments. The former will have more units to bring to market, but Kula Nei homes would have advantages due to views and inclusion in a smaller subdivision. Hence it is reasonable to expect Kula Nei market units to account for at least a third of new home construction in the subarea from 2010 onwards, and to be built out before 2020.

3.5 Demand for Affordable Units at Kula Nei

The proposed development will include units for sale or rent at controlled prices under an affordable housing program, as mandated by Hawaii County Code Chapter 11. These will be priced to be affordable to households earning from 80% to 140% of the County median income. The group in question accounts for a third of the county's households. Its share of the North Kona population is about 37%, according to a recent survey (SMS 2003).

As of 2003, an estimated 798 households in this income range in North Kona were in the market for a new home.[5] In 2006 dollars, such households would earn from $47,900 to $66,360 and be able to buy a home priced from $196,200 to $271,900 (according to U.S. Department of Housing and Urban Development estimates, at 6% interest, as posted at

[5] The count is of households planning to move within the next two years.

http://www.hcdch.state.hi.us/06sales.pdf). That range falls below the 2004 medians for condos and single family homes in the County (shown in Figure 2-2), much less the North Kona 2005 mean prices (shown in Figure 2-3). Since little affordable housing is now available for sale in West Hawaii, demand has grown steadily since 2003.[6]

Projects offering affordable units in the next few years include the County's "workforce housing" initiative at Waikoloa, in which buyers will gain very little equity over time, proposed developments near Kuakini Highway, south of Kailua-Kona, and components of other proposed developments designed to meet the County affordable housing rules. The Hawaii Housing Finance and Development Corporation has recently announced plans for a development along Palani Road across from Henry Street (Quirk 2007)

The South Kohala projects, anticipated as helping to address the need for affordable housing, are far from the North Kona urban center and most of the region's jobs, so they are likely to have an impact on demand islandwide, rather than on the demand for new affordable housing among North Kona residents. Units in these projects will be especially attractive to those who now commute from the Puna, Kau, Hamakua, and North Kohala to jobs at the South Kohala resorts. Units in the County's Waikoloa project and the State's Palani Road project will have deed restrictions limiting resale prices, and hence are likely to be less attractive to buyers than affordable units in private subdivisions.

Given the strong demand and limited competition, net demand for affordable units in Kula Nei is expected to be even stronger than for the market units, so these will be absorbed as quickly as the market units.

Table 8 shows a projection of annual lot and home sales, and home occupancy, based on the trends discussed above.

[6] In a recent lottery for townhouses in Seascapes, located near Lokahi Makai, 285 pre-qualified bidders drew to participate in a project with a total build out of about 100 units (Lottery results posted at http://www.akamairealty.com/LotteryResults.pdf, viewed August 28, 2006).

Table 8: Absorption and Occupancy at Kula Nei

Lot types	Count	Annual Sales	Years to Absorb
Affordable units	50	25	2.0
7,500 to 10,000 sq. ft.	15	7	2.1
10,000 to 15,000 sq. ft.	80	15	5.3
15,000 to 20,000 sq. ft.	75	15	5.0
Over 20,000 sq. ft.	50	10	5.0

NOTES: See text for details. Construction of affordable units assumed to occur immediately; construction of units on lots assumed to occur within four years of purchase.

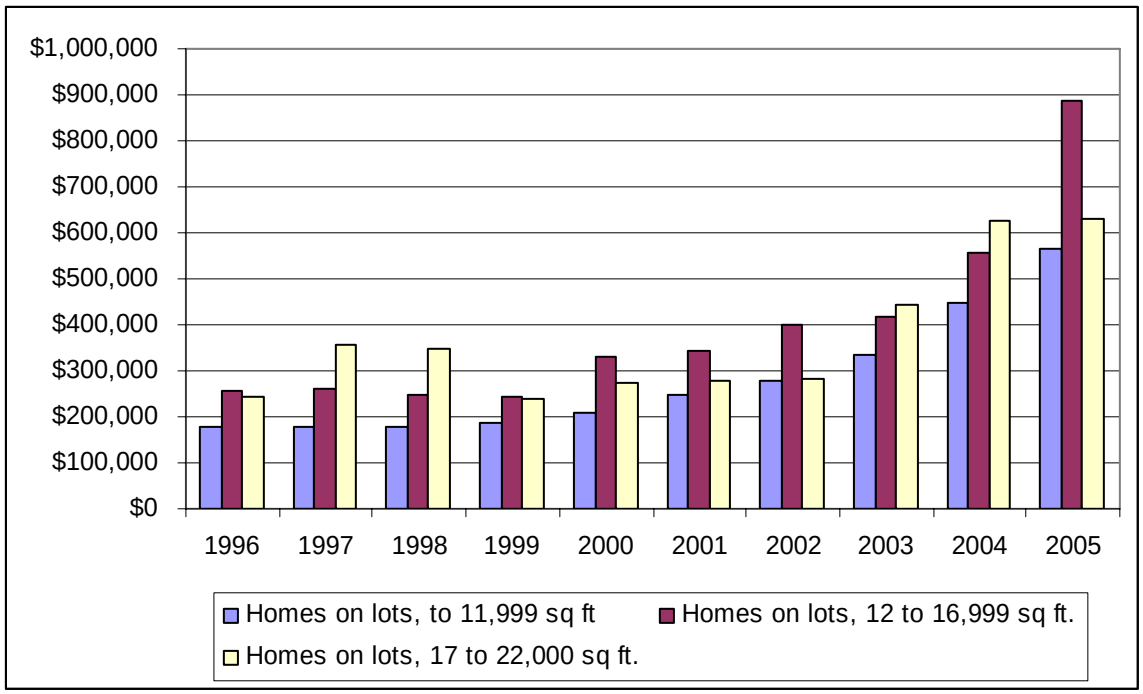
4 PRICING

Historical data on sales of homes and lots in the North Kona region show:

- There is demand for all the lot sizes in Kula Nei;
- Homes on the larger lots (i.e., over 10,000 square feet) have consistent sold for higher prices than ones on the smaller lots, even when price is computed per square foot of interior area in the home; and
- Prices for vacant lots of 7,500 square feet to a half acre have been climbing.

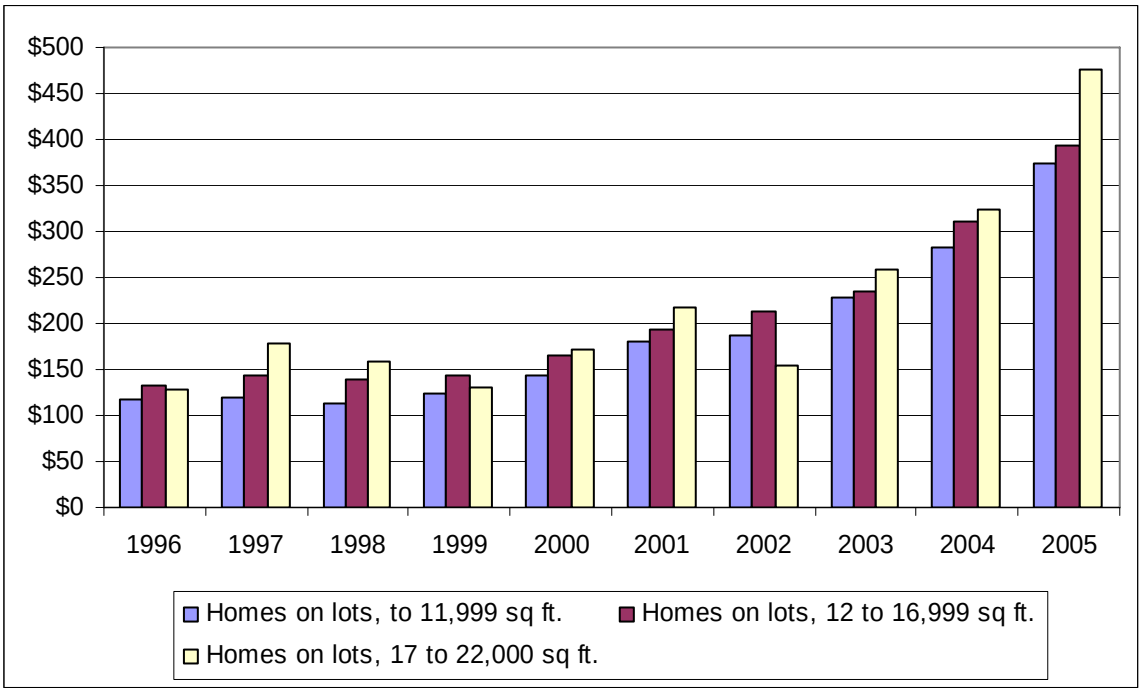
Data for the 3-7-3 subarea, including the Kula Nei site, show both a clear increase in the number of sales and in the value per square foot of land. By the end of 2005, an average value of approximately $30/square foot of land was reached. Given the advantages of lots in the project, it is likely that somewhat higher prices will be achieved.

Figure 4-1: Historical North Kona Home Prices by Lot Size, 1996-2005



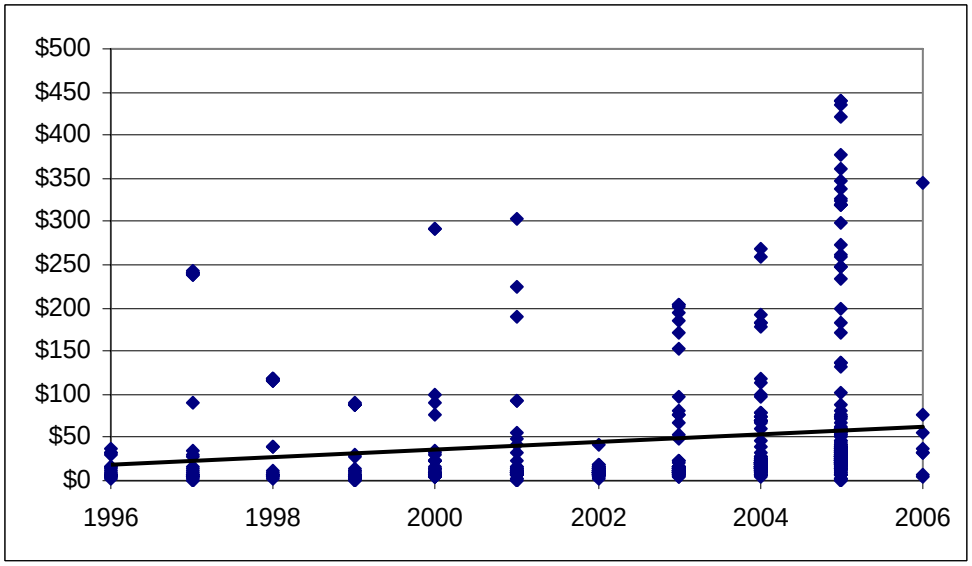
NOTE: Sales data for homes are grouped by lot size, not interior area. Earlier listings may contain some lots sold before house was built.
SOURCE: TMK data, as compiled by Hawaii Information Service.

Figure 4-2: Price Per Square Foot Interior Area, North Kona, 1996-2005



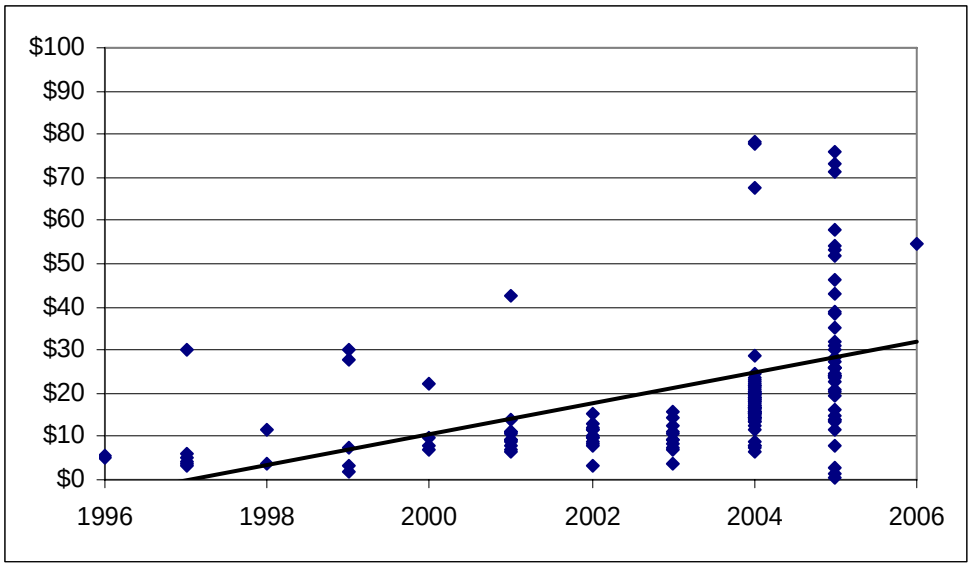
SOURCE: TMK files downloaded from Hawaii Information Service.

Figure 4-3: Sales Price Per Square Foot, Vacant Residential Land, TMK Area 3-7, for Lots from 7,000 to 22,000 Square Feet



SOURCE: TMK files downloaded from Hawaii Information Service.

Figure 4-4: Sales Price Per Square Foot of Land, Vacant Lot Sales, TMK Zone 3-7-3, for Lots from 7,000 to 22,000 Square Feet



SOURCE: TMK files downloaded from Hawaii Information Service.

5 REFERENCES

Hawaii State Department of Transportation, Airports Division. 2006. *Airport Activity Statistics by Calendar Year*. Website: http://www.hawaii.gov/dot/airports /publications/cysmallone.pdf; viewed on April 5, 2006.

Quirk, J. 2007. "Kona Affordable Housing Plan in Development." *West Hawaii Today*, March 6. Website: http://www.westhawaiitoday.com/articles/2007/03/06/local /local02.txt

SMS Marketing & Research Services, Inc. 2005. "Hawaii's Part-Time Residents." Presentation to Tourism and Travel Research Association, Hawaii Chapter by Aaron Peterson. Posted at http://www.smshawaii.com/ParttimeResidents.pdf; viewed on April 10, 2006.

———. 2003. *Hawaii Housing Policy Study: 2003 Update.* Prepared for the Housing and Community Development Corporation of Hawaii and others. Honolulu: HI. Website: http://www.hcdch.state.hi.us/05sales.pdf; viewed on April 12, 2006.

State of Hawaii, Department of Business, Economic Development and Tourism. 2005a. *Hawaii State Data Book, 2004.* Honolulu: HI. Website: http://www.hawaii.gov/dbedt /info/economic/databook/

———. 2005b. *Visitor Plant Inventory for 2004.* Honolulu: HI. Website: http://www.hawaii.gov/dbedt/info/visitor-stats/visitor-plant/

———. 2004. *Population and Economic Projections for the State of Hawaii to 2030*. Honolulu, HI. Website: http://www.hawaii.gov/dbedt/info/economic/data_reports /population-projections/.

———. No date. Website: http://www.hawaii.gov/dbedt/info/economic/data_reports /special/uiclaims.xls; viewed on August 21, 2006.

State of Hawaii, Department of Labor and Industrial Relations (DLIR). Website: http:///www.hiwi.org/cgi/dataanalysis/labForceReport.asp?menuchoice+labforce; viewed on August 21, 2006.

State of Hawaii, Public Housing Authority. 2006. *2006 Affordable Sales Price Guidelines.* Website: www.hcdch.sate.hi.us/06sales.pdf; viewed on August 30, 2006.

Sur, P. 2006. "More Supply, Less Demand." *Hawaii Tribune-Herald,* August 27, 2006.

Appendix B

CIVIL INFRASTRUCTURE

KULA NEI SUBDIVISION

TMK: 7-3-007: 38, 39; 7-3-009: 007

PREPARED FOR

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June 2007

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

1.0 PROJECT DESCRIPTION

The proposed development will be a master planned residential subdivision on approximately 128 acres of land located in North Kona, Hawaii.

The land use elements of the master plan includes approximately 270 residential units, community park, roadways, historic preservation, and associated infrastructure. Infrastructure facilities required to support the development include a wastewater collection, treatment and disposal or reuse system, a potable water system, and drainage facilities.

The preliminary development plan is summarized in Table 1-1.

TABLE 1-1: PRELIMINARY DEVELOPMENT PLAN

Land Use	Year							Total
	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	
Residential Units	39	40	40	39	40	38	34	270

The residential units are planned on approximately 92.5 acres, with unit sizes ranging from 800 to 3,000 square feet (sf). The balance of the 128 acre site will be used for a park, roads, and historic preservation.

2.0 EXISTING CONDITIONS

2.1 ROADWAYS AND TRAFFIC

There are no existing roadways within the project site. The parcel is bound by the existing subdivisions of Kona Hills Estates to the east, O'oma Plantation and Kona Acres to the north and the proposed Kaloko Heights subdivision to the south. Also located north and west of the project site are undeveloped state lands.

2.2 DRAINAGE FACILITIES

There are currently no existing drainage facilities onsite. Storm water disposal to drywells and lava sumps is typical in the North Kona area.

2.3 WATER SUPPLY

There is no existing water system on site. There are currently 4-inch and 6-inch County water lines along Kukuna Street, located just north of the project site within the Kona Acres subdivision. There are also 12-inch and 6-inch County water lines north of the project located in O'oma Plantation.

An existing 100,000 gallon County storage reservoir (Spillway Elevation = 950 ft) within Kona Acres is located approximately 1,700 feet north of the project site (Figure 1).

2.4 WASTEWATER COLLECTION, TREATMENT, AND DISPOSAL

There is currently no existing wastewater system within the project site. The nearest existing wastewater system is approximately 2.6 miles south of the project site, near the intersection of Kealakehe Parkway and Maiau Street (See Figure 6B). The existing County Wastewater Treatment Plant (WWTP) is located near Honokohau Marina and Small Boat Harbor.

3.0 PROPOSED CIVIL INFRASTRUCTURE

Infrastructure for the proposed project will be built over an approximately 7-year period as the project site is gradually developed. Construction is anticipated to begin in mid 2010 and provide the required infrastructure for the initial stages of development. From 2011 until 2016, the infrastructure systems will be expanded to accommodate the entire project. Construction of the proposed development is anticipated to be completed by mid 2017.

3.1 ROADWAYS

Kula Nei's internal roadways serving through-traffic will be generally designed as neighborhood streets with 50-foot rights-of-way. The County if Hawai'i's Planning Department has not determined at the time of this writing the design detail of Kula Nei's neighborhood streets, but the developer will comply with the public road design standards the County intends to require. All streets will accommodate pedestrian use, either with sidewalks or grassed shoulders.

3.1.1 OFFSITE ACCESS

Primary access to the site will be by an extension of Holoholo Street from Hina Lani Street through a currently undeveloped area identified as Kaloko Heights. Two secondary access routes will be provided. One will be from Hina Lani Street through Kaloko Heights, east of the primary access route. The other will be from Kaiminani Street through Kona Acres and through undeveloped State land by way of a planned Holoholo Street extension. (Figure 2).

3.1.2 ONSITE ROADS

MAIN ROADS

Holoholo Street, the main road through the project, will run in a north-south direction, providing site access as well as a pass through route from Kona Acres to Kaloko Heights.

The project will include one onsite main road, the "Loop Road" (Figure 3). Both Holoholo Street and the "Loop Road" will be dedicated to the County. It is anticipated that both Holoholo Street and the "Loop Road" will be designated as neighborhood streets with 50-foot rights-of-way by the County.

CUL-DE-SACS

Minor roads within the development will provide access to most of the residential units within the project. These local roads, which are not through roads, will also be dedicated to the County and will therefore comply with all County standards. It is anticipated that these streets will be designated as cul-de-sacs by the County.

3.2 SITE GRADING AND EROSION CONTROL

3.2.1 GRADING

The project does not propose major regrading of the site. The existing topography will be altered only to the extent necessary for construction of the proposed improvements. It is anticipated that grading will occur on a localized scale and that cut and fill quantities will generally balance as construction progresses.

3.2.2 EROSION CONTROL

During all phases of construction, erosion control practices will comply with both State and County regulations. NPDES permits will be obtained from the Hawaii Department of Health for storm water discharges from construction activities. Best management practice plans to control erosion during construction will be a component of the NPDES permits.

3.3 DRAINAGE FACILITIES

Storm water runoff from impervious areas will be collected through a system of swales, catch basins, and pipes and transported to shallow drywells or infiltration areas for disposal. The generally high permeability of the existing soils is evident by the absence of any natural storm water channels or gullies in the vicinity

of the site. Infiltration areas will be located in open spaces where practical. Shallow drywells will be located within roadway rights-of–way as needed.

3.4 WATER SYSTEM

The proposed water system was developed in accordance with the 2002 State of Hawaii Water System Standards. The design and construction of the proposed offsite water system and the onsite system within public rights-of-way will meet County Standards for future dedication.

The projected average water demand generated by the proposed development is approximately 120,000 gallons per day (gpd). All residences as well as the park will be served by the proposed water system. Water system calculations are provided in Appendix A.

3.4.1 OFFSITE

Water source and storage for the project will be provided by a new well and reservoir to be located on the parcel identified as TMK 7-3-006: por 036 and 037, approximately 0.86 miles east of the site (Figure 4).

A new 12-inch water line will connect the new reservoir to the existing 12-inch water line along Mamalahoa Highway. A second new 12-inch water line will extend westward from the 12-inch water line in Mamalahoa Highway, through parcels identified as TMK 7-3-007:042 and 043 to connect to the existing 12-inch water line in O'oma Plantation (TMK 7-3-007: 040 and 041). A 12-inch branch line through easements in O'oma Plantation will connect the project site to the existing 12-inch water line in O'oma Plantation.

The offsite water system improvements for the project will be provided by the owner for dedication to the County. Provision of water system capacity in excess of the water requirements for the Kula Nei project will be developed in the vicinity of Kula Nei.

3.4.2 ONSITE

The water system will consist of water lines to provide potable water service to all parcels within the project site. The water system will connect to the existing 12-inch water line on Kauila Alanui Street. A 15-foot wide easement will be needed through lots in O'oma Plantation. Stub outs will be provided at locations where onsite roads end at the property line and there is no existing water line.

The proposed development falls within the 950-ft, 1150-ft, and 1385-ft service zones. The majority of the site is located within the 1150-ft service zone and requires the construction of a 0.1 MG reservoir onsite (Figure 5). The water distribution system will be looped in order to provide reliable flow and pressure. Distribution pipes consist of 8-in and 12-in diameter pipes, due to the minimum required fire flow demands. Laterals sizes and locations to each lot will be determined during the design phase of the project.

3.5 WASTEWATER SYSTEM

The projected average wastewater flow generated by the project is approximately 81,000 gpd. Two wastewater collection and treatment alternatives are under consideration for the proposed development.

The proposed wastewater collection systems for the two alternatives identified below were configured to maximize the use of gravity flow and minimize pumping requirements for wastewater conveyance. Gravity flow is preferable to pumped flow for the following reasons:

- Gravity flow is more reliable than pumped flow.
- The maintenance and energy costs of operating sewage pump stations are significant.
- Standby power is required for sewage pump stations.
- A potential undesirable consequence of a pumping system failure is a sewage spill.

3.5.1 ALTERNATIVE 1: EXTENSION TO THE COUNTY SYSTEM

This alternative consists of connecting the onsite wastewater collection system to the County system at Kealakehe Parkway and Maiau Street (Figures 6A and 6B). The County collection system discharges to the County wastewater treatment plant (WWTP) at Kealakehe.

The onsite collection system would include two wastewater pump stations to pump sewage from areas that can not be served by gravity to the proposed gravity sewer line near the southern project boundary at Holoholo Street. Two pump stations are required, because the areas served are divided by an archaeological reserve that precludes a sewer line crossing.

Offsite gravity sewer lines would be constructed south from the project site along the proposed Holoholo Street alignment, west along Hina Lani Street, and south along the proposed Maiau Street alignment to an existing 18-inch County line at Kealakehe Parkway. The offsite sewer lines would be funded jointly with other developments that would be served by the new sewer lines.

3.5.2 ALTERNATIVE 2: INDIVIDUAL WASTEWATER SYSTEMS (IWSS) AND ONSITE WASTEWATER TREATMENT AND DISPOSAL

This alternative consists of using IWSs for lots 10,000 SF and larger. All remaining lots will be serviced by a private onsite collection system and WWTP. See Figure 7 for a proposed layout.

In this alternative, a WWTP located onsite, would provide service to approximately 80 residential units. The average flow to the WWTP would be approximately 25,200 gpd. The proposed wastewater treatment plant site would occupy approximately 0.5 acre and a minimum of 2 acres would be reserved for an onsite leaching field for effluent disposal.

The 10,000 SF and larger lots would each be served by an IWS. The typical IWS consists of a septic tank and leaching field on the lot that it serves. All IWSs will comply with the applicable State Department of Health (DOH) regulations.

Wastewater solids in the form of sludge from the WWTP and septage from septic tanks will be removed periodically by pumper trucks for disposal at the County WWTP, located approximately 4.25 miles southwest of the project site. The maximum anticipated frequency of sludge removal would be weekly from the proposed WWTP and annually from individual septic tanks. After processing by the County plant, dewatered biosolids would ultimately be disposed by the County. The current practice is to dispose of the solids at the West Hawaii County Landfill, approximately 3.5 miles south of the Queen Ka'ahumanu Highway/Waikoloa Road junction. The maximum rate of dewatered solids resulting from the proposed onsite WWTP is anticipated to be approximately 170 pounds per week. The maximum rate of dewatered solids resulting from the septic tank pumping at the project site is anticipated to be approximately 290 pounds per week.

3.5.3 PREFERRED WASTEWATER MANAGEMENT ALTERNATIVE

Wastewater Alternative 2, IWSs and Onsite Wastewater Treatment and Disposal, is the preferred wastewater management alternative based on the following reasons:

- IWSs and Onsite Wastewater Treatment and Disposal is the lowest cost alternative. Alternative 1, Connection to the County System is expected to be the most expensive.
- IWSs and Onsite Wastewater Treatment and Disposal will have the most aesthetic appearance as it will not require the construction of multiple pump stations.
- IWSs and Onsite Wastewater Treatment and Disposal will have the least impact on neighboring properties.
- The ability to address future system needs will be easier since all wastewater will be disposed of and treated onsite.

3.6 SOLID WASTE

The County of Hawai'i requires all solid waste (also known as rubbish), to be removed from all buildings and premises and disposed of at an approved solid waste disposal facility. All solid waste generated from the project will be taken to the West Hawai'i Landfill, a County transfer station, or recycled.

The Kula Nei Project is expected to begin construction in mid-2010, building approximately 40 units per year. The project is estimated to be completed in mid-2017 and will consist of 270 residential units.

Over the 7 year build out period, the average amount of solid waste generated by construction and operational activities is anticipated to range from 112 tons/year – 229 tons/year and 493 tons/year, respectively.

A preliminary solid waste management plan is provided in Appendix B.

4.0 PROBABLE IMPACTS AND PROPOSED MITIGATION

4.1 POTENTIAL SHORT-TERM IMPACTS

4.1.1 ROADS

The major road running through the site in a north-south direction, the extension of Holoholo Street, will be constructed in the early stages of development. It will provide site access as well as a through route between the existing Kona Acres to the north and the proposed Kaloko Heights residential development to the south.

No significant short-term environmental impacts are anticipated from the development of roadways associated with this project. Regional traffic impacts are assessed in a separate report.

4.1.2 GRADING, DRAINAGE, AND EROSION CONTROL

During grading activities, portions of the site would be disturbed and the potential for site erosion would increase. The contractor would be required to implement a best management practices (BMP) plan to contain and control site erosion and to prevent the discharge of sediment from the site. Based on the requirement for construction activities to comply with an approved BMP plan, the short-term environmental impacts from grading activities are anticipated to be insignificant.

The increase of impermeable surfaces resulting from site development will have the effect of increasing storm water runoff quantities on site. The runoff will be collected and discharged to on-site sumps and drywells for percolation into the ground. Thus, precipitation falling on the site will discharge into the ground as it does under pre-development conditions, and off-site runoff will not increase as a result of the proposed development.

4.1.3 WATER ENVIRONMENT

4.1.3.1 SURFACE WATER

There are no surface water bodies on or near the project site. As indicated in Section 4.1.2, the implementation of a BMP plan during construction will prevent the discharge of sediment from the site. As areas of the site are developed, drainage systems will collect runoff and discharge it to the subsurface. The project will be designed such that peak runoff rates from the site will not increase as a result of site development. The project will have no significant short-term effects on surface waters.

4.1.3.2 GROUNDWATER

Precipitation on the site currently percolates to the underlying groundwater. This will continue to be the case during and after site development. The construction activities BMP plan will require the contractors to manage materials to prevent the discharge of pollutants to the ground. After development, landscape management practices will be applied in public areas to minimize the use of fertilizers and pesticides that could potentially enter the groundwater. Based on the mitigative measures of conformance to a BMP plan during construction, it is anticipated that short-term impacts upon the local groundwater quality will not be significant.

4.1.4 WATER SUPPLY

Water supply infrastructure, including distribution lines and storage reservoirs will be constructed as approved by the County of Hawaii Department of Water Supply (DWS) and as needed for site development. No short-term detrimental impacts on the existing water supply system are anticipated as a result of the proposed project.

4.1.5 WASTEWATER

4.1.5.1 ALTERNATIVE 1: EXTENSION TO THE COUNTY SYSTEM

Extension of the County collection system to serve the proposed development would not have significant short-term impacts on the environment. Construction activities would conform to the applicable environmental requirements for storm water protection and mitigation of potential noise and dust impacts. County fees associated with permission to connect would be applied by the County to upgrade existing collection, treatment, and disposal facilities on an as-needed basis.

4.1.5.2 ALTERNATIVE 2: INDIVIDUAL WASTEWATER SYSTEMS AND ONSITE WASTEWATER TREATMENT AND DISPOSAL

The use of a combination of IWSs and onsite collection, treatment, and disposal will not impact any existing wastewater systems. Both IWSs and the proposed onsite wastewater treatment and disposal systems would conform to DOH requirements. Effluent that is discharged to the ground would conform to the applicable regulations and would not significantly affect the underlying aquifer or regional coastal waters.

4.1.6 SOLID WASTE

No significant short-term impacts on the existing solid waste collection and disposal systems or the environment are anticipated as a result of the proposed development.

4.2 POTENTIAL LONG-TERM IMPACTS

4.2.1 ROADS

No significant long-term environmental impacts are anticipated from the development of roadways associated with this project. Regional traffic impacts are assessed in a separate report.

4.2.2 DRAINAGE AND EROSION CONTROL

Site drainage in the long term would continue to be discharged to the subsurface and to recharge the underlying groundwater aquifer. After the completion of project construction, ground surfaces would be stable and the potential for erosion would be minimal. Long-term impacts of the project on drainage and erosion control are not anticipated to be significant.

4.2.3 WATER ENVIRONMENT

4.2.3.1 SURFACE WATER

The long-term impacts of the project on surface water in the vicinity of the project site would be similar to the impacts described under Potential Short-Term Impacts, and would not be significant.

4.2.3.2 GROUNDWATER

The long-term impacts of the project on groundwater in the vicinity of the project site would be similar to the impacts described under Potential Short-Term Impacts, and would not be significant.

4.2.4 WATER SUPPLY

The long-term impacts of the project on the DWS water production and transmission system would be to increase capacity of the existing system. No long-term detrimental impacts on the existing water supply system are anticipated as a result of the proposed project.

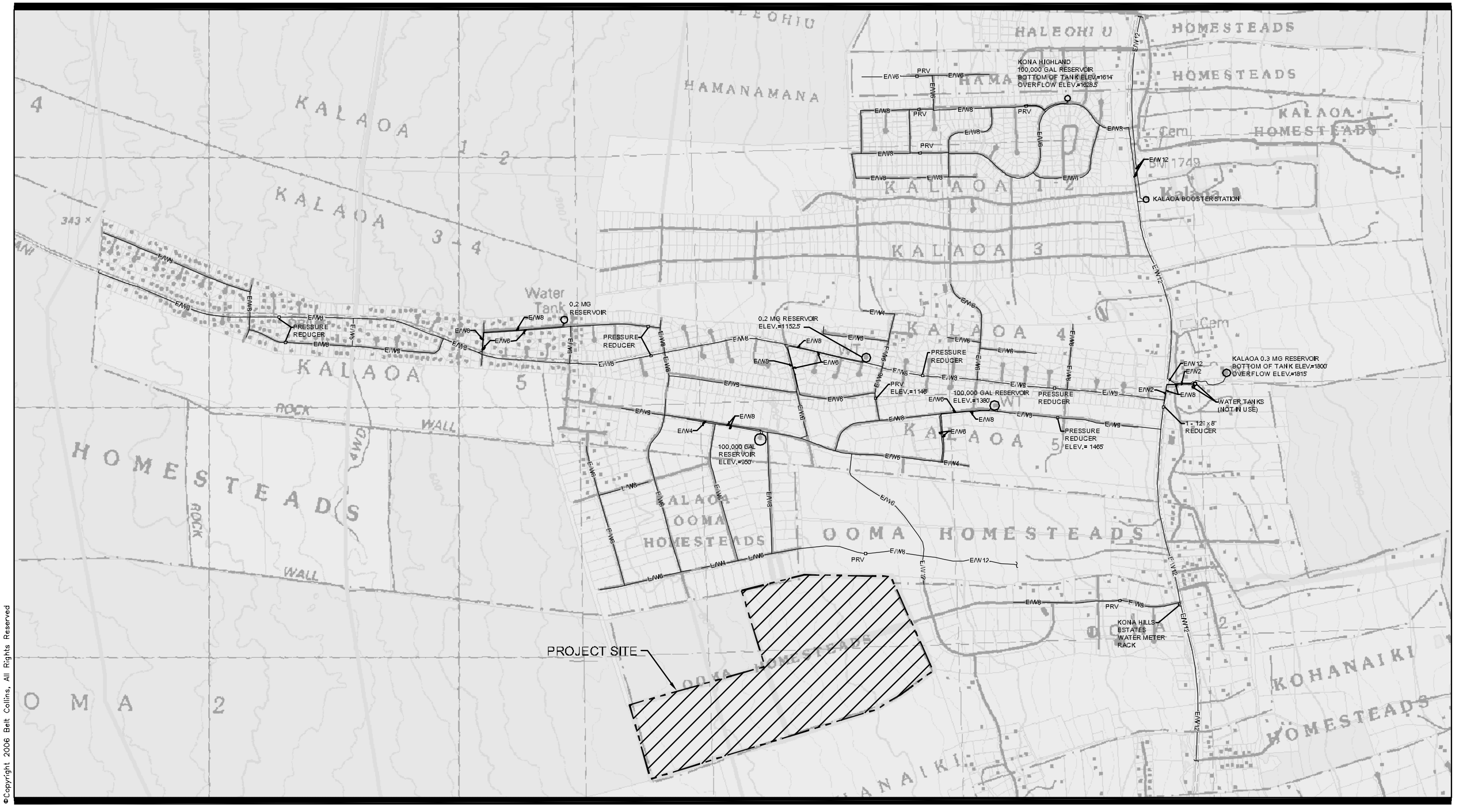
4.2.5 WASTEWATER

The long-term impacts of each of the two wastewater system alternatives would not be significant, because implementation of each alternative, including the treatment and disposal of wastewater, would be in conformance to the applicable regulations. Long-term impacts would be expected to be similar to the short-term impacts identified above, except that construction activities would be greatly reduced and would only be implemented on an as-needed basis to meet infrequent repair and replacement needs.

4.2.6 SOLID WASTE

No significant long-term impacts on the solid waste collection and disposal system or the environment are anticipated as a result of the proposed development.

Thu, 07 Jun 2007 – 10:23am
M:\Ooma Plantation\2006331300\CAD\Sheets\Figure 1-N Kona Ex System.dwg



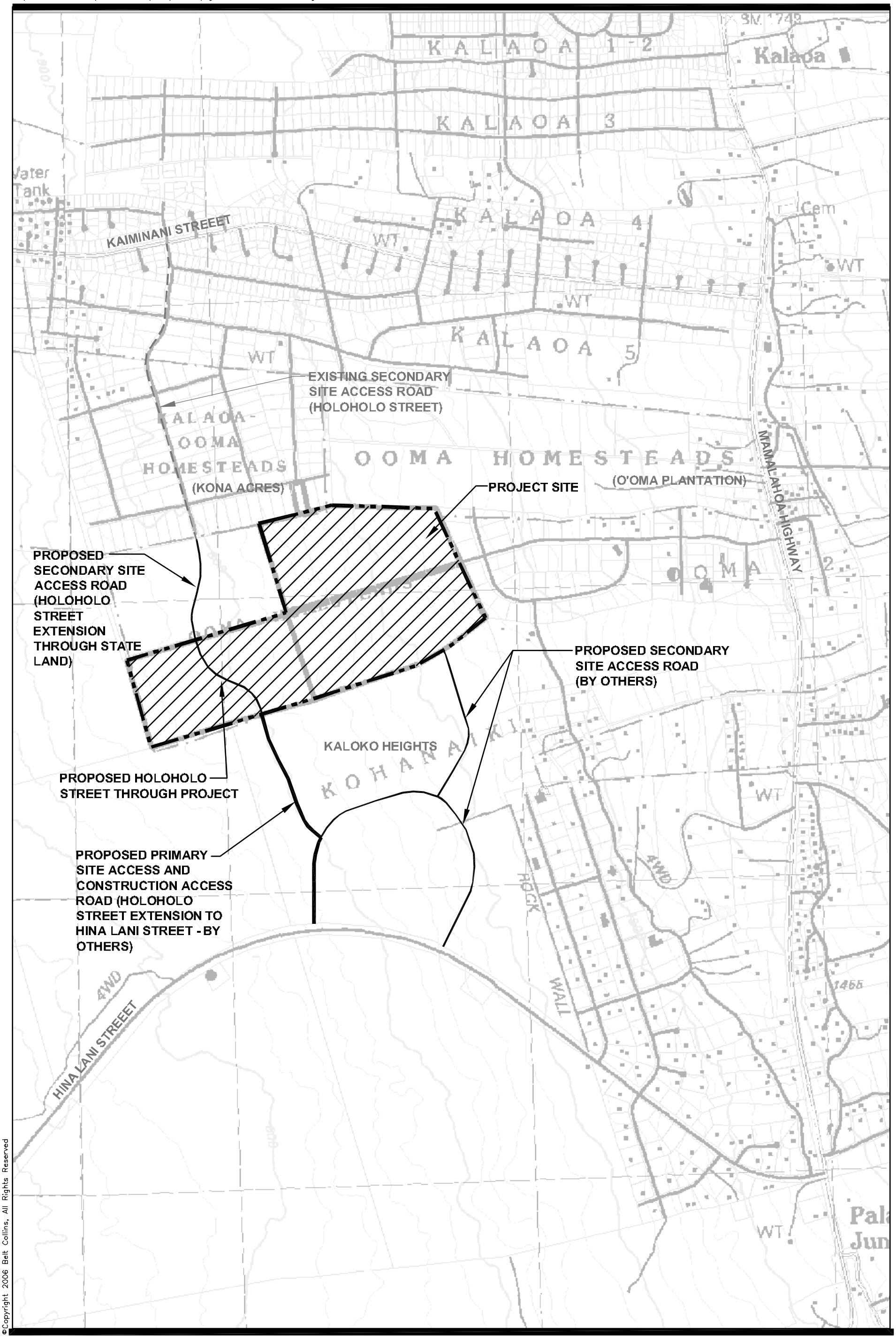
Belt Collins

NORTH

0 300 600 1200
SCALE IN FEET

Figure 1
PARTIAL NORTH KONA EXISTING WATER SYSTEM MAP

KULA NEI PROJECT
SHOPOFF GROUP
JUNE 2007



Belt Collins

NORTH

0 250 500 1000
SCALE IN FEET

Figure 2
PROPOSED OFFSITE SITE ACCESS

KULA NEI PROJECT
SHOPOFF GROUP
JUNE 2007

Thu, 07 Jun 2007 – 10:24am
M:\Ooma Plantation\2006331300\CAD\Sheets\Figure 3-Onsite Roads.dwg

KONA ACRES

KUKUNA STREET

HOLOHOLO STREET

KAUILA

KUKUNA STREET

PROPOSED "LOOP ROAD"

KONA HILLS ESTATES

HANE STREET

PROPOSED HOLOHOLO STREET EXTENSION (ACROSS STATE LAND)

STATE OF HAWAII

OLD HOMESTEAD ROAD (TRAIL)

PARK

WWTP

AFFORDABLE HOUSING

KALOKO HEIGHTS

BeltCollins

NORTH

0 100 200 400
SCALE IN FEET

LEGEND

ONSITE MINOR ROADS

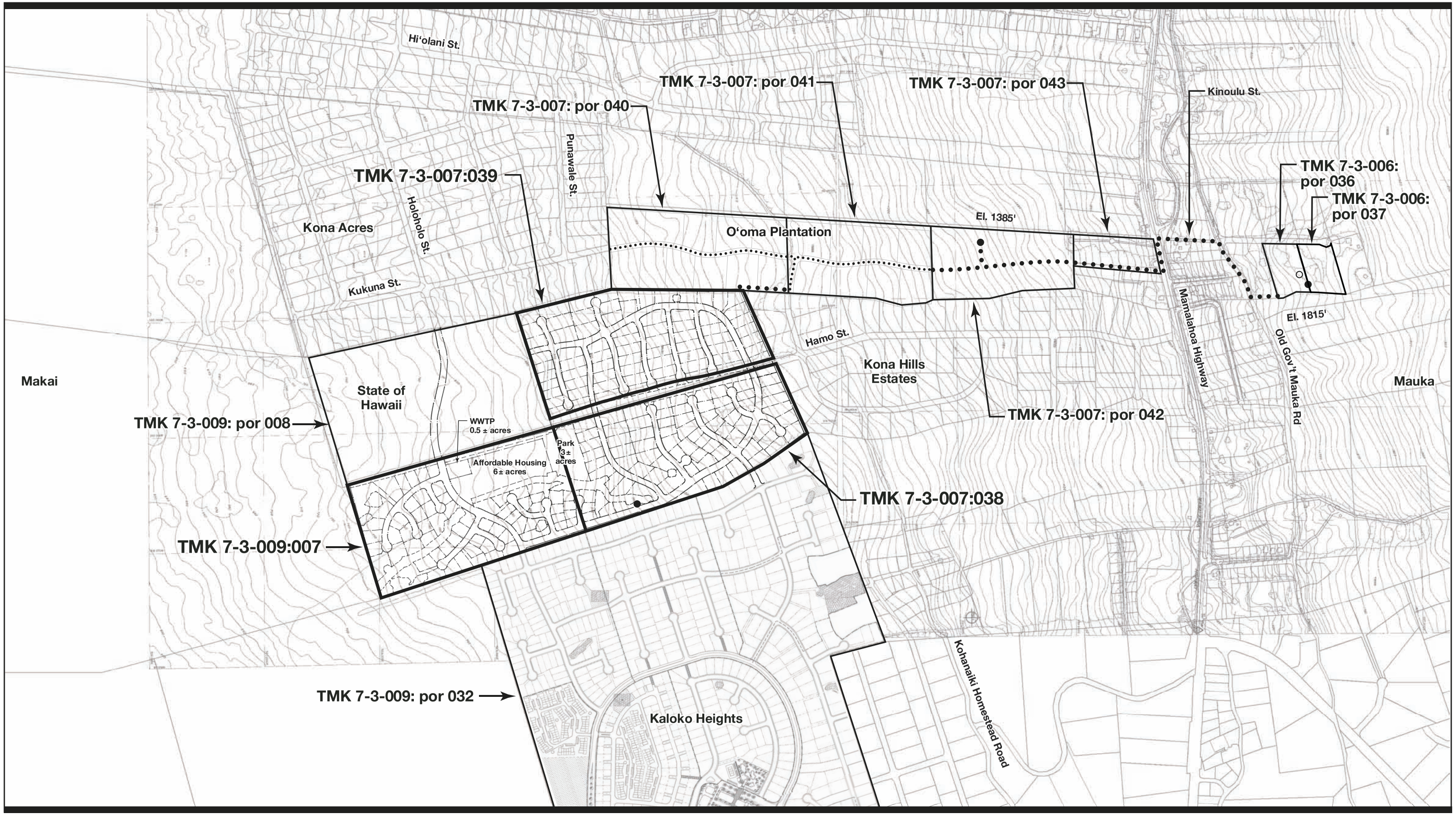
ONSITE CUL-DE-SAC STREETS

PROPOSED ROAD BY OTHERS

PROJECT BOUNDARY

Figure 3
PROPOSED ONSITE ROADS

KULA NEI PROJECT
SHOPOFF GROUP
JUNE 2007



Belt Collins

NORTH

0 400 800
SCALE IN FEET

LEGEND

- Proposed Water Line
- Existing Water Line
- Well Site
- Reservoir Site
- Project Area

Figure 4
PROPOSED OFF-SITE WATER SYSTEM
Kula Nei
North Kona, Hawaii
Environmental Impact Statement
Prepared for The Shopoff Group
June 2007

KONA ACRES

KUKUNA STREET

HOLOHOLO STREET

1-PRV
ELEV.=1050'

E/W6

E/W12

W12

CONNECT TO EXIST 12" WATER LINE

HAMO STREET

KONA HILLS ESTATES

HANE STREET

PROPOSED
HOLOHOLO STREET
EXTENSION (ACROSS
STATE LAND)

OLD HOMESTEAD
ROAD (TRAIL)

STATE OF HAWAII

PARK

WWTP

AFFORDABLE HOUSING

W8

W12

RESERVOIR SITE
1-0.1 MG RESERVOIR
OVERFLOW ELEV.=950'

1050

950

850

KALOKO HEIGHTS

STUBOUT FOR CONNECTION TO WATER LINE
IN NEIGHBORING DEVELOPMENT (TYP)

LEGEND

———W8———	950' RESERVOIR SYSTEM (650' - 850')
— · —W8— · —	1150' RESERVOIR SYSTEM (850' - 1050')
– – – –W8– – – –	1385' RESERVOIR SYSTEM (1050' and 1250')
----E/W12----	EXISTING WATER LINE
—·—·—·—	PROPOSED 15 FT WIDE WATER LINE EASEMENT
✲	PROPOSED FIRE HYDRANT (LOCATIONS ARE CONCEPTUAL)

Belt Collins

NORTH

0 75 250 500
SCALE IN FEET

Figure 5
PROPOSED ONSITE WATER SYSTEM

KULA NEI PROJECT
SHOPOFF GROUP
JUNE 2007

KONA ACRES

KUKUNA STREET

HOLOHOLO STREET

KAULA

KUKUNA STREET

HAMO STREET

KONA HILLS ESTA

HANE STREET

PROPOSED HOLOHOLO STREET EXTENSION (ACROSS STATE LAND)

OLD HOMESTEAD ROAD (TRAIL)

STATE OF HAWAII

PARK

WWTP

AFFORDABLE HOUSING

S8

STM6

PROPOSED SEWAGE PUMP STATION NO. 1

PROPOSED SEWAGE PUMP STATION NO. 2

PROPOSED CONSTRUCTION ACCESS ROAD

KALOKO HEIGHTS

S10

SEE FIGURE 6B FOR CONTINUATION

Belt Collins

NORTH

0 100 200 400
SCALE IN FEET

LEGEND

- ONSITE GRAVITY SEWER LINE
- OFFSITE GRAVITY SEWER LINE
- ONSITE GRAVITY SEWER LINE WITHIN PRIVATE EASEMENT
- ONSITE SEWER FORCE MAIN
- PROJECT BOUNDARY

Figure 6A
SEWER PLAN - OPTION 1: OFFSITE SEWER CONNECTION

KULA NEI PROJECT
SHOPOFF GROUP
JUNE 2007

Belt Collins

NORTH

0 200 400 800
SCALE IN FEET

Figure 6B
SEWER ALTERNATIVE 1: CONNECTION TO COUNTY WWTP

KULA NEI PROJECT
SHOPOFF GROUP
JUNE 2007

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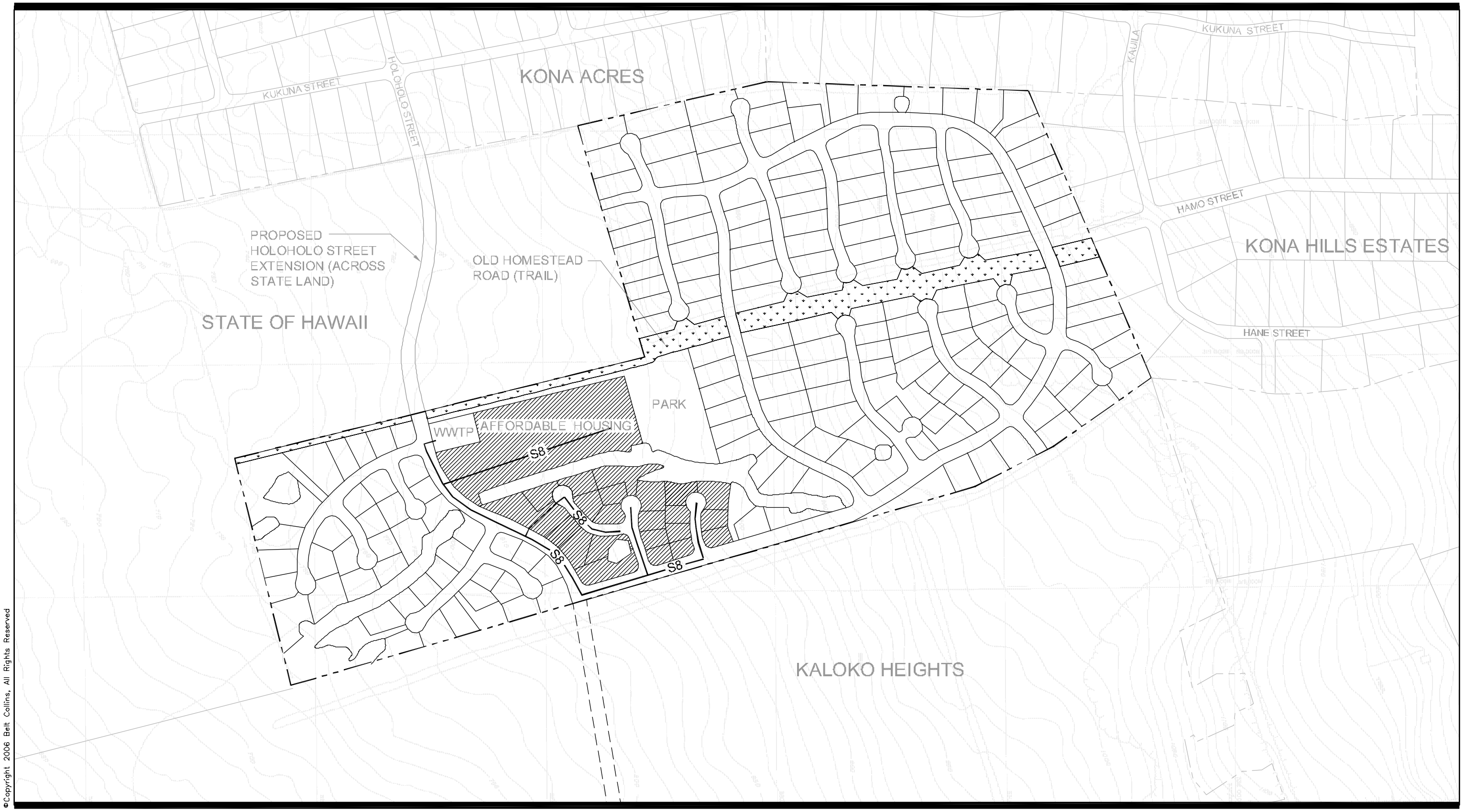


Belt Collins

NORTH

0 100 200 400
SCALE IN FEET

LEGEND

—S8— PROPOSED SEWER LINE
---S8--- PROPOSED SEWER LINE WITHIN PRIVATE EASEMENT
— - - — PROJECT BOUNDARY

LOTS SERVICED BY WWTP
LOTS SERVICED BY IWS

Figure 7
SEWER PLAN - OPTION 2: ONSITE WWTP/IWS

KULA NEI PROJECT
SHOPOFF GROUP
JUNE 2007

APPENDIX A:
WATER AND SEWER CALCULATIONS

Kula Nei Project
Potable Water Demand Projections

Description	No. of Units	Flow Rate							
		Unit Demand	Units	Average[1] (gpd)	Peak Factor	Peak Hour[2] (gph)	Peak Hour[3] (gpm)	Max. Daily[4] (gpd)	Max. Daily + Fire[5] (gpm)
Residential Units	270	400	gpu	108,000	5	22,500	375	162,000	1,613
Park	N/A	4000	gpa	12,000	5	2,500	42	18,000	N/A
Total	**270**			**120,000**	**5**	**25,000**	**417**	**180,000**	**1,625**

Notes:
1. Average Flow Rate (gpd) = No. of Units x Unit Demand (gpu or gpa)
2. Peak Hour (gph) = Average (gpd) x Peak Factor
3. Peak Hour (gpm) = Peak Hour (gph) / 60 (min/hour)
4. Max Daily (gpd) = 1.5 x Average Flow Rate (gpd)
5. Max Daily + Fire (gpm) = If {SFR Lot Size > 10,000 sf}, then {Max Daily Flow Rate (gpd) / 1,440 (min/day) + 500 (gpm)}
   If {SFR Lot Size < 10,000 sf}, then {Max Daily Flow Rate (gpd) / 1,440 (min/day) + 1,000 (gpm)}
   If {PUD Townhouse / Low Rise Apartments}, then {Max Daily Flow Rate (gpd) / 1,440 (min/day) + 1,500 (gpm)}

Reservoir Capacity
1. Meet Max. Daily Flow Rate + Fire Flow (Reservoir 3/4 full)
   Max. Daily Flow Rate: 180,000 gpd = 125 gpm
   Required Fire Flow: 1,500 gpm
   Max. Daily Flow Rate + Required Fire Flow: 1,625 gpm
   Max. Daily Flow Rate + Required Fire Flow for 120 minute duration: 1,625 gpm x 120 gpm = 195,000 gallons
   Full Tank Size (must be 3/4 full at start of fire): 195,000 gallons / 0.75 = **260,000 gallons**
2. Meet Max. Daily Consumption in 24 Hours
   Max Daily Flow Rate: **180,000 gallons**

Since 260,000 gallons > 180,000 gallons,
Minimum Required Reservoir Size: 0.3 MG

Abbreviations
sf: square feet
gpd: gallons / day
gph: gallons / hour
gpm: gallons / minute
N/A: Not Applicable

Kula Nei Project

Wastewater Flow Projections

Option 1: Connect to County System

Description	Area (ac)	No. of Units	Equivalent Population[1]	Flow Rate						Babbit Peak Factor[3]	Dry Weather I/I		Wet Weather I/I	
				Per Capita gpcd	Avg[2] gpd	Design Avg[6] gpd	Max[7] gpd	Design Max[8] gpd	Peak[9] gpd		gpcd	Total (gpd)[4]	gpad	Total (gpd)[5]
Residential Units	81.9	270	1,012	80	80,928	85,986	403,708	408,766	511,106	5.0	5	5,058	1,250	102,340
Total	**81.9**	**270**	**1,012**	**80**	**80,928**	**85,986**	**403,708**	**408,766**	**511,106**	**5.0**	**5**	**5,058**	**1,250**	**102,340**

Lots Serviced by SPS No. 1

Description	Area (ac)	No. of Units	Equivalent Population[1]	Flow Rate						Babbit Peak Factor[3]	Dry Weather I/I		Wet Weather I/I	
				Per Capita gpcd	Avg[2] gpd	Design Avg[6] gpd	Max[7] gpd	Design Max[8] gpd	Peak[9] gpd		gpcd	Total (gpd)[4]	gpad	Total (gpd)[5]
Residential Units	13.4	83	264	80	21,088	22,406	105,440	106,758	123,556	5.0	5	1,318	1,250	16,798
Total	**13.4**	**83**	**264**	**80**	**21,088**	**22,406**	**105,440**	**106,758**	**123,556**	**5.0**	**5**	**1,318**	**1,250**	**16,798**

Lots Serviced by SPS No. 2

Description	Area (ac)	No. of Units	Equivalent Population[1]	Flow Rate						Babbit Peak Factor[3]	Dry Weather I/I		Wet Weather I/I	
				Per Capita gpcd	Avg[2] gpd	Design Avg[6] gpd	Max[7] gpd	Design Max[8] gpd	Peak[9] gpd		gpcd	Total (gpd)[4]	gpad	Total (gpd)[5]
Residential Units	7.7	28	112	80	8,960	9,520	44,800	45,360	54,966	5.0	5	560	1,250	9,606
Total	**7.7**	**28**	**112**	**80**	**8,960**	**9,520**	**44,800**	**45,360**	**54,966**	**5.0**	**5**	**560**	**1,250**	**9,606**

Notes:

1. Equivalent Population = No. of Units x 4 persons / home (SFR) or No. of Units x 2.8 persons/home (MFR)
2. Average Flow Rate (gpd) = Per Capita Flow Rate (gpcd) x Equivalent Population
3. Babbit Peak Factor = If {5 / (Average Flow Rate (gpd) / 80 (gpd) / 1000)$^{0.2}$} > 5, then 5
4. Total Dry Weather I/I (gpd) = (Average Flow Rate (gpd) / 80 (gpcd)) x 5 (gpcd)
5. Total Wet Weather I/I (gpd) = 1,250 (gpad) x Area (ac)
6. Design Average Flow Rate (gpd) = Average Flow Rate (gpd) + Total Dry Weather I/I (gpd)
7. Max Flow Rate (gpd) = Average Flow Rate (gpd) x Babbit Peak Factor
8. Design Max Flow Rate (gpd) = Max Flow Rate (gpd) + Total Dry Weather I/I (gpd)
9. Peak Flow Rate (gpd) = Design Max Flow Rate (gpd) + Total Wet Weather I/I (gpd)

Abbreviations:

ac: acres
sf: square feet
gpd: gallons / day
gpad: gallons / acre / day
gpcd: gallons / capita / day
SFR: single family residential
MRF: multi family residential

References: City and County of Honolulu, *Design Standards of the Department of Wastewater Management* Vol 1, July 1993

Kula Nei Project

Wastewater Flow Projections

Option 2: Onsite WWTP / IWSs

Lots Serviced by Onsite WWTP

Description	No. of Units	Total Capita	Gallon per Capita (gpc)	Average Flow Rate[1] (gpd)	Required Absorption Area[2] (sf / 200 gallons)	Min Required Absorption Area[3] (sf)	Min Required Absorption Area (acres)	Required Absorption Area[4] (acres)
Residential Units	80	252	100	25,160	330	41,514	0.95	1.9
Total:				**25,160**	**330**	**41,514**	**0.95**	**1.9**

Notes:

1. Average Flow Rate: Total Capita x Gallon per Capita
2. Required Absorption Area: Assumed 60 min/in percolation rate
3. Min Required Absorption Area: (Required Absorption Area / 200 gallons) x Average Flow Rate
4. Required Absorption Area: 2 x Min Required Absorption Area
   Assumes 100% Redundancy

Abbreviations:

ac: acres	gpc: gallons / capita
sf: square feet	bldg: building
gpd: gallons / day	min: minimum

References:

1. Hawaii Administrative Rules Title 11. Department of Health Chapter 62: Wastewater Systems

APPENDIX B:
SOLID WASTE MANAGEMENT PLAN

B. SOLID WASTE

According to the Hawai'i County Code, solid waste (also known as rubbish) is defined as "any rejected material including paper and cardboard cartons, straw, excelsior, rags, clothes, shoes….and any other material of similar character". If not properly managed, solid waste can have serious negative effects on the environment which could potentially lead to various public health problems. The County of Hawai'i therefore requires solid waste to be removed from any building or premise and disposed of at an approved solid waste disposal facility.

Quantities of solid waste were estimated for both construction and operation phases of the planned development. The "construction phase" of development is anticipated to be from 2010 - 2017 when all planned facilities at the Kula Nei project will be under construction. The "operations phase" of development refers to the time at which all facilities have been constructed and are open for use. The construction and operations phases are expected to overlap, as construction of later portions of the Kula Nei Project will continue while earlier portions are completed and occupied.

B.1 CONSTRUCTION PHASE

As previously mentioned, construction of the proposed development is anticipated to start in mid-2010 and continue for 7 years until mid-2017. Projected building floor areas were used to estimate the amount of solid waste generated during construction (Tables B-1 and B-2). A range of 3.0 to 5.2 pounds (lbs) of construction waste per square foot (ft^2) of building floor area was used to estimate the amount of solid waste generated by construction activities.

TABLE B-1: BUILDING FLOOR AREA

Building	Area (ft^2)
Residential Units	800 – 3,000

TABLE B-2: SOLID WASTE GENERATION PROJECTIONS – CONSTRUCTION

Building Description	Year (tons / year)[1,2]						
	2010 - 2011	2011 - 2012	2012 - 2013	2013 - 2014	2014 - 2015	2015 - 2016	2016 - 2017
Residential Units	128 – 224	132 – 229	132 – 229	128 – 224	132 – 229	125 – 218	112 – 195

Notes:

1. All calculations, except the existing structure, are based on (3.0 lbs/ft^2) x (area of building) x (number of buildings constructed/year) to (5.2 lbs/ft^2) x (area of building) x (number of buildings constructed/year). Pounds were multiplied by 5 x 10^{-4} (or 1/2000) to convert to tons.

2. Calculation of construction waste is based on the assumption that the construction period will occur from mid-2010 through mid-2017.

Shown below in Table B-3 is an estimate of the components of construction waste based upon its typical composition. Table B-3 is an estimate only as the composition of construction waste will vary according to the material selected for the each individual facility.

TABLE B-3: SOLID WASTE COMPOSITION - CONSTRUCTION

Waste Type	% of Total Waste[1]	Year (tons / year)[2]						
		2010 - 2011	2011 - 2012	2012 - 2013	2013 - 2014	2014 - 2015	2015 - 2016	2016 - 2017
Wood	41.9	53 – 94	55 – 96	55 – 96	53 – 94	55 – 96	52 – 91	47 – 82
Drywall	28.2	36 – 63	37 – 65	37 – 65	36 – 63	37 – 65	35 – 62	31 – 55
Cardboard	6.5	8 – 15	8 – 15	8 – 15	8 – 15	8 – 15	8 – 15	7 – 13
Metal	1.6	2 – 4	2 – 4	2 – 4	2 – 4	2 – 4	2 – 4	1 – 4
Other[3]	21.9	28 – 49	28 – 51	28 – 51	28 – 49	28 – 51	27 – 48	24 – 43
Total	100.0	128 – 224	132 – 229	132 – 229	128 – 224	132 - 229	125 - 218	112 – 195

Notes:
1. HABiT, 2000.
2. Calculations based on annual waste generated.
3. Composed of plastics, shingles, ceramic, etc.

B.2 OCCUPANCY PHASE

The occupancy phase is anticipated to start in mid-2011 and increase continually until full occupancy is achieved in mid-2017. This assessment assumes that occupancy of units will lag construction by an average of 1 year. The quantity of solid waste generated by occupied residences is estimated as a function population rather than building floor area. This assessment is based on an assumed average of 4 persons per single family unit, 2.8 persons per multi family unit, and an assumed solid waste generation rate of 6.2 lbs of solid waste per person per day. Table B-4 provides population and residential solid waste estimates for 2011 through full occupancy in 2017.

TABLE B-4: SOLID WASTE GENERATION PROJECTIONS – RESIDENTIAL OCCUPANCY

Building Type	Year (tons / year)						
	2011 - 2012	2012 - 2013	2013 - 2014	2014 - 2015	2015 - 2016	2016 - 2017	2017 and Beyond
Total Population	156	312	424	560	720	872	1,008
Daily Waste Generation[2] (lbs/day)	967	1,934	2,629	3,472	4,464	5,406	6,250
Annual Waste Generation[3] (tons/year)	177	353	480	634	815	987	1,141

Notes:
1. Calculations are based on (6.2 lbs/person/day) x (total estimated population).
2. Based on an average of 4 persons per single family unit and 2.8 persons per multi family unit.
3. Annual waste generation = (daily waste generation) x (365 days) x (5 x 10^{-4} tons/lb).

The composition of wastes generated during the operations at the planned development is based upon the 1993 Hawai'i Integrated Solid Waste Management Plan as well as a 2003 Oahu Waste Composition Study. Table B-5 includes waste composition proportions anticipated at the proposed development. Management of these wastes is discussed in the following section.

TABLE B-5: SOLID WASTE COMPOSITION - OPERATIONS

Waste Type	% of Total Waste[1]	Year (tons / year)[2]						
		2010 - 2011	2011 - 2012	2012 - 2013	2013 - 2014	2014 - 2015	2015 - 2016	2016 - 2017
Paper	16.7	30	59	80	106	136	165	190
Yard Waste	12.5	22	44	60	79	102	123	143
Food Waste	8.4	15	30	40	53	68	83	96
Plastic	4.4	8	16	21	28	36	44	50
Other Organic	21.5	38	76	103	136	175	212	245
Metals	13.1	23	46	63	83	107	129	149
Glass	1.6	3	6	8	10	13	16	18
Other Inorganic	21.8	39	77	105	138	178	215	249
Total	100.0	177	353	480	633	814	986	1,140

Notes:
1. 1993 County of Hawai'i Integrated Solid Waste Management Plan, 2003 Oahu Waste Composition Study
2. Calculations based on annual waste generated.

B.3 SOLID WASTE MANAGEMENT

Solid wastes generated by the project will be collected and disposed at approved County solid waste disposal facilities. Solid wastes will be managed in conformance with the applicable DOH and County requirements.

CONSTRUCTION PHASE

Table B-2 shows the amount of construction waste that is expected to be generated during the construction of the Kula Nei Project from mid 2010 to mid 2017.

The primary method of reducing (or mitigating) the amount of construction waste to be hauled offsite is recycling. The following items or materials will be recycled to the extent practicable: green waste (processed and used on site), wood waste (processed with green waste when practical, depending on type of wood and ability to chip, and used on site), cardboard (recycled off site), and metals (recycled off site). The remaining categories of wastes (i.e., drywall, other) may be recycled if a local recycling vendor is available. Otherwise, these non-recyclable wastes will be hauled to the landfill. The construction waste that may be diverted or recycled is shown in Table B-7. Remaining waste which cannot be diverted or recycled will likely be hauled to the landfill.

TABLE B-7: SOLID WASTE COMPOSITION DIVERTED OR RECYCLED - CONSTRUCTION

Waste Type	% of Total Waste[1]	Year (tons / year)[2]						
		2010 - 2011	2011 - 2012	2012 - 2013	2013 - 2014	2014 - 2015	2015 - 2016	2016 - 2017
Wood	41.9	53 – 94	55 – 96	55 – 96	53 – 94	55 – 96	52 – 91	47 – 82
Cardboard	6.5	8 – 15	8 – 15	8 – 15	8 – 15	8 – 15	8 – 14	7 – 13
Metal	1.6	2 – 4	2 – 4	2 – 4	2 – 4	2 – 4	2 – 4	1 – 4
Total	100.0	64 – 112	65 – 115	65 – 115	64 – 112	66 – 115	62 – 109	56 – 98

Notes:
1. HABiT, 2000.
2. Calculations based on annual waste generated.

OPERATIONS PHASE

The primary method of reducing (or mitigating) the amount of operations waste to be hauled offsite is recycling. To the extent practicable, the planned development will arrange for green waste (e.g., yard waste) generated during grounds keeping be collected and processed for use as soil amendment on the site. Wastes that cannot be incorporated into green waste processing on site will be minimized, and recycled or hauled to the landfill as appropriate. Future arrangements for recycling collection (aluminum, paper, newspaper, glass, and plastic containers) in building areas, and waste hauling for the remainder of waste that is not readily recyclable, will be made. The wastes associated with commercial activities will also be recycled (likely to include cardboard, paper, glass, and plastic containers). Specialized materials associated with grounds keeping (e.g., pesticides and fertilizers) will be used according to accepted practices (i.e., pesticide rinsate will be used as product, and fertilizer will be used up or incorporated into green waste processing at the site). Specialized materials associated with maintenance and industrial activities (e.g., motor oil and solvents) will be recycled when possible or disposed according to accepted practices for the County of Hawai'i.

The anticipated recycled waste composition for operations is shown in Table B-8. Hawai'i County's recycling rate is approximately 25.8 percent (County of Hawai'i – Solid Waste Disposal Summary 2006 - 2006). Based on the Kula Nei Project having a recycling rate equivalent to that measure by Hawai'i County, approximately 294 tons / year of operational waste will be diverted or recycled based on the assumption that all residences within the project site are occupied. All other organic and inorganic categories of waste would likely be hauled to the landfill. Contracts with private recyclers and waste haulers will be developed to achieve these ends. In addition, green waste will be processed and used on site as soil amendment to the extent practical. Processing of green waste may involve chipping and passive composting of organic waste, resulting in soil amendment for use at the Kula Nei Project.

TABLE B-8: SOLID WASTE COMPOSITION DIVERTED OR RECYCLED - OPERATIONS

Waste Type	% of Total Waste[1]	Operations Waste (tons/year)[2]						
		2012	2013	2014	2015	2016	2017	2018 and Beyond
Paper	16.7	30	59	80	106	136	165	190
Yard Waste	12.5	22	44	60	79	102	123	143
Plastic	4.4	8	16	21	28	36	44	50
Metals	13.1	23	46	63	83	107	129	149
Glass	1.6	3	6	8	10	13	16	18
Total	**48.3**	**85**	**171**	**232**	**306**	**393**	**477**	**551**
Total Diverted Waste[3]	**25.8**	**46**	**91**	**124**	**163**	**210**	**254**	**294**

Notes:

1. 1993 County of Hawai'i Integrated Solid Waste Management Plan, 2003 Oahu Waste Composition Study

2. Calculations based on (annual waste generated from Table B-5) x ("% of Total Waste" column).

3. Calculation based on (annual waste generated from Table B-5) x (25.8 percent recycle rate).

SUMMARY

Based on the estimated waste generation rates for construction and operations at the Kula Nei Project and the solid waste management plans for waste diversion through minimization and recycling of materials, estimated waste diversion and landfilling generation are shown in Table B-9.

TABLE B-9: SUMMARY OF WASTE DIVERTED AND LANDFILLED (BY YEAR)

Waste Management Option			2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017 and Beyond
Construction	Diverted	Waste[1] (tons/yr)	64 – 112	65 – 115	65 – 115	64 – 112	65 – 115	62 – 109	56 – 98	NA
		# trucks (per week)[2]	0.1 – 0.2	0.1 – 0.2	0.1 – 0.2	0.1 – 0.2	0.1 – 0.2	0.1 – 0.2	0.1 – 0.2	NA
	Landfilled	Waste[3] (tons/yr)	64 - 112	66 – 115	66 – 115	64 – 112	66 – 115	62 – 109	56 – 98	NA
		# trucks (per week)[2]	0.1 – 0.2	0.1 – 0.2	0.1 – 0.2	0.1 – 0.2	0.1 – 0.2	0.1 – 0.2	0.1 – 0.2	NA
Operations	Diverted	Waste[4] (tons/yr)	NA	46	91	124	163	210	254	294
		# trucks (per week)	NA	0.1	0.2	0.2	0.3	0.4	0.5	0.6
	Landfilled	Waste[6] (tons/yr)	NA	131	262	356	470	604	732	846
		# trucks (per week)[5]	NA	0.3	0.3	0.2	0.2	0.3	0.2	0.2
Total Diverted Waste (tons/yr)			64 – 112	111 – 161	156 – 206	188 – 236	228 – 278	272 – 319	213 – 352	294
Total Landfilled Waste (tons/yr)			64 – 112	197 – 246	328 – 377	420 – 468	536 – 585	666 – 713	788 – 830	846

Notes:

1. *Diverted waste (tons/year) is waste that will be recycled. Values from total diverted construction waste (Table B-7).*
2. *Assumes that trucks pick up construction waste twice a month and each truck has a 10-ton capacity.*
3. *Calculation based on total construction waste (Table B-3) – total diverted construction waste (Table B-7).*
4. *Diverted waste is waste that will be recycled. Values from total diverted operations waste (Table B-8).*
5. *Assumes that each truck picking up operational waste has a 10-ton capacity.*
6. *Calculation based on total operations waste (Table B-5) – total diverted operations waste (Table B-8).*
7. *NA = Not applicable (Construction ends in mid-2017).*

Trucks will most likely be used to haul construction and operations waste to either a local recycling vendor, for diverted waste, or to the West Hawai'i Landfill, for landfilled waste. For construction waste the number of trucks is expected to be on an on-call basis, meaning that less than one truck per month will be required for both diverted and landfilled waste. For operations waste at full build-out, the number of trucks is expected to be approximately 1 truck per week for diverted and landfilled waste. The truck route to the West Hawai'i Landfill will most likely be from Queen Ka'ahumanu Highway and Pu'u Pohaku Road. The truck route to the local recycling vendor (anticipated to be Atlas Recycling Center in Kona town) will most likely be along Queen Kaahumanu Highway to Kaiwi Street.

According to the 2002 Updated Integrated Solid Waste Management Plan for the County of Hawai'i, the Pu'uanahulu Landfill is estimated to have 12 million cubic yards of air space which is enough to accommodate the waste generated by West Hawaii for approximately the next 40 years. In 2000, approximately 90,000 tons of waste was deposited at this landfill. Using this quantity of waste, the annual percent waste increase to the West Hawai'i Landfill from the Kula Nei Project was estimated (See Table B-10).

TABLE B-10: KULA NEI PROJECT WASTE GENERATION IMPACT ON WEST HAWAI'I LANDFILL

	2010-2011 (%)	2011-2012 (%)	2012-2013 (%)	2013-2014 (%)	2014-2015 (%)	2015-2016 (%)	2016-2017 (%)	2017 and Beyond (%)
Percent Annual Waste Increase to Landfill [1]	0.07 – 0.12	0.22 – 0.27	0.36 – 0.42	0.47 – 0.52	0.60 – 0.65	0.74 – 0.79	0.88 – 0.92	0.94

Notes:

Calculation based on [(total Landfilled Waste from Table B- 9) / (90,000 tons/year)] x 100 percent.

It should be noted that the objectives for waste diversion for both construction and operations at the Kula Nei Project are based upon the assumption that private companies in the vicinity of the development can be contracted to either directly recycle materials on the island of Hawai'i or to economically ship materials to recycling markets elsewhere in Hawai'i, the U.S. mainland, or international countries. If recycling

vendors are not immediately available for all materials intended to be recycled, some of these materials may be hauled to the landfill.

Appendix C

KULA NEI:
IMPACT ON AGRICULTURE

DECISION ANALYSTS HAWAI'I, INC.

KULA NEI:
IMPACT ON AGRICULTURE

PREPARED FOR:

The Shopoff Group

PREPARED BY:

Decision Analysts Hawai'i, Inc.

June 2007

CONTENTS

FIGURES

APPENDIX

EXECUTIVE SUMMARY

1. PROPOSED DEVELOPMENT

The Shopoff Group proposes to develop Kula Nei ("the Project"), a planned residential subdivision to be located on approximately 130 acres in the North Kona District of the Island of Hawai'i ("the Big Island"). Including Accessory Areas for road and water improvements, a total of about 151 acres will be affected by the Project.

At full development, the Project will provide about 270 residential market and affordable units.

2. AGRICULTURAL CONDITIONS

All 151 acres proposed for development have poor agronomic conditions for commercial crop production and for grazing cattle: soils are extremely rocky, rainfall is comparatively low, and water is not available for crop farming.

3. CURRENT AGRICULTURAL ACTIVITIES

With one small exception, no agricultural activities are taking place in the Primary Project Area or the Accessory Areas. The exception is cattle grazing on about 2 acres that are planned for off-site water improvements.

4. SURROUNDING LAND USES

Existing and planned residential projects border portions of the property on the north, east and south sides. Vacant State land lies to the west.

There are no known agricultural uses on the adjacent properties that could be affected by development of the Primary Project Area or off-site improvements in the Accessory Areas.

5. IMPACT ON AGRICULTURE

a. Existing Farming Operations

The Project will have no impact on existing farming operations since none exist on in the Primary Project Area or the Accessory Areas.

b. Existing Grazing Operations

Off-site water improvements to support the Project will result in the loss of about 2 acres of grazing land. The economic activity associated with cattle grazing on this amount of land is as follows:

— Grazing by one cow-and-calf unit about 10 weeks of a year.

— Revenues of less than $60 per year.

— Net revenues of less than $25 per year.

— Negligible employment and payroll.

In practice, the cow-and-calf unit would probably be relocated to other lands.

In any case, development of the Project and related off-site improvements will result in no significant impact on grazing operations, including no significant impact on the size of the affected herd, production, revenues, employment or payroll.

c. Growth of Diversified Agriculture

The Project will commit about 151 acres of agricultural land to a non-agricultural use. But as previously mentioned, the land is unsuitable for commercial crop farming. Furthermore, there is an ample supply of land elsewhere on the Big Island to accommodate the growth of diversified crops. Even more land is available to accommodate the growth of the cattle industry.

Thus, this commitment of land will not adversely affect the growth of diversified agriculture.

d. Mitigating Measures

Since insignificant adverse impacts related to agriculture are anticipated, no mitigating measures are warranted.

6. BENEFIT OF THE PROJECT

The loss of about 151 acres of poor-quality agricultural land will be offset by the benefit of about 270 housing units for Hawai'i residents.

7. CONSISTENCY WITH STATE AND COUNTY POLICIES

a. Availability of Lands for Agriculture

The *Hawai'i State Constitution*, the *Hawai'i State Plan*, and the *State Agriculture Functional Plan* call directly or implicitly for preserving the economic viability of plantation agriculture and promoting the growth of diversified agriculture. The *County of Hawai'i* General Plan also calls for promoting the growth of diversified agriculture. To accomplish these goals, an adequate supply of agriculturally suitable lands and water must be assured.

With regard to plantation agriculture, the Primary Project Area and Accessory Areas are not and never were part of a sugarcane or pineapple plantation.

With regard to diversified agriculture, the Primary Project Area and Accessory Areas have no recent history of being farmed or being used for livestock with the exception of about 2 acres of accessory land that is now used for grazing cattle. Also, the Primary Project Area and Accessory Areas have poor soils and lack agricultural water, thereby making the land unsuitable for commercial crop production. In addition, there is an ample supply of land elsewhere on the Big Island to accommodate the growth of diversified crops and the cattle industry. Therefore, development of the Project will not adversely affect the growth of diversified agriculture.

b. Conservation of Prime and Important Agricultural Lands

State policies also call for conserving and protecting prime agricultural lands, including protecting agricultural lands from urban development. Similarly, the *County General Plan* calls for protecting important agricultural lands.

Because of rocky soils, the Primary Project Area and Accessory Areas contain no prime agricultural lands. Nevertheless, about 2 acres that are planned for new water improvements are designated as Other under the ALISH classification. Even though the soils are poor, this classification presumably reflects a low-value “feed crop” (i.e., a grazing operation) in the late 1970s when the soils were rated.

c. County of Hawai'i General Plan

The *County General Plan* designates the Primary Project Area and surrounding lands as "Low-Density Urban." Thus, the Project is consistent with the *County General Plan.*

KULA NEI:
IMPACT ON AGRICULTURE

1. INTRODUCTION[1,2]

The Shopoff Group proposes to develop Kula Nei ("the Project"), a planned residential subdivision to be located on approximately 130 acres in the North Kona District of the Island of Hawai'i ("the Big Island"). Including Accessory Areas for road and water improvements, a total of about 151 acres will be affected by the Project.

The Primary Project Area is within the State Agricultural District, is designated as "Low-Density Urban" in the *County of Hawai'i General Plan*, and is zoned by County of Hawaii ("the County") as Agricultural, A-5a. Thus, development of the Project will require (1) a State Land Use Reclassification from Agriculture to Urban, and (2) a County Change of Zone from Agricultural to Residential.

This report addresses the impacts on agriculture of developing the Project. Succeeding sections address the following subjects: the general location of the Project, the specific location of the Primary Project Area and Accessory Areas, a description of the Project, agricultural conditions, potential crops, past agricultural activities, current agricultural activities, surrounding land uses, the agricultural land market, the impact of the Project on agriculture, the benefit of the Project, and consistency of the Project with State and County agriculture policies. Supporting figures and an Appendix are at the end of the report. The Appendix provides a summary of State and County goals, objectives, policies and guidelines related to agricultural lands.

2. LOCATION OF THE PROJECT[1]

As shown on Figures 1 and 2, the Primary Project Area is located *mauka* and slightly south of Keahole Point, and about 1 mile below the Mamalahoa Highway (also known as the Hawai'i Belt Road). The locations of the Primary Project Area and Accessory Areas are also indicated by the Tax Map Key (TMK) parcels shown in Figure 3.

3. PROJECT AND ACCESSORY AREAS[1,2]

a. Primary Project Area

The Primary Project Area covers approximately 130 acres. As shown in Figure 3, it includes three TMK parcels:

— TMK 7-3-007:038

— TMK 7-3-007:039

— TMK 7-3-009:007

The Primary Project Area also includes a narrow strip of land known as Homestead Road that extends west (downslope) from Hamo Street.

b. Accessory Areas

The Project will include Accessory Areas that total about 20.6 acres, including about 12.4 acres for new roads and about 8.2 acres for new water improvements. These areas include the following TMK parcels:

— New Roads

- TMK 7-3-009:008
- TMK 7-3-009:057
- TMK 7-3-009:061
- TMK 7-3-046:105

— New Water Well, Reservoirs and Transmission Lines

- TMK 7-3-006:035
- TMK 7-3-006:036
- TMK 7-3-006:037
- TMK 7-3-007:042
- TMK 7-3-007:043

In addition, the Accessory Areas will include parcels which contain either (1) an existing subterranean water transmission line that will be used to deliver potable water to the Project, or (2) an existing roadway that will be temporarily trenched to construct a new subterranean water transmission line. The impacted parcels, which are <u>not</u> included in total acreage for the Accessory Areas, include:

- TMK 7-3-007:080
- Mamalahoa Highway

- Kinoulu Street
- Old Government Road Mauka

4. PROJECT DESCRIPTION[2]

At full development, the Project will provide about 270 residential market and affordable homes (see Figure 4). Lots for the single-family homes will range in size from about 7,500 square feet to about 20,000 square feet.

The Project will also include a neighborhood park and supporting infrastructure (i.e., roadways, utilities, a potable water system, sewers, wastewater treatment, and drainage). Homestead Road is proposed for a greenbelt and a pedestrian trail.

5. AGRICULTURAL CONDITIONS

a. Soil Types[3]

Primary Project Area

The Primary Project Area contains two soil types as defined by the Natural Resources Conservation Service (NRCS), previously known as the Soil Conservation Service. The soils are:

rPYD	*Punalu'u* extremely rocky peat, 6 to 20% slopes.
rLV	Lava flows, *'a'a*, no range of slopes.

About 122 acres (94%) of the Primary Project Area have rPYD soils, and about 8 acres (6%) have rLV soils (see Figure 5).

Accessory Areas

The Accessory Areas contain three soil types:

rPYD	*Punalu'u* extremely rocky peat, 6 to 20% slopes.
rLV	Lava flows, *'a'a*, no range of slopes.
rKED	*Kaimu* extremely stony peat, 6 to 20% slopes.

As shown in Figure 5, most of the Accessory Areas have rPYD soils, although a portion of the proposed road that will pass through State land (TMK 7-3-009:008) has rLV soils, and three of the parcels for new water improvements (TMKs 7-3-006:035, 036 and 037) have rKED soils.

b. Soil Ratings

Three classification systems are commonly used to rate soils in Hawai'i: (1) Land Capability Grouping, (2) Agricultural Lands of Importance to the State of Hawai'i, and (3) Overall Productivity Rating.

Land Capability Grouping (NRCS Rating)[3,4]

The 1972 Land Capability Grouping by the NRCS rates soils according to eight levels, ranging from the highest classification level I to the lowest VIII.

Soil types rPYD and rKED are rated VIIs, and rLV is rated VIIIs. Class VII soils have very severe limitations that make them unsuitable for cultivation and restrict their use largely to pasture or range, and non-agricultural uses. Class VIII soils and landforms have very severe limitations that preclude their use for commercial plant production and restrict their use to non-agricultural uses. The subclassification "s" indicates that the soils are extremely rocky or stony.

These ratings indicate poor soils for the Primary Project Area and the Accessory Areas.

Agricultural Lands of Importance in the State of Hawai'i (ALISH)[5]

ALISH ratings were developed in 1977 by the NRCS, the UH College of Tropical Agriculture and Human Resources, and the State Department of Agriculture. This system classifies land into three broad categories: (a) Prime agricultural land which is land that is best suited for the production of crops because of its ability to sustain high yields with relatively little input and with the least damage to the environment; (b) Unique agricultural land which is non-Prime agricultural land used for the production of specific high-value crops (e.g., coffee and taro); and (c) Other agricultural land which is non-Prime and non-Unique agricultural land that is important to the production of crops.

Under ALISH, soils in the Primary Project Area are not classified, which indicates that they are not important to the production of crops (see Figure 6).

Most of the soils in the Accessory Areas are also not classified. However, less than 2 acres that are planned for new water improvements (most of TMKs 7-3-006:035, 036 and 037) are rated Other.

Overall Productivity Rating (LSB Rating)[4]

In 1972, the University of Hawai'i (UH) Land Study Bureau (LSB) developed the Overall Productivity Rating, which classifies soils according to five levels, with A representing the class of highest productivity and E the lowest.

About 12 acres (9%) of the Primary Project Area have soils that are rated D and about 118 acres (91%) are rated E (see Figure 7).

LSB ratings for the Accessory Areas are as follows:

— New Roads

• TMK 7-3-009:008	Not Classified
• TMK 7-3-009:057	Not Classified
• TMK 7-3-009:061	Not Classified
• TMK 7-3-046:105	E

— New Water Well, Reservoirs and Transmission Lines

• TMK 7-3-006:035	Mostly D, some C
• TMK 7-3-006:036	D
• TMK 7-3-006:037	D
• TMK 7-3-007:042	Mostly C, some D
• TMK 7-3-007:043	C

Summary Evaluation of Soil Quality

These soil-rating systems suggest that all of the 130 acres in the Primary Project Area are comprised of low-quality soils (VII and VIII for the NRCS ratings, not classified for ALISH, and D and E for the LSB rating).

The Accessory Areas also have poor soils, although the ALISH system gives a rating of Other for most of three of the parcels that will be used for new water improvements (TMKs 7-3-006:035, 036 and 037), and the LSB gives a rating of C for all or portions of three parcels that will be used for new water improvements (TMK 7-3-006:035 and TMKs 7-3-007:042 and 043).

c. Soil Characteristics[3]

Consistent with the above soils ratings, the soils within the Primary Project Area and Accessory Areas exhibit a number of unfavorable characteristics. The rPYD soil is comprised of (1) rock outcrops over 40% to 50% of the surface, and (2) medium-acid peat about 4 inches thick underlain by *pahoehoe* lava bedrock. The rLV soil is comprised of rough and broken *'a'a* lava with practically no soil covering. The rKED soil is comprised of extremely stony peat about 3 inches thick, underlain by fragmented *'a'a* lava.

d. Elevation[6]

The elevation of the Primary Project Area ranges from about 740 feet at the southwestern corner of the Project to about 1,140 feet at the northeastern corner.

e. Slopes[2]

Most of the Primary Project Area has slopes of 5 to 20%, with an average slope of about 10% (Figure 8). The Accessory Areas have similar slopes.

f. Climatic Conditions

Like other areas in Hawai'i, the Big Island has a mild *semi*tropical climate that is due primarily to three factors: (1) Hawai'i's mid-Pacific location near the Tropic of Cancer, (2) the surrounding warm ocean waters that vary little in temperature between the winter and summer seasons, and (3) the prevailing winds that bring air having temperatures that are close to those of the surrounding waters. However, mean temperatures in Hawaii decrease at the rate of about 1°F for each 200- to 300-foot increase in elevation.[4]

Solar Radiation[7]

The Primary Project Area receives considerable sunshine, with an average daily insolation of about 450 calories per square centimeter.

Rainfall[1]

Rainfall in the Primary Project Area averages about 25 to 30 inches per year, which is somewhat lower than the 50 to 100 inches for most of the Kona coffee belt. Unlike most areas in Hawai'i, rainfall in Kona is heavier in the summer than in the winter.

Temperatures[8]

Average temperatures range from the mid-60s in the winter to the mid-80s in the summer.

Winds[9,10]

Prevailing offshore morning breezes and onshore afternoon breezes average less than 12 miles per hour.

g. Water

Water is not currently available for crops or cattle.

h. Road Access[2]

Currently, there is no road providing legal access to the property. Hamo Street dead-ends at the eastern boundary of the Primary Project Area, but this is a private road through a gated community (Figure 3).

i. Locational Advantages and Disadvantages

Farmers on the west side of the Big Island are well-located for supplying the small West Hawai'i market.

Compared to farmers on O'ahu, they are at a disadvantage in supplying the larger Honolulu market because of the cost of interisland barge service and air-freight service.

Compared to other farmers in Hawai'i, they can compete reasonably well in supplying U.S. mainland markets. For surface cargo, Matson's overseas shipping service includes interisland barge service at no additional fee: except for some minor port charges, Matson charges a common fare for all islands.[11] For air cargo, service is available from the Kona International Airport. However, the number of flights, the number of destinations, and total hold capacity are far less than that available from Honolulu.

In supplying U.S. mainland markets, however, farmers on all islands are at a disadvantage in competing against low-cost producers (e.g., farmers on the mainland, and in Central and South America). Most of the competing farm areas have lower production and delivery costs than Hawai'i does. Competing against farmers in Mexico is particularly difficult given the North America Free Trade Agreement (NAFTA) and Mexico's proximity to major U.S. markets.

j. Summary

All 151 acres proposed for development have poor agronomic conditions for commercial crop production and for grazing cattle: soils are extremely rocky, rainfall is comparatively low, and water is not available for crop farming.

6. POTENTIAL CROPS

As indicated in Section 5.j., the agronomic conditions are unfavorable for commercial crop production. Crop production is theoretically possible (e.g.,

coffee), provided the land is cleared, soils are added, irrigation water is provided, and an access road is built. However, net returns from agriculture are relatively low and would not be sufficient to justify the costs.

7. PAST AGRICULTURAL ACTIVITIES[1,2,12-14]

Archaeological evidence indicates that Hawaiians grew crops on a portion of the property during the Precontact (pre-1778 A.D.) and Historic (after 1778 A.D.) periods. Water was collected from a lava tube.

By the mid- to late 1880s, land in the general area was used for grazing cattle, goats and donkeys. Before 1980, limited and intermittent cattle grazing occurred on upper portions of the property.

In recent decades, there has been no known agricultural use of the Primary Project Area or of most of the Accessory Areas.

8. CURRENT AGRICULTURAL ACTIVITIES[13]

With one small exception, no agricultural activities are taking place in the Primary Project Area or the Accessory Areas. The exception is cattle grazing on about 2 acres that are planned for off-site water improvements (TMKs 7-3-006:035, 036 and 037).

9. SURROUNDING LAND USES

Existing and planned residential projects border portions of the property on the north (Kona Acres and O'oma Plantation), east (Kona Hills Estates) and south (Kaloko Heights)—see Figure 3. Vacant State land lies to the west.

There are no known agricultural uses on the adjacent properties that could be affected by development of the Primary Project Area or off-site improvements in the Accessory Areas.

10. AGRICULTURAL LAND MARKET

a. Crop Land[15-17]

Statewide, a vast amount of land has been released from plantation agriculture: about 249,900 acres since 1968—an average decrease of over 6,940 acres per year over a 36-year period (see Figure 9). This release of land from plantation agriculture has far outpaced the demand for land for diversified crops—an increase of about 26,500 acres over this same period, or an average of about 740

acres per year. Since 1984, the growth has slowed to an average of 240 acres per year, most of which has occurred on O'ahu.

The net decrease in crop land amounted to 223,400 acres. While some of the released land has been converted or is scheduled to be converted to urban uses and commercial forest, an estimated 160,000+ acres remain available for diversified crops.

These findings also apply to the Big Island. Since 1973, about 106,000 acres were released from sugar production. At most, 17,000 acres were planted in macadamia nuts, papaya, and other crops. About 20,000 acres were replanted in commercial forest. Although some of the remaining 69,000 acres were used for homes, the vast majority of this land remains available for other crops.

The above information indicates that ample land is available in Hawai'i to accommodate the growth of diversified crops. The limiting factor to the growth of diversified crops is *not* the *land supply*, but rather the *size of the market* for crops that can be grown *profitably* in Hawai'i.

b. Grazing Land[15,18]

The total supply of grazing land in the State is about 1.15 million acres, most of which is located on the Big Island. Furthermore, the supply of grazing land has increased statewide due to the contraction of plantation agriculture. In contrast, the number of range cattle in Hawaii has remained at about 80,500 ± 3,300 beef cows since at least 1980. Over 75% of the beef cows are on the Big Island.

This large and increasing supply of grazing land combined with no growth in the number of cattle indicates that land is not the limiting factor to the growth of Hawaii's cattle industry.

11. IMPACT ON AGRICULTURE

a. Existing Farming Operations

The Project will have no impact on existing farming operations since none exist on in the Primary Project Area or the Accessory Areas.

b. Existing Grazing Operations[17]

Off-site water improvements to support the Project will result in the loss of about 2 acres of grazing land (TMKs 7-3-006:035, 036 and 037). The economic activity associated with cattle grazing on this amount of land is as follows:

— Grazing by one cow-and-calf unit about 10 weeks of a year (based on a stocking density of about 10 acres per cow-and-calf unit).

— Revenues of less than $60 per year (based on a calf yield of about 70% of the units, and a value of about $400 per calf).

— Net revenues of less than $25 per year (about 40%).

— Negligible employment and payroll (one ranch hand can manage a few thousand acres).

In practice, the cow-and-calf unit would probably be relocated to other lands.

In any case, development of the Project and related off-site improvements will result in no significant impact on grazing operations, including no significant impact on the size of the affected herd, production, revenues, employment or payroll.

c. Growth of Diversified Agriculture

The Project will commit about 151 acres of agricultural land to a non-agricultural use. But as previously mentioned, the land is unsuitable for commercial crop farming. Furthermore, there is an ample supply of land elsewhere on the Big Island to accommodate the growth of diversified crops. Even more land is available to accommodate the growth of the cattle industry.

Thus, this commitment of land will not adversely affect the growth of diversified agriculture.

d. Mitigating Measures

Since insignificant adverse impacts related to agriculture are anticipated, no mitigating measures are warranted.

12. BENEFIT OF THE PROJECT[2]

The loss of about 151 acres of poor-quality agricultural land will be offset by the benefit of about 270 homes for Hawai'i residents.

13. CONSISTENCY WITH STATE AND COUNTY AGRICULTURE POLICIES[19]

a. Availability of Lands for Agriculture

The *Hawai'i State Constitution*, the *Hawai'i State Plan*, and the *State Agriculture Functional Plan* call directly or implicitly for preserving the economic viability of plantation agriculture and promoting the growth of diversified agriculture. The *County of Hawai'i* General Plan also calls for promoting the growth

of diversified agriculture. To accomplish these goals, an adequate supply of agriculturally suitable lands and water must be assured.

With regard to plantation agriculture, the Primary Project Area and Accessory Areas are not and never were part of a sugarcane or pineapple plantation.

With regard to diversified agriculture, the Primary Project Area and Accessory Areas have no recent history of being farmed or being used for livestock with the exception of about 2 acres of accessory land that is now used for grazing cattle. Also, the Primary Project Area and Accessory Areas have poor soils and lack agricultural water, thereby making the land unsuitable for commercial crop production. In addition, there is an ample supply of land elsewhere on the Big Island to accommodate the growth of diversified crops and the cattle industry. Therefore, development of the Project will not adversely affect the growth of diversified agriculture.

b. Conservation of Prime and Important Agricultural Lands

State policies also call for conserving and protecting prime agricultural lands, including protecting agricultural lands from urban development. Similarly, the *County General Plan* calls for protecting important agricultural lands.

Because of rocky soils, the Primary Project Area and Accessory Areas contain no prime agricultural lands. Nevertheless, about 2 acres that are planned for new water improvements (TMKs 7-3-006:035, 036 and 037) are designated as Other under the ALISH classification. Even though the soils are poor, this classification presumably reflects a low-value "feed crop" (i.e., a grazing operation) in the late 1970s when the soils were rated.

c. County of Hawai'i General Plan

The *County General Plan* designates the Primary Project Area and surrounding lands as "Low-Density Urban." Thus, the Project is consistent with the *County General Plan.*

14. REFERENCES

[1] Belt Collins Hawai'i. "Environmental Impact Statement Preparation Notice, Kula Nei Project." November 15, 2006.

[2] Belt Collins Hawai'i Ltd., Honolulu, Hawai'i. 2007.

[3] U.S. Department of Agriculture, Soil Conservation Service. *Soil Survey of Island of Hawai'i, State of Hawai'i.* Washington, D.C. December 1973.

[4] Land Study Bureau. *Detailed Land Classification – Island of Hawai'i.* Honolulu, Hawai'i. December 1972.

[5] Harold L. Baker. *Agricultural Lands of Importance in the State of Hawai'i.* University of Hawai'i College of Tropical Agriculture and Human Resources, Honolulu, Hawaii. 1977.

[6] National Geographic. TOPO maps. 2003.

[7] State of Hawai'i, Department of Business and Economic Development, Hawai'i State Energy Office. *Hawai'i Sunshine Map,* May 1993.

[8] Armstrong, R. Warwick. *Atlas of Hawai'i,* Second edition. University of Hawai'i Press. Honolulu, Hawai'i. 1983.

[9] Juvik, Sonia P. and James O., *Atlas of Hawai'i, Third Edition*. University of Hawai'i Press. Honolulu, Hawai'i. 1998.

[10] AWS Truewind. "Wind Speed of Hawai'i Island at 50 Meters." Undated.

[11] Matson Navigation Company, Inc.

[12] Robert B. Rechtman. "Cultural Impact Assessment for the O'oma Planations Project Area." September 2006.

[13] Palmer & Associates Consulting. "Botanical Surveys: TMK 7-3-09: 7 & 8, TMK 7-3-06: 22, TMK 7-3-6: por 35, 36, 37, TMK 7-3-07: 42 & 43, TMK 7-3-07: 38 & 39 (Project Area and "Off Site Facilities), North Kona, Hawai'i." 2006.

[14] Office of Planning, State of Hawai'i. "Island of Hawai'i, Agricultural Land Use (1978 - 1980)." March 27, 2003.

[15] Hawai'i Agricultural Statistics Service. *Statistics of Hawaiian Agriculture.* Honolulu, Hawai'i. Annual.

[16] Schmitt, Robert C. *Historical Statistics of Hawai'i.* The University Press of Hawai'i, Honolulu, Hawai'i. 1977.

[17] Decision Analysts Hawai'i, Inc. 2006.

[18] Department of Business, Economic Development and Tourism. *The State of Hawai'i Data Book.* Honolulu, Hawai'i. Annual.

[19] Appendix. "Selected State and County Goals, Objectives, Policies and Guidelines Related to Agricultural Lands."

FIGURES

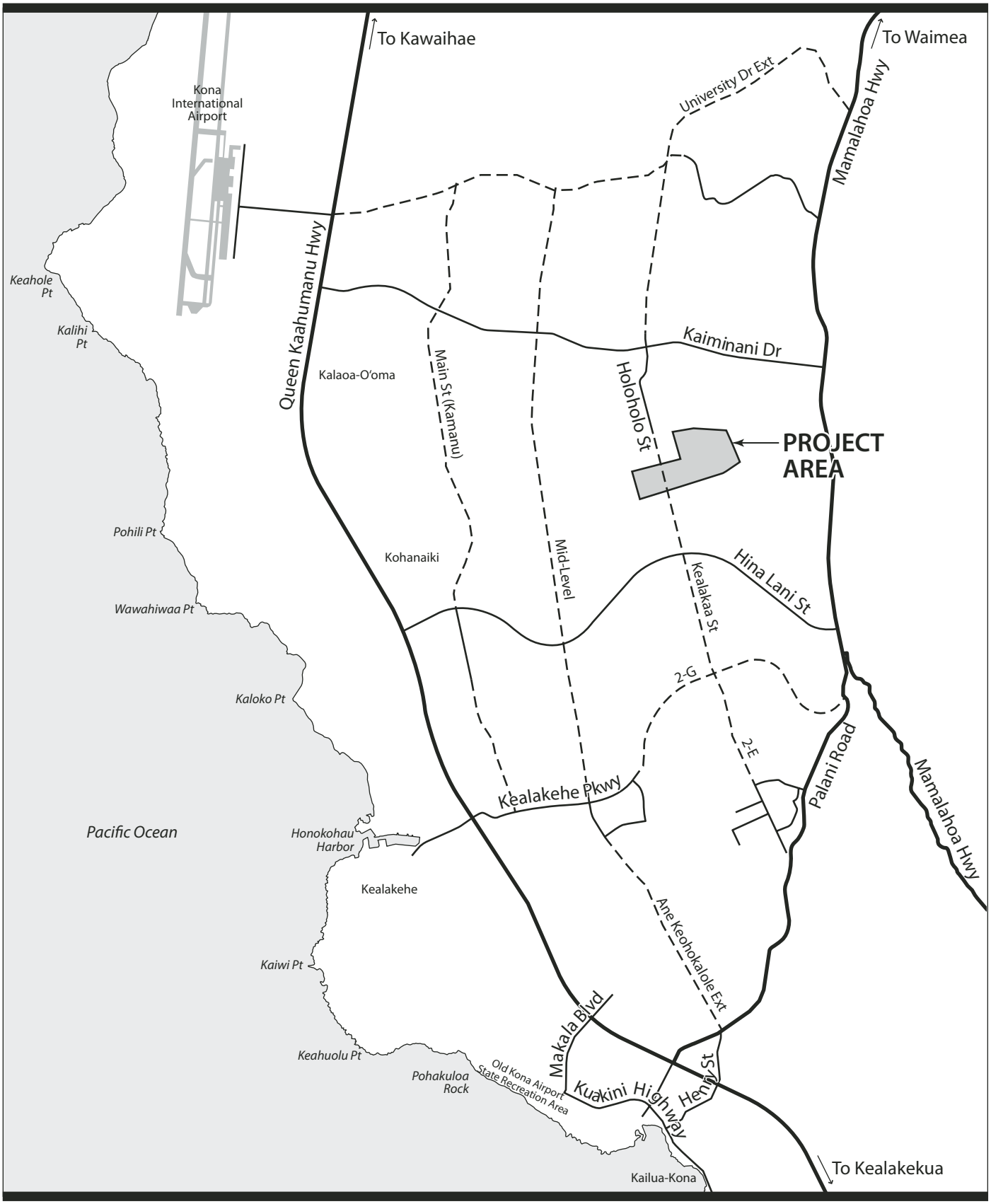
NORTH

0 3 6 12

SCALE IN MILES

Figure 1
LOCATION MAP, HAWAII ISLAND

Kula Nei
Prepared for: The Shopoff Group
October 2006



NORTH

0 2500 5000

SCALE IN FEET

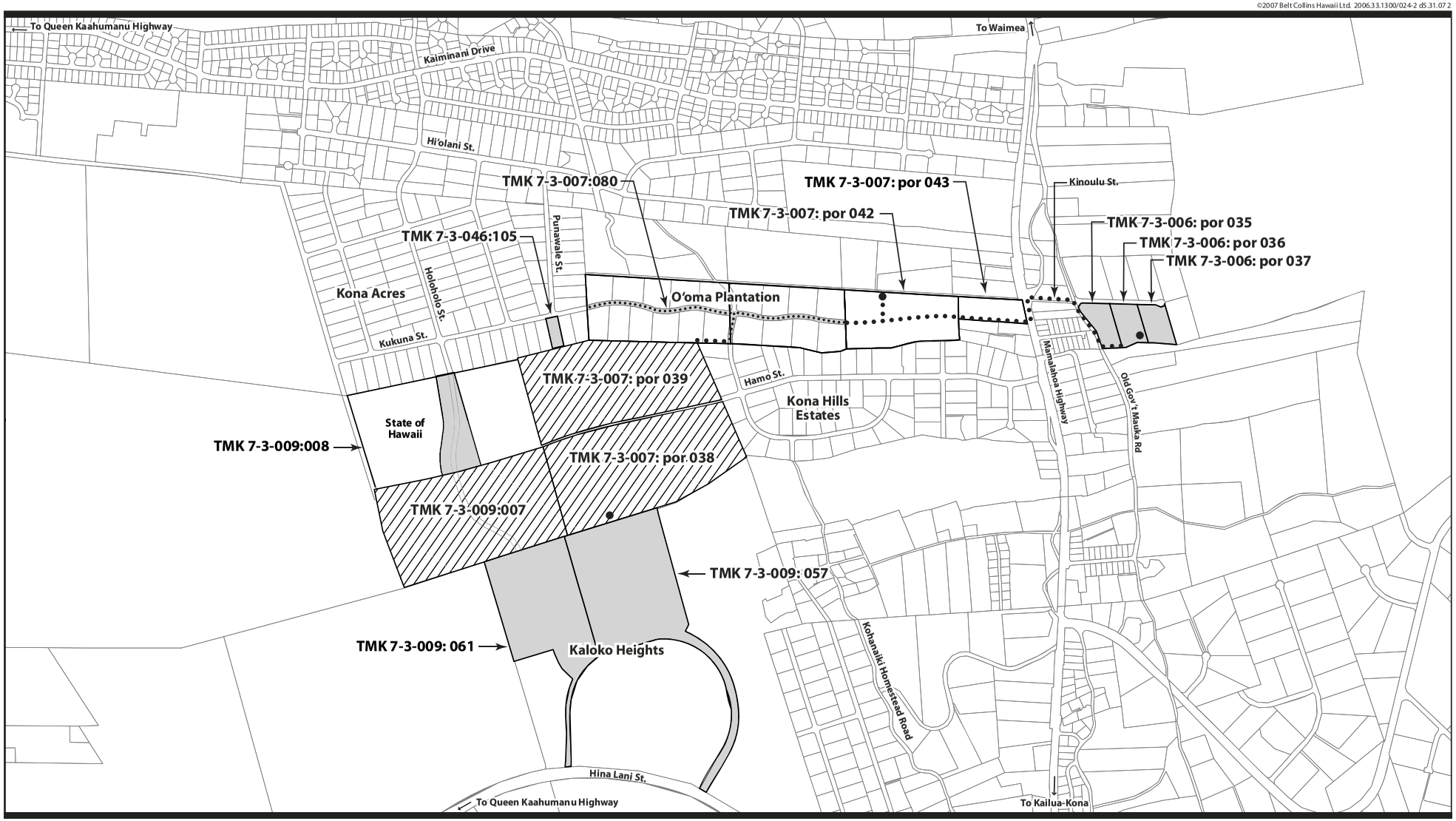
LEGEND

- Future Roads
- Minor Roads
- Major Roads

Figure 2

REGIONAL MAP

Kula Nei
North Kona, Hawaii
Environmental Impact Statement
Prepared for the Shopoff Group



Belt Collins

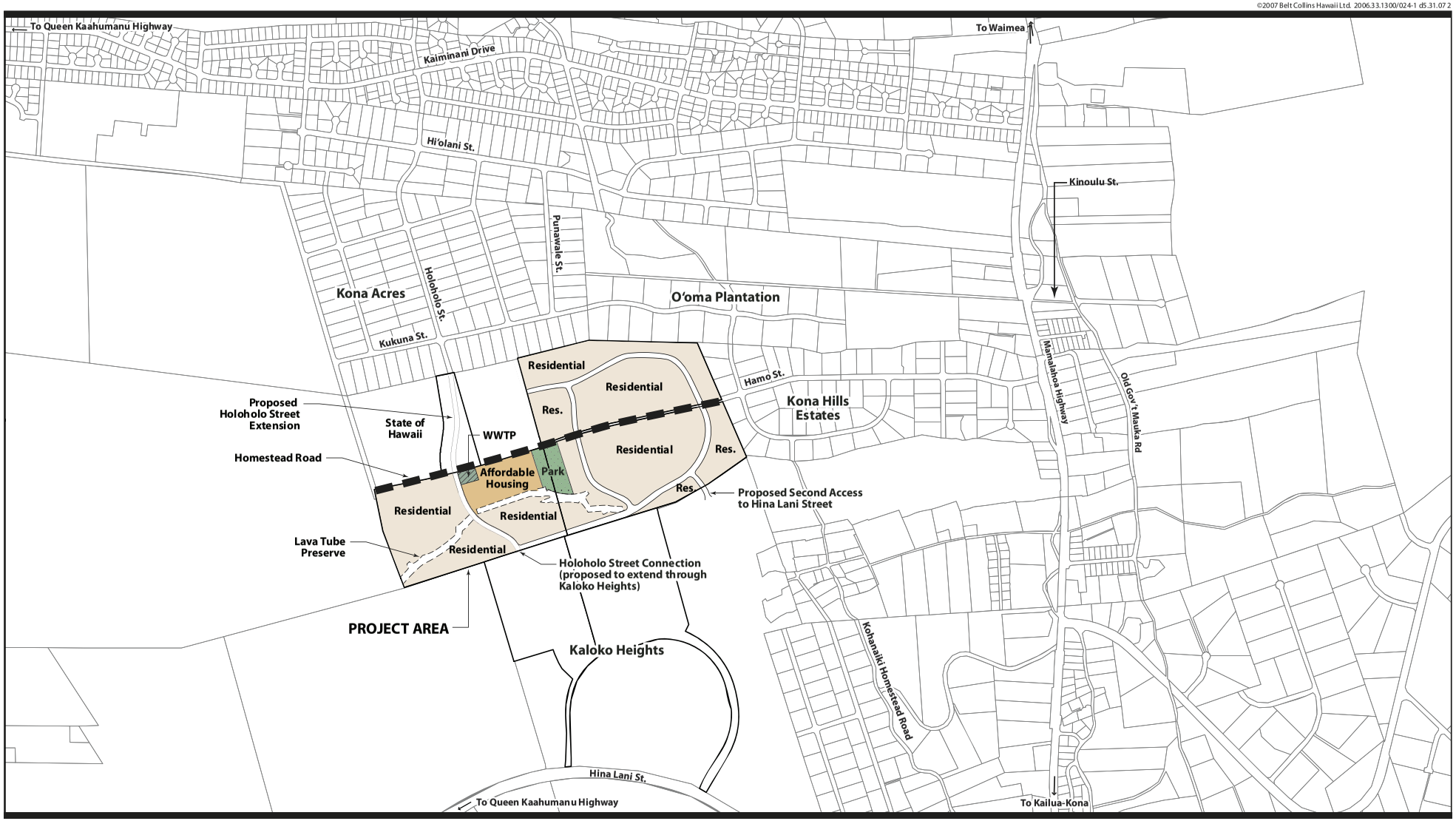
NORTH

0 500 1000
SCALE IN FEET

LEGEND

- Primary Project Area
- Accessory Area
- Existing Water Line
- Proposed Water Line
- Proposed Reservoir

Figure 3
TMK MAP
Kula Nei
North Kona, Hawaii
Environmental Impact Statement
Prepared for The Shopoff Group



Belt Collins

NORTH

0 500 1000
SCALE IN FEET

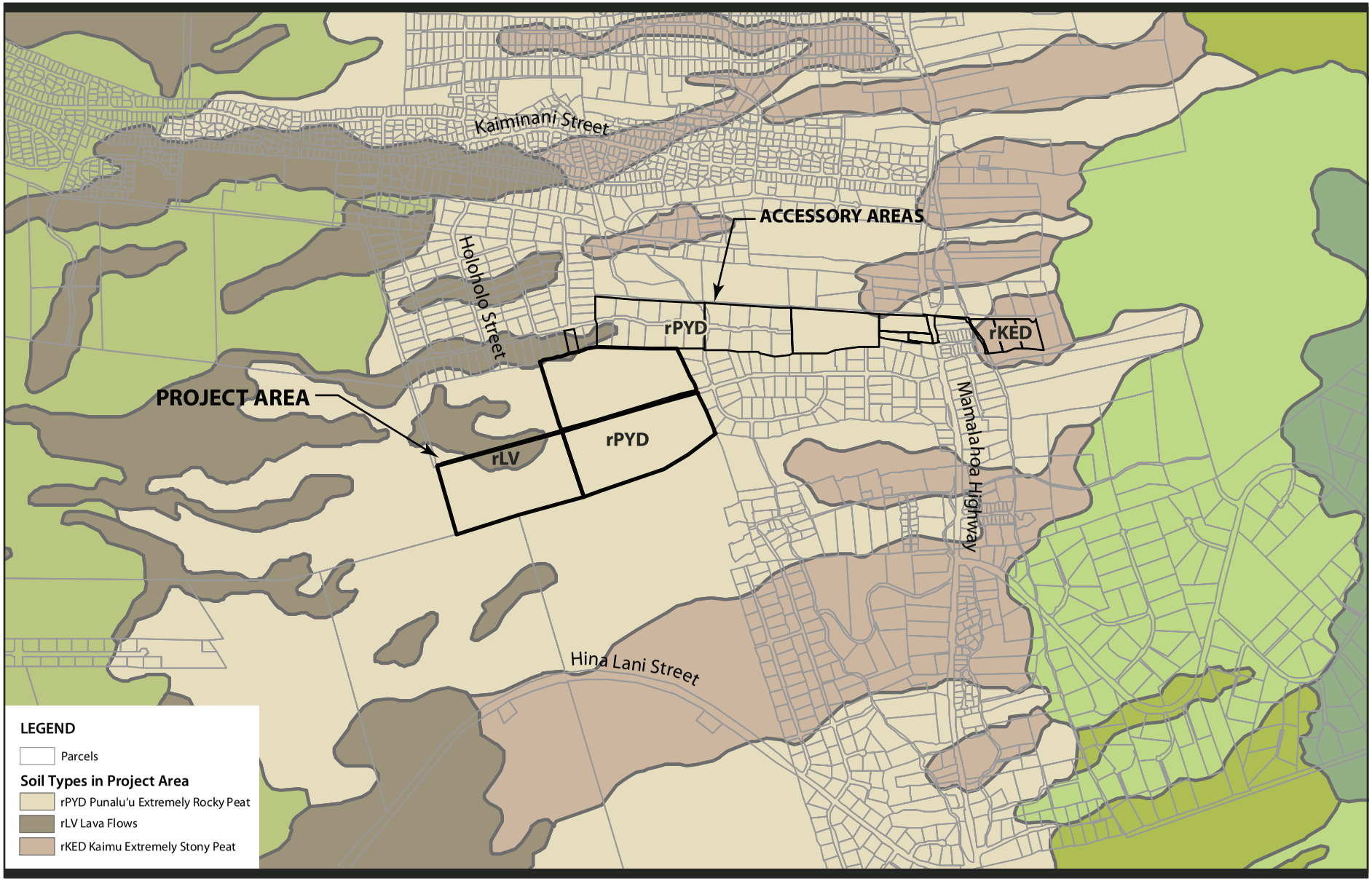
LEGEND

- Primary Market Residential
- Affordable Housing
- Park
- WWTP
- Petition Area
- Homestead Road

Area take offs (acres)

Primary Market Residential	94.0 ac	Lava Tube Preseerve	5.3 ac
Affordable Housing	6.0 ac	On-Site Reservoir	0.4 ac
Park (includes 1.3 acre leach field)	3.6 ac	Homestead Road	1.8 ac
WWTP	0.6 ac	Road Rights-of-Way	19.8 ac

Figure 4
CONCEPT PLAN
Kula Nei
North Kona, Hawaii
Environmental Impact Statement
Prepared for The Shopoff Group



Belt Collins

NORTH

0 1000 2000

SCALE IN FEET

Figure 5

SOILS MAP

Kula Nei
North Kona, Hawaii
Environmental Impact Statement
Prepared for The Shopoff Group

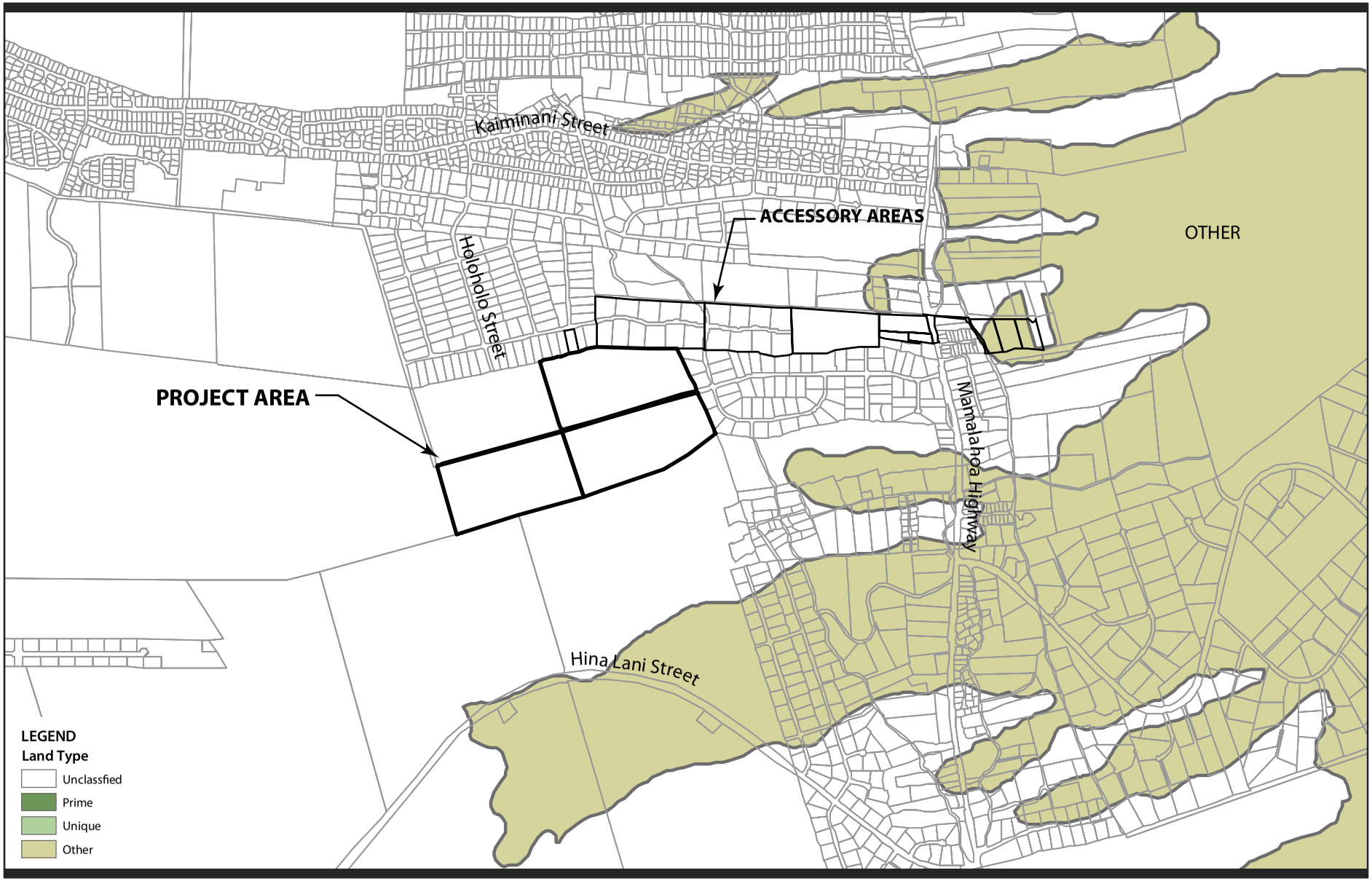
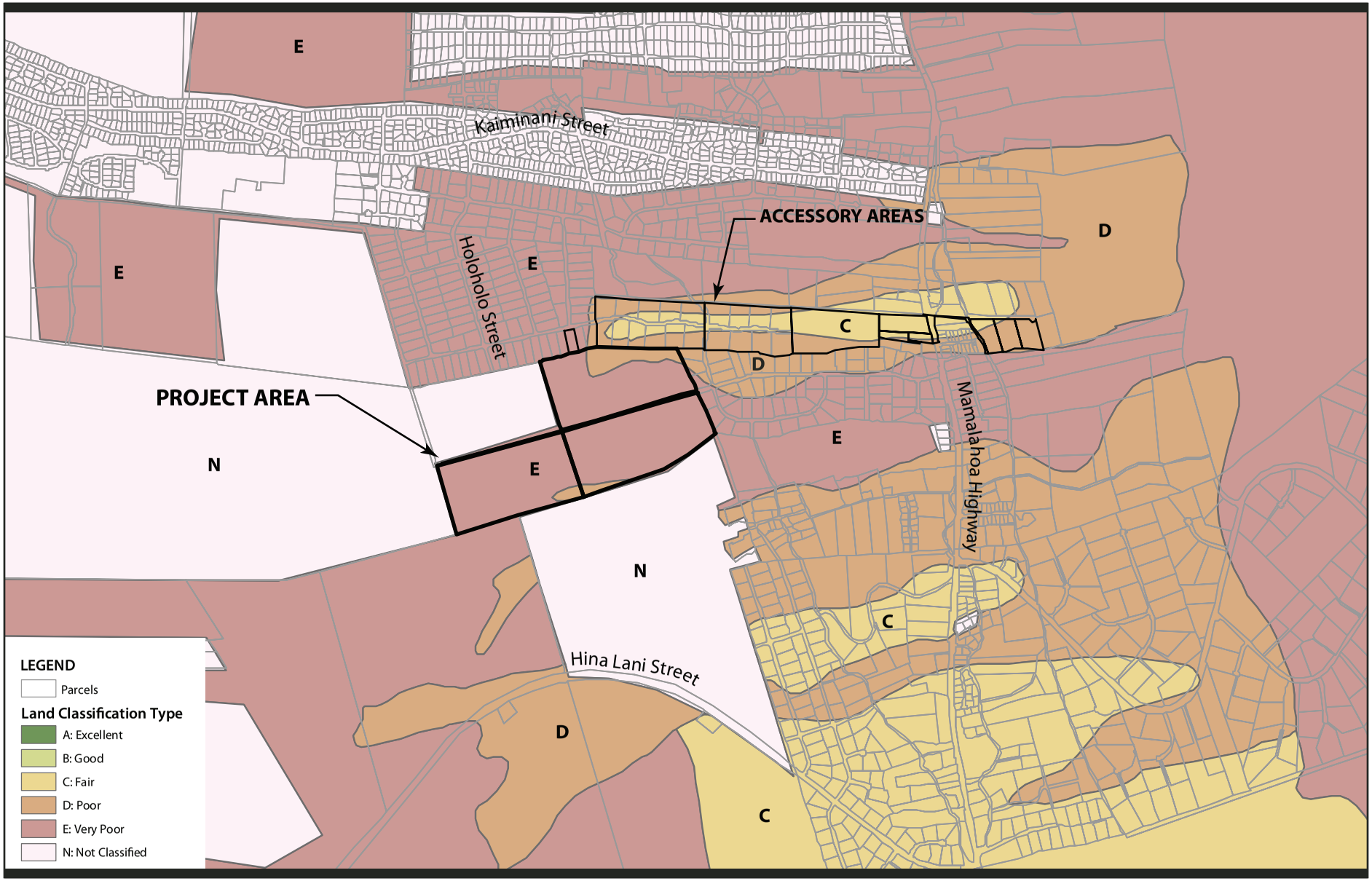


Figure 6

ALISH MAP

Kula Nei
North Kona, Hawaii
Environmental Impact Statement
Prepared for The Shopoff Group



Belt Collins

NORTH

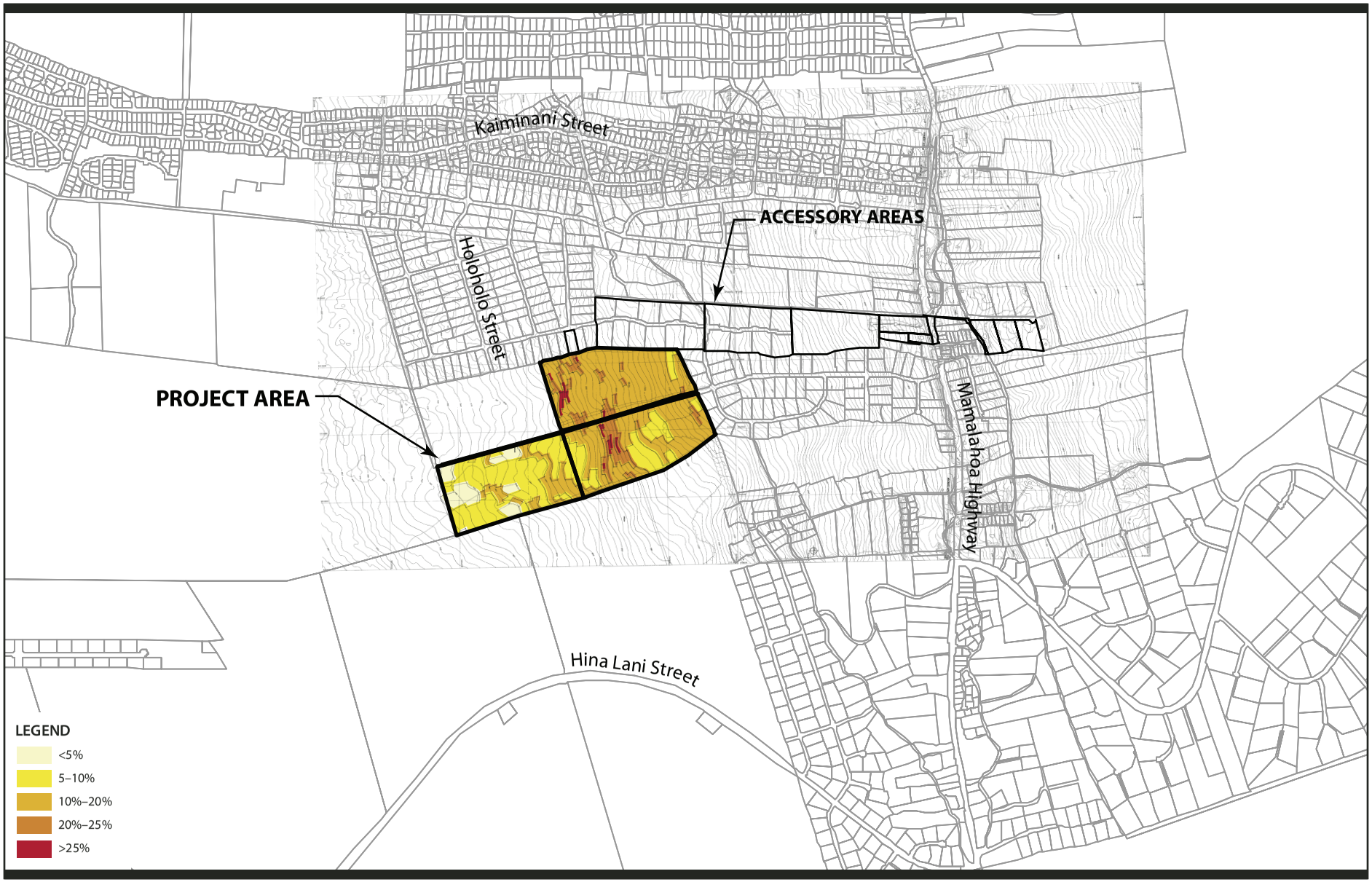
0 1000 2000

SCALE IN FEET

Figure 7

LSB MAP

Kula Nei
North Kona, Hawaii
Environmental Impact Statement
Prepared for The Shopoff Group



BeltCollins

NORTH

0 1000 2000

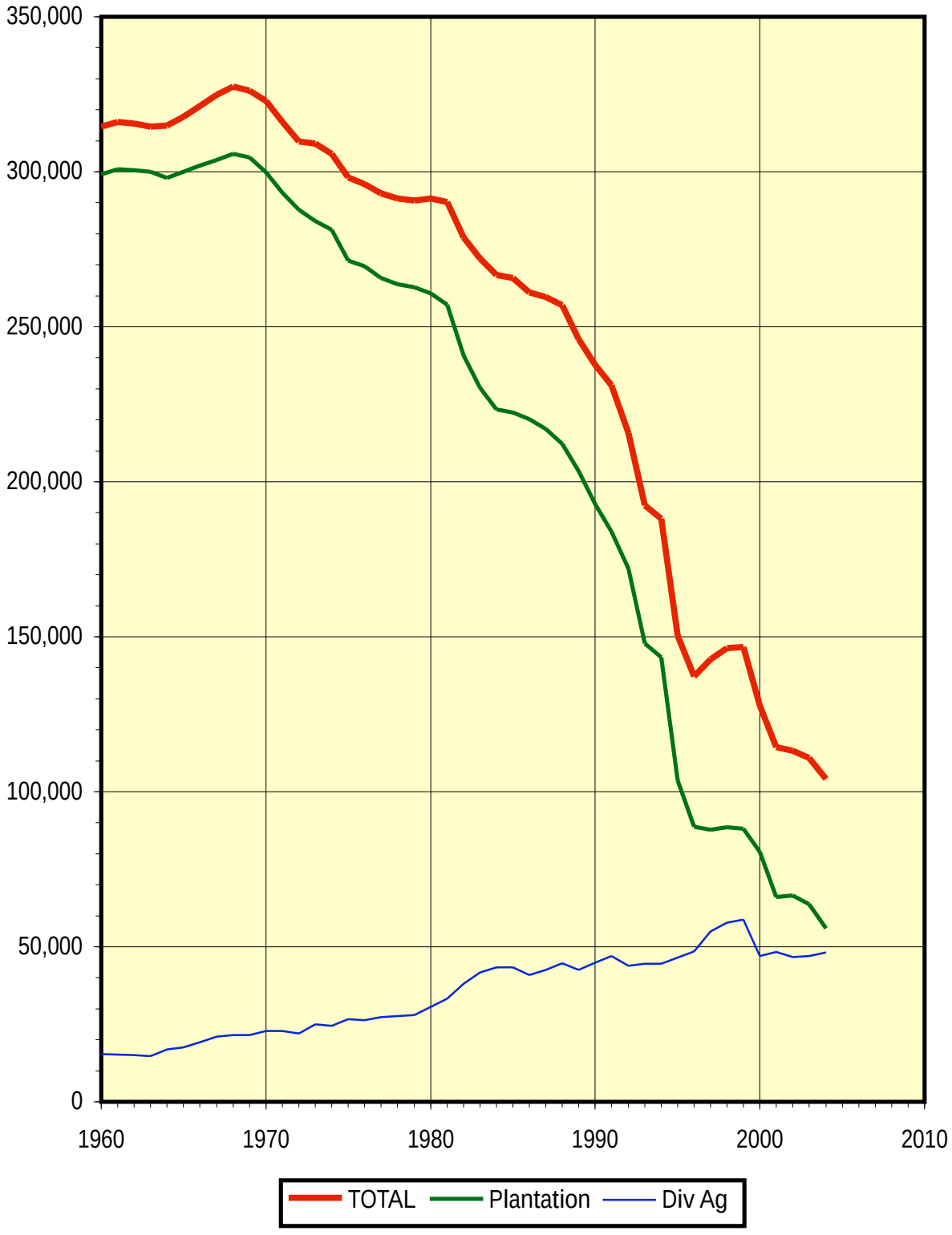
SCALE IN FEET

Figure 8

SLOPE MAP

Kula Nei
North Kona, Hawaii
Environmental Impact Statement
Prepared for The Shopoff Group

Figure 9. Statewide Acreage in Crop: 1960 to 2004



APPENDIX

APPENDIX:
SELECTED STATE AND COUNTY GOALS, OBJECTIVES, POLICIES AND GUIDELINES RELATED TO AGRICULTURAL LANDS

1. HAWAI'I STATE CONSTITUTION (Article XI, Section 3):

> …to conserve and protect agricultural lands, promote diversified agriculture, increase agricultural self-sufficiency and assure the availability of agriculturally suitable lands…

2. HAWAI'I STATE PLAN (Chapter 226, Hawaii Revised Statutes, as amended):[1,2]

Section 226-7 Objectives and policies for the economy--agriculture.

(a) Planning for the State's economy with regard to agriculture shall be directed towards achievement of the following objectives:

(1) Viability in Hawaii's sugar and pineapple industries.

(2) Growth and development of diversified agriculture throughout the State.

(3) An agriculture industry that continues to constitute a dynamic and essential component of Hawaii's strategic, economic, and social well-being.

(b) To achieve the agricultural objectives, it shall be the policy of the State to:

(2) Encourage agriculture by making best use of natural resources.

(10) Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs.

(16) Facilitate the transition of agricultural lands in economically nonfeasible agricultural production to economically viable agricultural uses.

Section 226-103 Economic priority guidelines.

(c) Priority guidelines to promote the continued viability of the sugar and pineapple industries:

(1) Provide adequate agricultural lands to support the economic viability of the sugar and pineapple industries.

(d) Priority guidelines to promote the growth and development of diversified agriculture and aquaculture:

(1) Identify, conserve, and protect agricultural and aquacultural lands of importance and initiate affirmative and comprehensive programs to promote economically productive agricultural and aquacultural uses of such lands.

(10) Support the continuation of land currently in use for diversified agriculture.

Section 226-104 Population growth and land resources priority guidelines.

(b) Priority guidelines for regional growth distribution and land resource utilization:

(2) Make available marginal or non-essential agricultural lands for appropriate urban uses while maintaining agricultural lands of importance in the agricultural district.

Section 226-106 Affordable Housing

Priority guidelines for the provision of affordable housing:

(1) Seek to use marginal or nonessential agricultural land and public land to meet housing needs of low- and moderate-income and gap-group households.

3. AGRICULTURAL STATE FUNCTIONAL PLAN (1991)[3]

(Functional plans are guidelines for implementing the State Plan. They are approved by the Governor, but not adopted by the State Legislature.)

Objective H: Achievement of Productive Agricultural Use of Lands Most Suitable and Needed for Agriculture.

Policy H(2): Conserve and protect important agricultural lands in accordance with the Hawaii State Constitution.

Action H(2)(a): Propose enactment of standards and criteria to identify, conserve, and protect important agricultural lands and lands in agricultural use.

Action H(2)(c): Administer land use district boundary amendments, permitted land uses, infrastructure standards, and other planning and regulatory functions on important agricultural lands and lands in agricultural use, so as to ensure the availability of agriculturally suitable lands and promote diversified agriculture.

4. COUNTY OF HAWAI'I GENERAL PLAN[4]

2: ECONOMIC

2.3. POLICIES

(a) Assist in the expansion of the agricultural industry through the protection of important agricultural lands ….

14: LAND USE

14.2 AGRICULTURE

14.2.2 Goals

(a) Identify, protect and maintain important agricultural land on the island of Hawai'i.

14.2.3 Policies

(a) Implement new approaches to preserve important agricultural lands.

(d) Agricultural land may be used as one form of open space or as a green belt.

(f) In order to minimize the potential conflicts between agricultural and non-agricultural uses, standards and guidelines for the establishment of well defined buffer areas as part of new, non-agricultural developments that are located adjacent to important agricultural lands shall be developed.

(i) Designate, protect and maintain important agricultural lands from urban encroachment.

(j) Ensure that development of important agricultural lands be primarily for agricultural use.

(k) Support the development of private and State agricultural parks to make agricultural land available for agricultural activities.

(s) Important agricultural lands shall not be rezoned to parcels too small to support economically viable farming units.

(t) Discourage speculative residential development on agricultural lands.

14.2.4.6 North and South Kona

14.2.4.6.2 Courses of Action

(a) Protect important agricultural land within the Kona Coffee Belt from urban encroachment through the use of zoning and other mechanisms.

(c) Encourage buffer zones or compatible uses between important agricultural land and adjacent uses of land.

Figure 7. Map 6 – Land Use Pattern Allocation Guide Map

The Project Area and surrounding lands are designated "Low-Density Urban."

5. REFERENCES

[1] State of Hawaii, Office of State Planning, Office of the Governor. *The Hawaii State Plan, 1991.* Honolulu, Hawaii. 1991.

[2] Act 25, S.B. No. 1158, April 15, 1993.

[3] Hawaii Department of Agriculture. *The Hawaii State Plan: Agriculture, State Functional Plan*. Honolulu, Hawaii. 1991.

[4] County of Hawai'i. *County of Hawai'i General Plan.* February 2005.

Appendix D

Botanical Survey

of

Kula Nei Development Area,

North Kona,

Island of Hawai‘i

by

Art Whistler, Ph.D.
Isle Botanica
Honolulu, Hawai‘i

Report prepared for

Belt Collins and Associates
Honolulu, Hawai‘i

May 2007

INTRODUCTION

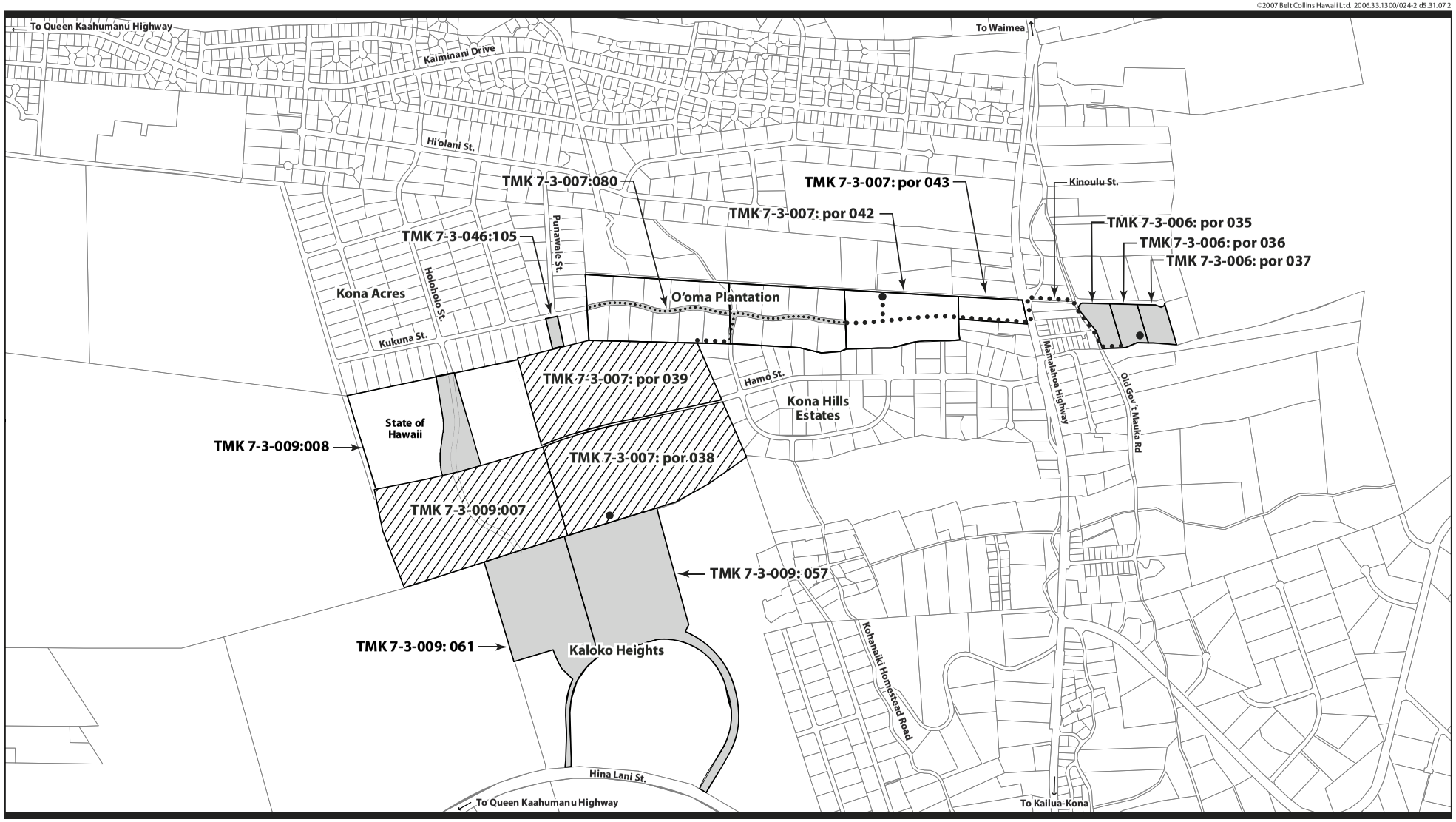
The project area is located in the North Kona District of the island of Hawai‘i, approximately 4.1 miles due north and upslope of Kailua-Kona, lying between 740 and 1140 ft elevation. The major portion where the residential development is proposed, called the “Primary Project Area,” comprises three large parcels, each roughly 2000 x 1000 ft, with two sharing a common long side and the third sharing a short side boundary, creating a flag-shaped lot (Fig. 1). The Primary Project Area comprises approximately 130 acres and includes the following TMK parcels: 7-3-007: 038; 7-3-007: 039; and 7-3-009: 007. They abut a continuous strip of land extending down slope from Hamo St. comprising an area referred to as Homestead Road, which is marked by a pair of parallel rock walls heading makai (see Fig. 3). This strip of land includes about 2.3 acres situated between parcels 038 and 039.

The study site also includes “Accessory Areas,” needed for the development of water reservoirs, pipelines, roadways, and transmission lines into the property. The Accessory Areas studied include the following TMK parcels: 7-3-009: por 008; 7-3-046: 105; 7-3-006: por 035; 7-3-006: por 036; 7-3-006: por 037; 7-3-007: por 040; 7-3-007: por 041; 7-3-007: por 042; and 7-3-007: por 043; (see Fig. 1). Two of these, TMK 7-3-007: por 040 and 041, comprise the recently graded O‘oma Plantation, and will be utilized for their existing water line to the current proposed development site. The proposed total land for the Accessory Areas is about 21 acres.

The terrain of the study site is characterized by gentle slopes of weathered pahoehoe and ‘a‘a lava flows ranging in age from 3000 to 5000 years. Originally it was probably covered with a dryland forest dominated by lama (*Diospyros sandwicensis*) and alahe‘e (*Psydrax odoratum*) with a mixture of other native trees, but it has been heavily disturbed in the past. Hawaiians used the area during the Precontact Era (before 1778) for habitation, agriculture, and water collection activities. Occupation continued into the European Era (after 1778), but the land was then used mostly as rough pasturage for goat, cattle, and donkeys, with a minor agriculture component. In recent years, the site has been vacant with no active development or formal cultivation activities. Limited cattle grazing has occurred on the upper portions of the property, but this too has now been abandoned.

METHODOLOGY

Before the fieldwork was carried out, a review of the literature was undertaken by the Principal Investigator (PI). The current status of the endangered species previously reported from the site was checked using the official database of threatened and endangered species (USFWS 2005). This list is identical to the State of Hawai‘i list of threatened and endangered plant species. In addition, information about threatened and endangered plant species found in the area was extracted from the Hawai‘i Natural Heritage Program database (Anon. 2005) of federally listed plant species (Fig. 2). Topographic maps and aerial photos were studied to determine the best access points and to locate places where native species are most likely to be found (lava flows). However, no significant lava flows occur on the property. No botanical surveys of adjacent areas were found, even though these recently developed areas were in similar vegetation. The O‘oma Plantation project is classified as State Agricultural District and is being developed as a large-lot agriculture subdivision, so apparently no EIS was required.



NORTH

0 500 1000

SCALE IN FEET

LEGEND

- Primary Project Area
- Accessory Area
- Existing Water Line
- Proposed Water Line
- Proposed Reservoir

PRIMARY PROJECT AREA AND ACCESSORY AREA

Kula Nei
North Kona, Hawaii
Environmental Impact Statement
Prepared for The Shopoff Group

After the literature review, a botanical field survey was conducted at the site by a two-person botanical team consisting of the PI (Art Whistler) and a Field Assistant (Beate Neher) from the 11th to 13th May 2007. Access was attained from Holoholo St. and Puawale St. on the north side
of the Primary Project Area. Transects were run across the parcels in some places, particularly in areas with the least disturbed forest, and in other places short transects were extended into the scrub vegetation from various points along the bulldozer roads around the parcels. All plant species encountered during the survey were recorded, along with an indication of their frequency. New lists were made for each vegetation type and/or day, and these were combined into a comprehensive checklist of all plants found at the study site (see Table 2). Notes were also taken on vegetation types present, indicating the dominance and frequency of the plant species found there. These were later analyzed and written up to form the vegetation section below.

Nearly all of the species encountered during the fieldwork were familiar to the field team and were identified in the field. The few that defied immediate identification were photographed and sent to Clyde Imada of the Bishop Museum, who promptly identified them (Imada, pers. comm. 2007).

THE VEGETATION

Three types of vegetation can be recognized on the Kula Nei property: (1) Managed Land Vegetation; (2) *Schinus*/*Psydrax* Scrub; and (3) disturbed *Diospyros*/ *Psydrax* dryland forest. These types are described below.

(1) Managed Land Vegetation

This comprises the areas at the site that are under periodic or frequent management, which includes bulldozing, mowing, and agriculture. Several parts of the study site fit into this category: (1) old bulldozed tracks that go around the main three Primary Project Area parcels (TMK 7-3-007: 038, 7-3-007: 039, and 7-3-009: 007); (2) the two western portions of O‘oma Plantation, both of which have already been graded; (3) the two parcels east of O‘oma Plantation, which appear to be an abandoned pasture in the western portion and a site for the storage of materials and equipment in the eastern portion; (4) and the easternmost portion, comprising three lots (TMK 7-3-006, pors 035, 036, and 037) that are currently used as home sites (the western and eastern lots) or as a pasture or large lawn (the middle parcel); and (5) the small access lot (TMK 7-3-046: 105) at the north side of the study site, which is currently cleared.

The bulldozed roads around the main western parcels are dominated by alien species, mostly herbs, shrubs, young trees and grasses (Fig. 4). The most dominant species here is fountain grass (*Pennisetum setaceum*), with lesser amounts of the Natal redtop (*Rhynchelytrum repens*) and molasses grass (*Melinus minutiflora*); the shrubs indigo (*Indigofera suffruticosa*), ‘uhaloa (*Waltheria indica*), lantana (*Lantana camara*), blue rat’s-tail (*Stachytarpheta cayennensis*), and ‘ilima (*Sida fallax*); the herbaceous life plant (*Kalanchoë pinnata*); the vine huehue (*Cocculus triloba*); and saplings of Christmas berry (*Schinus terebinthifolius*) and koa haole (*Leucaena leucocephala*). The ‘uhaloa, ‘ilima, and huehue are all native species, but are common indigenous weeds in Hawai‘i. Some areas appear to have been bulldozed more recently than the others, and are only sparsely vegetated (Fig. 5).

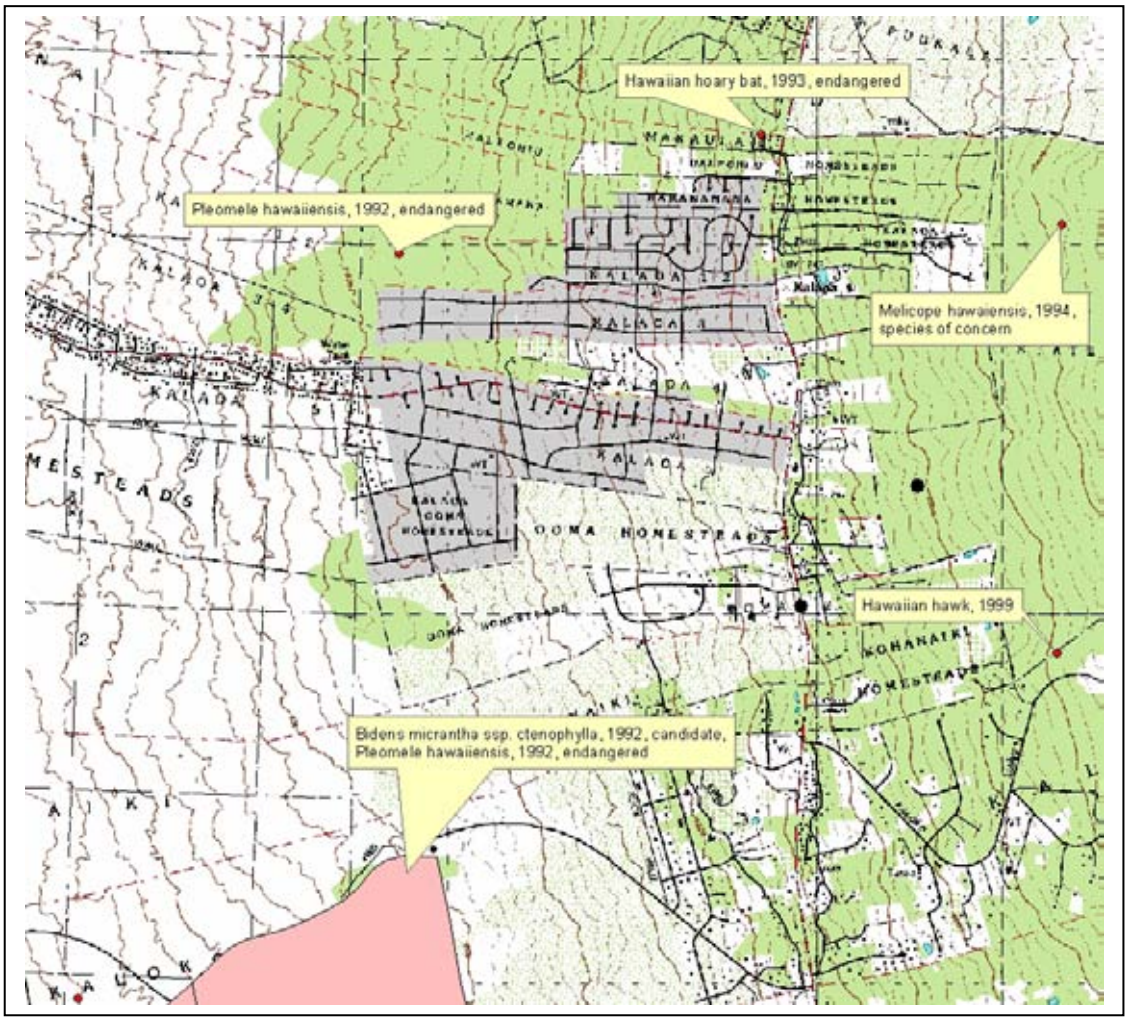


Fig. 2. Hawai‘i Natural Heritage Program database map of federally listed plant species.

In one place along the route of Homestead Road, there was a small patch of the endemic subshrub *Bidens micrantha* ssp. *ctenophylla*. This species was a candidate for federal listing as endangered or threatened, but was never classified as such, and hence has no protected status. It is occasional in other areas of similar vegetation at about the same elevation in the area outside the project area(Whistler 2006, 2007).

The largest of the Accessory Areas comprises the two O‘oma Plantation parcels (TMKs 7-3-007: por 040; and 7-3-007: por 041). These have already been graded (Fig. 6), and nearly all the vegetation has been removed. A number of weed species have come up after the grading, but most of these are dead, apparently a victim to Roundup spraying. Perhaps a third of the alien weedy species encountered during the survey were found in this graded area, including comb hyptis (*Hyptis pectinatus*), wild peppergrass (*Lepidium virginicum*), currant tomato (*Lycopersicon pimpinellifolium*), sow thistle (*Sonchus oleraceus*), bitter melon (*Momordica charantia*), and Natal redtop (*Rhynchelytrum repens*). The parcel contains two archeological site enclosures bounded by rock walls (Fig. 7). The vegetation inside these probably represents what

was present before the most recent grading. The dominant species in these include scattered Christmas berry (*Schinus terebinthifolius*) and alahe‘e (*Psydrax odoratum*) trees in an open matrix dominated by fountain grass (*Pennisetum setaceum*) and several other species of weedy shrubs, herbs, and grasses. Also present in the graded O‘oma Plantation properties is a new planting of coffee trees.

The two Accessory Parcels east of O‘oma Plantation and extending up to Mamalahoa Highway are highly disturbed and dominated mostly by herbaceous vegetation. The western one seems to be an abandoned pasture (Fig. 8), while the eastern one appears to be used for storage of equipment and materials (Fig. 9). A storage building and/or office and a pile of water pipes are found on the latter. Over a third of the alien species listed in Table 2 are found on these properties, with the only native species being weedy ones, such as the common native grass kukaepua‘a (*Digitaria setigera*) and scattered individuals of ‘ohi‘a lehua (*Metrosideros polymorpha*), which is a remnant of the natural vegetation that covered this area prior to human disturbance.

The three easternmost Accessory Area parcels mauka of Mamalahoa Highway are lots in a small established subdivision. The makai property is an occupied house lot dominated by cultivated plants trees and shrubs (most of which are not listed in Table 2, since they are not native or naturalized). The middle property is a large, periodically mowed lawn or pasture with several scattered ‘ohi‘a lehua (*Metrosideros polymorpha*) and silk oak (*Grevillea robusta*) trees that were apparently left standing when the land was cleared. The third property, mauka of the other two, is a well-manicured house lot.

(2) *Schinus*/*Psydrax* Scrub

This is the same vegetation described by Char and Associates (1989) on a nearby parcel as “*Canthium*/Christmas Berry Shrubland” (*Canthium* is the old name for *Psydrax*), and by the current name in an area south of the present study site (Whistler 2007). It covers most of the Primary Project Area parcels (Fig. 10). The main species dominating this community is the alien tree Christmas berry (*Schinus terebinthifolius*), along with somewhat lesser amounts of the indigenous tree alahe‘e (*Psydrax odoratum*). This type of vegetation differs most significantly from the following type by the relative infrequency of the native tree lama (*Diospyros sandwicensis*). *Schinus*/*Psydrax* Scrub somewhat matches the description of the “Lowland Dry Shrublands” described in Wagner et al. (1999), which is described as occurring in leeward situations on most of the main islands, at 330 to 2000 ft elevation, and being open and not exceeding 10 ft in height.

The third most prevalent tree in this community is strawberry guava (*Psidium cattleanum*), which is often found in clusters, particularly on the northern parcel (TMK 7-3-007: 039) of the Primary Project Area. Other trees occasional to uncommon in this type of vegetation include tall individuals of silk oak (*Grevillea robusta*) and the native shrub or tree ‘ulei (*Osteomeles anthyllidifolia*). The endemic ‘ohe makai (*Reynoldsia sandwicensis*), the endemic shrub or tree mamane (*Sophora chrysophylla*), and the indigenous shrub ‘a‘ali‘i (*Dodonaea viscosa*) are occasional to uncommon, while the Polynesian introductions noni (*Morinda citrifolia*) and candlenut (*Aleurites moluccana*) are occasional. Koa haole (*Leucaena leucocephala*) is uncommon in the scrub forest, but sometimes forms dense patches in more open areas.

The ground cover is also sparse in this type of vegetation, with scattered clumps of *Pennisetum setaceum* (fountain grass) found mostly in pockets of soil or pahoehoe, and perhaps being the most common species present. It is particularly sparse (see Fig. 10) under the dense canopy of the Christmas berry trees, where lawa‘e fern (*Phymatosorus grossus*) is one of the few plants that can survive in the dense shade there. Second in importance is probably air plant (*Kalanchoë pinnata*), which forms a dense undergrowth in some places, particularly under light canopy, but is entirely lacking in other places. Where the canopy opens up, as on patches of old lava flows, plants such as huehue (*Cocculus trilobus*), which is common as a vine in all forests at the study site, and the thorny alien shrub *Lantana camara* (lantana) are occasional to common (Fig. 11).

(3) Disturbed *Diospyros*/*Psydrax* Scrub

This type of forest appears only on the northwestern parcel (TMK 7-3-009: por 008) in the Accessory Area (Fig. 12). It is dominated by three tree species, alahe‘e (*Psydrax odoratum*), lama (*Diospyros sandwicensis*), and Christmas berry (*Schinus terebinthifolius*). It is similar to the above category of scrub forest, but has a much higher percentage of lama (*Diospyros sandwicensis*), and is consequently much less disturbed than the latter vegetation. The first two of the dominant trees here are native species and give their name to this type of vegetation, and the Christmas berry is an alien species, which is responsible for the qualifier “disturbed.” This is the least disturbed native forest in the whole study site, and covers the area included in the Holoholo St. extension corridor and the rest of the surrounding parcel.

Other tree species found here include the Polynesian introductions noni (*Morinda citrifolia*) and candlenut (*Aleurites moluccana*); the alien species koa haole (*Leucaena leucocephala*), silk oak (*Grevillea robusta*), umbrella tree (*Schefflera actinophylla*), and strawberry guava (*Psidium cattleanum*); and the native trees ‘ulei (*Osteomeles anthyllidifolia*), which is common in this forest, and ‘ohe makai (*Reynoldsia hawaiiensis*), which is uncommon. One other native tree uncommon in this vegetation is naio (*Myoporum sandwicense*). In some places, particularly where there is more soil development, koa haole may dominate, usually with a dense ground cover of life plant (*Kalanchoë pinnata*).

The ground cover in this type of vegetation is variable. When the canopy is broken or sparse, patches of fountain grass (*Pennisetum setaceum*) prevail. This is also the case in clearings, probably associated with rocky soil or lava outcroppings. Fountain grass is quite dense in these situations, and only a few other species, such as lawa’e fern (*Phymatosorus grossus*) and lantana (*Lantana camara*) associated with it. Other species common in sunny places include life plant (*Kalanchoë pinnata*), and lesser amounts of *Rivina humilis* (rouge plant), the native vine huehue (*Cocculus triloba*), and uncommon individuals or patches of the native herb ‘ala‘ala-wai-nui (*Peperomia leptostachya*).

THE FLORA

A total of 109 plant species (see Table 2) was recorded in the study site. Nineteen of the 109 are native and five of these native species are endemic. Indigenous plants are species that are native to a region or place, but are also found elsewhere. Endemic plants are species restricted to

a single region or area, i.e., in the case of Hawai‘i, they are found only in Hawai‘i. In biodiversity terms, the endemic status is the more important of the two categories, since if a species belonging to it is endangered or threatened in Hawai‘i, it would likewise be classified globally. Indigenous species, however, can be rare in Hawai‘i, but may be common elsewhere in the Pacific. Over 90% of the native plants in Hawai‘i are endemic, one of the highest rates in the world.

The majority of the 109 species encountered during the survey are naturalized “alien” plants that were accidentally or intentionally introduced to Hawai‘i, but which have now become established in the islands and can spread on their own. The present survey was conducted during a fairly dry part of the year, and if done in a rainy part or a wetter year, it is likely that additional species, mostly herbaceous alien weeds, would have been recorded, but this would be unlikely to turn up any native species, which are mostly shrubs and trees and are present all year round at the site.

Several threatened or endangered species have been reported in the area, and are shown on the Hawai‘i Natural Heritage Program database map (Fig. 2). There is a single record of hala pepe (*Pleomele hawaiiensis*) collected north of the study site in 1992, and a large sizeable population of the yucca-like plant is found at Kaloko about 1.2 miles to the south (Whistler 2006). There is a single collection record of mokihana kūkae moa (*Melicope hawaiiensis*) east and upslope of the site, but this is only a Species of Concern (SOC) and is not likely to be found on the present study site.

Table 1. Native species found at the study site

Bidens micrantha ssp. *ctenophylla* (Asteraceae)	ko‘oko‘olau	Endemic
Caesalpinia bonduc (Fabaceae)	gray nickers, kakalaioa	Indigenous
Cocculus trilobus (Menispermaceae)	huehue	Indigenous
Digitaria setigera (Poaceae)	kukaepua‘a	Indigenous
Diospyros sandwicensis (Ebenaceae)	lama	Endemic
Dodonaea viscosa (Sapindaceae)	a‘ali‘i	Indigenous
Ipomoea indica (Convolvulaceae)	koali-‘awa	Indigenous
Metrosideros collina (Myrtaceae)	‘ohi‘a lehua	Endemic
Myoporum sandwicense (Myoporaceae)	naio	Indigenous
Osteomeles anthyllidifolia (Rosaceae)	‘ulei	Indigenous
Peperomia leptostachya (Piperaceae)	‘ala‘ala-wai-nui	Indigenous
Psilotum nudum (Psilotaceae)	moa	Indigenous
Psydrax odoratum (Rubiaceae)	alahe‘e	Indigenous
Reynoldsia sandwicensis (Araliaceae)	‘ohe makai	Endemic
Senna gaudichaudii (Fabaceae)	kolomona	Indigenous
Sida fallax (Malvaceae)	‘ilima	Indigenous
Solanum americanum (Solanaceae)	popolo	Indigenous?
Sophora chrysophylla (Fabaceae)	mamane	Endemic
Waltheria indica (Sterculiaceae)	‘uhaloa	Indigenous

A small population of another "Species of Concern" *Bidens micrantha* ssp. *ctenophylla* was found in a bulldozed area along Homestead Road (Fig. 13). According to the USFWS (pers. comm. 2007a), "The majority of the wild individuals occur in two population areas: the privately owned Kaloko Honokohau lava flow area (approximately 1,000 plants) [see Whistler 2006], and the State-owned (Department of Hawaiian Home Lands (DHHL) Kealakehe population (approximately 1,000–2,000 plants). The remaining 5 wild individuals exist on State land at PuuWaaWaa Wildlife Sanctuary." The small population found at the present site constitutes a new record to add to these.

DISCUSSION AND RECOMMENDATIONS

Based upon the survey, there are three types of vegetation at the study site: (1) Managed Land Vegetation in bulldozed roads in the Primary Project Area, the graded O‘oma Plantation, the Accessory Area parcels east of O‘oma Plantation, and the three house lots lying mauka of Mamalahoa Highway; (2) *Schinus*/*Psydrax* Scrub dominated by Christmas berry (*Schinus terebinthifolius*) and alahe‘e (*Psydrax odoratum*), which covers the Primary Project Area; and (3) Disturbed *Diospyros*/*Psydrax* Scrub that lies on the northwestern parcel (TMK 7-3-009: por 008),where an extension of Holoholo Road is planned.

A total of 109 plant species were recorded from the study site (see Table 2). Of these, 19 are native species—14 indigenous species and 5 endemic species. None of these are federally listed as "threatened" or "endangered." One candidate species, ko‘oko‘olau (*Bidens micrantha* ssp. *ctenophylla*) was found in a bulldozed road area, and several individuals of the Species of Concern ‘ohe makai (*Reynoldsia hawaiiensis*) were found in the study site, but these species have no federal protection. No areas of wetlands or undisturbed native vegetation occur at the site. Consequently, there are no botanical impediments to carrying out the proposed construction. Because no species are federally listed as threatened or endangered, no mitigation is needed. According to the USFWS (pers. comm. 2007b), "neither [of the above] species is federally listed as endangered or threatened and therefore neither receives protection under the ESA [i.e., the Endangered Species Act of 1973]…*Bidens micrantha* ssp *ctenophylla* is a candidate species, which means that we believe it warrants listing under the ESA but that listing is currently precluded by other, higher priority actions." The least disturbed forest at the site is the northwestern parcel (TMK 7-3-009: por 008), through which the Holoholo St. extension corridor is planned. This parcel is owned by the State of Hawaii. No threatened or endangered plant species have been found here.

It is recommended that native and cultural species occurring on the site or in the general area should be considered for landscaping in the project to the extent practical. This would be a win-win situation. Some of the species make attractive ornamentals, and are already adapted to the dryland conditions at the site. Thus they require little maintenance and watering. A list of species recommended for planting as ornamentals are as follows:

Alahe‘e (*Psydrax odoratum*)—A small indigenous tree or shrub is common at the study site, to which it is well adapted. It has attractive dark green leaves, a thick canopy, and baseball-sized clusters of fragrant, attractive white flowers.

Halapepe (*Pleomele hawaiiensis*)—This federally-listed, yucca-like, endangered endemic plant species is similar to the money tree (*Dracaena marginata*) that is a popular ornamental plant in Hawai‘i. It was not found at the study site, but a population of it occurs at a similar elevation to the south at Kalolo.

‘Ilima (*Sida fallax*)—An indigenous shrub occasional to common at the site. It is a popular ornamental in Hawai‘i, where the orange mallow-like flowers are fashioned into exquisite leis.

Kolomona (*Senna gaudichaudii*)—Small indigenous tree with pale yellow flowers. It is similar to the scrambled eggs tree (*Senna surattensis*) that is a popular ornamental tree in Hawai‘i. It is uncommon at the study site.

Ko‘oko‘olau (*Bidens micrantha* ssp. *ctenophylla*)—An endemic shrub that is a candidate, federally listed endemic species. It is restricted mostly to this part of the island of Hawai‘i and has small, attractive, yellow, sunflower-like flowers. One small population was found in a bulldozed road along Homestead Road at the present study site.

Kukui (*Aleurites moluccana*)—This species is a Polynesian introduction to Hawai‘i rather than a native species, but it has important cultural significance since its seeds were traditionally used for night time illumination (hence its English name candlenut). Currently the seeds are used to produce massage oil and the fruits are fashioned into attractive, jet-black seed leis. Its gray-green leaves and large stature make it a popular ornamental tree in Hawai‘i.

Mamane (*Sophora chrysophylla*)—An endemic small tree or shrub common on the Big Island, especially at higher elevations. It has attractive yellow, sweetpea-like flowers and an unusual, bead-necklace-like pod. It is uncommon in the Primary Project Area.

Naio (*Myoporum sandwicense*)—An indigenous small tree or shrub with small, fragrant white flowers. Its English name is false sandalwood, indicative of its fragrant wood once used like sandalwood. The plant is easily grown from cuttings. It is uncommon in disturbed native forest at the current project site.

‘Ohe (*Reynoldsia sandwicensis*)—A large, fast growing endemic tree with an open canopy. This Species of Concern (SOC) is uncommon at the current project site.

‘Ohi‘a lehua (*Metrosideros polymorpha*)—This is the indigenous, medium-sized tree covering much of the island of Hawai‘i, and has attractive red or yellow, powderpuff-like flowers. Some varieties also have attractive gray-green leaves. It was found only as scattered individuals at the present study site, but may have been the dominant species at the top of the site, beyond the Primary Project Area.

‘Ulei (*Osteomeles anthyllidifolia*)—A sprawling indigenous shrub that makes a nice shrubby ground cover, occasional at the study site. It has attractive but small, white, rose-like flowers (it is a member of the rose family).

LITERATURE CITED

Anon. 2005 (Revised). Hawai‘i Natural Heritage Program Database. Hawai‘i Natural Heritage Program, Honolulu.

Char and Associates. 1989. Botanical survey, Queen Lili‘uokalani Trust Property, Keahuolu Lands, Kailua-Kona, Hawai‘i. Report prepared for Belt Collins and Associates, Honolulu. Mimeog., 19 pp

Imada, C. 2007. Pers. comm..

Palmer, D.D. 2003. Hawai‘i’s Ferns and Fern Allies. University of Hawaii Press, Honolulu. 324 pp.

Porter, J. R. 1972. Hawaiian names for vascular plants. University of Hawai‘i College of Tropical Agriculture Experimental Station Paper 1:1–64.

St. John, H. 1973. List and summary of the flowering plants in the Hawaiian Islands. Pacific Tropical Botanical Garden Memoir 1: 1–519.

U.S. Fish and Wildlife Service (USFWS). 2005. Endangered and Threatened Wildlife and Plants. 50CFR 17:11 and 17:12 (Tuesday, November 1, 2005).

U.S. Fish and Wildlife Service (USFWS). 2007a. Pers. comm.

U.S. Fish and Wildlife Service (USFWS). 2007b. Pers. comm.

Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1999. Manual of the flowering plants of Hawai‘i. University of Hawai‘i Press and Bishop Museum Press, Honolulu. 2 vols.

Whistler, A. 2006. Botanical survey of Kaloko Properties, North Kona, Islands of Hawai‘i. Reported prepared by Isle Botanica for Wilson Okamoto Corporation, Honolulu. Mimeog., 22 pp..

Whistler, A. 2007. Botanical survey of Queen Lili‘uokalani Trust Lands, Island of Hawai‘i. Reported prepared by Isle Botanica for Belt Collins and Associates, Honolulu. Mimeog., 18 pp.

TABLE 2. KULA NEI PLANT SPECIES CHECKLIST

The following is a checklist of the vascular plants inventoried during the field studies on the Kula Nei proposed development site. The plants are divided into three groups, Ferns (including fern allies), Monocots, and Dicots. Within these groups, the species are presented taxonomically by family, with each family and each species in the family in alphabetical order. The taxonomy and nomenclature of the ferns follow Palmer 2003 and the flowering plants (Monocots and Dicots) follow Wagner *et al*. (1990). In most cases, common English and/or Hawaiian names listed here have been taken from St. John (1973) or Porter (1972).

For each species, the following information is provided:

1. Scientific name with author citation.
2. Common English and/or Hawaiian name, when known.
3. Biogeographic status. The following symbols are used.
   E = endemic (found only in Hawai‘i).
   I = indigenous (native to Hawai‘i as well as other geographic areas).
   P = Polynesian introduction (introduced to Hawai‘i by Polynesians before the advent of the Europeans).
   X = Introduced or alien (not native, introduced to Hawai‘i, either accidentally or intentionally, after the advent of the Europeans).
4. Life form, whether it is a tree, shrub, vine, herb, fern, fern ally, or grass.

Species	Common Names	Status	Life Form
FERNS AND FERN ALLIES			
NEPHROLEPIDACEAE (Sword Fern Family)			
Nephrolepis multiflora (Roxb.) Jarret ex Morton	hairy swordfern	X	fern
POLYPODIACEAE (Common Fern Family)			
Phymatosorus grossus (Langsd. & Fisch.) Brownlie	laua‘e	X	fern
PSILOTACEAE (Psilotum Family)			
Psilotum nudum L.	moa	I	fern ally
MONOCOTS			
AGAVACEAE (Agave Family)			
Cordyline fruticosa (L.) A. Chev.	ti, ki	P	shrub
ARECACEAE (Palm Family)			
Cocos nucifera L.	coconut palm, niu	P	palm
COMMELINACEAE (Spiderwort Family)			
Commelina benghalensis L.	hairy honohono	X	herb
Rhoeo spathacea (Sw.) Stearn	oyster plant	X	herb

Species	Common Names	Status	Life Form
POACEAE (Grass Family)			
Digitaria setigera Roth	kukaepua‘a	I	grass
Eleusine indica (L.) Gaertn.	goose grass	X	grass
Leptochloa uninervia (K. Presl) Hitchc. & Chase	----------	X	grass
Melinus minutiflora P. Beauv.	molasses grass	X	grass
Oplismenus cf. *hirtellus* (L.) P. Beauv.	basket grass	X	grass
Panicum maximum Jacq.	Guinea grass	X	grass
Pennisetum clandestinum Chiov.	kikuyu grass	X	grass
Pennisetum purpureum Schumach.	elephant grass	X	grass
Pennisetum setaceum (Forssk.) Chiov.	fountain grass	X	grass
Rhynchelytrum repens (Willd.) C.E. Hubb.	Natal redtop	X	grass
Sporobolus diander (Retz.) P. Beauv.	dropseed	X	grass
	DICOTS		
ACANTHACEAE (Acanthus Family)			
Barleria repens Nees	coral creeper	X	subshrub
Justicia betonica L.	white shrimp-plant	X	shrub
Thunbergia alata Bojer ex Sims	black-eyed Susan	X	vine
AMARANTHACEAE (Amaranth Family)			
Amaranthus viridis L.	slender amaranth	X	herb
ANACARDIACEAE (Mango Family)			
Mangifera indica L.	mango	X	tree
Schinus molle L.	Peruvian pepper tree	X	tree
Schinus terebinthifolius Raddi	Christmas berry	X	tree
ARALIACEAE			
Reynoldsia sandwicensis A. Gray	‘ohe makai	E	tree
Schefflera actinophylla (Endl.) Harms	octopus tree	X	tree
ASCLEPIADACEAE (Milkweed Family)			
Asclepias physocarpa (E. Mey.) Schlechter	balloon plant	X	shrub
ASTERACEAE (Sunflower Family)			
Bidens micrantha Gaud. subsp. *ctenophylla* (Sherff) Nagatga & Ganders	----------	E	subshrub
Bidens pilosa L.	beggar’s-tick	X	herb
Cirsium vulgare (Savi) Ten.	bull thistle	X	herb
Conyza canadensis (L.) Cronq.	Canada fleabane	X	herb
Emilia fosbergii Nicolson	red pualele, emilia	X	herb
Emilia sonchifolia (L.) DC.	pualele, emilia	X	herb
Parthenium hysterophorus L.	Santa Maria	X	herb
Pluchea carolinensis (Jacq.) G. Don	pluchea	X	herb
Senecio madagascariensis Poir.	----------	X	herb
Sonchus oleraceus L.	sow thistle	X	herb

Species	Common Names	Status	Life Form
BEGONIACEAE (Begonia Family)			
Begonia hirtella Link	----------	X	herb
BIGNONIACEAE (Bignonia Family)			
Jacaranda mimosifolia D. Don	jacaranda	X	tree
BRASSICACEAE (Mustard Family)			
Lepidium virginicum L.	wild peppergrass	X	herb
BUDDLEIACEAE (Butterfly-bush Family)			
Buddleia asiatica Lour.	dogtail, heulo'ilio	X	shrub
CACTACEAE (Cactus Family)			
Opuntia ficus-indica (L.) Mill.	prickly pear, panini	X	shrub
CARICACEAE (Papaya Family)			
Carica papaya L.	papaya	X	tree
CLUSIACEAE (Mangosteen Family)			
Clusia rosea Jacq.	autograph tree	X	tree
CONVOLVULACEAE (Morning-Glory Family)			
Ipomoea indica (J. Burm.) Merr.	koali-'awa	I	vine
CRASSULACEAE (Stonecrop Family)			
Kalanchoë pinnata (Lam.) Pers.	air plant	X	herb
Kalanchoë tubiflora (Haw.) Raym.-Hamet	chandelier plant	X	herb
CUCURBITACEAE (Gourd Family)			
Coccinea grandis (L.) Voigt	ivy gourd	X	vine
Momordica charantia L.	wild bittermelon	X	vine
EBENACEAE (Ebony Family)			
Diospyros sandwicensis (A. DC.) Fosb.	lama	E	tree
EUPHORBIACEAE (Spurge Family)			
Aleurites moluccana (L.) Willd.	candlenut, kukui	P	tree
Chamaesyce hirta (L.) Millsp.	garden spurge	X	herb
Euphorbia heterophylla L.	kaliko	X	herb
Ricinus communis L.	castor bean	X	shrub
FABACEAE (Pea Family)			
Caesalpinia bonduc (L.) Roxb.	gray nickers, kakalaioa	I	shrub
Canavalia cathartica Thouars	mauna-loa	X	vine
Chamaecrista nictitans (L.) Moench	partridge pea, lau-ki	X	herb
Crotalaria micans Link	----------	X	subhsrub
Crotalaria pallida Aiton	smooth rattlepod	X	subshrub
Desmanthus pernambucanus (L.) Thellung	virgate mimosa	X	herb
Desmodium incanum DC.	Spanish clover	X	herb
Glycine wightii (Wight & Arn.) Verdc.	----------	X	vine
Indigofera suffruticosa Mill.	indigo, 'iniko	X	shrub
Leucaena leucocephala (Lam.) de Wit	koa haole	X	tree
Mimosa pudica L.	sensitive plant	X	herb

Species	Common Names	Status	Life Form
FABACEAE (cont'd.)			
Senna gaudichaudii (Hook. & Arn.) H. Irwin & Barneby	kolomona	I	tree
Senna occidentalis (L.) Link	coffee senna	X	shrub
Senna septemtrionalis (Viv.) H. Irwin & Barneby	kolomona	X	shrub
Sophora chrysophylla (Salisb.) Seem.	mamane	E	tree
Vigna speciosa (Kunth) Verdc.	snail maunaloa	X	vine
LAMIACEAE (Mint Family)			
Hyptis pectinata (L.) Poir.	comb hyptis	X	herb
MALVACEAE (Mallow Family)			
Abutilon grandifolium (Willd.) Sweet	hairy abutilon	X	shrub
Malvastrum coromandelianum (L.) Garcke	false mallow	X	herb
Sida fallax Walp.	ʻilima	I	subshrub
Sida rhombifolia L.	Cuba jute	X	subshrub
MELIACEAE (Mahogany Family)			
Melia azedarach L.	Chinaberry tree	X	tree
MENISPERMACEAE (Moonseed Family)			
Cocculus trilobus (Thunb.) DC.	huehue	I	vine
MYOPORACEAE (False-sandalwood Family)			
Myoporum sandwicense A. Gray	naio, false sandalwood	I	tree
MYRTACEAE (Myrtle Family)			
Metrosideros polymorpha Gaud.	ʻohiʻa lehua	E	tree
Psidium cattleianum Sabine	strawberry guava	X	tree
Psidium guajava L.	guava	X	tree
Syzygium jambos (L.) Alston	rose apple	X	tree
OLEACEAE (Olive Family)			
Olea europa L.	olive	X	tree
OXALIDACEAE (Wood-Sorrel Family)			
Oxalis corniculata L.	wood sorrel	P?	herb
PASSIFLORACEAE (Passionflower Family)			
Passiflora edulis Sims	passionfruit, lilikoʻi	X	vine
Passiflora foetida L.	love-in-a-mist	X	vine
Passiflora suberosa L.	----------	X	vine
PHYTOLACCACEAE (Pokeweed Family)			
Rivina humilis L.	rouge plant	X	herb
PIPERACAEAE (Pepper Family)			
Peperomia leptostachya Hooker & Arnott	ʻalaʻala-wai-nui	I	herb
POLYGALACEAE (Milkwort Family)			
Polygala paniculata L.	bubblegum plant	X	herb

Species	Common Names	Status	Life Form
PORTULACACEAE (Purslane Family)			
Portulaca oleracea L.	common purslane	X	herb
Portulaca pilosa L.	ʻihi	X	herb
PROTACEAE (Protea Family)			
Grevillea robusta A. Cunn. ex R. Br.	silk oak	X	tree
ROSACEAE (Rose Family)			
Osteomeles anthyllidifolia (Sm.) Lindl.	ʻulei	I	shrub
RUBIACEAE (Coffee Family)			
Morinda citrifolia L.	Indian mulberry, noni	P	tree
Psydrax odoratum (Forst. f.) A. C. Sm. & S. Darwin	alaheʻe	I	tree
RUTACEAE (Citrus Family)			
Murraya paniculata (L.) Jack.	mock orange	X	shrub
SAPINDACEAE (Soapberry Family)			
Dodonaea viscosa Jacq.	ʻaʻaliʻi	I	shrub
SCROPHULARIACEAE (Snapdragon Family)			
Lophospermum erubescens D. Don	larger roving sailor	X	herb
Russelia equisetifolia Schltdl. & Cham	firecracker plant	X	subshrub
SOLANACEAE (Nightshade Family)			
Lycopersicon pimpinellifolium (Jusl.) Mill.	currant tomato	X	herb
Solanum americanum Mill.	black nightshade, popolo	I?	herb
Solanum torvum Sw.	prickly solanum	X	shrub
STERCULIACEAE (Cacao Family)			
Melochia umbellata (Houtt.) Stapf	----------	X	tree
Waltheria indica L.	ʻuhaloa	I	subshrub
VERBENACEAE (Verbena Family)			
Lantana camara L.	lantana	X	shrub
Stachytarpheta cayennensis (Rich.) Vahl	blue rat’s-tail	X	subshrub
Stachytarpheta dichotoma (Ruiz & Pav.) Vahl	owi	X	subshrub

Appendix E

AVIFAUNAL AND FERAL MAMMAL SURVEY

FOR THE KULA NEI PROJECT, NORTH KONA, HAWAII

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(Revised)
25 April 2007

INTRODUCTION

The purpose of this report is to provide the findings of a two day (15-16 April 2006) field survey of an approximately 128 acre site known as the Kula Nei Project, located in the district of North Kona, Hawaii. In addition to the data obtained from the field survey pertinent published and unpublished sources are also noted in the report. These sources add a broader perspective of the wildlife resources in this region. The goals of the survey were:

1-To document the species of birds and mammals currently on the property.

2-To examine the site for the purpose of identifying the natural resources available to wildlife in this region.

3-To devote special attention to documenting the presence and possible use of this property by native and migratory species particularly those that are listed as threatened or endangered.

SITE DESCRIPTION

The property (TMK 7-3-07:38 & 39, plus TMK 7-3-09:7) is located at approximately 1000 feet elevation. The topography has a relatively gentle slope with no prominent ravines. Vegetation is mostly alien with a scattering of native trees: Hawaiian Persimon or Lama (*Diospyros sandwicensis*); Alahe'e (*Canthium odoratum*); and Hawaiian Hopseed or A'ali'I (*Dodonaea viscose*). Brush and trees in the northern portion of the site are dense and form a virtual impenetrable thicket. A recently

bulldozed section along the perimeter provided the access to TMK 7-3-009:007. The southern portion (TMK 7-3-007:039) contains former ranch roads and more grass with fewer dense patches of forest. No wetland habitat occurs on the property. The lands to the north and east of the project site are developed residential properties. To the south and west are undeveloped ranch lands.

SURVEY PROTOCOL

The field survey was conducted over two consecutive days (15,16 April 2006). Observations were made in the early morning and late in the day when birds are most active. The site was covered on foot and all birds seen or heard were noted. Observations of mammals were limited to visual sightings and evidence in the form of tracks and skeletal remains. No attempts were made to trap mammals in order to obtain relative abundance estimates. The early evening of 15 April was used to search the site for the presence of the endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus*). A Pettersson Elektronik AB Ultrasound Detector D 100 was used to listen for echolocating bats.

Weather during the survey was generally clear with a thin layer of high clouds. The winds were light and overall the conditions for detecting vocalizing birds was

excellent. The scientific and common vernacular names used in this report follow Honacki et al. (1982), Pratt (1998) and Pyle (2002).

RESULTS AND DISCUSSION

Native Land Birds:

No native land birds were recorded on the survey. Given the habitats available on this property and the location of the site, the only probable native land birds that might on occasion forage in this area are the Hawaiian or Short-eared Owl (*Asio flammeus sandwichensis*), known as Pueo in Hawaiian and the Io or Hawaiian Hawk (*Buteo solitarius*). They forage in a variety of habitats including forests, agricultural lands and grasslands (Pratt et al. 1987, Hawaii Audubon Society 2005). Pueo is not listed as endangered or threatened on the island of Hawaii, however, the State of Hawaii does list the population on Oahu as endangered. The Io is an endangered species and is confined to the island of Hawaii.

Native Waterbirds:

No native waterbirds were recorded nor would any be expected on this site. No wetland habitat occurs on the property.

Seabirds:

No nesting seabirds were seen on the survey and none would be expected on this site given its location and easy access to ground predators. Some species might fly over the site on occasion.

Migratory Birds:

Migratory shorebirds breed in the arctic and "winter" in Hawaii. A few individuals may be seen in May-July but the majority of the migratory shorebirds are here between August and the end of April. The most abundant shorebird in Hawaii is the Pacific Golden-Plover (*Pluvialis fulva*). Much research has been conducted on this species both in Hawaii and on their breeding grounds in Alaska (Johnson et al. 1981, 1989, 1993, 2001a, 2001b). Two Pacific Golden-Plover were seen flying over the site during the course of the survey. This bird prefers to forage in areas with low grass, such as lawns, open bare fields and along the shoreline. There is presently no suitable habitat for foraging plover on this site. They often roost on lava flows on the Big Island (pers. observ.), perhaps to avoid cats and other predators. No other species of migratory shorebirds were recorded nor would they be expected on this property. None of the shorebirds that regularly "winter" in Hawaii are listed as threatened or endangered.

Introduced Birds:

A total of 14 introduced species were tallied on the survey (Table1). Previous studies elsewhere in west Hawaii have produced comparable lists of introduced birds (Bruner 1979, 1984, 1985, 1986, 1989, 1990, 1995, 2002, 2003, 2005). None of the introduced birds are listed as threatened or endangered.

Mammals:

The only mammal seen on the survey was the Small Indian Mongoose (*Herpestes auropunctatus*). Five mongoose were observed along the northern boundary. The tracks of cats (*Felis catus*) and feral pigs were noted in several places on the site. Skeletal remains of pig were also observed. The endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus*) was not recorded on the evening search using the ultrasound detector. The bat can be seen along the Kona coast so it is possible that it may occasionally forage and roost on or around this site (Tomich 1986, Kepler and Scott 1990, Jacobs 1991, 1993, and Reynolds et al. 1998).

CONCLUSIONS

The entire site was thoroughly surveyed and birds and mammals found were those typical of this type of habitat in West Hawaii. No unexpected species were recorded. No native birds or mammals were found on the survey. Only one species of migratory shorebird was seen and it was only observed flying over the site. The natural resources of this property are not unusual or unique. Most undeveloped lands at this elevation in North Kona have similar disturbed resources. Development of the property should not significantly alter the relative abundance or array of birds in this region of west Hawaii.

TABLE ONE

Introduced species of birds found on a two day (15,16 April 2006) field survey of the Kula Nei Project Property in North Kona, Hawaii.

COMMON NAME	SCIENTIFIC NAME
Gray Francolin	*Francolinus pondicerianus*
Kalij Pheasant	*Lophura leucomelanos*
Spotted Dove	*Streptopelia chinensis*
Zebra Dove	*Geopelia striata*
Mitred Parakeet	*Aratinga mitrata*
Red-billed Leiothrix	*Leiothrix lutea*
Japanese White-eye	*Zosterops japonicus*
Northern Mockingbird	*Mimus polyglottos*
Common Myna	*Acridotheres tristis*
Northern Cardinal	*Cardinalis cardinalis*
House Finch	*Carpodacus mexicanus*
African Silverbill	*Lonchura cantans*
Nutmeg Mannikin	*Lonchura punctulata*
Java Sparrow	*Padda oryzivora*

SOURCES CITED

Bruner, P.L. 1979. An avifaunal and feral mammal survey of Mahukona Properties, Hawaii. Unpubl. ms. Prep. for Belt Collins & Associates.

_____ 1984. An avifaunal and feral mammal survey of Waikoloa Beach Resort Property, Hawaii. Unpubl. ms. Prep. for Belt Collins & Associates.

_____ 1985. Avifaunal and feral mammal survey of Natural Energy Laboratory of Hawaii Property at Keahole Point, North Kona, Hawaii. Unpubl. ms. Prep. for Marine Sciences Group (MSG).

_____ 1986. An avifaunal and feral mammal survey of property proposed for development at Makalawena, North Kona, Hawaii. Unpubl. ms. Prep. for Phillips Brandt Reddick & Associates.

_____ 1989. Survey of the avifauna and feral mammals at Queen Liliuokalani Trust Property, Kailua, Kona, Hawaii. Unpubl. ms. Prep. for Belt Collin & Associates.

_____ 1990. Survey of the avifauna and feral mammals at Ooma 2 Ahupua'a North Kona, Hawaii, TMK 7-3-9:5. Unpubl ms. Prep. for Helber Hastert & Kimura.

_____ 1991. Survey of the avifauna and feral mammals on lands near Kamoa Point, North Kona, Hawaii. Unpubl. ms. Prep. for PBR-Hawaii.

_____ 2002. Avifaunal and feral mammal survey at O'oma II, North Kona, Hawaii. Unpubl. ms. Prep. for Helber Hastert & Fee, Honolulu.

_____ 2003. Avifaunal and feral mammal field survey of Keahole Generating Station, North Kona, Island of Hawaii. Unpubl. ms. Prep. for Belt Collins Hawaii Ltd.

_____ 2005. Avifaunal and feral mammal field survey for the Keopu-Hienaloli Flood Control Project, Kona, Hawaii. Unpubl. ms. Prep. for Oceanit Laboratories, Inc.

Hawaii Audubon Society. 2005. Hawaii's Birds. Sixth Edition. Hawaii Audubon Society, Honolulu. 141 pp.

Honacki, J.H., K.E. Kinmann and Koeppl ed. 1982. Mammal species of the world: A taxonomic and geographic reference. Allen Press, Inc. and the Association of Systematic Collections. Lawrence, Kansas. 694 pp.

Jacobs, D.S. 1991. The distribution and abundance of the endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus*), on the island of Hawaii. Unpubl. report submitted to University of Hawaii, Department of Zoology.

_____ 1993. Foraging behavior of the endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus*). Final report to U.S. Fish Wildlife Service. Grant No 14-48-0001-92580. Unpubl.

Johnson, O.W., P.M. Johnson and P.L. Bruner. 1981. Wintering behavior and site-faithfulness of Golden-Plovers on Oahu. 'Elepaio 41(12):123-130.

Johnson, O.W., M.L. Morton, P.L. Bruner and P.M. Johnson. 1989. Fat cyclicity, flight ranges and features of wintering behavior in Pacific Golden-Plovers. Condor 91:156-177.

Johnson. O.W., P.G. Connors, P.L. Bruner, and J.L. Maron. 1993. Breeding ground fidelity and mate retention in the Pacific Golden-Plover. Wilson Bull. 105:60-67.

Johnson, O.W., P.L. Bruner, J.J. Rotella, P.M. Johnson, and A.E. Bruner. 2001a. Long term study of apparent survival in Pacific Golden-Plovers at a wintering ground on Oahu, Hawaiian Islands. The Auk 118 (2):342-351.

Johnson, O,W., P.L. Bruner, A.E. Bruner, P.M. Johnson, R.J. Kienholz, and P.A. Brusseau. 2001b. Features of breeding biology in Pacific Golden-Plovers nesting on the Seward Peninsula, Alaska. Wader Study Group Bulletin 25:59-65.

Kepler, C.B., and J.M. Scott. 1990. Notes on the distribution and behavior of the endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus*). 'Elepaio 50(7):59-64.

Pratt, H.D. 1998. A pocket guide to Hawaii's Trees and Shrubs. Mutual Publishing, Honolulu. 136 pp.

Pratt, H.D., P.L. Bruner, and D.G. Berrett. 1987. A field guide to the birds of Hawaii and the tropical Pacific. Princeton University Press. Princeton , New Jersey. 409 pp.

Pyle, R.L. 2002. Checklist of the birds of Hawaii – 2002. 'Elepaio 62(6):137-148.

Reynolds, M.H., B.M.B. Nielsen, and J.D. Jacobi. 1998. Survey on the Hawaiian Hoary Bat in the district of Puna, Hawaii Island. 'Elepaio 57(9):153-157.

Tomich, P.Q. 1986. Mammals in Hawaii. Bishop Museum Press. Honolulu. 375 pp.

AVIFAUNAL AND FERAL MAMMAL SURVEY OF ACCESSORY AREAS INVOLVED IN THE KULA NEI PROJECT, NORTH KONA, ISLAND OF HAWAII

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(Revised)
25 April 2007

INTRODUCTION

The purpose of this report is to present the results of a two day (20, 21 July 2006) field survey of accessory areas needed for the development of roads and the water system involved in the Kula Nei Project located in the district of North Kona, Hawaii. In addition to the data obtained from the field survey pertinent published and unpublished sources are also noted in the report. These sources add a broader perspective of the wildlife resources in this region. The goals of the survey were:

1- To document the species of birds and mammals currently on the property.

2- To examine the site for the purpose of identifying the natural resources available to wildlife in this region.

3- To devote special attention to documenting the presence and possible use of this property by native and migratory species particularly those that are listed as threatened or endangered.

SITE DESCRIPTION

Three separate areas were investigated. The first was Holoholo Street Extension Study Area (TMK 7-3-09: Portion of 8). The second site was the South Well Site Study Area TMK 7-3-06: Portion of 35,36,37). The final site was TMK 7-3-07: Portion of 42 and 43. All three areas contained native and alien (introduced) vegetation. Grass and cleared patches were mixed with dense, second growth forest. Residential landscaped property adjoined each of the sites. No wetland habitat was observed.

SURVEY PROTOCOL

The field survey was conducted over two consecutive days (20, 21 July 2006). Observations were made in the early morning and late in the day when birds are most active. Each site was covered on foot and all birds seen or heard were noted. Observations of mammals were limited to visual sightings and evidence in the form of tracks and skeletal remains. No attempts were made to trap mammals in order to obtain

relative abundance estimates. The evening of 20 July was used to search for the presence of the endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus*). A Pettersson Elektronik AB Ultrasound Detector D 100 was used to listen for echolocating bats.

Weather during the survey was clear and hot. The winds were relatively light and overall the conditions for detecting vocalizing birds was excellent. The scientific and common vernacular manes used in this report follow Honacki et al. (1982), Pratt (1998) and Pyle (2002).

RESULTS AND DISCUSSION

Native Land birds:

No native land birds were observed on the survey. The only native land birds which potentially could forage in the area of this survey are the Hawaiian Short-eared Owl (*Asio flammeus sandwichensis*), known as Pueo in Hawaiian and the Io or Hawaiian Hawk (*Buteo solitarius*). Pueo is not listed as endangered or threatened on the island of Hawaii, however, the State of Hawaii does list the population on Oahu as endangered. The Io is an endangered species and is confined to the island of Hawaii.

Native Water Birds:

No native water birds were recorded and would not be expected on this site. No wetland habitat was found on the survey of the three areas.

Seabirds:

No nesting seabirds were seen on the survey and would not be expected to nest in this area due to predator access and human disturbance. Some species might rarely be seen flying over these sites (pers. observ.)

Migratory Birds:

No migratory shorebirds were tallied. This was not unexpected due to the time of year. Most individuals nest in the arctic between May and August. The most abundant shorebird in Hawaii is the Pacific Golden-Plover or Kolea (*Pluvialis fulva*). This bird forages in areas with low grass, such as lawns, open bare fields and along the shoreline (Johnson et al. 1981, 1989, 2001). The open areas on these sites are likely used by foraging plovers from August to the end of April. This species is not listed as endangered or threatened.

Alien (Introduced) Birds:

Tables 1, 2, 3 note the alien birds observed on each of the three study areas. None of these species are listed as threatened or endangered. No unexpected species were noted.

Mammals:

The introduced Small Indian Mongoose (*Herpestes auropunctatus*) was the only mammal seen on the survey of these accessory areas. Feral cats (*Felis catus*), rats (*Rattus spp*) and mice (*Mus musculus*) also are likely to occur on these sites but were not observed. The endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus*) was not detected by the Ultrasound device nor were any seen. Tomich 1986, Kepler and Scott 1990, Jacobs 1991, 1993, and Reynolds et al. 1998 all provide useful information on this endangered mammal.

CONCLUSIONS

Each of the three areas were thoroughly surveyed and birds and mammals found were those to be expected in this region of the island of Hawaii. The native Hawaii Amakihi is still relatively common at higher elevations. The native Hawaiian Hoary bat is frequently seen on the island of Hawaii and Kauai but is much less common on the other islands. The Kolea was not observed but this migratory shorebird undoubtedly winters on the open areas from August to late April. The natural resources on these properties are not unusual or unique. Most of the sites were disturbed or covered in second growth vegetation. The proposed uses of these properties for the Kula Nei project should pose no threat to the relative abundance of birds and mammals in this region of the island of Hawaii.

TABLE ONE

Alien (Introduced) species of birds found on a two day (20, 21 July 2006) field survey of the Holoholo Street Extension Study Area (TMK 7-3-09: Portion of 8).

COMMON NAME	SCIENTIFIC NAME
Kalij Pheasant	*Lophura leucomelanos*
Spotted Dove	*Streptopelia chinensis*
Zebra Dove	*Geopelia striata*
Red-billed Leiothrix	*Leiothrix lutea*
Japanese White-eye	*Zosterops japonicus*
Common Myna	*Acridotheres tristis*
Northern Cardinal	*Cardinalis cardinalis*
House Finch	*Carpodacus mexicanus*
Nutmeg Mannikin	*Lonchura punctulata*

TABLE TWO

Alien (Introduced) species of birds recorded on a two day (20, 21 July 2006) field survey of South Well Site Study Area TMK 7-3-06: Portion of 35, 36 and 37).

Common Name	Scientific Name
Spotted Dove	*Streptopelia chinensis*
Zebra Dove	*Geopelia striata*
Japanese White-eye	*Zosterops japonicus*
Common Myna	*Acridotheres tristis*
Northern Cardinal	*Cardinalis cardinalis*
House Finch	*Carpodacus mexicanus*

TABLE THREE

Alien (Introduced) species of birds found on a 20, 21 July 2006 field survey of TMK 7-3-07: Portion of 42 and 43.

COMMON NAME	SCIENTIFIC NAME
Kalij Pheasant	*Lophura leucomelanos*
Wild Turkey	*Meleagris gallopavo*
Spotted Dove	*Streptopelis chinensis*
Zebra Dove	*Geopelia striata*
Japanese White-eye	*Zosterops japonicus*
Common Myna	*Acridotheres tristis*
Northern Cardinal	*Cardinalis cardinalis*
House Finch	*Carpodacus mexicanus*
Nutmeg Mannikin	*Lonchura punctulata*
Java Sparrow	*Padda oryzivora*

SOURCES CITED

Hawaii Audubon Society. 2005 Hawaii's Birds. Sixth Edition. Hawaii Audubon Society, Honolulu. 141pp.

Honacki, J.H., K.E. Kinmann and Koeppl ed. 1982. Mammal species of the world: A taxonomic and geographic reference. Allen Press, Inc. and the Association of Systematic Collections. Lawrence, Kansas. 694pp.

Jacobs, D.S. 1991. The distribution and abundance of the endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus*), on the island of Hawaii. Unpubl. report submitted to University of Hawaii, Department of Zoology.

_____ 1993. Foraging behavior of the endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus*). Final report to U.S. Fish Wildlife Service. Grant No 14-48-0001-92580. Unpubl.

Johnson, O. W., P.M. Johnson and P.L. Bruner. 1981. Wintering behavior and site-faithfulness of Golden-Plovers on Oahu. 'Elepaio 41(12):123-130.

Johnson, O.W., M.L. Morton, P.L. Bruner and P.M. Johnson. 1989. Fat cyclicity, flight ranges and features of wintering behavior in Pacific Golden-Plovers. Condor 91:156-177.

Johnson O.W., P.L. Bruner, J.J. Rotella, P.M. Johnson, and A.E> Bruner. 2001. Long term study of apparent survival in Pacific Golden-Plovers at a wintering Ground on Oahu, Hawaiian Islands. The Auk 118(2):342-351.

Kepler, C.B., and J.M. Scott. 1990. Notes on the distribution and behavior of the endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus*). 'Elepaio 50(7):59-64.

Pratt, H.D. 1998. A pocket guide to Hawaii's Trees and Shrubs. Mutual Publishing, Honolulu. 136pp.

Pratt,H.D., P.L. Bruner and D.G. Berrett. 1987. A field guide to the birds of Hawaii and the tropical Pacific. Princeton University Press. Princeton, New Jersey. 409pp.

Pyle, R.L. 2002. Checklist of the birds of Hawaii – 2002. 'Elepaio 62(6):137-148.

Reynolds, M.H., B.M.B. Nielsen, and J.D. Jacobi. 1998. Survey on the Hawaiian Hoary Bat in the district of Puna, Hawaii Island. 'Elepaio 57(9):153-157.

Tomich, P.Q. 1986. Mammals in Hawaii. Bishop Museum Press. Honolulu. 375pp.

Appendix F

BIOLOGICAL SURVEYS OF LAVA TUBE CAVES

THE KULA NEI PROJECT
KONA, ISLAND OF HAWAI'I

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TABLE OF CONTENTS

LIST OF FIGURES, TABLES, AND PLATES

Executive Summary

In April 2006 the Shopoff Group tasked SWCA Environmental Consultants (SWCA) to investigate lava tube caves within three parcels of The Kula Nei Project, Kona, Hawai'i Island. The purpose of the study was to provide information to support preparation of an environmental impact assessment. Specific study objectives included: 1) biological and geophysical surveys of caves within The Kula Nei Project area; 2) identification of biologically significant caves; 3) a list of species found in the caves; and 4) providing management recommendations for the more biologically significant caves.

The Kula Nei Project area is approximately 129.992-acres overall and consists of three principal tracts (TMK 7-3-07:39, 39.63 acres; TMK 7-3-07:38, 43.35 acres; and TMK 7-3-09:07, 45.28 acres) in Ahupua'a of O'oma, Kona District, Hawai'i Island. Elevation of the site ranges from approximately 735 to 1125 feet above mean sea level. Drainage occurs primarily by overland sheet flow in a northeast (mauka) to southwest (makai) direction. The three tracts lie along the southwest flank of the Hualalai volcano, and are underlain with both pahoehoe and a'a lavas. Clark and Rechtman (2006) and Nelson et al (2007) documented fourteen lava tube archaeological sites with more than twenty-five entrances, tube-related collapse structures, and sinks in the area, representing more than 1/2 mile of open lava tube passage. Surface expressions of these features were concentrated in the southern portion of TMK 7-3-007: 038 and throughout TMK 7-3-009: 007. SWCA recorded additional entrances and tube segments that did not contain archaeological material.

Concurrent geophysical investigations conducted at the site by SWCA and Escarpment Environmental with ground penetrating radar (GPR) using very low frequency techniques identified 120 anomalies, eighteen of which are strong anomalies indicating large shallow voids. The distribution of known lava tubes and strong anomalies supports a geomorphologic interpretation of the property whereby the shallowest and largest voids are coincident with the youngest pahoehoe flow event. This flow is generally recognizable in air photos by the dominance of non-native fountain grass where soils are poorly developed to absent. Although sub-surface voids may occur anywhere in terrain formed by pahoehoe lava, this flow represents the highest risk for inadvertently encountering significant voids during construction.

SWCA conducted biological investigations in 13 accessible caves and cave segments within the Kula Nei Project area, and found 32 species of cave arthropods. At least five of the 32 species are troglobitic, and three are endemic to Hawai'i Island.; however, current State and Federal regulations provide no special protection for any of these species. The remaining species are either facultative cave residents, regular visitors to caves, or accidental cave residents. Nymphs of an unidentified cixid plant hopper in the genus *Oliarus* were found in two tube segments (SIHP 25059 and 16131).

Many non-cave-adapted native plants and birds are known to use damp cave entrances on Hawai'i Island for shelter or nesting; however, SWCA biologists did not observe any evidence of cave use by such species during their surveys. Although several species of native flora occur within the project area, vegetation is generally dominated by introduced species. The presence of suitable cave habitat and supporting native plant roots, and presence of native obligate cave-dwelling invertebrates, indicate that additional cave ecosystems not open to human access probably exist within the Kula Nei Project area.

Based upon our investigation of the property, including our review of the Hawaii Cave Protection Law, SWCA finds no indication that cave resources on The Kula Nei Project site represent a statutory obstacle to development other than where regulated archaeological resources are coincident with cave entrances or underlying passages (Clark and Rechtman 2006 and 2007. Measures are recommended to avoid accidental breakthroughs during construction and utility trenching as the properties are developed. These represent the most appropriate steps to avoid and conserve cave ecosystems at The Kula Nei Project.

- Gate cave entrances associated with SIHP sites 24424, 25059, and 16131.

- Minimize the addition of topsoil or other impermeable material to the surface directly above known caves and preserves.

- Control invasive plant species within the preserves (e.g. fountain grass and other aggressive, fire-prone grasses). Landscaping in areas to be developed should utilize native plants to the maximum extent practicable. The use of aggressive fire-prone non-native grasses in landscaping should be discouraged.

- Exercise care to minimize the amount of surface disturbance during construction and trenching in the vicinity of known caves. Proposed trenching and excavation alignments should be carefully screened for the likelihood of breakthroughs.

- Prevent wildfires and develop a rapid response plan to fires within the preserves and subdivisions.

- Allow biological monitoring in accessible caves by competent cave biologists during project construction. A monitor can also provide advisory assistance in case of an accidental breakthrough during blasting, trenching, or construction activities.

1.0 Background to the Resource

Most of our knowledge of cave species comes from work in continental regions with very different geological and evolutionary histories than Hawai'i. In well studied cave systems in the mainland US and elsewhere (principally southern Europe, Japan and New Zealand), cave faunas are characteristically associated with karstic landscapes or limestone regions with subterranean voids created by dissolution of the rock (Barr 1968). In the continental United States, it is thought that the cave animals are typically relicts of faunas left behind after the last ice age as geohydrologic regimes changed in the northern hemisphere (Barr 1968, Poulson and White 1969, Christiansen 1982, Culver 1982). Because the Hawaiian Islands are younger and geologically very different, with most caves occurring in basalts rather than limestones, there was no expectation that a cave-adapted fauna would have developed here. This preconception was dramatically changed when in the 1970's Dr. Frank Howarth (B. P. Bishop Museum) began discovering and describing a diverse array of troglobites in Hawaii (Howarth 1972, 1983, 1991). Animals that can be found in caves (cavernicoles) are generally termed:

- Troglobites – obligate and exclusive cave dwellers for their entire life.
- Troglophyles – can live in caves or other cave-like (moist cool dark) habitats.
- Trogloxenes – can be found in caves but do not live their entire life there. They may have adaptations to the cave environment such that they complete part of their life cycle in caves, but must return to the surface to feed and thus retain adaptations for surface life.

Troglobites are characterized by a number of anatomical and physiological adaptations to cave life collectively referred to as troglomorphy (Barr 1968, Christiansen 1982, Holsinger 1994, Culver et al 1995, Christman et al 2005). Troglomorphic characteristics include loss of pigment and loss of sclerotization (hardening of exoskeletons), reduction or loss of eyes, elongation of appendages and sensory structures with long hairs, lengthened life span, modified life history patterns, and metabolic adaptations to nutrient-poor conditions. As a result of adaptation to low energy environments, the life cycle of many troglobites is characterized by delayed reproduction, increased longevity, lower total egg production, and production of larger eggs (Culver 1982).

Associated with these adaptations are very narrow and specific ecological requirements which include high (100% +) relative humidity, temperatures that do not fluctuate rapidly, and for some troglobites, a tolerance of, or perhaps a preference for high CO_2 levels (Howarth and

Stone 1990). Conversely, troglobites are thought to be poor competitors with surface animals, except in their very restricted cave habitats. Also, they probably are not able to acclimate quickly to rapid changes in their physical, biological or chemical environment (Barr 1968, Culver 1982).

The origin and geographic distribution of troglobites have important general implications for evolutionary biology (Barr 1968, Holsinger 1988). Many continental troglobitic species are considered to be relicts persisting in subsurface refugia long after their surface ancestors abandoned their geographic range due to climate fluctuations. Troglobite species present stunning examples of evolutionary processes. They come from an array of taxa, both vertebrate and invertebrate, and while their diversity is impressive, they tend to share a suite of morphological and physiological characteristics that represent adaptations to a common and very specific environment. Functionally, the evolution and diversity of troglobites in Hawai'i parallels that of continental cave faunas, however, in terms of systematics and evolution, the species are derived from completely different ancestors and the evolution has taken place in a very different geological and ecological framework.

Due to the lack of light for photosynthesis, most cave communities lack in situ primary producers. Instead, they rely on energy and nutrient input from the surface, and thus, cave systems can be strongly influenced by characteristics of the surface ecosystem. Nutrients are introduced into caves in the form of plant detritus washed in by surface waters, micro- and macro-organisms that enter caves under their own power, guano from bats, rats, and mice, from plant roots that penetrate the cave, and the eggs and wastes of trogloxene species and the bodies of occasional epigeal animals that wander into the cave and die. As such, cave communities are typically thought to be made up of decomposers (Culver 1982); they break down organic debris brought into the cave to obtain nutrients and energy. Cave communities often have fairly low species diversity due both to the restrictive environment and the reduced pool of species available to any cave system (Culver 1970).

Howarth and Stone (1990) described several cave zone habitats for troglobites. The ***entrance zone*** receives sunlight and may have surface plants. The ***twilight zone*** has some light present but at lower levels of illumination. The ***transition zone*** has no light but is affected by surface temperature and humidity changes. The first three zones are all to a greater or lesser extent influenced by surface conditions. Deeper into the cave are the ***dark zone*** which has little or no daily air exchange with the surface and high relative humidity and generally constant conditions; and the ***stagnant zone*** which has less air exchange than the dark zone often with high CO_2 levels. Typically true troglobite populations are restricted to the dark and stagnant zones though individuals do occur in the transition zone.

Another important concept, particularly with reference to the habitat of small cave animals, is that of mesocaverns. These are small voids, cracks and passages inaccessible to humans, but accessible, or perhaps even preferred by troglobites (Howarth 1983). Because these small features are often undetectable as well as inaccessible, quantifying them or even verifying their presence can be highly uncertain, yet they may actually be the primary habitat of species of interest. Here the term 'cave' will refer to voids large enough for humans to investigate directly. The term 'mesocavern' will refer exclusively to those very small spaces inhabitable by cave fauna, but inaccessible to humans and 'cave system' will refer to subterranean features with both accessible caves and mesocaverns with known or potential connectivity among them.

Troglobites are vulnerable to impacts from human activities due to their absolute dependence on specific environmental conditions present only in caves systems. The cave environment is relatively monotonous compared to surface habitats and is characterized by stable temperatures, constant near-saturation humidity, low evaporation rates, and the absence of in situ photosynthetic nutrient production (Barr 1968, Culver 1982, Howarth and Stone 1990).

1.1 Lava Tubes on Hawai'i Island

The oldest lava flows on Hawai'i Island are considered less than 500,000 years old (Wolfe and Morris 1996). The Kula Nei Project is located on the western flank of the 8,271 ft Hualalai volcano. Hualalai is the third oldest of the five volcanoes on Hawaii with flows dating to at least 130,000 years before present (Moore and Clague 1992). Three major rift zones radiate from the top of Hualalai to the north, northwest and southeast. Lavas in the project area are between 3,000 and 5,000 years old and probably originated from a vent in the northwest rift zone between the Ka'upulehu Cone and Pu'u A'lauawa (Wolfe and Morris 1996). The last eruption of Hualalai occurred in 1801 creating the Huehue lava flow, which passed to the north of the project area, reaching the coast near Keahole Point. While Hualalai is still considered a significant volcanic hazard, seismic activity within Hualalai is currently low and there is no evidence of magma movement (Clague and Dalrymple 1987). Moore, Clague, Rubin and Bohrson (1987) suggested that another eruption is probable in the next 200 years, but could occur in the next few decades. The last major earthquake originating from Hualalai occurred in 1929 and shook the area with aftershocks for more than a month. A few intermittent streams in the area are subject to flash flooding (Peterson and Moore 1987), but no significant surface drainage channels occur on the Kula Nei property.

Surface lavas of Hualalai are primarily alkalic olivine basalts. Basaltic lavas are generally classified into two types, ʻaʻa and pahoehoe. ʻAʻa lavas have a rough, clinker like surface overlying a denser core. Pahoehoe usually has a smooth ropey surface. The two forms differ primarily in heat and gas content but can erupt from the same volcanic vent. ʻAʻa and pahoehoe lavas vary greatly in their ability to produce soils and support vegetation. The rough texture of ʻaʻa forms soils better than the smoother pahoehoe. As a result, ʻaʻa flows often support a greater plant diversity than similar aged pahoehoe.

Lavas within the project area consist of both ʻaʻa and pahoehoe. Voids can occur in a'a, but pahoehoe is strongly associated with the presence of lava tube caves. Lava tube caves form readily when the surface crust of a pahoehoe flow cools and insulates the underlying flow allowing it to travel for many miles without loosing its heat energy (Kauahikaua et al 2004). As the eruption ceases, the molten lava drains from the tube leaving an empty passage. Sections of lava tube often collapse creating skylights, sinkholes, cracks and trenches. These openings can be very deep and often have vertical or undercut walls. Blockages within the tube can result in over-pressuring and subsequent surface breakout. Surface breakouts can be persistent leading to new tube branches, which may or may not parallel the master tube.

Clearing of the blockage may result in abandonment of breakout passages and resumption of flow through the master tube. Lava tubes in Hawaii are valued as biological resources (Giffin 2003 and Appendix A). Cave entrances and passages provide important habitat for many kinds of plants and animals. Volcanic sinkholes and skylights in some Hawaiian caves form natural refugia where vascular plants can persist without being damaged by herbivores. Arthropods, snails, birds, and mammals also inhabit lava tubes. Howarth (1983, 1990, 1991 and 1993) described the fascinating ecology of native cave arthropods and their habitats in Hawaii. In some areas, native forest birds, especially ʻapapane (*Himatione sanguinea*) and ʻomaʻo (*Myadestes obscurus*), occur in lava tube openings.

Lava tube skylights and sinkholes formed natural pitfalls where palaeontological (fossil) resources can be found today (Olson and James 1982, 1991; Olson and Ziegler 1995; Ziegler 2002). Extinct endemic waterfowl including a flightless goose have recently been documented from the Big Island and may have been extirpated by the native Hawaiians (Giffin 2003). Bones of goats, feral hogs, and birds were observed in the Kula Nei caves. Sinkhole debris piles likely contain significant palaeontological deposits.

Hawaiian caves have been described as ecologically sensitive environments. None of the obligate cave fauna now known from Hawaii Island are currently listed as Candidate, Threatened, or Endangered species by the U.S. Fish and Wildlife Service (Service). Kauaʻi

Cave Amphipod *Spelaeorchestia koloana and the* Kaua'i Cave Wolf Spider *Adelocosa anops* are both listed as endangered species by the Service, but neither of these species occurs on the island of Hawai'i. The Service recognizes one species of cave invertebrate on Hawai'i Island, the troglobitic cixid leafhopper *Oliarus polyphemus,* as a species of concern. This species was not found within The Kula Nei Project area.

2.0 Study Methods

SWCA Geologist Dr. Kemble White assisted by biologist Wendy McDowell of the University of Hawaii, Department of Botany, conducted cave surveys between 17 May and 2 June 2006. Surface reconnaissance surveys were first conducted to locate known cave entrances or other indicators of subsurface voids, and to locate any previously unidentified features. Where caves and entrances identified in this study correspond with known archaeological sites identified by Clark and Rechtman (2006 and 2007), this report refers to the sites by their SHPD site number (Table 1). The SWCA team then spent approximately 18 hours searching for troglobitic fauna in 13 accessible caves within the project area. Invertebrate specimens collected within the caves were preserved in 95% ethanol and delivered to Dr. Frank Howarth of the Bishop Museum for taxonomic analysis. An aerial reconnaissance of the property was conducted by helicopter in order to better place cave entrances and tube segments within their geomorphologic context.

Table 1. Cross reference table for SWCA cave entrances and geophysical anomalies and corresponding SIHP site numbers.

TMK Number	SIHP Number*	SWCA Cave Entrance	SWCA Anomaly	Type*	Function*
3-7-3-09:007	16103	11.1-11.3		Lava tube	Burial/habitation
	16105	11.4		Lava tube	Burial/habitation
	16131	8, 9		Lava tube	Habitation
	24424	12	25, 113	Lava tube	Water Collection
	25059	12		Lava tube	Habitation
	25060	6,8		Lava tube	Habitation
	25062	3		Lava tube	Habitation
	25063	4,5		Lava tube	Habitation
	25064	18		Lava tube	Habitation
	25065	17	59	Lava tube	Habitation
	25066	16	58	Lava tube	Habitation
	25067	15		Lava tube	Habitation
	25069	10	49, 51	Lava tube	Burial/habitation
3-7-3-07:038	24420	1,2	104-106	Lava tube	Habitation
	24424	13	25-27, 74, 113	Lava tube	Habitation

** From Clark and Rechtman (2006 and 2007)*

Kristin White and Ian Moede of Escarpment Environmental (EE) conducted geophysical investigations with ground penetrating radar using very low frequency techniques during this same period. The EE team used a portable SIR (subsurface interface radar) model 3000 System with a midrange 270 MHz antenna (GSSI model 5104) to collect field data. Additionally, a Geonics EM-16 Very Low Frequency (VLF) devise was used to measure anomalies. Data was post-processed using software for VLF (RAMAG) and GPR (ArcView and Radan). Both techniques are known to be effective at detecting subsurface voids in pahoehoe flows on Hawai'i Island. Although thick vegetation and difficult topography limited geophysical data collection from within the center of the three parcels at Kula Nei, the interior boundary roads were used to generate more than three miles of continuous transect data. The locations of all anomalies were flagged in the field. Four lines of evidence were used to construct a constraints map of the property identifying the area of highest likelihood for encountering significant voids during construction.

The zones were delineated based on the occurrence of: 1) the surface expression of known voids based on SWCA's field survey and the results of previous archaeological investigations, 2) the location of geophysical anomalies detected with either Ground Penetrating Radar or Very Low Frequency techniques, 3) a geomorphologic interpretation of the lava flow based on the above factors and topography, and 4) an apparent correlation between the occurrence of larger silver oak trees and fountain grass with known cave passage.

3.0 Results

3.1 Vegetation

Whistler (2007) found three principal vegetation types within The Kula Nei Project area: vegetation typical of managed lands, mixed Christmas berry/alahe'e scrub, and disturbed lama/alahe'e scrub. One hundred and nine plant species were recorded in the project area, 14 of which are indigenous and five are endemic to Hawai'i (Whistler 2007). He noted that the most of the 109 plants species found within The Kula Nei Project area are naturalized alien plants either accidentally or intentionally introduced to Hawai'i. None of the plant species he found are listed as threatened or endangered species by the U.S. Fish and Wildlife Service.

Fountain grass (*Pennisetum setaceum*) was found by Whistler (2007) to be a dominant species in the primary project area parcels, particularly where tree canopy is broken. Fountain grass is an alien fire prone grass that is the focus of extensive state and federal invasive species removal and control programs statewide. Cave invertebrates are particularly sensitive to toxic smoke caused by wildfires (Howarth 1993, Howarth and Ramsay 1991).

The northwestern portion of TMK 7-3-09 (entrance 8, SIHP 16131), through which the Holoholo Street extension corridor is planned, is found to have the least disturbed areas of a native dry forest, and was recommended by Whistler (2007) for protection. Conservation of native deep rooted trees over known caves is also a recommendation of this report as a means to avoid damaging known cave ecosystems.

3.2 Geology

Clark and Rechtman (2006) and Nelson et al (2007) documented fourteen lava tube archaeological sites with more than twenty-five entrances, tube-related collapse structures, and sinks in the area, representing more than 1/2 mile of open lava tube passage. Surface expressions of these features were concentrated in the southern portion of TMK 7-3-007: 038 and throughout TMK 7-3-009: 007. SWCA recorded additional entrances and tube segments that did not contain archaeological material. The location and orientation of thirteen discrete tube segments suggests the presence of at least three master tubes (probably from a rapid succession of flows) under the western TMK 3-7-3-07:38 and the eastern TMK 3-7-3-09:07. The western portion of TMK 3-7-3-09:07 contains a complicated network of branching breakout passages. The longest single tube segment is traversable for most of its 2,400-foot length within the project boundary.

The ages of Hualalai lava flows have been determined with correlations between soil depth and age (Moore and Clague 1991). Little or no soil cover (except in wet forest areas) occurs on lavas less than 5,000 years old such as those on the property. On lavas between 5,000-10,000 years old there can be 4-8 inches (10.2- 20.3 cm) of soil. Flows over 10,000 years old accumulate soils more than 8 inches (20.3 cm) deep. All of the known tube segments as well as sixteen of the eighteen strong geophysical anomalies occur within the boundaries of a pahoehoe flow outlined on the site geologic map where soils are relatively absent and fountain grass and hale koa dominate the vegetation. While moderate and weak anomalies are scattered throughout the rest of the property, these voids are likely smaller and deeper presenting a lesser risk of construction mishaps. Similarly, cultural and biological resources are less likely to be associated with these voids.

Clark and Rechtman (2006) and Nelson et al (2007) documented twenty-five lava tube entrances, tube-related collapse structures, and sinks on the tract, and approximately 2,250 feet of open lava tube passage in fourteen segments. Expression of these features at the surface was concentrated in the southeastern TMK 7-3-07:38 and the majority of TMK 7-3-09:07. In addition to studying these features, SWCA documented two additional entrances and four additional segments of passage totaling approximately 850 feet in length. Several tube entrances and interiors can be seen in the photo plates attached to this report.

SWCA and Escarpment Environmental identified 100 anomalies using GPR technology. Of these, 18 were rated as having the strongest signal associated with a pronounced anomaly or estimated to be greater than 10 feet wide or deep. Several of these correlated with the locations of known tube segments (Table 1). Forty-six out of 100 had a moderate signal associated with a moderately sized anomaly probably less than ten feet wide or deep. The remaining 35 anomalies either were associated with shallow anomalies or were less pronounced features. As demonstrated by visual inspection of any road cut in the project area, subsurface voids are nearly ubiquitous in lava terrains. Those that present significant construction hazards are likely to return the signature of a strong anomaly.

The site geologic map shows the locations of all known tube segments, their entrances, and probable tube locations based on geophysical anomalies and geomorphologic observations made from the air. The solid red lines drawn between GPS points taken at the tube entrances represent the paths of known tubes. Because the tubes naturally undulate in their course, the actual cave footprints may deviate somewhat from the mapped representation. Based upon a combination of the location of collapsed termini of open tubes, strong GPR anomalies, and paths observed in aerial photos, the authors believe that some additional lava tubes may exist on in the Kula Nei Project area. Since the presence of such caves could not be confirmed through direct observation, their locations have been 'inferred' and represented as dashed red lines on the site geologic map.

Lava tubes at The Kula Nei Project area seem to be generally shallow with ceiling thickness between five and ten feet. The cross sectional dimensions of lava tubes vary between ten and forty feet in width and two to twenty feet in height. Deeper tube development was observed only in the makai tube segment extending from entrance 6 in the central portion of TMK 7-3-09:07. This tube segment has the most complex morphology on the property with breakout segments to the northwest and southwest and two near-vertical drops of fifteen to twenty feet leading to deeper tube segments. These hazardous vertical segments may be a reason that this section of tube was walled off from the adjacent living area by the native Hawaiian residents. These deeper segments seem to then shallow in the makai direction. The segment leading directly makai from entrance six ends in a collapse area where plant roots and surface invertebrate fauna including black widow spiders were observed.

The largest single lava cave 'room' on the property is located mauka of entrance 12 (SIHP 25060) in the vicinity of the tract boundary roads between TMK 7-3-09:07 and TMK 7-3-07:38. The room occurs at the confluence of two passages and is roughly fifty to sixty feet in diameter and up to twenty feet high. The southern branch ends in a rubble pile which is different in composition from normal cave breakdown and likely marks an entrance that was bulldozed shut during clearing of the road. Anomaly 27 (near SIHP 24424) probably marks a segment of this passage. Entrance 13 was discovered by SWCA during the field survey after negotiating a constriction in the previously mapped mauka end of the tube accessible from entrance 12 (SIHP 25059). Strong airflow from a breakdown mauka of entrance 13 indicated the presence of the continued known and inferred tube segments shown on the site geologic map. Entrance 13 appears to have been bulldozed in the past.

Several strong GPR anomalies occurred outside of the youngest pahoehoe flow delineated on the site geologic map (68, 72, 80, 81, 83, 92, 93, 95, 100, and 119). These could be additional tube segments although some could be voids resulting from grading of the

boundary roads. None of these anomalies are associated with known entrances or obvious collapse features at the surface.

3.3 Cave Life

Cave fauna found at Kula Nei include representatives of all three ecological groups (troglophiles, trogloxenes, and accidentals) (Appendix B). SWCA found 32 species of cave arthropods at Kula Nei, at least five of which are troglobitic species and three of which are endemic to Hawai'i Island. These include the wolf spider *Lycosa howarthi*, moths of the genus *Schrankia*, and cixid plant-hopping bugs of the genus *Oliarus*. Adult specimens were not encountered; however, additional specimens would be required to determine their taxonomic status. All described *Oliarus* species are closely associated with native *Metrosideros polymorpha* (ohia) tree roots. This evidence may represent an entirely new invasion of caves by this group of native insects (Howarth, personal communication). Whistler (2007) found *M. polymorpha* Kula Nei; however, the species did not appear to be a dominant member of the three principal vegetation types he described on the property. Tree roots found within in the caves at Kula Nei are most likely to be those of silver oak (*Grevillea robusta*), huehue (*Cocculus trilobus*). This evidence may represent an entirely new invasion of caves by this group of native insects (Howarth, personal communication).

Five other troglobite species from caves at Kula Nei may be endemic but would require further collections and study. These include a mite, the spider *Theotima makua,* an Oonopid spider, an isopod, and a springtail. *Theotima makua* and the troglophilic millipede *Asiomorpha coarctata* found at Kula Nei represent new records of occurrence on Hawaii Island. Troglobitic diversity was greatest in the lava tube segments mauka of entrance 12 (SIHP 24424 and 25059), between entrances 7 and 12 (SIHP 24424), and between entrances 8 and 9 (SIHP 16131 and 25060) (see Table 1, and Appendices B and C). Shorter tube segments may provide suitable troglobitic habitat in mesocaverns extending away from accessible passages, but were generally too dry to support a rich cave adapted community.

Giffin (2003) described the ecology of similar cave communities at nearby Pu'u Wa'awa'a. The cave fauna described from Pu'u Wa'awa'a however is more diverse than that described from The Kula Nei Project area. Moths (*Schrankia* spp.) and ciixid plant hoppers are among the most widespread, abundant, and conspicuous group of cave insects in Hawaii. Most are flightless and blind, and complete their life cycles underground. Millipedes (*Nannolene* spp.) and centipedes (*Lithobius* spp.) are also common cave inhabitants. Other common cave invertebrates include small wingless springtails (Collembola), secretive crickets (Gryllidae), and humpback flies (*Megaselia* spp.). Cave insects typically locate mates by transmitting species-specific substrate-borne vibrations along plant roots (Hoch and Howarth 1993). At least seven species of *Oliarus* occur on Hawaii Island, though only two were found at Kula Nei. Giffin (2003) considers all to be rare even though a considerable amount of apparently suitable habitat exists. However, none of the cave invertebrates found during our study are listed as Candidate, Threatened, or Endangered, or as species of concern, by the US Fish and Wildlife Service.

3.4 Blackburn's Sphinx Moth (a non-cave-adapted Endangered Species)

Once thought to be extinct on Hawai'i Island, endangered Blackburn's sphinx moths (*Manduca blackburni*) were rediscovered at Pu'u Wa'awa'a north of The Kula Nei Project area. It appears that numbers of this species have increased in the past few years due to the recent invasion of non-native tree tobacco (*Nicotiana glauca*). The recovery plan for *Manduca blackburni* (USFWS 2005) recognizes four management areas important to the recovery of the species on the Island of Hawai'i, only two of which are near The Kula Nei Project area. Management units 12 and 13 (Kailua-Kona north and south) are delineated largely by habitat for *Manduca* sp. host plants. Management Unit 11 (at Pu'u Wa'awa'a) is known to harbor moths and has been designated as critical habitat for *M. blackburni*. Although Units 12 and 13 contain elements

important to the moths, no individuals have been seen in these parcels and neither was designated as critical habitat.

M. blackburni was not found within The Kula Nei Project area by wildlife biologist Phil Bruner (2006), nor were any found by SWCA in association with this study. The primary constituent elements required by the Blackburn's sphinx moth larvae for foraging, sheltering, maturation, and dispersal are the two documented host plant species within the endemic genus *Nothocestrum* (*N. latifolium* and *N. breviflorum*), and the dry and mesic habitats between the elevations of sea level and 5,000 ft (1,525 m) and receiving between 10 and 100 inches (25 and 250 cm) of annual precipitation (68 FR 34710-34766). The primary constituent elements required by Blackburn's sphinx moth adults for foraging, sheltering, dispersal, breeding, and egg production are native, nectar-supplying plants including, but not limited to, *Ipomoea indica* and other species within the genus *Ipomoea, Capparis sandwichiana,* and *Plumbago zeylanica,* and within the dry to mesic habitats between the elevations of sea level and 5,000 ft (1,525 m) and receiving between 10 and 100 inches (25 and 250 cm) of annual precipitation (68 FR 34710-34766). Of these plants, Whistler (2007) found only *Ipomoea indica* within The Kula Nei Project area.

3.5 Threats to Cave Fauna

Threats to Hawaiian cave fauna and their habitats come from a variety of factors, including the following identified by the US Fish and Wildlife Service:

Pre-Contact Threats

- Land clearing and burning, resulting in the removal of surface plant sources of nutrition
- Manipulation of surface waters for kalo irrigation, changing natural humidity regimes
- Shelter cave fires, resulting in death of arthropods from toxic smoke

Post-Contact Threats

- Grazing and fires, resulting in the removal of surface plant sources of nutrition
- Predation by non-native species, including alien spiders, centipedes, scorpions, and rats
- Urbanization, resulting in physical cave collapse, food chain collapse, and habitat sedimentation
- Water development and redirection of rainwater, changing natural humidity regimes
- Cigarette smoke and cave fires, resulting in death by toxic smoke and nicotine gas
- Human intrusion and vandalism, resulting in habitat degradation and injury to cave species

The most important extrinsic threats may be indirect. Caves in the area are known to have invertebrate predators as well, including the alien web-building brown violin spider (*Loxosceles sp.*) and black widow spider (*Latrodectus sp)*. The alien terrestrial predaceous nemertine worm *Argonemertes dendyi* from Australia, has appeared on the Island of Hawai'i apparently spread via nursery materials. Threats specific to The Kula Nei Project area include impacts to the habitat of the organisms rather than directly to the animals. There are two phases to be considered, the construction phase and the residential phase. Breakthroughs created by trenching operations for installation of utilities (electricity, cable, water, and sewage) have the potential to expose habitats to sunlight and air can destroy habitats by exposing them to the elements. Assuming that the trenching for utilities will be associated with road construction, some estimate of the area impacted by trenching can be made. Depending on the flexibility of the planning for trenching locations, consultation with engineers could serve to minimize impacts of trenching. Preventative and remedial actions for construction activities are discussed below.

Once The Kula Nei project area has been developed, less acute but more subtle chronic threats may be involved. These include questions of sewage and other wastewater treatment,

use of pesticides and fertilizers by homeowners and other potential introduction of toxic materials into the subterranean system. Li et al (2000) conducted research for the Service to evaluate the fate of organophosphates and carbamates in the Kiahuna golf course cave in Po'ipu, Kaua'i. Cave arthropods were feared to be at risk from pesticide residues that might penetrate plant roots and soils under golf courses. Among the factors compounding this risk was their small population sizes, highly restricted geographic range on a single lava flow, and tendency of the arthropods to seek water which might concentrate the pesticide residues. Both in Hawai'i and in mainland caves, the highest populations of troglobites are often found shortly after water and organic matter was introduced to caves, such as following heavy rains. However, the research of Li et al (2000) on soil and water samples collected in the Kiahuna golf course cave did not indicate that either organophosphate or carbamate pesticides applied to the surface were penetrating the cave. Companion studies conducted by Li et al (1998) also found the lack of cholinesterase inhibition in non-native cave cockroaches, indicating that there is not a complete pathway for these pesticides from the golf course above to the endangered arthropods below.

4.0 Conclusions and Recommendations

Hawaiian lava tube systems, including the caves of The Kula Nei Project area, contain a variety of natural resources. SWCA found 32 species of cave arthropods at Kula Nei, at least three of which are troglobitic species endemic to Hawaii Island. Troglobitic diversity was greatest in the lava tube segments mauka of entrance 12 (SIHP 24424 and 25059), between entrances 7 and 12 (SIHP 24424), and between entrances 8 and 9 (SIHP 16131 and 25060) (see Table 1, and Appendices B and C). Shorter tube segments may provide suitable troglobitic habitat in mesocaverns extending away from accessible passages, but were generally too dry to support a rich cave adapted community. The presence of these species does not preclude development of the property. The biological resources within the project area do not represent a statutory obstacle to development. The lava tube preserve recommended for protection of archaeological and cultural resources at Kula Nei will also benefit the underlying cave ecosystem. In order to minimize risk to personnel and equipment from collapse of subsurface voids, construction activities on the property should follow appropriate safety protocols. Where excavation activities and movement of heavy equipment on the youngest pahoehoe flow (see Site Geologic Map) cannot be avoided, additional safety protocols should be considered. The following measures can be taken to minimize and avoid impacts to cave habitats and their unique fauna.

- Gate cave entrances associated with SIHP sites 24424, 25059, and 16131.
- Minimize the addition of topsoil or other impermeable material to the surface directly above known caves and preserves.
- Control invasive plant species within the preserves (e.g. fountain grass and other aggressive, fire-prone grasses). Landscaping in areas to be developed should utilize native plants to the maximum extent practicable. The use of aggressive fire-prone non-native grasses in landscaping should be discouraged.
- Exercise care to minimize the amount of surface disturbance during construction and trenching in the vicinity of known caves. Proposed trenching and excavation alignments should be carefully screened for the likelihood of breakthroughs.
- Prevent wildfires and develop a rapid response plan to fires within the preserves and subdivisions.
- Allow biological monitoring in accessible caves by competent cave biologists during project construction. A monitor can also provide advisory assistance in case of an accidental breakthrough during blasting, trenching, or construction activities.

5.0 Bibliography

Barr, T.C. 1968. Cave ecology and the evolution of troglobites. Evolutionary Biology 2: 35-102.

Bruner, P. 2006. Avifaunal and feral mammal survey for O'oma Plantation, North Kona, Hawaii. Contract Report prepared for Belt Collins Hawaii. 9pp

Christiansen, K.A. 1982. The zoogeography of cave Collembola east of the Great Plains: NSS Bulletin, v. 44, p. 32-41.

Christman, M.C., D.C. Culver, M.K. Madden, and D. White. 2005. Patterns of endemism of the eastern North American cave fauna. Journal of Biogeography 32 (8), 1441–1452.

Clague, D.A. and G.B. Dalrymple. 1987. The Hawaiian-Emperor Volcanic Chain, Part 1, Geologic Evolution. pp. 5-54 In: R.W. Decker, T.L. Wright and P.H. Staufefer (Eds.), Volcanism in Hawaii. U.S. Geol. Surv. Prof. Pap. 1350. Washington, D.C.

Clark, M.R. and R.B. Rechtman. 2005. An archaeological Inventory Survey of TMKs:3-7-3-07:39 and 3-7-3-46:105. O'oma 1st and 2nd ahupua'a, North Kona District, Island of Hawaii. Rechtman Consulting, LLC.

Clark, M.R. and R.B. Rechtman. 2006. An archaeological Inventory Survey of TMK:3-7-3-07:38 (updated). O'oma 2nd ahupua'a, North Kona District, Island of Hawaii. Rechtman Consulting, LLC.

Clark, M.R. and R.B. Rechtman. 2007. An archaeological Inventory Survey of TMK:3-7-3-009:007 (updated). O'oma 2nd ahupua'a, North Kona District, Island of Hawaii. Rechtman Consulting, LLC.

Culver, D. C. 1970. Analysis of simple cave communities. I. Caves as islands. Evolution 24: 463-474.

Culver, D.C. 1982. Cave Life; Evolution and Ecology. Harvard University Press, Cambridge, Massachusetts.

Culver, D. C., T. C. Kane and D. W. Fong. 1995. Adaptation and natural selection in caves: the evolution of *Gammarus minus*. Harvard University Press, Cambridge, MA 223 pp.

Gagne, W.C. and L.W. Cuddihy. 1999. Vegetation in Wagner, W.L., D.L. Herbst, and S.H. Sohmer. 1999. Manual of the Flowering Plants of Hawaii: Revised Edition. University of Hawaii Press, Honolulu, 1919 pp

Giffin, J.G. 2003. Pu'u Wa'awa'a Biological Assessment. Hawai'I Department of Land and Natural Resources division of Forestry and Wildlife.

Handy, E.S. and E.G. Handy. 1972. Native Planters in Old Hawaii: Their Life, Lore , and Environment. Bernice P. Bishop Museum Bull. 233. Bishop Museum Press, Honolulu, HI.

Hoch, H. and F.G. Howarth. 1993. Evolutionary Dynamics of Behavioral Divergence Among Populations of the Hawaiian Cave-dwelling Planthopper *Oliarus polyphemus* (Homoptera: Fulgoroidea: Cixiidae). Pacific Science 47(4):303-318. Univ. of Hawaii Press.

Hoch, H. and F.G. Howarth. 1999. Multiple Cave Invasions by Species of the Planthopper Genius *Oliarus* in Hawaii (Homoptera: Fulgoroidea: cixiidae). Zoo. J. Linnean Soc., 127:453-475. [Desc. of new cave adapted planthopper from Pu'u Wa'awa'a]

Holsinger, J.R. 1988. Troglobites: The Evolution of Cave-Dwelling Organisms. American Scientist, Vol. 76, March-April 1988.

Holsinger, J.R. 1994. Pattern and process in the biogeography of subterranean amphipods. Hydrobiologia 287: 131-145.

Howarth, F.G. 1972. Cavernicoles in Lava tubes on the Island of Hawaii. Science 175: 325-326.

Howarth, F.G. 1973. The cavernicolous fauna of Hawaiian lava tubes, 1. Introduction. Pacific Insects 15: 139-151.

Howarth, F.G. 1983. Ecology of cave arthropods. Annual Review of Entomology 28: 365-389. Juvick, S. P. and J. O. Juvick 1998. Atlas of Hawai'i (3rd edition) University of Hawai'i Press. Honolulu.

Howarth, F.G. 1987. The Evolution of Non-relictual Tropical Troglobites. International Journal of Speleology 16, pp.1-16.

Howarth, F.G. 1990. Hawaiian terrestrial arthropods: An overview. Bishop Museum Occasional Papers 30: 4-26.

Howarth, F.G. 1991. Hawaiian Cave Faunas: Macroevolution on Young Islands. pp. 285 295 in: E.C. Dudley (Ed.). The Unity of Evolutionary Biology. Dioscorides Press, Portland Or. Vol. 1, 588 pp.

Howarth, F.G and F.D. Stone. 1990. Elevated carbon dioxide levels in Bayliss Cave, Australia: Implications for the evolution of obligate cave species. Pacific Science. 44: 207-218.

Howarth, F.G. and G.W. Ramsay. 1991. The conservation of island insects and their habitats. Pp. 71-107: in Collins, N. M. and J. A. Thomas (eds.) The Conservation of Insects and Their Habitats. Academic Press, London.

Howarth, F.G. 1993. High-Stress Subterranean Habitats and Evolutionary Change in Cave-Inhabiting Arthropods. The American Naturalist. 142, Supplement:65-77.

Howarth, F.G. and A. Medeiros. 1989. Non-native invertebrates. pp. 82-87: in Stone, C. P. and D. B. Stone (eds), Conservation Biology in Hawaii. University of Hawaii Cooperative National Park Resources Studies Unit, Honolulu, Hawaii.

Howarth, F.G. and W.P. Mull. 1992. Hawaiian Insects and Their Kin. University of Hawaii Press, Honolulu. pp. 124-125.

Kauahikaua, J., Sherrod, D.R., Cashman, K.V., Heliker, C., Hon, K., Mattox, T.N., and J.A. Johnson. 2004. Hawaiian Lava-Flow Dynamics During the Pu'u 'Ö'ö-Küpaianaha Eruption: A Tale of Two Decades U.S. Geological Survey Professional Paper 1676 pp.63-88.

Li, Q., K. Sakuda, R. Harada, and F. Guo. 1998. Analysis of water samples for low levels of pesticides and analysis of inhibition of neurotransmitter breakdown in insects. Department of Environmental Biochemistry, University of Hawaii for the US Fish and Wildlife Service, Ecological Services, Honolulu, Hawaii.

Li, Q., K. Sakuda, R. Harada, and F. Guo. 2000. A study on the effects of golf course organophosphate and carbamate pesticides on endangered, cave-dwelling arthropods, Kauai, Hawaii. Department of Environmental Biochemistry, University of Hawaii for the US Fish and Wildlife Service, Ecological Services, Honolulu, Hawaii.

Moore, R.B., D.A. Clague, M.Rubin and W.A. Bohrson. 1987. Hualalai Volcano: A Preliminary Summary of Geologic, Petrologic, and Geophysical Data. Pages 571-585 in R.W. Decker, T.L. Wright, and P.H. Stauffer (eds.). Volcanism in Hawaii. U. S. Geological Survey Professional Paper; 1350. U.S. Gov. Printing Office. 2 vols.

Moore, R.B. and David A. Clague. 1991. Geologic Map of Hualalai Volcano, Hawaii. U.S. Dept. of the Interior. Misc. Investigations Series. Map I-2213 (sheets 1 & 2). U.S. Geological Survey.

Moore, J.G. and D.A. Clague. 1992. Volcano Growth and Evolution of the Island of Hawaii. Bull. of the Geological Society of America 104:1471-1484.

Olson, S.L. and H.F. James. 1982. Prodromus of the fossil avifauna of the Hawaiian Islands. Smithsonian Contributions to Zoology 365:1-59.

Olson, S.L. and H.F. James. 1991. Descriptions of thirty-two new species of flightless birds from the Hawaiian Islands: Part I. Non-Passeriformes. Ornithological Monographs 45:1-88.

Olson, S.L. and A.C. Ziegler. 1995. Remains of land birds from Lisianski Island, with observations on the terrestrial avifauna of the Northwestern Hawaiian Islands. Pacific Science 49:111-125.

Poulson, T.L. and W.B. White. 1969. The cave environment. Science 165: 971-981.

Ziegler, A.C. 2002. Hawaiian Natural History, Ecology, and Evolution. University of Hawaii Press, Honolulu, 477 pp

Peck, S.B. 1998. A summary of diversity and distribution of the obligate cave-inhabiting faunas of the United States and Canada. Journal of Cave and Karst Studies, April 1998: 18-26.

Peterson, D.W. and R.B. Moore. 1987. Geologic History and Evolution of Geologic Concepts, Island of Hawaii. Pages 149-186 in R.W. Decker, T.L. Wright, and P.H. Stauffer (eds.). Volcanism in Hawaii. U. S. Geological Survey Professional Paper; 1350. U.S. Gov. Printing Office. 2 vols.

U.S. Fish and Wildlife Service. 2005. Recovery Plan for the Blackburn's Sphinx Moth (*Manduca blackburni*). Portland, Oregon. 125 pp.

U.S. Fish and Wildlife Service. 2003. Endangered and threatened wildlife and plants; designation of critical habitat for Blackburn's sphinx moth, final rule. Federal Register: 68(111): 34710-34766.

U.S. Fish and Wildlife Service. 2000. Endangered and threatened wildlife and plants: determination of endangered status for Blackburn's sphinx moth from Hawaii. Federal Register 65(21): 4770-4779.

Van Riper, Charles III. 1973. The nesting of apapane in lava caves on the island of Hawaii. The Wilson Bulletin vol 85. no. 2, pp. 238-240.

Whistler, A. 2007. Botanical Survey of Kula Nei Development Area, North Kona, Island of Hawai'i. Prepared for Belt Collins Hawaii. 36pp.

Wolfe, E.W. and J. Morris. 1996. Geologic Map of the Island of Hawaii. Geologic Investigations Series Map I-2524-A. U.S. Geological Survey.

Plate 1. Geologist Kristin White examines a collapsed lava tube cave.

Plate 2. This cave entrance represents a naturally collapsed lava blister.

Plate 3. A collapsed lava tube on TMK 7-3-07:38.

Plate 4. This partially collapsed meter-scale lava tube was found under TMK 7-3-09:07.

Plate 5. Descending into a lava tube at the beginning of the biospeleological survey.

Plate 6. Biologist Wendy McDowell descends into a lava tube on TMK 7-3-09:07.

Plate 7. Geologist Dr. Kemble White. Note tree root in foreground.

Plate 8. A large cave entrance in a pahoehoe lava flow. Note prevalence of fountain grass.

Plate 9. Main lava tube and cave entrance near the southeast corner of TMK 7-3-09:07.

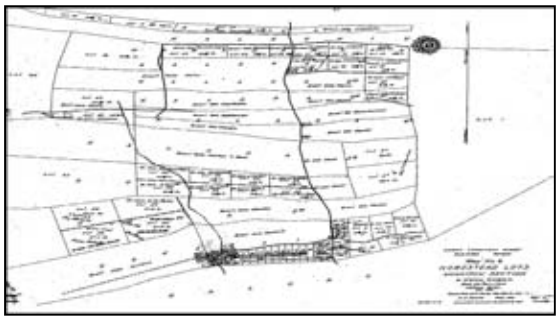
Plate 10. Biologist Wendy McDowell exiting newly discovered opening to main tube on TMK 7-3-07:38.

Plate 11. Escarpment Environmental technician Ian Moede pulls the ground penetrating radar (GPR) unit over the terrain at The Kula Nei Project area to assist with mapping of lava tubes.

Appendix G

RC-0311

An Archaeological Inventory Survey of TMKs:3-7-3-07:39 and 3-7-3-46:105



‘O‘oma 1st and 2nd *ahupua‘a*
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ARCHAEOLOGICAL, CULTURAL, AND HISTORICAL STUDIES

An Archaeological Inventory Survey of TMK:3-7-3-07:39 and 3-7-3-46:105

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RECHTMAN CONSULTING

EXECUTIVE SUMMARY

At the request of Stacy Dickensen of ʻOʻoma Plantation, Rechtman Consulting, LLC conducted an archaeological inventory survey of a 39.36 acre parcel (TMK:3-7-3-07:39) located in ʻOʻoma 2nd Ahupuaʻa, and an adjoining 43,706 square foot parcel (TMK:3-7-3-46:105) located in ʻOʻoma 1st Ahupuaʻa, North Kona District, Island of Hawaiʻi. The larger parcel was formerly referred to as Lot 56 of the ʻOʻoma Homesteads. It was originally sold to E. M. Paiwa in 1898 as Grant 4273. The smaller parcel is a lot within the Kona Palisades Subdivision. Prior to this study, no previous archaeological work had been conducted at either of the two study parcels.

As a result of the current inventory survey seventeen archaeological sites were recorded on TMK:3-7-3-7:39 and a single archaeological site was recorded on TMK:3-7-3-46:105. The recorded sites include seven Historic walls (Sites 23834, 24759, 24769, 24770, 24771, 24772, and 24774), one Historic enclosure (Site 24760), a probable Historic roadway (Site 24775), two trail segments (Sites 24761 and 24763), a modified outcrop used for Precontact habitation purposes (Site 24762), a terrace used for Precontact habitation purposes (Site 24764), three Precontact lava blister habitations (Sites 24765, 24766, and 24767), one human burial within a lava blister (Site 24768), a Precontact habitation complex containing five features (Site 24773), and a large agricultural complex that spans the entire larger parcel of the current project area (Site 24776). Sixteen 1 x 1 meter test units were excavated at four of the recorded sites (Sites 24762, 24764, 24773, and 24776). Collectively, these sites represent nearly continual use of the study parcel from Precontact times (perhaps as early as the 1400s; Haun and Henry 2003:80) to the late Historic Period.

All of the recorded archaeological sites are considered significant under Criterion D. Site 24774, the southern boundary wall of the larger study parcel, is also a portion of the northern boundary wall of a Historic ʻOʻoma Homestead road, and as such it is also considered significant under Criterion A. Site 24768 consists of a small lava blister containing human skeletal remains, and due to the presence of the burial it is also considered significant under Criterion D. Sites 23834, 24759, 24760, 24761, 24763, 24765, 24766, 24767, 24769, 24770, 24771, 24772, and 24775 are all recommended for no further work. Sites 24762, 24764, 24773, and 24776 are all recommended for data recovery and a data recovery plan should be prepared for these sites in consultation with DLNR-SHPD. Sites 24768 and 24774 are recommended for preservation. A search for lineal and cultural descendants should be undertaken and a burial treatment plan should be prepared in consultation with any identified descendants and the Hawaiʻi Island Burial Council for Site 24768, and a preservation plan should be prepared in consultation with DLNR-SHPD for Site 24774. The above treatment recommendations should be considered preliminary until approved by DLNR-SHPD.

CONTENTS

FIGURES

TABLES

INTRODUCTION

At the request of Stacy Dickensen of ʻOʻoma Plantation, Rechtman Consulting, LLC conducted an archaeological inventory survey of a 39.36 acre parcel (TMK:3-7-3-07:39) located in ʻOʻoma 2nd Ahupuaʻa, and an adjoining 43,706 square foot parcel (TMK:3-7-3-46:105) located in ʻOʻoma 1st Ahupuaʻa, North Kona District, Island of Hawaiʻi (Figures 1 and 2). The larger parcel was formerly referred to as Lot 56 of the ʻOʻoma Homesteads. It was originally sold to E. M. Paiwa in 1898 as Grant 4273. The smaller parcel is a lot within the Kona Palisades Subdivision. Prior to this study, no previous archaeological work had been conducted at either of the two study parcels. As a result of the current inventory survey seventeen archaeological sites were recorded on TMK:3-7-3-7:39 and a single archaeological site was recorded on TMK:3-7-3-46:105. This survey was performed in accordance with the Rules Governing Minimal Standards for Archaeological Inventory Surveys and Reports as contained in Hawaiʻi Administrative 13§13–284. The current project was undertaken in compliance with both the historic preservation review process requirements of the Department of Land and Natural Resources-State Historic Preservation Division (DLNR-SHPD) and the County of Hawaiʻi Planning Department.

This report contains background information outlining the project area's physical and cultural contexts, a presentation of previous archaeological work in the immediate vicinity of the parcel, and current survey expectations based on that previous work. Also presented is an explanation of the project's methods, detailed description of the archaeological resources encountered, interpretation and evaluation of those resources, and treatment recommendations for all of the documented sites.

Project Area Description

The current project area consists of two study parcels; a 39.36 acre parcel (TMK:3-7-3-07:39) located in ʻOʻoma 2nd Ahupuaʻa, and an adjoining 43,706 square foot parcel (TMK:3-7-3-46:105) located in ʻOʻoma 1st Ahupuaʻa, North Kona District, Island of Hawaiʻi (see Figures 1 and 2). The study parcels are located below Māmalahoa Highway at elevations ranging from approximately 850 feet to 1,120 feet above sea level. The project area can be accessed from the east through Kona Hills Estates gated community, or from the north through the Kona Palisades Subdivision. The larger parcel (Parcel 39) is bordered to the north and east primarily by developed/bulldozed residential parcels (TMK:3-7-3-46:105 being the exception), and to the south and west by undeveloped parcels. The smaller parcel (Parcel 105) is bordered to the north by Kukuna Street, to the east and west by developed residential parcels, and to the south by Parcel 39. Parcel 105 has been nearly completely grubbed and grated, and a bulldozed 4WD road leads south from that parcel on to Parcel 39 (Figure 3). The bulldozed road bisects Parcel 39 and follows the boundaries of the parcel around its entire periphery. These roads were formerly drivable, but they are currently overgrown with dense vegetation. A roughly 2.5-acre area in the central portion of Parcel 39 has also been previously bulldozed. Historic boundary walls surround the entire larger parcel of the project area, and double walls run along the southern boundary of that parcel, marking the former route of an old ʻOʻoma Homestead road.

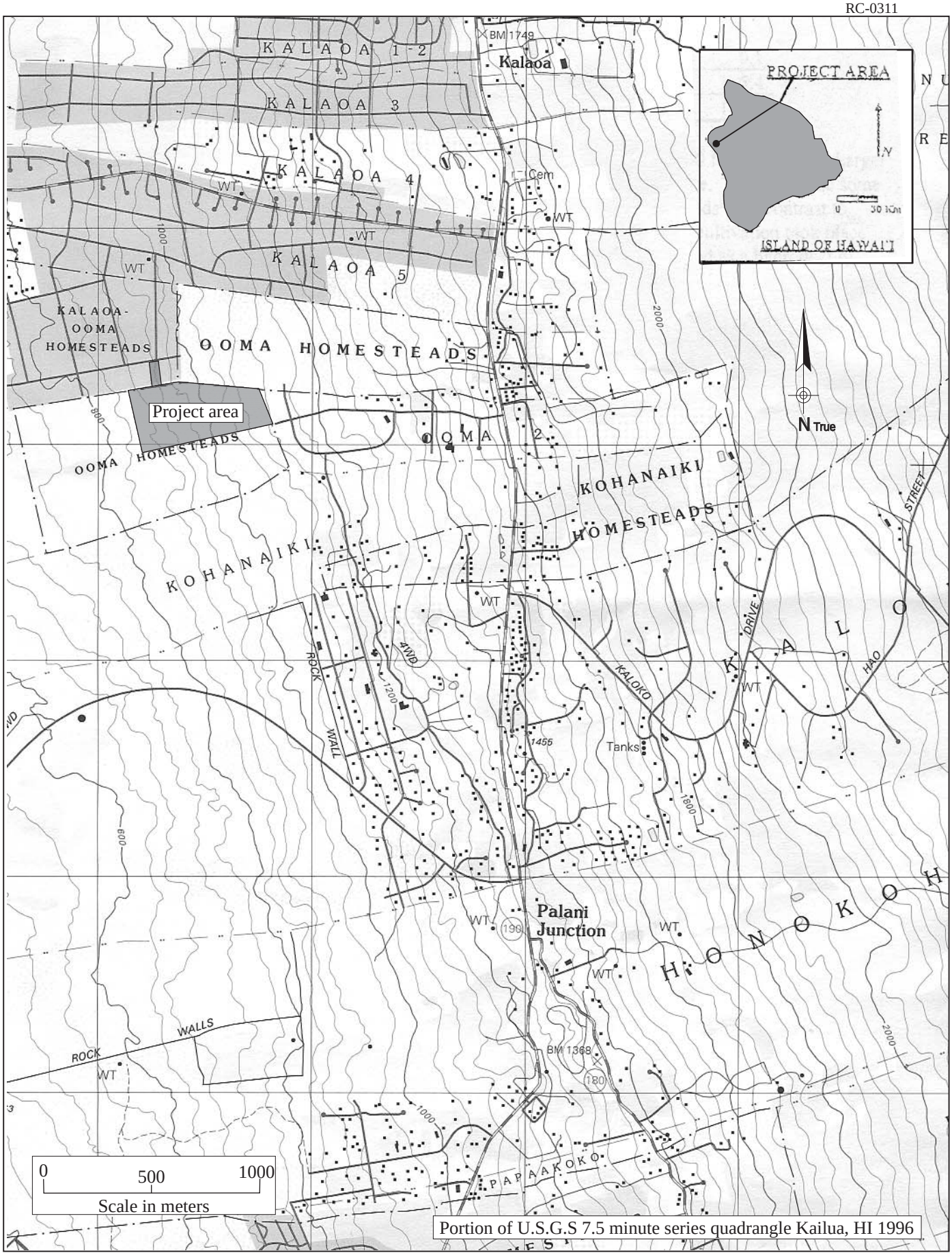

Figure 1. Project area location.

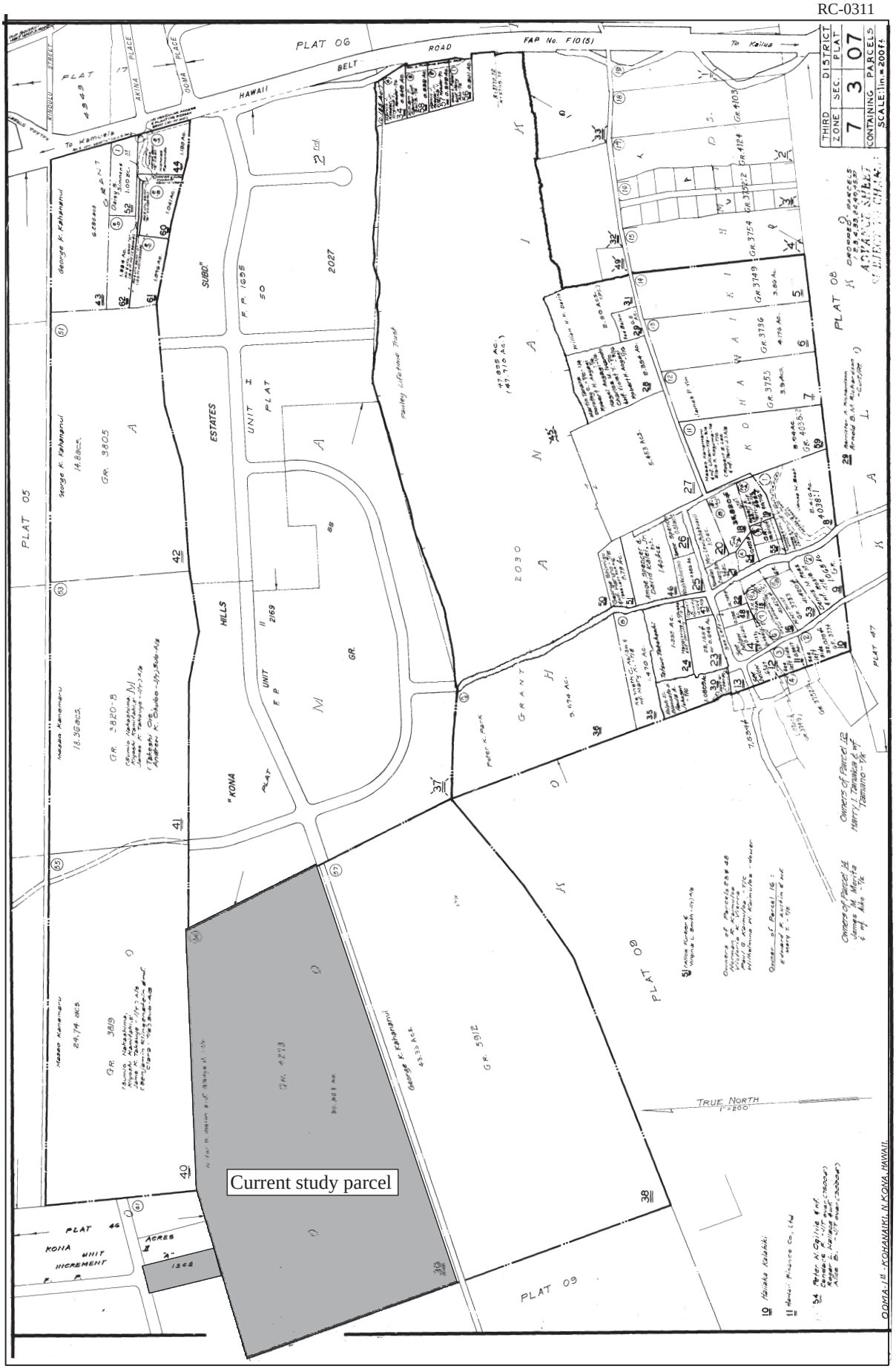

Figure 2. Tax Map Key (TMK):3-7-3-07 showing the location of the current study parcel (39).

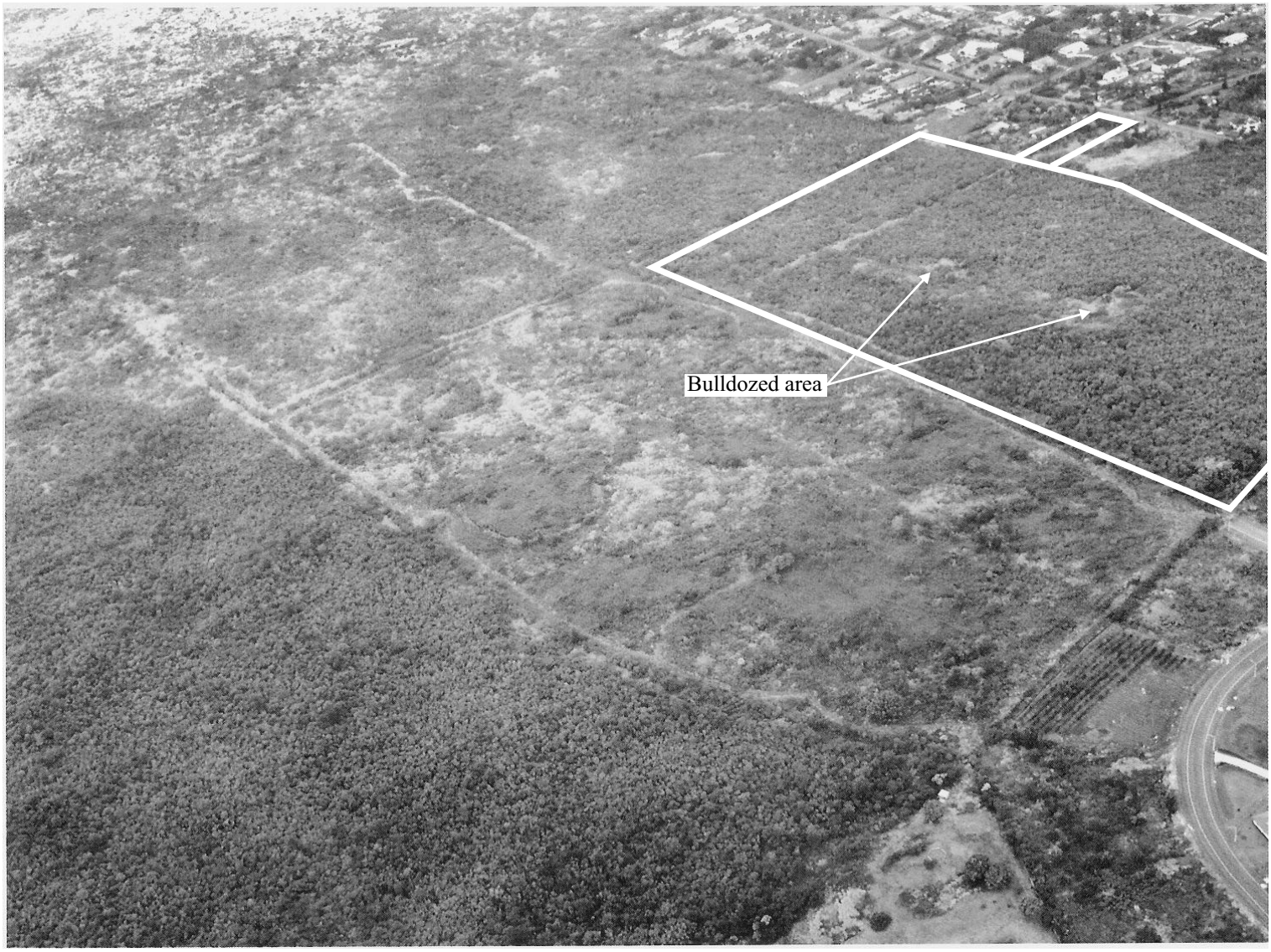

Figure 3. Aerial view of the project area to the northwest.

The current project area is located on weathered *pāhoehoe* and *ʻaʻā* lava flows that originated from Hualālai between 3,000 and 5,000 years ago (Wolfe and Morris 1996). The entire project area slopes steeply to the west. The climate in this area is characterized by a scarcity of water and hot, sunny weather conditions (Drolet and Schilz 1991:5). The mean annual rainfall measures 750 mm (Giamelluca et al. 1980:99), with temperature ranges from 75 to 85 degrees. There are no permanent water drainages within or near the project area. The limited amount of soil development, paucity of water, and overall barren conditions of these rubble-strewn slopes make this a marginal zone associated with limited resources (Drolet and Schilz 1991:5).

The entire project area is blanketed by a dense growth of vegetation. Identified floral species included mango (*Mangifera indica*), silver oak (*Gravillea robusta*), Christmas-berry (*Schinus terebinthifolius*) *koa-haole* (*Leucaena Leucocephala*), weeping fig (*Ficus benjamina*), *kukui* (*Aleurites moluccana*), guava (*Psidium guajava*), autograph trees (*Clusia rosea*), ti (*Cordyline fruticosa*), and fountain grass (*Pennisetum setaceum*), along with various other non-native vines, grasses, shrubs, and weeds. In addition to this, a large amount of pakalolo (Cannabis sp.) was discovered in the western portion of Parcel 39 growing in plastic trashcans.

BACKGROUND

To generate set of expectations regarding the nature of archaeological resources that might be encountered on the study parcel, and to establish an environment within which to assess the significance of any such resources, previous archaeological studies relative to the project area and a historical context for the general North Kona region are presented.

Previous Archaeological Research

Thrum (1908) compiled the earliest systematic report on archaeological features—*heiau* or ceremonial sites—on the island of Hawai'i. Thrum's work was the result of literature review and field visits spanning several decades. Unfortunately, Thrum's work did not take him into ʻOʻoma, and his documentation on *heiau* ends at Lanihau, south of the study area; and picks up to the north, in the Puʻu Anahulu vicinity. Likewise, the 1906-1907, J.F.G. Stokes detailed field survey of *heiau* on the island of Hawaiʻi for the B. P. Pauahi Bishop Museum (Stokes and Dye 1991) stopped short of doing comprehensive work in the Kekaha region, and no sites were recorded in ʻOʻoma.

In 1929-1930, the Bishop Museum contracted John Reinecke to conduct a survey of Hawaiian sites in West Hawaiʻi, including ʻOʻoma and the Kekaha region (Reinecke n.d.). A portion of Reinecke's survey fieldwork extended north from Kailua as far as Kalāhuipuaʻa. His work being the first attempt at a survey of sites of varying function, ranging from ceremonial to residency and resource collection.

During his study, Reinecke traveled along the shore of Kekaha, documenting near-shore sites. Where he could, he spoke with the few native residents he encountered. Among his general descriptions of the Kekaha region, Reinecke observed:

> This coast formerly was the seat of a large population. Only a few years ago Keawaiki, now the permanent residence of one couple, was inhabited by about thirty-five Hawaiians. Kawaihae and Puako were the seat of several thousands, and smaller places numbered their inhabitants by the hundreds. Now there are perhaps fifty permanent inhabitants between Kailua and Kawaihae–certainly not over seventy-five.
>
> When the economy of Hawaii was based on fishing this was a fairly desirable coast; the fishing is good; there is a fairly abundant water supply of brackish water, some of it nearly fresh and very pleasant to the taste; and while there was no opportunity for

> agriculture on the beach, the more energetic Hawaiians could do some cultivation at a considerable distance *mauka*.
>
> The scarcity of remains is therefore disappointing. This I attribute to four reasons: (1) those simply over looked, especially those a short distance mauka, must have been numerous; (2) a number must have been destroyed, as everywhere, by man and by cattle grazing; (3) the coast is for the most part low and storm-swept, so that the most desirable building locations, on the coral beaches, have been repeatedly swept over and covered with loose coral and lava fragments, which have obscured hundreds of platforms and no doubt destroyed hundreds more; (4) many of the dwellings must have been built directly on the sand, as are those of the family at Kaupulehu, and when the posts have been pulled up, leave no trace after a very few years.
>
> The remains on this strip of coast have some special characteristics differentiating them from the rest in Kona. First, there is an unusual number of petroglyphs and papamu, especially about Kailua and at Kapalaoa. Second, probably because of the strong winds, there are many walled sites, both of houses and especially of temporary shelters… (Reinecke n.d.:1-2)

The following site descriptions are quoted from Reinecke's draft manuscript of fieldwork conducted between Pūhili Point on the Kohanaiki-'O'oma 2nd boundary, and into Kalaoa 5th. In the site descriptions below, Reinecke references the occurrence of at least—6-house sites; 7 enclosures and pens (one of which is an "old cattle pen"); 11 terraces and platforms (one of which he felt was a "*heiau*"); 2 caves; 2 ahu; 1 stepping stone trail; 3 waterholes and a well; and 11 shelters. Apparently, no one was residing in the area at the time of his field survey.

Reinecke's site descriptions, south to north, across 'O'oma 2nd and 'O'oma 1st included:

> Site 66. Very doubtful dwelling site. Then a row of sand-covered platforms at the border of the sand and the beach lava, enough for 6-10 homes. Remains of an old, large pen.
>
> Site 67. Dry well on the crest of the beach.
>
> Site 68. Water hole, two small platforms, four or more shelters, pens with very small platform.
>
> Site 69. Large cattle pen. Doubtful old, rough platform at its north end. Remains of two old platforms by an ahu to the north.
>
> Site 70. Walled platform, S.E. corner terraced, badly broken down. Platform mauka. The walls of this and of Site 73 are built of thin places of pahoehoe surface lava, rather unusual in appearance. [Reinecke n.d.:15]
>
> Site 71. A knob partly walled on its slopes, with house site. Adjoining it on the south is a rough platform with three smooth boulders – heiau and kuula? Back of this a house platform and a platform about a fine shelter cave. Another platform and wall are about a slight natural depression filled with bones, including those of a whale.
>
> Site 72. Ruins of a pen.
>
> Site 73. Apparently a modern dwelling site of unusual construction; two terraces of pebbles, the upper 29x25x2 in front and 4-5' high elsewhere; the lower 19x10x25x3, with a three-sided pen at N.E.; surrounded by a carefully laid wall.
>
> Site 74. A shelter about a shallow cave; remains of another shelter; an ahu.
>
> Site 75. Trace of site; house platform; enclosure on shore. There are many faint traces of

> sites on this strip of coast. Toward the north is an unmistakable small site.
>
> Site 76. Modern shelter pen; house or shelter site; shelter mauka by kiawe tree.
>
> Site 77. Platform; tiny pen; sites of some kind marked by stones in lines on the pahoehoe flow.
>
> Site 78. Slightly brackish springs and pools; house site, shelters, stepping stone path leading to the walled house site… [Reinecke n.d.:16]

In more recent times, Haun and Henry (2003:8) indicate that 40 archaeological surveys and excavation projects have been conducted in ʻOʻoma Ahupuaʻa and the adjacent (to the north) *ahupuaʻa* of Kalaoa. These studies identified (not including the Haun and Henry study) "53 permanent habitations, 379 temporary habitations, 3,736 agricultural features, 25 burials, 17 ritual features, 34 trail segments, 65 *ahu*, and 18 petroglyphs," and, "two hundred and twenty-one habitation features [that] were not categorized by residential permanence" (2003:13). According to Haun and Henry (2003:13), dates from these studies indicate initial settlement of the area by A.D. 1400, with gradual increase in population during the 15th century, and the most intensive use from the 1600's through the early Historic period.

Eight previous archaeological studies have been conducted at proximate locations to the current project area. Four of these studies were conducted in ʻOʻoma 2nd Ahupuaʻa to the south and west of the current project area (Clark and Rechtman 2005; Rechtman Consulting, LLC in prep; Rosendahl 1989; Walker and Rosendahl 1990), two studies were conducted in ʻOʻoma 1st Ahupuaʻa to the northwest and northeast of the current project area (Haun and Henry 2000, 2003), and two studies were conducted in Kohanaiki Ahupuaʻa to the south of the current project area (Barrera 1991; Clark and Rechtman 2002). The findings of each of these studies are presented in chronological order below and the location of each study is shown in Figure 4.

Rosendahl (1989) conducted an inventory survey of a 200-foot wide corridor in ʻOʻoma 2nd Ahupuaʻa for a proposed Kohana-Iki Resort water development project. The project area extended along the northern boundary of Kohanaiki Ahupuaʻa from Queen Kaʻahumanu Highway (at approximately 80 feet above sea level) to approximately 760 feet above sea level (see Figure 4). As a result of that survey four archaeological sites were recorded. The sites included two *pāhoehoe* excavations located just above the highway (Site 5696), a ceremonial/habitation complex with an alignment, a cave, a rock shelter, two terraces, an enclosing wall, and a *papamū* located at 280 feet above sea level (Site 5697), a mound located at 440 feet above sea level (Site 5698), and a Historic boundary wall located at approximately 760 feet above sea level (Site 5699).

Walker and Rosendahl (1990) also conducted an inventory survey in ʻOʻoma 2nd Ahupuaʻa for the same proposed water development project. Their project area consisted of a 2,600-foot long by 300-foot wide corridor that extended from the Rosendahl (1989) corridor north along the 700-foot contour across the entire *ahupuaʻa* (see Figure 4). Walker and Rosendahl (1990) identified 13 sites that encompassed more than 27 features. Although the report is described as an inventory survey, only temporary site numbers were assigned and no detailed recording was undertaken. They note, however, that:

> The principal types of sites and features identified were mounds of varying sizes possibly related to agricultural activities. Several caves (one containing human burial remains), enclosures, cairns, a trail segment, a boulder alignment, and a terrace were also noted. In addition to agriculture, functional feature types encountered include boundary, habitation, transportation, burial, and marker. (Walker and Rosendahl 1990:4)

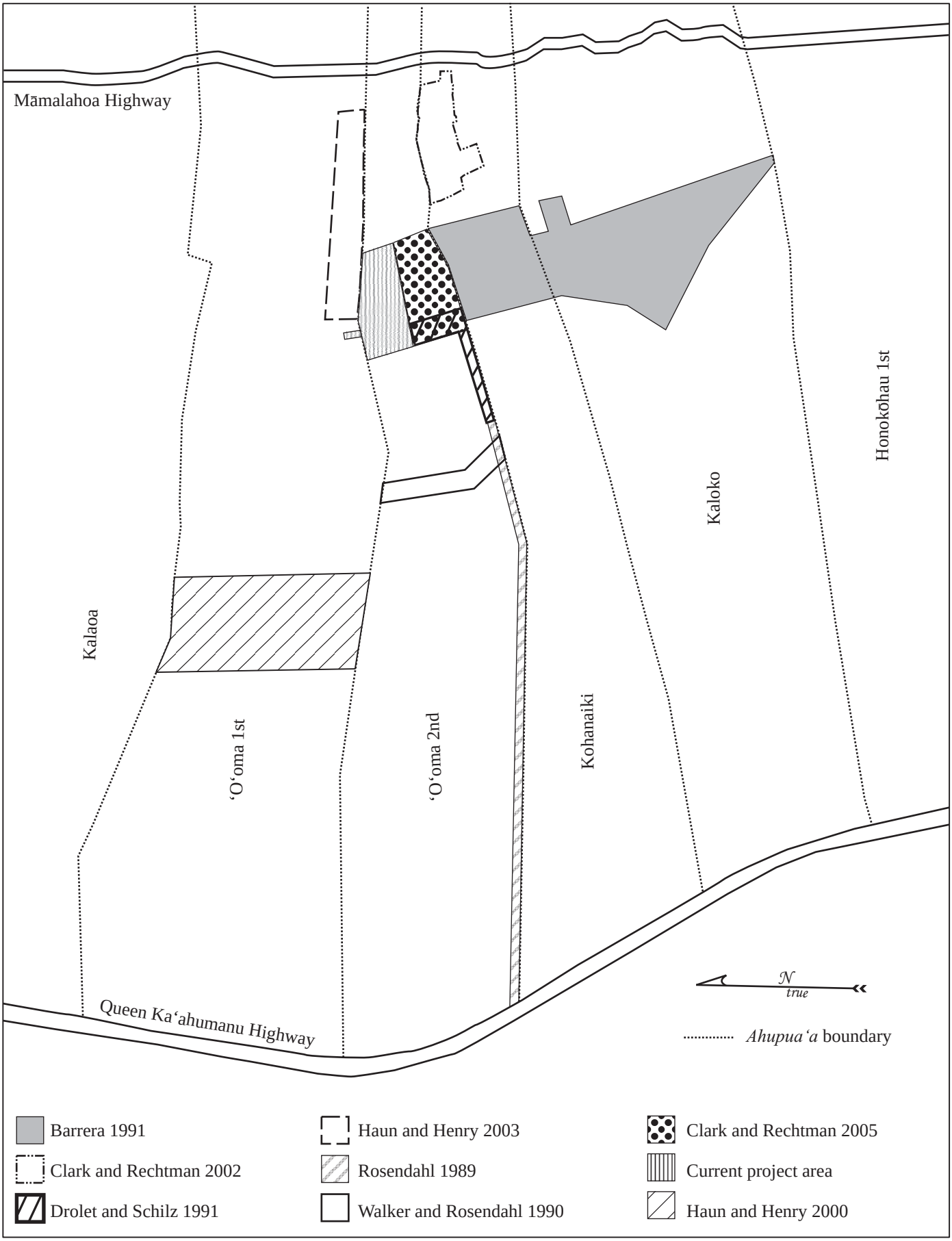

Figure 4. Previous archaeological studies in the vicinity of the current project area.

A third inventory survey for the proposed water development project within ʻOʻoma 2nd was conducted by Drolet and Schilz (1991). Their survey area consisted of a 100-foot wide corridor that ran from the termination of the Rosendahl (1989) corridor at approximately 760 feet above sea level, along the northern boundary of Kohanaiki Ahupuaʻa, to approximately 900 feet above sea level. The corridor then turned north, widened to 200 feet and crossed the *makai* portion of the Clark and Rechtman (2005) study area, terminating at the southern boundary of the current project area (see Figure 4). This survey area encompassed approximately 8.8 acres and 29 archaeological sites containing 41 distinct features were recorded within its boundaries. Drolet and Schilz conclude that:

> The most common feature found were cobble mounds. A total of 22 were found that included circular, oval, and linear forms. The mounds were presumably were constructed for agricultural use and suggest seasonal cropping of tuber plants such as sweet potato. Other types of features included one modified outcrop, one stone alignment, and two platforms, which appear to be associated with the agricultural mounds. There were four shelters located, each with evidence of temporary residence, and five enclosures, that also indicate habitation units. Four of the five enclosures were located within the cave sites. Finally, the last category of identified features included walls, nine of which were recorded. These were both high and low constructions. The presence of this latter type of wall construction suggests field divisions and possibly water diversion systems built during prehistoric occupation to facilitate agricultural development.
>
> All but three of the archaeological sites located appear to form a cluster of features dating to the late prehistoric period. The exceptions are Sites 16106, 16125, and 16126 that are historic walls reportedly built 60 to 70 years ago….
>
> There appears to be an important relationship between the cave complexes and the agricultural features found during the current survey. The lava tubes within the five clustered cave complexes located served as principal occupation sites, and the shallow midden deposits and limited structural constructions within these tubes suggest only temporary occupation and probably seasonal use. The dry farming garden features surrounding the caves also point to a seasonal cropping pattern. Clearly, the lack of soil build up within this zone, along with the deep lava deposits and lack of permanent water supply, had to have been factors that influenced the type of land use patterns evidenced in the archaeological record. (1991:30-32)

Barrera (1991) conducted an archaeological inventory survey and data recovery effort at two parcels (TMK: 3-7-3-09:1 and 17) within Kohanaiki and Kaloko *ahupuaʻa* located south of the current project area (see Figure 4). Barrera's study area ranged from 800 to 1,100 feet above sea level. As a result of the study, Barrera identified 140 archaeological sites that were located primarily within Kohanaiki Ahupuaʻa. He attributes the scarcity of sites within Kaloko Ahupuaʻa to "extensive recent land clearing that occurred there." Sixty-one of the sites were determined to lie within the boundaries of the Kohanaiki Homesteads, a collection of combined agricultural and residential lots (located to the south of the current project area) that were settled in the late 1800s. The majority of the remaining sites were determined to be components of the Kona Field System. These sites consisted primarily of *kuaiwi*, cross-walls, terraces, and mounds. Also several permanent and temporary habitations were identified, along with a single small *heiau* or men's house. Barrera (1991:63) suggests that human occupation of the project area began in the last quarter of the fifteenth century and continued unabated into the eighteenth century at which point there is a no residential population for nearly 150 years until the settlement of the Kohanaiki Homesteads.

Haun and Henry (2000) conducted an inventory of a roughly 50-acre parcel (TMK:3-7-3-10:03) located in ʻOʻoma 1st Ahupuaʻa to the northwest of the current project area (see Figure 4).That survey identified seventeen archaeological sites containing 186 distinct features. The recorded features included

pāhoehoe excavations, mounds, terraces, quarries, filled cracks, cairns, walls, pavements, trails, alignments, cupboards, caves, and several miscellaneous types. Functions assigned to the features included agriculture, temporary habitation, resource procurement, marker, transportation, livestock control, storage, ceremonial, refuge, tool manufacture, and indeterminate. One large lava tube within the project area was used for Precontact habitation purposes and contained a possible shrine. A quarry site was also discovered on the property where dense basalt cobbles were being taken from an *ʻaʻā* field and then being reduced on a nearby *pāhoehoe* flow, perhaps to form hammerstones (Haun and Henry 200:57).

Clark and Rechtman (2002) conducted an inventory survey of a fifty-two acre property (TMK: 3-7-3-7:27 and 50) in Kohanaiki Ahupuaʻa to the southeast of the current project area (see Figure 4). As a result of that survey five archaeological sites were recorded, including an enclosure remnant (Site 23628), two stone terraces (Sites 23629 and 23630), and two sets of historic boundary walls (one set surrounding each parcel; Sites 23631 and 23632). Clark and Rechtman (2002:10) note that nearly the entire study area had been mechanically cleared to accommodate coffee cultivation, and that an interconnected series of old bulldozed access roads spanned the entire larger parcel (TMK: 3-7-3-7:50). In addition to this, several rusted 50-gallon metal drums (perhaps as many a 100) were noted over the entire project area. These drums were typically found in groups and, more often then not, they were located near one of the old bulldozed access roads. There was also ample evidence of more recent agricultural pursuits on the study parcels—*pakalolo* (*Cannabis*) cultivation. Clark and Rechtman (2002:10) identified a number of recently constructed rock rings (perhaps as many as 50) containing soil mixed with vermiculite and often associated with modern artifacts (i.e. fertilizer bags, rubber hose, plastic bottles, etc.). These rock rings varied widely in size and shape, but were all certainly of modern construction, and at least one was observed to be currently under cultivation.

Haun and Henry (2003) conducted an inventory survey of a roughly 41-acre parcel (TMK:3-7-3-7:40) in ʻOʻoma 1st Ahupuaʻa that borders the current project area to the north (see Figure 4). The project area ranged in elevation from 980 to 1,280 feet above sea level. As a result of that survey twenty-one archaeological sites were recorded with an estimated 2,046 features. Haun and Henry report that:

> The sites are comprised of 14 single feature sites and eight complexes of features. The features consist of an estimated 1,105 modified outcrops and 788 mounds, 41 enclosures, 36 *kuaiwi*, 29 platforms, 21 terraces, ten walls, nine caves and seven field boundaries. Functionally, the features consist of agriculture (n=1,984), permanent habitation (n=32), livestock control (n=14), historic habitation (n=8), temporary habitation (n=6) storage (1), and burial (n=1). (2003:15)

Although the entire project area was subject to intensive pedestrian survey, Haun and Henry explain that:

> Hundreds of agricultural features, primarily mounds and modified outcrops, were identified throughout the parcel during the initial survey transects. A sample of these features was recorded in a 10 m wide transect extending across the entire parcel from east to west. Agricultural features within the transect were subjected to limited recording . . . Feature density values from the transect were used to estimate the total number of mounds and modified outcrops in the project area. Non-agricultural sites were subjected to detailed recording…(2003:4)

Of the non-agricultural sites, the six temporary habitations consisted exclusively of caves. Seven radiocarbon dates, ranging from A.D 1400 to A.D. 1800, were obtained from these caves, with five of the dates falling between the 1400s to the mid-1600s (Haun and Henry 2003:80). Six Precontact permanent habitation sites and two Historic habitation sites were also recorded. The Precontact permanent habitations all included from one to three structure foundations consisting of terraces, platforms, and enclosures. Three of these sites were enclosed by walled yards. The Historic habitation sites both included significant amounts

of Historic debris. Five Historic ranching walls were also recorded. The one burial site discovered during the inventory survey (Site 23826) consisted of a large rectangular platform with stacked sides. In addition to this, several more burials were inadvertently discovered within concealed lava blisters during the initial grubbing of the parcel.

Prior to the commencement of fieldwork for the current inventory survey, Rechtman Consulting, LLC (Clark and Rechtman 2005) completed a study of a roughly 43-acre parcel (TMK:3-7-3-7:38; former Lot 57 of the ʻOʻoma Homesteads) located directly south of the current project area within ʻOʻoma 2nd Ahupuaʻa (see Figure 4). As a result of that study three archaeological sites previously recorded by Drolet and Schilz (1991) (Sites 16106, 16125, and 16126) and twelve newly recorded sites (Sites 24413–24424) were identified on the subject parcel. Drolet and Schilz (1991) had recorded nineteen sites on the subject parcel, but due to widespread mechanical clearing of the property in 1994, only three were remaining (all boundary walls) at the time of the Clark and Rechtman (2005) study.

Clark and Rechtman (2005) note that the fifteen sites recorded on TMK:3-7-3-7:38 represented nearly continual use of the parcel from Precontact times (perhaps as early as the 1400s; Haun and Henry 2003:80) to the 1940s. Historic sites located on the study parcel included the remains of a former residence that was occupied until ca. 1939 (Site 24422), the boundary walls that surrounded the entire parcel (Sites 16106, 16125, 16126, and 24423), a small enclosure of undetermined homesteading function (Site 24415), a large enclosure that may have functioned as a goat pen (Site 24414), and several core-filled wall segments that may have once formed several large enclosures on the property (Site 24416). Precontact sites recorded on the study parcel included a burial platform containing a slab-lined crypt with articulated human skeletal remains (Site 24413), a three-sided habitation enclosure (Site 24417), a modified outcrop (Site 24418), a stepping stone trail segment (Site 24419), a lava tube system containing four habitation areas near openings (Site 24420), two mounds (Site 24421), and a large lava tube that was used for water collection (Site 24424).

Clark and Rechtman (2005) also suggest that the widespread mechanical clearing that occurred on the study parcel in 1994 drastically altered the earlier cultural landscape of the property. They site earlier archaeological studies by Drolet and Schilz (1991) and Haun and Henry (2003), and historical research and oral interviews compiled by Rechtman and Maly (2003), that overwhelmingly indicates that the project area was likely blanketed by Precontact agricultural features prior to the land clearing. The extent and type of these potential features, however, could only be surmised based on the findings of these other studies.

Rechtman Consulting, LLC (in prep) recently completed an inventory survey of a 45.3-acre study parcel (TMK 3-7-3-9:7; former Lot 59 of the ʻOʻoma Homesteads) located to southwest within ʻOʻoma 2nd Ahupuaʻa (see Figure 4). This study parcel is located adjacent to the west of the Clark and Rechtman (2005) project area, and a portion of it was previously studied by Drolet and Schilz (1991). As a result of the fieldwork Rechtman Consulting, LLC recorded sixty-four Precontact habitation sites including eighteen within individual lava tubes, eleven habitation complexes containing multiple features, and thirty-five at single feature sites including, four pavements, nine platforms, nine enclosures, and thirteen modified outcrops. Eight burials were discovered on the property including four within individual lava tubes, two within small platforms, one in a soil area with upright slabs, and one in a pavement. Eight trail segments, a lava tube used for water collection, four Historic boundary walls, a Historic enclosure, and an extensive agricultural complex containing approximately 300 features including mounds, modified outcrops, terraces, *kuaiwi*, and enclosures were also recorded on the study parcel. Seventeen 1 x 1 meter test units were excavated at seventeen of the recorded features. The findings presented above should be considered preliminary until all data has been fully analyzed and a final report for the project has been prepared.

Cultural and Historical Background

While the physical study area is limited to a portion of ʻOʻoma 1st and 2nd *ahupuaʻa* identified as TMK:3-7-3-07:38 and 3-7-46:105, in an effort to provide a comprehensive and holistic understanding of the current project area, this section of the report examines the entire *ahupuaʻa* and their relationship to neighboring lands within the larger Kekaha region. In 2003, Rechtman Consulting, LLC prepared a Cultural Impact Assessment for the proposed development of TMK:3-7-3-09:22 within coastal ʻOʻoma 2nd Ahupuaʻa (Rechtman and Maly 2003). Extensive research for that study was conducted by Kepā Maly of Kumu Pono Associates, and it included a review of archival-historical literature from both Hawaiian and English language sources, including an examination of Hawaiian Land Commission Award records from the *Māhele ʻĀina* (Land Division) of 1848; survey records of the Kingdom and Territory of Hawaiʻi; and historical texts authored or compiled by D. Malo (1951), J.P. Iʻi (1959), S. M. Kamakau (1961, 1964, 1976, and 1991), Wm. Ellis (1963), A. Fornander (1916-1919 and 1996), T. Thrum (1908), J.F.G. Stokes and T. Dye (1991), M. Beckwith (1970), Reinecke (n.d.); and Handy and Handy with Pukui (1972). That study also included several native accounts from Hawaiian language newspapers (compiled and translated from Hawaiian to English, by Kepā Maly), and historical narratives authored by eighteenth and nineteenth century visitors to the region. The information was presented within thematic categories by ordered chronological by the date of publication.

The archival-historical resources were located in the collections of the Hawaiʻi State Archives (HSA), State Land Division (LD), State Survey Division (SD), and State Bureau of Conveyances (BoC); the Bishop Museum Archives (BPBM); Hawaiian Historical Society (HHS); University of Hawaiʻi-Hilo Moʻokini Library; private family collections; and in the collection of Kumu Pono Associates.

Over the last ten years, Kepā Maly of Kumu Pono Associates has researched and prepared several detailed studies—in the form of review and translation of accounts from Hawaiian language newspapers, historical accounts recorded by Hawaiian and non-Hawaiian residents, and government land use records—for lands in the Kekaha region of which ʻOʻoma is a part. Kepā Maly has also conducted a number of detailed oral history interviews with elder *kamaʻāina* documenting their knowledge of the Kekaha region (including ʻOʻoma), and he undertook new interviews and further consultation as a part of the 2003 study. All of the interview participants (both past and present) shared their personal knowledge of the land and practices of the families who lived in ʻOʻoma and vicinity. One additional oral-historical interview with Mrs. Elizabeth (Kahananui) Lee was conducted by Clark and Rechtman (2005) and it too is summarized below for the purposes of the current study.

As the information collected by Rechtman and Maly (2003) was so complete, this report presents only a slightly modified version of the cultural and historical background for ʻOʻoma Ahupuaʻa and the Kekaha region than was already generated. It is a comprehension of this background information that facilitates a more complete understanding of the potential significance of the resources that exist within the current study area.

Natural and Cultural Resources in a Hawaiian Context

In Hawaiian society, natural and cultural resources are one and the same. Native traditions describe the formation (the literal birth) of the Hawaiian Islands and the presence of life on and around them in the context of genealogical accounts. All forms in the natural environment, from the skies and mountain peaks, to the watered valleys and lava plains, and to the shoreline and ocean depths were believed to be embodiments of Hawaiian deities. One Hawaiian genealogical account, records that Wākea (the expanse of the sky–father) and Papa-hānau-moku (Papa—Earth-mother who gave birth to the islands)—also called Haumea-nui-hānau-wā-wā (Great Haumea—Woman-earth born time and time again)—and various gods and creative forces of nature, gave birth to the islands. Hawaiʻi, the largest of the islands, was the first-born of these island children. As the Hawaiian genealogical account continues, we find that these same god-

beings, or creative forces of nature who gave birth to the islands, were also the parents of the first man (Hāloa), and from this ancestor, all Hawaiian people are descended (cf. Beckwith 1970; Malo 1951:3; Pukui and Korn 1973). It was in this context of kinship, that the ancient Hawaiians addressed their environment and it is the basis of the Hawaiian system of land use.

An Overview of Hawaiian Settlement

Archaeologists and historians describe the inhabiting of these islands in the context of settlement that resulted from voyages taken across the open ocean. For many years, researchers have proposed that early Polynesian settlement voyages between Kahiki (the ancestral homelands of the Hawaiian gods and people) and Hawai‘i were underway by A.D. 300, with long distance voyages occurring fairly regularly through at least the thirteenth century. It has been generally reported that the sources of the early Hawaiian population—the Hawaiian Kahiki—were the Marquesas and Society Islands (Cordy 2000; Emory in Tatar 1982:16-18).

For generations following initial settlement, communities were clustered along the watered, windward (*ko‘olau*) shores of the Hawaiian Islands. Along the *ko‘olau* shores, streams flowed and rainfall was abundant, and agricultural production became established. The *ko‘olau* region also offered sheltered bays from which deep sea fisheries could be easily accessed, and near shore fisheries, enriched by nutrients carried in the fresh water, could be maintained in fishponds and coastal waters. It was around these bays that clusters of houses where families lived could be found (McEldowney 1979:15). In these early times, Hawai‘i’s inhabitants were primarily engaged in subsistence level agriculture and fishing (Handy et al. 1972:287).

Over a period of several centuries, areas with the richest natural resources became populated and perhaps crowded, and by about A.D. 900 to 1100, the population began expanding to the *kona* (leeward side) and more remote regions of the island (Cordy 2000:130). In Kona, communities were initially established along sheltered bays with access to fresh water and rich marine resources. The primary “chiefly” centers were established at several locations—the Kailua (Kaiakeakua) vicinity, Kahalu‘u-Keauhou, Ka‘awaloa-Kealakekua, and Hōnaunau. The communities shared extended familial relations, and there was an occupational focus on the collection of marine resources. By the fourteenth century, inland elevations to around the 3,000-foot level were being turned into a complex and rich system of dryland agricultural fields (today referred to as the Kona Field System). By the fifteenth century, residency in the uplands was becoming permanent, and there was an increasing separation of the chiefly class from the common people. In the sixteenth century the population stabilized and the *ahupua‘a* land management system was established as a socioeconomic unit (see Ellis 1963; Handy et al. 1972; Kamakau 1961; Kelly 1983; and Tomonari-Tuggle 1985).

In Kona, where there were no regularly flowing streams to the coast, access to potable water (*wai*), was of great importance and played a role in determining the areas of settlement. The waters of Kona were found in springs and caves (found from shore to the mountain lands), or procured from rain catchments and dewfall. Traditional and historic narratives abound with descriptions and names of water sources, and also record that the forests were more extensive and extended much further seaward than they do today. These forests not only attracted rains from the clouds and provided shelter for cultivated crops, but also in dry times drew the *kēhau* and *kēwai* (mists and dew) from the upper mountain slopes to the low lands (see also traditional-historical narratives and oral history interviews in this study).

In the 1920s-1930s, Handy et al. (1972) conducted extensive research and field interviews with elder native Hawaiians. In lands of North and South Kona, they recorded native traditions describing agricultural practices and rituals associated with rains and water collection. Primary in these rituals and practices was the lore of Lono—a god of agriculture, fertility, and the rituals for inducing rainfall. Handy et al., observed:

> The sweet potato and gourd were suitable for cultivation in the drier areas of the islands. The cult of Lono was important in those areas, particularly in Kona on Hawai‘i . . . there were temples dedicated to Lono. The sweet potato was particularly the food of the common people. The festival in honor of Lono, preceding and during the rainy season, was essentially a festival for the whole people, in contrast to the war rite in honor of Ku which was a ritual identified with Ku as god of battle. (Handy et al. 1972:14)

Handy et al. (1972) noted that the worship of Lono was centered in Kona. Indeed, it was while Lono was dwelling at Keauhou, that he is said to have introduced taro, sweet potatoes, yams, sugarcane, bananas, and *‘awa* to Hawaiian farmers (Handy et al. 1972:14). The rituals of Lono "The father of waters" and the annual *Makahiki* festival, which honored Lono and which began before the coming of the *kona* (southerly) storms and lasted through the rainy season (the summer months), were of great importance to the native residents of this region (Handy et al. 1972: 523). The significance of rituals and ceremonial observances in cultivation and indeed in all aspects of life was of great importance to the well being of the ancient Hawaiians, and cannot be overemphasized, or overlooked when viewing traditional sites of the cultural landscape.

Hawaiian Land Use and Resource Management Practices

Over the generations, the ancient Hawaiians developed a sophisticated system of land and resources management. By the time ‘Umi-a-Līloa rose to rule the island of Hawai‘i in ca. 1525, the island (*moku-puni*) was divided into six districts or *moku-o-loko* (cf. Fornander 1973–Vol. II:100-102). On Hawai‘i, the district of Kona is one of six major *moku-o-loko* within the island. The district of Kona itself, extends from the shore across the entire volcanic mountain of Hualālai, and continues to the summit of Mauna Loa, where Kona is joined by the districts of Ka‘ū, Hilo, and Hāmākua. One traditional reference to the northern and southern-most coastal boundaries of Kona tells us of the district's extent:

> *Mai Ke-ahu-a-Lono i ke ‘ā o Kani-kū, a hō‘ea i ka ‘ūlei kolo o Manukā i Kaulanamauna e pili aku i Ka‘ū!*—From Keahualono [the Kona-Kohala boundary] on the rocky flats of Kanikū, to Kaulanamauna next to the crawling (tangled growth of) ‘ūlei bushes at Manukā, where Kona clings to Ka‘ū! (*Ka‘ao Ho‘oniua Pu‘uwai no Ka-Miki in Ka Hōkū o Hawai‘i*, September 13, 1917; Translated by Kepā Maly)

Kona, like other large districts on Hawai‘i, was further divided into ‘okana or kalana (regions of land smaller than the *moku-o-loko*, yet comprising a number of smaller units of land). In the region now known as Kona ‘akau (North Kona), there are several ancient regions (*kalana*) as well. The southern portion of North Kona was known as "Kona kai ‘ōpua" (interpretively translated as: Kona of the distant horizon clouds above the ocean), and included the area extending from Lanihau (the present-day vicinity of Kailua Town) to Pu‘uohau (now known as Red Hill). The northern-most portion of North Kona was called "Kekaha" (descriptive of an arid coastal place). Native residents of the region affectionately referred to their home as *Kekaha-wai-‘ole o nā Kona* (Waterless Kekaha of the Kona District), or simply as the *āina kaha*. It is within this region of Kekaha, that the lands of ‘O‘oma are found.

The *ahupua‘a* were also divided into smaller individual parcels of land (such as the *‘ili, kō‘ele, māla*, and *kīhāpai*, etc.), generally oriented in a *mauka-makai* direction, and often marked by stone alignments (*kuaiwi*). In these smaller land parcels the native tenants tended fields and cultivated crops necessary to sustain their families, and the chiefly communities with which they were associated. As long as sufficient tribute was offered and *kapu* (restrictions) were observed, the common people, who lived in a given *ahupua‘a* had access to most of the resources from mountain slopes to the ocean. These access rights were almost uniformly tied to residency on a particular land, and earned as a result of taking responsibility for stewardship of the natural environment, and supplying the needs of the *ali‘i* (see Kamakau 1961:372-377 and Malo 1951:63-67).

Entire *ahupua‘a*, or portions of the land were generally under the jurisdiction of appointed *konohiki* or lesser chief-landlords, who answered to an *ali‘i-‘ai-ahupua‘a* (chief who controlled the *ahupua‘a* resources). The *ali‘i-‘ai-ahupua‘a* in turn answered to an *ali‘i ‘ai moku* (chief who claimed the abundance of the entire district). Thus, *ahupua‘a* resources supported not only the *maka‘āinana* and *‘ohana* who lived on the land, but also contributed to the support of the royal community of regional and/or island kingdoms. This form of district subdividing was integral to Hawaiian life and was the product of strictly adhered to resources management planning. In this system, the land provided fruits and vegetables and some meat in the diet, and the ocean provided a wealth of protein resources. Also, in communities with long-term royal residents, divisions of labor (with specialists in various occupations on land and in procurement of marine resources) came to be strictly adhered to. It is in this cultural setting that we find ‘O‘oma and the present study area.

The *ahupua‘a* of ‘O‘oma (historically, ‘O‘oma 1st and 2nd) are two of some twenty ancient *ahupua‘a* within the *‘okana* of Kekaha-wai-‘ole. The place name ‘O‘oma can be literally translated as concave. To date, no tradition explaining the source of the place name has been located, though it is possible that the name refers to the indentation of the shoreline fronting a portion of ‘O‘oma. A few place names within ‘O‘oma were discussed in traditional accounts, thus we have some indication of the histories associated with this land.

While there are only limited native accounts that have been recorded about ‘O‘oma, we do know that the land was so esteemed, that during the youth of Kauikeaouli (later known as Kamehameha III), the young prince—son of Kamehameha I and his sacred wife Keōpūolani—was taken to be raised near the shore of ‘O‘oma under the care of his stewards from infancy until he was five years old (Kamakau 1961:263-264). Again, this is a significant part of the history of this land, as great consideration went into all aspects of the young king’s upbringing (see I‘i 1959 and Kamakau 1961).

The Environmental Setting of ‘O‘oma

The *ahupua‘a* of ‘O‘oma cross several environmental zones that are generally called *wao* in the Hawaiian language. These environmental zones include the near-shore fisheries and shoreline strand (*kahakai*) and the *kula kai/kula uka* (shoreward/inland plains). These regional zones were greatly desired as places of residence by the natives of the land.

While the *kula* region of ‘O‘oma and greater Kekaha is now likened to a volcanic desert, native and historic accounts describe or reference groves of native hardwood shrubs and trees such as *‘ūlei* (*Osteomeles anthyllidifolia*), *ēlama* (*Diospyros ferrea*), *uhiuhi* (*Caesalpina kavaiensis*), and *ohe* (*Reynoldsia sandwicensis*) extending across the land and growing some distance shoreward. The few rare and endangered plants found in the region, along with small remnant communities of native dryland forest (Char 1991) give an indication that there was a significant diversity of plants growing upon the *kula* lands prior to the introduction of ungulates.

The lower *kula* lands receive only about 20 inches of rainfall annually, and it is because of their dryness, the larger region of which ‘O‘oma is a part, is known as “Kekaha.” While on the surface, there appears to be little or no potable water to be found, the very lava flows which cover the land contain many underground streams that are channeled through subterranean lava tubes which feed the springs, fishponds and anchialine ponds on the *kula kai* (coastal flats). Also in this region, on the flat lands, about a half-mile from the shore, is the famed *Alanui Aupuni* (Government Trail), built in 1847, at the order of Kamehameha III. This trail or government roadway, was built to meet the needs of changing transportation in the Hawaiian Kingdom, and in many places it overlays the older near shore *ala loa* (ancient foot trail that encircled the island).

Continuing into the *kula uka* (inland slopes), the environment changes as elevation increases. Based on historic surveys, it appears that ‘O‘oma ends at a survey station named Kuhiaka, 2,145 feet above sea

level (cf. Register Map No. 1449). This zone is called the *wao kanaka* (region of man) and *wao nahele* (forest region). Rainfall increases to 30 or 40 inches annually, and taller forest growth occurred. This region provided native residents with shelter for residential and agricultural uses, and a wide range of natural resources that were of importance for religious, domestic, and economic purposes. In ʻOʻoma, this region is generally between the 1,200 to 2,200 foot elevation, and is crossed by the present-day Māmalahoa Highway. The highway is situated not far below the ancient *ala loa*, or foot trail, also known as Ke-alaʻehu, and was part of a regional trail system passing through Kona from Kaʻū and Kohala.

The ancient Hawaiians saw (as do many Hawaiians today) all things within their environment as being interrelated. That which was in the uplands shared a relationship with that which was in the lowlands, coastal region, and even in the sea. This relationship and identity with place worked in reverse as well, and the *ahupuaʻa* as a land unit was the thread which bound all things together in Hawaiian life. In an early account written by Kihe (in *Ka Hōkū o Hawaiʻi*, 1914-1917), with contributions by John Wise and Steven Desha Sr., the significance of the dry season in Kekaha and the custom of the people departing from the uplands for the coastal region is further described:

> *…ʻOia ka wā e neʻe ana ka lā iā Kona, hele a maloʻo ka ʻāina i ka ʻai kupakupa ʻia e ka lā, a o nā kānaka, nā liʻi o Kona, pūheʻe aku la a noho i kahakai kāhi o ka wai e ola ai nā kānaka* – It was during the season, when the sun moved over Kona, drying and devouring the land, that the chiefs and people fled from the uplands to dwell along the shore where water could be found to give life to the people. (*Ka Hōkū o Hawaiʻi*, April 5, 1917)

It appears that the practice of traveling between upland and coastal communities in the ʻOʻoma *ahupuaʻa* greatly decreased by the middle nineteenth century. Indeed, the only claimant for *kuleana* land in ʻOʻoma, during the *Māhele ʻĀina* of 1848—when native tenants were allowed to lay claim to lands on which they lived and cultivated—noted that he was the only resident in ʻOʻoma at the time (see *Helu* 9162 to Kahelekahi, in this study). This is perhaps explained by the fact that at time of the *Māhele* there was a significant decline in the Hawaiian population, and changes in Hawaiian land tenure led to the relocation of many individuals from various lands.

Native Traditions and Historical Accounts of ʻOʻoma and the Kekaha Region

This section of the study presents *moʻolelo*—native traditions and historical accounts (some translated from the original Hawaiian by Kepā Maly)—of the Kekaha region that span several centuries. There are very few accounts that have been found to date, that specifically mention ʻOʻoma. Thus, narratives that describe neighboring lands within the Kekaha region help provide an understanding of the history of ʻOʻoma, describing features and the use of resources that were encountered on the land.

It may be, that the reason there are so few accounts for ʻOʻoma, is that it may have been considered a marginal settlement area, occupied only after the better situated lands of Kekaha—those lands with the sheltered bays, and where fresh water could be easily obtained—were populated. As the island population grew, so too did the need to expand to more remote or marginal lands. This thought is found in some of the native traditions and early historic accounts below. However, as people populated the Kekaha lands, they came to value its fisheries—those of the deep sea, near shore, and inland fishponds.

The native account of Punia (also written Puniaiki – cf. Kamakau 1964), is perhaps among the earliest accounts of the Kekaha area, and in it is found a native explanation for the late settlement of Kekaha. The following narratives are paraphrased from Fornander's *Hawaiian Antiquities and Folklore* (Fornander 1959):

Punia: A Tale of Sharks and Ghosts of Kekaha

Punia was born in the district of Kohala, and was one of the children of Hina. One day, Punia desired to get lobster for his mother to eat, but she warned him of Kai‘ale‘ale and his hoards of sharks who guarded the caves in which lobster were found. These sharks were greatly feared by all who lived along, and fished the shores of Kohala for many people had been killed by the sharks. Heeding his mother’s warning, Punia observed the habits of the sharks and devised a plan by which to kill each of the sharks. Setting his plan in motion, Punia brought about the deaths of all the subordinate sharks, leaving only Kai‘ale‘ale behind. Punia tricked Kai‘ale‘ale into swallowing him whole. Once inside Kai‘ale‘ale, Punia rubbed two sticks together to make a fire to cook the sweet potatoes he had brought with him. He also scraped the insides of Kai‘ale‘ale, causing great pain to the shark. In his weakened state, Kai‘ale‘ale swam along the coast of Kekaha, and finally beached himself at Alula, near the point of Maliu in the land of Kealakehe. The people of Alula, cut open the shark and Punia was released.

At that time Alula was the only place in all of Kekaha where people could live, for all the rest of the area was inhabited by ghosts. When Punia was released from the shark, he began walking along the trail, to return to Kohala. While on this walk, he saw several ghosts with nets all busy tying stones for sinkers to the bottom of the nets, and Punia called out in a chant trying to deceive the ghosts and save himself:

Auwe no hoi kuu makuakane	Alas, O my father of these coasts!
	o keia kaha e!
Elua wale no maua lawaia o keia wahi.	We were the only two fishermen of this place (Kaha).
Owau no o ko‘u makuakane,	Myself and my father,
E hoowili aku ai maua i ka ia o ianei,	Where we used to twist the fish up in the nets,
O kala, o ka uhu, o ka palani,	The kala, the uhu, the palani,
O ka ia ku o ua wahi nei la,	The transient fish of this place.
Ua hele wale ia no e maua keia kai la!	We have traveled over all these seas,
Pau na kuuna, na lua, na puka ia.	All the different place, the holes, the runs.
Make ko‘u makuakane, koe au.	Since you are dead, father, I am the only one left.

Hearing Punia’s wailing, the ghosts said among themselves, “Our nets will be of some use now, since here comes a man who is acquainted with this place and we will not be letting down our nets in the wrong place.” They then called out to Punia, “Come here.” When Punia went to the ghosts, he explained to them, the reason for his lamenting; “I am crying because of my father, this is the place where we used to fish. When I saw the lava rocks, I thought of him.” Thinking to trick Punia and learn where all the ku‘una (net fishing grounds) were, the ghosts told Punia that they would work under him. Punia went into the ocean, and one-by-one and two-by-two, he called the ghosts into the water with him, instructing them to dive below the surface. As each ghost dove into the water, Punia twisted the net entangling the ghosts. This was done until all but one of the ghosts had been killed. That ghost fled and Kekaha became safe for human habitation (Fornander 1959:9-17).

One of the earliest datable accounts that describes the importance of the Kekaha region fisheries comes from the mid-sixteenth century, following ‘Umi-a-Līloa’s unification of the island of Hawai‘i under his rule.

Writing in the 1860s, native historian, Samuel Mānaiakalani Kamakau (1961) told readers about the reign of ʻUmi, and his visits to Kekaha:

> ʻUmi-a-Liloa did two things with his own hands, farming and fishing...and farming was done on all the lands. Much of this was done in Kona. He was noted for his skill in fishing and was called Puʻipuʻi a ka lawaiʻa (a stalwart fisherman). Aku fishing was his favorite occupation, and it often took him to the beaches (Ke-kaha) from Kalahuipuaʻa to Makaula[1]. He also fished for ʻahi and kala. He was accompanied by famed fishermen such as Pae, Kahuna, and all of the chiefs of his kingdom. He set apart fishing, farming and other practices… (Kamakau 1961:19-20)

In his accounts of events at the end of ʻUmi's life, Kamakau (1961) references Kekaha once again. He records that Koʻi, one of the faithful supporters and a foster son of ʻUmi, sailed to Kekaha, where he killed a man who resembled ʻUmi. Koʻi then took the body and sailed to Makaʻeo in the *ahupuaʻa* of Keahuolu. Landing at Makaʻeo in the night, Koʻi took the body to the cave where ʻUmi's body lay. Replacing ʻUmi's body with that of the other man, Koʻi then crossed the lava beds, returning to his canoe at Makaʻeo. From there, ʻUmi's body was taken to its' final resting place… (Kamakau 1961:32-33).

As a child in ca. 1812, Hawaiian historian John Papa Iʻi passed along the shores of Kekaha in a sailing ship, as a part of the procession by which Kamehameha I returned to Kailua-Kona from his residency on Oʻahu. In his narratives, Iʻi described the shiny lava flows and fishing canoe fleets of the "Kaha" (Kekaha) lands:

> The ship arrived outside of Kaelehuluhulu, where the fleet for aku fishing had been since the early morning hours. The sustenance of those lands was fish.
>
> When the sun was rather high, the boy [Iʻi] exclaimed, "How beautiful that flowing water is!" Those who recognized it, however, said, "That is not water, but pahoehoe. When the sun strikes it, it glistens, and you mistake it for water…"
>
> Soon the fishing canoes from Kawaihae, the Kaha lands, and Ooma drew close to the ship to trade for the paʻiʻai (hard poi) carried on board, and shortly a great quantity of aku lay silvery-hued on the deck. The fishes were cut into pieces and mashed; and all those aboard fell to and ate, the women by themselves.
>
> The gentle Eka sea breeze of the land was blowing when the ship sailed past the lands of the Mahaiulas, Awalua, Haleohiu, Kalaoas, Hoona, on to Oomas, Kohanaiki, Kaloko, Honokohaus, and Kealakehe, then around the cape of Hiiakanoholae… (Iʻi 1959:109-110)

Ka-Lani-Kau-i-ke-Aouli (Kamehameha III)

In ca. 1813, Ka-lani Kau-i-ke-aouli, who grew up to become Kamehameha III, was born. S.M. Kamakau (1961) tells us that the baby appeared to be still-born, but that shortly after birth, he was revived. Upon the revival of the baby, he was given to the care of Ka-iki-o-ʻewa, who with Keawe-a-mahi and family, raised the child in seclusion at ʻOʻoma for the first five years of the young king's life. Kauikeaouli apparently held some interest in the land of ʻOʻoma 2nd through the Māhele ʻĀina, as he originally claimed ʻOʻoma 2nd as his personal property. Though he subsequently gave it up to the Kingdom (Government) later during the Division (see records of *Māhele ʻĀina* in this study).

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1 Kalāhuipuaʻa is situated in the district of Kohala, bounding the northern side of Puʻuanahulu in Kekaha. Makaʻula is situated a few *ahupuaʻa* north of ʻOʻoma.

Kamakau provides us with the following description of Kauikeaouli's birth and early life at ʻOʻoma:

> Ka-lani-kau-i-ke-aouli was the second son of Ke-opu-o-lani by Kamehameha, and she called him Kiwalaʻo after her own father. She was the daughter of Kiwalaʻo and Ke-kuʻi-apo-iwa Liliha, both children of Ka-Iola Pupuka-o-Hono-ka-wai-lani, and hence she [Ke-opu-o- lani] was a niʻaupiʻo and a naha chiefess, and the niʻaupiʻo rank descended to her children and could not be lost by them. While she was carrying the child [Kau-i-ke-aouli] several of the chiefs begged to have the bringing up of the child, but she refused until her kahu, Ka-lua-i-konahale, known as Kua-kini, came with the same request. She bade him be at her side when the child was born lest some one else get possession of it. He was living this side of Keauhou in North Kona, and Ke-opu-o-lani lived on the opposite side.
>
> On the night of the birth the chiefs gathered about the mother. Early in the morning the child was born but as it appeared to be stillborn Kua-kini did not want to take it. Then came Ka-iki-o-ʻewa from some miles away, close to Kuamoʻo, and brought with him his prophet who said, "The child will not die, he will live." This man, Ka-malo-ʻihi or Ka-pihe by name, came from the Napua line of kahunas descended from Makua-kau-mana whose god was Ka-ʻonohi-o-ka-la (similar to the child of God). The child was well cleaned and laid upon a consecrated place and the seer (kaula) took a fan (peʻahi), fanned the child, prayed, and sprinkled it with water, at the same time reciting a prayer addressed to the child of God, something like that used by the Roman Catholics—
>
> "He is standing up, he is taking a step, he walks" (*Kulia-la, kaʻina-la, hele ia la*).
>
> Or another—
>
> | | |
> |---|---|
> | *Huila ka lani i ke Akua,* | The heavens lighten with the god, |
> | *Lapalapa ka honua i ke keiki* | The earth burns with the child, |
> | *E ke keiki e, hooua i ka punohu lani,* | O son, pour down the rain that brings the rainbow, [page 263] |
> | *Aia i ka lani ka Haku e,* | There in heaven is the Lord. |
> | *O kuʻu ʻuhane e kahe mau,* | Life flows through my spirit, |
> | *I laʻa i kou kanawai.* | Dedicated to your law. |
>
> The child began to move, then to make sounds, and at last it came to life. The seer gave the boy the name of "The red trail" (Ke-aweawe-ʻula) signifying the roadway by which the god descends from the heavens.
>
> Ka-iki-o-ʻewa became the boy's guardian and took him to rear in an out-of-the-way place at ʻOʻoma, Kekaha. Here Keawe-a-mahi, the lesser chiefs, the younger brothers and sisters of Ka-iki-o-ʻewa, and their friends were permitted to carry the child about and hold him on their laps (uha). Ka-pololu was the chief who attended him; Koʻi-pepeleleu and Ulu-nui's mother [were] the nurses who suckled him. Later Ka-ʻai-kane gave him her breast after she had given birth to Ke-kahu-puʻu. Here at ʻOʻoma he was brought up until his fifth year, chiefly occupied with his toy boats rigged like warships and with little brass cannon loaded with real powder mounted on [their] decks. The firing off of these cannon amused him immensely. He excelled in foot races. On one occasion when the bigger boys had joined in the sport, a [rascal] boy named Ka-hoa thought to play a practical joke by smearing with mud the stake set up to be grasped by the one who first reached the goal. He expected one of the larger boys to be the winner, but it was the little prince who first caught the stick and had his hands smeared. "You will be burnt alive for dirtying up the prince. We are going to tell Ka-pololu on you!"

> the boys threatened; but the prince objected, saying, "Anyone who tells on him shall never eat with me again or play with me and I will never give him anything again." Kau-i-ke-aouli was a splendid little fellow. He loved his playmates and never once did them any hurt, and he was kind and obedient to his teachers… [Kamakau 1961:264]

It is not until the early twentieth century, that we find a few detailed native accounts which tell of traditional features and residents of ʻOʻoma and vicinity. The writings of John Whalley Hermosa Isaac Kihe, a native son of Kekaha, in Hawaiian language newspapers (recently translated by Kepā Maly from the original Hawaiian texts), share the history of the land and sense the depth of attachment that native residents felt for ʻOʻoma and the larger Kekaha-wai-ʻole-o-nā-Kona.

> Kihe (who also wrote under the name of Ka-ʻohu-haʻaheo-i-nā-kuahiwi-ʻekolu) was born in 1853, his parents were native residents of Honokōhau and Kaloko (his grandfather, Kuapāhoa, was a famed kahuna of the Kekaha lands). During his life, Kihe taught at various schools in the Kekaha region; served as legal counsel to native residents applying for homestead lands in ʻOʻoma and vicinity; worked as a translator on the Hawaiian Antiquities collections of A. Fornander; and was a prolific writer himself. In the later years of his life, Kihe lived at Puʻu Anahulu and Kalaoa, and he is fondly remembered by elder kamaʻāina of the Kekaha region. Kihe, who died in 1929, was also one of the primary informants to Eliza Maguire, who translated some of the writings of Kihe, publishing them in abbreviated form in her book "Kona Legends" (1926).

Writers today have varying opinions and theories pertaining to the history of Kekaha, residency patterns, and practices of the people who called Kekaha-wai-ʻole-o-nā-Kona home. For the most part, our interpretations are limited by the fragmented nature of the physical remains and historical records, and by a lack of familiarity with the diverse qualities of the land. As a result, most of us only see the shadows of what once was, and it is difficult at times, to comprehend how anyone could have carried out a satisfactory existence in such a rugged land.

Kihe and his co-authors provide readers with several references to places and events in the history of ʻOʻoma and neighboring lands. Through the narratives, we learn of place name origins, areas of ceremonial significance, how resources were managed and accessed, and the practices of those native families who made this area their home.

One example of the rich materials recorded by native writers, is found in "*Kaʻao Hoʻoniua Puʻuwai no Ka-Miki*" (The Heart Stirring Story of Ka-Miki). This tradition is a long and complex account, that was published over a period of four years (1914-1917) in the weekly Hawaiian-language newspaper *Ka Hōkū o Hawaiʻi*. The narratives were primarily recorded for the paper by Hawaiian historians John Wise and J.W.H.I. Kihe.

While "*Ka-Miki*" is not an ancient account, the authors used a mixture of local stories, tales, and family traditions in association with place names to tie together fragments of site-specific histories that had been handed down over the generations. Also, while the personification of individuals and their associated place names may not be entirely "ancient," such place name-person accounts are common throughout Hawaiian (and Polynesian) traditions. The English translations below are a synopsis of the Hawaiian texts, with emphasis upon the main events and areas being discussed. Diacritical marks and hyphenation have been placed to help with pronunciation of certain words.

"Kaao Hooniua Puuwai no Ka-Miki" (The Heart stirring Story of Ka-Miki)

This *moʻolelo* (tradition) is set in the 1300s (by association with the chief Pili-a-Kaʻaiaea), and is an account of two supernatural brothers, Ka-Miki (The quick, or adept, one) and Ma-Kaʻiole (Rat [squinting]

eyes). The narratives describe the birth of the brothers, their upbringing, and their journey around the island of Hawai‘i along the ancient *ala loa* and *ala hele* (trails and paths) that encircled the island. During their journey, the brothers competed alongside the trails they traveled, and in famed *kahua* (contest fields) and royal courts, against *‘ōlohe* (experts skilled in fighting or in other competitions, such as running, fishing, debating, or solving riddles, that were practiced by the ancient Hawaiians). They also challenged priests whose dishonorable conduct offended the gods of ancient Hawai‘i. Ka-Miki and Ma-Ka‘iole were empowered by their ancestress Ka-uluhe-nui-hihi-kolo-i-uka (The great entangled growth of uluhe fern which spreads across the uplands), who was one of the myriad of body forms of the goddess Haumea, the earth-mother, creative force of nature who was also called Papa or Hina. Among her many nature-form attributes were manifestations that caused her to be called upon as a goddess of priests and competitors (people, places named for them, and other place names are marked below with underlining):

> …Kūmua was the husband of Ka-uluhe-nui-hihi-kolo-i-uka. The place that is named for Kūmua is in the uplands of Kohanaiki, an elevated rise from where one can look towards the lowlands. The shore and deep sea are all clearly visible from this place. The reason that Kūmua dwelt there was so that he could see the children and grandchildren of he and his wife.
>
> Wailoa, a daughter, was the mother of Kapa‘ihilani, also called Kapa‘ihi. There is a place in the uplands of Kohanaiki, below Kūmua, to the northwest, a hidden water hole, that is called Kapa‘ihi. Wailoa is a pond there on the shore of Kohanaiki. Because Wailoa married Kahunakalehu, a native of the area, she lived and worked there. Thus the name of that pond is Wailoa, and it remains so to this day.
>
> Pipipi‘apo‘o was another daughter of Kūmua and Ka-uluhe-nui-hihi-kolo-i-uka. She married Haleolono, one who cultivated sweet potatoes upon the ‘ilima covered flat lands of Nānāwale, also called Nāhi‘ahu (Nāwah‘iahu), as it has been called from before and up to the present time. Cultivating the land was the skill of this youth Haleolono, and because he was so good at it, he was able to marry the beauty, Pipipi‘apo‘o.
>
> Pipipi‘apo‘o’s skill was that of weaving pandanus mats, and there are growing many pandanus trees there, even now. The grove of pandanus trees and a nearby cave, is called Pipipi‘apo‘o to this day, and you may ask the natives of Kohanaiki to point it out to you.
>
> Kapukalua was a son of Kūmua and Ka‘uluhe. He was an expert at aku lure fishing, and all other methods of fishing of those days gone by. He married Kauhi‘onohua a beauty with skin as soft as the blossoms of the hīnano, found in the pandanus grove of ‘O‘oma. This girl was pleasingly beautiful, and because of her fame, Kapukalua, the exceptionally skilled son of the sea spray of ‘Apo‘ula, secured her as his wife. Here, we shall stop speaking of the elders of Ka-Miki… [January 8, 1914]

The tradition continues, recounting the training of the brothers, and preparations of their *hālau ali‘i* (royal compound) at Kohanaiki. At the dedication ceremonies it was revealed that one of the *kahuna* of the Kaha lands, had taken up the habit of killing people, and that he had also thought to take the lives of Ka-Miki and Ma-Ka‘iole. We revisit the story here, and learn the name of a priest of ‘O‘oma and Kohanaiki—

> …The sun broke forth and the voices of the roosters and the ‘elepaio of the forests were heard resonating and rising upon the mountain slopes. The day became clear, with no clouds to be seen, it was calm. So too, the ocean was calm and the shore of La‘i a ‘Ehu (Kona) was calm. The flowers of the upland forest reddened and unfolded, and nodded gently in the kēhau breezes.

> The priests gathered together to discuss these events and prepared to apologize to the children of the chief, asking for their forgiveness. They selected ʻElepaio, Pūhili, Kaluaʻōlapa, and Kalua-ʻōlapa-uwila to go before the brothers for this purpose.
>
> ʻElepaio was the high priest of Honokōhau. The place where he dwelt bears the name ʻElepaio [an ʻili on the boundary of Honokōhau nui & iki]. It is in the great grove of *ʻulu (kaulu ʻulu)* on the boundary between Honokōhau-nui and Honokōhau-iki… [April 23, 1914]
>
> Pūhili was the high priest of ʻOʻoma and Kohanaiki, the place where he lived is on the plain of Kohanaiki, at the shore, and bears his name to this day. It is on the boundary between Kohanaiki and ʻOʻoma.
>
> Kaluaʻōlapa was the high priest of Haleʻōhiʻu and Kamāhoe, that is the waterless land of Kalaoa (Kalaoa wai ʻole). The place where he lived was in the uplands of Maulukua on the plain covered with *ʻilima* growth. This place bears his name to this day.
>
> Kalua-ʻōlapa-uwila was the high priest of Kealakehe and Keʻohuʻolu (Keahuolu), and it was he who built the *heiau* named Kalua-ʻōlapa-uwila, which is there along the shore of Kealakehe, next to the road that goes to Kailua. The nature of this priest was that of a shark and a man. The shark form was named Kaiwi, and there is a stone form of the shark that can be seen near the *heiau* to this day.
>
> These priests all went to the door of the house and presented the offerings of the black pig, the red fish, the black *ʻawa*, the white rooster, the *malo* (loin clothes), and all things that had been required of their class of priests. They also offered their prayers and asked forgiveness for their misspoken words. They then called for their prayers to be freed and the *kapu* ended… [April 30, 1914]

Through the 1920s, up to the time of his death in 1929, J.W.H.I. Kihe continued to submit traditional accounts and commentary on the changing times to the paper, *Ka Hōkū o Hawaiʻi*. In 1923, Kihe penned a series of articles, some of which formed the basis of Eliza Maguire's *Kona Legends* (1926). One of the accounts, "*Ka Punawai o Wawaloli*" (The Pond of Wawaloli), describes that the pond of Wawaloli, on the shore of ʻOʻoma, was named for a supernatural ocean being, who could take the form of the *loli* (sea cucumber) and of a handsome young man. Through this account it is learned that people regularly traveled between the uplands and shore of ʻOʻoma; the *kula* lands were covered with *ʻilima* growth; and that a variety of fish, seaweeds, and shellfish were harvested along the shore. Also, the main figures in the tradition are memorialized as places on the lands of ʻOʻoma, Kalaoa, and neighboring *ahupuaʻa*. These individuals and places include Kaluaʻōlapa (a hill on the boundary of Hāmanamana and Haleohiʻu), Wawaloli (a bay between ʻOʻoma and Kalaoa), Hoʻohila (on the boundary of Kaū and Puʻukala), Pāpaʻapoʻo (a cave site in Hāmanamana), Kamakaoiki and Malumaluiki (locations unknown). The following narratives were translated by Kepā Maly from the original Hawaiian texts published in *Ka Hōkū o Hawaiʻi* (September 23rd, October 4th & 11th, 1923):

*Ka Punawai o Wawaloli (*The Pond of Wawaloli*)*

> The place of this pond (Wawaloli) is set there on the shore of the ʻOʻoma near Kalaoa. It is a little pond, and is there to this day. It is very close to the sandy shore, and further towards the shore there is also a pond in which one can swim. There is a tradition of this pond, that is held dearly in the hearts of the elders of this community.
>
> Wawaloli is the name of a loli (sea cucumber) that possessed dual body forms (kino

pāpālua), that of a loli, and that of a man!

Above there on the ʻilima covered flat lands, there lived a man by the name of Kaluaʻōlapa and his wife, Kamakaoiki, and their beautiful daughter, Malumaluiki.

One day the young maiden told her mother that she was going down to the shore to gather limu (seaweeds), ʻōpihi (limpets), and pupu (shellfish). Her mother consented, and so the maiden traveled to the shore. Upon reaching the shore, Malumaluiki desired to drink some water, so she visited the pond and while she was drinking she saw a reflection in the rippling of the water, standing over her. She turned around and saw that there was a handsome young man there, with a smile upon his face. He said… [September 27, 1923] "…Pardon me for startling you here as we meet at this pond, in the afternoon heat which glistens off of the pāhoehoe."

She responded, "What is the mistake of our meeting, you are a stranger, and I am a stranger, and so we have met at this pond." The youth, filled with desire for the beautiful young maiden, answered "I am not a stranger here along this shore, indeed, I am very familiar with this place for this is my home. And when I saw you coming here, I came to meet you."

These two strangers, having thus met, then began to lay out their nets to catch kala, uhu, and pālani, the native fish of this land. And in this way, the beauty of the plains of Kalaoa was caught in the net of the young man who dwelt in the sea spray of ʻOʻoma.

These two strangers of the long day also fished for hīnālea, and then for kawele ʻā. It was during this time, that their lines became entangled like those of the fishermen of Wailua (a poetic reference to those who become entangled in a love affair).

The desire for the limu, ʻōpihi, and pūpū was completely forgotten, and the fishing poles bent as the lines were pulled back in the sea spray. The handsome youth was moistened in the rains that fell, striking the land and the beloved shore of the land. The sun drew near, entering the edge of the sea and was taken by Lehua Island. Only then did these two fishers of the long day take up their nets.

Before the young maiden began her return to the uplands, she told the youth, "Tell me your name." He answered her, "The name by which I am known by, is Wawa. But my name, when I go and dwell in the pond here, is Loli. And when you return, you may call to me with the chant:

E Loli nui kīkewekewe[2]	Oh great Loli moving back and forth
I ka hana ana kīkewekewe	Doing your work moving back and forth
I kuʻu piko kīkewekewe	You are in my mind moving back and forth
A ka makua kīkewekewe	The parents moving back and forth
I hana ai kīkewekewe	Are at their work moving back and forth
E piʻi mai ʻoe kīkewekewe	Won't you arise moving back and forth
Ka kaua puni kīkewekewe	To that which we two desire moving back and forth
Puni kauoha kīkewekewe	Your command is desired moving back and forth

[2] "Kīkewekewe" is translated by Eliza Maguire (1926) as "charmer." Kepā Maly was unfamiliar with this meaning of the word. It is most commonly used in the refrain of a song, and is here translated as "moving back and forth," as the word is used in the spoken language. Kewe also means concave, similar to the place name ʻOʻoma.

Having finished their conversation, the maiden then went to the uplands. It was dark, and the kukui lamps had been lit in the house. Malumaluiki's parents asked her, "Where are your limu, ʻōpihi and pūpū?" She replied, "It is proper that you have asked me, for when I went to the shore it was filled with people who took all there was? Thus I was left with nothing, not even a fragment of limu or anything else. So I have returned up here."

Well, the family meal had been made ready, so they all sat to eat together. But after a short while the maiden stood up. Her parents inquired of this, and she said she was no longer hungry, and that her feet were sore from traveling the long path. So the maiden went to sleep. She did not sleep well though, and felt a heat in her bosom, as she was filled with desire, thus she had no sleep that night.

With the arrival of the first light of day, the Malumaluiki went once again down to the shore. Upon arriving at the place of the pond, she entered the water and called out as described above. Then, a loli appeared and turned into the handsome young man. They two then returned to their fishing for the kala, uhu and pālani, the native fish the land.

So it was that the two lovers met regularly there on the shore of ʻOʻoma. Now Malumaluiki's parents became suspicious because of the actions of the daughter, and her regular trips to the shore. So they determined that they should secretly follow her and spy on her.

One day, the father followed her to the shore, where he saw his daughter sit down by the side of the pond. He then heard her call out —

E Loli nui kīkewekewe	Oh great Loli moving back and forth
I ka hana ana kīkewekewe	Doing your work moving back and forth
I kuʻu piko kīkewekewe	You are the center of my life moving back and forth
Piko maikaʻi kīkewekewe	It is good moving back and forth
A ka makua kīkewekewe	The parents moving back and forth
I hana ai kīkewekewe	Are at their work moving back and forth
E piʻi mai ʻoe kīkewekewe	Won't you arise moving back and forth
Ka kaua puni kīkewekewe	To that which we two desire moving back and forth
Puni kauoha kīkewekewe	Your command is desired moving back and forth

[October 4, 1923]

"O Loli, here is your desire, the one you command, Malumaluiki, who's eyes see nothing else."

Her father then saw a loli coming up from the pond, and when it was up, it turned into the youth. He watched the two for a while, unknown to them, and saw that his daughter and the youth of the two body forms (kino pāpālua), took their pleasure in one another.

The father returned to the uplands and told all of this to her mother, who upon hearing it, was filled with great anger, because of the deceitfulness of her daughter. But then she learned that the man with whom her daughter slept was of dual body forms. Kamakaoiki then told Kaluaʻōlapa that he should "Go down and capture the loli, and beat it to death," to which he agreed.

> One day, Kaluaʻōlapa went down early, and hid, unseen by the two lovers. Malumaluiki arrived at the pond and called out, and he then memorized the lines spoken by his daughter. When she left, returning to the uplands, he then went to the pond and looked closely at it. He then saw a small circular opening near the top of the water in the pond. He then understood that that was where the loli came up from. He then slept that night and in the early morning, he went to the pond and set his net in the water. He then began to call out as his daughter had done with the above words.
>
> When he finished the chant, the loli began to rise up through the hole, and was ensnared in the net. Kaluaʻōlapa then carried him up onto the kula, walking to the uplands. On his way, he saw his daughter coming down, and he hid until she passed him by.
>
> When the daughter arrived at the pond, she called out in the chant as she always did. She called and called until the sun was overhead, but the loli did not appear in the pond, nor did he come forward in his human form. Thus, she thought that he had perhaps died, and she began to wail and mourn for the loss of her lover. Finally as evening came, the beautiful maiden stood, and ascended the kula to her home.
>
> Now, let us look back to the Kaluaʻōlapa. He went up to his house and showed the loli to his wife. Seeing the loli, she told her husband, "Take it to the kahuna, Pāpaʻapoʻo who lives on the kula of Hoʻohila." So he went to the kahuna and explained everything that had occurred to him, and showed him the loli in his net. Seeing this and hearing of all that had happened, Pāpaʻapoʻo told the father to build an imu in which to kālua the great loli that moves back and forth (loli kīkewekewe). He said, "When the loli is killed, then your daughter will be well, so too will be the other daughters of the families of the land." Thus, the imu was lit and the supernatural loli cooked.
>
> When the daughter returned to her home, her eyes were all swollen from crying. Her mother asked her, "What is this, that your eyes are puffy from crying, my daughter?" She didn't answer, she just kneeled down, giving no response. At that time, her father returned to the house and saw his daughter kneeling down, and he said "Your man, with whom you have been making love at the beach has been taken by the kahuna Pāpaʻapoʻo. He has been cooked in the imu that you may live, that all of the girls who this loli has loved may live."
>
> That pond is still there on the shore, and the place with the small round opening is still on the side of that pond to this day. It is something to remember those things of days gone by, something that should not be forgotten by those of today and in time to come. [October 11, 1923]

Ka Loko o Paaiea (The fishpond of Pāʻaiea)

The tradition of *Ka loko o Paaiea* (The fishpond of Pāʻaiea) was written by J.W.H.I. Kihe, and printed in *Ka Hōkū o Hawaiʻi* in 1914 and 1924. The narratives describe traditional life and practices in various *ahupuaʻa* of Kekaha, and specifically describes the ancient fishpond Pāʻaiea. The following excerpts from Kihe's *moʻolelo*, include references to Wawaloli, on the shore of ʻOʻoma and Kalaoa. Pāʻaiea, was destroyed by the Hualālai lava flows of 1801, reportedly as a result of the pond overseer's refusal to give the goddess Pele—traveling in human form—any fish from the pond:

> Pāʻaiea was a great fishpond, something like the ponds of Wainānāliʻi and Kīholo, in ancient times. At that time the high chiefs lived on the land, and these ponds were filled with fat awa, ʻanae, āhole, and all kinds of fish that swam inside. It is this pond that was filled by the lava flows and turned into pāhoehoe, that is written of here. At that time, at Hoʻonā. There was a Konohiki (overseer), Kepaʻalani, who was in charge of the houses

(hale papa‘a) in which the valuables of the King [Kamehameha I] were kept. He was in charge of the King’s food supplies, the fish, the hālau (long houses) in which the fishing canoes were kept, the fishing nets and all things. It was from there that the King’s fishermen and the retainers were provisioned. The houses of the pond guardians and Konohiki were situated at Ka‘elehuluhulu and Ho‘onā.

In the correct and true story of this pond, we see that its boundaries extended from Ka‘elehuluhulu on the north, and on the south, to the place called Wawaloli (between ‘O‘oma and Kalaoa). The pond was more than three miles long and one and a half miles wide, and today, within these boundaries, one can still see many water holes.

While traveling in the form of an old woman, Pele visited the Kekaha region of Kona, bedecked in garlands of the *ko‘oko‘olau* (*Bidens* spp.). Upon reaching Pā‘aiea at Ho‘onā, Pele inquired if she might perhaps have an *‘ama‘ama*, young *āholehole*, or a few *‘ōpae* (shrimp) to take home with her. Kepa‘alani, refused, “they are *kapu*, for the King.” Pele then stood and walked along the *kuapā* (ocean side wall) of Pā’aiea till she reached Ka‘elehuluhulu. There, some fishermen had returned from aku fishing, and were carrying their canoes up onto the shore…

…Now because Kepa‘alani was stingy with the fishes of the pond Pā‘aiea, and refused to give any fish to Pele, the fishpond Pā‘aiea and the houses of the King were all destroyed by the lava flow. In ancient times, the canoe fleets would enter the pond and travel from Ka‘elehuluhulu to Ho‘onā, at Ua‘u‘ālohi, and then return to the sea and go to Kailua and the other places of Kona. Those who traveled in this manner would sail gently across the pond pushed forward by the ‘*Eka* wind, and thus avoid the strong currents which pushed out from the point of Keāhole

It was at Ho‘onā that Kepa‘alani dwelt, that is where the houses in which the chiefs valuables (*hale papa‘a*) were kept. It was also one the canoe landings of the place. Today, it is where the light house of America is situated. Pelekāne (in Pu‘ukala) is where the houses of Kamehameha were located, near a stone mound that is partially covered by the *pāhoehoe* of Pele. If this fishpond had not been covered by the lava flows, it would surely be a thing of great wealth to the government today… [J.W.H.I. Kihe in *Ka Hoku o Hawaii*; compiled and translated by Maly, from the narratives written February 5-26, 1914 and May 1-15, 1924].

Na Ho‘omanao o ka Manawa (The Recollections of a Native Son)

Later in 1924, Kihe, described the changes which had occurred in the Kekaha region since his youth. In the following article, titled *Na Ho‘omanao o ka Manawa* (in *Ka Hōkū o Hawai‘i* June 5th & 12th 1924), Kihe wrote about the villages that were once inhabited throughout Kekaha, identifying families, practices, and schools of the historic period (ca. 1860-1924). In the two part series (translated by Maly), he also shared his personal feelings about the changes that had occurred, including the demise of the families and the abandonment of the coastal lands of Kekaha.

There has arisen in the mind of the author, some questions and thoughts about the nature, condition, living, traveling, and various things that bring pleasure and joy. Thinking about the various families and the many homes with their children, going to play and strengthening their bodies.

In the year 1870, when I was a young man at the age of 17 years old, I went to serve as the substitute teacher at the school of Honokōhau. I was teaching under William G. Kanaka‘ole who had suffered an illness (ma‘i-lolo, a stroke).

In those days at the Hawaiian Government Schools, the teachers were all Hawaiian and taught in the Hawaiian language. In those days, the students were all Hawaiian as well, and the books were in Hawaiian. The students were all Hawaiian… There were many, many Hawaiian students in the schools, no Japanese, Portuguese, or people of other nationalities. Everyone was Hawaiian or part Hawaiian, and there were only a few part Hawaiians.

The schools included the school house at Kīholo where Joseph W. Keala taught, and later J.K. Kaʻailuwale taught there. At the school of Makalawena, J. Kaʻelemakule Sr., who now resides in Kailua, was the teacher. At the Kalaoa School, J.U. Keaweʻake was the teacher. There were also others here, including myself for four years, J. Kainuku, and J.H. Olohia who was the last one to teach in the Hawaiian language. At Kaloko, Miss Kaʻaimahuʻi was the last teacher before the Kaloko school was combined as one with the Honokōhau school where W.G. Kanakaʻole was the teacher. I taught there for two years as well... [Kihe includes additional descriptions on the schools of Kona]

It was when they stopped teaching in Hawaiian, and began instructing in English, that significant changes took place among our children. Some of them became puffed up and stopped listening to their parents. The children spoke gibberish (English) and the parents couldn't understand (*nā keiki namu*). Before that time, the Hawaiians weren't marrying too many people of other races. The children and their parents dwelt together in peace with the children and parents speaking together… [June 5, 1924]

…Now perhaps there are some who will not agree with what I am saying, but these are my true thoughts. Things which I have seen with my own eyes, and know to be true…In the year 1870 when I was substitute teaching at Honokōhau for W.G. Kanakaʻole, I taught more than 80 students. There were both boys and girls, and this school had the highest enrollment of students studying in Hawaiian at that time [in Kekaha]. And the students then were all knowledgeable, all knew how to read and write.

Now the majority of those people are all dead. Of those things remembered and thought of by the people who yet remain from that time in 1870; those who are here 53 years later, we cannot forget the many families who lived in the various (*ʻāpana*) land sections of Kekaha.

From the lands of Honokōhau, Kaloko, Kohanaiki, the lands of ʻOʻoma, Kalaoa, Haleʻohiʻu, Makaʻula, Kaū, Puʻukala-ʻŌhiki, Awalua, the lands of Kaulana, Mahaiʻula, Makalawena, Awakeʻe, the lands of Kūkiʻo, Kaʻūpūlehu, Kīholo, Keawaiki, Kapalaoa, Puʻuanahulu, and Puʻuwaʻawaʻa. These many lands were filled with people in those days.

There were men, women, and children, the houses were filled with large families. Truly there were many people [in Kekaha]. I would travel around with the young men and women in those days, and we would stay together, travel together, eat together, and spend the nights in homes filled with aloha.

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

Kaloko was the same in those days, but now, it is a land without people. The men, the women, and the children are all gone, they have passed away. Only one man, J.W. Haʻau, remains. He is the only native child (keiki kupa) besides this author, who remains.

At Kohanaiki, there were many people on this land between 1870 and 1878. These were happy years with the families there. In those years Kaiakoili was the haku ʻāina (land overseer)...

Now the land is desolate, there are no people, the houses are quiet. Only the houses remain standing, places simply to be counted. I dwelt here with the families of these homes. Indeed it was here that I dwelt with my kahu hānai (guardian), the one who raised me. All these families were closely related to me by blood. On my fathers' side, I was tied to the families of Kaloko [J.W.H.I. Kihe's father was Kihe, his grandfather was Kuapāhoa, a noted kahuna of Kaloko]. I am a native of these lands.

The lands of ʻOʻoma, and Kalaoa, and all the way to Kaulana and Mahaiʻula were also places of many people in those days, but today there are no people. At Mahaiʻula is where the great fishermen of that day dwelt. Among the fishermen were Poʻokoʻai mā, Pāʻaoʻao senior, Kaʻao mā, Kaiʻa mā, Kaʻāʻīkaula mā, Pāhia mā, and John Kaʻelemakule Sr., who now dwells at Kailua.

Kaʻelemakule moved from this place [Mahaiʻula] to Kailua where he prospered, but his family is buried there along that beloved shore (kapakai aloha). He is the only one who remains alive today… At Makalawena, there were many people, men, women, and their children. It was here that some of the great fishermen of those days lived as well. There were many people, and now, they are all gone, lost for all time.

Those who have passed away are Kahaʻialiʻi mā, Mamaʻe mā, Kapehe mā, Kauaionuʻuanu mā, Hopulāʻau mā, Kaihemakawalu mā, Kaomi, Keoni Aihaole mā, and Pahukula mā. They are all gone, there only remains the son-in-law of Kauaionuʻuanu, J.H. Mahikō, and Jack Punihaole, along with their children, living in the place where Kauaionuʻuanu and Ahu once lived.

At Kūkiʻo, not one person remains alive on that land, all are gone, only the ʻaʻā remains. It is the same at Kaʻūpūlehu, the old people are all gone, and it is all quiet… [June 12, 1924]

*Ko Keoni Kaelemakule Moolelo Ponoi – Kakau ponoi ia mai no e ia (*The True Story of John Kaʻelemakule – Actually written by him[3]*)*

In the period between 1928 and 1930, John Kaʻelemakule Sr., who was a native of Kekaha, living at Mahaiʻula, Kaulana and Kohanaiki, wrote a series of articles that were published in serial form in *Ka Hōkū o Hawaiʻi*. The story is a rich account of life in Kekaha between 1854 and 1900. Kaʻelemakule's texts introduce us to the native residents of Kekaha, and include descriptions of the practices and customs of the

[3] This account was published in serial form in the Hawaiian newspaper *Ka Hōkū o Hawaiʻi*, from May 29, 1928 to March 18, 1930. The translated excerpts in this section include narratives that describe Mahaiʻula and nearby lands in Kekaha with references to families, customs, practices, ceremonial observances, and sites identified in text. The larger narratives also include further detailed accounts of Kaʻelemakule's life, and business ventures. A portion of the narratives pertaining to fishing customs (November 13, 1928 to March 12, 1929), and canoeing practices (March 19 to May 21, 1929) were translated by M. Kawena Pukui, and may be viewed in the Bishop Museum-Hawaiian Ethnological Notes (BPBM Archives).

families who resided there. In the following excerpts from Ka‘elemakule’s narratives (translated by Kepā Maly), we find reference once again to ‘O‘oma and neighboring lands, and the practices associated with procuring water in this region:

“Kekaha Wai Ole o na Kona” (Waterless Kekaha of Kona)

…We have seen the name “Kekaha wai ole o nā Kona” since the early part of my story in *Ka Hōkū o Hawai‘i*, and we have also seen it in the beautiful tradition of Mākālei. An account of the boy who dwelt in the uplands of Kekaha wai ‘ole, that was told by Ka-‘ohu-ha‘aheo-i-nā-kuahiwi-‘ekolu [the penname used by J.W.H.I. Kihe]. I think that certain people may want to know the reason and meaning of this name. So it is perhaps a good thing for me to explain how it came about. The source of it is that in this land of Kekaha even in the uplands, between Kaulana in the north and ‘O‘oma in the south, there was no water found even in the ancient times. For a little while, I lived in the uplands of Kaulana, and I saw that this land of Kekaha was indeed waterless.

The water for bathing, washing one’s hands or feet, was the water of the banana stump (*wai pūma‘ia*). The *pūmai‘a* was grated and squeezed into balls to get the juice. The problem with this water is that it makes one itchy, and one does not really get clean. There were not many water holes, and the water that accumulated from rain dried up quickly. Also there would be weeks in which no rain fell… The water which the people who lived in the uplands of Kekaha drank, was found in caves. There are many caves from which the people of the uplands got water… [September 17, 1929:3]

…The *kūpuna* had very strict *kapu* (restrictions) on these water caves. A woman who had her menstrual cycle could not enter the caves. The ancient people kept this as a sacred *kapu* from past generations. If a woman did not know that her time was coming and she entered the water cave, the water would die, that is, it would dry up. The water would stop dripping. This was a sign that the *kapu* of Kāne-of-the-water-of-life (Kaneikawaiola) had been desecrated. Through this, we learn that the ancient people of Kekaha believed that Kāne was the one who made the water drip from within the earth, even the water that entered the sea from the caves. This is what the ancient people of Kekaha wai ‘ole believed, and there were people who were *kia‘i* (guardians) who watched over and cleaned the caves, the house of Kāne… [September 24, 1929:3]

When the *kapu* of the water cave had been broken, the priest was called to perform a ceremony and make offerings. The offerings were a small black pig; a white fish, and *āholehole*; young taro leaves; and *awa*. When the offering was prepared, the priest would chant to Kane:

E Kane i uka, e Kane i kai,	O Kane in the uplands, O Kāne at the shore,
E Kane i ka wai, eia ka puaa,	O Kane in the water, here is the pig,
Eia ka awa, eia ka luau,	Here is the ‘awa, here are the taro greens,
Eia ka ia kea.	Here is the white fish.

Then all those people of the uplands and coast joined together in this offering, saying:

He mohai noi keia ia oe e Kane,	This is a request offering to you o Kāne,
E kala i ka hewa o ke kanaka i hana ai,	Forgive the transgression done by man,
A e hoomaemae i ka hale wai,	Clean the water house (source),

A e hoonui mai i ka wai o ka hale,	Cause the water to increase in the house,
I ola na kanaka,	That the people may live,
Na ohua o keia aina wai ole.	Those who are dependent on this waterless land.
Amama.	It is finished…

[October 1, 1929:3; Kepā Maly, translator]

It is not surprising today, when we hear of caves in which cultural materials are found. Along trails, near residences, and in once remote areas, a wide range of uses occurred. Caves in the Kekaha lands were used to store items, keep planting shoots cool and fresh for the next season, to hide or take shelter in, to catch water, and as burial sites.

Land Tenure in ʻOʻoma and Vicinity

Through the traditions and early historical accounts cited above, we see that there are descriptions of early residences and practices of the native families on the lands of ʻOʻoma and within greater Kekaha. Importantly, we find chiefly associations with the land of ʻOʻoma 2nd, as documented by the residency of the chiefs Kaikioʻewa, Keaweamahi, their families and retainers, while they were serving as the guardians of the young king, Kauikeaouli (Kamehameha III in ca. 1813-1818; Kamakau 1961 and Gov. Kapeau, 1847 in this study). Among the earliest government records documenting residency in ʻOʻoma and vicinity, are those of the *Māhele ʻĀina* (Land Division), Interior and Taxation Departments, Roads and Public Works, and the Government Survey Division.

This section of the study describes land tenure (residency and land use) and identifies families associated with ʻOʻoma and it's neighboring lands. The documentation is presented in chronologically within the following subsections, The *Māhele ʻĀina* (1848): Disposition of ʻOʻoma, Land Grants in ʻOʻoma and Vicinity (1855-1864), The Government Homesteading Program in Kekaha, Field Surveys of J.S. Emerson (1882-1889), and Trails and Roads of Kekaha (Governmental Communications).

A review of the records below reveals that none of the claims by native tenants made during the *Māhele*, or any of the applications for Royal Patent Grants, included lands that are a part of the current development area.

The *Māhele ʻĀina* (1848): Disposition of ʻOʻoma

In Precontact Hawaiʻi, all land, ocean, and natural resources were held in trust by the high chiefs (*aliʻi ʻai ahupuaʻa* or *aliʻi ʻai moku*). The use of land, fisheries and other resources were given to the *hoaʻāina* (native tenants) at the prerogative of the *aliʻi* and their representatives or land agents (*konohiki*), who were considered lesser chiefs. By 1845, the Hawaiian system of land tenure was being radically altered, and the foundation for implementing the *Māhele ʻĀina* was set in place, system of fee-simple right of ownership.

As the *Māhele* evolved, it defined the land interests of Kauikeaouli (King Kamehameha III), some 252 high-ranking *Aliʻi* and *Konohiki*, and the Government. As a result of the *Māhele*, all land in the Kingdom of Hawaiʻi came to be placed in one of three categories: (1) Crown Lands (for the occupant of the throne); (2) Government Lands; and (3) *Konohiki* Lands (cf. Indices of Awards 1929). The "Enabling" or "*Kuleana Act*" of the *Māhele* (December 21, 1849) further defined the frame work by which *hoaʻāina* (native tenants) could apply for, and be granted fee-simple interest in "*Kuleana*" lands (cf. Kamakau in *Ke Au Okoa* July 8 & 15, 1869; 1961:403-403). The *Kuleana Act* also reconfirmed the rights of *hoaʻāina* to access, subsistence and collection of resources necessary to their life upon the land in their given *ahupuaʻa* ("Enabling Act"[4], August 6, 1850 – HSA DLNR 2-4).

[4] See also *"Kanawai Hoopai Karaima no ko Hawaii Pae Aina"* (Penal Code) 1850.

In the *Buke Kakau Paa no ka Mahele Aina* (Land Division Book), between Kamehameha III and his supporters, we learn that by the time of the *Māhele ʻĀina*, ʻOʻoma was divided into two *ahupuaʻa*, ʻOʻoma 1st and 2nd. ʻOʻoma 1st was claimed by Moses Kekūāiwa (brother of Kamehameha IV and V, and Victoria Kamāmalu), one of the children of Kīnaʻu and M. Kekūanaoʻa, thus, a grandson of Kamehameha I. ʻOʻoma 2nd was held by Kamehameha III (*Buke Māhele*, January 27, 1848:13-14). On March 8, 1848, Kamehameha III assigned his interest in ʻOʻoma 2nd to the Government land inventory (*Buke Māhele*, 1848:183).

Moses Kekūāiwa died on November 24, 1848, and his father, Mataio Kekūanaoʻa, administrator of the estate, relinquished in commutation, his rights to ʻOʻoma 1st, giving the land over to the Government land inventory (Foreign Testimony Volume 3:408). Thus, both ʻOʻoma 1st and 2nd were assigned to the Government Land inventory (Government Lands - Indices of Awards 1929:10).

In 2000, the Kumu Pono Associates digitized the entire collection of handwritten records from the *Māhele ʻĀina*. Most of the records are in the Hawaiian language, and to-date have not been accurately indexed. An extensive review of all the records identifies only one native tenant who filed a claim of residency and land use in ʻOʻoma during the *Māhele*. The claim—Helu 9162, by Kahelekahi—was not awarded, and except for an entry in Native Register Volume 8 (Figure 5), there is no further record of the claim. Below, is a copy of the original Hawaiian text from the Native Register. The account is of particular interest as Kahelekahi reported that in 1848, he was the only resident in ʻOʻoma:

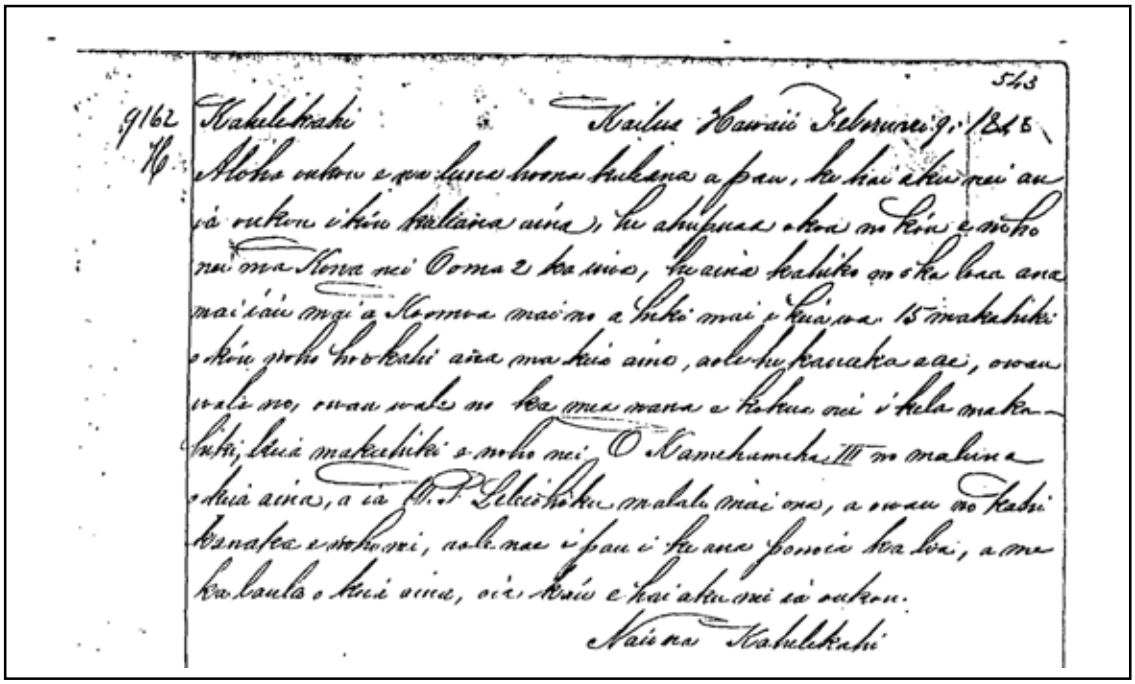

Figure 5. Copy of Native Register Vol. 8:543 Helu 9162, claim of Kahelekahi for *kuleana* at ʻOʻoma.

Kahelekahi – Helu 9162
Kailua, Hawaii February 9, 1848

Greetings to all of you commissioner who quiet land titles, I hereby tell you of my claim for land. I have an entire ahupuaa situated there in Kona, it's name is Ooma 2. It is an old land gotten by me from Koomoa, and held to this time. For 15 years, I have been the only one residing on this land, there are no other people, only me. I am the only one, there is no one living here to help from one year to the next year. Kamehameha III is the one above, who has this land, and W.P. Leleiohoku is below him, and I am the one man dwelling there. The survey of the length and width of this land is not accurately

completed. That is what I have to tell you.

Done by me, Kahelekahi
[Native Register Vol. 8:543; translated by Kepā Maly]

In 1849, S. Haanio, Tax Assessor of North Kona, submitted a report to the Board of Education regarding those individuals who were subject to the Tuesday Tax Laws (*Poalua*), to be worked as a part of the School Tax requirements of the time. At the time of Haanio's report, three individual families were identified as residents of ʻOʻoma. Residents in the neighboring lands of Kalaoa and Kohanaiki were also listed, they were:

> Kalaoa: 1. Kila, 2. Piena, 3. Nakuala, 4. Kupono, 5. Loa, 6. Kaeha, 7. Keliipuipui, 8. Kapuolokai, 9. Kaainoa, 10. Paina, 11. Kalimaonaona, 12. Kaikeleaukai, 13. Kanahele, 14. Kukaani, 15. Kupuai, and 16. Helekahi[5]
>
> Ooma: 1. Kalua, 2. Kamaka and 3. Mamali
>
> Kohanaiki: 1. Hulikoa, 2. Kaoeno, 3. Honolii and 4. Awa [HSA – Series 262, Hawaii 1849].

Unfortunately, there is no indication of where Kalua, Kamaka, and Mamali were living in ʻOʻoma at the time. Based on traditional patterns of residency in the region, it is likely that they had primary residences in the uplands, near sheltered *māla ʻai* (agricultural fields), and kept near shore residences for seasonal fishing, collection of salt, and other resources of the coastal zone. Of the three names given for ʻOʻoma, descendants of the Kalua and Kamaka lines are known to still be residing in the Kekaha region.

Land Grants in ʻOʻoma and Vicinity (1855-1864)

In conjunction with the *Māhele*, the King also authorized the issuance of Royal Patent Grants to applicants for tracts of land, larger than those generally available through the Land Commission. The process for applications was set forth by the "Enabling Act" of August 6, 1850, which set aside portions of government lands for grants.

> Section 4. Resolved that a certain portion of the Government lands in each Island shall be set apart, and placed in the hands of special agents to be disposed of in lots of from one to fifty acres in fee simple to such natives as may not be otherwise furnished with sufficient lands at a minimum price of fifty cents per acre. [HSA – "Enabling Act" Series DLNR 2-4]

The Kingdoms' policy of providing land grants to native tenants was further clarified in a communication from Interior Department Clerk, A. G. Thurston, on behalf of Keoni Ana (John Young), Minister of the Interior; to J. Fuller, Government Land Agent-Kona:

> *February 23, 1852*
> …His Highness the Minister of the Interior instructs me to inform you that he has and does hereby appoint you to be Land Agent for the District of Kona, Hawaii. You will entertain no application for the purchase of any lands, without first receiving some part, say a fourth or fifth of the price; then the terms of sale being agreed upon between yourself and the applicant you will survey the land, and send the survey, with your report upon the same to this office, for the Approval of the Board of Finance, when your sales have been approved you will collect the balance due of the price; upon the receipt

[5] Helekahi or Kahelekahi – the one who made a claim for a kuleana in ʻOʻoma during the Māhele (Helu 9162).

of which at this office, the Patent will be forwarded to you.

Natives who have no claims before the Land Commission have no Legal rights in the soil.

They are therefore to be allowed the first chance to purchase their homesteads. Those who neglect or refuse to do this, must remain dependant upon the mercy of whoever purchases the land: as those natives now are who having no kuleanas are living on lands already Patented, or belonging to Konohikis.

Where lands have been granted, but not yet Patented, the natives living on the land are to have the option of buying their homesteads, and then the grant be located, provided this can be done so as not to interfere with them.

No Fish Ponds are to be sold, neither any landing places.

As a general thing you will charge the natives but 50 cents pr. acre, not exceeding 50 acres to any one individual.

Whenever about to survey land adjoining that of private individuals, notice must be given them or their agents to be present and point out their boundaries… [Interior Department Letter Book 3:210-211]

Between 1855 and 1864, at least six applications were made for land in the *ahupua'a* of 'O'oma, and four of them were patented. The applications were made by:

Grant	Applicant	Land	Acreage	Book and Year
1590	Kauhini	Hamanamana, Kalaoa and Ooma 1	1,816	8:1855 (canceled)
1599	J. Hall	Ooma 2	101.33	8:1855 (canceled)
1600	Kaakau	Ooma 2	58.5	8:1855
2027	Kameheu	Ooma 2	101.33	11:1856 (same area as Grant 1599)
2031	Koanui	Ooma 1	24.5	11:1856
2972	Kaakau & Kama	Kalaoa 5 & Ooma 1	515	14:1864

["Index of all Grants Issued…Previous to March 31, 1886;" 1887]

The grants to Ka'akau and Kameheu in 'O'oma 2nd were patented by 1859, as recorded in the following letter:

April 8, 1859
S. Spencer, Interior Department Clerk;
to Lot Kamehameha, Minister of the Interior;
Lands in Puaa and Ooma 2 in Kona, Hawaii which were sold by the Government Agent:

Royal Patent 1600, Kaakau 58 50/100 acres in Ooma	$29.25
Royal Patent 2027, Kameheu, 101 33/100 acres in Ooma	$38.00

[HSA – Interior Department, Lands]

In the years following issuance of the first Royal Patents in 'O'oma and vicinity, native tenants and others continued to express interest in the lands of 'O'oma and neighboring *ahupua'a*. Applications were made to either lease or purchase portions of the remaining government lands. In 1865, Government

Surveyor and Land Agent, S.C. Wiltse, wrote to the Minister of the Interior, describing the condition and status of the lands remaining to the government.

September 5, 1865
S.C. Wiltse, Government Surveyor and Land Agent;
to F.W. Hutchinson, Minister of the Interior.
Kona Hawaii. Government Lands in this District not Sold;
also those Sold and Not Patented:

…"Kalaoa 5th"
Not in the Mahele book but believed to be Gov't. land. This land above the Govt. Road has been sold and Patented. Below the road I have surveyed 515 acres which was sold by Sheldon to "Kaakau" & "Kama" who payed him $165.00. As no valuation was made of this land per acre by Sheldon I afterwards valued it myself as follows, 300 Ac. at 50 cts. per acre, 215 at 25 cts. per Ac. The balance due according to this valuation including Patent was $42.75 which was payed to me in March 1864 and forwarded by me to your office. The survey of this land is in your office. If the payments made are satisfactory, these men would be very glad to get their Patent.

This is a piece of 3rd rate land, used only as goat pasture, no improvements on it. Makai of this survey is about 400 Ac. remaining to the Govt., but of very little value.

"Ooma 1st & 2nd"
The best part of these lands have been sold, there remains to the Govt. the forest part, 2 or 300 Ac., and the makai part some 1500 Ac., about 500 of which is 3rd rate land, the balance rocks.

"Kohanaiki"
The forest part of this land is all that remains to the Gov't., this is extensive, extending to the mauka side of the forest. It may contain 1500 to 2000 Ac.

The makai part of this land containing 220 Ac. has been sold both by Sheldon and myself. In April 1863 I was surveying in Kona when "Nahuina" (who lives on the adjoining land of "Kaloko") applied to me to survey the makai part of the Gov't. land Kohanaiki which he wished to purchase. I inquired whether he had applied to Sheldon for this lands (Sheldon was then in Honolulu) he told me that he had not, but would do so immediately, if it was necessary he would go to Honolulu for that purpose. I told him that I was then writing to Sheldon and I would make the application for him which I did, but never got an answer. I wrote several times to him about that time, for information about Gov't. lands, but he declined to answer my letters.

On the 30th of May following, I surveyed said piece of land for "Nahuina." When I was making this survey "Kapena" (who bought this land from Sheldon) was present, and afterwards went to Honolulu and payed Sheldon for this land.

"Nahuina" had the money then to pay for this land, and I told him to keep it until he knew who he was paying it to. I was perfectly satisfied then that Sheldon's transaction as Gov't. land Agt. was not honest. Mr. Sheldon had then been away from Kona nearly three months, he had previous to this resigned his office as Judge and taken up his residence permanently in Honolulu. Afterwards when requested by Mr. S. Spencer to act as land Agt. for Kona, "Nahuina" payed me for this land at 25 cents per Acre. Its only value is for a place for a residence on the beach.

> I have been thus particular in giving you the history of this affair, so that you might be able to decide which of the parties were intitled to said land… [HSA – Interior Department, Lands]

Historical records document that the primary use of the *kula* – lowlands in the Kekaha region, was for goat ranching, with limited cattle ranching. Throughout the 1800s, most of the cattle ranching occurred on the *mauka* slopes nearer the old upper government road.

Summary of Land Tenure Described in Grant Records

Grant No.'s 1600 (for Kaakau) and 2031 (for Koanui) are situated on the *mauka* side of the Alanui Aupuni (the Upper Government Road, near present-day Māmalahoa Highway) in ʻOʻoma 2nd and 1st.

Grant No. 1599 (surveyed for Kauhini), was situated across the *kula* lands from Oʻoma 1st in the south, to Hāmanamana, in the north. Communications from the 1880s, indicate that the parcel was never patented, though Kauhini had lived in ʻOʻoma 1st, through the time of his death (before 1888). J.S. Emerson's Register Map No. 1449, identifies a Triangulation Station in ʻOʻoma 1st as "Kauhini." At almost the same time that Kauhini's grant was surveyed, other grants in Kalaoa and ʻOʻoma covering a portion of the area described under Kauhini's grant were patented to Kakau and Kama (Royal Patent Grant No. 2972). In 1888, this confusing situation was brought to the government's attention in a letter from more than 70 native residents of ʻOʻoma and the larger Kekaha region, when the Minister of the Interior was developing homestead lots for applicants (see communications below).

Grant No. 2027 (for Kameheu), situated in ʻOʻoma 2nd, extends from the *makai* edge of the Upper Government Road, to a short distance below the historic Homestead Road between Kaloko and Kalaoa, at about 900 feet above sea level (see Register Map No. 1449).

ʻOʻoma grantee Kaakau (Grant No. 1600), also held an interest in Grant No. 2972 in the land of Kalaoa 5th and ʻOʻoma 1st, which he shared with his relative, Kama. Historic survey records (in Register Maps and Survey Field Books) do identify "Kama's house" near the Wawaloli pond (Register Map No. 1449) in ʻOʻoma 2nd. The same house is later identified as "Keoki Mao's House" (Register Map No. 1280).

In 1888, government surveyor J.S. Emerson identified Kama as a resident in ʻOʻoma, near the mauka government road (see communication below). This Kama is identified in oral history interviews as being an elder of the Kamaka line, from whom the often-mentioned Palakiko Kamaka and others descend. A temporary beach shelter—in the vicinity of "Kama's House" marked near the shore of ʻOʻoma 2nd on Register Maps 1449 and 1280—remained in use by family members at least until the outbreak of World War II (see interviews with Peter Kaikuaana Park, Geo. Kinoulu Kahananui, and Valentine K. Ako in Rechtman and Maly 2003).

While no formal awards or grants of land appear to have been made for the near shore *kula* or beach lands, it is logical to assume that families living in the uplands of the ʻOʻoma and Kalaoa-Kohanaiki *ahupuaʻa*, made regular visits to the near shore lands. The practice of continued travel between upland residences and near-shore shelters, is also described by *kupuna* Peter K. Park, who was born and raised in the *mauka* section of ʻOʻoma, and by other *kupuna* from neighboring lands.

No records indicating that the above Royal Patent Grantees had applied for coastal parcels as a part of their original claims were found while conducting the present research. A further review of the *Māhele* records was also made to determine if any of the grant applicants had been *Māhele* claimants (as is sometimes the case). Their names did not appear in the Register or Testimony volumes for the area.

Ka ʻĀina Kaha–(A Native's Perspective)

In 1875, J.P Puuokupa, a native resident of Kalaoa wrote a letter to the editor of the Hawaiian newspaper, *Ku Okoa*, responding to a letter which had been previously published in the paper (written by a visitor to Kona). The first account apparently described the Kekaha region as a hard land that presented many difficulties to the residents. It was also reported that a drought on Hawaiʻi had significantly impacted crop production, and that a "famine" was occurring. Puuokupa, responded to the account and described the situation as he knew it, from living upon the land. His letter is important as it provides us with an explanation as to why people of the region—including ʻOʻoma—lived mostly in the uplands, for it was there that the rich soils enabled residents to cultivate the land and sustain themselves.

> *Mai Kailua a hiki i Kiholo–*(From Kailua to Kiholo)
> …The people who live in the area around Kailua are not bothered by the famine. They all have food. There are sweet potatoes and taro. These are the foods of these lands. There are at this time, breadfruit bearing fruit at Honokohau on the side of Kailua, and at Kaloko, Kohanaiki, Ooma and the Kalaoas where lives J.P. [the author]. All of these lands are cultivated. There is land on which coffee is cultivated, where taro and sweet potatoes are cultivated, and land livestock is raised. All of us living from Kailua to Kalaoa are not in a famine, there is nothing we lack for the well being of our bodies.
>
> Mokuola[6] is seen clearly upon the ocean, like the featherless back of the *ʻukeke* (shore bird). So it is in the uplands where one may wander gathering what is needed, as far as Kiholo which opens like the mouth of a long house into the wind. It is there that the bow of the boats may safely land upon the shore. The livelihood of the people there is fishing and the raising of livestock. The people in the uplands of Napuu are farmers, and as is the custom of those people of the backlands, they all eat in the morning and then go to work. So it is with all of the native people of these lands, they are a people that are well off.
>
> …As was said earlier, coffee is the plant of value on these lands, and so, is the raising of livestock. From the payments for those products, the people are well off, and they have built wooden houses. If you come here you shall see that it is true. Fish are also something which benefits the people. The people who make the *pai ai* on Maui bring it to Kona and trade it. Some people also trade their *poi* for the coffee of the natives here… (J.P. Puuokupa, in *Ku Okoa* November 27, 1875; translated by Kepā Maly)

The Government Homesteading Program in Kekaha

Following the *Māhele* and Grant programs of the middle 1800s, it was found that many native tenants still remained on lands for which they had no title. In 1884, the Hawaiian Kingdom initiated a program to create Homestead lots on Government lands—a primary goal being to get more Hawaiian tenants in possession of fee-simple property (Homestead Act of 1884). The Homestead Act allowed applicants to apply for lots of up to 20 acres in size, and required that they own no other land.

On Hawaiʻi, several lands in the Kekaha region of North Kona, were selected and a surveying program was authorized to subdivide the lands. Initially, those lands extended from Kohanaiki to Kūkiʻo. Because it was the intent of the Homestead Act to provide residents with land upon which they could cultivate crops or graze animals, most of the lots were situated near the *mauka* road (near the present-day Māmalahoa Highway) that ran between Kailua and ʻAkāhipuʻu.

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[6] *Moku-ola* — literally: Island of life — is a poetic reference to a small island in Hilo Bay which was known as a place of sanctuary, healing, and life. By poetic inference, the Kekaha region was described as a place of life and well-being.

Early in the process, native residents of Kekaha soon began writing letters to the Minister of the Interior, observing that 20 acre parcels were insufficient "to live on in every respect." They noted that because of the rocky nature of the land, goats were the only animals that they could raise, and thus, try to make their living (cf. State Archives–Land File, December 26, 1888, and Land Matters Document No. 255; and communications below).

During the first years of the Homestead Program, all of the remaining government lands in the Kekaha region, from Kohanaiki to Kūkiʻo 2nd, had been leased to King David Kalākaua for grazing purposes. The following lease was issued, with the notation that should portions of the land be desired for Homesteading purposes, the King would relinquish his lease:

> *August 2nd 1886*
> *General Lease 364*
> *Between His Majesty Kalakaua;*
> *and Walter M. Gibson, Minister of the Interior*
> [Lease of unencumbered government lands between Kealakehe to Kukio 2nd]:
>
> …Oma [Ooma] No. 1 & 2 – yearly rent Ten dollars…
> Each and every of the above mentioned lands are let subject to the express condition that at any time during the term of this lease, the Minister of the Interior may at his discretion peaceably enter upon, take possession, and dispose of such piece or pieces of land included in the lands hereby demised, as may be required for the purposes of carrying out the terms and intent of the Homestead Laws now in force, or that may be hereafter be enacted during the term of this lease… [State Land Division Lease Files]

By 1889, the demand for homestead lots in ʻOʻoma and other Kekaha lands was so great that King Kalākaua gave up his interest in the lands:

> *January 22, 1889*
> *J.W. Robertson, Acting Chamberlain;*
> *to J.A. Hassinger, Chief Clerk, Interior Department*
> [Regarding termination of Lease No. 364 for lands from Kukio to Kohanaiki]:
>
> …I have the honor to acknowledge the receipt of your communication, of the 17th, instant, informing me that you are directed, by His Excellency the Minister of the Interior, to say, that he desires to take possession of the lands, described in Government Lease No. 364, for Homestead purposes, and requests the surrender of the lease.
>
> His Majesty the King, is willing, for the purpose of assisting in carrying out the Homestead Act, to accede to the terms of the lease, so far as to give up only such portions of the lands, as are suitable to be apportioned off for Homestead purposes.
>
> It has come to the knowledge of His Majesty, that several of the applicants for portions of the above lands, are already in possession of lands elsewhere, and living in comfortable homes. They are not poor people, nor are they entitled to the privilege of obtaining lands under the Homestead Act, but are desirous of obtaining more of such property, for the purpose of selling or leasing to the Chinese, which class is beginning to outnumber the natives in nearly every district…
>
> His Majesty is desirous of retaining the balance of lands, that may be left after the apportionment has been completed; and also desires to lease remnants of other Government lands in that section of the Island…

Reply attached – Dated January 22, 1889:
The lands of Kohanaiki and Kalaoa and Makaula have been divided up into Homestead lots, and taken up.
Lands marked * are in Emerson's List of lands to be sold. Emerson's List attached.

His Majesty has paid rent to Aug. 22, 1889. Another rent is due in adv. from this date…

* Kukio 2	* Maniniowali
* Mahaiula	* Kaulana
* Awalua	Puukala
+ Makaula	+ Kalaoa 1, 2, 3, 4 & 5
* Oma 1 & 2	+ Kohanaiki

Lease cancelled by order – Minister of Int. August 2, 1889 [HSA – Interior Department, Lands]

One of the significant issues that arose with the development of homesteads in the Kekaha region, involved the lands of ʻOʻoma, Kalaoa and Hāmanamana, which had been surveyed for Kauhini in 1855, under Grant No. 1590. The grant was apparently never patented, and questions regarding the government's authority to divide portions of the ʻOʻoma-Kalaoa-Hāmanamana lands into Homestead lots were raised. Adding to the confusion, in 1888, John A. Maguire was also making his move from Kohala to Kona, and in the process of establishing his Huehue Ranch. One of the lands he reportedly purchased was covered under the unperfected Grant No. 1590. Thus, homestead applicants and program managers met with a wide range of challenges during the program's history.

Homestead Communications

There are a number of letters between native residents (applicants for Homestead lands) and government agents, documenting the development of the homesteading program and residency in Kekaha. Tracts of land in Kohanaiki, ʻOʻoma, Kalaoa and neighboring *ahupuaʻa* were let out to native residents, and eventually to non-native residents as well. Those lands which were not sold to native tenants were sold or leased to ranching interests—most of which came under John A. Maguire of Huehue Ranch.

One requirement of the Homestead Program was that lots which were to be sold as homesteads to the applicants, needed to be surveyed. J.S. Emerson, one of the most knowledgeable and best-informed surveyors to work in Kona, began surveying the Kekaha region homestead lots in 1888. Emerson's letters to Surveyor General, W. D. Alexander, provide valuable historical documentation about the community and land. Writing from ʻOʻoma in April 1888, Emerson spoke highly of the Hawaiian families living on the land; he also described land conditions and weather at the time. In the letter, we find that questions regarding the status of several lands in Kona had arisen, and that John A. Maguire was planning to "settle" in Kona (see communications in Part 4 of this section of the study). Emerson's letters along with those below from the native tenants of the land, provide first hand accounts of the land development of the communities in Kekaha. The following communications are among those found in the collection of the Hawaiʻi State Archives (HSA).

May 1888
J.W.H. Isaac Kihe, Jr., et al.; to L.A. Thurston, Minister of the Interior
[Petition with 71 signatures, regarding discrepancy in land grant to Kauhini in Kalaoa and Ooma; and desires that said land be divided into Homestead Lots for applicants]:

…We, the undersigned, subjects residing within the boundaries of Kekaha, from Kohanaiki to Makalawena, and Whereas, the land said to belong to Kauhini is within the boundaries above set forth; Whereas, some doubt and hesitancy has come into our minds

concerning the things relating to said land of Kauhini, and that it is proper that a very careful investigation be made, because, we have never known said Kauhini to have lands in the Kalaoas and Ooma 1, and because of such doubt, the Government sold some pieces in said land of 687 acres to Kama, Kaakau and Hueu, and they have been living with all the rights for 20 years and over, on pieces that were acquired by them. Therefore, we leave this request before your Excellency, the honorable one, with the grounds of this request:

First: The said land of Kauhini is not a land that is clear in every way, so that it can be shown truthfully and clearly that it belongs to Kauhini and his heirs – said kuleana.

Second: The land said to belong to Kauhini was only surveyed, but the money was not paid, that is the price for the land, only the payment for the survey was paid. We are ready with witnesses to prove this ground, as well as other grounds.

Third: Because of Kama and Kaakau and Hueu's knowing that Kauhini had no true interest in the land, therefore, they bought from the Government some acres of in the piece which Kauhini had surveyed, and the Government readily agreed to sell to them. This is real proof that said land was not conveyed to Kauhini, and the second is that Kauhini was living right there and he made no protest against the sale by the Government of those 687 acres to Kama (k), Kaakau (k) and Hueu (k), up to the time of his death, and only now has the question been raised through the plat of the survey, and thereby basing the claim that Kauhini had some land.

…We ask your honor that this matter be traced in the Government Departments, so as to find out the truth, there is much trouble and uncertainty about this land.

And our inquiry to be based upon these great questions. Does the land belong to Kauhini? Or to the Government?… [HSA – Interior Department, Lands]

May 16, 1888
Interior Department Clerk; to J.W.H. Isaac Kihe, Jr.:
…I have been directed by the Honorable Minister of the Interior, to say, that your request asking that Kauhini's interest in the lands of Kalaoa & Ooma 1 be investigated, and to let you know the you are wanted to send, or to bring here to Honolulu, 2 or 3 good witnesses, and all the papers found by you or them, concerning this land of Kauhini… [HSA Interior Department Lands]

May 16, 1888
J.F. Brown, Government Surveyor; to L.A. Thurston, Minister of the Interior
[Regarding disposition of Grant No. 1590, to Kauhini for Lands in Hamanamana, Kalaoa, and Ooma; Figure 6]:

…With reference to the letter of inquiry of numerous natives in N. Kona, Hawaii, I beg to report:

That as regards the land belonging to Kauhini, I find that Grant 1590 on record and signed in due form, assigned to Kauhini something over 1800 acres shown in sketch by yellow tinted boundary line. At the bottom of the page however and in different handwriting is the following remark "Memo – this to be cancelled" S.S. (Stephen Spencer)?

Later the grants shown in sketch by blue lines were issued to the parties indicated in the sketch, and this fact together with the memo attached to the Grant, and the statements and beliefs of the natives leads me to think that the Grant to Kauhini was actually cancelled, but of this I have not yet obtained further proof than I have here given… [HSA – Interior Department, Lands]

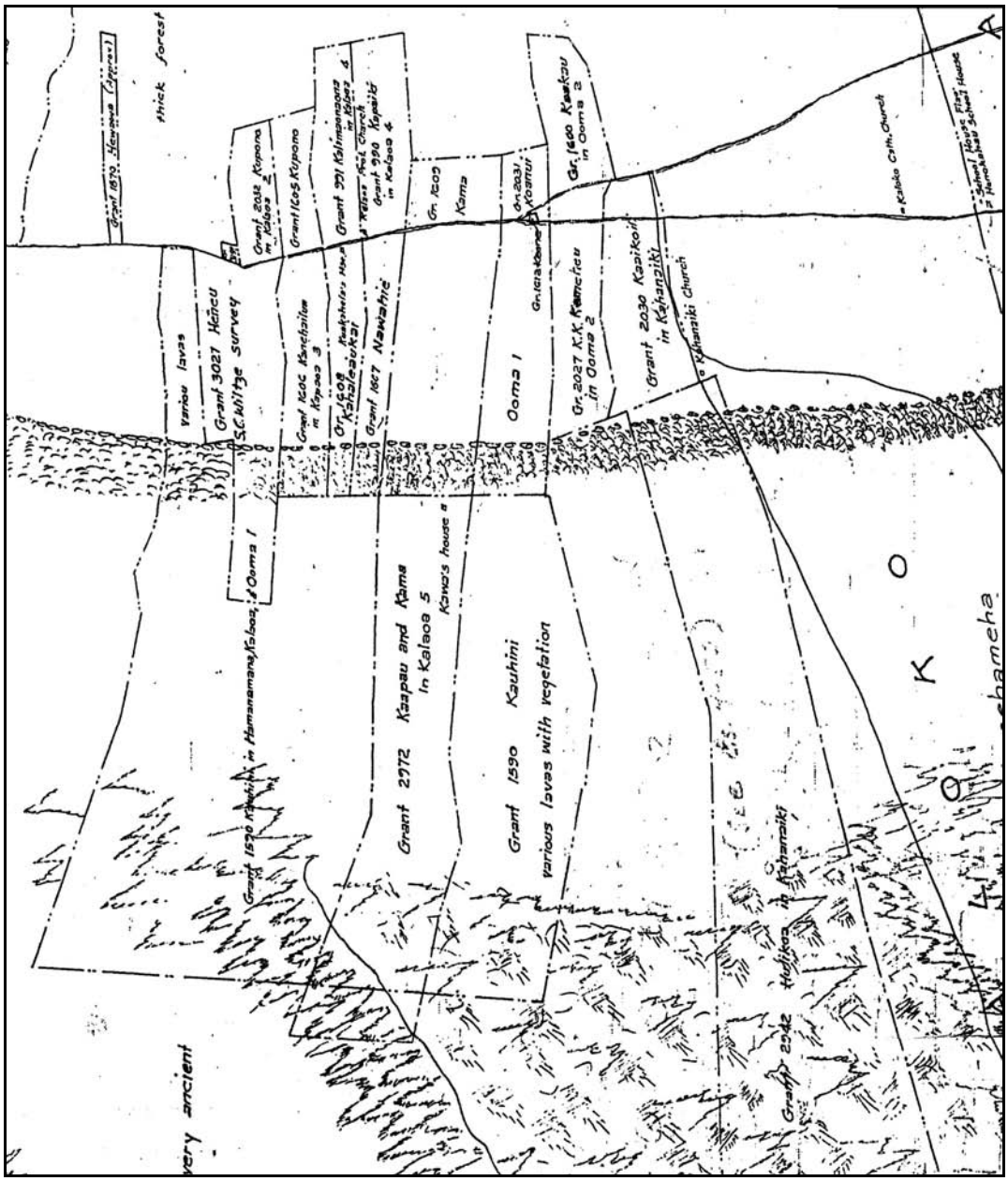


Figure 6. Portion of 1882 Register Map No. 1280 showing original boundaries of Grant No. 1590, to Kauhini.

May 1888 - J.W.H.I. Kihe, Jr.; to L.A. Thurston, Minister of the Interior:
…Oh honorable one, I am ready with the right witnesses to come when I receive the order, and if you agree, oh honorable one, to help with the fares for us on the vessel, and for our support while staying there and coming back.

Proofs are ample to prove that the land belongs to the Government, when I arrive with the witnesses, according to what you wish to be done… [HSA – Interior Department, Lands]

[Applying to purchase remnant lands from Makaula to Ooma 2nd, as a native Hui; and that land not be sold to outsiders.]

…We the undersigned, kamaaina (old residents) who reside from "Makaula" to "Ooma 2," joining "Kohanaiki," hereby petition and we also file this petition with you, and for you to consider and conferring with the Minister of the Interior, whether to consent or refuse the petition which we humbly file, and at the same time setting forth the nature of the land and the boundaries desired.

We ask that all be sold to us as a Hui, that the remnants of all the Government lands from "Hamanamana" to "Ooma 2 (two)," that is from the Government remnant of "Hamanamana, Kalaoa 1, 2, 3, 4, 5, Ooma 1 & 2" running until it meets the sea. Being the remnants remaining from the "Homesteads" lately, and remaining after the sale of the lands formerly sold by the Government, these are the remnants which we wish to buy as a "HUI." If you consent, and also the "Minister of the Interior," for these reasons:

1. The "remnants of Government lands" aforesaid, join our land kuleanas and were lately surveyed, and for that reason we believe it proper that they be sold to us.

2. The "kuleanas" that were surveyed for us are not sufficient to live on in every respect, they are too small, and are not in accordance with the law, that is one hundred acres, (Laws 1888).

3. Because of our belonging to, and being old residents of said places, is why we ask that consent be granted us for the sale to us and not to any one from other places, or we may be put to trouble in the future.

With these reasons, we leave this with you, and for you to approve, and we also adhere to our first offer per acre, and the explanations in regards to said offer.

FIRST: The price per acre to be 10 cents per acre.

SECOND: The nature of the land is rocky and lava stones in all from one and to the other, and there is only one kind of animal which can roam thereon, and it is goats, and that is the only thing to make anything out of, and to benefit us if we acquire it.

THIRD: If this land is acquired by others, they will probably cause us trouble, because the kuleanas which we have got are very small and not enough, not 20 acres of the land were acquired by us; very few of the lots reach 20 acres or more.

And because of these reasons and the explanations herein, we leave before your Excellency for the granting of the consent or not… [HSA – Interior Department, Lands]

ca. February 1889
Petition of J.W.H. Isaac Kihe, Jr. and 21 others;
to L.A. Thurston, Minister of the Interior
[Transmitting first payment for Homestead Land from Makaula to Kohanaiki]:

…We, the ones whose names are below, persons who but for the pieces of "Homestead" lands from Makaula to Kohanaiki, present to you documents of proof and money as first payment of ten ($10.00) dollars in the hands of J. Kaelemakule, the Agent appointed for the "Homestead" lands in North Kona, Hawaii.

We ask that the Agreements be sent up, with the Government for five years to J. Kaelemakule, the Agent here, in number the same as there are names below…

1. J.W.H. Isaac Kihe, Jr.	9. P. Nahulanui	17. Keawehawaii
2. S. Mahauluae	10. Kaukaliinea	18. D. Kaninau
3. D.P. Manuia	11. Kamahiai (w)	19. Mokuaikai
4. S.M. Kaawa	12. C.K. Kapa	20. Nuuanau
5. H.P. Ku	13. P.K. Kanuha	21. S. Kaimuloa
6. W.N. Kailiino	14. J. Haau	22. J. Kaloa
7. Z. Kawainui	15. G. Mao	
8. Kikane	16. J. Pule	

[HSA – Interior Department Document No. 227]

February 18, 1889
J. Kaelemakule, Land Agent; to L.A. Thurston, Minister of the Interior:
I am sending the correct report of the applicants for homestead lands here in North Kona, and their respective names, and the amount they have paid for their initial deposits in order that the agreements will be made correctly…

Pule $10.	Keoki Mao $10.	Mahuluae $10.	Haau $10.
Nuuanu $10.	Manuia $10.	Kaukaliinea $10.	Kamahiai (w) $10.
Kaawa $10.	Kaninau $10.	J. Kaelemakule $10.	Kawainui $10.
Mokuaikai $10.	Keawehawaii $10.	Nahulanui $10.	Kaloa $10.
Haiha $10.	Kapa $10.	Kaumuloa $10.	Isaac Kihe $10.
Kailiino $10.	Kanuha $10.	Ku $10.	Kikane $10.

[HSA – Interior Department, Lands]

October 7, 1889
J. Kaelemakule, Land Agent; to L.A. Thurston, Minister of the Interior:
…The applications of Kahinu and Lilinoe which were sent down during the month of August, please have the lots changed, because the map of Ooma has arrived with new numbers, as follows: Kahinu, Lot 51; Lilinoe, Lot 49, in Ooma 1st … [HSA – Interior Department, Lands]

October 10, 1889
J.W.H. Isaac Kihe, Secretary; to L.A. Thurston, Minister of the Interior:
…I leave some more names who make applications for homestead lands here in North Kona… The places wanted by those named are:

Pika Kaninau at Ooma 1
Kahinu at Ooma 2
Keaweiwi at Ooma 2… [HSA – Interior Department, Lands]

October 28, 1889
J. Kaelemakule, Land Agent; to L.A. Thurston, Minister of the Interior:
…The eight lots in Ooma have all been taken, none are left… These lots have been very quickly taken by the bidders, before the issuance of the notice from the Minister… Bear in mind the agreements for Kahinu and Lilinoe… [HSA – Interior Department, Lands]

December 31, 1890
J.W.H.I. Kihe, Jr.; to C.N. Spencer, Minister of the Interior:
We, the undersigned, who are without homes, and are destitute and have no place to live on, and whereas, the government has permitted all the people who have no lands, and that they receive homesteads, and for that reason, your humble servants make application that our application may be speedily granted which we now place before Your Excellency, that the Government land which was divided and surveyed by Joseph S. Emerson, be immediately sub-divided, the same being portions of Kalaoa 5 and Ooma, on the mauka side of Kama (k), Koanui (k), to the junction with Ooma of Kaakau (k), containing an area of one hundred and fifteen acres (115), and it is those acres which your applicants are applying for before Your Excellency, and where as your applicants are native Hawaiians by birth, residing at Kalaoa, North Kona, Island of Hawaii. And the minds of your servants hope and desire to have a place to live on in the future, and to have a home for all time, and Your Excellency, your servants humbly place their petition with the hope that you will grant this application...

M.E. Kuluwaimaka (k)
H. Hanawahine (k)
D.W. Kanui (k)
Mr. Kahumoku (k)
[HSA – Interior Department, Lands]

July 30, 1890
Petition of Kaihemakawalu and 63 native residents of Kekaha;
to C.N. Spencer, Minister of the Interior
[Requesting that lands available for Homesteading be sub-divided and granted to applicants]:

…We, the undersigned, old-timers living from Kealakehe to Kapalaoa, who are subject to taxes, and who have the right to vote in the District of Kona, Hawaii, and ones who are really without lands, and who wish to place this application before Your Excellency, that all of these Government lands here in North Kona, be given to the native Hawaiians who are destitute and poor, being the lots which were sub-divided by the Government which are lying idle and for which no Agreements have been given out, and also the lots which were granted Agreements and issued in the time when Lorrin A. Thurston was Minister of the Interior, and also the lots which still remain undivided. All of these Government lands are what we are now again asking that the dividing and sub-dividing be continued in these remnants of Government lands, until all of the poor and needy ones are provided for.

Your Excellency, we ask that no consent whatever be given to permitting lands to be acquired by the rich through sale at auction, or by lease, and if there is to be any lease, then to be leased to the poor ones, if they are supplied with homes.

Your Excellency, we ask that you immediately send copies of all agreements of the Government lands which were cut up and sub-divided, which are remaining and have no documents for those lots. And we also ask that a surveyor be sent now to again survey and sub-divide the remaining Government lands, being the Government lands of Kaulana, Mahaiula, Kukio 1 & 2, mauka of the Government Road, and Kalaoa 5 & Ooma 1, mauka of the Government Road, joining Kama's and Koanui's.

> And now, Your Excellency, we also ask that all of the pieces of Government land lying idle outside of these lands which have been sub-divided, and lands which are to be sub-divided, applied for above, to be allowed to be leased to use for five cents per acre, because, they are rocky and pahoehoe lands only left, and the number of acres being about three thousand and over, thereby giving the Government some income from these which have been lying idle and without any value… [HSA – Interior Department, Lands]
>
> *June 22, 1893*
> *J. Kaelemakule, Land Agent; to J.A. King, Minister of the Interior:*
> …I am forwarding you with this, the copy of the agreement of Wm. Harbottle, and some applications as herein below set forth (Figure 7):
>
> # 107, Kalua (w), for Lot # 59, Map 6, Ooma;
> # 108, G.M. Paiwa, for Lot # 56, Map 6, Ooma;
> # 109, Namakaokalani, for Lot # 58, Map 6, Ooma;
> # 110, Pika Kaninau, for Lot # 57, Map 6, Ooma.
>
> Lot # 57 above set forth, was formerly agreed with D. Kealoha Hoopii, but this applicant left altogether and lived a long time in Kohala, and has done nothing towards the land, and has never signed the agreement to this day. As two years have gone by, I thought it would be better to give the lands to the new applicant… [HSA – Interior Department, Lands]
>
> *August 31, 1898*
> *Statement of Leases of Public Lands*
> *Under Control of the Commissioner of Public Lands…*
> …Ooma (mauka) 1160 acres – Coffee, wood lands & grazing
> Lease No. 432 – Annual rent $60. – Expires August 1st, 1906…
> Reservation in lease by which the Gov't. may take up portions suited to settlement. [HSA – F.O. & Ex, 1898 – Public Lands]

In May 1902, the Territorial Survey Office issued Register Map No. 2123, depicting a portion of the Kalaoa-Ooma Homesteads. ʻOʻoma 1st had been divided into 25 lots extending from near the shore (excluding the shore line) to the upper limits of the ahupuaʻa; also excluding the early Royal Patent Grant parcels previously sold to native tenants.

Applicants for land in ʻOʻoma 1st (from *makai* to *mauka*) included:

- Kanealii – Right of Purchase Lease # 30; Lot 4-B (cancelled);
  Kanealii's parcel was just mauka of the shore line exclusion.

- Wm. Keanaaina – Right of Purchase Lease #33; Lot 13 (Patented by Grant No. 5472);
  The makai end of Wm. Nuuanu Keanaaina's Grant 5472, is situated at approximately 325 feet above sea level.

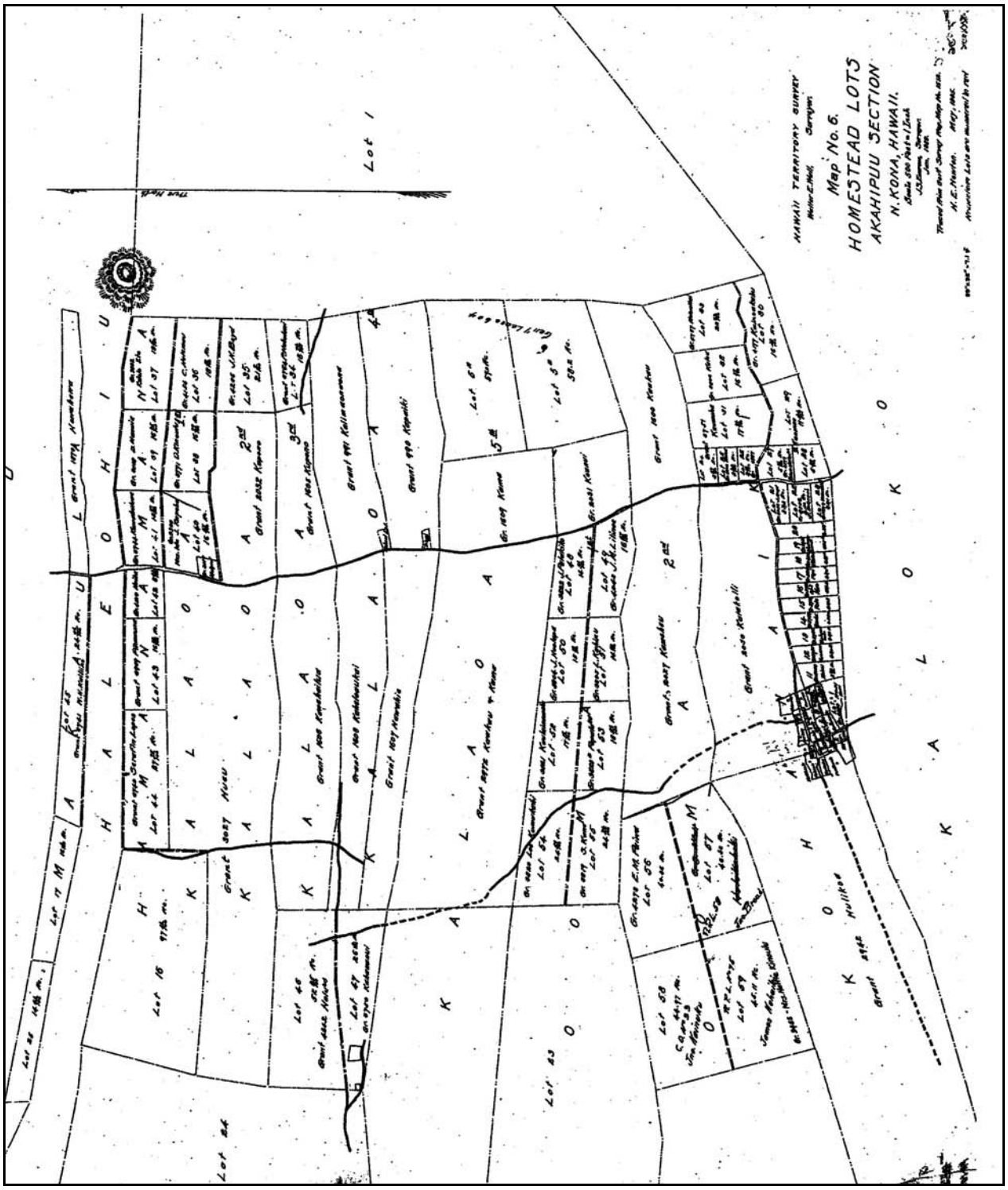


Figure 7. 1902 homestead map No. 6 showing Ooma-Kalaoa Homestead Lots (State Survey Division).

- J. Maiola – Right of Purchase Lease # 28; Lot 14 (cancelled);
  J. Maiola's parcel was situated about 525 feet above sea level.

- K. Kama Jr. – Right of Purchase Lease #27; Lot 15
  (Patented by Grant No. 5046).
  The makai end of K. Kama's Grant No. 5046, is situated at approximately 725 feet above sea level.

Territorial Survey Map No. 6 (Homestead Lots, Akahipuu Section), surveyed by J.S. Emerson in 1889, depicts the eight original homestead lots sold to applicants. The lots are in the area extending from 1,022 feet above sea level to the old Māmalahoa Highway. The lots contained approximately 15 to 25 acres each, and were (*makai* to mauka) sold to:

- S. Kane – Grant No. 3819, Lot 55;
- Loe Kumukahi – Grant No. 3820, Lot 54;
- Papala (w) – Grant No. 3820 B, Lot 53;
- Kaulainamoku – Grant No. 3821, Lot 52
- L. Kahinu – Grant No. 3805, Lot 51
- J. Hoolapa – Grant No. 3804, Lot 50
- J.M. Lilinoe – Grant No. 4343, Lot 49
- J. Palakiko – Grant No. 3822, Lot 48

Except for the Homestead parcels and the two lots patented to Keanaaina and Kama (totaling ten parcels of the available 25 parcels), no other land in ʻOʻoma 1st was sold during this time. The land was retained by the government and portions leased out for grazing (see General Lease No.'s 590 and 604).

ʻOʻoma 2nd was also divided into homestead parcels, but only six lots were made in the subdivision (see Register Map No. 2123). The two *makai* lots consisted of approximately 1,333 acres—the first lot from above the shore to the 1847 *Alanui Aupuni*, containing approximately 302 acres, and the other lot running *mauka* from the same *Alanui Aupuni*, to about the 800 foot elevation (containing approximately 1,031 acres). In 1899, John A. Maguire, founder of Huehue Ranch applied for a Patent Grant on both of the *makai* lots, but he only secured Grant No. 4536, for the lower parcel of 302 acres, in ʻOʻoma 2nd. Maguire's Huehue Ranch did hold General Lease No.'s 1001 and 590 for grazing purposes on the remaining government lands—both below and above the *mauka* highway—in ʻOʻoma 2nd.

Between 700 and 1,100 feet elevation, four Homestead lots were subdivided, containing 40.50 to 45 acres each. Applicants for the lots (*makai* to *mauka*) were:

- James Kuhaiki – Right of Purchase Lease # 75, Lot 59
  (Patented to Mrs. Hattie Kinoulu);
- Jno. Kainuku – C.O. No. 33, Lot 58 (not granted by 1902);
- Holokahiki – C.O. No. 11, Lot 57
  (cancelled; R.P.L. # 59 to Jno. Broad); and
- E.M. Paiwa – Grant No. 4273, Lot 56.

The notes of survey from Maguire's Grant No. 4536 describes the near shore parcel in ʻOʻoma 2nd (Figure 8). Of particular interest, it also references one of the prominent cultural-historical features on the boundary between ʻOʻoma 2nd and Kohanaiki, an "old 'Kahua hale' on white sand…" The "kahua hale" is an old house site. The notes of survey read:

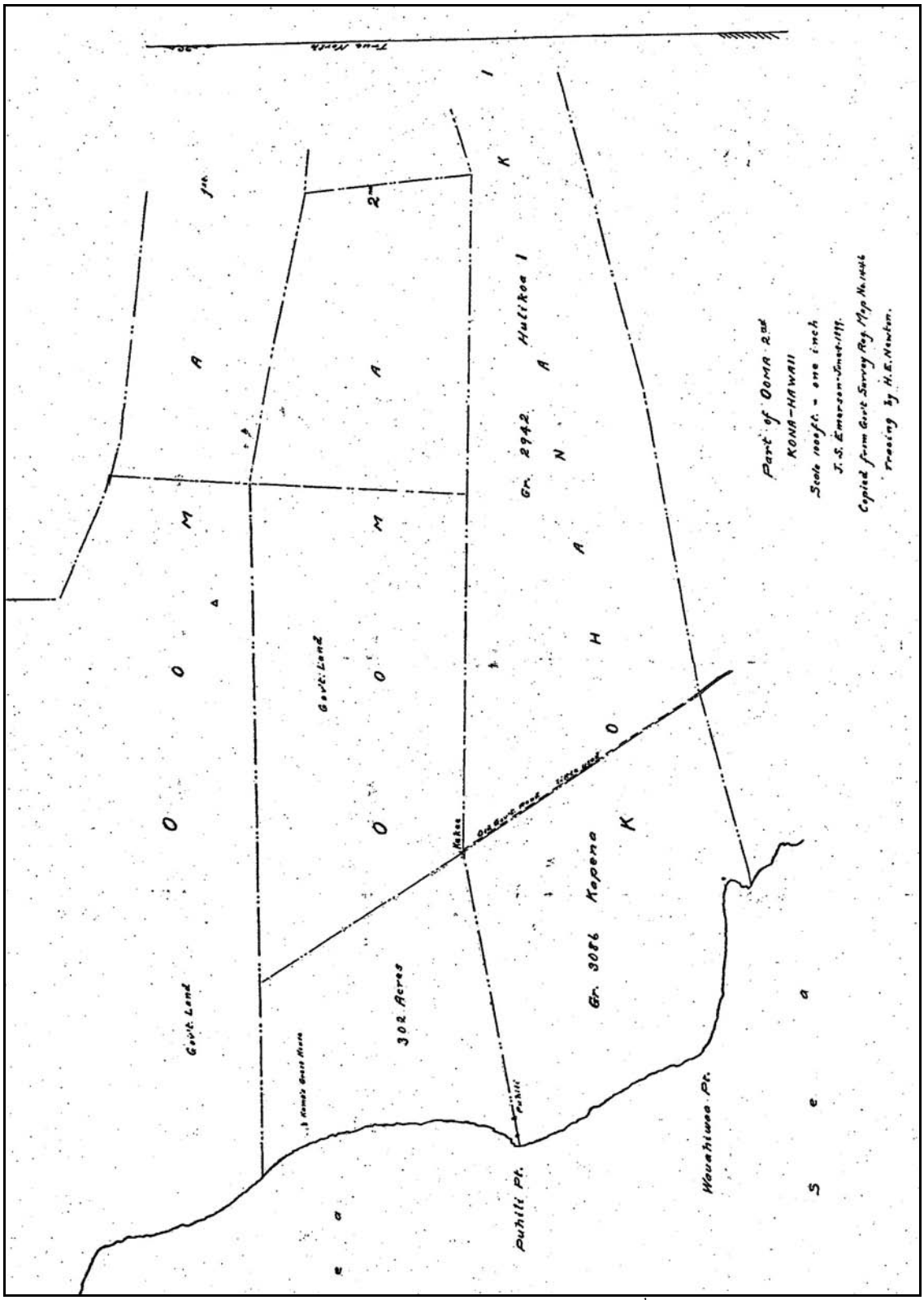


Figure 8. 1899 Grant Map No. 4536 showing *makai* portion of ‘O‘oma 2nd to John A. Maguire.

Grant No. 4536
To J.A. Maguire
Purchase Price $351.00
A Portion of Ooma 2nd, N. Kona, Hawaii Applied for by J.C. Lenhart, June 8, 1899.
Beginning at Puhili Gov't. trig. St. on the boundary between Kohanaiki and Ooma marked by a drill hole in stone 9 feet South of the South corner of an old "Kahua hale" on white sand at a point from which
Akahipuu Gov't. trig. Sta. is N 55º 27' 39" E true 32634.7 feet
Keahole Gov't. Trig. Sta. is N 21º 52' 36" W true 9310.5 ft.
Keahuolu Gov't Trig. Sta. is S 22º 24' 36" E true 20,141.8 ft., and running —
1. S. 79º 26' W. true 298.0 feet along Gr. 3086 Kapena, to a large [mark] on solid pahoehoe by the sea at Puhili Point, thence continuing the same line to the sea shore and along the sea shore to a point whose direct bearing and distance is:
2. N. 4º 54' W. true 4192.0 feet;
3. Due east true 2920.0 feet along Ooma 1st;
4. S. 31º 30' E. true 3920.0 feet along reservation for Gov't. Road 30 feet wide;
5. S 790º 45' W. true 4387.0 feet along Grant 3086 Kapena, to initial point and including an area of 302 acres.

J.S. Emerson, Surveyor
Oct. 10, 1901.

Field Surveys of J.S. Emerson (1882-1889)

Among the most interesting historic Government records of the study area—in the later nineteenth century—are the communications and field notebooks of Kingdom Surveyor, Joseph S. Emerson. Born on O'ahu, J.S. Emerson (like his brother, Nathaniel Emerson, a compiler of Hawaiian history) had the ability to converse in Hawaiian, and he was greatly interested in Hawaiian beliefs, traditions, and customs. As a result of this interest, his letters and field notebooks record more than coordinates for developing maps. While in the field, Emerson also sought out knowledgeable native residents of the lands he surveyed, as guides. Thus, while he was in the field he also recorded their traditions of place names, residences, trails, and various features of the cultural and natural landscape (including the extent of the forest and areas impacted by grazing). Among the lands that Emerson worked in was the greater Kekaha region of North Kona, including the lands of 'O'oma and vicinity.

One of the unique facets of the Emerson field notebooks is that his assistant J. Perryman, was also a sketch artist. While in the field, Perryman prepared detailed sketches that help to bring the landscape of the period to life. In a letter to W.D. Alexander, Surveyor General, Emerson described his methods and wrote that he took readings off of:

> …every visible hill, cape, bay, or point of interest in the district, recording its local name, and the name of the *Ahupuaa* in which it is situated. Every item of local historical, mythological or geological interest has been carefully sought & noted. Perryman has embellished the pages of the field book with twenty four neatly executed views & sketches from the various trig stations we have occupied… [Emerson to Alexander, May 21, 1882; HSA – DAGS 6, Box 1]

Discussing the field books, Emerson also wrote to Alexander, reporting "I must compliment my comrade, Perryman, for his very artistic sketches in the field book of the grand mountain scenery…" (HSA – HGS DAGS 6, Box 1; Apr. 5, 1882). Later he noted, "Perryman is just laying himself out in the matter of topography. His sketches deserve the highest praise…" (ibid. May 5, 1882). Field book sketches and the Register Maps that resulted from the fieldwork provide a glimpse of the country side of more than 100 years ago.

Field Notebooks and Correspondence from the Kekaha Region

The following documentation is excerpted from the field notebooks and field communications of J. S. Emerson. Emerson undertook his original surveys of lands in the Kekaha region in 1882-1883 (producing Register Maps No. 1278 and 1280). Subsequently, in 1888-1889, Emerson returned to Kekaha to survey out the lots to be developed into Homesteads for native residents of ʻOʻoma and vicinity (see above, The Government Homesteading Program in Kekaha). Through Emerson's letters and notes taken while surveying, we learn about the people who lived on the land—some of them identified in preceding parts of the study—and about places on the landscape. The numbered sites and place names cited from the field books coincide with sketches prepared by Perryman, which are shown as figures in the current study.

J.S. Emerson Field Notebook Vol. 111 Reg. No. 253
West Hawaii Primary Triangulation, Kona District
Akahipuu; May 27, 1882
(Figures 9 and 10)

Site # and Comment:

…6 – Koanui's frame house. E.G. In Honokohau – nui.

7 – Aimakapaa Cape. Extremity. In Honokohau-nui.

11 – Beniamina's house (frame). N.G. In Aiopio. In Honokohau-nui.

12 – Beniamina's house No. 2. E.G. In Honokohau-nui.

18 – Lae o Palaha. Between Kaloko and Honokohau-nui.

19 – Awanuka Bay (Haven of rest) Retreat during storms in this dist.

20 – Kealiihelepo's (frame house). N.G. In Kaloko.

21 – Lae Maneo. From the "Maneo" fish in Kaloko.

22 – Kohanaiki Bay. By sea wall of fish pond.

23 – Kaloko-nui fish pond. Tang. S. end by Nuuanu's grass house.

24 – Wall between fish pond of Kaloko nui and iki.

25 – Kaloko iki fish pond. Tang. N. extremity.

Kaloko nui was originally a bay, shut off from the sea by a wall by Kamehameha 1st order.

26 – Kawaimaka's frame house. In Kohanaiki.

27 – Lae o Wawahiwaa. Rock cape. In Kohanaiki.

28 – Keoki Mao's grass house. In Ooma.

29 – Pahoehoe hill. Between Ooma and Kalaoa 5.

30 – Lae o Keahole. Extremity. In Kalaoa 5.

31 – Lae o Kukaenui. Resting place for boats.

32 – Makolea Bay.

33 – Lae o Unualoha.

34 – Pohaku Pelekane.

35 – Lae o Kahekaiao. Kahe-ka-iao – place of the "iao" which abound there. [Notebook 253:33,35]

…Keahole Bay.

Lae o Kalihi in Kalaoa 5.

Wawaloli Bay in Kalaoa 5.

Lae o Kekaaiki.

Limu Koko in Ooma 1.

Lae o Puhili in Kohanaiki.

Lae o Kealakehe in Kealakehe.

Hueu's frame house in Kalaoa 4, makai side of Gov't. Road.

Kuakahela's frame house in Kalaoa 5.

Protestant Church Steeple in Kalaoa 5.

Kama's frame house, N. gable in Ooma 1.

While taking sightings from Keāhole, Perryman prepared additional sketches of the landscape. One sketch on page 69 of the field book (Figure 11) depicts the view up the slope of Hualālai. Dated June 4, 1882, the sketch is of importance as it also depicts Kalaoa Village and church; the upper Government road; Kohanaiki Village; and two trails to the coast, one trail to Honokōhau, and the other near the Kaloko-Kohanaiki boundary. Use of these trails continued through the 1950s.

The other sketch on page 73 of the field book (dated June 8, 1882) depicts the coastline south from Keāhole, to an area beyond Keauhou (Figure 12). Of interest, we see only the near-shore "Trail" in the foreground, with no trail on the *kula* lands. Then a short distance south, a house is depicted on the shore, in the ʻOʻoma vicinity (identified as the house of Kama or Keoki Mao on Emerson's Register Maps). And a little further beyond (south) the house, two trails are indicated—presumably the *Alanui Aupuni* on the *kula* lands to ʻOʻoma, and the near shore trail, seen coming in from Honokōhau.

While surveying the uplands on Hualālai in August 1882, Perryman drew a sketch of the Keāhole-Honokōhauiki coastal lands. This sketch (Figure 13) from field Book No. 254 shows the reverse view of Figure 12. Noting again, that the only trail given at that time, was the near shore trail, running out of Honokōhau-Kaloko, Kohanaiki, ʻOʻoma and on to Keāhole.

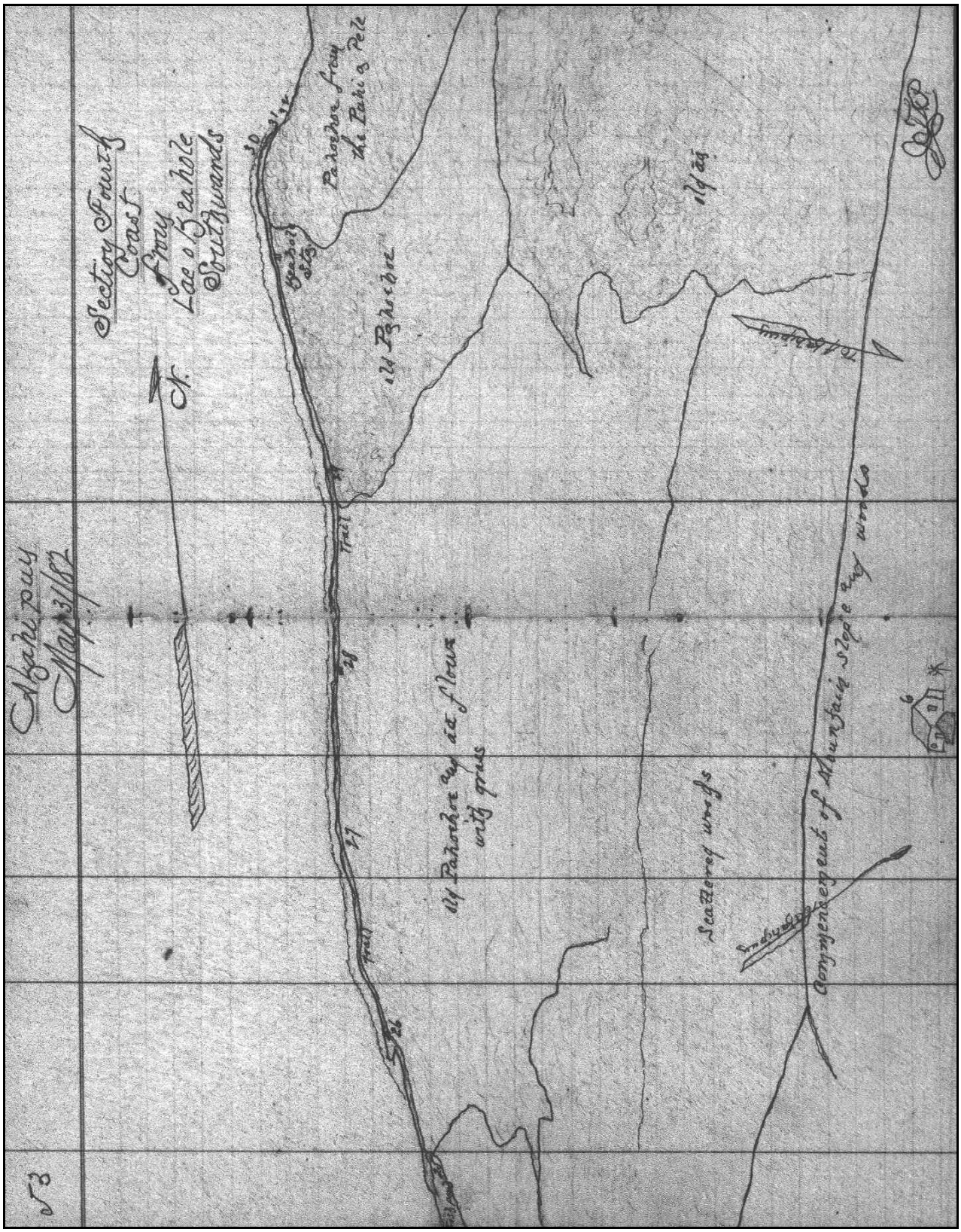


Figure 9. J. S. Emerson, field notebook map, Book 253:53 (State Survey Division).

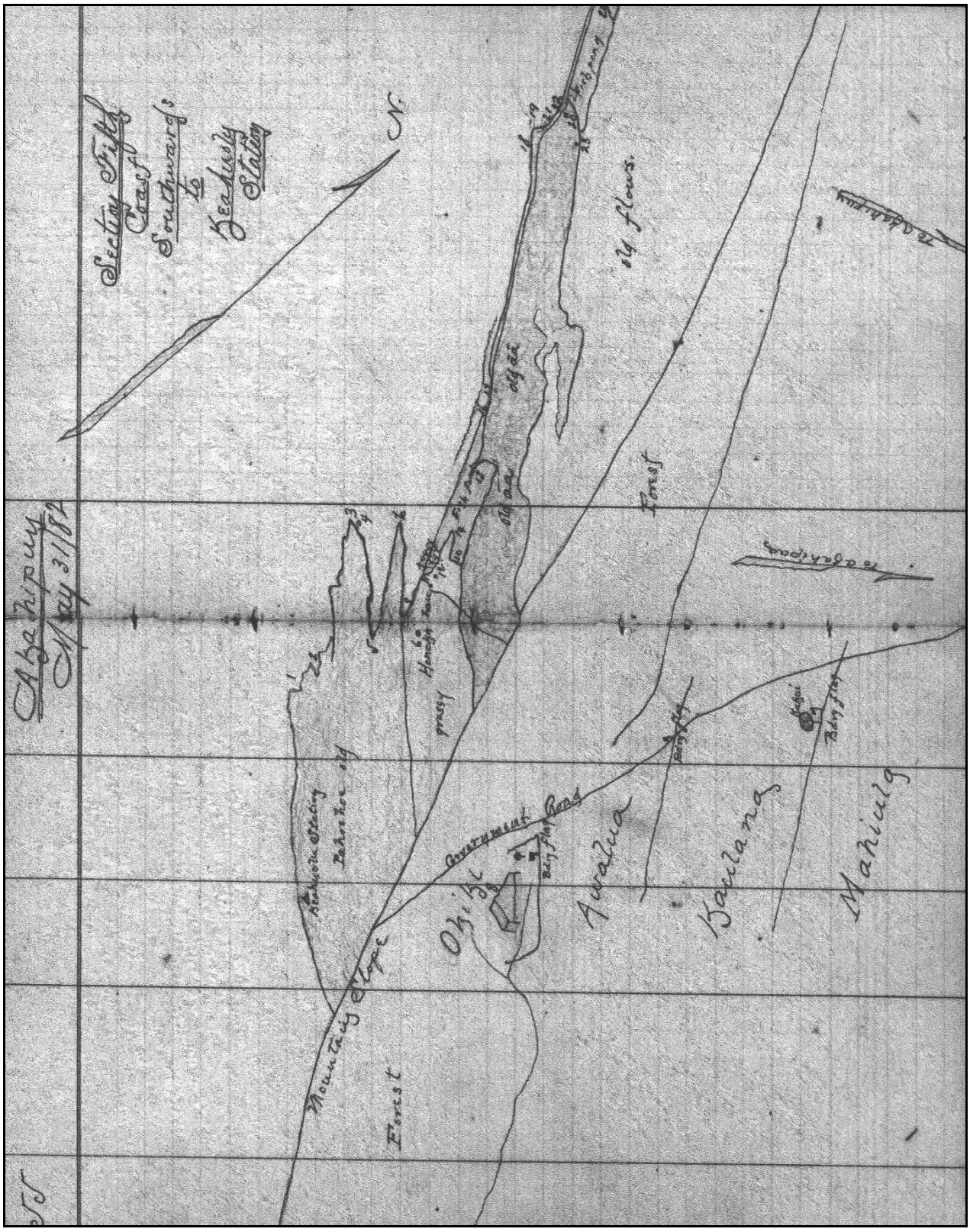


Figure 10. J. S. Emerson, field notebook map, Book 253:55 (State Survey Division).

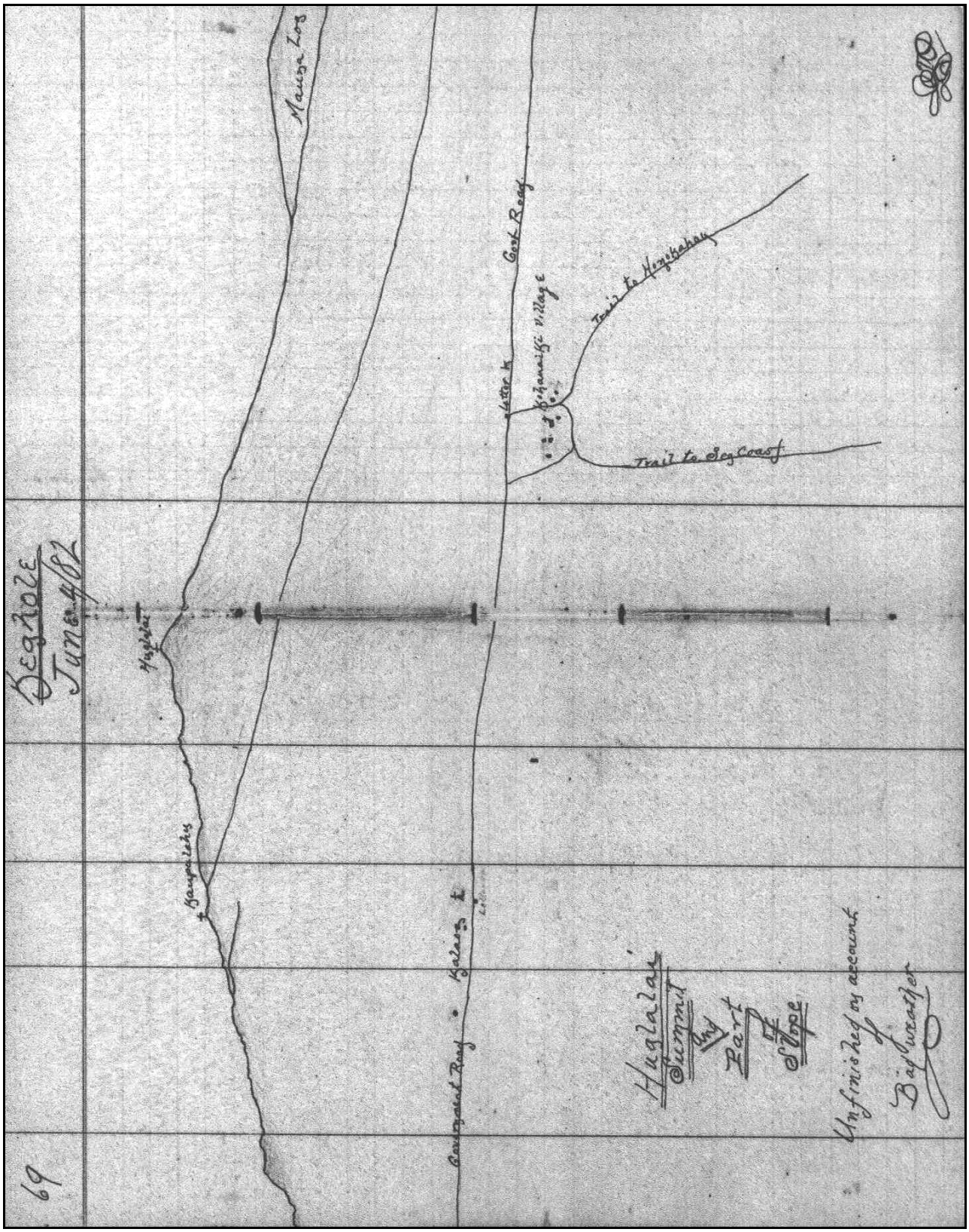


Figure 11. J. S. Emerson, field notebook map, Book 253:69 (State Survey Division).

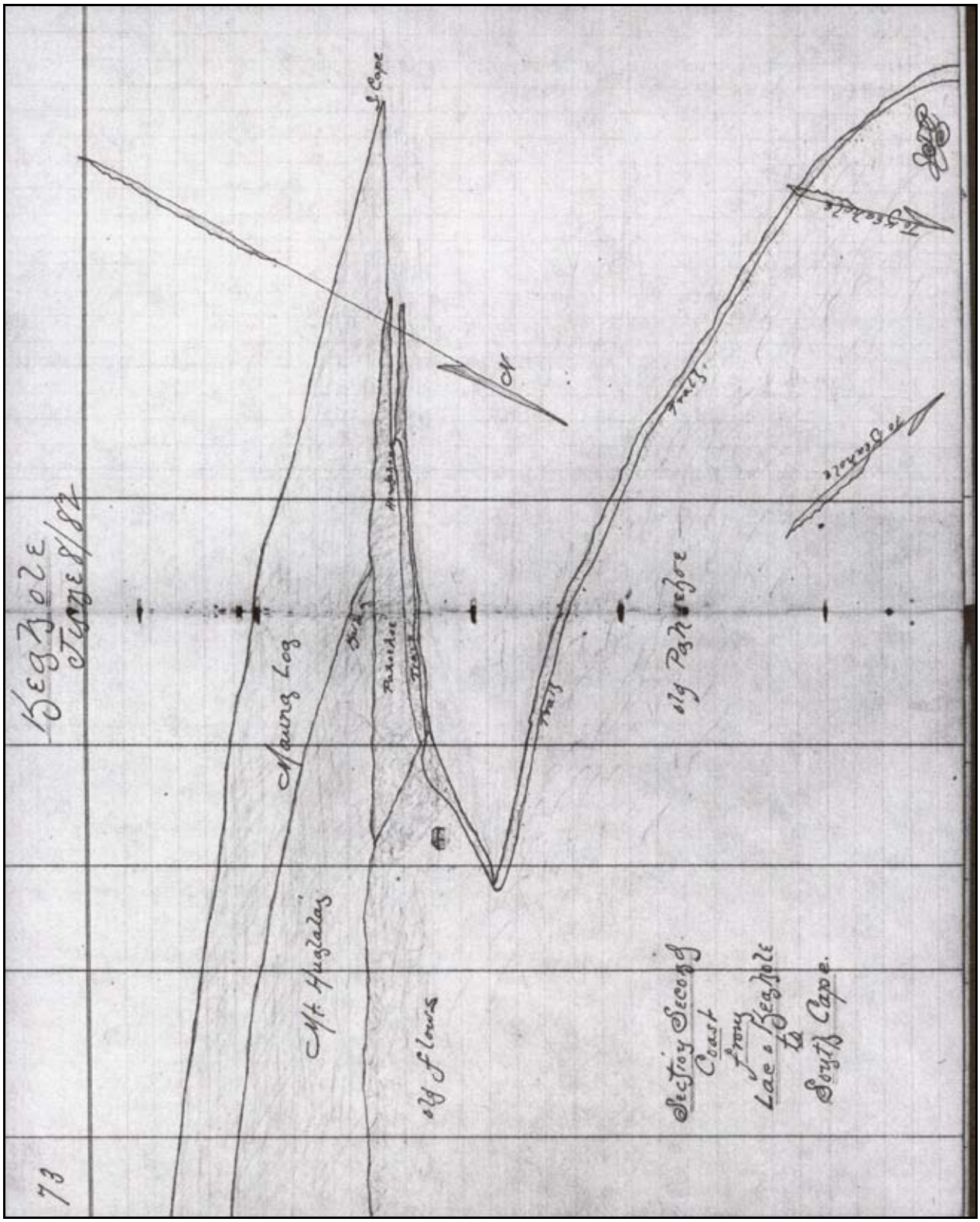


Figure 12. J. S. Emerson, field notebook map, Book 253:73 (State Survey Division).

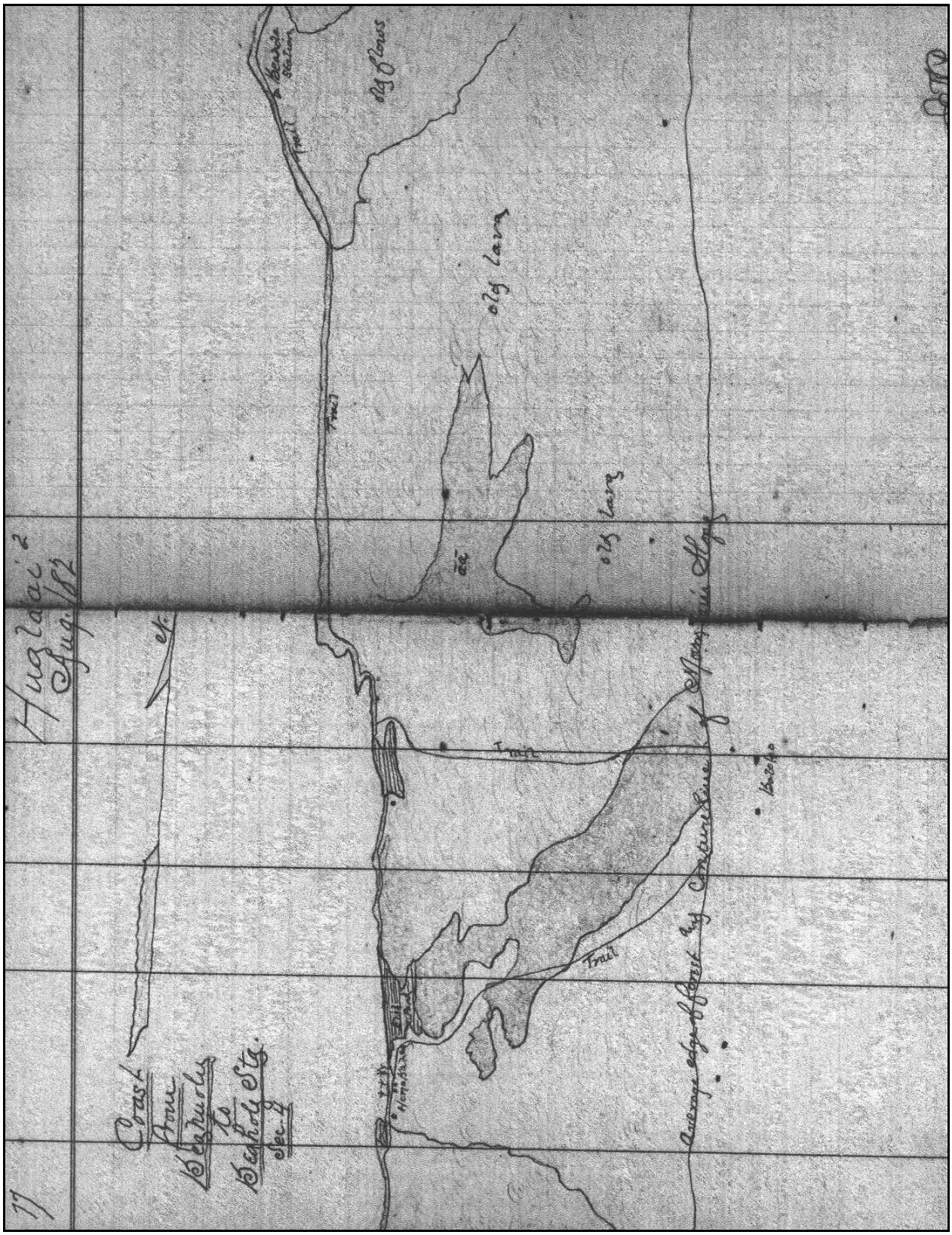


Figure 13. J. S. Emerson, field notebook map, Book 254:77 (State Survey Division).

While surveying the ‘O‘oma and vicinity homestead lots in 1888-1889, Emerson camped near Kama’s house in ‘O‘oma 1st. The following communications were sent by Emerson to W.D. Alexander, and tell us more about the people of the land, their beliefs, and commentary on then current events in the Kingdom. Of interest, we also find that J.W.H. Isaac Kihe, whose writing of traditions, and as a representative of the native families in the land application process—which have been cited extensively in this study—is also mentioned in Emerson’s narratives.

(Underlining, italics and brackets are inserted to draw attention to certain passages.)

> *April 8, 1888*
> …Our tent is pitched in Ooma on the *mauka* Govt. road at a convenient distance from Kama’s fine cistern which supplies us with the water we need. The pasturage is excellent and fire wood abundant. As I write 4:45 P.M. the thermometer is 71º, barometer 28.78. The entire sky is overcast with black storm clouds over the mountains. The rainy season comes late to Kona this year and has apparently just begun. We have had about three soaking rains with a good deal of cloud & drizzle. We are now having a gentle rain which gladdens the residents with water for their cisterns… We have set a large number of survey signals and identified many important corners of Gov’t. lands etc. from Puhiapele on the boundary of Kaupulehu to the boundary line of Kaloko. The natives welcome us and do a great deal to help the work along. Tomorrow I expect to go to Kuili station with a transit and make a few observations & reset the old signal... The Kamaainas tell me that Awakee belongs to the Gov’t. though I see it put down as LCA 10474 Namauu no Kekuanaoa.
>
> They also tell me that the heirs of Kanaina estate still receive rent for the Ahupuaa of Kaulana, though I have recorded as follows in my book, Kaulana ½ Gov’t. per civil Code 379, ½ J. Malo per Mahele Bk. Title not perfected; all Gov’t. Please examine into the facts about Kaulana and instruct me as to what I shall do about it. Kealoha Hopulaau rents it and if it is Gov’t. land the Gov’t. should receive the rent or sell it off as homesteads. It is a desirable piece of land, a part of it at least… [HSA – HGS DAGS 6, Box 2]
>
> *April 17, 1888*
> ...The work is being pushed rapidly and steadily forward. The natives render me most valuable assistance and find all the important corners for me as fast as I can locate them. It is hard getting around on account of the rocks & stones, to say nothing of trees etc., but there is a great deal of really fine land belonging to the Government, admirably adapted to coffee etc. The more I see of it the better it appears.
>
> As to Kaulana, if I hear nothing to the contrary from you, I will leave it all as Gov’t. land.
>
> Mr. McGuire [sic] of Kohala, the representative for that district, proposes to settle in Kona. He has bought Grant 1590, Kauhine, in Ooma, Kalaoa etc. and wants the Gov’t. to make good to him the amount taken from him by Grants 2972, Kaakau & Kama, and 3027, Hueu, which occupy portions of the same land granted to Kauhine. If his title is good, would it not be just to leave Kaakau & Kama as well as Hueu in possession of their lots where they have lived for over 20 years, and give McGuire an area in adjoining lands equal to that taken from him by these two grants.
>
> It is said that Chas. Achi has written to the natives that Grant 1590, Kauhine, has been cancelled. Will you learn the true state of the case and be so kind as to inform me… [HSA – HGS DAGS 6, box 2 Jan.-Apr. 1888]

In his field book notes, on May 1st, 1888, Emerson noted that he had placed the "Pulehu" station on the "ground by ahu, about 4 feet makai of Kama's goat pen, on the iwi aina between Kalaoa 5 and Ooma 1…" (J.S. Emerson Field Book 291:83).

In the same field book on May 19th, 1888, while surveying the area near the boundary of 'O'oma 1st and 2nd, at the 325 foot elevation, Emerson cited off of a station named "Kahokukahi." The point is "on the entrance of the cave, Kahokukahi… The above is the vertical entrance of a famous *ana kaua*, which extends for a long distance to the E. and to the W…" (J.S. Emerson Field Book 291:137). An "ana kaua" would be a place, where during times of war, people could hide and fortify themselves. Emerson's description indicates that the cave runs some distance *mauka* and *makai* of "Kahokukahi."

On May 23, 1888, Emerson surveyed Pūhili, the boundary between Kohanaiki and 'O'oma 2nd. He observed, "Large [mark] on solid pahoehoe, on bound. bet. Kohanaiki & Ooma, by the sea, near the end of a cape… Station mark, drill hole in stone, 9 ft. S. of the S. corner of an old "kahua hale" on white sand…" (J.S. Emerson Field Book 291:151).

Returning to his "old camp Ooma," in August 1888, Emerson submitted the following letter to Alexander:

> *August 25th, 1888*
> …I have to report that the very intricate and irregular remainder of Gov't. land situated in Kealakehe is cut up into homesteads, ready for the committee to estimate its values. The job has been made unusually long & tedious by the absurd arrangement of the old kuleanas scattered around at random. I have also run out the boundaries of Papaakoko, ready for fencing. Thursday P.M. I made my way through a heavy rain to this place and set up tent in the storm. It rained a good deal every day since and is raining now. In spite of the weather the work of cutting up Ooma 1st goes bravely on. I have a huge umbrella to camp under while it rains. I propose to finish up Ooma 1st & return to Honolulu by the next trip of the *Hall*.
>
> Kailua beach is the great rendezvous for men & asses from all parts of the country when the steamer arrives from Honolulu. It has in consequence become the natural place to tell and hear gossip & news. Here, the sand-lot orator, mounted on a packing box, can address the largest crowd. T.N. Simeona, who stole the church money, keeps the pound and takes care of the court house wanting to make a speech, repaired to the beach last Wednesday morning and is reported to have made a windy harangue to the effect that the King was hewa and that the Ministers were pono! Up to that time he had always been the contemptible too of the King's party and was loud in his denunciation of the Government. I explain this change in his talk by his wish to retain his Gov't. billets & his desire to avoid arrest as a rebel.
>
> A native man told me the other day (Wednesday) that the Cabinet was hewa in two things viz.
>
> 1st They taxed chickens, banana trees and many other things that had not been heretofore taxed.
>
> 2nd They arrested and sent to Molokai many who were not lepers. For these reasons many justified Wilcox for trying to out the ministers.
>
> There is a sturdy old native living at Kaloko named Kealiihelepo, whom I greatly respect. Said he to me "When King Kalakaua returned from his foreign trip he made a

> speech at Kailua and said that 'in foreign lands the foreign God was losing his power. His former worshippers were deserting him. That the old Hawaiian Gods were still mana and them he would worship.'" But said Kealiihelepo "The King was mistaken. Our old Gods were once mighty, but the coming of the foreigner with his Gods has robbed them of their strength. Therefore the King has made the mistake to oppose the God who is now in power, and Jehovah is opposing him. Hence the King's pilikia."
>
> You are entirely justified in calling Kona "that heathen district." [HSA – HGS DAGS 6, box 2 Jan.-Apr. 1888]

On October 14th 1888, Emerson wrote to Alexander, briefing him on conversations he was having with J.W.H. Isaac Kihe, his "encyclopedia," "the son of a famous sorcerer." Later, Emerson used many of the notes taken during his conversations with Kihe, to develop his paper on Hawaiian religion (Emerson 1892). J.W.H. Isaac Kihe, was the son of Kihe, who was the son of Kuapahoa, of Kaloko (notes of J.S. Emerson, September 25, 1915; in collection of the Hawaiian Historical Society). While at 'O'oma, Kihe described the various nature forms taken by the deceased, and their role in the spiritual practices. On October 14th Kihe named for him some of the gods called upon by those who practiced the Kahuna Kuni sorcery.

> *Ooma*
> *October 14, 1888*
> *J.S. Emerson; to W.D. Alexander:*
> …I have just been having a chat with a son of a famous sorcerer, with the following for a summary of what he said.
>
> There are four gods worshipped by murders and sorcerers viz:
>
> (1). Kui-a-Lua, the god of the Lua, Mokomoko, Haihai and other forms of violence.
>
> (2). Uli, the god of the Anaana, Kuni, Hoopiopio and Lawe Maunu.
>
> (3). Kalaipahoa, god of the Hoounauna, Hookomokomo and Hooleilei.
>
> (4). Hiiaka-i-ka-poli-o-Pele, the goddess of the Poi uhane, Apo leo, Pahiuhiu and Hoonoho uhane… [J.S. Emerson, in collection of the Hawaiian Historical Society]

Trails and Roads of Kekaha (Governmental Communications)

Alahele (trails and byways) and *alaloa* (regional thoroughfares) are an integral part of the cultural landscape of Hawai'i. The *alahele* provided access for local and regional travel, subsistence activities, cultural and religious purposes, and for communication between extended families and communities. Trails were, and still remain important features of the cultural landscape.

Traditional and historical accounts (cited in this study) describe at least two traditional trails that were of regional importance which pass through the lands of 'O'oma. One trail is the *alaloa*—parts of which were modified in the 1840s and later, into what is now called the *Alanui Aupuni* (Government Road) or Māmalahoa Trail or King's Highway—that crosses the *makai* (near shore) lands, linking royal centers, coastal communities, and resources together. The other major thoroughfare of this region is "*Kealaehu*" (The path of Ehu), which passes through the uplands, generally a little above the *mauka* Government Road or old Māmalahoa Highway, out to the 'Akāhipu'u vicinity, and then cuts down to Kīholo in Pu'u Wa'awa'a. From Kīholo, the *makai alaloa* and Kealaehu join together as the *Alanui Aupuni,* and into Kohala, passing through Kawaihae and beyond. The *mauka* route provided travelers with a zone for cooler traveling, and access to inland communities and resources. It also allowed for more direct travel between the extremities of North and South Kona (cf. Malo 1951; I'i 1959; Kamakau 1961; Ellis 1963; and *Māhele* and Boundary Commission Testimonies).

In addition to the *alahele* and *alaloa*, running laterally with the shore, there are another set of trails that run from the shore to the uplands. By nature of traditional land use and residency practices, every *ahupua'a* also included one or more *mauka-makai* trail. In native terminology, these trails were generally known as—*ala pi'i uka* or *ala pi'i mauna* (trails that ascend to the uplands or mountain). Some of these trails are described in native accounts and oral history interviews cited in this study.

Along the trails of the Kekaha region of which 'O'oma is a part, are found a wide variety of cultural resources, including, but not limited to residences (both permanent and temporary), enclosures and exclosures, wall alignments, agricultural complexes, resting places, resource collection sites, ceremonial features, *ilina* (burial sites), petroglyphs, subsidiary trails, and other sites of significance to the families who once lived in the vicinity of the trails. The trails themselves also exhibit a variety of construction methods, generally determined by the environmental zone and natural topography of the land. "Ancient" trail construction methods included the making of worn paths on *pāhoehoe* or *'a'ā* lava surfaces, curbstone and coral-cobble lined trails, or cobble stepping stone pavements, and trails across sandy shores and dry rocky soils.

Following the early nineteenth century, western contact brought about changes in the methods of travel (horses and other hoofed animals were introduced). By the mid-nineteenth century, wheeled carts were also being used on some of the trails. In the Kona region portions of both near shore and upland *ala hele-ala loa* were realigned (straightened out), widened, and smoothed over, while other sections were simply abandoned for newer more direct routes. In establishing modified trail—and early road-systems—portions of the routes were moved far enough inland so as to make a straight route, thus, taking travel away from the shoreline.

It was not until 1847, that detailed communications regarding road construction on Hawai'i began to be written and preserved. It was also at that time that the ancient trail system began to be modified and the alignments became a part of a system of "roads" called the "*Alanui Aupuni*" or Government Roads. Work on the roads was funded in part by government appropriations, and through the labor or financial contributions of area residents and prisoners working off penalties (see communications below). Where the *Alanui Aupuni* crosses the lands of 'O'oma, the alignment includes several construction methods, such as being lined with curbstones; elevated; and with stone filled "bridges" in areas that level out the contour of the roadway.

The following letters provide readers with a historical overview of the *Alanui Aupuni*, and travel through 'O'oma and the Kekaha region. Of particular interest to the lands of 'O'oma, are those communications addressing the lower Government Road which passes through the proposed development area.

(Underlining, italics, and square brackets have been added.)

> *June 26, 1847*
> *George L. Kapeau to Keoni Ana*
> I have received your instructions, that I should explain to you about the *alaloa* (roadways), *alahaka* (bridges), lighthouses, markets, and animal pounds. I have not yet done all of these things. I have thought about where the *alanui heleloa* (highways) should be made, from Kailua to Kaawaloa and <u>from Kailua to Ooma, where our King was cared for</u> [7], and then afterwards around the island. It will be a thing of great value, for the roads to be completed. Please instruct me which is the

7 For the first five years of his life (till ca. 1818), Kauikeaouli was raised at 'O'oma, by Ka-iki-o-'ewa and Keawe-a-mahi *mā* (see Kamakau 1961; and this study).

proper thing for me to do about the *alaloa*, *alahaka*, and the laying out of the *alaloa*… [HSA – Interior Department Misc., Box 142; Kepā Maly, translator)

August 13, 1847
Governor of Hawaii, George L. Kapeau; to
Premier and Minister of Interior, Keoni Ana
Aloha oe e ka mea Hanohano –
I have a few questions which I wish to ask you. Will the police officers be required to pay, when they do not attend the Tuesday (*Poalua*) labor days? How about parents who have several children? What about school teachers and school agents? Are they not required to work like all other people when there is Government work on the roads and highways?

I believe that school agents, school teachers and parents who have several children, should only go and work on the weeks of the public, and not on the *konohiki* days…

…The roads from Kailua and down the pali of Kealakekua, and from Kailua to Honokohau, Kaloko, Ooma, at the places that were told our King, and from thence to Kaelehuluhulu [at Kaulana in Kekaha], are now being surveyed. When I find a suitable day, I will go to Napoopoo immediately, to confer with the old timers of that place, in order to decide upon the proper place to build the highway from Napoopoo to Honaunau, and Kauhako, and thence continue on to meet the road from Kau. The road is close to the shore of Kapalilua…

The width of the highways around Hawaii, is only one fathom, but, where it is suitable to widen where there is plenty of dirt, two fathoms and over would be all right… If the roads are put into proper condition, there are a lot of places for the strangers to visit when they come here. The Kilauea volcano, and the mountains of Maunaloa, Maunakea, Hualalai.

There is only one trouble to prevent the building of a highway all around, it is the steep gulches at Waipio and Pololu, but this place can be left to the very last… [HSA – Roads, Hawaii]

March 29, 1848
Governor Kapeau; to Minister of the Interior, Keoni Ana:
[Acknowledging receipt of communication and answering questions regarding construction methods used in building the roads.]

…I do not know just what amount of work has been done, but, I can only let you know what has come under my notice.

The highway has been laid from Kailua to Kaloko, and running to the North West, about four miles long, but it is not completely finished with dirt. The place laid with dirt and in good condition is only 310 fathoms.

The highway from Kealakekua to Honaunau has been laid, but is not all finished, and are only small sections… [HSA – Roads, Hawaii]

July 9, 1873
R.A. Lyman; to
E.O. Hall, Minister of the Interior.

Notifies Minister that *the road from Kiholo to Kailua needs repairing*. [HSA – Interior Department – Land Files]

August 14, 1873
R.A. Lyman; to
E.O. Hall, Minister of the Interior:
I have just reached here [Kawaihae] from Kona. I have seen most of the roads in N. Kona, and they are being improved near where the people live. If there is any money to be expended on the roads in N. Kona, I would say that the place where it is most needed is from Kiholo to Makalawena, or the Notch on Hualalai.

This is the main road around the island and is in very bad condition. Hardly anyone lives there, and there are several miles of road across the lava there, that can only be worked by hiring men to do it. There is also a road across a strip of Aa a mile & a half or 2 in length in the south end of S. Kohala next to the boundary of N. Kona, that needs working, and then the road from here [Kawaihae] to Kona will be quite passable… [HSA – Roads, Hawaii]

November 4, 1880
J.W. Smith, Road Supervisor, North Kona; to
A.P. Carter, Minister of the Interior:
…Heretofore I have been paying one dollar per day, but few natives will work for that, they want $1.50 per day. Thus far I have refused to pay more than $1.00 and have been getting men for that sum.

<u>The most urgent repairs are needed on the main road from Kaupulehu to Kiholo, and north of Kiholo to the Kohala boundary, a distance of about 20 miles</u>... [HSA – Roads, Hawaii]

Kailua Nov. 19th, 1880
Geo. McDougall; to
A.P. Carter, Minister of the Interior —
…I noticed among the appropriation passed by the last Legislature, an item of $5000 for Roads in North Kona Hawaii — as I am very much interested about roads in this neighbourhood, I take the liberty to express my opinions what is wanted to put the roads in good repair and give the most satisfaction to all concerned.

The Road from Kailua going north for about eight miles to where it joins the upper Road, has never been made, it is only a mule track winding through the lava. It could cost to make it a good cart road, fully two thousand dollars. And from Kailua to where it joins the South Kona road, about 12 miles was made by Gov. Adams, and is in pretty much the same state as he left it, only a little worse of the ware of 20 years or more, it could cost to make it in good repair about 15 hundred dollars. Then we could have 20 miles of good road… [HSA – Interior Department Letters]

March 21st, 1885
C.N. Arnold, Road Superintendent-in-Chief, Hawaii; to
Charles Gulick, Minister of Interior:
…In accordance with your instructions I beg to hand you the following list of names as being those I would select for Supervisors in the different Road Districts under my charge:

… Judge J.K. Hoapili, North Kona District…

Hoping these parties may meet with your approval… [HSA – Roads, Hawaii]

March 1886
Petition to Charles Gulick, Minister of the Interior:
[Signed by 53 residents of North Kona, asking that the appropriated funds be expended for the Kailua-Kohanaiki Road]:

We the people whose names are below, subjects of the King, residing in North Kona, Island of Hawaii:

The funds have been appropriated by the Legislature for the opening of the road from Kailua to Kohanaiki, therefore, we humbly request that the road be made there. The length of this road being thought of is about five miles more or less. The road that is there at the present time is not fit for either man nor beast.

Your people have confidence that as so explained, you will kindly grant our request, and end this trouble in our District…

[those signing included names of individuals known to have ties to the ʻOʻoma vicinity]:
…J. Kamaka, Kuakahela, Kahulanui, & Palakiko… [HSA – Roads Hawaii; Maly, translator]

March 9th, 1887
C.N. Arnold, Road Superintendent-in-Chief, Hawaii; to
Chas. Gulick, Minister of the Interior:
[Arnold provides documentation of the early native trail from Kailua to the upper Kohanaiki region, and its' ongoing use at the time. He also notes that McDougall (resident at Honokōhau) and others are presently in the business of dairy ranching]:

…The enclosed petition [cited above] has just come to hand from North Kona. The petitioners are mistaken when they say that any special appropriation has been made for this road as there has never been a Government road in this part of the District. There is however an old native trail which has always been used as a short cut, from the lower part of the district between Keahou [sic] and Kailua, by persons who were traveling to Kawaihae and Waimea. The opening of a good road here would be a great convenience to the traveling public and also a great accommodation to a great many people who live on, or nearly on the line of it. I may mention among the number, Messrs. McDougall and Clark who are engaged in dairy ranching near the head of the proposed line. I may also mention that I, with Mr. Smith, made a preliminary survey of it, at the request of His Majesty the King, who is also interested in the opening of this road, as it opens up all of His Kailua lands for settlement. I regard the road as necessary for the above reasons.

From the preliminary survey made, I estimate that a wagon road 12 feet wide will cost from Kailua to the *mauka* Govt. road at Kohanaiki $6000. The length of the road is 5 ¾ miles. The elevation of highest point (*mauka* Road) is 1600 feet above tide at Kailua. Mr. Smith Supt. of Public Works has all the notes of the survey, and can give you full information in regard to this matter… [HSA – Roads, Hawaii]

July 14th, 1887
C.N. Arnold, Road Superintendent-in-Chief, Hawaii; to
L.A. Thurston, Minister of the Interior:

…In obedience to your request I beg to hand you the following list of the District Supervisors under my jurisdiction:

…North Kona – Hon. J.K. Nahale; Native… [HSA – Roads Hawaii]

March 8, 1888
J. Kaelemkule; Supervisor, North Kona Road Board; to
L.A. Thurston, Minister of the Interior.
[Ka‘elemakule provides Thurston with an overview of work on the roads of North Kona, and describes the Government roads (*Ala nui Aupuni* or *Ala loa*) which pass through the Kekaha region]:

The road that runs from Kailua to Kohanaiki, on the north of Kailua, perhaps 6 miles. It is covered with aa stone, and is perhaps one of the worst roads here. The Road Board of North Kona has appropriated $200 for work in the worst areas, and that work has been undertaken and the road improved. The work continues at this time. This is one of the important roads of this district, and it is one of the first roads that should be worked on.

The government road or ala loa from upland Kainaliu (that is the boundary between this district of South Kona) [Kealaehu], runs straight down to Kiholo and reaches the boundary of the district adjoining South Kohala, its length is 20 and 30 miles. With a troubled heart I explain to your Excellency that from the place called Kapalaoa next to South Kohala until Kiholo – this is a very bad section of about 8 miles; This place is always damaged by the animals of the people who travel along this road. The pahoehoe to the north of Kiholo called Ke A. hou, is a place that it is justified to work quickly without waiting. Schedule A, attached, will tell you what is proposed to care for these bad places…

Schedule A: [Appropriations needed]
The road from Kailua to Kohanaiki, and then joining with the inland Government Road – $500.

The upland Road from Kainaliu to the boundary adjoining S. Kohala – $1,500.00. [HSA – Roads Hawaii; Kepā Maly, translator]

September 30, 1889
Thos. Aiu, Secretary, North Kona Road Board (for J. Kaelemakule); to
L.A. Thurston, Minister of the Interior.
[Provides Thurston with an overview of work on the roads of North Kona, and identifies individuals who are responsible for road maintenance (cantoniers) in various portions of the district; several of the individuals named were also old residents and applicants for Homestead lots. Of interest, Kaelemakule’s report indicates that maintenance of the Alanui Aupuni which crossed into the kula lands of ‘O‘oma, had not been assigned to anyone. (see report of Dec. 22, 1890)]:

1. In that section of the road which proceeds from Kailua near the shore to Kohanaiki, Mano is the cantonier.
2. That section of the road from Kukuiooohiwai to Keahuolono, Paiwa is the cantonier…
3. That section of road from Kailua to the shore of Honokohau, Keaweiwi is the cantonier …

4. That section of road from Kukuioohiwai to Lanihau along the upland road, Isaac Kihe is the caretaker…

The work done along these sections is the cutting of brush – guava, lantana and such – which trouble the road, and the removal of bothersome stones… [HSA – Roads Hawaii; Kepā Maly, translator]

December 22, 1890
J. Kaelemkule; Supervisor, North Kona Road Board; to
C.N. Spencer, Minister of the Interior
[Reports on the cantoniers assigned to road work in various sections of North Kona. As in 1889, apparently no one was assigned to the lower Alanui Aupuni through the ʻOʻoma kula lands. Though Kaelemakule did include the road section on the land, extending through Kalaoa, on his attached diagram]:

…I forward to you the list of names of the cantoniers who have been hired to work on the roads of this district, totaling 15 sections; showing the alignment of the road and the length of each of the sections. The monthly pay is $4.00 per month, at one day of work each week. The board wanted to increase it to two days a week, but if that was done, there would not have been enough money as our road tax is only $700.00 for this district… You will receive here the diagram of the roads of North Kona. [HSA – Roads Hawaii; Kepā Maly, translator] (Figure 14)

Twentieth Century Travel in ʻOʻoma and Neighboring lands of Kekaha

Kamaʻāina who have participated in oral history interviews (Rechtman and Maly 2003), describe on-going travel between the uplands and coastal lands of ʻOʻoma and other *ahupuaʻa* in Kekaha. The primary method of travel between 1900 and 1947, was by foot or on horse or donkey, and those who traveled the land, were generally residents of the ʻOʻoma, Kalaoa, Kohanaiki Homesteads and other lands in the immediate vicinity. The old ʻOʻoma Homestead road that borders the current project area to the north, was used during this time. After World War II, retired military vehicles became available to the public, after that time, the *Alanui Aupuni* and some of the smaller trails along the shore were modified for vehicular traffic.

The primary routes of travel through the 1960s, descended from upland Kohanaiki and Kaloko, or came out of Kailua. In the 1950s, Huʻehuʻe Ranch bulldozed a jeep road to the shore at Kaloko. The ranch, and some individuals who went to the shore either as a part of their ranch duties, or for leisure fishing along the coast, used this jeep road. The *Alanui Aupuni* was modified from Kailua, to at least as far as Honokōhau and Kaloko, and remained in use through the 1970s. It was not until the Queen Kaʻahumanu Highway was opened (ca. 1973) that travel across the *kula kai* (shoreward plains) of ʻOʻoma was once again made possible for the general public.

Summary of Oral-Historical Information

In Rechtman and Maly (2003:Volume II) elder *kamaʻāina* of the Kekaha region, tell much the same story as that described in the communications from the period of homestead development, and in the accounts given by J. Puuokupa in 1875 and J.W.H. Isaac Kihe in 1924. By the late 1800s, only a few permanent residence remained along the ʻOʻoma (and Kekaha) coastline. Primary residences were in the uplands, in the vicinity of the old Māmalahoa Highway. In that region, people were able to cultivate a wide range of crops—both native staples and new introductions—with which to sustain themselves, and in some case even as cash crops.

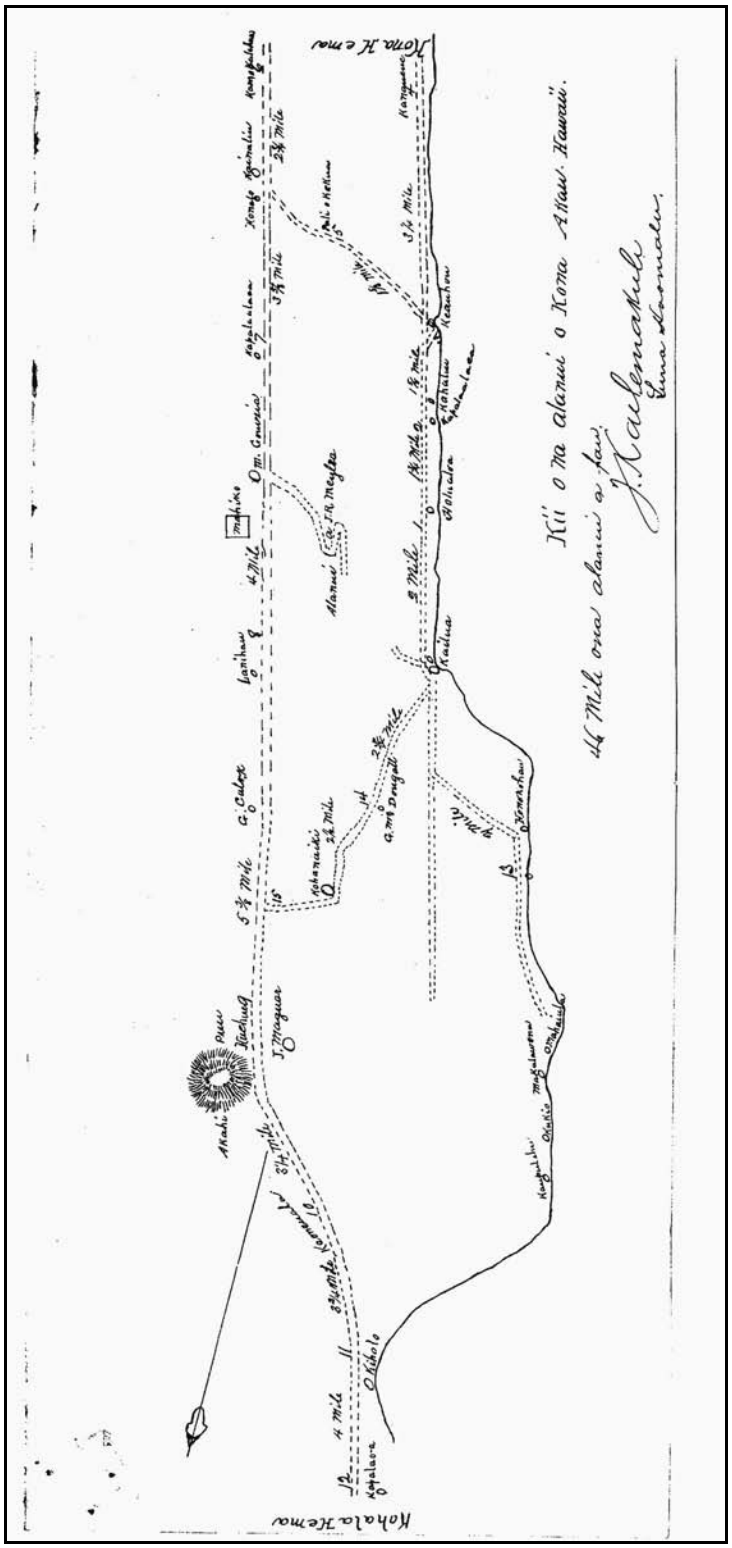


Figure 14. *Kii o na alanui o Kona Akau* (diagram of the roads of North Kona); J. Kaelemakule Sr., Road Supervisor (HSA – Roads, Hawaii; December 22, 1890).

By the middle to late 1800s, the *kula* lands, from around the 900-foot elevation to shore, were primarily used for goat, cattle, and donkey pasturage. The families of the uplands regularly traveled to the coast via trails. This was usually done to go fishing, or to round up cattle, goats, or donkeys. During periods of extreme dry weather, when water resources dried up, the families relied on the brackish water ponds in the near-shore lands. In ʻOʻoma, near Wawaloli, the area marked on J.S. Emerson's Register Maps 1280 (see Figure 6), as Kama's or Keoki Mao's house, families still took shelter, and drank the water from the spring, through the 1940s. Such was the case at various locations of the coast, between Kohanaiki, ʻOʻoma, Kalaoa, Hoʻonā, Kaulana, and lands further north to Kapalaoa.

An additional oral interview was conducted with *kamaʻāina* Elizabeth Maluihi Ako Lee (Auntie Elizabeth) for the Clark and Rechtman (2005) study of TMK:3-7-3-7:38. Auntie Elizabeth was born in 1929 and was raised by her *hanai* family, Kahananui, in upland ʻOʻoma. As a child she walked the upland trails and cultivated sweet potatoes on her family land on a parcel located to the southwest of the current study parcels. Her family also owned the parcel immediately south of the current project area, which they used to graze cattle. Auntie Elizabeth recalled a Korean man living on that parcel during the 1930s. The man had a house that burned down ca. 1939 when his *akolehau* still exploded. Auntie Elizabeth did not recall any specific information that related to the current study parcel.

AHUPUAʻA SETTLEMENT PATTERNS AND CURRENT SURVEY EXPECTATIONS

Archaeological studies undertaken within the greater North Kona District indicate that initial prehistoric settlement was concentrated primarily along the coast (Cordy 1981, Cordy et al.1991). As coastal populations increased, so did the development of agricultural fields in the upland areas, reaching their greatest extent in the late 1700s. As the fields expanded so did native populations in the upland resource areas. By the sixteenth century temporary and permanent habitations were found at higher elevations within the *ʻapaʻa* zone (Barrera 1991).

In Historic times, with the shift to a market economy and a western style of land ownership in Hawaiʻi, populations shifted from the coast to the upland areas. Much of the old style of agriculture was abandoned in favor of coffee farms and cattle ranches, which have had a significant impact on the Precontact archaeological record.

Based on the Historical information collected by Rechtman and Maly (2003) and the findings of the archaeological inventory surveys previously conducted nearby the current study parcel (Clark and Rechtman 2005; Haun and Henry 2003) a fairly detailed set of project area expectations can be arrived at. Precontact use of the project area is likely to be marked by numerous and diverse agricultural features (including modified outcrops, mounds, enclosures, terraces and perhaps *kuaiwi*) and associated habitation sites. The habitation sites could include platforms, enclosures, modified outcrops, terraces, pavements, or lava tubes. A network of trails would have connected these upland agricultural and habitation areas to each other and to the coast and to more *mauka* resource areas. Remnants of this trail network may be present within the current project area. If burials are encountered, they are expected to be found within platforms, lava tubes, or concealed lava blisters.

Historic use of the current study parcels is likely to be marked by ranching and habitation related sites. Historic feature types could include core-filled walls, enclosures, roads, or house pads. Historic sites that are present on the larger of the two study parcels may have been constructed by E. M. Paiwa who purchased the parcel as Grant 4273 (Lot 56 of the ʻOʻoma Homesteads) in 1898. The smaller parcel was a portion of Grant 1590 to Kauhini (Lot 43 of the ʻOʻoma Homesteads) in 1855 that was never perfected.

FIELDWORK

Fieldwork for the current inventory survey was directed by Robert B. Rechtman, Ph.D.. All fieldwork was conducted between April 13-27, 2005 by J. David Nelson, B.A., Michael E. Rivera, B.A., Mark J. Winburn B.A., Olivier M. Bautista, B.A., and Christopher S. Hand, B.A., with the additional help of Matthew R. Clark, B.A. on April 20-22, 2005. Fieldworkers were in the field eight hours a day Monday through Friday during these dates.

Methods

During the intensive inventory survey of the study area, the entire parcel was subject to north/south pedestrian transects with fieldworkers spaced at 10-meter intervals. When archaeological resources were encountered, they were plotted on a map of the study parcel using Garmin 76s handheld GPS technology (with sub five-meter accuracy), and then (when appropriate) cleared of vegetation, mapped in detail using tape and compass, photographed, and described using standardized site record forms. Sites were also evaluated at that time for the need of subsurface testing.

All test units (TUs) excavated during the current project measured either 1 x 1 meter or 1 x 2 meters. Excavation of the test units proceeded following natural stratigraphic layers. Where applicable, the layers were excavated in arbitrary 10-centimeter levels. All recovered soil matrix was passed through 1/4-inch mesh screen, and all recovered cultural material was remanded to the laboratory for detailed analysis. Level record forms, filled out for each level of each layer in each unit, were used to record soil descriptions, Munsell color notations, cultural constituents collected, and a general description of the level. Upon completion of a unit, photographs were taken, a profile drawing was prepared, and the unit was back-filled as close to its original specifications as possible.

Recovered cultural material was processed at the Rechtman Consulting, LLC laboratory facility and is currently curated at that location as well. To begin the laboratory process the recovered cultural material was first washed and then separated, by level within individual units, into material classes and separated by species or type (to the lowest taxonomic level possible). An accession number (ACC #) was then sequentially assigned to each group of related items; and the material encompassed by an individual accession number was quantified by the number of identified specimens (NISP), weighed, and when applicable considered for the minimum number of individuals (MNI) present. The findings of the inventory survey along with detailed descriptions of the encountered archaeological resources and the results of subsurface testing are presented below.

Findings

As a result of the current inventory survey one previously recorded archaeological site (Site 23834) and eighteen newly recorded sites (Sites 24759 to 24776) were identified on the subject parcels (Table 1). The recorded sites include seven Historic walls (Sites 23834, 24759, 24769, 24770, 24771, 24772, and 24774), one Historic enclosure (Site 24760), a probable Historic roadway (Site 24775), two trail segments (Sites 24761 and 24763), a modified outcrop used for Precontact habitation purposes (Site 24762), a terrace used for Precontact habitation purposes (Site 24764), three Precontact lava blister habitations (Sites 24765, 24766, and 24767), one human burial within a lava blister (Site 24768), a Precontact habitation complex containing five features (Site 24773), and a large agricultural complex that spans the entire larger parcel of the current project area (Site 24776). Sixteen 1 x 1 meter test units were excavated at four of the recorded sites (Sites 24762, 24764, 24773, and 24776). All of the recorded archaeological sites are described in detail below and their locations are shown in Figure 15.

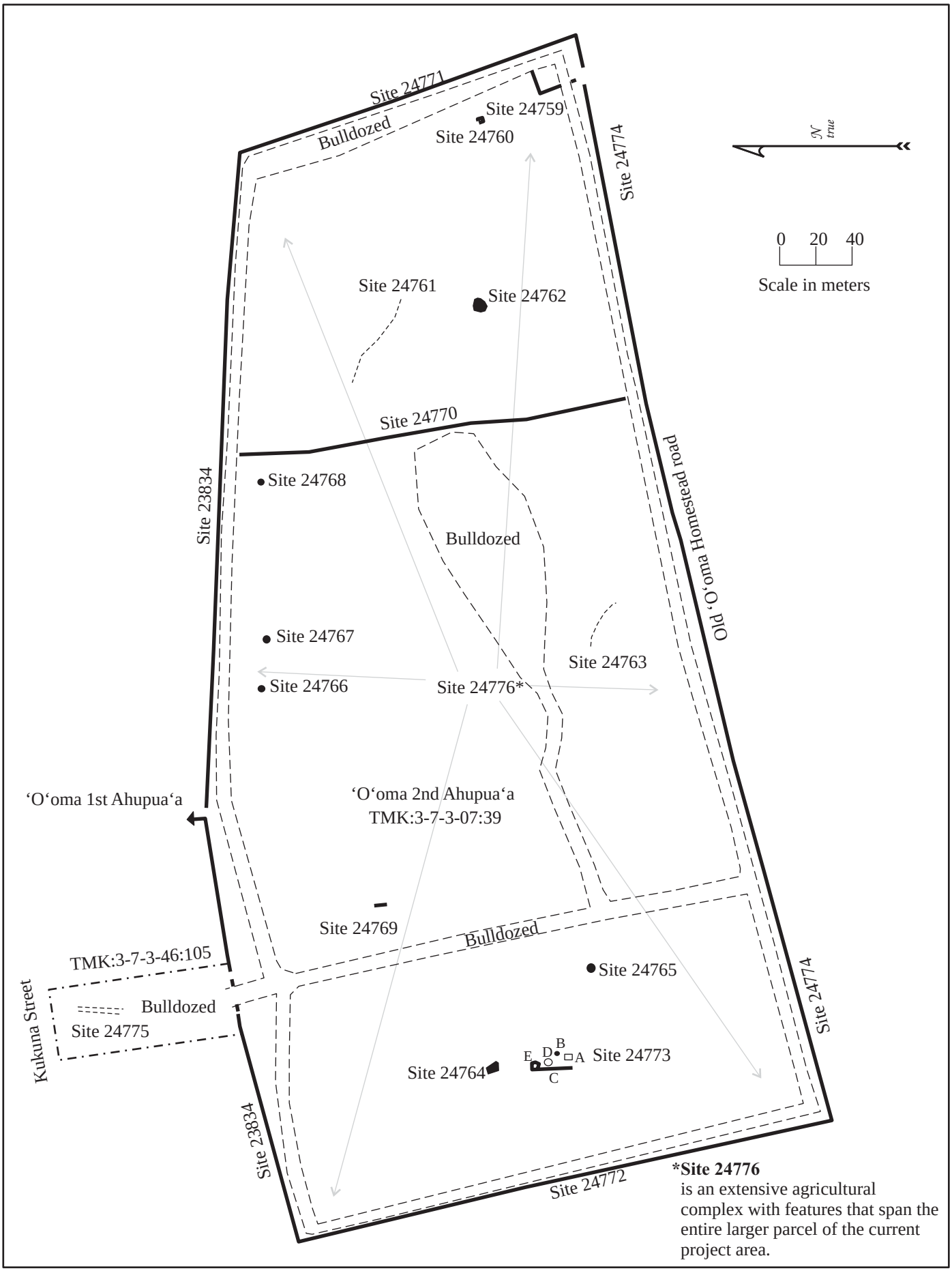


Figure 15. Project area plan view.

Table 1. Archaeological sites recorded during the current inventory survey.

SIHP No.	*Formal Type*	*Functional Type*	*Age*
23834	Wall	Boundary	Historic
24759	Wall	Ranching	Historic
24760	Enclosure	Homesteading	Historic
24761	Trail	Trail	Precontact
24762	Modified outcrop	Habitation	Precontact
24763	Trail	Trail	Precontact
24764	Terrace	Habitation	Precontact
24765	Lava blister	Habitation	Precontact
24766	Lava blister	Habitation	Precontact
24767	Lava blister	Habitation	Precontact
24768	Lava blister	Burial/Habitation	Precontact
24769	Wall segment	Ranching	Historic
24770	Wall	Ranching	Historic
24771	Wall	Boundary	Historic
24772	Wall	Boundary	Historic
24773	Complex	Habitation	Precontact
24774	Wall	Boundary	Historic
24775	Roadway	Road	Historic/modern
24776	Complex	Agriculture	Precontact

SIHP Site 23834

Site 23834 is a core-filled wall that runs along the northern boundary of the current study parcel (see Figure 15). This site was originally recorded by Haun and Henry (2003:50) as the southern boundary wall of a parcel that is located adjacent to and east of the current study parcel. Beginning in the northeastern corner of the current study parcel, at the southern end of Site 24771 (the eastern boundary wall), Site 23834 runs east/west along the southern property boundary for 360 meters to a 10-meter break in the wall where a second wall (Site 22742) runs north away from the current project area along the western boundary of the Haun and Henry (2003) project area. Site 23834 continues along the southern property boundary for an additional 250 meters beyond the break to the northwestern corner of the parcel. A 20-meter break caused by a bulldozer is present in this section of the wall along the southern edge of Parcel 105. Site 23834 continues *makai* beyond the current project area for an undetermined distance. A bulldozed road parallels this wall to south for its entire length. The wall is constructed of stacked *pāhoehoe* cobbles. Intact sections of Site 23834 average 1.0 meter tall by 0.8 meters wide (Figure 16), but collapsed sections are more numerous than intact sections.

This Historic boundary wall was likely built during at least two separate construction episodes. The western 250 meters of the wall may have been constructed first, perhaps by Kauhini, who purchased Grant 1590 (an adjoining parcel to the northwest of the larger parcel of the current project area that includes Parcel 105) in 1855. The eastern section of the wall that was previously recorded by Haun and Henry (2003) may have been constructed by either S. Kane, who purchased Grant 3819 (Lot 55 of the ʻOʻoma Homesteads; an adjoining parcel to the northeast of the current project area) in 1895, or by E. M. Paiwa who purchased the larger parcel of the current project area as Grant 4273 (Lot 56 of the ʻOʻoma Homesteads) in 1898.


Figure 16. SIHP Site 23834, view to north near eastern end.

SIHP Site 24759

Site 24759 is an L-shaped wall segment located in the extreme southeastern corner of the current project area (see Figure 15). The wall is core-filled and constructed of stacked *pāhoehoe* cobbles (Figure 17). Beginning near the bulldozer break in Site 24774 (the southern boundary wall), the wall runs north for 22 meters. It then turns and runs east for an additional 12 meters, terminating at a bulldozed roadway 10 meters west of Site 24771 (the eastern boundary wall). It appears that Site 24759, utilizing the southern and eastern boundary walls, formerly created a roughly square enclosure in the southeastern corner of the project area. The wall attains a maximum height of 1.0 meter and it averages 70 centimeters wide. A bulldozer destroyed a portion of the western wall of Site 24759 near its southern end. The interior of the enclosure has also been bulldozed. It is likely that Site 24759 was constructed for ranching purposes sometime after 1898 when E. M. Paiwa purchased the current study parcel as Lot 56 of the ʻOʻoma Homesteads (Grant 4273).

SIHP Site 24760

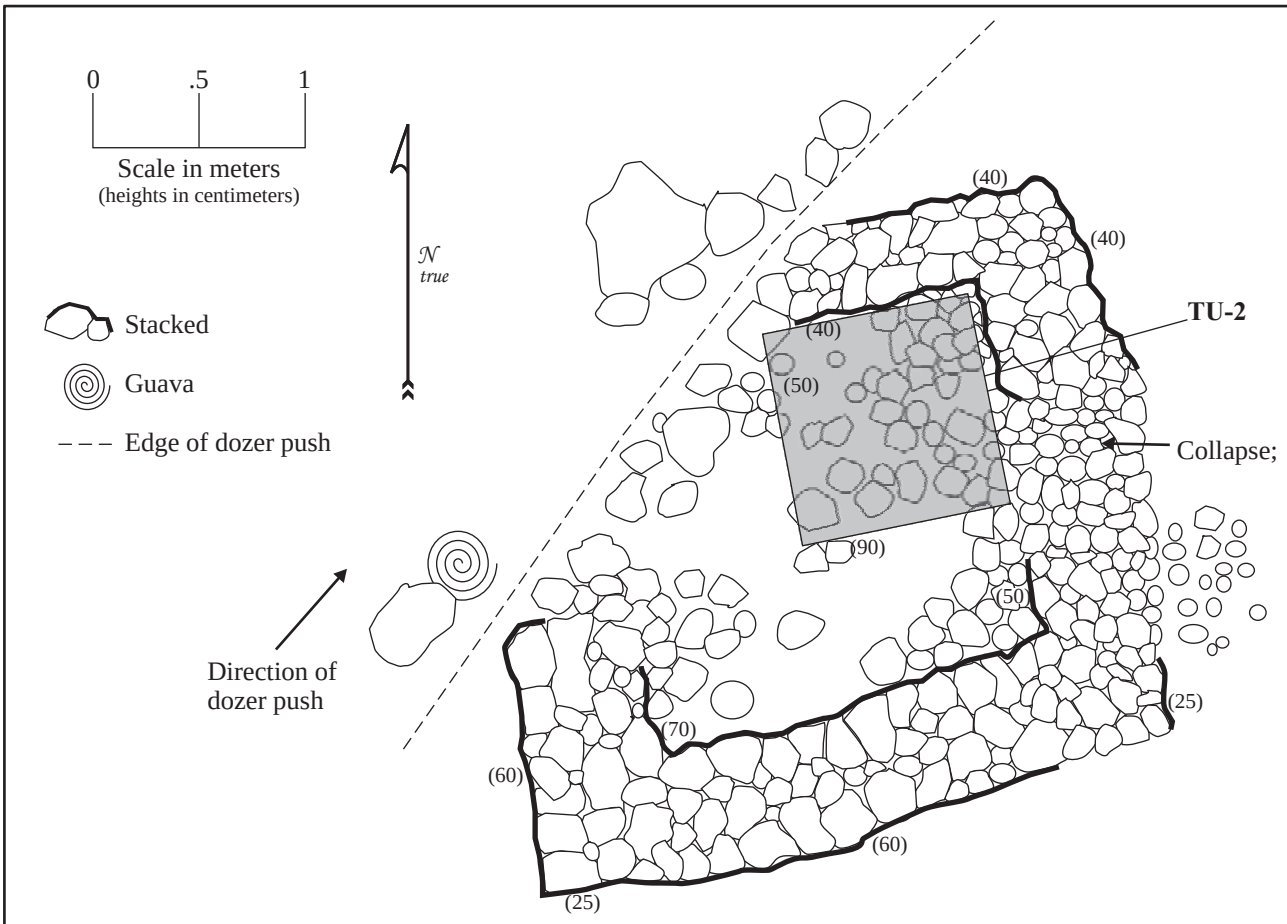
Site 24760 is a small Historic enclosure located in the southeastern portion of the current project area (see Figure 15). The enclosure measures 3.0 meters (east/west) by 2.8 meters (north/south) (Figure 18). It has core-filled walls constructed of stacked *pāhoehoe* cobbles that stand up to four courses (65 centimeters) high by 60 centimeters wide (Figure 19). A bulldozer has destroyed the northwestern corner of the enclosure. The cobbles that formed that portion of the site are present in a push pile located approximately six meters northeast of the enclosure. A 1 x 1 meter test unit (TU-2) was excavated in the northeastern corner of Site 24760.


Figure 17. SIHP Site 24759, view to northwest.

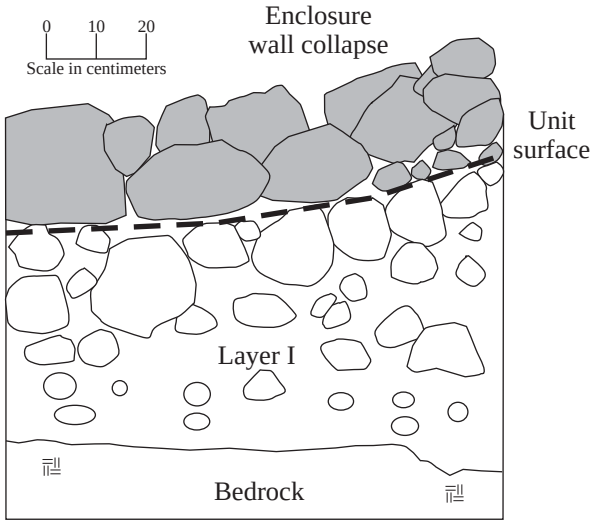
Excavation of TU-2 revealed a single stratigraphic layer resting on decomposing bedrock (see Figure 18). Layer I consisted of loose cobbles and pebbles mixed with a small amount of very dark brown (7.5YR 2.5/2) silt. Some collapsed cobbles from the enclosure walls were also present on the surface of TU-2. Layer I was excavated to a depth of 40 to 60 centimeters beneath the surface of the unit where decomposing bedrock was encountered and excavation of TU-2 was terminated. No artifacts were recovered during the excavation of TU-2. Based on the formal attributes of Site 24760 (i.e. core-filled walls), however, it appears that the enclosure was constructed during Historic times—likely post 1898 when E. M. Paiwa purchased the parcel (Grant 4273)—for homesteading purposes.

SIHP Site 24761

Site 24761 is a trail segment that runs *mauka/makai* in the east-central portion of the current project area (see Figure 15). The traceable route of the trail is marked by a 50-meter long, raised, constructed pathway that has flat-laid slabs on its surface. The pathway averages 1.1 meters wide and it is raised approximately 40 centimeters above the surrounding ground surface. The raised pathway is segmented into three sections by two exposed bedrock outcrops that are free of cobbles and do not require modification for pedestrian use of the trail. Site 24761 likely continued both east and west beyond the raised pathway, but the route of the trail is not traceable on the exposed bedrock ground surface. To the east the trail may have continued along the northern edge of a *kuaiwi* wall (Feature 34 of Site 24776) to the eastern property boundary and perhaps beyond. To the west, it seems that the trail may have followed the flat top surface of a raised, linear, exposed bedrock outcrop. Where that outcrop intersects Site 24770 (a Historic ranch wall that bisects the parcel), a gap in the wall appears to have been filled in with a large *pāhoehoe* slab after the walls original construction was completed. This may indicate that the route of Site 24761 once passed through the wall at that location, and that perhaps the trail was used during both Precontact times and Historic times.



TU-2 North wall profile



TU-2, base of excavation, view to north.

Layer I - Loose coobles and pebbles mixed with a small amount of very dark brown (7.5YR 2.5/2) silt.

Figure 18. SIHP Site 24760 plan view and TU-2 profile.


Figure 19. SIHP Site 24760, view to south of interior south wall.

SIHP Site 24762

Site 24762 is a modified outcrop located in the eastern portion of the current project area (see Figure 15). The site consists of a prominent bedrock outcrop that has been modified with stacked *pāhoehoe* cobbles along its western (down slope) edge to create a level top surface on the outcrop. The level surface measures 6.5 meters by 6.5 meters (Figure 20). It consists of primarily of exposed bedrock with some cobble modification along the edges (Figure 21), especially the western edge. The western edge consists of stacked cobbles standing three to five courses (up to 1.0 meter) high (Figure 22), while the northern and southern edges have minimal cobble modification against the natural bedrock. The northeastern edge of the outcrop is not modified, and it fades into the natural terrain. The ground surface in the vicinity of the feature slopes steeply to the south and west. Owing to this steeply sloping terrain, there are excellent views towards the ocean from the surface of the feature. A single 1 x 1 meter test unit (TU-12) was excavated into the stacked cobble modification along the western edge of Site 24762.

Excavation of TU-12 revealed a two-layer stratigraphic profile (see Figure 20). Layer I, the architectural layer, consisted of 40 to 120 centimeters of small to large sized *pāhoehoe* cobbles resting partially on bedrock (in the eastern half of the unit) and partially on Layer II (in the western half of the unit). Layer II consisted of approximately seven centimeters of very dark brown (10YR 2/2) silt containing roughly 20% gravels and numerous roots that was present between the base of Layer I and bedrock. Excavation of TU-12 terminated approximately 127 centimeters beneath the surface of the unit at bedrock (Figure 23). Cultural material recovered from TU-12 included marine shell, volcanic glass, coral, and charcoal (Table 2), suggesting that Site 24762 was utilized for Precontact habitation purposes. The nature of this habitation may have been short-term and recurrent, and related to the use of the agricultural fields in the vicinity of the site. The presence of the volcanic glass flakes at Site 24762 may also suggest that some agricultural processing took place there.

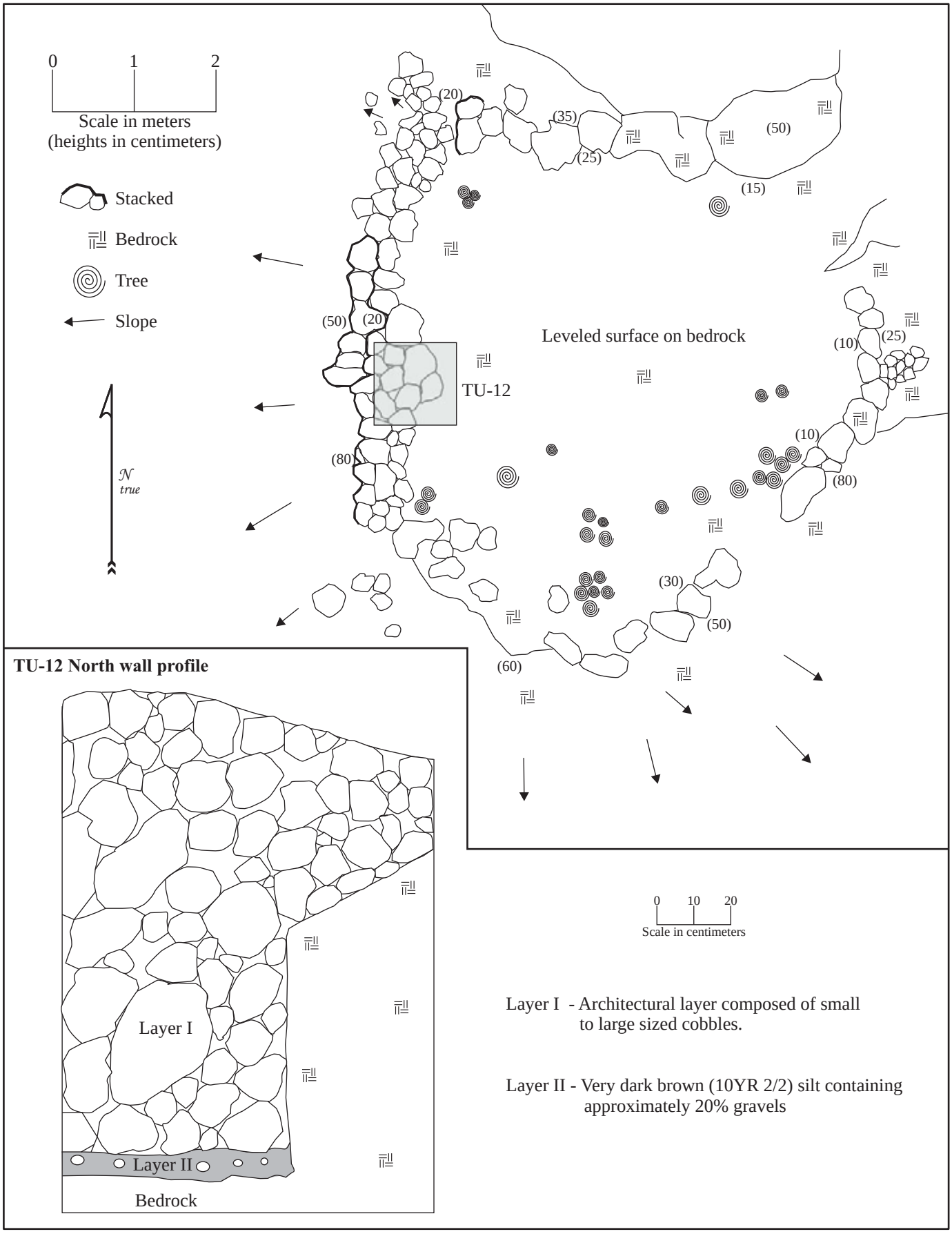


Figure 20. SIHP Site 24762 plan view and TU-12 profile.

Table 2. Cultural material recovered from SIHP Site 24762, TU-12.

ACC#	*Layer*	*Material*	*Species/type*	*Count*	*MNI*	*Weight (g)*
16	I	Coral	Waterworn	1	-	68.7
17	I	Organic	Charcoal	-	-	0.5
18	I	Shell	*Cypraea*	2	1	7.2
19	I	Shell	*Drupa*	1	1	3.9
20	I	Volcanic glass	Flakes	4	-	4.5
10	II	Shell	*Drupa*	2	1	0.2
11	II	Coral	Waterworn	1	-	1.6
12	II	Organic	Charcoal	-	-	0.4
13	II	Organic	*Kukui*	1	1	0.6
14	II	Shell	*Cypraea*	1	1	0.5
15	II	Volcanic glass	Flakes	20	-	11.3

Figure 21. SIHP Site 24762, view to southeast of feature's top surface.

Figure 22. SIHP Site 24762, view to southeast of feature's stacked western edge.

Figure 23. SIHP Site 24762, TU-12 base of excavation, view to north.

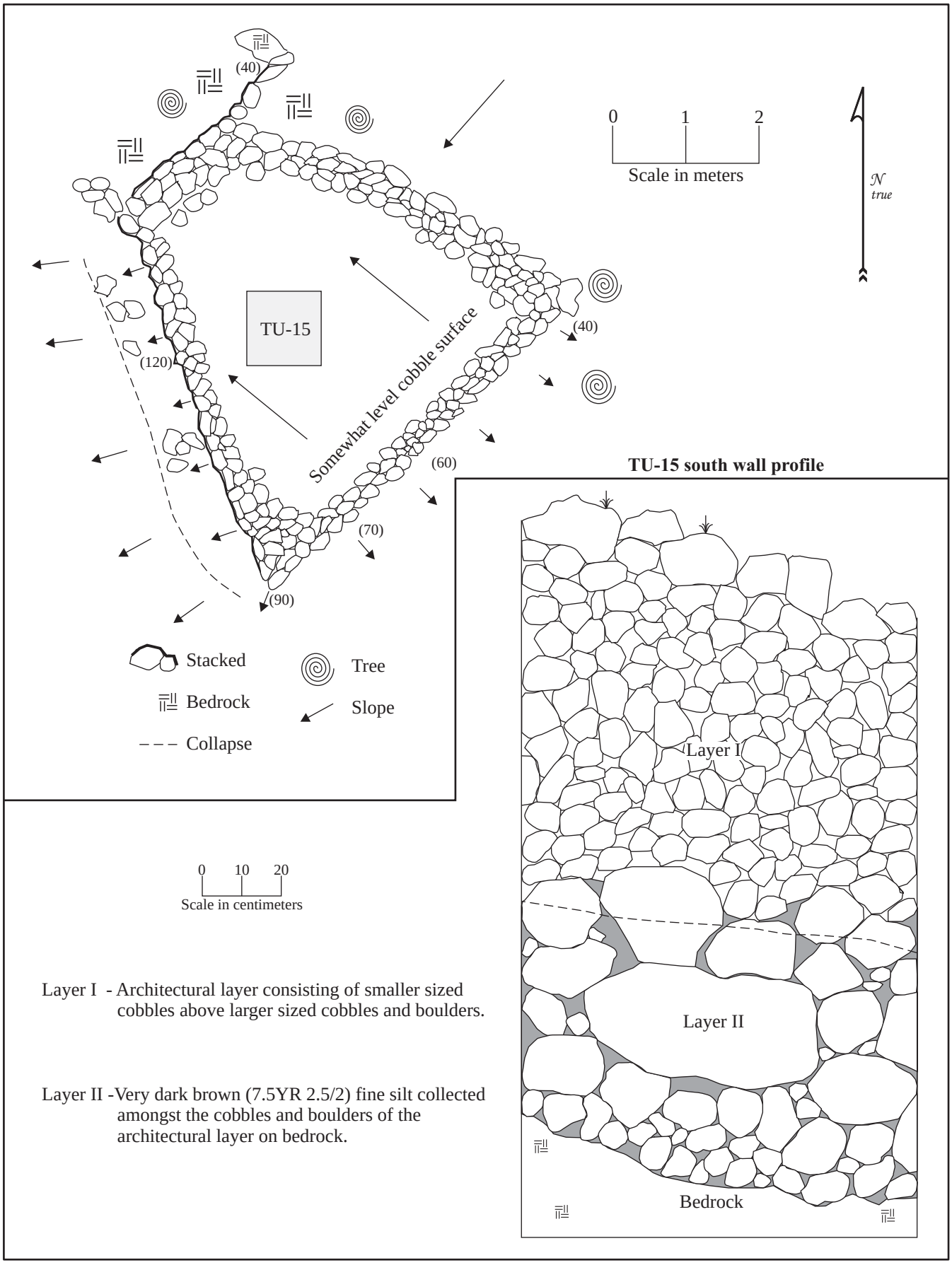
SIHP Site 24763

Site 24763 is short *mauka*/*makai* trail segment located in the south-central portion of the current project area (see Figure 15). The segment measures approximately 25 meters long by 0.7 meters wide. It is likely that the trail once continued both *mauka* and *makai* but the route is no longer traceable beyond the 25 meters. Site 24763 is characterized by a cleared path across rubble areas that is paved with small cobbles (Figure 24). A few flat-laid slabs, used as stepping-stones, were also observed along the route of the trail. Site 24763 generally follows the easiest, most-traversable terrain as it runs northwest/southeast up and down the slope. The trail was likely used primarily during Precontact times

Figure 24. SIHP Site 24763, view to east.

SIHP Site 24764

Site 24764 consists of a Precontact habitation terrace located in the northwestern portion of the current project area (see Figure 15). The terrace measures 6.6 meters long (north/south) by 4.6 meters wide (east/west) (Figure 25). It is irregularly shaped and terraced into the natural slope of a *pāhoehoe* bedrock hillside along its northern and eastern edges. The western edge of the terrace consists of stacked *pāhoehoe* cobbles standing up to 10 courses (1.2 meters) high (Figure 26). The southern edge may have been formerly stacked, but it is currently collapsed, and consists of a sloped pile of cobbles rising 40 to 90 centimeters from ground surface to the surface of the terrace. The terrace's surface is only somewhat level (Figure 27). It consists of small to medium sized cobbles that slope gently from the southeast to the northwest. A 1 x 1 meter test unit (TU-15) was excavated in the central portion Site 24764.



Layer I - Architectural layer consisting of smaller sized cobbles above larger sized cobbles and boulders.

Layer II -Very dark brown (7.5YR 2.5/2) fine silt collected amongst the cobbles and boulders of the architectural layer on bedrock.

Figure 25. SIHP Site 24764 plan view and TU-15 profile.

Figure 26. SIHP Site 24764, view to east of feature's stacked western edge.

Figure 27. SIHP Site 24764, view to south of feature's top surface.

Excavation of TU-15 revealed a two-layer stratigraphic profile (see Figure x-profile). Layer I, the architectural layer, extended from the surface of the unit to bedrock at a depth of 1.6 meters. The uppermost 1.0 meter of Layer I consisted of smaller sized cobbles, while the remaining 0.6 meters beneath consisted of larger sized cobbles and boulders. Layer II consisted of approximately 65 centimeters of very dark brown (7.5YR 2.5/2) fine silt that had collected among the cobbles and boulders of the architectural layer on bedrock. Excavation of TU-15 terminated at bedrock 1.6 meters beneath the surface of the unit (Figure 28). Cultural material recovered from the unit included marine shell, bird bone, pig (*Sus*) bone, fish bone, volcanic glass flakes, fire-cracked rock, and charcoal (Table 3). Based upon these findings and the formal attributes of the feature it was determined that Site 24764 was used for Precontact habitation purposes.

Table 3. Cultural material recovered from SIHP Site 24764, TU-15.

ACC#	*Layer*	*Level*	*Material*	*Species/type*	*Count*	*MNI*	*Weight (g)*
56	I	-	Organic	Charcoal	-	-	1.4
57	I	-	Shell	*Drupa*	1	1	1.9
58	I	-	Shell	*Cellana*	1	1	4.5
59	I	-	Shell	*Cypraea*	2	1	4.2
60	I	-	Fish bone	Unknown	1	1	0.1
61	I	-	Volcanic glass	Flakes	3	-	2.0
62	II	1	Volcanic glass	Flakes	33	-	19.8
63	II	1	Basalt	Waterworn	1	-	58.4
64	II	1	Shell	*Drupa*	3	2	8.2
65	II	1	Shell	*Cypraea*	16	3	29.9
66	II	1	*Echinoderm*	*Echinoidea*	30	1	1.4
67	II	1	Shell	Unknown	6	2	1.0
68	II	1	Fish bone	Unkown	3	1	0.7
69	II	1	Mammal bone	*Sus*	3	1	1.1
70	II	1	Organic	Charcoal	-	-	0.4
71	II	2	Shell	*Conus*	2	1	0.6
72	II	2	*Echinoderm*	*Echinoidea*	11	1	3.4
73	II	2	Shell	*Nerita*	1	1	0.2
74	II	2	Shell	*Cypraea*	7	1	7.3
75	II	2	Fish bone	Unknown	1	1	0.1
76	II	2	Volcanic glass	Flakes	23	-	10.2
77	II	2	Shell	*Drupa*	11	1	11.5
78	II	2	Organic	Charcoal	-	-	1.6
79	II	3	Shell	*Tridaena*	3	1	4.6
80	II	3	Shell	*Nerita*	6	5	0.5
81	II	3	Mammal bone	Unknown	1	1	0.2
82	II	3	Shell	*Conus*	1	1	4.0
83	II	3	Shell	*Cypraea*	9	1	7.0
84	II	3	Shell	*Drupa*	27	2	31.4
85	II	3	Shell	Unknown	11	1	0.2
86	II	3	Volcanic glass	Flakes	41	-	22.2
87	II	3	Coral	Waterworn	2	-	5.2
88	II	3	*Echinoderm*	*Echinoidea*	20	1	3.1
89	II	3	Organic	Charcoal	-	-	1.5

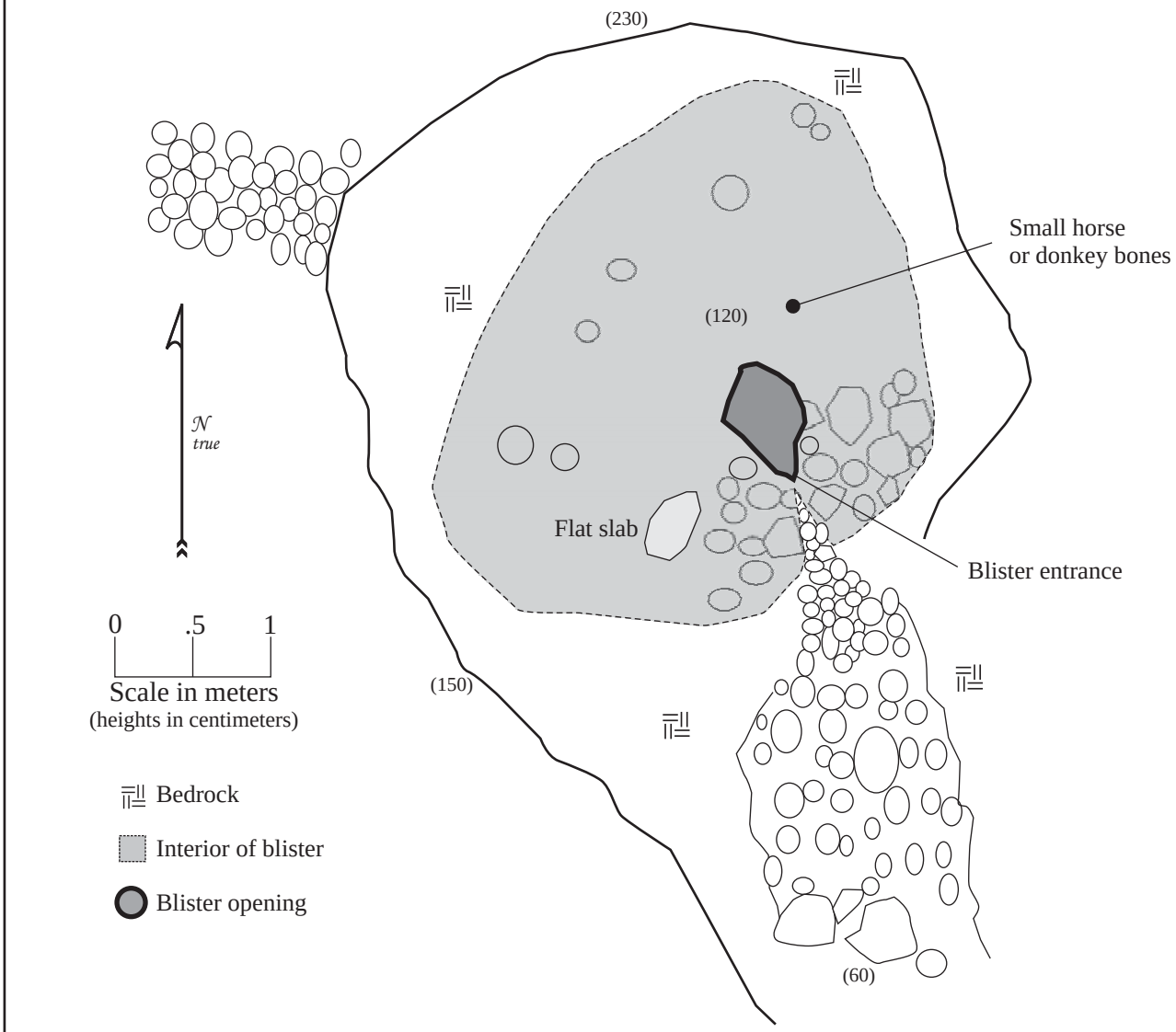
Figure 28. SIHP Site 24764, TU-15 base of excavation, view to south.

SIHP Site 24765

Site 24765 is a small lava blister located in the west-central portion of the current project area (see Figure 15). Based on the presence of burnt *kukui* nut fragments and a flat *pāhoehoe* slab with possible use marks on it found within the blister, along with some cobble clearing of the floor, it appears Site 24765 was used for Precontact temporary habitation purposes. The blister is present within a bedrock outcrop that is raised on all sides. No cobble modification is present surrounding the outcrop. A small opening (70 centimeters long by 50 centimeters wide) located near the apex of the outcrop leads to the interior of the blister (Figure 29). The roughly circular interior measures 3.5 meters in diameter and has a maximum floor to ceiling height of 1.2 meters. The floor consists of level soil. Several cobbles that appear to have been cleared from the floor are piled against the southern wall of the blister. One of these cobbles is a flat piece of *pāhoehoe* that measures 20 centimeters long by 15 centimeters wide by 8 centimeters thick. The surface of the cobble facing upwards shows signs of use/wear, suggesting that it may have been used as a grinding slick, or perhaps for tool manufacture and sharpening. The scattered bones of a small horse or donkey are also present within the blister beneath the opening.

SIHP Site 24766

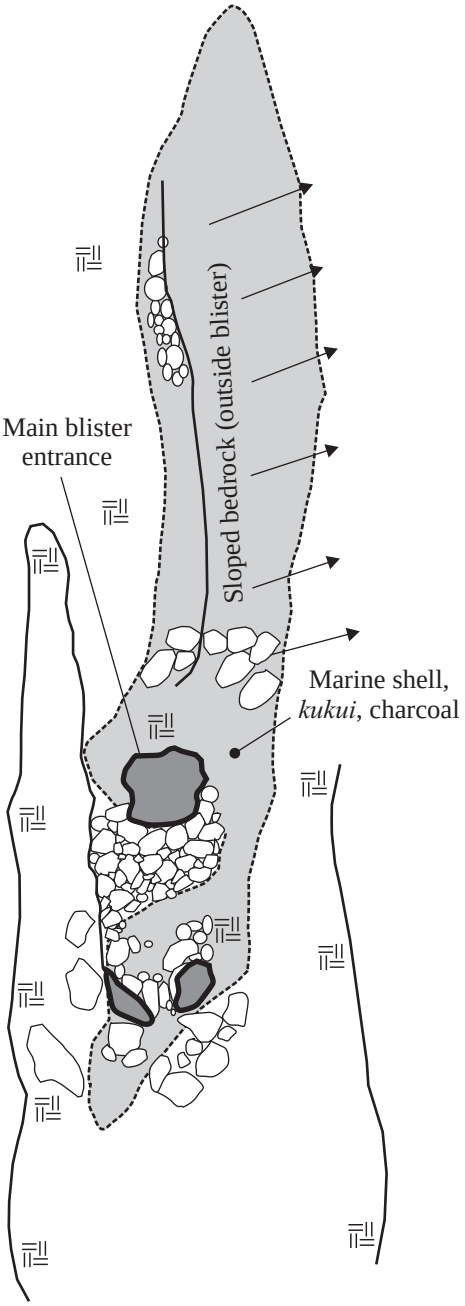
Site 24766 consists of a lava blister located in the north-central portion of the current project area (see Figure 15). Based on the presence of *Cellena* shell fragments, charcoal, and *kukui* within the blister (Figure 30), it appears Site 24766 was used for Precontact temporary habitation purposes. Site 24766 is long and narrow measuring approximately 14.0 meters long (east/west) by up to 2.5 meters wide (north/south), but only a small portion of it is suitable for habitation. The blister is accessed through an entrance that measures 80 centimeters by 70 centimeters located near its western end. A 2.5-meter by 2.0-meter area directly east of the entrance, with a floor to ceiling height of 85 centimeters, is the area that was likely used for habitation. This area has a soil and cobble floor, while the remainder of the blister has a jagged bedrock floor partially covered by collapsed ceiling rubble. The nature of the habitation at Site 24766 may have been short-term and recurrent and related to the use of the agricultural fields on the study parcel.



Blister entrance, overview to northwest.

Interior of blister, view to northwest.

Figure 29. SIHP Site 24765 plan view and photograph.



Overview to north of main blister entrance.

View to west of the raised bedrock outcrop with the main blister entrance in the foreground.

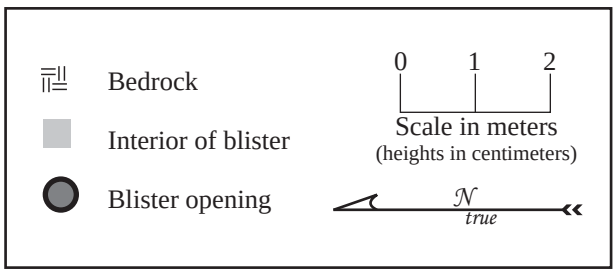


Figure 30. SIHP Site 24766 plan view and photograph.

SIHP Site 24767

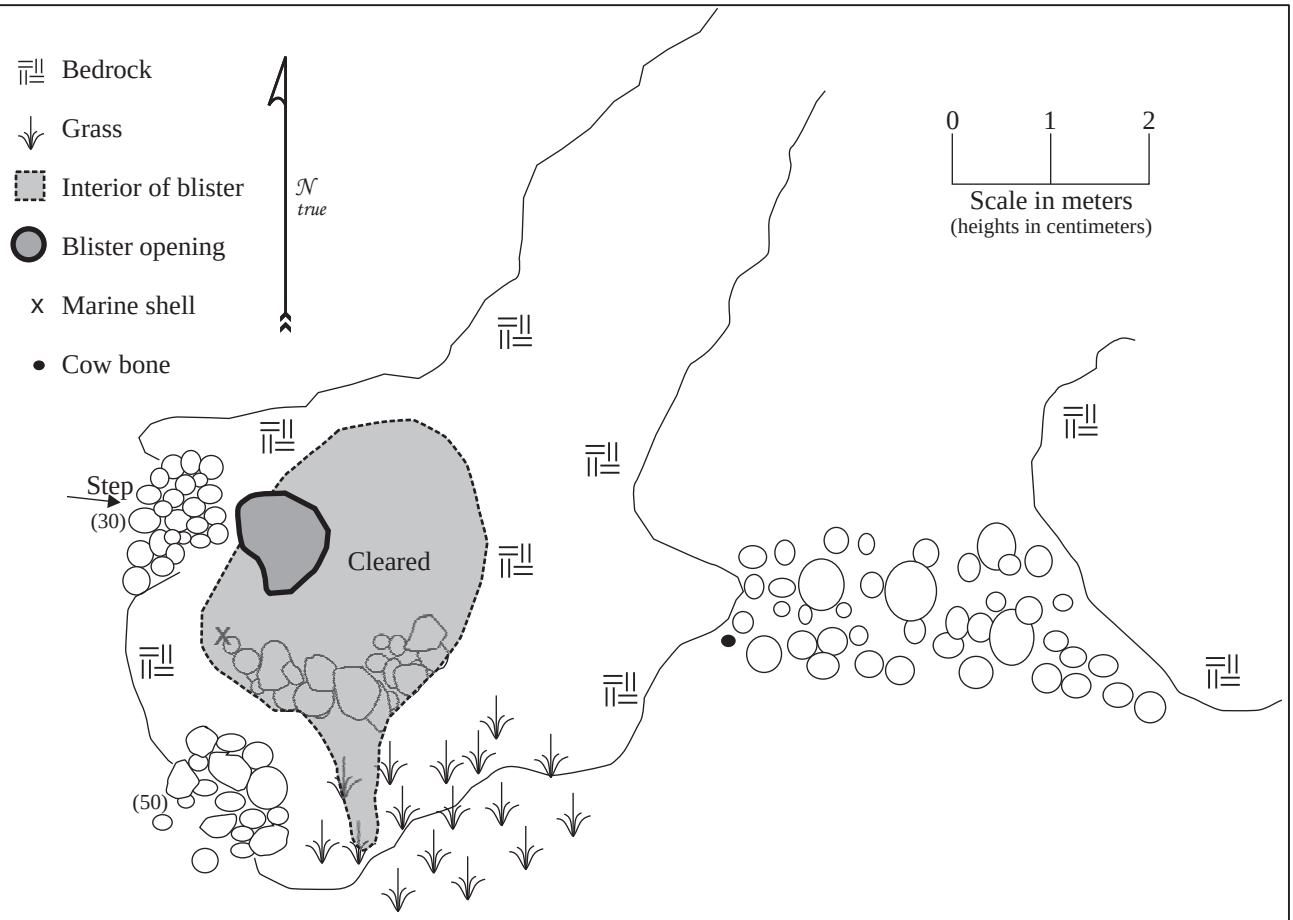
Site 24767 consists of a small lava blister located in the north-central portion of the current project area to the east of Site 24766 (see Figure 15). Based on the presence of two unidentified marine shell fragments and burnt *kukui* within the blister (Figure 31), it appears Site 24767 was used for Precontact temporary habitation purposes. The blister is present within a raised bedrock outcrop. It is accessed through a 1.0 meter by 1.5-meter opening in the northwestern portion of the outcrop. The interior of the blister measures 3.0 meters long by 2.5 meters wide with a maximum floor to ceiling height of 70 centimeters. The floor of the blister consists of thin soil and cobbles. A pile of cobbles located along the southern wall of the blister may have been cleared from the floor to create the habitation area. The nature of the habitation at Site 24767 may have been short-term and recurrent and related to the use of the agricultural fields on the study parcel.

SIHP Site 24768

Site 24768 consists of a lava blister located in the north-central portion of the current project area (see Figure 15). Sparse habitation debris and scattered human skeletal remains were discovered within Site 24768, indicating that the blister may have been used for both Precontact temporary habitation purposes and to conceal a burial. The blister is accessed from its western end through a small opening (1.2 meters by 1.0 meter) in an area of exposed bedrock ground surface (Figure 32). The opening is rubble filled, but drops a sloped 0.9 meters to the floor of the blister below. A 3.7-meter by 2.5-meter level area within the blister adjacent to the opening has been cleared of cobbles and has a floor that consists of thin soil and exposed bedrock. This area has a maximum floor to ceiling height of 1.1 meters. Narrow passageways with low ceilings run both east and west from the cleared area, but they have been blocked with the cobbles cleared from the central area of Site 24768 and were not accessible. Several pig (*Sus*) bones, a marine shell fragment, and a waterworn coral fragment were discovered on ground surface within Site 24768. Human skeletal remains (including two toe bones, a partial long bone, and a vertebra) were found within a cobble rubble pile in the northwestern corner of the blister. These bones were rodent-gnawed and appeared to have dragged by a rodent from elsewhere in the blister to their current location. Although the cobble rubble deposits within Site 24768 were searched for further human skeletal remains, none were found. It is likely that the original interment location for the discovered remains was somewhere within one of the narrow, inaccessible passageways that are now filled with rubble.

SIHP Site 24769

Site 24769 is a short, core-filled wall segment located in the north-central portion of the current project area (see Figure 15). The wall segment runs north/south for 8.5 meters between two raised bedrock outcrops with cobbles piled against them (Figure 33). The wall stands up to 1.0 meter high by 1.0 meter wide. The northern portion of the wall is neatly stacked and core-filled, but the southern portion is rough and collapsed. Cobble rubble is present to the east of the wall, while a cleared area consisting of thin soil and exposed bedrock is present to the west of the wall. The cobbles cleared from the this area have been piled against two raised sections of bedrock (65-75 centimeters tall) that run west from the northern and southern ends of the core-filled wall. A plastic tub was observed in this cleared area to the west of the wall. Agricultural features of Site 24776 surround Site 24769 in all directions. It is likely that this site was once part of the agricultural features, but was modified to its current specifications at some later date for an unknown purpose; perhaps to create an enclosure, or to use the thin soil to the west of the wall as a planting area, or perhaps for Historic ranching purposes.



Site 24767, view to east of blister opening.

Figure 31. SIHP Site 24767 plan view and phototogrph.

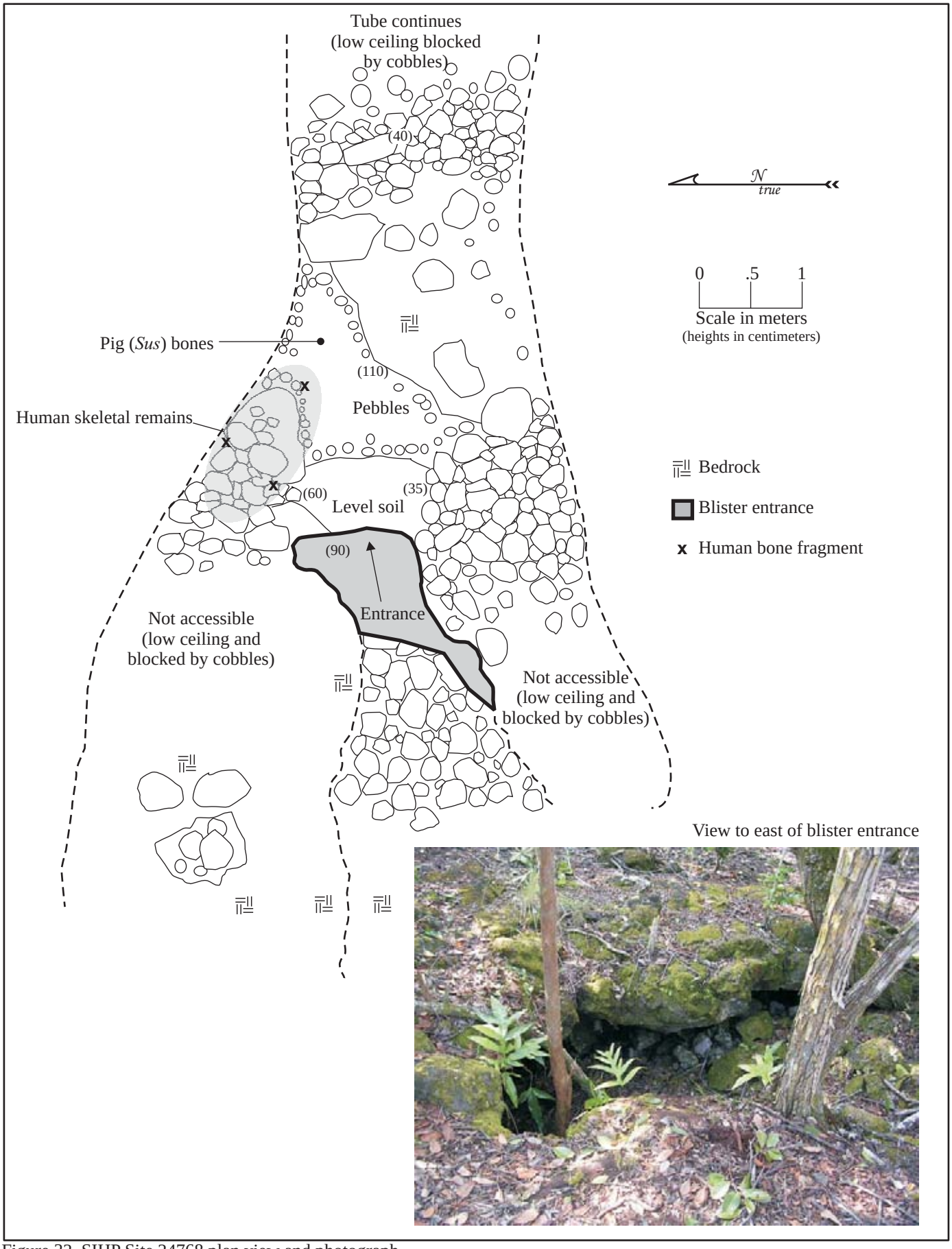
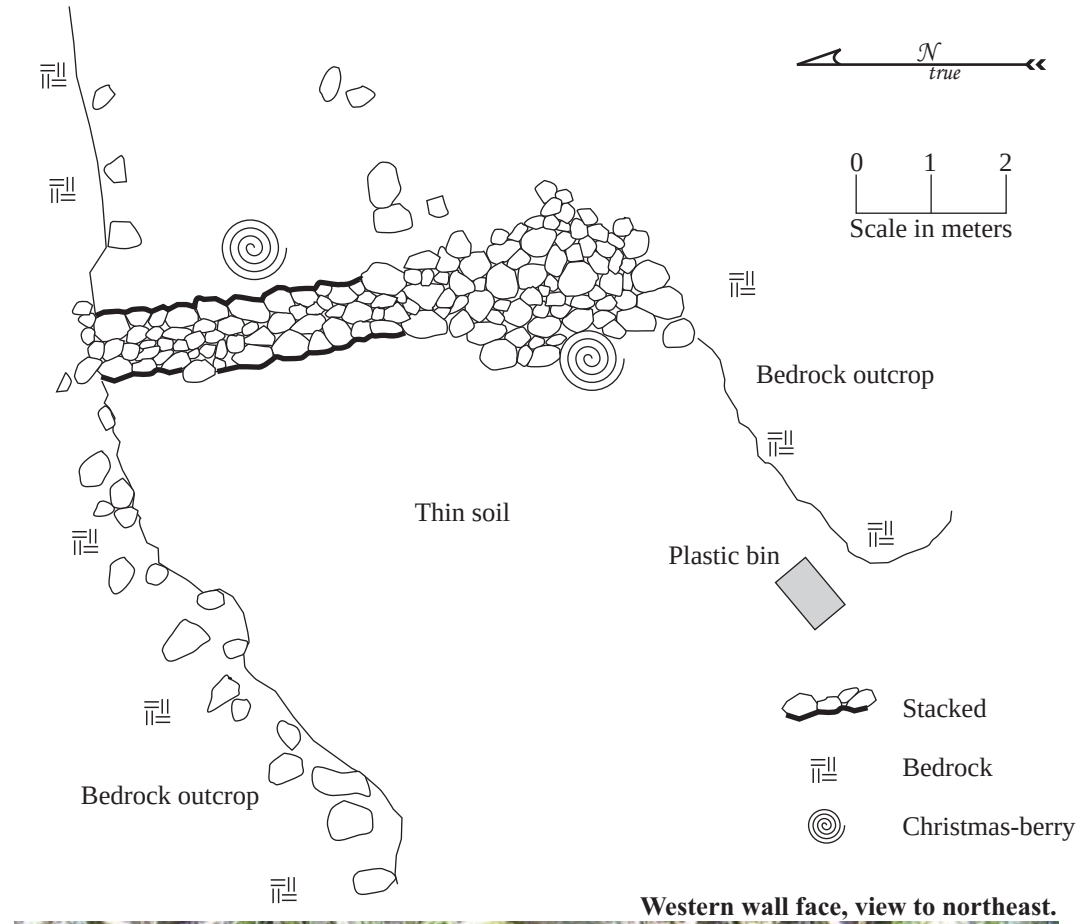


Figure 32. SIHP Site 24768 plan view and photograph.



Western wall face, view to northeast.

Figure 33. SIHP Site 24769 plan view and photograph.

SIHP Site 24770

Site 24770 is a core-filled wall that bisects the eastern portion of the current project area (see Figure 15). The wall stretches for approximately 220 meters north to south across the entire larger parcel of the current project area (Figure 34). It is separated from Sites 23834 and 24772 (the northern and southern boundary walls of the parcel) by bulldozed roads. Intact sections of Site 24770 stand up to 1.1 meters tall by 0.8 meters wide. Although collapsed in a couple of locations the wall is in a relatively good state of repair. This Historic wall may have been constructed for ranching purposes by E. M. Paiwa, who purchased the current project area as Grant 4273 (Lot 56 of the ʻOʻoma Homesteads) in 1898.

Figure 34. SIHP Site 24770, view to south of wall's southern end.

SIHP Site 24771

Site 24771 is a core-filled wall that runs along the eastern boundary of the current study parcel (see Figure 15). The wall measures approximately 200 meters long and averages 1.1 meters tall by 70 centimeters wide (Figure 35). It is constructed of stacked *pāhoehoe* cobbles that have collapsed in several locations. Bulldozer push from the development of the adjoining parcel to the east has covered the central portion of the wall largely destroying it (Figure 36). Site 24771 terminates at Site 23834 at its northern end and stops just short of Site 24774 at its southern end. A bulldozed road parallels Site 24771 along its western edge for nearly its entire length. This Historic boundary wall may have been constructed by K. K. Kameheu who purchased Grant 2027 (an adjoining parcel to the east) in 1856, or E. M. Paiwa who purchased the current study parcel as Grant 4273 (Lot 56 of the ʻOʻoma Homesteads) in 1898.

SIHP Site 24772

Site 24772 is a core-filled wall that runs along the western boundary of the current project area (see Figure 15). The wall stretches for approximately 300 meters along the entire western boundary of the larger study parcel. It terminates at Site 23834 at its northern end and it joins Site 24774 at its southern end. A bulldozed road parallels the wall along its eastern edge. Site 24772 averages 0.8 meters tall by 0.7 meters wide, but achieves the maximum dimensions of 1.5 meters tall by 0.9 meters wide (Figure 37). It is constructed of stacked *pāhoehoe* cobbles that have collapsed along much of the length of the wall. This Historic boundary wall was likely built sometime after 1898 when the current study parcel was sold to E. M. Paiwa as Lot 56 of the ʻOʻoma Homesteads (Grant 4273).

Figure 35. SIHP Site 24771, view to west of an intact section near the wall's northern end.

Figure 36. SIHP Site 24771, view to south of a bulldozed damaged section.

Figure 37. SIHP Site 24772, view to southwest.

SIHP Site 24773

Site 24773 consists of a Precontact habitation complex located in the west-central portion of the current project area (see Figure 15). The complex encompasses five distinct features (Features A-E) that are contained within a roughly 30-meter (north/south) by 15-meter area (east/west) (Figure 38). The features of Site 24773 include a small habitation terrace (Feature A), a modified lava blister (Feature B), a terrace/retaining wall that runs along the entire western (down slope) edge of the site area (Feature C), a modified outcrop (Feature D), and a small enclosure (Feature E). Only modern debris, including plastic trashcans and tarpaulins, was observed on ground surface at Site 24773, but a test unit excavated at Feature A (TU-14) revealed a substantial subsurface deposit of cultural debris that was consistent with the Precontact habitation function assigned to the site. Detailed descriptions of all the features at Site 24773 follow below.

Feature A

Feature A is a terrace located in the southeastern portion of Site 24773 approximately two meters south of Feature B (see Figure 38). The terrace measures roughly 6.0 meters by 5.0 meters. The eastern edge of Feature A is level with ground surface to the east, while the western edge is raised up to 1.5 meters above ground surface to the west (Figure 39). The northwestern portion of the terrace incorporates natural bedrock and has a vertical edge, but the southwestern portion slopes gradually from ground surface to the feature's surface. The surface of Feature A slopes slightly to the west and appears to have been loosely paved with small cobbles. A 1 x 1 meter test unit (TU-14) was excavated in the northeastern corner of Feature A.

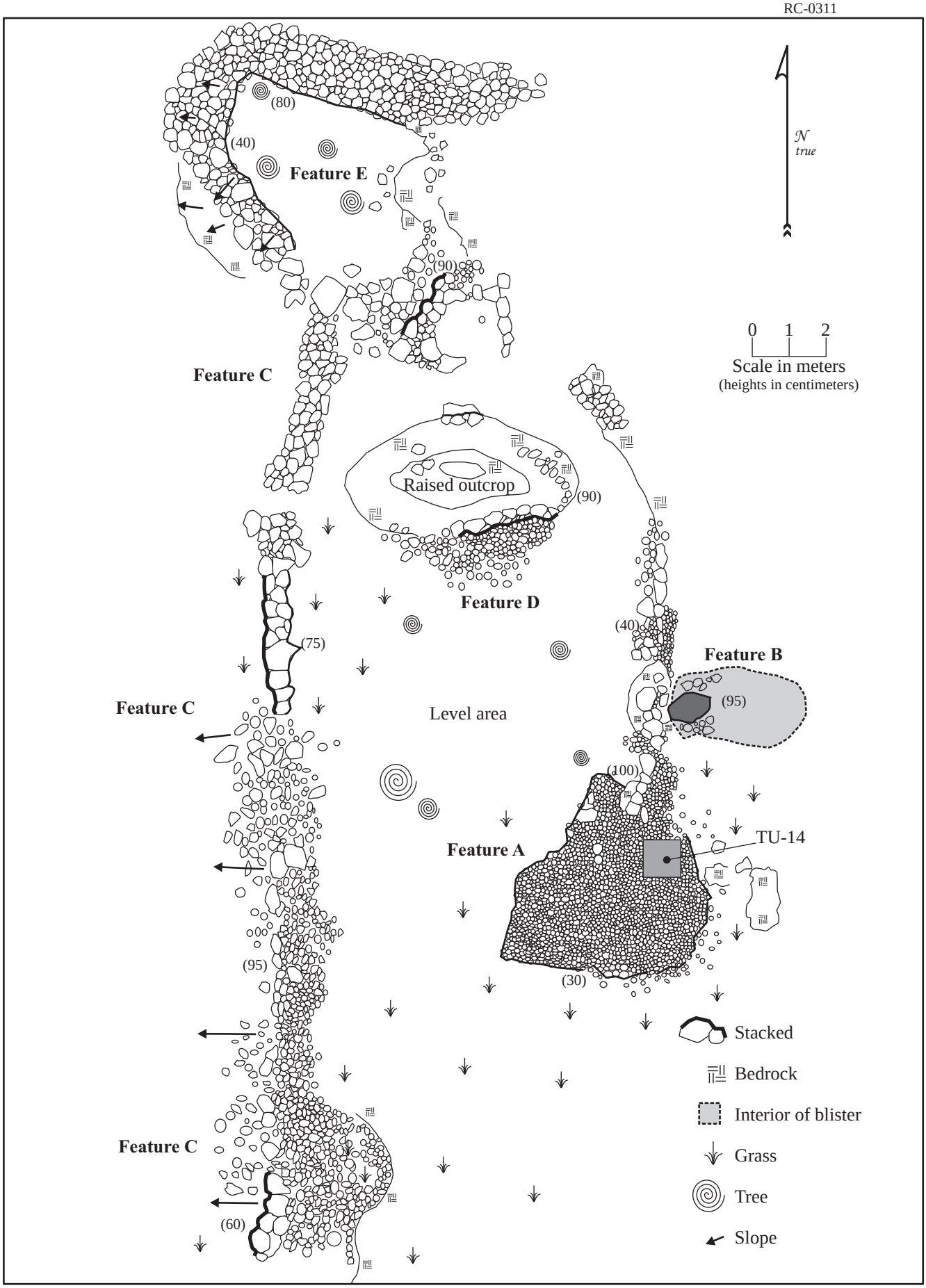


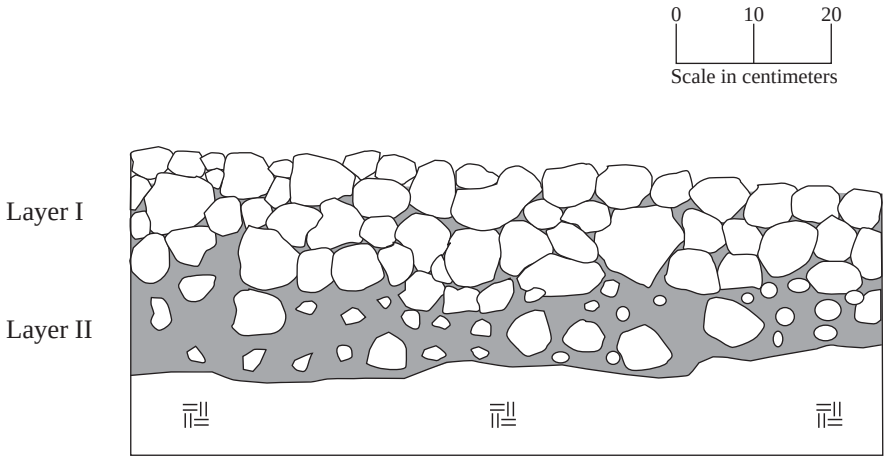
Figure 38. SIHP Site 24773 plan view.

Excavation of TU-14 revealed a two-layer stratigraphic profile resting on bedrock (Figure 40). Layer I, the architectural layer, consisted of small *pāhoehoe* cobbles mixed with organic debris. Layer I was present to a depth of 6 to 20 centimeters beneath the surface of TU-14 where it gradually became mixed with Layer II. Layer II consisted of very dark brown (10YR 2.5/2) granular silt collected amongst the cobbles of Layer I. Layer II was excavated in four arbitrary 10-centimeter levels. The amount of Layer I cobbles within Layer II decreased with depth from a maximum of approximately 70% cobble content within Layer II, Level 1 to a minimum of 30% cobble content within Layer II, Level 4. Cultural debris recovered from TU-14 included marine shell, *kukui*, fish bone, urchin, waterworn coral, volcanic glass, charcoal, a shark tooth, a basalt flake, and two coral abraders (Table 4). Debris was present within Layer I and Levels 1-3 of Layer II. No debris was recovered from Level 4 of Layer II. Excavation of TU-14 terminated at bedrock at a maximum depth of 50 centimeters beneath the surface of Feature A (Figure 41).

Table 4. Cultural material recovered from SIHP Site 24773 Feature A, TU-14.

ACC#	*Layer*	*Level*	*Material*	*Species/type*	*Count*	*MNI*	*Weight (g)*
22	I	-	Shell	*Cypraea*	1	1	0.2
23	I	-	Coral	Waterworn	1	-	5.5
24	I	-	Organic	*Kukui*	2	1	2.7
25	II	1	Shell	Unknown	1	1	0.1
26	II	1	Shell	*Cypraea*	4	1	1.8
27	II	1	Coral	Waterworn	2	-	2.1
28	II	1	Shell	*Drupa*	2	2	1.6
29	II	1	Volcanic glass	Flake	1	-	0.1
30	II	1	Coral	Abrader	1	-	3.0
31	II	1	Organic	Charcoal	-	-	2.7
32	II	1	Organic	Charcoal	-	-	4.0
33	II	2	Organic	Charcoal	-	-	4.2
34	II	2	Coral	Waterworn	6	-	5.2
35	II	2	Organic	*Kukui*	1	1	1.4
36	II	2	Shell	*Drupa*	3	1	1.0
37	II	2	Shell	*Cypraea*	1	1	0.1
38	II	2	Shell	Unknown	9	1	1.4
39	II	2	Volcanic glass	Flakes	13	-	9.1
40	II	3	Volcanic glass	Flakes	7	-	2.7
41	II	3	Volcanic glass	Chunk	1	-	12.8
42	II	3	Fish bone	Unknown	1	1	0.1
43	II	3	Fish bone	Shark tooth	1	1	0.1
44	II	3	Coral	Abrader	1	-	9.2
45	II	3	Basalt	Flake	1	-	0.9
46	II	3	Organic	*Kukui*	5	1	0.2
47	II	3	Coral	Waterworn	6	-	3.9
48	II	3	Shell	*Cypraea*	7	2	4.4
49	II	3	Shell	*Drupa*	2	1	0.4
50	II	3	Shell	*Thais*	1	1	0.5
51	II	3	*Echinoderm*	*Echinoidea*	1	-	0.1
52	II	3	Shell	Unknown	5	2	1.0
53	II	3	Organic	Charcoal	-	-	5.0
54	II	3	Shell	*Drupa*	1	1	1.3
55	II	3	Organic	Charcoal	-	-	1.4

Figure 39. SIHP Site 24773 Feature A, view to southwest of terrace surface.



Layer I - Architectural layer consisting of small cobbles mixed with organic debris.

Layer II - Very dark brown (10YR 2.5/2) granular silt containing 30 to 70% gravels.

Figure 40. SIHP Site 24773 Feature A TU-14 west wall profile.


Figure 41. SIHP Site 24773 Feature A, TU-14 base of excavation view to west.

Feature B

Feature B consists of a modified lava blister located approximately two meters north of Feature A (see Figure 38). The opening to Feature B faces west and measures 0.9 by 0.7 meters. The opening drops 0.95 meters to the floor of the blister below (Figure 42). The interior of Feature B measures 3.5 meters (east/west) by 3.2 meter (north/south) and has a maximum floor to ceiling height of 0.9 meters. The interior floor consists of level soil and small cobbles with some exposed bedrock also present. Larger cobbles within Feature B have been cleared to the periphery of the blister. Five plastic bins and eight plastic trashcan lids were found stashed inside the blister (Figure 43), and several goat bones were scattered on the Feature's floor. The bins and lids appear to have been stored for marijuana cultivation, which was taking place nearby Site 24773 at the time of the current fieldwork. The goat bones are probably from a goat that died of natural causes. Although no Precontact habitation debris was observed within Feature B, it is likely, based on its proximity to Feature A, that the blister was used as a shelter or storage area within the larger context of Site 24773.

Feature C

Feature C is a terrace wall that runs along the western edge of Site 24773 (see Figure 38). It stretches cross-slope from south to north for approximately 26 meters before terminating at Feature E to the north. The wall retains soil to the east and creates a level area with some exposed bedrock between Features A, B, C, and D. Feature C is constructed of boulders and cobbles that appear to have been formerly stacked, but are currently mostly collapsed, and stand up to 1.0 meter above ground surface to the west (Figure 44). In the central portion of Feature C the wall stands up to 0.8 meters above ground surface to the east, otherwise it is level with ground surface to the east.

Figure 42. SIHP Site 24773 Feature B entrance, overview to east.

Figure 43. SIHP Site 24773 Feature B, interior view to east.


Figure 44. SIHP Site 24773 Feature C, view to southwest.

Feature D

Feature D is a modified outcrop located in the north-central portion of Site 24773 (see Figure 38). The bedrock outcrop measures 6.5 meters (east/west) by 5.0 meters (north/south) and it is raised 1.5 to 2.5 meters above ground surface on all sides. The southern and eastern edges of the outcrop have been modified with loosely stacked/piled cobbles and boulders that appear to have been cleared from the area to the south of the outcrop (Figure 45). The modification stands up to 0.9 meters high against the bedrock. A few cobbles also appear to have been cleared against the northern edge of the outcrop near Feature E.

Feature E

Feature E is a small enclosure located in the northwestern corner of Site 24773 at the northern termination of Feature C (see Figure 38). The enclosure measures 7.5 meters long (east/west) by 5.5 meters wide (north/south). Like Feature C the enclosure is terraced, with loosely stacked/piled cobbles along its western, southern, and northern edges raised a sloped 0.9 meters above ground surface to the west (Figure 46). The eastern edge incorporates exposed bedrock and is raised up to 0.9 meters above the interior floor of Feature E. The interior of the enclosure consists of thin soil with some exposed bedrock present. The interior is cobble free, and it appears that the cobbles removed from the central area were used to create the enclosure walls. The interior northern, southern, and western walls rise 0.1-0.8 meters above the cleared central area. Based on the proximity of this feature to the other features of Site 24773 and the findings at TU-14 within Feature A, it appears that Feature E likely served a specialized habitation function within the larger habitation complex.

Figure 45. SIHP Site 24773 Feature D, view to north.

Figure 46. SIHP Site 24773 Feature E, view to northwest.

SIHP Site 24774

Site 24774 is a core-filled wall that runs along the southern boundary of the current project area (see Figure 15). Site 24774 also borders the northern edge of an old ʻOʻoma Homestead road, and a second wall (Site 16126) is present along the southern edge of the road (on TMK:3-7-3-7:38) approximately three meters distant (Clark and Rechtman 2005). These two walls appear to have been constructed during separate episodes by the individual homestead owners. Site 24774 runs along the entire southern boundary of the larger parcel of he current study area for a distance of approximately 600 meters. It joins with Site 24771 at its eastern end, and terminates near Site 24772 at its western end. Where Site 24774 joins with Site 24772 a roughly one meter deep hole has been excavated in the wall junction, perhaps as a property corner marker. The excavated cobbles are piled to the south of 24774, between that wall and Site 16126 (Figure 47). A 10-meter break caused by a bulldozer is present near the eastern end of the wall, and a bulldozed road runs parallel to the north edge of the wall for much of its length. Site 24774 averages 1.0 meter tall by 0.8 meters wide. It is constructed of stacked *pāhoehoe* cobbles that have collapsed in only a few locations. This Historic boundary wall was likely built sometime after 1898 when the parcel was sold to E. M. Paiwa as Lot 56 of the ʻOʻoma Homesteads (Grant 4273).

The old Homestead road that Site 24774 borders was discussed in oral interviews with Kepā Maly as a route that was taken from the uplands to the coast by *kupuna* Peter Keikuaʻana Park, who was born in ʻOʻoma in 1918 (Rechtman and Maly 2003:II-31). In a side note Rechtman and Maly describe the route of the road thusly:

> The road as described by *kupuna* starts *mauka* in ʻOʻoma 2nd, goes *makai* between Homestead lots 58 and 59 [see Figure 7], held for Kuhaiki and Kainuku; then runs north across ʻOʻoma 1st, into Kalaoa and the old Kamaka House, from where it then cuts *makai* to the shore (see Register map No. 2123). (2003:II-32)

Figure 47. SIHP Site 24774, junction with Site 24772, view to northeast.

SIHP Site 24775

Site 24775 was the only site recorded on TMK:3-7-3-46:105 in ‘O‘oma 1st within the current project area (see Figure 15). This site consists of a roughly 25-meter long segment of old roadway (Figure 48). The site is located approximately 60 meters north of a break in Site 23834 near the intersection of Kukuna Street and Punawele Street within the Kona Palisades residential subdivision. Site 24775 is terraced along its western (down slope) edge with loosely stacked and piled cobbles and boulders standing 0.3 to 0.6 meters tall. To the east of this terrace is a roughly 2.5-meter wide cleared and leveled pathway lined along its eastern edge with a single course alignment of cleared cobbles. Site 24775, like the rest of TMK:3-7-3-46:105, has been bulldozed at both its northern and southern ends, making inferences of where the site once went difficult. It may be that Site 24775 represents an old continuation to the north of Punawele Street that was perhaps related to the Historic homestead use of the area. It could also be that Site 24775 is a modern construction. Site 24775 does not have the appearance an older Hawaiian trail. Bulldozing has significantly impacted this site.

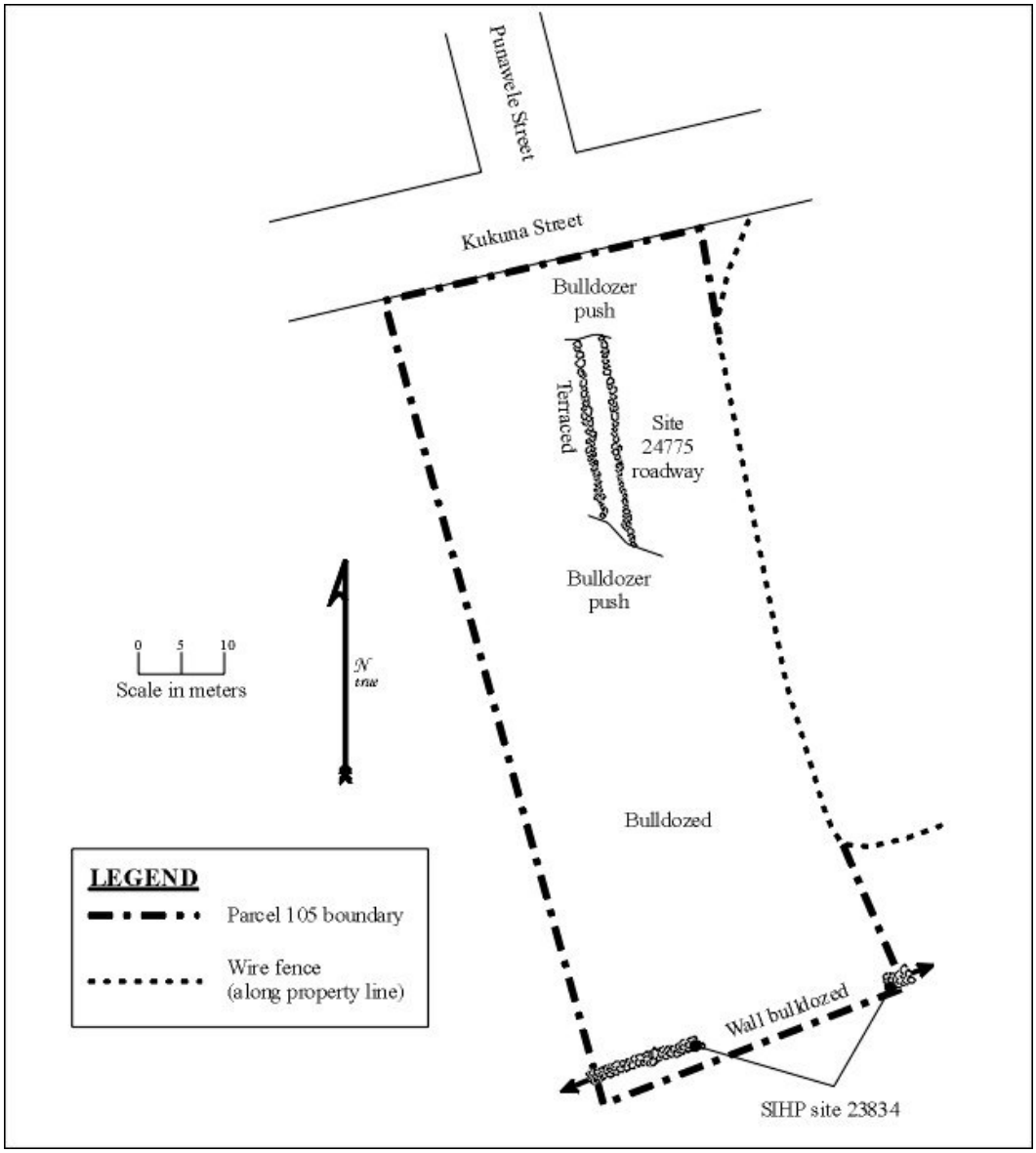


Figure 48. SIHP Site 24775 plan view of parcel 105 and photo.

SIHP Site 24776

Site 24776 is an agricultural complex that spans the larger parcel of the current project area (Figure 49). Features of this site are found in loosely arranged fields over the entire parcel, except in locales where it has been previously bulldozed or where no soil is present. All of the fields correspond to soil areas within the current project area and most are defined by rough walls that run along their boundaries. The eastern and western (*mauka* and *makai*) field boundary walls are generally terraced into the natural slope of the terrain and retain soil on their upslope sides. They generally terminate to the north and south at longer walls (*kuaiwi*) that often run along the northern and southern boundaries of several fields. Contained within the boundaries of the fields is a diverse array of features including mounds, modified outcrops, terraces, and enclosures. These features appear to have functioned as either clearing or planting features depending on their form and setting. To understand how these features were used for agricultural purposes we first need to define the physical characteristics specific to each type of feature encountered within the current project area.

Agricultural Feature Definitions

The features of Site 24776 are quantifiable forms, constructed or modified by human hands, which make up the archaeological landscape and record generations of human occupation. It is important to keep in mind that individuals construct features at a certain time for a specific purpose. However, by the time archaeologists encounter these features, they are often overgrown with vegetation, collapsed and destroyed, and sometimes dismantled or rebuilt; and almost always lack all perishable components. Numerous formal feature types have been identified (but not agreed upon) during the past 100 or so years of archaeological research (augmented by historical documentation and oral historical accounts) on the island of Hawai‘i. Indeed, as Kirch points out, “given the bewildering variety of forms and permutations that Hawaiian structures take…no single classification has yet been found to be entirely satisfactory. In fact, Hawaiian archaeologists commonly use ad hoc combinations of functional and formal types in their survey work, applying functional terms to sites whose past use seems relatively unambiguous, and using formal, descriptive terms for sites that might have been used for several alternative purposes” (1985:36-38). By nature, this lack of agreement on feature terminology hinders comparisons between sites and projects, and the “ad hoc” combination of formal and functional terms used in describing features in the field can preclude innovative interpretation.

To help alleviate the hindrance of conflicting terminology, a set of formal feature definitions, specific to the current project area—but keeping in mind previous archaeological work—is presented below. The definitions present only the common attributes that enabled us to place the diverse formal feature types into easily quantifiable groups and are followed by a discussion of possible function. The formal feature types encountered at Site 24776 are mound, modified outcrop, wall, enclosure, and terrace. A definition of each type is presented below.

Mound

A mound is collection of stones with an irregular surface. Mounds range considerably in size, shape, method of construction, and type of stone used. They are constructed from as few as four stones or as many as the topography and the effort of the individual(s) constructing them allow. The shape of a mound varies considerably depending on the terrain and the individual purpose of construction. However, all mounds, as dictated by gravity, have sloped sides. Mounds are either piled or stacked, or a combination of both. Stacked mounds usually contain a fill of piled stones with an outside layer stacked around the edges. The type of stone used in mound construction is a reflection of the immediately available source material. The size of stone used is also a function of material availability. A mound can have a different function depending on its temporal and spatial associations. Mounds observed within the current project area are thought to have functioned primarily as clearing features, but may also have been utilized as planting features.

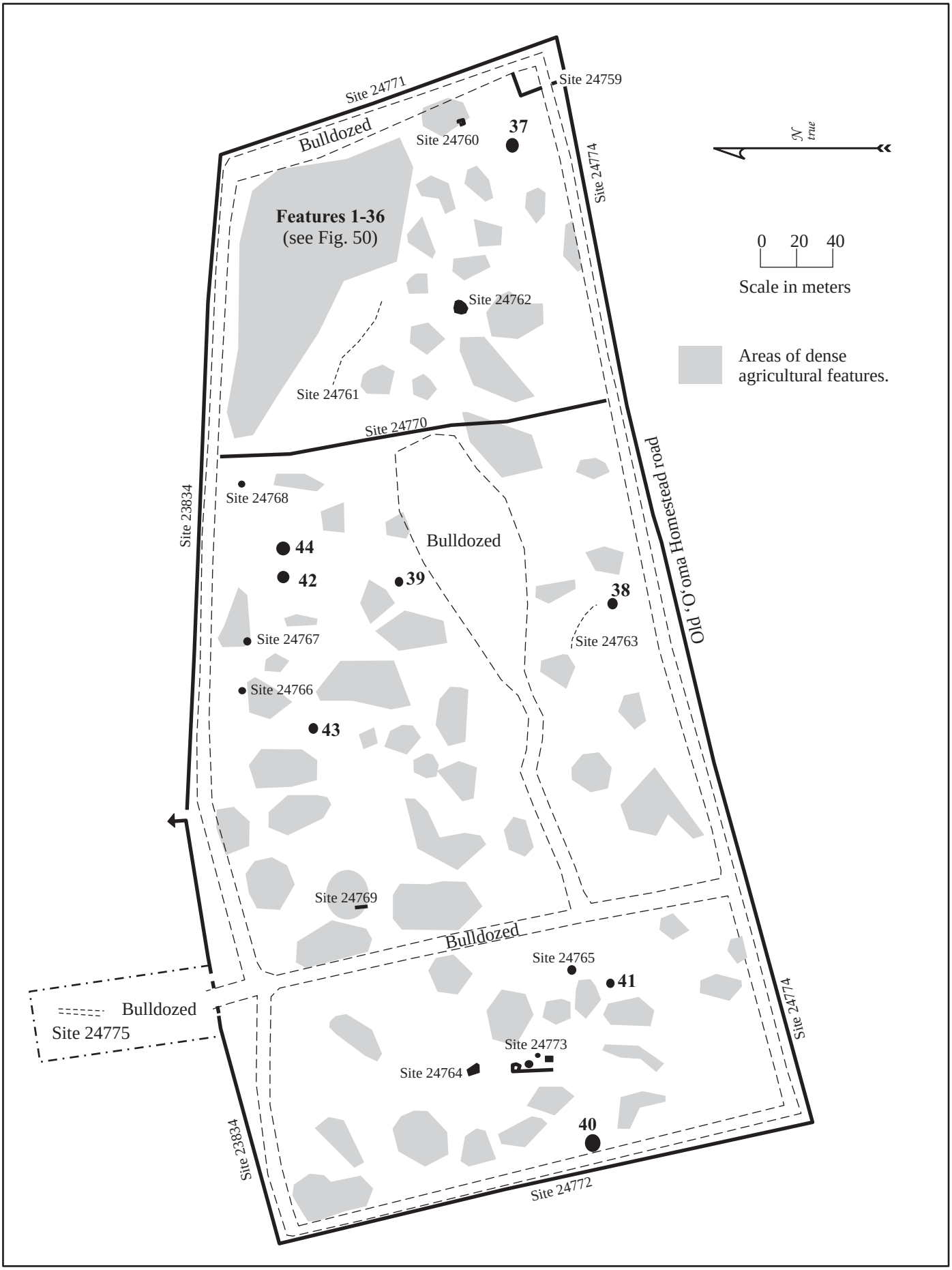


Figure 49. SIHP Site 24776 plan view.

Modified outcrop

A modified outcrop is a natural bedrock formation with an associated collection of stones placed against and supported by it. Unlike a mound, the stone collection is not freestanding and depends on the bedrock formation for support, although it may rise above the level of the outcrop itself. The type and size of the stones used is a function of the immediately available source materials. The stones are either stacked, piled, or a combination of both, but the size of the stone collection must be significantly smaller than the size of the bedrock formation, otherwise the feature is considered a mound. The surface of a modified outcrop is always irregular with sloped sides and incorporated bedrock. Occasionally, if the stones are stacked against a vertical bedrock formation, the stacked edges will also approach vertical. Modified outcrops observed within the current project area are thought to have functioned primarily as clearing features, but some may also have been utilized as planting features.

Wall

A wall is a linear or curvilinear alignment of stones (at least two courses high) that is considerably longer than it is wide. Walls are constructed using stones of various type and size depending upon the source material. They generally have sloped sides, although in neatly stacked walls the slope approaches vertical. Walls may also form adjoining or shaped segments (i.e. L-shaped, T-shaped, U-shaped, etc.). The walls encountered at Site 24776 were all piled with no obvious placement of stones. These recorded walls appear to have functioned primarily as agricultural field boundaries that were created during the clearing of soil areas (Cordy 2000; Kirch 1985; Soehren and Newman 1968). The *mauka/makai* trending boundary walls (*kuaiwi*) within the current project area, for the most part, follow the edges of linear swales of exposed *pāhoehoe* bedrock. These bedrock formations naturally segment the project area into alternating sections of bedrock and soil, with exposed bedrock at the top of the swales and soil accumulation in the low spots between the swales. The *kuaiwi* consist of stones cleared from the soil areas, and piled against the bedrock swales. The other features of the agricultural fields are present in the soil areas between these *kuaiwi*. The cross-slope walls are generally terraces (see below) that run short distances between the *kuaiwi*. This pattern was observed again and again throughout the current project area.

Enclosure

An enclosure is a construction of stones that surrounds an interior space around at least 75% of its perimeter. The construction may incorporate natural formations (i.e. bedrock outcrops, boulders, etc.) or other formal feature types (i.e. walls, terraces, etc.) into its length. Construction materials are of varying type and size depending on the source. The shape of an enclosure (i.e. square, rectangular, three sided, many sided, circular, oval, or irregular) varies considerably depending on the topography and its intended function. The enclosure walls may be stacked, piled, or collapsed (formerly stacked). Some enclosures completely surround an interior space with no openings. The enclosure recorded at Site 24776 all contain at least some soil and appear to have functioned as planting features. The walls seem to have been constructed primarily of cobbles cleared from the interior space and it is likely they were designed to keep animals out of the planting area.

Terrace

A terrace is a linear or curvilinear stone construction built perpendicular to the natural slope of the terrain. It is generally longer than it is wide and at least two courses high. On the upslope side of the terrace soil is either placed, or more often naturally accumulated, to form a relatively level surface area. The stones of a terrace may be piled or stacked (piled edges are sloped, while stacked edges are generally vertical). Terrace walls are typically built connecting *kuaiwi* and are of stacked or piled construction with a rectangular or trapezoidal profile. The terrace is a specialized feature of an agricultural field. It many cases it functioned to trap or retain soil creating a planting area (Kirch 1985; Soehren and Newman 1968). In some cases within the project area terraces cover bedrock outcrops, and although they retain some soil on their up slope sides they appear to be clearing features rather than planting features. These terraces are generally shorter constructions that have possible soil planting areas on their down slope sides.

Distribution of Agricultural Features Previously Recorded by Haun and Henry (2003) on a Nearby Parcel

Haun and Henry (2003) discovered similar agricultural features as those discussed above, arranged in similar fields, on a study parcel located adjacent to, and northeast of, the current project area (see Figure 4). Based on the presence of thirty-nine mounds and fifty-five modified outcrops recorded within a ten-meter wide density transect that stretched the length of the parcel, they estimated that the 41.3-acre project area contained roughly 1,981 agricultural features (Site 23839; Haun and Henry 2003:61). The density transect was divided into three elevation zones each containing equal acreage: Zone 1 - from 1,000 to 1,090 feet above sea level; Zone 2 – from 1,090 to 1,185 feet above sea level; and Zone 3 – from 1,185 to 1,290 feet above sea level. The features were then discussed in density by zone. Zone 1 and the bottom half of Zone 2 correspond to the upper elevations of the current study parcel. Haun and Henry (2003:61) estimated that 241 mounds and 583 modified outcrops were present in the 13.65–acre Zone 1 within their project area. They summarize the findings by zone thusly:

> The results of the density transect analysis indicates that the majority of the clearing features (n=824 or 44%) are situated below 1,090 ft elevation, within Zone 1. The per acre density within this zone is 57 clearing piles per acre. The density of features drops to 35 features per acre in Zone 2, with a total 502 clearing piles or 26%. The density of clearing features increases slightly in Zone 3 to 39 features per acre (n=563 or 30% of total). These findings indicate that throughout the project area there are potentially a total 1,889 clearing piles consisting of 1,105 modified outcrops and 784 mounds. (Haun and Henry 2003:61)

Haun and Henry also recorded formal agricultural fields delineated by *kuaiwi,* field boundaries, and terraces throughout the project area. They recorded thirty-five *kuaiwi*, seven field boundaries, and seven terraces. In addition to these features they recorded twenty-two planting enclosures and twenty-one agricultural platforms (formal mounds), most of which were located in the inland portion of the project area. Four test units were excavated at four of the agricultural platforms, all of which, with the exception of a few *kukui* nut shells, lacked cultural remains. These findings indicated that more formal agricultural features and less crude, clearing features were located at higher elevation zones within the project area. Haun and Henry explain the differences in per acre density of agricultural feature by elevation zone in this manner:

> The inland-seaward differences in the agricultural feature landscape are probably a result of rainfall. Historic maps dating to the 1800s show the project area straddling the seaward edge of the upland forest. This "forest line" was likely the seaward limit of the more intensive gardening that occurred in the upland, better watered part of the *ahupua'a*. This forest edge marked the transition from informal scattered agricultural plots to formal walled fields based on the distribution of agricultural features in the project area. This boundary apparently also marks a transition in habitation sites with seaward areas dominated by temporary habitation and permanent habitations more frequent inland of the forest edge. (2003:85)

The Haun and Henry (2003) findings indicate that agricultural features should be numerous within the current project area, but should consist primarily of clearing features such as mounds and modified outcrops with less formal walled fields present than were identified within the upper reaches of their project area. Haun and Henry (2003:61) suggest a density of 57 clearing features per acre within the upper portions of the current project area. If their model holds true, the density of features should increase as elevation (which helps determine the amount of rainfall) decreases within the project area. In other words, in areas that are less suited for agriculture (i.e. areas with less soil and less rain) more features should be present because more effort is required to prepare the area for cultivation.

Agricultural Features Recorded During the Current Inventory Survey

During the current inventory survey the entire study parcel was inspected utilizing tightly spaced pedestrian transects. During these transects it was discovered that nearly the entire larger study parcel of the current project area, encompassing 39.36 acres, was blanketed by diverse agricultural features. Areas of dense features were plotted on a map of the current project area, but the features were not recorded in detail (see Figure 49). Instead, a single, typical agricultural field unit located in the northeastern corner of the current study parcel was mapped and described in detail and an array of features consisting of diverse formal types located at various elevations within the project area were mapped, described, and subjected to subsurface testing. In all, forty-four features of Site 24776 (Features 1-44) were mapped and recorded in detail. The feature number, formal feature type, maximum feature dimensions, physical attributes (i.e. piled or stacked), and the number of the test unit excavated at the feature (if any) are presented in Table 5. The formal feature type allows for an interpretation of possible feature function (see above), while comparison between feature dimensions and attributes suggest a spectrum of the amount of effort expended to create the feature (e.g. a large stacked feature requires more effort to construct than a small piled feature). The recorded features included ten modified outcrops, fourteen mounds, fourteen terraces, three enclosures, and three *kuaiwi*. Features 1-36 are arranged in what appears to be a typical agricultural field unit within the current project area and are discussed together, while the remaining features consist of diverse formal types that are located at various elevations within the current project area and are discussed individually.

A Typical Agricultural Field Unit (Features 1-36 of Site 24776)

Features 1-36 of Site 24776 make-up what could be considered a typical agricultural field unit within the current project area. All of these features are contained within a roughly 100-meter (north/south) by 50-meter (east/west) area in the northeastern corner of the larger study parcel (Figure 50). The main body of these features (n=25) is centered on and around a level area containing ample soil for agricultural pursuits. This area is bounded to the north and south by *kuaiwi* (Features 31 and 35), one of which (Feature 35) continues west beyond the field boundaries (Figures 51 and 52). A terrace wall (Feature 22) runs along the western boundary of the soil area, and a series of three broken terraces (Features 23, 28, and 32) run along the eastern boundary. To the west of Feature 22 the project area terrain begins to slope steeply to the west and no features are present until the base of the rocky slope. The broken terraces along the eastern edge of the soil area are constructed against bedrock and the terrain to the east of these features consists of exposed bedrock and scattered cobbles with no features present. Bulldozing has occurred to the east of the field unit.

Within the soil area contained by the boundary walls are nineteen distinct features including ten mounds (Features 2, 5, 6, 7, 8, 9, 13, 24, 26, 27), five modified outcrops (Features 1, 10, 11, 25, and 29), and four terraces (Features 3, 4, 12, and 14) (see Figure 50 and Table 5). With the exception of the largest terrace (Feature 14), which appears designed to retain soil on its up slope side, all of the remaining features listed above are interpreted as clearing features. These features are all crude collections of stones that are located on or near exposed bedrock outcrops with soil surrounding them. It appears that the features were constructed as cobbles were removed from the soil areas to prepare the field for planting. Of the nineteen features within this field unit, thirteen are piled, four are stacked, and two are partially stacked and partially piled. A 1 x 1 meter test unit (TU-10) was excavated at the feature with the most formal appearance in this area, Feature 7 (Figure 53), a stacked mound (see the results of subsurface testing at Site 24776 below). Excavation of TU-10 revealed that the feature was constructed with stacked cobbles surrounding an inner fill of piled cobbles, and that only five to ten centimeters of soil was present above bedrock beneath this feature. No cultural debris was recovered from Feature 7.

Table 5. Recorded features of SIHP Site 24776.

Feature #	*Feature Type*	*Length (m)*	*Width (m)*	*Height (m)*	*Attributes*	*Test Unit*
1	Modified outcrop	6.7	6.4	0.8	Piled	-
2	Mound	10.0	2.0	0.5	Piled	-
3	Terrace	4.0	1.4	0.5	Piled	-
4	Terrace	7.1	1.5	0.8	Stacked	-
5	Mound	2.6	2.4	0.6	Stacked/Piled	-
6	Mound	5.3	1.5	0.8	Stacked	-
7	Mound	3.0	3.0	0.9	Stacked	TU-10
8	Mound	1.6	1.6	0.6	Stacked	-
9	Mound	2.3	2.3	0.5	Piled	-
10	Modified outcrop	2.0	1.0	0.4	Piled	-
11	Modified outcrop	2.1	1.4	0.5	Piled	-
12	Terrace	4.0	2.5	0.5	Piled	-
13	Mound	1.8	1.4	0.7	Piled	-
14	Terrace	12.0	2.0	0.6	Stacked/piled	-
15	Terrace	15.0	2.5	1.5	Piled	-
16	Terrace	30.0	1.2	1.0	Stacked	-
17	Mound	1.7	0.8	0.3	Piled	-
18	Modified outcrop	3.1	2.6	0.8	Stacked/piled	-
19	Terrace	7.6	0.9	0.4	Piled/stacked	-
20	Terrace	3.7	1.0	0.5	Piled/stacked	-
21	Mound	2.2	2.0	0.4	Piled	-
22	Terrace	32.0	2.4	0.6	Piled	-
23	Terrace	7.8	1.0	0.3	Piled	-
24	Mound	1.8	1.7	0.2	Piled	-
25	Modified outcrop	4.6	2.0	0.6	Piled	-
26	Mound	2.0	2.0	0.7	Piled	-
27	Mound	2.9	2.4	0.5	Piled	-
28	Terrace	11.0	0.9	0.6	Stacked	-
29	Modified outcrop	1.7	1.5	0.4	Piled	-
30	Mound	1.0	0.9	0.3	Piled	-
31	*Kuaiwi*	55.0	1.6	0.6	Piled/stacked	-
32	Terrace	6.5	2.5	0.8	Piled	-
33	Enclosure	8.8	6.5	1.0	Stacked	TU-3
34	*Kuaiwi*	75.0	1.8	07	Piled	-
35	*Kuaiwi*	230.0	2.5	0.6	Piled	-
36	Mound	4.0	4.0	0.7	Stacked	TU-11
37	Enclosure	6.2	5.5	0.6	Stacked/piled	TU-1
38	Modified outcrop	3.9	3.2	0.6	Stacked/piled	TU-4
39	Enclosure	12.0	8.0	0.7	Piled/stacked	TU-5, 6
40	Terrace	6.0	3.0	1.0	Stacked	TU-7
41	Modified outcrop	3.5	3.1	1.6	Stacked	TU-8
42	Modified outcrop	2.5	1.5	0.4	Piled	TU-9
43	Modified outcrop	10.0	8.0	1.0	Piled	TU-13
44	Terrace	3.5	1.5	0.9	Stacked	TU-16

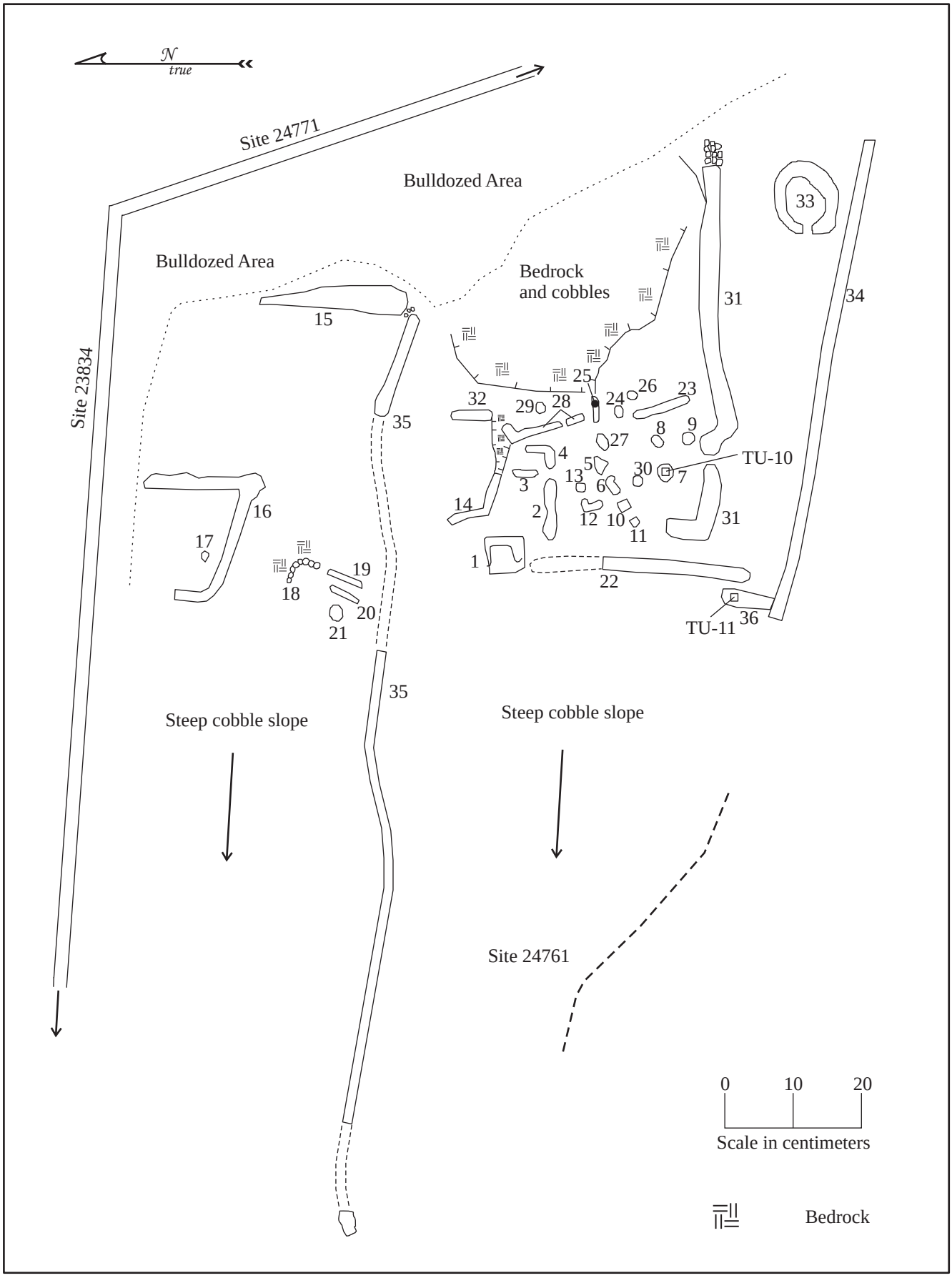


Figure 50. SIHP Site 24776, Features 1-36 plan view.

Figure 51. SIHP Site 24776 Feature 31, view to east.

Figure 52. SIHP Site 24776 Feature 35, view to northwest.


Figure 53. SIHP Site 24776 Feature 7 (foreground), Feature 8, and Feature 30 (background), view to north.

As previously mentioned Feature 14, a partially stacked terrace, is the only feature contained in this area that appears to have been constructed for a purpose other than clearing stones from the soil planting areas. The upslope side of this feature (to the north and east) retains ample soil that is less rocky than soil in other areas of the field unit. The soil retained by Feature 14 was almost certainly used for planting. It is not clear, however, if the soil accumulated naturally in this area after the construction of this feature, or if the soil was present prior to the construction of the feature, or if the soil was purposely placed in the area by the individual(s) who constructed the feature. A secondary function of Feature 14 would have been to clear stones from the surrounding soil areas (the feature is rather large and contains a significant number of stones). The three other terraces in this area (Features 3, 4, and 12) are all small and incorporate at least some bedrock (Figure 54). These features appear to have been constructed primarily to clear cobbles from planting areas on their down slope sides, although as an added benefit of their construction they do help retain some soil on their up slope sides, which may have already been naturally accumulated behind bedrock outcrops when they were created.

Additional agricultural features are present to the north and south of the twenty-five features discussed above (see Figure 50). These features, although in close proximity to others, appear to be portions of adjoining field units. Seven features are located to the north of Feature 35, a *kuaiwi* that runs along the northern boundary of the field unit discussed above. These features include four terraces (Features 15, 16, 19, and 20), two mounds (Features 17 and 21), and a modified outcrop (Feature 18). Feature 15 is a crude terrace that runs north from Feature 35 at the eastern extent of the field area. This feature has been largely disturbed by bulldozing to its east and north, making functional interpretations difficult. To the west of Feature 15 the ground is level, but rocky with a large amount of exposed bedrock evident and only thin soil accumulated in small pockets. No features are present in this area and it is possible that either it was not used for agricultural purposes or that only the small soil pockets were minimally used for planting purposes.

Figure 54. SIHP Site 24776 Feature 12, view to southeast.

At the western edge of this level area, at the top of a steep rocky slope, six more features are present surrounding areas with ample soil for planting. Feature 16 is an L-shaped terrace constructed of loosely stacked cobbles. This feature surrounds a soil area and was likely constructed as stones were cleared from that area for planting purposes. The eastern segment of this terrace may have also been designed to retain soil on its up slope side. One piled clearing mound (Feature 17) is present within the planting area defined by Feature 16. To the south of Feature 16 are two more terraces, a modified outcrop, and a mound that runs north from Feature 35. Combined these features create a two tiered soil area that was likely used for planting. Features 19 and 20 are terraces that aid in soil retention, while Features 18 and 21 are clearing features. Feature 35 (the *kuaiwi*) continues west down the steep rocky slope beyond this planting area, but no other planting or clearing features are present on either side of the *kuaiwi* until the base of the slope, a good distance to the west.

To the south of Feature 31, the *kuaiwi* that runs along the southern edge of the twenty-five features that make up the main body of the typical field unit within the current project area, the ground surface consists of a raised linear ridge of exposed bedrock ten to fifteen meters wide. On the south side of this small ridge is a second *kuaiwi* (Feature 34) that appears to be the northern boundary wall of another field unit. These raised bedrock ridges are a recurring landform feature that run *mauka/makai* at varying intervals throughout the current project area. They are generally free of features, and typically have *kuaiwi* constructed along their northern and southern edges with agricultural features constructed in the low areas between them. Two features, an enclosure and a mound (Features 33 and 36), happen to be present on this bedrock ridge between Features 31 and 34. It is also possible that a *mauka/makai* trail (Site 24761), recorded to the west of the field unit followed this ridge between the two *kuaiwi*, although the route of the trail could not be positively identified in the field.

Feature 33 is a neatly constructed enclosure located near the eastern end of Feature 34 that is strategically placed over a pocket of soil. This enclosure contains an interior of thin soil and the walls are constructed of dry-stacked stones cleared from the interior space (Figure 55). The enclosure is surrounded by exposed bedrock. A 1 x 1 meter test unit (TU-3) excavated within this feature revealed approximately 15 centimeters of extremely rocky silt resting on bedrock (see results of subsurface testing at Site 24776 below). Two volcanic glass flakes were recovered from TU-3. The presence of volcanic glass flakes and soil within this enclosure, combined with the tall walls, suggest that the feature may have been used for planting purposes, with the walls designed to keep animals out of the planting area. Feature 36 (Figure 56) is stacked mound located near the western end of Feature 34 slightly west of Feature 22 (see Figure 50). This mound is loosely connected to Feature 34 by a linear stone alignment. A 1 x 1 meter test unit (TU-11) excavated in the central portion of Feature 36 revealed a single architectural layer of piled cobble fill with stacked edges present on bedrock. Almost no soil was present within TU-11 suggesting that the feature was created for clearing purposes (see results of subsurface testing at Site 24776 below).

Figure 55. SIHP Site 24776 Feature 33, view to southwest.

Figure 56. SIHP Site 24776 Feature 36, view to southeast.

Results of Subsurface Testing at Site 24776

Twelve test units were excavated at eleven of the recorded agricultural features (see Table 5). The tested features included two mounds, three terraces, three enclosures, and three modified outcrops. In all cases, the findings from the test units were consistent with the assigned agricultural function of the features. With the exception of some *kukui* nut shells, all but two of the excavated test units revealed a complete lack of cultural debris. One test unit (TU-3 excavated at Feature 33) revealed the presence of two volcanic glass flakes, and another test unit contained a single coral abrader (TU-9 excavated at Feature 42). With the exception of the enclosures, most of the excavated features lacked any soil, suggesting that they are likely clearing features, rather than planting features. The tested enclosures appear to have been utilized as planting features. Each of the tested features and the subsurface findings at these features are discussed in detail below.

Feature 7

Feature 7 is a circular mound located in the northeastern portion of the current project area (see Figures 49 and 50). The mound measures 3.0 meters in diameter and stands up to 0.9 meters tall (Figure 57). Larger cobbles are loosely stacked up to two courses high around the periphery of the feature with smaller cobbles filling the interior. The top surface of the feature is neatly constructed, but not level. It is mounded up in the center. A 1 x 1 meter test unit (TU-10) was excavated in the central portion of Feature 7.

Excavation of TU-10 revealed a two-layer stratigraphic profile (see Figure 57). Layer I, the architectural layer, consisted of up to 48 centimeters of small to large sized *pāhoehoe* cobbles with smaller cobbles on top and larger cobbles towards the bottom. This layer was resting on Layer II, a very dark brown (7.5YR 2.5/2) silt containing approximately 10% gravel. Layer II was present in a 5 to 10 centimeter thick layer beneath Layer I on bedrock. No cultural debris was recovered from either Layer I or Layer II. Excavation of TU-10 terminated at bedrock roughly 55 centimeters beneath the surface of Feature 7.

Feature 33

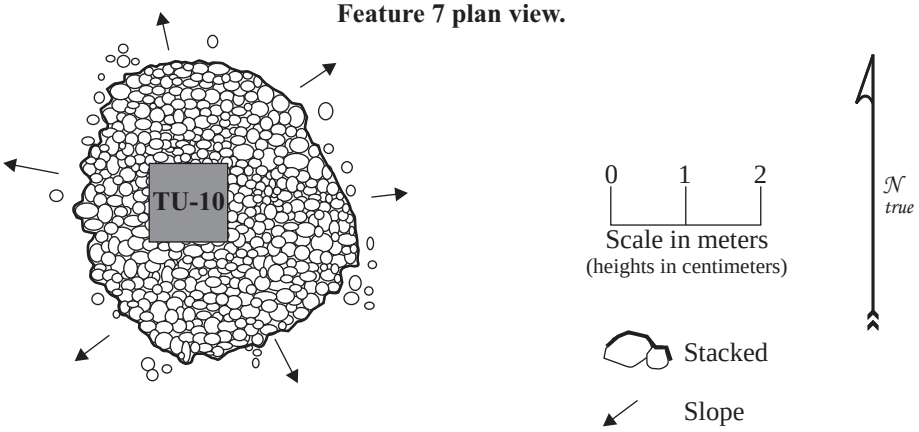
Feature 33 is an enclosure located in the east-central portion of the current project area (see Figures 49 and 50). The enclosure is roughly oval in shape and measures 8.8 meters long (east/west) by 6.5 meters wide (north/south) (Figure 58). The walls are constructed of dry-stacked medium to large sized *pāhoehoe* cobbles standing five to six courses (up to 1.0 meter) high. The enclosure has two possible entrances; one in the southeastern corner, and another in the center of the west wall. The northern wall of the enclosure is constructed against a raised bedrock outcrop. Feature 33 has an interior space that measures roughly 4.5 meters by 4.0 meters. The interior contains cobble rubble and has exposed bedrock in its northeastern corner that slopes gently to a level soil area in the southwestern corner. A 1 x 1 meter test unit (TU-3) was excavated into the soil in the southwestern corner of Feature 33.

Excavation of TU-3 revealed a single stratigraphic soil layer (Layer I) resting on bedrock (see Figure 58). Layer I consisted of very dark brown (10YR 2/2) silt containing approximately 70% gravels and small cobbles with roots throughout. This layer was present to a maximum depth of 15 centimeters beneath the surface of the unit where it terminated at smooth *pāhoehoe* bedrock. Two small volcanic glass flakes were recovered from the screen during the excavation of TU-3. Excavation of the unit terminated at bedrock.

Feature 36

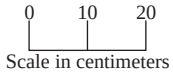
Feature 36 consists of a stacked, circular mound with a linear extension that is located in the northeastern portion of the current project area near the western termination of Feature 34 and the southern termination of Feature 22 (see Figures 49 and 50). The mound measures roughly 4.0 meters in diameter and stands up to 0.7 meters tall (Figure 59). The edges of the mound consist of stacked larger-sized cobbles, while the central portion consists of a fill of smaller mounded cobbles. A 2.0-meter wide, single course alignment of cobbles runs south from the southern edge of the mound for 11.0 meters to Feature T-5, loosely connecting Feature 36 with that feature. A 1 x 1 meter test unit (TU-11) was excavated in the central portion of the stacked mound.

Feature 7 plan view.

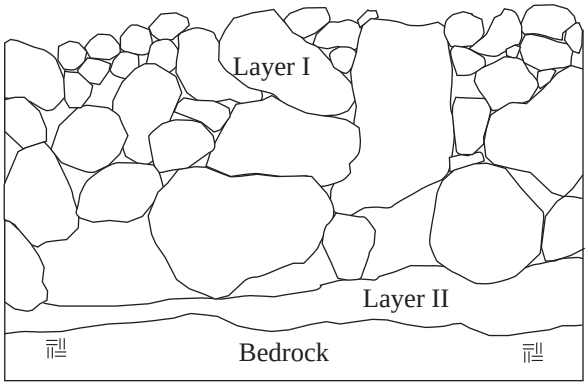


Feature 7, view to northeast.

TU-10 north wall profile



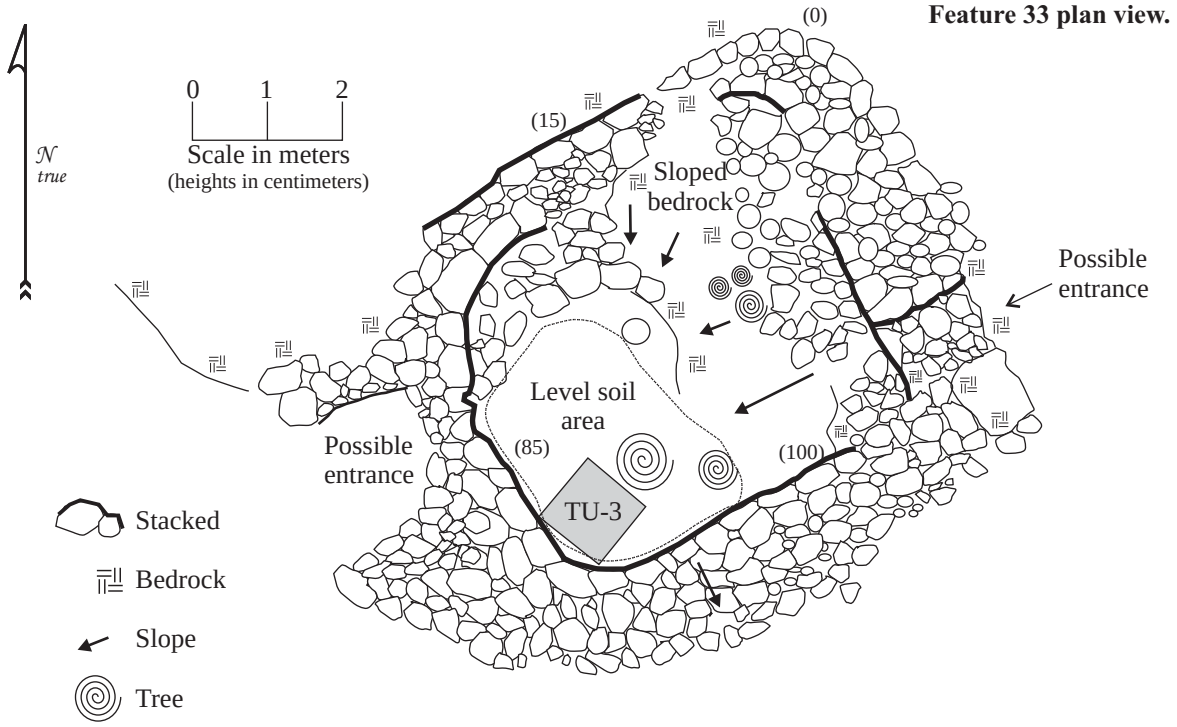
TU-10 base of excavation, view to north.



Layer I - Architectural layer consisting of small to large sized cobbles with smaller cobbles on top and larger cobbles towards the bottom.

Layer II - Very dark brown (7.5YR 2.5/2) silt containing approximatelly 10% gravels.

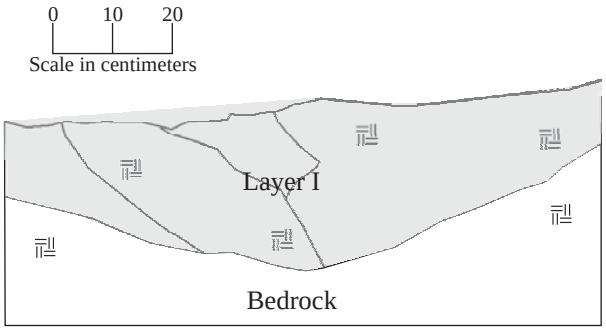
Figure 57. SIHP Site 24776 Feature 7 plan view and TU-10 profile.



Feature 33, view to southwest.

TU-3, base of excavation, view to northwest.

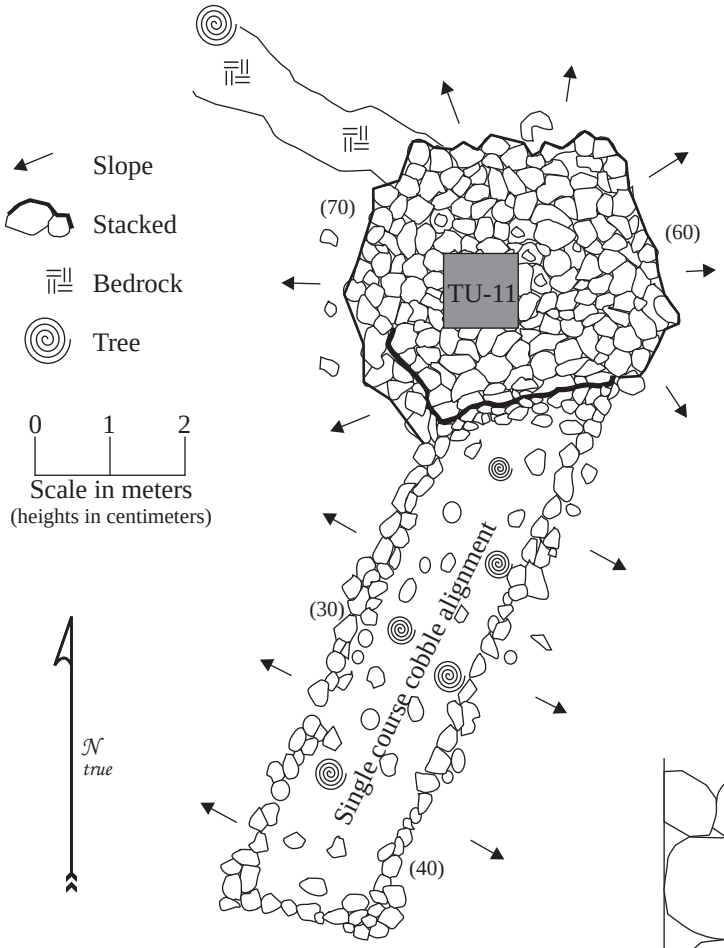
TU-3 northwest wall profile.



Layer I - Very dark brown (10YR 2/2) silt containing approximately 70% gravels, small cobbles, and roots throughout.

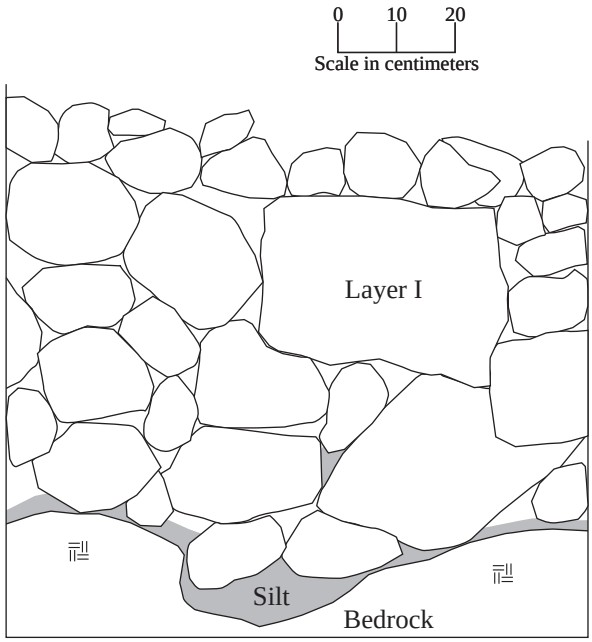
Figure 58. SIHP Site 24776 Feature 33 plan view and TU-3 profile.

Feature 36 plan view.



Feature 36, view to southeast.

TU-11 north wall profile.



Layer I - Architectural layer of various sized cobbles piled on bedrock with a small amount of very dark brown (7.5YR 2.5/2) silt collected in the bedrock cracks.

TU-11 base of excavation, view to north

Figure 59. SIHP Site 24776 Feature 36 plan view and TU-11 profile.

Excavation of TU-11 revealed a single stratigraphic layer of small to large sized *pāhoehoe* cobbles piled on bedrock (Layer I) (see Figure 59). This layer extended to a maximum depth of 85 centimeters beneath the surface of the unit. At the base of Layer I, within the bedrock cracks, a small amount of very dark brown (7.5YR 2.5/2) silt had collected. This soil was passed through ¼-inch mesh screen, but no cultural debris was recovered from it or the rest of TU-11. Excavation of TU-11 terminated at bedrock at a maximum depth of 85 centimeters beneath the surface of Feature 36.

Feature 37

Feature 37 is a rectangular enclosure located in the southeastern corner of the current project area (see Figure 49). The enclosure measures 6.2 meters long by 5.5 meters wide (Figure 60). The walls consist of cobbles and boulders that are currently mounded and collapsed, averaging 0.8 meters wide by 0.6 meters tall. Some remnant stacking is present along the interior northern wall and in the northeastern corner, suggesting that the walls may have been formerly stacked. The interior floor of the enclosure measures roughly 2.6 meters square and consists of small cobbles and pebbles that slope slightly to the west. A 1 x 1 meter test unit (TU-1) was excavated in the northwestern corner of Feature 37.

Excavation of TU-1 revealed a single stratigraphic layer (Layer I) of small *pāhoehoe* cobbles with approximately 5% very dark brown (10YR 2/2) granular silt collected amongst them resting on fractured *pāhoehoe* bedrock (see Figure 60). No artifacts were recovered from TU-1, and the excavation terminated at bedrock 10-17 centimeters beneath the surface of the unit.

Feature 38

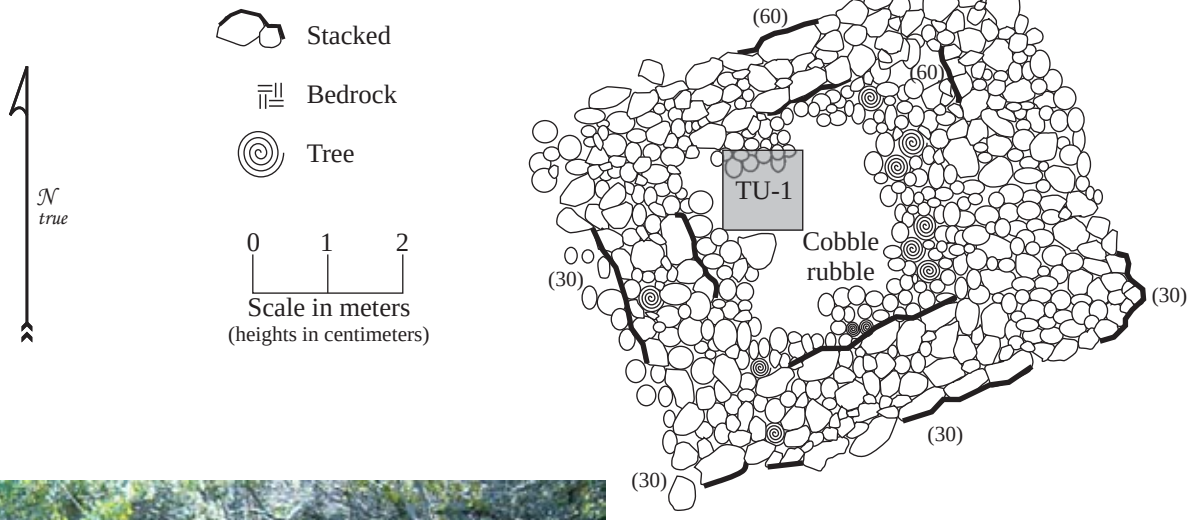
Feature 38 is a modified outcrop located in the south-central portion of the current project area near the eastern termination of Site 24763 (see Figure 49). The feature is constructed of loosely stacked and piled cobbles on a raised bedrock outcrop. It measures 3.9 meters (north/south) by 3.2 meters (east/west) (Figure 61). The northern, southern, and western edges of the feature consist of stacked cobbles standing one to four courses (up to 65 centimeters) tall. The surface of the feature contains a roughly level fill of small cobbles that fades into the surrounding bedrock terrain to the east. A small, natural lava blister with a *ti* plant growing out of it is present four meters to the north of the modified outcrop. A one by one meter test unit (TU-4) was excavated in the west central portion of the surface of Feature 38.

Excavation of TU-4 revealed a single stratigraphic layer (Layer I) consisting of approximately 40 centimeters of cobbles, small boulders, and fragments of fractured bedrock piled on the surface of the bedrock outcrop (see Figure 61). A small amount of very dark brown (10YR 2.5/2) silt was discovered within the deep bedrock cracks of the outcrop. This soil was screened, but no cultural debris was discovered within TU-4. Excavation of TU-4 terminated at bedrock up to 40 centimeters beneath the surface of Feature 38.

Feature 39

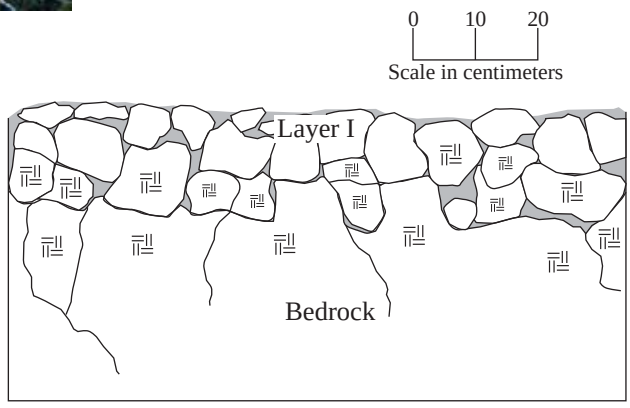
Feature 39 is an enclosure located in the central portion of the current project area (see Figure 49). The enclosure is roughly rectangular, measuring twelve meters (north/south) by eight meters (east/west) (Figure 62). The walls consist primarily of piled cobbles, standing 60-70 centimeters tall, but they exhibit some signs of being formerly stacked along the interior edges. The interior of the enclosure contains level soil to the north and exposed bedrock that is elevated above the soil to the south. The bedrock slopes up towards the southeastern corner of Feature 39 where no wall is present. This may have been the entrance to the enclosure. Cobbles are piled against the northern edge of the bedrock where it appears a blister was filled in. Two test units were excavated at Feature 39, one in the northeastern interior corner of the enclosure in soil (TU-5), and another along the northern edge (TU-6) of the bedrock where a small blister appeared to have been filled in (Figure 63).

Feature 37 plan view.



Feature 37, view to northeast.

TU-1 south wall profile

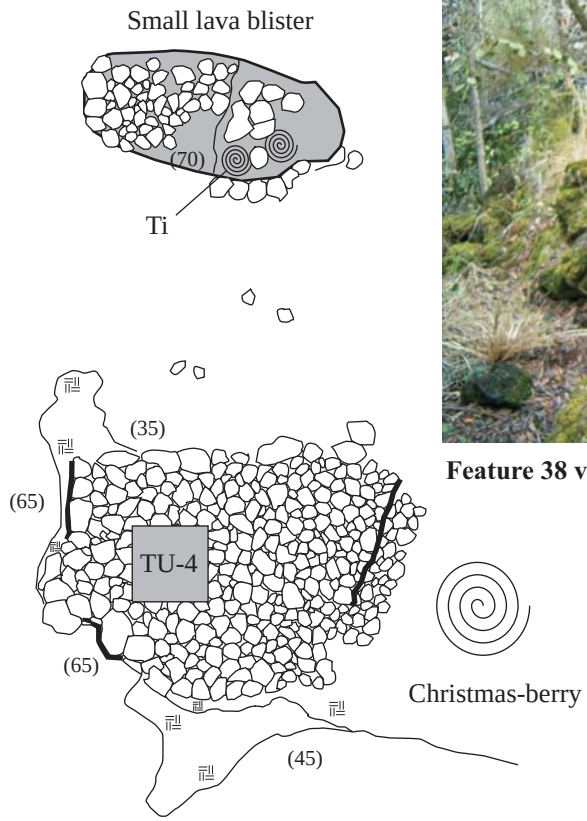


Layer I - Small cobbles mixed with very dark brown (10YR 2/2) granular silt resting on fractured bedrock

TU-1 base of excavation, view to south.

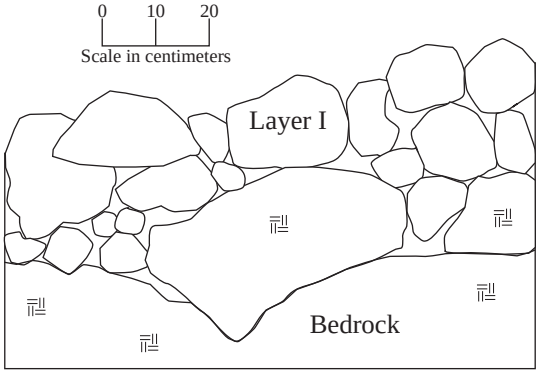
Figure 60. SIHP Site 24776 Feature 37 plan view and TU-1 profile.

Feature 38 plan view.



Feature 38 view o west.

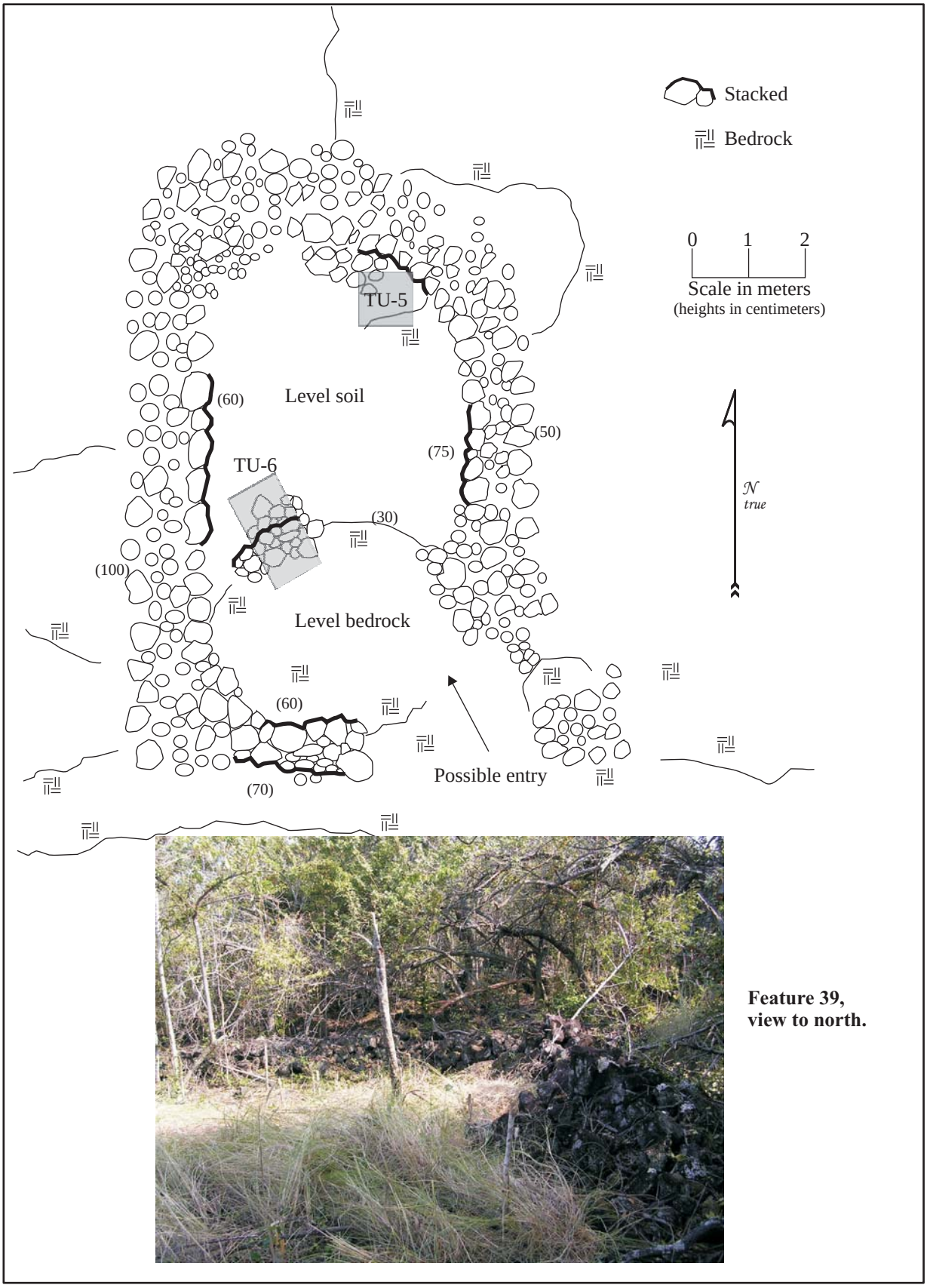
TU-4 south wall profile



Layer I - Piled cobbles, small boulders, and fractured bedrock on the surface of a bedrock outcrop.

TU-4 base of excavation, view to south

Figure 61. SIHP Site 24776 Feature 38 plan view and TU-4 south wall profile.



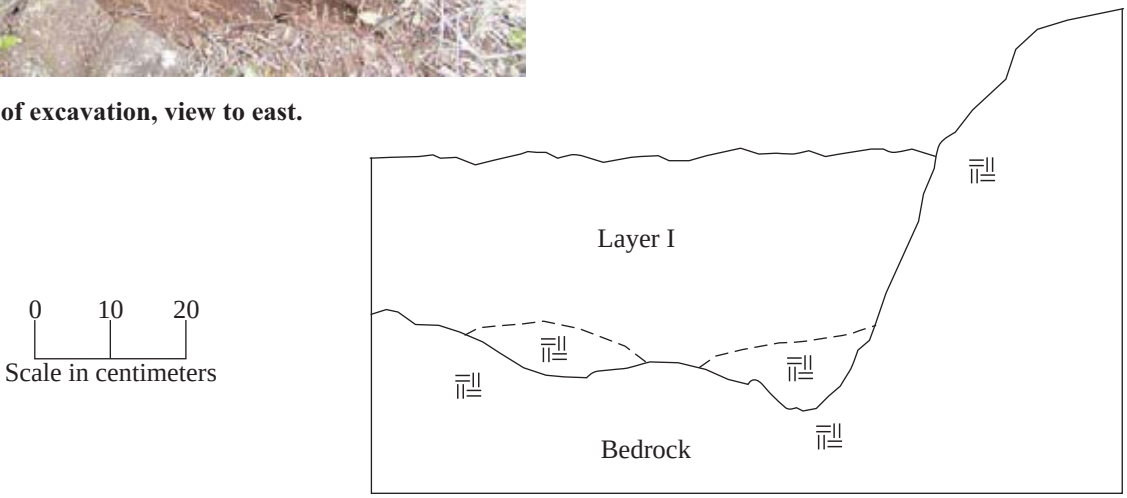
Feature 39, view to north.

Figure 62. SIHP Site 24776 Feature 39 plan view and photograph.

TU-5 base of excavation, view to east.

TU-5 east wall profile.

Layer I - Very dark brown silt (10YR 2.5/2) containing approximately 40% cobbles.

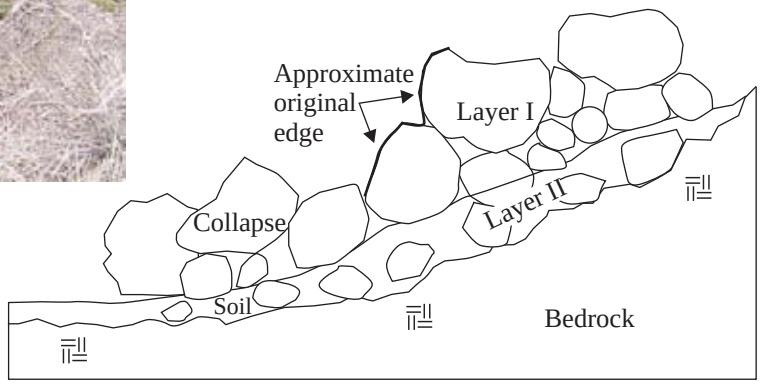


TU-6 base of excavation, view to northwest.

TU-6 northeast wall profile.

Layer I - Architectural layer consisting of small boulders and cobbles piled against a raised bedrock and within a blister.

Layer II - Very dark brown (10YR 2.5/2) silt at the base of the small blister.



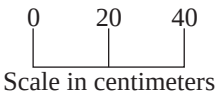


Figure 63. SIHP Site 24776 Feature 39, TU-5 and TU-6 profiles.

TU-5 was a 1 x 1 meter test unit placed in the northeastern corner of Feature 39 along the interior wall edge. Some collapsed cobbles from the wall were present on the surface of the unit, but were removed prior to excavation. Excavation of TU-5 revealed an approximately 30-centimeter thick soil layer (Layer I) resting on bedrock (see Figure 63). Some bedrock was also present at the surface of TU-5. Layer I consisted of very dark brown silt (10YR 2.5/2) containing approximately 40% cobbles. Several *kukui* nut fragments were recovered from the unit, but many appeared rodent gnawed and may have been introduced to the feature later than the time of its use. Excavation of TU-5 terminated at bedrock 0-30 centimeters beneath the surface of the unit.

TU-6 was a 1 x 2 meter test unit placed in the west-central portion of Feature 39 along the northern edge of the exposed bedrock in the southern portion of the enclosure on top of a cobble pile that appeared to be filling in a small blister (see Figure 63). The unit was excavated to determine if the blister may have been an entry to a larger blister beneath the exposed bedrock. Excavation of TU-6 revealed up to eighty centimeters of cobbles (Layer I) piled on 0-20 centimeters of soil (Layer II) within the small blister. Layer I consisted of small boulders and cobbles piled against the raised bedrock and within the blister. Layer II consisted of up to 20 centimeters of very dark brown (10YR 2.5/2) silt collected within the base of the small blister. Rodent gnawed *kukui* nut fragments were recovered from Layer II, but no opening to any larger blister was revealed. Excavation of TU-6 terminated at bedrock up to one meter beneath the surface of the unit.

Feature 40

Feature 40 is terrace located in the extreme western portion of the current project area near the southwestern corner (see Figure 49). The terrace is 6.0 meters long (north/south) and constructed against a steep slope with stacked cobbles and boulders along the western edge of the feature standing up to 1.0 meter (six courses) tall (Figure 64). This western edge of Feature 40 slopes inward from the base of the feature to the top surface of the terrace. The top surface is approximately 3.0 meters wide (east/west) and consists of leveled cobbles of various sizes. The feature fades into a steep bedrock slope to the east. A 1 x 1 meter test unit (TU-7) was excavated into the central portion of the level surface of Feature 40.

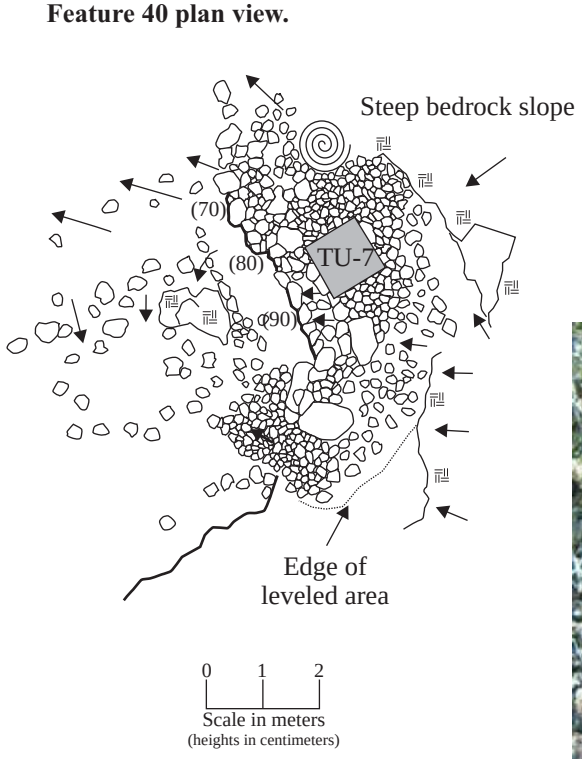
Excavation of TU-7 revealed a two-layer stratigraphic profile (see Figure 64). Layer I, the architectural layer, consisted of piled, various sized cobbles and boulders that went from the surface of the unit to the base of the unit at a depth of 1.0 meter where it rested on bedrock. At approximately 50 centimeters beneath the surface of TU-7 Layer I became mixed with Layer II. This layer consisted of very dark brown (10YR 2/2) slightly sandy silt that had accumulated amongst the Layer I cobbles and accounted for approximately 50% of the unit matrix. Layer II continued to a depth of 1.0 meter beneath the surface of the unit where the excavation of TU-7 terminated at bedrock. Three *kukui* nut fragments were recovered from TU-7 within Layer I.

Feature 41

Feature 41 is a modified outcrop located in the southwestern portion of the current project area approximately ten meters southwest of Site 24765 (see Figure 49). Feature 41 measures 3.5 meters (east /west) by 3.1 meters (north/south) and consists of stacked cobbles against the southern edge of an exposed bedrock outcrop (Figure 65). The southern and eastern edges of the feature stand up to 0.5 meters above the surrounding ground surface, the northern edge is level with the bedrock outcrop, and the western edge is located atop a vertical bedrock face that stands up to 1.6 meters above ground surface to the west. The surface of the feature is roughly leveled with small cobbles. A 1 x 1 meter test unit (TU-8) was excavated into the surface of Feature 41 near its southern edge.

Excavation of TU-8 revealed a single stratigraphic layer of cobbles (Layer I) resting on bedrock (see Figure 65). Layer I consisted of 20-60 centimeters of piled cobbles on a sloping bedrock surface. A very small amount of very dark brown (10YR 2/2) silt had collected within deep bedrock cracks. This soil was screened, but the only debris recovered from the unit consisted of ten small *kukui* nut fragments discovered amongst the Layer I cobbles. Excavation of TU-8 terminated at bedrock at a maximum depth of 60 centimeters beneath the surface of Feature 41.

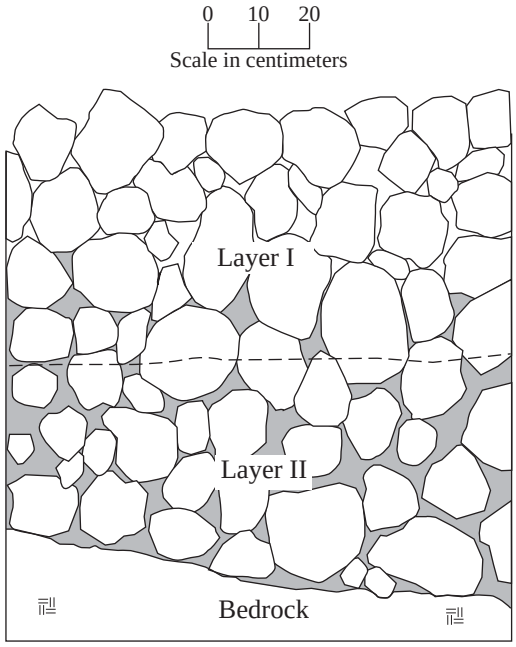
Feature 40 plan view.



Feature 40, view to northeast.

TU-7 base of excavation, view to northeast.

TU-7 west wall profile.

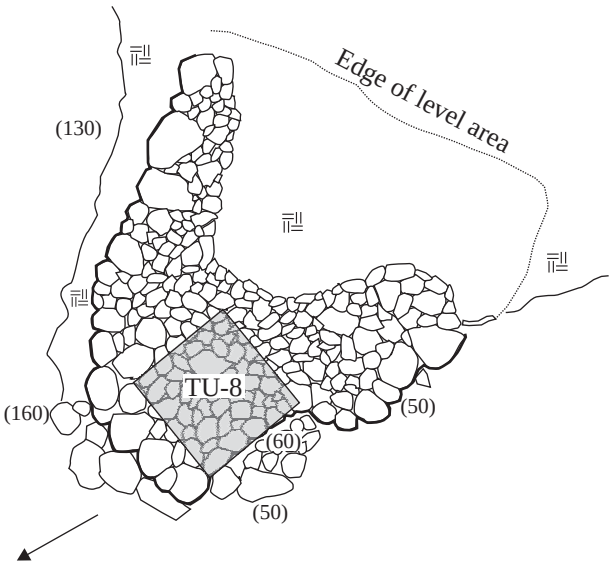


Layer I - Architectural layer consisting of piled, various sized cobbles and boulders resting on bedrock.

Layer II - Very dark brown (10YR 2/2) slightly sandy silt accumulated amongst the cobbles of the architectural layer.

Figure 64. SIHP Site 24776 Feature 40 plan view and TU-7 profile.

Feature 41 plan view.



Feature 41, view to southwest.

TU-8 base of excavation, view to southwest.

0 .5 1
Scale in meters
(heights in centimeters)

N true

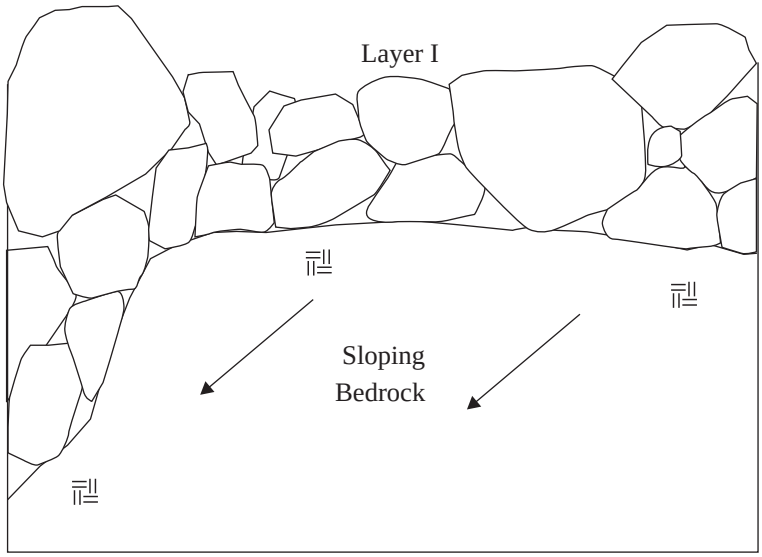
Stacked

Bedrock

Slope

TU-8 southwest wall profile.

0 10 20
Scale in centimeters



Layer I - Piled cobbles resting on sloping bedrock with a very small amount of very dark brown (10YR 2/2) silt within deep bedrock cracks.

Figure 65. SIHP Site 24776 Feature 41 plan view and TU-8 profile.

Feature 42

Feature 42 is a modified outcrop located in the north-central portion of the current project area (see Figure 49). The bedrock outcrop measures approximately five meters square and is raised on all sides with a maximum height of 2.5 meters on the western (down slope) side (Figure 66). A 2.5-meter long (north/south) by 1.5-meter wide (east/west) area along the eastern edge of the outcrop has been modified with piled cobbles. The cobbles are piled to a height of 40 centimeters along their eastern edge and are level with the bedrock outcrop to the west. A small crack in the bedrock (25 centimeters by 20 centimeters) located to the west of the pile appeared to lead to a larger subsurface chamber, but was not accessible. The piled cobbles appeared to be filling the eastern portion of this crack, perhaps concealing a blister opening. For this reason a 1 x 1 meter test unit (TU-9) was excavated into the central portion of the modified area at Feature 42.

Excavation of TU-9 revealed a single stratigraphic layer (Layer I) of piled cobbles mixed with a small amount of soil resting on bedrock (Layer I) (see Figure 66). It also revealed an extension of the small crack leading to the observed subsurface chamber, but the opening was not large enough to access the small chamber. Layer I consisted of piled small to large sized cobbles on and against the bedrock outcrop. This layer was present to a depth of 35 to 45 centimeters beneath the surface of TU-9 and contained approximately 5% dark reddish brown (10YR 2.5/2) silt throughout. A triangular-shaped coral abrader, 6.0 centimeters long by 2.0 centimeters wide and weighing 11.0 grams, was recovered from the southwestern quadrant of TU-9 approximately 40 centimeters beneath the surface of the unit. No other cultural material was recovered from Feature 42. Excavation of TU-9 terminated at bedrock at a maximum depth of 45 centimeters beneath the surface of the unit.

Feature 43

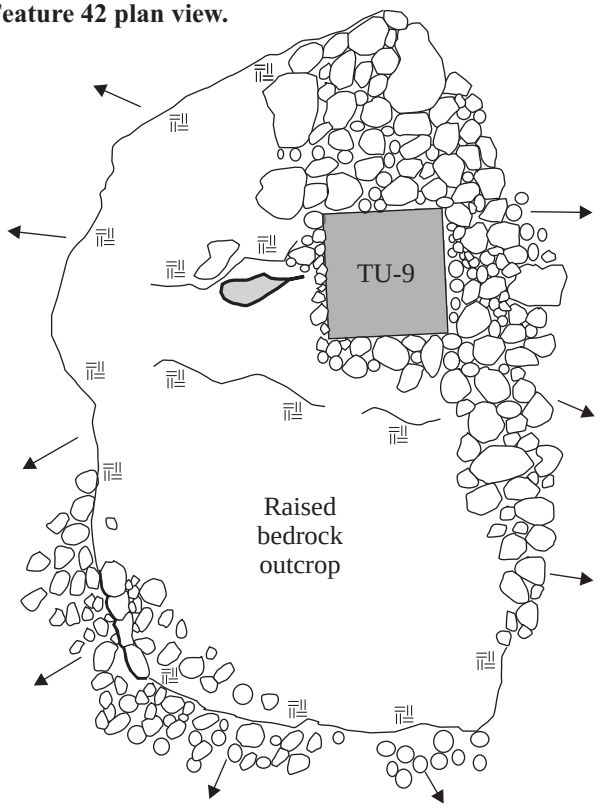
Feature 43 consists of a modified outcrop located in the north-central portion of the current project area (see Figure 49). The feature measures roughly 10 meters (north/south) by 8 meters (east/west) and is constructed of various sized cobbles piled on and against a bedrock outcrop that rises up 1.0 meter above the feature's surface to the south and east (Figure 67). The surface of Feature 43 is relatively level, but not uniformly paved. The piled western and northern edges of the feature rise a sloping 30 to 60 centimeters above ground surface to the north and west. A small lava blister with an opening that measured 50 x 30 centimeters was noted in the southwestern corner of the feature. The blister was 70 centimeters deep, but was not accessible. It ran both northwest and southeast for an undermined distance and no cultural debris was observed from the opening. A 1 x 1 meter test unit (TU-13) was excavated in the central level surface of Feature 43 (see Figure 67).

Excavation of TU-13 revealed a two-layer stratigraphic profile consisting of cobbles near the surface (Layer I) and cobbles mixed with soil (Layer II) near the base on bedrock (see Figure 67). Layer I consisted of approximately 30 centimeters of small sized cobbles resting partially on bedrock and partially on Layer II. With depth, Layer I gradually transitioned into Layer II approximately 30 centimeters beneath the surface of TU-13. Layer II consisted of various sized cobbles mixed with decomposing bedrock and very dark brown (10YR 2/2) silt. This layer was approximately 30 centimeters thick and terminated at bedrock approximately 60 centimeters beneath the surface of the unit. No cultural debris was recovered during the excavation of TU-13. Excavation terminated at bedrock 60 centimeters beneath thee surface of Feature 43.

Feature 44

Feature 44 consists of a small terrace located in the north central portion of the current project area (see Figure 49). The terrace has a neatly stacked western edge and a level, neatly paved top surface. It measures 3.5 meters long (north/south) by 1.5 meters wide (east/west), and stands up to 0.9 meters (four to five courses) tall along its western edge (Figure 68). The eastern edge of the feature is level with ground surface to the east. Exposed bedrock is present on ground surface to the west of the feature. A 1 x 1 meter test unit (TU-16) was excavated in the central portion of Feature 44.

Feature 42 plan view.



Bedrock

Blister opening

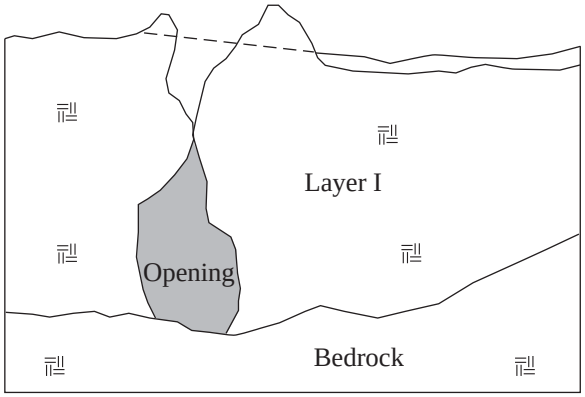
0 .5 1
Scale in meters
(heights in centimeters)

N
true

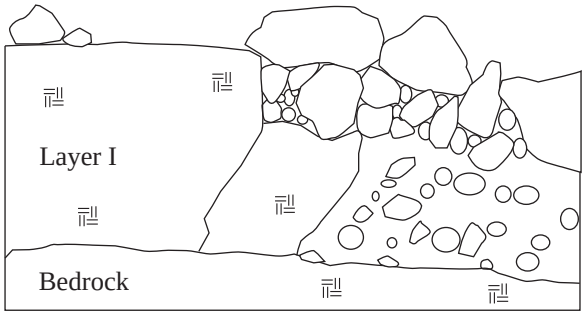
Feature 42, view to northwest.

TU-9 base of excavation, view to west.

TU-9 west wall profile.



TU-9 north wall profile.

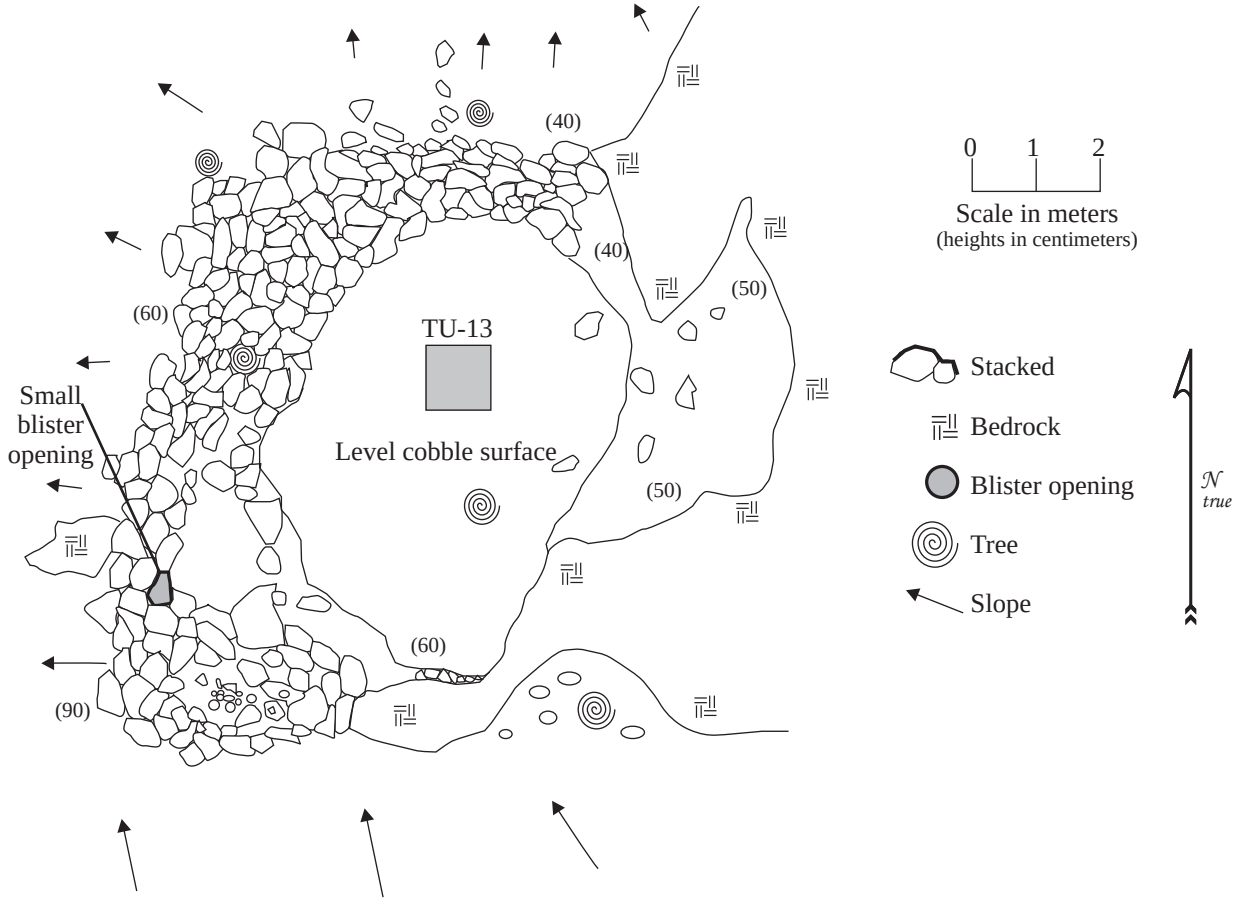


0 10 20
Scale in centimeters

Layer I - Piled small to large sized cobbles resting on bedrock and covering small blister opening. Cobbles mixed with approximately 5% dark reddish brown (10YR 2.5/2) silt throughout.

Figure 66. SIHP Site 24776 Feature 42 plan view and TU-9 profiles.

Feature 43 plan view.



TU-13 east wall profile.

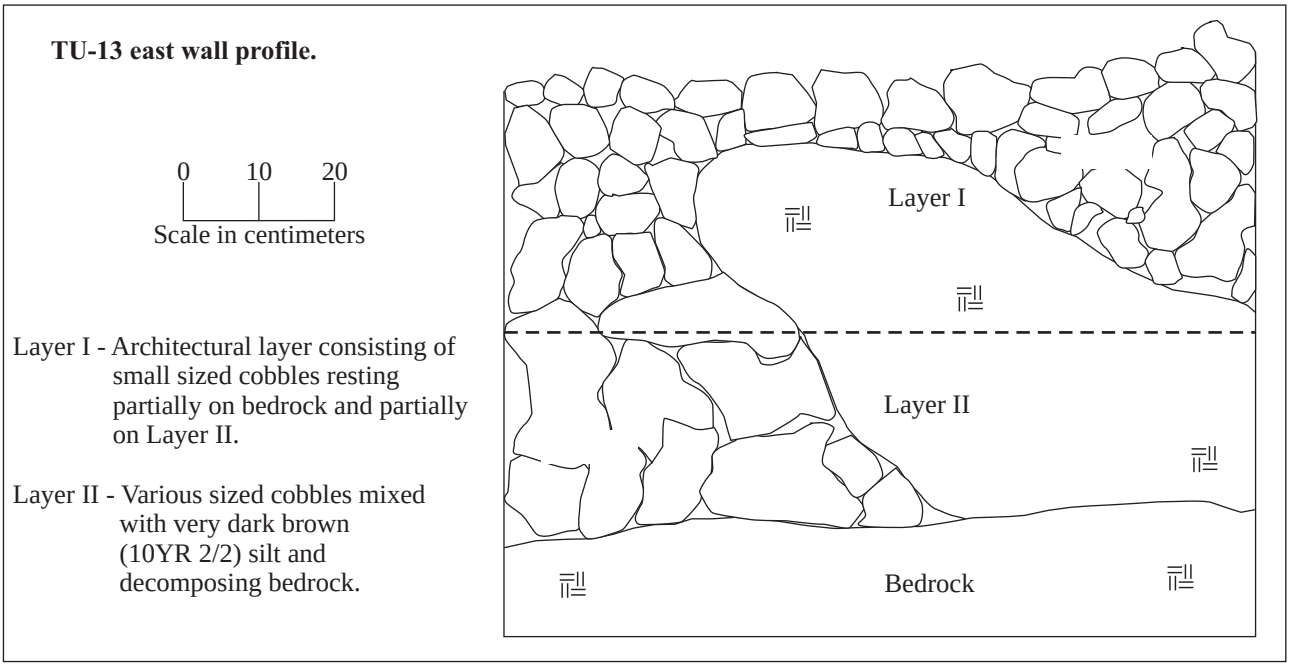
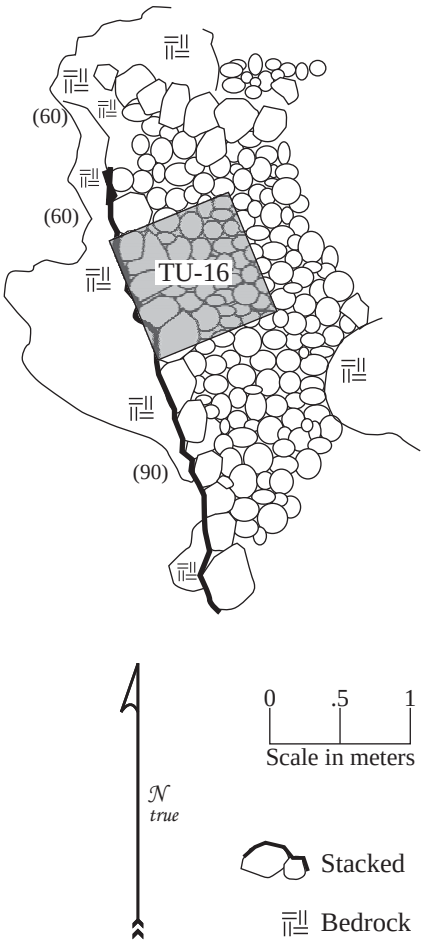


Figure 67. SIHP Site 24776 Feature 43 plan view and TU-13 profile.

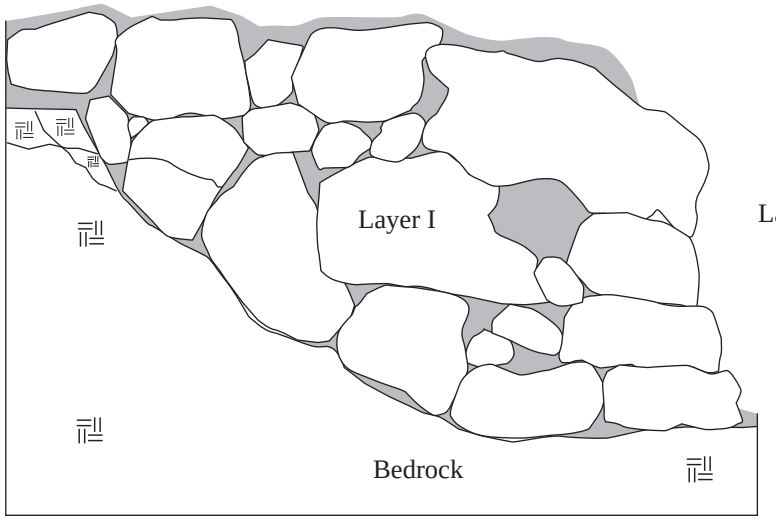
Feature 44 plan view.



Feature 44, view to north.

TU-16 base of excavation, view to south.

TU-16 south wall profile.



0 10 20
Scale in centimeters

Layer I - Architectural layer consisting of small to medium sized *pāhoehoe* cobbles resting on bedrock with stacking on the western retaining edge and decomposing organic material throughout.

Figure 68. SIHP Site 24776 Feature 44 plan view and TU-16 south wall profile.

Excavation of TU-16 revealed a single architectural layer (Layer I) of small to medium sized *pāhoehoe* cobbles resting on bedrock (see Figure 68). The western retaining edge of the feature was stacked, but the fill material behind was not. Layer I also contained some decomposing organic material. Along the western edge of TU-16 Layer I was present to a depth of 55 centimeters beneath the surface of the feature. Excavation of TU-16 terminated at bedrock. No cultural material was recovered from TU-16.

Discussion of Agricultural Practices within the Current Project Area

The current project area lies within what has been termed the Kona Field System (Cordy 1995; Newman 1970; Schilt 1984). This area of dryland agricultural fields extends north from Hoʻokena Ahupuaʻa to at least Kaū Ahupuaʻa and east from the coastline all the way to the forested slopes of Hualālai (Cordy 1995). A large portion of the field system is designated in the Hawaiʻi State Inventory of Historic Places (SIHP) as Site 50-10-37-6601 and has been determined eligible for inclusion in the National Register of Historic Places. The basic characteristics of this agricultural/residential system as presented in Newman (1970) have been confirmed and elaborated on by ethnohistorical investigations (Kelly 1983) and summarized by Cordy (1995). The construct is based on the Hawaiian terms for the major vegetation zones, which are used to define and segregate space within the region's *ahupuaʻa*. These zones are bands roughly parallel to the coast that mark changes in elevation and rainfall (Table 6).

Table 6. Traditional Hawaiian agricultural zones*.

Zone	*Annual Rainfall*	*Description*	*Elevation*	*Primary Crops*
Kula	c. 30-50 in (0.8-1.2 m)	Plain, open country inland from the coast	Coast-500 ft (0-150 m)	*Wauke,* gourd, and sweet potato
Kalu or *Kaluʻulu*	c. 40-55 in. (1.00-1.35 m)	Luxuriant, cultivable zone	500-1,000 ft. (150-300 m)	Breadfruit, *wauke*, sweet potato, mountain apple, some taro
ʻĀpaʻa	c. 55-80 in. (1.35-2.00 m)	Dryland cultivation zone	1,000-2,500 ft (300-750 m)	Taro, sweet potato, sugar cane, *kī*, and banana
ʻAmaʻu	c. 80 in. (2.0 m)	Upland/fern zone	2,000-3,000 ft (600-900 m)	Banana and *ʻamaʻu* (fern)

*Based on Cordy's (1995) summary of land zones and agricultural patterns in Central Kona.

The Cordy (1995) model for traditional Hawaiian agricultural zones summarized above in Table 6 is meant to describe the Precontact land use patterns for Central Kona; an area to the south of the current project area. In fact, these zones were first described in the context of the entire Kona Field System by Newman (1974) who was looking at the area above Kealakekua Bay. As Cordy (1995:10) relates several types of variations have been noted in the fields of central Kona since the Newman (1974) study. These variations include localized lava flow and soil patterns which can have a considerable impact on soil depth and coverage and accordingly on field patterns (Cordy 1995). Localized variations in the amount of rainfall would have also had a considerable impact on field patterns.

The current project area is located to the north of the area described in the Cordy (1995) model, near the northern extent of the Kona Field System. The further north one travels along the Kona coast, the more arid the environment becomes. It stands to reason that as the amount of rainfall decreases near the coast the elevational bands that define the traditional agricultural zones begin to shift inland, as dictated by the localized rainfall patterns. Indeed, as Cordy (1995:18) notes the pattern is somewhat different in the North Kona ahupuaʻa north of Kailua. Although the Kona fields extend into this area, he relates that, "the rainfall lines pull further up the mountain", and that although similar, "the zones are at different distances from the shore and at different elevations than in Central Kona" (Cordy 1995:18). Keeping this in mind, based on the formal attributes of the agricultural features recorded at Site 24776 and the amount of annual rainfall the area receives (ca. 750 mm; Giamelluca et al. 1980:99), it appears that the current project area, despite its

elevation (ca. 850 to 1,120 ft. above sea level), falls within the upper *kula* zone of North Kona, perhaps near the transition to the *kalu'ulu* zone.

The *kula* zone is traditionally associated with the cultivation of sweet potatoes (*'uala*), but paper mulberry (*wauke*) and gourds (*ipu*) were also grown in this zone. According to Cordy, agricultural ruins often cover much of the ground surface within the *kula*, and formal feature types usually include "mounds, short and irregular terrace facings without soil behind, small clearings in which stones have been removed, small enclosures with soil inside, and pits sometimes with soil and sometimes not" (1995:6). Cordy also notes that localized soils in the *kula* zone have resulted in the variations in field types, that "if soils are present, sometimes low and irregular terraces are present", and that "if soils are more limited, mounds and small clearings are common" (1995:10).

As was recorded by countless early European visitors to Kona, these soil areas would have been planted to the greatest possible extent, primarily in sweet potatoes. For example, Lt. King who traveled with Captain Cook to Kealakekua Bay in 1779, wrote of the near shore *kula*, "the Sweet Potatoe grows everywhere" (in Beaglehole 1967:608) and further inland, "for the first 2½ miles [the ground] is composed of burnt loose stone, & yet almost the hole surface beginning a little at the back of the town, is made to yield Sweet potatoes & the cloth plant" (in Beaglehole 1967:521).

Handy and Handy note that "Sweet potatoe culture was secondary in Hawaii to that of taro, the preferred dietary item, but owing to the exigencies of terrain and climate it was nevertheless widespread and attended by systematic care, both horticultural and ritualistic" (1972:124). They go on to describe that the planters of old Hawai'i were adept at the selection and adaptation of particular sweet potato varieties to varying localities, and that many different names and rituals existed for the various aspects of the sweet potato and its cultivation. Handy and Handy (1972:127) relate that sweet potato was more valuable than taro in three main ways: (1) it could be grown in much less favorable localities with respect to sun and soil; (2) it matured more rapidly (within three to six months); and (3) in terms of planting and care of cultivation, it was much less labor intensive.

The time factor regulating the planting of sweet potato is somewhat variable and depends upon weather rather than the regular seasons (Handy and Handy 1972:128). In dry areas such as the current project area, Precontact farmers would wait until the ground had received several good soakings before planting. In Kona, where precipitation at lower elevations is always generally low, planting generally took place during the summer months (Handy and Handy 1972:128). Sweet potatoes were always propagated from cuttings and never from seeds (Handy and Handy 1972:129). Soil planting areas were prepared by burning off grasses and shrubs, removing any stubble, and then turning over the soil. Patches in rocky places were called *makaili*; these patches often consisted of small pockets of semi decomposed lava into which the sweet potato cuttings were placed and then fertilized "with rubbish [mulch] and by heaping up of fine gravel and stones around the vines" (Handy and Handy 1972:129). Handy and Handy relate that the yields of *makaili* patches were said to be rather tasteless and rigid or wrinkled.

The Hawaiian Newspaper *Ka Nupepa Ku'oko'a* for March 24, 1922 contained the following account of another method of Precontact Hawaiian planting:

> Rocky lands in the olden days were walled up all around with the big and small stones of the patch until there was a wall about 2 feet high and in the enclosure were put weeds of every kind, *'ama'u* tree ferns and so on, and then topped with soil taken from the patch itself, to enrich it, or in other words to rot the rubbish and weeds and make soil.
>
> After several long months, the rotted weeds were truly converted into soil of the best grade. The farmer waited for the time when he knew that the rains would fall, then he made the patch ready for planting. If for sweet potatoes, he made mounds for them and for taro too, on some places on Hawaii.

> In planting his sweet potato slips or taro, his work ended when the rain fell. When the rains came the farmer's heart was gladdened because it gave the slips a start, the roots began to creep and his troubles were all over. (in Handy and Handy 1972:131)

As illustrated in the above article and reiterated by Handy and Handy (1972:132-133), cultivation of sweet potatoes after planting was minimal. During the growth of the tubers soil was occasionally mounded up around the roots for protection from pests such as rats and weevils and for the continued presence of need soil nutrients. Small unhealthy tubers were generally removed from the patch so that the larger healthy ones could flourish, and unwanted weeds were also occasionally removed. The vines were not allowed to grow out of control or to get too wet. When the potatoes were ready, only enough were harvested to supply the immediate needs of the farmer, the plants were never dug out completely (Handy and Handy 1972:133). This ensured that further food and cutting stock would be available on an as needed basis. All aspects of sweet potato cultivation were accompanied by ritual to help ensure a bountiful harvest (c.f. Handy and Handy 1972:136-149).

Although the feature types and feature distribution within the current project area appears to fit the expected archaeological pattern for the *kula* zone where sweet potatoes were the primary crop, it is possible, based on the elevation and the presence of rough *kuaiwi,* that the area is located near the transition to the *kalu'ulu* zone. This zone is somewhat indistinguishable from the *'apa'a* zone in site patterning (Cordy 1995:7). For this reason, most information about the *kalu'ulu* is the same for the *'apa'a*. Formal walled agricultural fields consisting of *kuaiwi* characterize this zone. *Kuaiwi* are low, broad, long multifunctional piles of rocks created by land clearing and rock removal from soil areas. *Kuaiwi* are oriented *mauka/makai* with shorter, perpendicular cross-wall segments connecting them. The cross-wall segments function as soil traps and retaining features, creating terrace-like areas to enhance planting. The distribution of soils suitable for agriculture determines, in part, the locations of the formal walled fields, and there is a direct relationship between suitable soils and older lava flows. Consequently, areas of young lava flow in the *kalu'ulu* and *'apa'a* do not always have *kuaiwi* (Burtchard 1995; Hammatt et al. 1987; Haun et al. 1998). Breadfruit, *wauke*, sweet potato, mountain apple, and some taro were the dominant crops in this zone.

William Ellis, one of the first missionaries to arrive on the Island of Hawai'i, visited the area above Kailua (likely to the south of the current project area) on a tour around the island in 1825. Ellis' description of the area provides a sense of what the transition from the *kula* zone to the *kalu'ulu* zone to the upper zones may have been like during Precontact times. Ellis writes:

> After traveling over the lava for about a mile, the hollows in rocks began to be filled with a light brown soil; and about half a mile further, the surface was entirely covered with a rich mould, formed by decayed vegetation and decomposed lava. Here through a beautiful part of the country, quite a garden compared with that through which they had passed, on first leaving town. It was generally divided into small fields, about fifteen rods square, fenced with low stone walls, made of fragments of lava which had been gathered from the surface of the enclosures. These fields were planted with bananas, sweet potatoes, mountain taro, tapa trees, melons, and sugar cane, flourishing luxuriantly in every direction. Having traveled about three or four miles through this delightful region, and passed several pools of fresh water, they arrived at the thick woods, which extends several miles up the sides of the lofty mountain that rises immediately behind Kairua. (1963:27-28)

Further information relating to the probable use of the current project area for the cultivation of sweet potato, and perhaps its continued use for that purpose into Historic times, comes from an oral interview conducted for the Clark and Rechtman (2005) study of TMK:3-7-3-7:38. In that interview *kama'āina* Elizabeth Maluihi Ako Lee (Auntie Elizabeth) related that as a child in the 1930s and early 1940s she helped her *hanai* family cultivate sweet potatoes on an 'O'oma Homestead parcel (Lot 59) located to the

southwest of the current project area. Auntie Elizabeth described clearing cobbles from soil areas and then planting sweet potato cuttings in the rock-free soil. The cobbles removed from the soil were collected into clearing mounds. During a recent field visit to former Lot 59 with the authors of this report, Auntie Elizabeth pointed out several small mounds that were similar to those she had created as a child, but she noted that they were not nearly as tidy as the neatly stacked features her family normally built. When asked if she ever used the mounds for planting or covering the young sweet potato cuttings to protect them, Auntie Elizabeth replied that, no, they always planted in the cleared soil areas. The interview with Auntie Elizabeth provides interesting insights into the Hawaiian methods of sweet potato cultivation, and suggests that continued Historic use of the upper *kula* for agricultural purposes may have altered the earlier agricultural landscape.

The most recent agricultural pursuit within the current project area, the cultivation of *pakalolo* (*Cannabis* sp.) has also had an affect on the earlier agricultural landscape. At several locations in the western portion of the larger study parcel features had been rearranged to accommodate and conceal plastic trashcans containing soil (Figure 69). Features were also adapted to help create rough water catchments consisting of corrugated tin roofing material that channeled rain water and dew fall into plastic containers and/or directly into the soil filled trash cans. Small lava blisters were used to conceal growing supplies. At one location, what appeared to be a previously existing planting enclosure had been surrounded by a wire fence, lined with plastic, and filled with introduced soil (Figure 70). While the cultivation of *pakalolo* does not offer much insight into the earlier Hawaiian agricultural practices that may have taken place at Site 24776, it does stress the difficultly involved, and innovation needed, to produce a successful harvest in the dry reaches of this part of North Kona.

Figure 69. Plastic trashcan concealed near a modified outcrop within the current project area.

Figure 70. Recently modified enclosure within the current project area.

Summary and Conclusions

As a result of the current inventory survey one previously recorded archaeological site (Site 23834) and eighteen newly recorded sites (Sites 24759 to 24776) were identified on the subject parcels. The recorded sites include seven Historic walls (Sites 23834, 24759, 24769, 24770, 24771, 24772, and 24774), one Historic enclosure (Site 24760), a probable Historic roadway (24775), two trail segments (Sites 24761 and 24763), a modified outcrop used for Precontact habitation purposes (Site 24762), a terrace used for Precontact habitation purposes (Site 24764), three Precontact lava blister habitations (Sites 24765, 24766, and 24767), one human burial within a lava blister (Site 24768), a Precontact habitation complex containing five features (Site 24773), and a large agricultural complex that spans the entire larger parcel of the current project area (Site 24776). Sixteen 1 x 1 meter test units were excavated at five of the recorded sites (Sites 24762, 24764, 24773and 24776).

Collectively, these sites represent nearly continual use of the study parcel from Precontact times (perhaps as early as the 1400s; Haun and Henry 2003:80) to the late Historic Period. By far the most numerous features present within the current project area are features of Site 24776. These features blanket the landscape and record the history of agricultural pursuits that occurred on the study parcels. Features of this site are found in loosely arranged fields over the entire project area, except in locales where it has been previously bulldozed or where no soil is present. All of the fields correspond to soil areas within the current project area and most are delineated by rough walls that run along their boundaries. The features of Site 24776 appear, for the most part, to be clearing piles, and it is likely that the fields were used primarily for the planting of sweet potatoes. The use of these fields likely began during Precontact times and continued

into Historic times. Only a small portion of Site 24776 was recorded in detail, and much more detailed recording, including further feature mapping and subsurface testing, should be undertaken at this site.

Several small Precontact habitation sites are interspersed among the agricultural features of Site 24776. These sites include, a modified outcrop (Site 24762), a terrace (Site 24764), four lava blisters (Sites 24765, 24766, 24767, and 24768), and a complex containing five features (Site 24773). The nature of the habitation that occurred at these sites appears to have been short term and recurrent, and primarily related to the agricultural use of the project area. The four lava blisters are all small with cleared floors, each containing a few fragments of marine shell. These blisters would have offered shelter from rain or sun, but are not comfortable, and would likely have been utilized solely on a nightly, daily, or as needed basis. One of the lava blisters (Site 24768) also contained human skeletal remains and appears to have been used both for habitation and burial. The three remaining Precontact habitation sites are all above ground cobble constructions. Based on the findings of subsurface testing at these sites it is likely that the nature of habitation that occurred at them was of longer duration, or more frequent, than at the lava blisters. However, the use of these sites was also likely related to the Precontact agricultural use of the current project area.

Two trail segments (Sites 24761 and 24763) that appear to date to the Precontact Period were also recorded on the study parcels. These trails likely accessed a network of trails that connected the people living and farming in this middle-upland area to other resource and habitation areas further *mauka* and *makai*. They also likely connected habitation areas to agricultural fields and other habitation areas. Unfortunately, only small sections of each trail could be traced across the *pāhoehoe* bedrock landscape of the current project area, making interpretation of discrete associations between these sites and other sites extremely difficult.

The most recently constructed sites located on the study parcels include seven Historic walls (Sites 23834, 24759, 24769, 24770, 24771, 24772, and 24774), one Historic enclosure (Site 24760), and a probable Historic roadway (24775). These sites are all likely related to the homesteading use of the current project area. E. M. Paiwa purchased the larger parcel of the current project area in 1898 as Grant 4273 (Lot 56 of the ʻOʻoma Homesteads), and the smaller parcel was a portion of Grant 1590 to Kauhini (Lot 43 of the ʻOʻoma Homesteads) in 1855 that was never perfected. Four of the Historic walls run along the boundaries of the larger parcel, while the remaining three are present within the confines of the larger parcel. The presence of these walls, along with the Historic enclosure, suggests that cattle ranching may have occurred on the study parcels at some point during Historic times. The Historic roadway may have accessed the current project area at some point in the past, but interpretation of this site is made difficult by the fact tat it has been bulldozed at both ends and very little of the roadway remains.

SIGNIFICANCE EVALUATION AND TREATMENT RECOMMENDATIONS

The above-described archaeological resources are assessed for their significance based on criteria established and promoted by the DLNR-SHPD and contained in the Hawaiʻi Administrative Rules 13§13-284-6. These significance evaluations should be considered as preliminary until DLNR-SHPD provides concurrence. For resources to be considered significant they must possess integrity of location, design, setting, materials, workmanship, feeling, and association and meet one or more of the following criteria:

A. Be associated with events that have made an important contribution to the broad patterns of our history;

B. Be associated with the lives of persons important in our past;

C. Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value;

D. Have yielded, or is likely to yield, information important for research on prehistory or history;

E. Have an important traditional cultural value to the native Hawaiian people or to another ethnic group of the state due to associations with traditional cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group's history and cultural identity.

The significance and recommended treatments for the recorded sites are discussed below and listed in Table 7.

Table 7. Site significance and treatment recommendations.

SIHP No.	*Function*	*Temporal Association*	*Significance*	*Recommended Treatment*
23834	Boundary	Historic	D	No further work*
24759	Ranching	Historic	D	No further work
24760	Homesteading	Historic	D	No further work
24761	Trail	Precontact	D	No further work
24762	Habitation	Precontact	D	Data recovery
24763	Trail	Precontact	D	No further work
24764	Habitation	Precontact	D	Data recovery
24765	Habitation	Precontact	D	No further work
24766	Habitation	Precontact	D	No further work
24767	Habitation	Precontact	D	No further work
24768	Burial/Habitation	Precontact	D, E	Preservation
24769	Ranching	Historic	D	No further work
24770	Ranching	Historic	D	No further work
24771	Boundary	Historic	D	No further work
24772	Boundary	Historic	D	No further work
24773	Habitation	Precontact	D	Data Recovery
24774	Boundary	Historic	A, D	Preservation
24775	Road	Historic/modern	D	No further work
24776	Agriculture	Precontact	D	Data recovery

*Previously approved DLNR-SHPD treatment (Haun and Henry 2003).

Sites 23834, 24771, and 24772 are all Historic core-filled boundary walls that were likely constructed in the latter part of the nineteenth century. These walls are considered significant under Criterion D for information they have yielded relative to 19th and 20th Century land use on the current study parcels. It is argued that research already conducted at these Historic sites has successfully mitigated any potential impacts resulting from the proposed development of the study parcels. Site 23834 has a previously approved treatment from Haun and Henry (2003) of no further work. The authors of the current study concur with this treatment recommendation and, in accordance, recommend that treatment for Site 24423 also be no further work.

Site 24774, the southern boundary wall of the larger study parcel, is also a portion of the northern boundary wall of a Historic ʻOʻoma Homestead road. Although this wall was likely constructed at the same time as the other boundary walls and for a similar purpose, it is considered significant under Criterion A and D because of its dual function of marking the property boundary and lining the Historic roadway. The authors of the current study feel that its association with a potential public right-of-way makes it a good candidate for preservation. The Historic wall on the opposite side of the ʻOʻoma Homestead road (Site 16126) was also recommended for preservation (Clark and Rechtman 2005).

Sites 24759, 24760, 24769, 24770, and 24775 are all Historic sites present within the boundaries of the current study parcels. These sites are all considered significant under Criterion D for information they have yielded relative to past land use on the property. It is argued that the information collected during the current study at these Historic sites has successfully mitigated any potential impacts resulting from the proposed development of the study parcels. No further work is the recommended treatment for Sites 24759, 24760, 24769, 24770, and 24775.

Site 24768 consists of a small lava blister containing human skeletal remains. It appears that this site was also used for Precontact habitation purposes. Site 24768 is considered significant under Criterion D and E and recommended for preservation. A search for lineal and cultural descendants should be undertaken and a burial treatment plan should be prepared in consultation with any identified descendants and the Hawai‘i Island Burial Council.

Sites 24762, 24764, 24765, 24766, 24767, and 24773 all appear to have been utilized during the Precontact Period for habitation purposes. Sites 24765, 24766, and 24767 are all slightly modified lava blisters containing sparse cultural deposits, while Sites 24762, 24764, and 24773 are all above ground cobble constructions containing stratified cultural deposits. All of these sites are considered significant under Criterion D for information they have yielded, or are likely to yield, relative to Precontact life ways on the study parcels. It is argued that information collected during the current study at Sites 24765, 24766, and 24767 has successfully mitigated any potential impacts resulting from the proposed development of the study parcels and no further work is the recommended treatment for those sites. Sites 24762, 24764, and 24773, however, still retain the potential for further data collection and are recommended for data recovery. A data recovery plan should be prepared in consultation with DLNR-SHPD.

Sites 24761 and 24763 are both trail segments that appear to date to the Precontact use of the study parcels. Both sites are considered significant under Criterion D for information they have yielded relative to Precontact life ways, but are recommended for no further work.

Site 24776 consists of an extensive agricultural complex that spans the entire larger parcel of the current project area. Site 24776 is considered significant under Criterion D for information it has yielded, and is likely to yield, relative to past life ways on the current study parcels. As only a small portion of this site was recorded in detail during the current study, it is recommended for data recovery. Further study at Site 24776 should include locational mapping of all of the features of the site within the project area boundaries, preparation of detailed plan view maps of selected features, and further subsurface testing at selected features. A data recovery plan should be prepared in consultation with DLNR-SHPD.

REFERENCES CITED

ACHP (Advisory Council on Historic Preservation)
1985 Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review. Draft Report. Advisory Council on Historic Preservation. Washington, D.C.

Barrera, W., Jr.
1991 Kohanaiki, North Kona, Hawaii Island: Archaeological Inventory Survey and Data Recovery. Chiniago Inc. Prepared for Richard M. Sato and Associates, Honolulu.

Beaglehole, J.
1967 *The Journals of Captain James Cook on His Voyages of Discovery*. London: The Hakluyt Society. (edited from the original manuscripts by J. Beaglehoe)

Beckwith, M.
1970 *Hawaiian Mythology*. Honolulu: University of Hawaii Press.

Burtchard, G.
1995 Population and Land Use on the Keauhou Coast, the Mauka Land Inventory Survey, Keauhou, North Kona, Hawai‘i Island. Part I: Narrative Volume. International Archaeological Research Institute, Inc. Prepared for Belt, Collins and Associates and Kamehameha Investment Corporation, Honolulu.

Char, W.
1991 Botanical Survey of Honokohau 1 and 2, North Kona District, Island of Hawaii. Prepared for Lanihau Partners, LP.

Clark, M., and R. Rechtman,
2005 An Archaeological inventory survey of TMK:3-7-3-07:38, ‘O‘oma 2nd Ahupua‘a, North Kona District, Island of Hawai‘i. Rechtman Consulting, LLC report RC-0311a. Prepared for ‘O‘oma Plantation, Kailua-Kona, Hawai‘i.

Cordy, R.
1981 *A Study of Prehistoric Social Change: The Development of Complex Societies in the Hawaiian Islands*. New York: Academic Press.

1986 Fieldcheck of Ooma II Barrera Study. Ms. On file Historic Sites Section DLNR-State Parks.

1995 Central Kona Archaeological Settlement Patterns. State Historic Preservation Division, Department of Land and Natural Resources, State of Hawaii.

2000 *Exalted Sits the Chief. The Ancient History of Hawai‘i Island*. Mutual Publishing: Honolulu, Hawai‘i.

Cordy, R., J. Tainter, R. Renger, and R. Hitchcock
1991 An Ahupua‘a Study: The 1971 Archaeological Work at Kaloko *Ahupua‘a*, North Kona, Island of Hawai‘i. *Western Archaeological and Conservation Center Publications in Anthropology* 58. Prepared for the National Park Service, U.S. Department of the Interior.

Drolet, R. and A. Schilz
1991 Final Report Archaeological Inventory Survey O‘oma 2 North Kona, Hawai‘i Island. Ogden Environmental and Energy Services Co.,Inc. Prepared for Helber Hastert & Fee, Honolulu.

Ellis, W.
1963 *Journal of William Ellis*. Honolulu: Advertiser Publishing Co., Ltd.

Emerson, J.S.
1892 “The Lesser Hawaiian Gods.” In Second Annual Report of the Hawaiian Historical Society for the Year 1892, pp. 1-24. Honolulu, Hawaii.

Fornander, A.
1916-1919 Fornander Collection of Hawaiian Antiquities and Folklore. (9 vols.). Honolulu: Bishop Museum Press.

1959 *Selections from Fornander’s Hawaiian Antiquities and Folk-Lore*. S.H. Elbert, editor. The University Press of Hawaii.

1973 *An Account of the Polynesian Race: Its Origin and Migrations*. Tokyo: Charles E. Tuttle Co., Inc.

1996 *Ancient History of the Hawaiian People*. Mutual Publishing, Australia.

Giambelluca, T., M. Nullet, and T. Schroeder
1980 *Rainfall Atlas of Hawai‘i*. Report R76. Water Resources Research Center, University of Hawaii at Manoa, with the cooperation of the Department of Meteorology, University of Hawaii at Manoa. State of Hawaii, Department of Land and Natural Resources, Division of Water and Land Development.

Handy, E., E. Handy, with M. Pukui
1972 Native Planters in Old Hawaii, Their Life, Lore, and Environment. *B.P. Bishop Museum Bulletin 233.* B.P. Bishop Museum Press.

Hammatt, H., D. Shideler, and D. Borthwick
1987 Archaeological Survey and Test Excavations of a 15-Acre Parcel, Kealakehe, Kona, Hawaii (TMK 7-4-17:30). Cultural Surveys Hawaii. Prepared for Mauna Lani Resort, Inc.

Haun, A., and D. Henry
2000 Archaeological Inventory Survey TMK: 3-7-3-10:03, Land of O‘oma 1 North Kona District, Island of Hawaii. Haun & Associates, Report 160-062802, Keaau, Hawaii. Prepared for Mr. David DeLuz, Sr., Hilo, Hawaii.

2003 Archaeological Inventory Survey TMK:7-3-7:40 and 41, Land of O‘oma 1, North Kona District, Island of Hawaii. Prepared for Mr. Sidney Fuke.

Haun, A., J. Henry, J. Jimenez, M. Kirkendall, K. Maly, and T. Wolforth
1998 Ali‘i Highway Phased Mitigation Program Phase I – Archaeological Intensive Survey, North Kona District, Island of Hawai‘i, vol. 1, Summary. PHRI Report 1320-052798. Submitted to County of Hawai‘i.

I‘i, J.
1959 Fragments of Hawaiian History. Honolulu: Bishop Museum Press.

Kamakau, S.
1961 Ruling Chiefs of Hawaii. Honolulu: Kamehameha Schools Press.

1964 *Ka Po‘e Kahiko*: The People of Old. *B.P. Bishop Museum Special Publication* 51. Bishop Museum Press, Honolulu.

1976 The Works of the People of Old. *B.P. Bishop Museum Special Publication* 61. Bishop Museum Press, Honolulu.

1991 Tales and Traditions of the People of Old, Nā Mo‘olelo a ka Po‘e Kahiko. Bishop Museum Press, Honolulu.

Kelly, M.
1983 *Na Mala O Kona*: Gardens of Kona. A History of Land Use in Kona, Hawai‘i. Departmental Report Series 83-2. Department of Anthropology, B.P. Bishop Museum, Honolulu. Prepared for the Department of Transportation, State of Hawaii.

Maguire, E.
1926 Kona Legends. Honolulu: Paradise of the Pacific Press.

Malo, D.
1951 Hawaiian Antiquities. Honolulu, B.P. Bishop Museum.

Maly, K. (translator)
ms. “*Mai Kailua a hiki i Kiholo.*” J.P. Puuokupa, in *Ku Okoa* November 27, 1875.

ms. “*Kaao Hooniua Puuwai no Ka-Miki.*” J.W.H.I. Kihe, in *Ka Hoku o Hawai‘i*, January 8, 1914 - December 6, 1917.

ms. “*Ka Punawai o Wawaloli.*” J.W.H.I. Kihe, in *Ka Hoku o Hawai‘i*, September 23rd, October 4th & 11th, 1923.

ms. “Na Hoomanao o ka Manawa.” J.W.H. Isaac Kihe, in *Ka Hoku o Hawaii*, June 5th & 12th 1924.

ms. “Ka Loko o Paaiea.” J.W.H. Isaac Kihe, in *Ka Hoku o Hawaii*, February 5-26, 1914 and May 1-15, 1924.

ms. “Ko Keoni Kaelemakule Moolelo Ponoi.” J.W.H. Isaac Kihe, in *Ka Hoku o Hawaii*, Sept. 17 & 24, & Oct. 1, 1929.

McEldowney, H.
1979 Archaeological and Historical Literature Search and Research Design: Lava Flow Control Study, Hilo, Hawai‘i. BPBM Report, Honolulu.

Newman, T.
1970 Hawaiian Fishing and Farming on the Island of Hawaii in A.D. 1778. Department of Land and Natural Resources, Division of State Parks.

1974 Hawai‘i Registers of Historic Places Form: 10-37-6601, Kona Field System. On file, SHPD (hanging files).

Pukui, M. and A. Korn
1973 *The Echo of Our Song. Chants and Poems of the Hawaiians*. Honolulu: University Press of Hawaii.

Rechtman, R., and K. Maly
2003 Cultural Impact Assessment for the Proposed Development of TMK:3-7-3-9:22, ‘O‘oma 2nd Ahupua‘a, North Kona District, Island of Hawai‘i, Volume I and II. Rechtman Consulting Report RC-0154. Prepared for Helber Hastert & Fee, Honolulu, Hawai‘i.

Reinecke, J.
n.d. Survey of Hawaiian Sites, 1929-1930. Manuscript in Department of Anthropology, B.P. Bishop Museum, Honolulu.

Rosendahl, M.
1989 Archaeological Inventory Survey, Kohana-Iki Resort Water Development Project Area, Land of Ooma 2nd, District of North Kona, Island of Hawaii. PHRI Report 477-011589. Prepared for M & E Pacific, Inc.

Schilt, R.
1984 Subsistence and Conflict in Kona, Hawaii. An Archaeological Study of the Kuakini Highway Realignment Corridor. *Departmental Report Series* 84-1. Department of Anthropology, B.P. Bishop Museum, Honolulu. Prepared for the Department of Transportation, State of Hawaii.

Stokes, J., and T. Dye
1991 *Heiau* of the Island of Hawai‘i. *Bishop Museum Bulletin in Anthropology* 2. Bishop Museum Press, Honolulu.

Tatar, E.
1982 Nineteenth Century Hawaiian Chant. *Pacific Anthropological Records No. 33*. Department of Anthropology, B.P. Bishop Museum, Honolulu.

Thrum, T.
1908 Heiaus and Heiau Site Throughout the Hawaiian Islands. Island of Hawaii. Hawaiian Almanac and Annual 1909:38-47. Honolulu.

Tomonari-Tuggle, M.
1985 Cultural Resource Management Plan, Cultural Resource Management at the Keauhou Resort. PHRI Report 89-060185. Prepared for Kamehameha Investment Corp.

Walker, A. and P. Rosendahl
1990 Archaeological Inventory Survey, Phase I—Site Identification, Ooma-2 Water System Development Project Area, TMK:7-3-09:5, Land of Ooma 2nd, North Kona District, Island of Hawaii. PHRI Report 802-043090. Prepared for Nansay Hawaii, Inc.

Wolfe, E., and J. Morris
1996 Geological Map of the Island of Hawaii. U.S. Department of the Interior, U.S. Geological Survey.

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April 28, 2004

Dr. Alan Haun
Haun & Associates
HCR 1 Box 4730
Keaau, Hawaii 96749

LOG NO: 2004.1338
DOC NO: 0404PM11

Dear Dr. Haun:

SUBJECT: Chapter 6E-42 Historic Preservation Review Final Report (222-041504): "Archaeological Inventory Survey (Haun and Henry 2004) Land of O'oma 1 North Kona District Island of Hawai'i" TMK: 7-3-7:40 and 41

Thank you for submitting a copy of the above referenced report for our review and comment. The report was received in our office April 20, 2004. Revisions were made to address the comments in our review letter of March 1, 2004 (Log No. 2003.2578; Doc. No. 0312PM05). Further revisions to the significance evaluations and recommended site treatments were received via fax on April 28, 2004.

As indicated in our previous review letter, we believe that the archaeological inventory survey probably identified all of the larger non-agricultural sites and a reasonable sample of the numerous agricultural features in the roughly 41.3-acre project area, located between the approximately 980 and 1280 foot elevations in the Land of O'oma. A total of 22 sites, with an estimated 2055 component features, were found in the survey area. Two of the walls that enclose the subject parcel (Sites 22742 and 22743) had been previously recorded. Thus, 20 new sites were recorded in the survey. A wide variety of feature types is represented, including modified outcrops, mounds, terraces, *kua'iwi*, enclosures, walls, caves, and other types. There is a corresponding wide variety of feature/site functions represented, including habitation, agriculture, livestock control, storage, and burial.

In our March 1, 2004 review letter we stated our opinion that the non-agricultural sites had been adequately documented and interpreted to the extent possible with the available data, except for Sites 23831, 23836 and 23838 where there was a need in our view to re-evaluate the existing data and in some instances collect additional information to assess the possible presence of human remains. Additional excavations were conducted at all three of these sites to address our concerns. Human remains were found in a slab-lined crypt at Site 23838. No human remains were found in the excavations conducted at Sites 23831 and 23836.

Our March 1, 2004 review letter also raised some questions about the documentation of Site 23839, the large agricultural site complex. We believe that you made a good faith effort to address our concerns in the revised report.

We agree with the revised site significance evaluations. All 22 sites are evaluated as significant under Criterion "d" because they have yielded information important for understanding prehistoric and historic land uses in the local area. The three sites with burials (23823, 23826, and 23838) are also assessed as significant under Criterion "e" because of the obvious cultural and religious significance to native Hawaiian people.

We also agree with the revised site treatment recommendations. The three burial sites (23823, 23826, and 23838) will be preserved in place. Six sites (23825, 23831, 23832, 23835, 23836 and 23839) possess additional research potential and are recommended for data recovery. The other thirteen sites identified in the survey have been adequately documented and hold no significant additional research potential. No further work will be required at these thirteen sites.

The revised report meets with our approval. The next step in the historic preservation review process is the development of a Burial Treatment Plan and a Data Recovery Plan for our review and approval. If you have any questions about the Data Recovery Plan please contact our Hawaii Island archaeologist, Patrick McCoy, at 692-8029. Any questions regarding the preparation of the Burial Treatment Plan should be directed to our Burials Program Director, Kai Markell, at 587-0008.

Aloha,

P. Holly McEldowney

P. Holly McEldowney, Administrator
State Historic Preservation Division

PM:jen

c. Chris Yuen, County of Hawaii Planning Department
Kai Emler, County of Hawaii Department of Public Works
Kai Markell, SHPD Burial Sites Program
Chair, Hawai'i Island Burial Council

Appendix H

RC-0311

An Archaeological Inventory Survey of TMK:3-7-3-07:38

ʻOʻoma 2nd Ahupuaʻa
North Kona District
Island of Hawaiʻi

PREPARED BY:

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and
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PREPARED FOR:

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June 2005
(revised June 2006)

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ARCHAEOLOGICAL, CULTURAL, AND HISTORICAL STUDIES

An Archaeological Inventory Survey of TMK:3-7-3-07:38

‘O‘oma 2nd Ahupua‘a
North Kona District
Island of Hawai‘i

RECHTMAN CONSULTING

EXECUTIVE SUMMARY

At the request of Stacy Dickensen of ʻOʻoma Plantation, Rechtman Consulting, LLC conducted an archaeological inventory survey of a 43.35 acre parcel (TMK:3-7-3-07:38) located in ʻOʻoma 2nd Ahupuaʻa, North Kona District, Island of Hawaiʻi. The parcel was formerly known as Lot 57 of the ʻOʻoma Homesteads. It was originally sold to John Broad in 1913 as Grant 5912. The *makai* portion of the current study parcel was previously the subject of an archaeological inventory survey conducted by Drolet and Schilz (1991). During that study nineteen archaeological sites (Site 16106 and Sites 16109-16126) were recorded on the parcel. However, widespread mechanical clearing on the study parcel in 1994 obliterated all but three of the previously recorded sites, and likely countless other sites. Despite this bulldozing, three previously recorded archaeological sites (Sites 16106, 16125, and 16126) and twelve newly recorded sites (Sites 24413–24424) were identified on the subject parcel (Table 1). Four 1 x 1 meter test units were excavated at three of the recorded sites (Sites 24413, 24415, and 24417).

These fifteen sites represent nearly continual use of the study parcel from Precontact times (perhaps as early as the 1400s; Haun and Henry 2003:80) to the 1940s. Historic sites located on the study parcel include the remains of a former residence that was occupied until ca. 1939 (Site 24422), the boundary walls that surround the entire parcel (Sites 16106, 16125, 16126, and 24423), a small enclosure of undetermined homesteading function (Site 24415), a large enclosure that may have functioned as a goat pen (Site 24414), and several core-filled wall segments that may have once formed several large enclosures on the property (Site 24416). Precontact sites recorded on the study parcel included a burial platform containing a slab-lined crypt with articulated human skeletal remains (Site 24413), a three-sided habitation enclosure (Site 24417), a modified outcrop (Site 24418), a stepping stone trail segment (Site 24419), a lava tube system containing four habitation areas near openings (Site 24420), two mounds (Site 24421), and a large lava tube that was used for water collection (Site 24424). Based on the findings of the current study, no further work is the recommended treatment for Sites 16106, 16125, 24414, 24415, 24416, 24419, 24421, 24422, and 24423. Sites 24417, 24418, and 24420 are recommended for data recovery and preservation is the recommended treatment for Sites 16126, 24413, and 24424.

CONTENTS

FIGURES

TABLES

INTRODUCTION

At the request of Stacy Dickensen of ʻOʻoma Plantation, Rechtman Consulting, LLC conducted an archaeological inventory survey of a 43.35 acre parcel (TMK:3-7-3-07:38) located in ʻOʻoma 2nd Ahupuaʻa, North Kona District, Island of Hawaiʻi (Figures 1 and 2). The parcel was formerly known as Lot 57 of the ʻOʻoma Homesteads. It was originally sold to John Broad in 1913 as Grant 5912. The *makai* portion of the current study parcel was previously the subject of an archaeological inventory survey conducted by Drolet and Schilz (1991). During that study seventeen archaeological sites (Site 16106 and Sites 16109-16126) were recorded on the parcel. However, widespread mechanical clearing on the study parcel in 1994 obliterated all but three of the previously recorded sites, and likely countless other sites. Despite this bulldozing, twelve newly identified sites were recorded on the subject parcel as a result of the current study. This survey was performed in accordance with the Rules Governing Minimal Standards for Archaeological Inventory Surveys and Reports as contained in Hawaiʻi Administrative 13§13–284. The current project was undertaken in compliance with both the historic preservation review process requirements of the Department of Land and Natural Resources-State Historic Preservation Division (DLNR-SHPD) and the County of Hawaiʻi Planning Department.

This report contains background information outlining the project area's physical and cultural contexts, a presentation of previous archaeological work in the immediate vicinity of the parcel, and current survey expectations based on that previous work. Also presented is an explanation of the project's methods, detailed description of the archaeological resources encountered, interpretation and evaluation of those resources, and treatment recommendations for all of the documented sites.

Project Area Description

The current project area consists of 43.35 acres (TMK:3-7-3-07:38) located in ʻOʻoma 2nd Ahupuaʻa, North Kona District, Island of Hawaiʻi (see Figures 1 and 2). The study parcel is located below Māmalahoa Highway at elevations ranging from approximately 850 feet to 1,120 feet above sea level. The parcel is currently accessed from the east through the Kona Hills Estates gated community. The project area is bordered to the north, south, and west by undeveloped parcels. A gate in the northeastern corner of the current study parcel accesses a bulldozed 4WD road that leads to the west along the northern property boundary. Formerly, drivable 4WD roads encircled the entire parcel (Figure 3), but they are currently overgrown by vegetation and not easily accessible by vehicle. Historic boundary walls surround the entire project area. A double wall borders the parcel to the north, marking the former route of an old ʻOʻoma Homestead road.

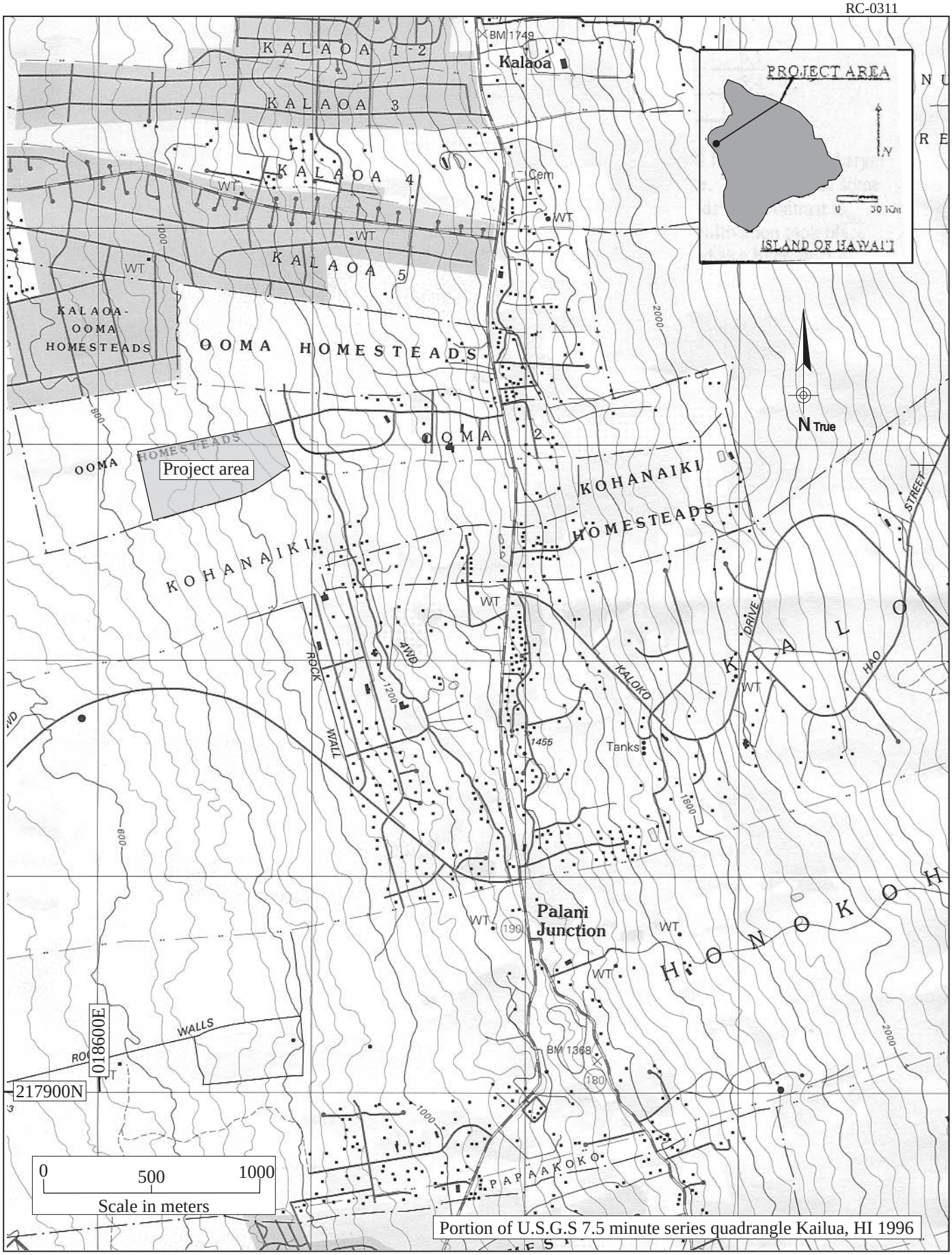


Figure 1. Project area location.

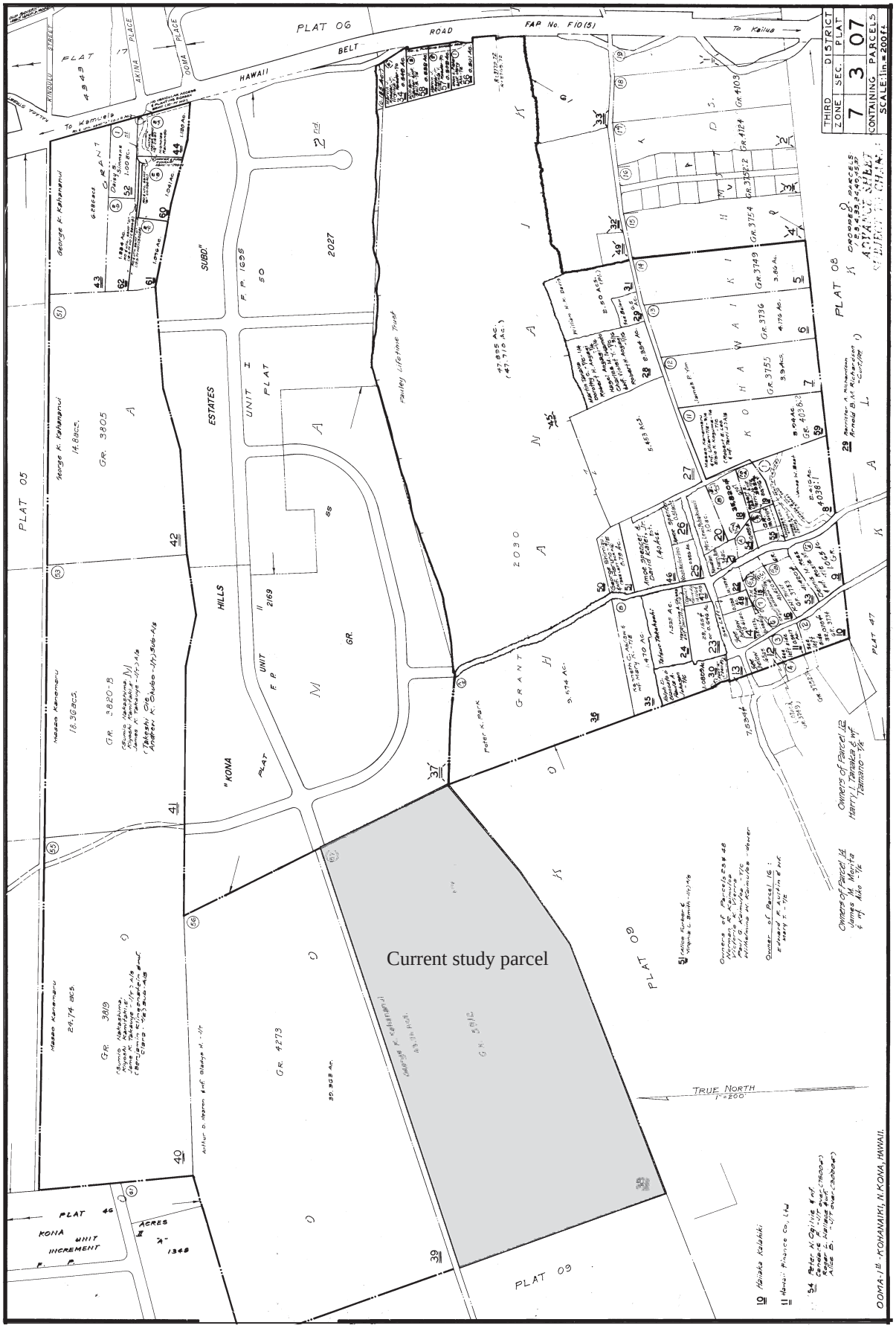


Figure 2. Tax Map Key (TMK):3-7-3-07 showing the location of the current study parcel (38).

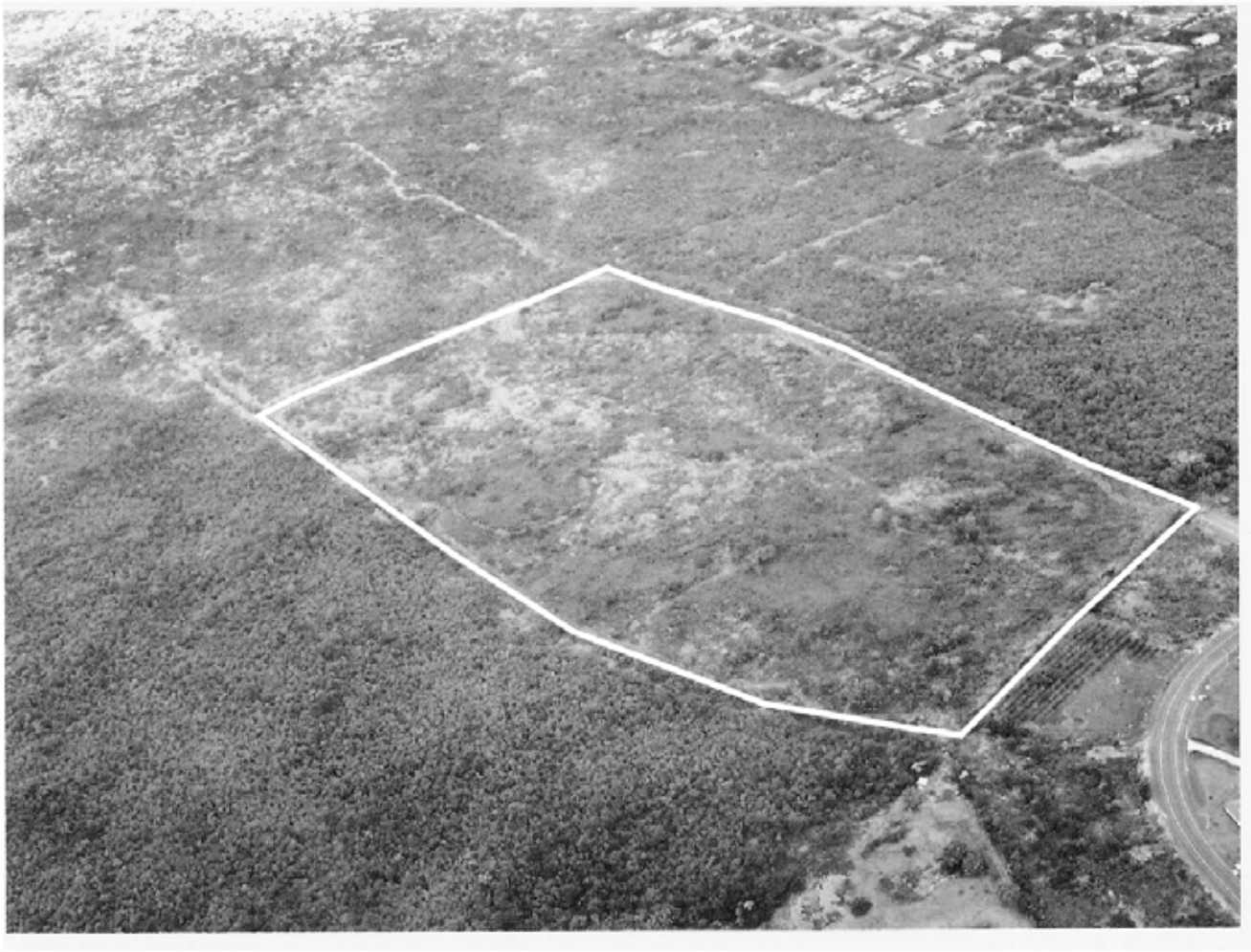


Figure 3. Aerial view of the current project area to the northwest.

The current project area is located on weathered *pāhoehoe* and *ʻaʻā* lava flows that originated from Hualālai between 3,000 and 5,000 years ago (Wolfe and Morris 1996). Thin soil, described as punuluʻu extremely rocky peat (Armstrong et al. 1983), is present in pockets over the entire project area, which slopes steeply to the west with sustained 6 to 20 percent slopes. According to Drolet and Schilz, who previously studied a portion of the current project area:

> The climate in this inland sector is characterized by a scarcity of water and hot, sunny weather conditions. The mean annual rainfall measures 750 mm (Giamelluca et al. 1980:99), with temperature ranges from 75 to 85 degrees. No permanent water drainage exists within or near the project area. The minimum amount of soil development, scarcity of water and barren conditions caused by the blanket of lava cobbles and boulders on the surface of the slopes make this a marginal zone associated with limited resources. (1991:5)

Owing to the relatively recent land clearing on the current study parcel (see Figure 3), nearly the entire project area is blanketed by a rather homogenous growth of *koa-haole* (*Leucaena Leucocephala*) and fountain grass (*Pennisetum setaceum*). Other floral species present include a few large mango (*Mangifera indica*), silver oak (*Gravillea robusta*), and Christmas-berry (*Schinus terebinthifolius*) that were spared by the bulldozer, and various other non-native weeds, vines and grasses.

BACKGROUND

To generate set of expectations regarding the nature of archaeological resources that might be encountered on the study parcel, and to establish an environment within which to assess the significance of any such resources, previous archaeological studies relative to the project area and a historical context for the general South Kona region are presented.

Previous Archaeological Research

Thrum (1908) compiled the earliest systematic report on archaeological features—*heiau* or ceremonial sites—on the island of Hawai'i. Thrum's work was the result of literature review and field visits spanning several decades. Unfortunately, Thrum's work did not take him into ʻOʻoma, and his documentation on *heiau* ends at Lanihau, south of the study area; and picks up to the north, in the Puʻu Anahulu vicinity. Likewise, the 1906-1907, J.F.G. Stokes detailed field survey of *heiau* on the island of Hawaiʻi for the B. P. Pauahi Bishop Museum (Stokes and Dye 1991) stopped short of doing comprehensive work in the Kekaha region, and no sites were recorded in ʻOʻoma.

In 1929-1930, the Bishop Museum contracted John Reinecke to conduct a survey of Hawaiian sites in West Hawaiʻi, including ʻOʻoma and the Kekaha region (Reinecke n.d.). A portion of Reinecke's survey fieldwork extended north from Kailua as far as Kalāhuipuaʻa. His work being the first attempt at a survey of sites of varying function, ranging from ceremonial to residency and resource collection.

During his study, Reinecke traveled along the shore of Kekaha, documenting near-shore sites. Where he could, he spoke with the few native residents he encountered. Among his general descriptions of the Kekaha region, Reinecke observed:

> This coast formerly was the seat of a large population. Only a few years ago Keawaiki, now the permanent residence of one couple, was inhabited by about thirty-five Hawaiians. Kawaihae and Puako were the seat of several thousands, and smaller places numbered their inhabitants by the hundreds. Now there are perhaps fifty permanent inhabitants between Kailua and Kawaihae–certainly not over seventy-five.

> When the economy of Hawaii was based on fishing this was a fairly desirable coast; the fishing is good; there is a fairly abundant water supply of brackish water, some of it nearly fresh and very pleasant to the taste; and while there was no opportunity for agriculture on the beach, the more energetic Hawaiians could do some cultivation at a considerable distance *mauka*.
>
> The scarcity of remains is therefore disappointing. This I attribute to four reasons: (1) those simply over looked, especially those a short distance mauka, must have been numerous; (2) a number must have been destroyed, as everywhere, by man and by cattle grazing; (3) the coast is for the most part low and storm-swept, so that the most desirable building locations, on the coral beaches, have been repeatedly swept over and covered with loose coral and lava fragments, which have obscured hundreds of platforms and no doubt destroyed hundreds more; (4) many of the dwellings must have been built directly on the sand, as are those of the family at Kaupulehu, and when the posts have been pulled up, leave no trace after a very few years.
>
> The remains on this strip of coast have some special characteristics differentiating them from the rest in Kona. First, there is an unusual number of petroglyphs and papamu, especially about Kailua and at Kapalaoa. Second, probably because of the strong winds, there are many walled sites, both of houses and especially of temporary shelters… (Reinecke n.d.:1-2)

The following site descriptions are quoted from Reinecke's draft manuscript of fieldwork conducted between Pūhili Point on the Kohanaiki-'O'oma 2nd boundary, and into Kalaoa 5th. In the site descriptions below, Reinecke references the occurrence of at least—6-house sites; 7 enclosures and pens (one of which is an "old cattle pen"); 11 terraces and platforms (one of which he felt was a "*heiau*"); 2 caves; 2 ahu; 1 stepping stone trail; 3 waterholes and a well; and 11 shelters. Apparently, no one was residing in the area at the time of his field survey.

Reinecke's site descriptions, south to north, across 'O'oma 2nd and 'O'oma 1st included:

> Site 66. Very doubtful dwelling site. Then a row of sand-covered platforms at the border of the sand and the beach lava, enough for 6-10 homes. Remains of an old, large pen.
>
> Site 67. Dry well on the crest of the beach.
>
> Site 68. Water hole, two small platforms, four or more shelters, pens with very small platform.
>
> Site 69. Large cattle pen. Doubtful old, rough platform at its north end. Remains of two old platforms by an ahu to the north.
>
> Site 70. Walled platform, S.E. corner terraced, badly broken down. Platform mauka. The walls of this and of Site 73 are built of thin places of pahoehoe surface lava, rather unusual in appearance. [Reinecke n.d.:15]
>
> Site 71. A knob partly walled on its slopes, with house site. Adjoining it on the south is a rough platform with three smooth boulders – heiau and kuula? Back of this a house platform and a platform about a fine shelter cave. Another platform and wall are about a slight natural depression filled with bones, including those of a whale.
>
> Site 72. Ruins of a pen.
>
> Site 73. Apparently a modern dwelling site of unusual construction; two terraces of pebbles, the upper 29x25x2 in front and 4-5' high elsewhere; the lower 19x10x25x3, with a three-sided pen at N.E.; surrounded by a carefully laid wall.

> Site 74. A shelter about a shallow cave; remains of another shelter; an ahu.
>
> Site 75. Trace of site; house platform; enclosure on shore. There are many faint traces of sites on this strip of coast. Toward the north is an unmistakable small site.
>
> Site 76. Modern shelter pen; house or shelter site; shelter mauka by kiawe tree.
>
> Site 77. Platform; tiny pen; sites of some kind marked by stones in lines on the pahoehoe flow.
>
> Site 78. Slightly brackish springs and pools; house site, shelters, stepping stone path leading to the walled house site… [Reinecke n.d.:16]

In more recent times, Haun and Henry (2003:8) indicate that 40 archaeological surveys and excavation projects have been conducted in ʻOʻoma Ahupuaʻa and the adjacent (to the north) *ahupuaʻa* of Kalaoa. These studies identified (not including the Haun and Henry study) "53 permanent habitations, 379 temporary habitations, 3,736 agricultural features, 25 burials, 17 ritual features, 34 trail segments, 65 *ahu*, and 18 petroglyphs," and, "two hundred and twenty-one habitation features [that] were not categorized by residential permanence" (2003:13). According to Haun and Henry (2003:13), dates from these studies indicate initial settlement of the area by A.D. 1400, with gradual increase in population during the 15th century, and the most intensive use from the 1600's through the early Historic period.

Six previous studies have been conducted at proximate locations to the current project area and two additional studies are currently being conducted. One of these studies included a portion of the current project area (Drolet and Schilz 1991). Two other studies were conducted in ʻOʻoma 2nd Ahupuaʻa *makai* of the current project area (Rosendahl 1989; Walker and Rosendahl 1990). One study was conducted in ʻOʻoma 1st Ahupuaʻa to the north of the current project area (Haun and Henry 2003). Two studies were conducted in Kohanaiki Ahupuaʻa to the south of the current project area (Barrera 1991; Clark and Rechtman 2002). The findings of each of these studies is presented in chronological order below and their locations are depicted on Figure 4. In addition to this, Rechtman Consulting, LLC has recently completed inventory fieldwork at an adjacent parcel to the north of the current study area, and is currently conducting inventory fieldwork on an adjacent parcel to the west of the current project area. The preliminary field findings of both these surveys are also presented below and their locations are shown on Figure 4.

Rosendahl (1989) conducted an inventory survey of a 200-foot wide corridor in ʻOʻoma 2nd Ahupuaʻa for a proposed Kohana-Iki Resort water development project. The project area extended along the northern boundary of Kohanaiki Ahupuaʻa from Queen Kaʻahumanu Highway (at approximately 80 feet above sea level) to approximately 760 feet above sea level (see Figure 4). As a result of that survey four archaeological sites were recorded. The sites included two *pāhoehoe* excavations located just above the highway (Site 5696), a ceremonial/habitation complex with an alignment, a cave, a rock shelter, two terraces, an enclosing wall, and a *papamū* located at 280 feet above sea level (Site 5697), a mound located at 440 feet above sea level (Site 5698), and a Historic boundary wall located at approximately 760 feet above sea level (Site 5699).

Walker and Rosendahl (1990) also conducted an inventory survey in ʻOʻoma 2nd Ahupuaʻa for the same proposed water development project. Their project area consisted of a 2,600-foot long by 300-foot wide corridor that extended from the Rosendahl (1989) corridor north along the 700-foot contour across the entire *ahupuaʻa* (see Figure 4). Walker and Rosendahl (1990) identified 13 sites that encompassed more than 27 features. Although the report is described as an inventory survey, only temporary site numbers were assigned and no detailed recording was undertaken. They note, however, that:

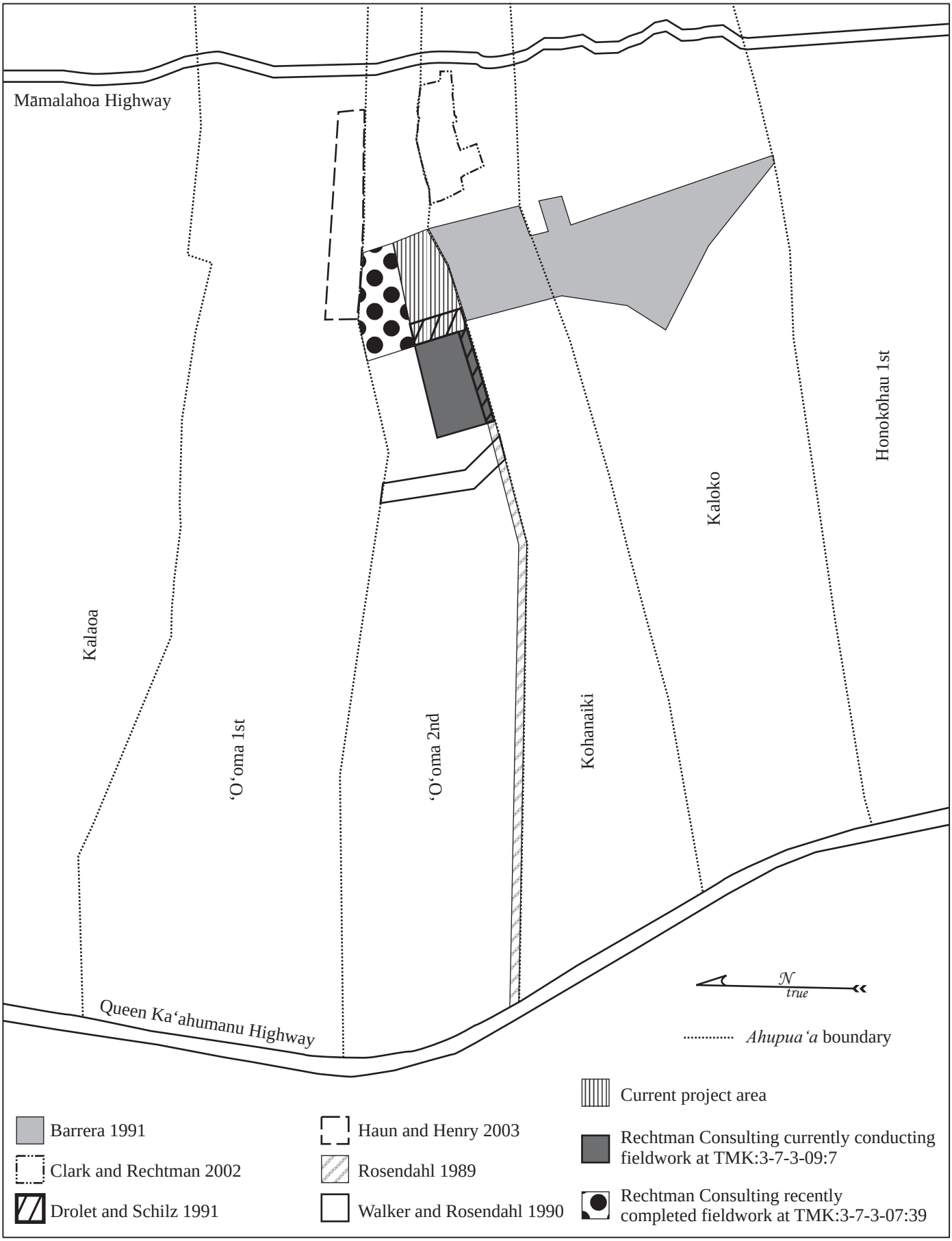


Figure 4. Previous archaeological studies in the vicinity of the current project area.

The principal types of sites and features identified were mounds of varying sizes possibly related to agricultural activities. Several caves (one containing human burial remains), enclosures, cairns, a trail segment, a boulder alignment, and a terrace were also noted. In addition to agriculture, functional feature types encountered include boundary, habitation, transportation, burial, and marker. (Walker and Rosendahl 1990:4)

A third inventory survey for the proposed water development project within ʻOʻoma 2nd was conducted by Drolet and Schilz (1991). Their survey area consisted of a 100-foot wide corridor that ran from the termination of the Rosendahl (1989) corridor at approximately 760 feet above sea level, along the northern boundary of Kohanaiki Ahupuaʻa, to approximately 900 feet above sea level. The corridor then turned north, widened to 200 feet and crossed the *makai* portion of the current project area, terminating at the northern boundary of the current project area (see Figure 4). This survey area encompassed approximately 8.8 acres and 29 archaeological sites containing 41 distinct features were recorded within its boundaries. Drolet and Schilz conclude that:

> The most common feature found were cobble mounds. A total of 22 were found that included circular, oval, and linear forms. The mounds were presumably were constructed for agricultural use and suggest seasonal cropping of tuber plants such as sweet potato. Other types of features included one modified outcrop, one stone alignment, and two platforms, which appear to be associated with the agricultural mounds. There were four shelters located, each with evidence of temporary residence, and five enclosures, that also indicate habitation units. Four of the five enclosures were located within the cave sites. Finally, the last category of identified features included walls, nine of which were recorded. These were both high and low constructions. The presence of this latter type of wall construction suggests field divisions and possibly water diversion systems built during prehistoric occupation to facilitate agricultural development.
>
> All but three of the archaeological sites located appear to form a cluster of features dating to the late prehistoric period. The exceptions are Sites 16106, 16125, and 16126 that are historic walls reportedly built 60 to 70 years ago….
>
> There appears to be an important relationship between the cave complexes and the agricultural features found during the current survey. The lava tubes within the five clustered cave complexes located served as principal occupation sites, and the shallow midden deposits and limited structural constructions within these tubes suggest only temporary occupation and probably seasonal use. The dry farming garden features surrounding the caves also point to a seasonal cropping pattern. Clearly, the lack of soil build up within this zone, along with the deep lava deposits and lack of permanent water supply, had to have been factors that influenced the type of land use patterns evidenced in the archaeological record. (1991:30-32)

Nineteen of the recorded sites (Site 16106 and Sites 16109-16126) were located within the current project area. Feature types recorded at these sites included mounds, walls, platforms, and enclosures. Appendix A contains detailed descriptions of each of these sites and a map depicting their locations. At the time of the current inventory survey, only three of these previously recorded sites remained on the subject parcel. The other sixteen sites were bulldozed away in the middle 1990s. The three remaining sites (Sites 16106, 16125, and 16126) are all core-filled boundary walls that are described in detail below.

Barrera (1991) conducted an archaeological inventory survey and data recovery effort at two parcels (TMK: 3-7-3-09:1 and 17) within Kohanaiki and Kaloko *ahupuaʻa* that border the current project area to the south (see Figure 4). Barrera's study area ranged from 800 to 1,100 feet above sea level. As a result of the study, Barrera identified 140 archaeological sites that were located primarily within Kohanaiki Ahupuaʻa. He attributes the scarcity of sites within Kaloko Ahupuaʻa to "extensive recent land clearing

that occurred there." Sixty-one of the sites were determined to lie within the boundaries of the Kohanaiki Homesteads, a collection of combined agricultural and residential lots (located to the south of the current project area) that were settled in the late 1800s. The majority of the remaining sites were determined to be components of the Kona Field System. These sites consisted primarily of *kuaiwi*, cross-walls, terraces, and mounds. Also several permanent and temporary habitations were identified, along with a single small *heiau* or men's house. Barrera (1991:63) suggests that human occupation of the project area began in the last quarter of the fifteenth century and continued unabated into the eighteenth century at which point there is a no residential population for nearly 150 years until the settlement of the Kohanaiki Homesteads.

Clark and Rechtman (2002) conducted an inventory survey of a fifty-two acre property (TMK: 3-7-3-7:27 and 50) in Kohanaiki Ahupua'a to the southeast of the current project area (see Figure 4). As a result of that survey five archaeological sites were recorded, including an enclosure remnant (Site 23628), two stone terraces (Sites 23629 and 23630), and two sets of historic boundary walls (one set surrounding each parcel; Sites 23631 and 23632). Clark and Rechtman (2002:10) note that nearly the entire study area had been mechanically cleared to accommodate coffee cultivation, and that an interconnected series of old bulldozed access roads spanned the entire larger parcel (TMK: 3-7-3-7:50). In addition to this, several rusted 50-gallon metal drums (perhaps as many a 100) were noted over the entire project area. These drums were typically found in groups and, more often then not, they were located near one of the old bulldozed access roads. There was also ample evidence of more recent agricultural pursuits on the study parcels—*pakalolo* (*Cannabis*) cultivation. Clark and Rechtman (2002:10) identified a number of recently constructed rock rings (perhaps as many as 50) containing soil mixed with vermiculite and often associated with modern artifacts (i.e. fertilizer bags, rubber hose, plastic bottles, etc.). These rock rings varied widely in size and shape, but were all certainly of modern construction, and at least one was observed to be currently under cultivation.

Haun and Henry (2003) conducted an inventory survey of a roughly 41-acre parcel (TMK:3-7-3-7:40) in 'O'oma 1st Ahupua'a to the north of the current project area (see Figure 4). The project area ranged in elevation from 980 to 1,280 feet above sea level. As a result of that survey twenty-one archaeological sites were recorded with an estimated 2,046 features. Haun and Henry report that:

> The sites are comprised of 14 single feature sites and eight complexes of features. The features consist of an estimated 1,105 modified outcrops and 788 mounds, 41 enclosures, 36 *kuaiwi*, 29 platforms, 21 terraces, ten walls, nine caves and seven field boundaries. Functionally, the features consist of agriculture (n=1,984), permanent habitation (n=32), livestock control (n=14), historic habitation (n=8), temporary habitation (n=6) storage (1), and burial (n=1). (2003:15)

Although the entire project area was subject to intensive pedestrian survey, Haun and Henry explain that:

> Hundreds of agricultural features, primarily mounds and modified outcrops, were identified throughout the parcel during the initial survey transects. A sample of these features was recorded in a 10 m wide transect extending across the entire parcel from east to west. Agricultural features within the transect were subjected to limited recording . . . Feature density values from the transect were used to estimate the total number of mounds and modified outcrops in the project area. Non-agricultural sites were subjected to detailed recording…(2003:4)

Of the non-agricultural sites, the six temporary habitations consisted exclusively of caves. Seven radiocarbon dates, ranging from A.D 1400 to A.D. 1800, were obtained from these caves, with five of the dates falling between the 1400s to the mid-1600s (Haun and Henry 2003:80). Six Precontact permanent habitation sites and two Historic habitation sites were also recorded. The Precontact permanent habitations all included from one to three structure foundations consisting of terraces, platforms, and enclosures. Three

of these sites were enclosed by walled yards. The Historic habitation sites both included significant amounts of Historic debris. Five Historic ranching walls were also recorded. The one burial site discovered during the inventory survey (Site 23826) consisted of a large rectangular platform with stacked sides. In addition to this, several more burials were inadvertently discovered within concealed lava blisters during the initial grubbing of the parcel.

Rechtman Consulting, LLC recently completed fieldwork on a roughly 40-acre parcel (TMK:3-7-3-7:39) located between the Haun and Henry (2003) project area and the current project area within ʻOʻoma 2nd Ahupuaʻa (see Figure 4). Preliminary field results from that project indicate a similar site distribution to what was recorded by Haun and Henry (2003). Nearly the entire project area is blanketed with a wide array of agricultural features. In addition to this, five temporary habitations were recorded within lava blisters, two other habitations were discovered at terrace like features, and a number of Historic sites were recorded, including walls and enclosures. One burial was discovered within a lava blister.

Rechtman Consulting, LLC is currently conducting fieldwork at a roughly 45-acre parcel (TMK:3-7-3-9:7) located directly *makai* of the current project area within ʻOʻoma 2nd Ahupuaʻa (see Figure 4). Portions of this parcel were previously studied by Rosendahl (1989) and Drolet and Schilz (1991). One site recorded by Rosendahl (1989), a core-filled wall (Site 5699), and thirteen sites recorded by Drolet and Schilz (1991), including four lava tube habitations (Sites 16103-16105, and 16131), four low walls, mounds, and alignments (Sites 16127-16130), two mound clusters (Sites 16107 and 16108), and three Historic walls (Sites 16106, 16125, and 16126), are still extant on that parcel. In addition to these sites, to date, four lava tubes and two platforms containing burials, seventeen lava tube habitations, and three blister habitations, along with twenty-three enclosures, twenty-seven platforms, and two pavements of yet undetermined function have also been discovered. A blanket of presumed agricultural features also covers this parcel.

Cultural and Historical Background

While the physical study area is limited to a portion of ʻOʻoma 2nd Ahupuaʻa identified as TMK:3-7-3-07:38, in an effort to provide a comprehensive and holistic understanding of the current project area, this section of the report examines the entire *ahupuaʻa* and its relationship to neighboring lands within the larger Kekaha region. In 2003, Rechtman Consulting, LLC prepared a Cultural Impact Assessment for the proposed development of TMK:3-7-3-09:22 within coastal ʻOʻoma 2nd Ahupuaʻa (Rechtman and Maly 2003). Extensive research for that study was conducted by Kepā Maly of Kumu Pono Associates, and it included a review of archival-historical literature from both Hawaiian and English language sources, including an examination of Hawaiian Land Commission Award records from the *Māhele ʻĀina* (Land Division) of 1848; survey records of the Kingdom and Territory of Hawaiʻi; and historical texts authored or compiled by D. Malo (1951), J.P. Iʻi (1959), S. M. Kamakau (1961, 1964, 1976, and 1991), Wm. Ellis (1963), A. Fornander (1916-1919 and 1996), T. Thrum (1908), J.F.G. Stokes and T. Dye (1991), M. Beckwith (1970), Reinecke (n.d.); and Handy and Handy with Pukui (1972). That study also included several native accounts from Hawaiian language newspapers (compiled and translated from Hawaiian to English, by Kepā Maly), and historical narratives authored by eighteenth and nineteenth century visitors to the region. The information was presented within thematic categories ordered chronologically by the date of publication.

The archival-historical resources were located in the collections of the Hawaiʻi State Archives (HSA), State Land Division (LD), State Survey Division (SD), and State Bureau of Conveyances (BoC); the Bishop Museum Archives (BPBM); Hawaiian Historical Society (HHS); University of Hawaiʻi-Hilo Moʻokini Library; private family collections; and in the collection of Kumu Pono Associates.

Over the last ten years, Kepā Maly of Kumu Pono Associates has researched and prepared several detailed studies—in the form of review and translation of accounts from Hawaiian language newspapers,

historical accounts recorded by Hawaiian and non-Hawaiian residents, and government land use records—for lands in the Kekaha region of which ʻOʻoma is a part. Kepā Maly has also conducted a number of detailed oral history interviews with elder *kamaʻāina* documenting their knowledge of the Kekaha region (including ʻOʻoma), and he undertook new interviews and further consultation as a part of the 2003 study. All of the interview participants (both past and present) shared their personal knowledge of the land and practices of the families who lived in ʻOʻoma and vicinity. One additional oral-historical interview with Mrs. Elizabeth (Kahananui) Lee was also conducted for the current study.

As the information collected by Rechtman and Maly (2003) was so complete, this report presents only a slightly modified version of the cultural and historical background for ʻOʻoma Ahupuaʻa and the Kekaha region than was already generated. It is a comprehension of this background information that facilitates a more complete understanding of the potential significance of the resources that exist within the current study area.

Natural and Cultural Resources in a Hawaiian Context

In Hawaiian society, natural and cultural resources are one and the same. Native traditions describe the formation (the literal birth) of the Hawaiian Islands and the presence of life on and around them in the context of genealogical accounts. All forms in the natural environment, from the skies and mountain peaks, to the watered valleys and lava plains, and to the shoreline and ocean depths were believed to be embodiments of Hawaiian deities. One Hawaiian genealogical account, records that Wākea (the expanse of the sky–father) and Papa-hānau-moku (Papa—Earth-mother who gave birth to the islands)—also called Haumea-nui-hānau-wā-wā (Great Haumea—Woman-earth born time and time again)—and various gods and creative forces of nature, gave birth to the islands. Hawaiʻi, the largest of the islands, was the first-born of these island children. As the Hawaiian genealogical account continues, we find that these same god-beings, or creative forces of nature who gave birth to the islands, were also the parents of the first man (Hāloa), and from this ancestor, all Hawaiian people are descended (cf. Beckwith 1970; Malo 1951:3; Pukui and Korn 1973). It was in this context of kinship, that the ancient Hawaiians addressed their environment and it is the basis of the Hawaiian system of land use.

An Overview of Hawaiian Settlement

Archaeologists and historians describe the inhabiting of these islands in the context of settlement that resulted from voyages taken across the open ocean. For many years, researchers have proposed that early Polynesian settlement voyages between Kahiki (the ancestral homelands of the Hawaiian gods and people) and Hawaiʻi were underway by A.D. 300, with long distance voyages occurring fairly regularly through at least the thirteenth century. It has been generally reported that the sources of the early Hawaiian population—the Hawaiian Kahiki—were the Marquesas and Society Islands (Cordy 2000; Emory in Tatar 1982:16-18).

For generations following initial settlement, communities were clustered along the watered, windward (*koʻolau*) shores of the Hawaiian Islands. Along the *koʻolau* shores, streams flowed and rainfall was abundant, and agricultural production became established. The *koʻolau* region also offered sheltered bays from which deep sea fisheries could be easily accessed, and near shore fisheries, enriched by nutrients carried in the fresh water, could be maintained in fishponds and coastal waters. It was around these bays that clusters of houses where families lived could be found (McEldowney 1979:15). In these early times, Hawaiʻi's inhabitants were primarily engaged in subsistence level agriculture and fishing (Handy et al. 1972:287).

Over a period of several centuries, areas with the richest natural resources became populated and perhaps crowded, and by about A.D. 900 to 1100, the population began expanding to the *kona* (leeward side) and more remote regions of the island (Cordy 2000:130). In Kona, communities were initially established along sheltered bays with access to fresh water and rich marine resources. The primary

"chiefly" centers were established at several locations—the Kailua (Kaiakeakua) vicinity, Kahaluʻu-Keauhou, Kaʻawaloa-Kealakekua, and Hōnaunau. The communities shared extended familial relations, and there was an occupational focus on the collection of marine resources. By the fourteenth century, inland elevations to around the 3,000-foot level were being turned into a complex and rich system of dryland agricultural fields (today referred to as the Kona Field System). By the fifteenth century, residency in the uplands was becoming permanent, and there was an increasing separation of the chiefly class from the common people. In the sixteenth century the population stabilized and the *ahupuaʻa* land management system was established as a socioeconomic unit (see Ellis 1963; Handy et al. 1972; Kamakau 1961; Kelly 1983; and Tomonari-Tuggle 1985).

In Kona, where there were no regularly flowing streams to the coast, access to potable water (*wai*), was of great importance and played a role in determining the areas of settlement. The waters of Kona were found in springs and caves (found from shore to the mountain lands), or procured from rain catchments and dewfall. Traditional and historic narratives abound with descriptions and names of water sources, and also record that the forests were more extensive and extended much further seaward than they do today. These forests not only attracted rains from the clouds and provided shelter for cultivated crops, but also in dry times drew the *kēhau* and *kēwai* (mists and dew) from the upper mountain slopes to the low lands (see also traditional-historical narratives and oral history interviews in this study).

In the 1920s-1930s, Handy et al. (1972) conducted extensive research and field interviews with elder native Hawaiians. In lands of North and South Kona, they recorded native traditions describing agricultural practices and rituals associated with rains and water collection. Primary in these rituals and practices was the lore of Lono—a god of agriculture, fertility, and the rituals for inducing rainfall. Handy et al., observed:

> The sweet potato and gourd were suitable for cultivation in the drier areas of the islands. The cult of Lono was important in those areas, particularly in Kona on Hawaiʻi . . . there were temples dedicated to Lono. The sweet potato was particularly the food of the common people. The festival in honor of Lono, preceding and during the rainy season, was essentially a festival for the whole people, in contrast to the war rite in honor of Ku which was a ritual identified with Ku as god of battle. (Handy et al. 1972:14)

Handy et al. (1972) noted that the worship of Lono was centered in Kona. Indeed, it was while Lono was dwelling at Keauhou, that he is said to have introduced taro, sweet potatoes, yams, sugarcane, bananas, and *ʻawa* to Hawaiian farmers (Handy et al. 1972:14). The rituals of Lono "The father of waters" and the annual *Makahiki* festival, which honored Lono and which began before the coming of the *kona* (southerly) storms and lasted through the rainy season (the summer months), were of great importance to the native residents of this region (Handy et al. 1972: 523). The significance of rituals and ceremonial observances in cultivation and indeed in all aspects of life was of great importance to the well being of the ancient Hawaiians, and cannot be overemphasized, or overlooked when viewing traditional sites of the cultural landscape.

Hawaiian Land Use and Resource Management Practices

Over the generations, the ancient Hawaiians developed a sophisticated system of land and resources management. By the time ʻUmi-a-Līloa rose to rule the island of Hawaiʻi in ca. 1525, the island (*moku-puni*) was divided into six districts or *moku-o-loko* (cf. Fornander 1973–Vol. II:100-102). On Hawaiʻi, the district of Kona is one of six major *moku-o-loko* within the island. The district of Kona itself, extends from the shore across the entire volcanic mountain of Hualālai, and continues to the summit of Mauna Loa, where Kona is joined by the districts of Kaʻū, Hilo, and Hāmākua. One traditional reference to the northern and southern-most coastal boundaries of Kona tells us of the district's extent:

Mai Ke-ahu-a-Lono i ke ʻā o Kani-kū, a hōʻea i ka ʻūlei kolo o Manukā i

> *Kaulanamauna e pili aku i Ka‘ū!*—From Keahualono [the Kona-Kohala boundary] on the rocky flats of Kanikū, to Kaulanamauna next to the crawling (tangled growth of) ‘ūlei bushes at Manukā, where Kona clings to Ka‘ū! (*Ka‘ao Ho‘oniua Pu‘uwai no Ka-Miki in Ka Hōkū o Hawai‘i*, September 13, 1917; Translated by Kepā Maly)

Kona, like other large districts on Hawai‘i, was further divided into ‘okana or kalana (regions of land smaller than the *moku-o-loko*, yet comprising a number of smaller units of land). In the region now known as Kona ‘akau (North Kona), there are several ancient regions (*kalana*) as well. The southern portion of North Kona was known as “Kona kai ‘ōpua” (interpretively translated as: Kona of the distant horizon clouds above the ocean), and included the area extending from Lanihau (the present-day vicinity of Kailua Town) to Pu‘uohau (now known as Red Hill). The northern-most portion of North Kona was called “Kekaha” (descriptive of an arid coastal place). Native residents of the region affectionately referred to their home as *Kekaha-wai-‘ole o nā Kona* (Waterless Kekaha of the Kona District), or simply as the *āina kaha*. It is within this region of Kekaha, that the lands of ‘O‘oma are found.

The *ahupua‘a* were also divided into smaller individual parcels of land (such as the *‘ili, kō‘ele, māla*, and *kīhāpai*, etc.), generally oriented in a *mauka-makai* direction, and often marked by stone alignments (*kuaiwi*). In these smaller land parcels the native tenants tended fields and cultivated crops necessary to sustain their families, and the chiefly communities with which they were associated. As long as sufficient tribute was offered and *kapu* (restrictions) were observed, the common people, who lived in a given *ahupua‘a* had access to most of the resources from mountain slopes to the ocean. These access rights were almost uniformly tied to residency on a particular land, and earned as a result of taking responsibility for stewardship of the natural environment, and supplying the needs of the *ali‘i* (see Kamakau 1961:372-377 and Malo 1951:63-67).

Entire *ahupua‘a*, or portions of the land were generally under the jurisdiction of appointed *konohiki* or lesser chief-landlords, who answered to an *ali‘i-‘ai-ahupua‘a* (chief who controlled the *ahupua‘a* resources). The *ali‘i-‘ai-ahupua‘a* in turn answered to an *ali‘i ‘ai moku* (chief who claimed the abundance of the entire district). Thus, *ahupua‘a* resources supported not only the *maka‘āinana* and *‘ohana* who lived on the land, but also contributed to the support of the royal community of regional and/or island kingdoms. This form of district subdividing was integral to Hawaiian life and was the product of strictly adhered to resources management planning. In this system, the land provided fruits and vegetables and some meat in the diet, and the ocean provided a wealth of protein resources. Also, in communities with long-term royal residents, divisions of labor (with specialists in various occupations on land and in procurement of marine resources) came to be strictly adhered to. It is in this cultural setting that we find ‘O‘oma and the present study area.

The *ahupua‘a* of ‘O‘oma (historically, ‘O‘oma 1st and 2nd) are two of some twenty ancient *ahupua‘a* within the *‘okana* of Kekaha-wai-‘ole. The place name ‘O‘oma can be literally translated as concave. To date, no tradition explaining the source of the place name has been located, though it is possible that the name refers to the indentation of the shoreline fronting a portion of ‘O‘oma. A few place names within ‘O‘oma were discussed in traditional accounts, thus we have some indication of the histories associated with this land.

While there are only limited native accounts that have been recorded about ‘O‘oma, we do know that the land was so esteemed, that during the youth of Kauikeaouli (later known as Kamehameha III), the young prince—son of Kamehameha I and his sacred wife Keōpūolani—was taken to be raised near the shore of ‘O‘oma under the care of his stewards from infancy until he was five years old (Kamakau 1961:263-264). Again, this is a significant part of the history of this land, as great consideration went into all aspects of the young king’s upbringing (see I‘i 1959 and Kamakau 1961).

The Environmental Setting of ʻOʻoma

The *ahupuaʻa* of ʻOʻoma cross several environmental zones that are generally called *wao* in the Hawaiian language. These environmental zones include the near-shore fisheries and shoreline strand (*kahakai*) and the *kula kai/kula uka* (shoreward/inland plains). These regional zones were greatly desired as places of residence by the natives of the land.

While the *kula* region of ʻOʻoma and greater Kekaha is now likened to a volcanic desert, native and historic accounts describe or reference groves of native hardwood shrubs and trees such as *ʻūlei* (*Osteomeles anthyllidifolia*), *ēlama* (*Diospyros ferrea*), *uhiuhi* (*Caesalpina kavaiensis*), and *ohe* (*Reynoldsia sandwicensis*) extending across the land and growing some distance shoreward. The few rare and endangered plants found in the region, along with small remnant communities of native dryland forest (Char 1991) give an indication that there was a significant diversity of plants growing upon the *kula* lands prior to the introduction of ungulates.

The lower *kula* lands receive only about 20 inches of rainfall annually, and it is because of their dryness, the larger region of which ʻOʻoma is a part, is known as "Kekaha." While on the surface, there appears to be little or no potable water to be found, the very lava flows which cover the land contain many underground streams that are channeled through subterranean lava tubes which feed the springs, fishponds and anchialine ponds on the *kula kai* (coastal flats). Also in this region, on the flat lands, about a half-mile from the shore, is the famed *Alanui Aupuni* (Government Trail), built in 1847, at the order of Kamehameha III. This trail or government roadway, was built to meet the needs of changing transportation in the Hawaiian Kingdom, and in many places it overlays the older near shore *ala loa* (ancient foot trail that encircled the island).

Continuing into the *kula uka* (inland slopes), the environment changes as elevation increases. Based on historic surveys, it appears that ʻOʻoma ends at a survey station named Kuhiaka, 2,145 feet above sea level (cf. Register Map No. 1449). This zone is called the *wao kanaka* (region of man) and *wao nahele* (forest region). Rainfall increases to 30 or 40 inches annually, and taller forest growth occurred. This region provided native residents with shelter for residential and agricultural uses, and a wide range of natural resources that were of importance for religious, domestic, and economic purposes. In ʻOʻoma, this region is generally between the 1,200 to 2,200 foot elevation, and is crossed by the present-day Māmalahoa Highway. The highway is situated not far below the ancient *ala loa*, or foot trail, also known as Ke-alaʻehu, and was part of a regional trail system passing through Kona from Kaʻū and Kohala.

The ancient Hawaiians saw (as do many Hawaiians today) all things within their environment as being interrelated. That which was in the uplands shared a relationship with that which was in the lowlands, coastal region, and even in the sea. This relationship and identity with place worked in reverse as well, and the *ahupuaʻa* as a land unit was the thread which bound all things together in Hawaiian life. In an early account written by Kihe (in *Ka Hōkū o Hawaiʻi*, 1914-1917), with contributions by John Wise and Steven Desha Sr., the significance of the dry season in Kekaha and the custom of the people departing from the uplands for the coastal region is further described:

> *…ʻOia ka wā e neʻe ana ka lā iā Kona, hele a maloʻo ka ʻāina i ka ʻai kupakupa ʻia e ka lā, a o nā kānaka, nā liʻi o Kona, pūheʻe aku la a noho i kahakai kāhi o ka wai e ola ai nā kānaka* – It was during the season, when the sun moved over Kona, drying and devouring the land, that the chiefs and people fled from the uplands to dwell along the shore where water could be found to give life to the people. (*Ka Hōkū o Hawaiʻi*, April 5, 1917)

It appears that the practice of traveling between upland and coastal communities in the ʻOʻoma *ahupuaʻa* greatly decreased by the middle nineteenth century. Indeed, the only claimant for *kuleana* land in ʻOʻoma, during the *Māhele ʻĀina* of 1848—when native tenants were allowed to lay claim to lands on

which they lived and cultivated—noted that he was the only resident in ʻOʻoma at the time (see *Helu* 9162 to Kahelekahi, in this study). This is perhaps explained by the fact that at time of the *Māhele* there was a significant decline in the Hawaiian population, and changes in Hawaiian land tenure led to the relocation of many individuals from various lands.

Native Traditions and Historical Accounts of ʻOʻoma and the Kekaha Region

This section of the study presents *moʻolelo*—native traditions and historical accounts (some translated from the original Hawaiian by Kepā Maly)—of the Kekaha region that span several centuries. There are very few accounts that have been found to date, that specifically mention ʻOʻoma. Thus, narratives that describe neighboring lands within the Kekaha region help provide an understanding of the history of ʻOʻoma, describing features and the use of resources that were encountered on the land.

It may be, that the reason there are so few accounts for ʻOʻoma, is that it may have been considered a marginal settlement area, occupied only after the better situated lands of Kekaha—those lands with the sheltered bays, and where fresh water could be easily obtained—were populated. As the island population grew, so too did the need to expand to more remote or marginal lands. This thought is found in some of the native traditions and early historic accounts below. However, as people populated the Kekaha lands, they came to value its fisheries—those of the deep sea, near shore, and inland fishponds.

The native account of Punia (also written Puniaiki – cf. Kamakau 1964), is perhaps among the earliest accounts of the Kekaha area, and in it is found a native explanation for the late settlement of Kekaha. The following narratives are paraphrased from Fornander's *Hawaiian Antiquities and Folklore* (Fornander 1959):

Punia: A Tale of Sharks and Ghosts of Kekaha

Punia was born in the district of Kohala, and was one of the children of Hina. One day, Punia desired to get lobster for his mother to eat, but she warned him of Kaiʻaleʻale and his hoards of sharks who guarded the caves in which lobster were found. These sharks were greatly feared by all who lived along, and fished the shores of Kohala for many people had been killed by the sharks. Heeding his mother's warning, Punia observed the habits of the sharks and devised a plan by which to kill each of the sharks. Setting his plan in motion, Punia brought about the deaths of all the subordinate sharks, leaving only Kaiʻaleʻale behind. Punia tricked Kaiʻaleʻale into swallowing him whole. Once inside Kaiʻaleʻale, Punia rubbed two sticks together to make a fire to cook the sweet potatoes he had brought with him. He also scraped the insides of Kaiʻaleʻale, causing great pain to the shark. In his weakened state, Kaiʻaleʻale swam along the coast of Kekaha, and finally beached himself at Alula, near the point of Maliu in the land of Kealakehe. The people of Alula, cut open the shark and Punia was released.

At that time Alula was the only place in all of Kekaha where people could live, for all the rest of the area was inhabited by ghosts. When Punia was released from the shark, he began walking along the trail, to return to Kohala. While on this walk, he saw several ghosts with nets all busy tying stones for sinkers to the bottom of the nets, and Punia called out in a chant trying to deceive the ghosts and save himself:

Auwe no hoi kuu makuakane	Alas, O my father of these coasts!
o keia kaha e!	
Elua wale no maua lawaia o keia wahi.	We were the only two fishermen of this place (Kaha).
Owau no o koʻu makuakane,	Myself and my father,

E hoowili aku ai maua i ka ia o ianei,	Where we used to twist the fish up in the nets,
O kala, o ka uhu, o ka palani,	The kala, the uhu, the palani,
O ka ia ku o ua wahi nei la,	The transient fish of this place.
Ua hele wale ia no e maua keia kai la!	We have traveled over all these seas,
Pau na kuuna, na lua, na puka ia.	All the different place, the holes, the runs.
Make koʻu makuakane, koe au.	Since you are dead, father, I am the only one left.

> Hearing Punia's wailing, the ghosts said among themselves, "Our nets will be of some use now, since here comes a man who is acquainted with this place and we will not be letting down our nets in the wrong place." They then called out to Punia, "Come here." When Punia went to the ghosts, he explained to them, the reason for his lamenting; "I am crying because of my father, this is the place where we used to fish. When I saw the lava rocks, I thought of him." Thinking to trick Punia and learn where all the kuʻuna (net fishing grounds) were, the ghosts told Punia that they would work under him. Punia went into the ocean, and one-by-one and two-by-two, he called the ghosts into the water with him, instructing them to dive below the surface. As each ghost dove into the water, Punia twisted the net entangling the ghosts. This was done until all but one of the ghosts had been killed. That ghost fled and Kekaha became safe for human habitation (Fornander 1959:9-17).

One of the earliest datable accounts that describes the importance of the Kekaha region fisheries comes from the mid-sixteenth century, following ʻUmi-a-Līloa's unification of the island of Hawaiʻi under his rule. Writing in the 1860s, native historian, Samuel Mānaiakalani Kamakau (1961) told readers about the reign of ʻUmi, and his visits to Kekaha:

> ʻUmi-a-Liloa did two things with his own hands, farming and fishing...and farming was done on all the lands. Much of this was done in Kona. He was noted for his skill in fishing and was called Puʻipuʻi a ka lawaiʻa (a stalwart fisherman). Aku fishing was his favorite occupation, and it often took him to the beaches (Ke-kaha) from Kalahuipuaʻa to Makaula[1]. He also fished for ʻahi and kala. He was accompanied by famed fishermen such as Pae, Kahuna, and all of the chiefs of his kingdom. He set apart fishing, farming and other practices… (Kamakau 1961:19-20)

In his accounts of events at the end of ʻUmi's life, Kamakau (1961) references Kekaha once again. He records that Koʻi, one of the faithful supporters and a foster son of ʻUmi, sailed to Kekaha, where he killed a man who resembled ʻUmi. Koʻi then took the body and sailed to Makaʻeo in the *ahupuaʻa* of Keahuolu. Landing at Makaʻeo in the night, Koʻi took the body to the cave where ʻUmi's body lay. Replacing ʻUmi's body with that of the other man, Koʻi then crossed the lava beds, returning to his canoe at Makaʻeo. From there, ʻUmi's body was taken to its' final resting place… (Kamakau 1961:32-33).

As a child in ca. 1812, Hawaiian historian John Papa Iʻi passed along the shores of Kekaha in a sailing ship, as a part of the procession by which Kamehameha I returned to Kailua-Kona from his residency on Oʻahu. In his narratives, Iʻi described the shiny lava flows and fishing canoe fleets of the "Kaha" (Kekaha) lands:

> The ship arrived outside of Kaelehuluhulu, where the fleet for aku fishing had been since the early morning hours. The sustenance of those lands was fish.

[1] Kalāhuipuaʻa is situated in the district of Kohala, bounding the northern side of Puʻuanahulu in Kekaha. Makaʻula is situated a few *ahupuaʻa* north of ʻOʻoma.

> When the sun was rather high, the boy [I‘i] exclaimed, “How beautiful that flowing water is!” Those who recognized it, however, said, “That is not water, but pahoehoe. When the sun strikes it, it glistens, and you mistake it for water…”
>
> Soon the fishing canoes from Kawaihae, the Kaha lands, and Ooma drew close to the ship to trade for the pa‘i‘ai (hard poi) carried on board, and shortly a great quantity of aku lay silvery-hued on the deck. The fishes were cut into pieces and mashed; and all those aboard fell to and ate, the women by themselves.
>
> The gentle Eka sea breeze of the land was blowing when the ship sailed past the lands of the Mahaiulas, Awalua, Haleohiu, Kalaoas, Hoona, on to Oomas, Kohanaiki, Kaloko, Honokohaus, and Kealakehe, then around the cape of Hiiakanoholae… (I‘i 1959:109-110)

Ka-Lani-Kau-i-ke-Aouli (Kamehameha III)

In ca. 1813, Ka-lani Kau-i-ke-aouli, who grew up to become Kamehameha III, was born. S.M. Kamakau (1961) tells us that the baby appeared to be still-born, but that shortly after birth, he was revived. Upon the revival of the baby, he was given to the care of Ka-iki-o-‘ewa, who with Keawe-a-mahi and family, raised the child in seclusion at ‘O‘oma for the first five years of the young king’s life. Kauikeaouli apparently held some interest in the land of ‘O‘oma 2nd through the Māhele ‘Āina, as he originally claimed ‘O‘oma 2nd as his personal property. Though he subsequently gave it up to the Kingdom (Government) later during the Division (see records of *Māhele ‘Āina* in this study).

Kamakau provides us with the following description of Kauikeaouli’s birth and early life at ‘O‘oma:

> Ka-lani-kau-i-ke-aouli was the second son of Ke-opu-o-lani by Kamehameha, and she called him Kiwala‘o after her own father. She was the daughter of Kiwala‘o and Ke-ku‘i-apo-iwa Liliha, both children of Ka-Iola Pupuka-o-Hono-ka-wai-lani, and hence she [Ke-opu-o- lani] was a ni‘aupi‘o and a naha chiefess, and the ni‘aupi‘o rank descended to her children and could not be lost by them. While she was carrying the child [Kau-i-ke-aouli] several of the chiefs begged to have the bringing up of the child, but she refused until her kahu, Ka-lua-i-konahale, known as Kua-kini, came with the same request. She bade him be at her side when the child was born lest some one else get possession of it. He was living this side of Keauhou in North Kona, and Ke-opu-o-lani lived on the opposite side.
>
> On the night of the birth the chiefs gathered about the mother. Early in the morning the child was born but as it appeared to be stillborn Kua-kini did not want to take it. Then came Ka-iki-o-‘ewa from some miles away, close to Kuamo‘o, and brought with him his prophet who said, “The child will not die, he will live.” This man, Ka-malo-‘ihi or Ka-pihe by name, came from the Napua line of kahunas descended from Makua-kau-mana whose god was Ka-‘onohi-o-ka-la (similar to the child of God). The child was well cleaned and laid upon a consecrated place and the seer (kaula) took a fan (pe‘ahi), fanned the child, prayed, and sprinkled it with water, at the same time reciting a prayer addressed to the child of God, something like that used by the Roman Catholics—
>
> “He is standing up, he is taking a step, he walks” (*Kulia-la, ka‘ina-la, hele ia la*).
>
> Or another—
>
> | | |
> |---|---|
> | *Huila ka lani i ke Akua,* | The heavens lighten with the god, |
> | *Lapalapa ka honua i ke keiki* | The earth burns with the child, |

E ke keiki e, hooua i ka punohu lani,	O son, pour down the rain that brings the rainbow, [page 263]
Aia i ka lani ka Haku e,	There in heaven is the Lord.
O ku‘u ‘uhane e kahe mau,	Life flows through my spirit,
I la‘a i kou kanawai.	Dedicated to your law.

> The child began to move, then to make sounds, and at last it came to life. The seer gave the boy the name of “The red trail” (Ke-aweawe-‘ula) signifying the roadway by which the god descends from the heavens.
>
> Ka-iki-o-‘ewa became the boy’s guardian and took him to rear in an out-of-the-way place at ‘O‘oma, Kekaha. Here Keawe-a-mahi, the lesser chiefs, the younger brothers and sisters of Ka-iki-o-‘ewa, and their friends were permitted to carry the child about and hold him on their laps (uha). Ka-pololu was the chief who attended him; Ko‘i-pepeleleu and Ulu-nui’s mother [were] the nurses who suckled him. Later Ka-‘ai-kane gave him her breast after she had given birth to Ke-kahu-pu‘u. Here at ‘O‘oma he was brought up until his fifth year, chiefly occupied with his toy boats rigged like warships and with little brass cannon loaded with real powder mounted on [their] decks. The firing off of these cannon amused him immensely. He excelled in foot races. On one occasion when the bigger boys had joined in the sport, a [rascal] boy named Ka-hoa thought to play a practical joke by smearing with mud the stake set up to be grasped by the one who first reached the goal. He expected one of the larger boys to be the winner, but it was the little prince who first caught the stick and had his hands smeared. “You will be burnt alive for dirtying up the prince. We are going to tell Ka-pololu on you!” the boys threatened; but the prince objected, saying, “Anyone who tells on him shall never eat with me again or play with me and I will never give him anything again.” Kau-i-ke-aouli was a splendid little fellow. He loved his playmates and never once did them any hurt, and he was kind and obedient to his teachers… [Kamakau 1961:264]

It is not until the early twentieth century, that we find a few detailed native accounts which tell of traditional features and residents of ‘O‘oma and vicinity. The writings of John Whalley Hermosa Isaac Kihe, a native son of Kekaha, in Hawaiian language newspapers (recently translated by Kepā Maly from the original Hawaiian texts), share the history of the land and sense the depth of attachment that native residents felt for ‘O‘oma and the larger Kekaha-wai-‘ole-o-nā-Kona.

> Kihe (who also wrote under the name of Ka-‘ohu-ha‘aheo-i-nā-kuahiwi-‘ekolu) was born in 1853, his parents were native residents of Honokōhau and Kaloko (his grandfather, Kuapāhoa, was a famed kahuna of the Kekaha lands). During his life, Kihe taught at various schools in the Kekaha region; served as legal counsel to native residents applying for homestead lands in ‘O‘oma and vicinity; worked as a translator on the Hawaiian Antiquities collections of A. Fornander; and was a prolific writer himself. In the later years of his life, Kihe lived at Pu‘u Anahulu and Kalaoa, and he is fondly remembered by elder kama‘āina of the Kekaha region. Kihe, who died in 1929, was also one of the primary informants to Eliza Maguire, who translated some of the writings of Kihe, publishing them in abbreviated form in her book “Kona Legends” (1926).

Writers today have varying opinions and theories pertaining to the history of Kekaha, residency patterns, and practices of the people who called Kekaha-wai-‘ole-o-nā-Kona home. For the most part, our interpretations are limited by the fragmented nature of the physical remains and historical records, and by a lack of familiarity with the diverse qualities of the land. As a result, most of us only see the shadows of what once was, and it is difficult at times, to comprehend how anyone could have carried out a satisfactory existence in such a rugged land.

Kihe and his co-authors provide readers with several references to places and events in the history of ʻOʻoma and neighboring lands. Through the narratives, we learn of place name origins, areas of ceremonial significance, how resources were managed and accessed, and the practices of those native families who made this area their home.

One example of the rich materials recorded by native writers, is found in "*Kaʻao Hoʻoniua Puʻuwai no Ka-Miki*" (The Heart Stirring Story of Ka-Miki). This tradition is a long and complex account, that was published over a period of four years (1914-1917) in the weekly Hawaiian-language newspaper *Ka Hōkū o Hawaiʻi*. The narratives were primarily recorded for the paper by Hawaiian historians John Wise and J.W.H.I. Kihe.

While "*Ka-Miki*" is not an ancient account, the authors used a mixture of local stories, tales, and family traditions in association with place names to tie together fragments of site-specific histories that had been handed down over the generations. Also, while the personification of individuals and their associated place names may not be entirely "ancient," such place name-person accounts are common throughout Hawaiian (and Polynesian) traditions. The English translations below are a synopsis of the Hawaiian texts, with emphasis upon the main events and areas being discussed. Diacritical marks and hyphenation have been placed to help with pronunciation of certain words.

"Kaao Hooniua Puuwai no Ka-Miki" (The Heart stirring Story of Ka-Miki)

This *moʻolelo* (tradition) is set in the 1300s (by association with the chief Pili-a-Kaʻaiaea), and is an account of two supernatural brothers, Ka-Miki (The quick, or adept, one) and Ma-Kaʻiole (Rat [squinting] eyes). The narratives describe the birth of the brothers, their upbringing, and their journey around the island of Hawaiʻi along the ancient *ala loa* and *ala hele* (trails and paths) that encircled the island. During their journey, the brothers competed alongside the trails they traveled, and in famed *kahua* (contest fields) and royal courts, against *ʻōlohe* (experts skilled in fighting or in other competitions, such as running, fishing, debating, or solving riddles, that were practiced by the ancient Hawaiians). They also challenged priests whose dishonorable conduct offended the gods of ancient Hawaiʻi. Ka-Miki and Ma-Kaʻiole were empowered by their ancestress Ka-uluhe-nui-hihi-kolo-i-uka (The great entangled growth of uluhe fern which spreads across the uplands), who was one of the myriad of body forms of the goddess Haumea, the earth-mother, creative force of nature who was also called Papa or Hina. Among her many nature-form attributes were manifestations that caused her to be called upon as a goddess of priests and competitors (people, places named for them, and other place names are marked below with underlining):

> …Kūmua was the husband of Ka-uluhe-nui-hihi-kolo-i-uka. The place that is named for Kūmua is in the uplands of Kohanaiki, an elevated rise from where one can look towards the lowlands. The shore and deep sea are all clearly visible from this place. The reason that Kūmua dwelt there was so that he could see the children and grandchildren of he and his wife.
>
> Wailoa, a daughter, was the mother of Kapaʻihilani, also called Kapaʻihi. There is a place in the uplands of Kohanaiki, below Kūmua, to the northwest, a hidden water hole, that is called Kapaʻihi. Wailoa is a pond there on the shore of Kohanaiki. Because Wailoa married Kahunakalehu, a native of the area, she lived and worked there. Thus the name of that pond is Wailoa, and it remains so to this day.
>
> Pipipiʻapoʻo was another daughter of Kūmua and Ka-uluhe-nui-hihi-kolo-i-uka. She married Haleolono, one who cultivated sweet potatoes upon the ʻilima covered flat lands of Nānāwale, also called Nāhiʻahu (Nāwahʻiahu), as it has been called from before and up to the present time. Cultivating the land was the skill of this youth Haleolono, and because he was so good at it, he was able to marry the beauty, Pipipiʻapoʻo.

> Pipipiʻapoʻo's skill was that of weaving pandanus mats, and there are growing many pandanus trees there, even now. The grove of pandanus trees and a nearby cave, is called Pipipiʻapoʻo to this day, and you may ask the natives of Kohanaiki to point it out to you.
>
> Kapukalua was a son of Kūmua and Kaʻuluhe. He was an expert at aku lure fishing, and all other methods of fishing of those days gone by. He married Kauhiʻonohua a beauty with skin as soft as the blossoms of the hīnano, found in the pandanus grove of ʻOʻoma. This girl was pleasingly beautiful, and because of her fame, Kapukalua, the exceptionally skilled son of the sea spray of ʻApoʻula, secured her as his wife. Here, we shall stop speaking of the elders of Ka-Miki… [January 8, 1914]

The tradition continues, recounting the training of the brothers, and preparations of their *hālau aliʻi* (royal compound) at Kohanaiki. At the dedication ceremonies it was revealed that one of the *kahuna* of the Kaha lands, had taken up the habit of killing people, and that he had also thought to take the lives of Ka-Miki and Ma-Kaʻiole. We revisit the story here, and learn the name of a priest of ʻOʻoma and Kohanaiki—

> …The sun broke forth and the voices of the roosters and the ʻelepaio of the forests were heard resonating and rising upon the mountain slopes. The day became clear, with no clouds to be seen, it was calm. So too, the ocean was calm and the shore of Laʻi a ʻEhu (Kona) was calm. The flowers of the upland forest reddened and unfolded, and nodded gently in the kēhau breezes.
>
> The priests gathered together to discuss these events and prepared to apologize to the children of the chief, asking for their forgiveness. They selected ʻElepaio, Pūhili, Kaluaʻōlapa, and Kalua-ʻōlapa-uwila to go before the brothers for this purpose.
>
> ʻElepaio was the high priest of Honokōhau. The place where he dwelt bears the name ʻElepaio [an ʻili on the boundary of Honokōhau nui & iki]. It is in the great grove of *ʻulu (kaulu ʻulu)* on the boundary between Honokōhau-nui and Honokōhau-iki… [April 23, 1914]
>
> Pūhili was the high priest of ʻOʻoma and Kohanaiki, the place where he lived is on the plain of Kohanaiki, at the shore, and bears his name to this day. It is on the boundary between Kohanaiki and ʻOʻoma.
>
> Kaluaʻōlapa was the high priest of Haleʻōhiʻu and Kamāhoe, that is the waterless land of Kalaoa (Kalaoa wai ʻole). The place where he lived was in the uplands of Maulukua on the plain covered with *ʻilima* growth. This place bears his name to this day.
>
> Kalua-ʻōlapa-uwila was the high priest of Kealakehe and Keʻohuʻolu (Keahuolu), and it was he who built the *heiau* named Kalua-ʻōlapa-uwila, which is there along the shore of Kealakehe, next to the road that goes to Kailua. The nature of this priest was that of a shark and a man. The shark form was named Kaiwi, and there is a stone form of the shark that can be seen near the *heiau* to this day.
>
> These priests all went to the door of the house and presented the offerings of the black pig, the red fish, the black *ʻawa*, the white rooster, the *malo* (loin clothes), and all things that had been required of their class of priests. They also offered their prayers and asked forgiveness for their misspoken words. They then called for their prayers to be freed and the *kapu* ended… [April 30, 1914]

Through the 1920s, up to the time of his death in 1929, J.W.H.I. Kihe continued to submit traditional accounts and commentary on the changing times to the paper, *Ka Hōkū o Hawai‘i*. In 1923, Kihe penned a series of articles, some of which formed the basis of Eliza Maguire's *Kona Legends* (1926). One of the accounts, "*Ka Punawai o Wawaloli*" (The Pond of Wawaloli), describes that the pond of Wawaloli, on the shore of ‘O‘oma, was named for a supernatural ocean being, who could take the form of the *loli* (sea cucumber) and of a handsome young man. Through this account it is learned that people regularly traveled between the uplands and shore of ‘O‘oma; the *kula* lands were covered with *‘ilima* growth; and that a variety of fish, seaweeds, and shellfish were harvested along the shore. Also, the main figures in the tradition are memorialized as places on the lands of ‘O‘oma, Kalaoa, and neighboring *ahupua‘a*. These individuals and places include Kalua‘ōlapa (a hill on the boundary of Hāmanamana and Haleohi‘u), Wawaloli (a bay between ‘O‘oma and Kalaoa), Ho‘ohila (on the boundary of Kaū and Pu‘ukala), Pāpa‘apo‘o (a cave site in Hāmanamana), Kamakaoiki and Malumaluiki (locations unknown). The following narratives were translated by Kepā Maly from the original Hawaiian texts published in *Ka Hōkū o Hawai‘i* (September 23rd, October 4th & 11th, 1923):

*Ka Punawai o Wawaloli (*The Pond of Wawaloli*)*

> The place of this pond (Wawaloli) is set there on the shore of the ‘O‘oma near Kalaoa. It is a little pond, and is there to this day. It is very close to the sandy shore, and further towards the shore there is also a pond in which one can swim. There is a tradition of this pond, that is held dearly in the hearts of the elders of this community.
>
> Wawaloli is the name of a loli (sea cucumber) that possessed dual body forms (kino pāpālua), that of a loli, and that of a man!
>
> Above there on the ‘ilima covered flat lands, there lived a man by the name of Kalua‘ōlapa and his wife, Kamakaoiki, and their beautiful daughter, Malumaluiki.
>
> One day the young maiden told her mother that she was going down to the shore to gather limu (seaweeds), ‘ōpihi (limpets), and pupu (shellfish). Her mother consented, and so the maiden traveled to the shore. Upon reaching the shore, Malumaluiki desired to drink some water, so she visited the pond and while she was drinking she saw a reflection in the rippling of the water, standing over her. She turned around and saw that there was a handsome young man there, with a smile upon his face. He said… [September 27, 1923] "…Pardon me for startling you here as we meet at this pond, in the afternoon heat which glistens off of the pāhoehoe."
>
> She responded, "What is the mistake of our meeting, you are a stranger, and I am a stranger, and so we have met at this pond." The youth, filled with desire for the beautiful young maiden, answered "I am not a stranger here along this shore, indeed, I am very familiar with this place for this is my home. And when I saw you coming here, I came to meet you."
>
> These two strangers, having thus met, then began to lay out their nets to catch kala, uhu, and pālani, the native fish of this land. And in this way, the beauty of the plains of Kalaoa was caught in the net of the young man who dwelt in the sea spray of ‘O‘oma.
>
> These two strangers of the long day also fished for hīnālea, and then for kawele‘ā. It was during this time, that their lines became entangled like those of the fishermen of Wailua (a poetic reference to those who become entangled in a love affair).
>
> The desire for the limu, ‘ōpihi, and pūpū was completely forgotten, and the fishing poles bent as the lines were pulled back in the sea spray. The handsome youth was moistened in the rains that fell, striking the land and the beloved shore of the land. The

sun drew near, entering the edge of the sea and was taken by Lehua Island. Only then did these two fishers of the long day take up their nets.

Before the young maiden began her return to the uplands, she told the youth, "Tell me your name." He answered her, "The name by which I am known by, is Wawa. But my name, when I go and dwell in the pond here, is Loli. And when you return, you may call to me with the chant:

E Loli nui kīkewekewe[2]	Oh great Loli moving back and forth
I ka hana ana kīkewekewe	Doing your work moving back and forth
I kuʻu piko kīkewekewe	You are in my mind moving back and forth
A ka makua kīkewekewe	The parents moving back and forth
I hana ai kīkewekewe	Are at their work moving back and forth
E piʻi mai ʻoe kīkewekewe	Won't you arise moving back and forth
Ka kaua puni kīkewekewe	To that which we two desire moving back and forth
Puni kauoha kīkewekewe	Your command is desired moving back and forth

Having finished their conversation, the maiden then went to the uplands. It was dark, and the kukui lamps had been lit in the house. Malumaluiki's parents asked her, "Where are your limu, ʻōpihi and pūpū?" She replied, "It is proper that you have asked me, for when I went to the shore it was filled with people who took all there was? Thus I was left with nothing, not even a fragment of limu or anything else. So I have returned up here."

Well, the family meal had been made ready, so they all sat to eat together. But after a short while the maiden stood up. Her parents inquired of this, and she said she was no longer hungry, and that her feet were sore from traveling the long path. So the maiden went to sleep. She did not sleep well though, and felt a heat in her bosom, as she was filled with desire, thus she had no sleep that night.

With the arrival of the first light of day, the Malumaluiki went once again down to the shore. Upon arriving at the place of the pond, she entered the water and called out as described above. Then, a loli appeared and turned into the handsome young man. They two then returned to their fishing for the kala, uhu and pālani, the native fish the land.

So it was that the two lovers met regularly there on the shore of ʻOʻoma. Now Malumaluiki's parents became suspicious because of the actions of the daughter, and her regular trips to the shore. So they determined that they should secretly follow her and spy on her.

One day, the father followed her to the shore, where he saw his daughter sit down by the side of the pond. He then heard her call out —

E Loli nui kīkewekewe	Oh great Loli moving back and forth
I ka hana ana kīkewekewe	Doing your work moving back and forth
I kuʻu piko kīkewekewe	You are the center of my life moving back and forth

[2] "Kīkewekewe" is translated by Eliza Maguire (1926) as "charmer." Kepā Maly was unfamiliar with this meaning of the word. It is most commonly used in the refrain of a song, and is here translated as "moving back and forth," as the word is used in the spoken language. Kewe also means concave, similar to the place name ʻOʻoma.

Piko maikaʻi kīkewekewe	It is good moving back and forth
A ka makua kīkewekewe	The parents moving back and forth
I hana ai kīkewekewe	Are at their work moving back and forth
E piʻi mai ʻoe kīkewekewe	Won't you arise moving back and forth
Ka kaua puni kīkewekewe	To that which we two desire moving back and forth
Puni kauoha kīkewekewe	Your command is desired moving back and forth

[October 4, 1923]

"O Loli, here is your desire, the one you command, Malumaluiki, who's eyes see nothing else."

Her father then saw a loli coming up from the pond, and when it was up, it turned into the youth. He watched the two for a while, unknown to them, and saw that his daughter and the youth of the two body forms (kino pāpālua), took their pleasure in one another.

The father returned to the uplands and told all of this to her mother, who upon hearing it, was filled with great anger, because of the deceitfulness of her daughter. But then she learned that the man with whom her daughter slept was of dual body forms. Kamakaoiki then told Kaluaʻōlapa that he should "Go down and capture the loli, and beat it to death," to which he agreed.

One day, Kaluaʻōlapa went down early, and hid, unseen by the two lovers. Malumaluiki arrived at the pond and called out, and he then memorized the lines spoken by his daughter. When she left, returning to the uplands, he then went to the pond and looked closely at it. He then saw a small circular opening near the top of the water in the pond. He then understood that that was where the loli came up from. He then slept that night and in the early morning, he went to the pond and set his net in the water. He then began to call out as his daughter had done with the above words.

When he finished the chant, the loli began to rise up through the hole, and was ensnared in the net. Kaluaʻōlapa then carried him up onto the kula, walking to the uplands. On his way, he saw his daughter coming down, and he hid until she passed him by.

When the daughter arrived at the pond, she called out in the chant as she always did. She called and called until the sun was overhead, but the loli did not appear in the pond, nor did he come forward in his human form. Thus, she thought that he had perhaps died, and she began to wail and mourn for the loss of her lover. Finally as evening came, the beautiful maiden stood, and ascended the kula to her home.

Now, let us look back to the Kaluaʻōlapa. He went up to his house and showed the loli to his wife. Seeing the loli, she told her husband, "Take it to the kahuna, Pāpaʻapoʻo who lives on the kula of Hoʻohila." So he went to the kahuna and explained everything that had occurred to him, and showed him the loli in his net. Seeing this and hearing of all that had happened, Pāpaʻapoʻo told the father to build an imu in which to kālua the great loli that moves back and forth (loli kīkewekewe). He said, "When the loli is killed, then your daughter will be well, so too will be the other daughters of the families of the land." Thus, the imu was lit and the supernatural loli cooked.

When the daughter returned to her home, her eyes were all swollen from crying. Her mother asked her, "What is this, that your eyes are puffy from crying, my daughter?"

> She didn't answer, she just kneeled down, giving no response. At that time, her father returned to the house and saw his daughter kneeling down, and he said "Your man, with whom you have been making love at the beach has been taken by the kahuna Pāpa‘apo‘o. He has been cooked in the imu that you may live, that all of the girls who this loli has loved may live."
>
> That pond is still there on the shore, and the place with the small round opening is still on the side of that pond to this day. It is something to remember those things of days gone by, something that should not be forgotten by those of today and in time to come. [October 11, 1923]

*Ka Loko o Paaiea (*The fishpond of Pā‘aiea*)*

The tradition of *Ka loko o Paaiea* (The fishpond of Pā‘aiea) was written by J.W.H.I. Kihe, and printed in *Ka Hōkū o Hawai‘i* in 1914 and 1924. The narratives describe traditional life and practices in various *ahupua‘a* of Kekaha, and specifically describes the ancient fishpond Pā‘aiea. The following excerpts from Kihe's *mo‘olelo*, include references to Wawaloli, on the shore of ‘O‘oma and Kalaoa. Pā‘aiea, was destroyed by the Hualālai lava flows of 1801, reportedly as a result of the pond overseer's refusal to give the goddess Pele—traveling in human form—any fish from the pond:

> Pā‘aiea was a great fishpond, something like the ponds of Wainānāli‘i and Kīholo, in ancient times. At that time the high chiefs lived on the land, and these ponds were filled with fat awa, ‘anae, āhole, and all kinds of fish that swam inside. It is this pond that was filled by the lava flows and turned into pāhoehoe, that is written of here. At that time, at Ho‘onā. There was a Konohiki (overseer), Kepa‘alani, who was in charge of the houses (hale papa‘a) in which the valuables of the King [Kamehameha I] were kept. He was in charge of the King's food supplies, the fish, the hālau (long houses) in which the fishing canoes were kept, the fishing nets and all things. It was from there that the King's fishermen and the retainers were provisioned. The houses of the pond guardians and Konohiki were situated at Ka‘elehuluhulu and Ho‘onā.
>
> In the correct and true story of this pond, we see that its boundaries extended from Ka‘elehuluhulu on the north, and on the south, to the place called Wawaloli (between ‘O‘oma and Kalaoa). The pond was more than three miles long and one and a half miles wide, and today, within these boundaries, one can still see many water holes.
>
> While traveling in the form of an old woman, Pele visited the Kekaha region of Kona, bedecked in garlands of the *ko‘oko‘olau* (*Bidens* spp.). Upon reaching Pā‘aiea at Ho‘onā, Pele inquired if she might perhaps have an *‘ama‘ama*, young *āholehole*, or a few *‘ōpae* (shrimp) to take home with her. Kepa‘alani, refused, "they are *kapu*, for the King." Pele then stood and walked along the *kuapā* (ocean side wall) of Pā'aiea till she reached Ka‘elehuluhulu. There, some fishermen had returned from aku fishing, and were carrying their canoes up onto the shore…
>
> …Now because Kepa‘alani was stingy with the fishes of the pond Pā‘aiea, and refused to give any fish to Pele, the fishpond Pā‘aiea and the houses of the King were all destroyed by the lava flow. In ancient times, the canoe fleets would enter the pond and travel from Ka‘elehuluhulu to Ho‘onā, at Ua‘u‘ālohi, and then return to the sea and go to Kailua and the other places of Kona. Those who traveled in this manner would sail gently across the pond pushed forward by the *‘Eka* wind, and thus avoid the strong currents which pushed out from the point of Keāhole
>
> It was at Ho‘onā that Kepa‘alani dwelt, that is where the houses in which the chiefs valuables (*hale papa‘a*) were kept. It was also one the canoe landings of the place.

> Today, it is where the light house of America is situated. Pelekāne (in Puʻukala) is where the houses of Kamehameha were located, near a stone mound that is partially covered by the *pāhoehoe* of Pele. If this fishpond had not been covered by the lava flows, it would surely be a thing of great wealth to the government today… [J.W.H.I. Kihe in *Ka Hoku o Hawaii*; compiled and translated by Maly, from the narratives written February 5-26, 1914 and May 1-15, 1924].

Na Hoʻomanao o ka Manawa (The Recollections of a Native Son)

Later in 1924, Kihe, described the changes which had occurred in the Kekaha region since his youth. In the following article, titled *Na Hoʻomanao o ka Manawa* (in *Ka Hōkū o Hawaiʻi* June 5th & 12th 1924), Kihe wrote about the villages that were once inhabited throughout Kekaha, identifying families, practices, and schools of the historic period (ca. 1860-1924). In the two part series (translated by Maly), he also shared his personal feelings about the changes that had occurred, including the demise of the families and the abandonment of the coastal lands of Kekaha.

> There has arisen in the mind of the author, some questions and thoughts about the nature, condition, living, traveling, and various things that bring pleasure and joy. Thinking about the various families and the many homes with their children, going to play and strengthening their bodies.
>
> In the year 1870, when I was a young man at the age of 17 years old, I went to serve as the substitute teacher at the school of Honokōhau. I was teaching under William G. Kanakaʻole who had suffered an illness (maʻi-lolo, a stroke).
>
> In those days at the Hawaiian Government Schools, the teachers were all Hawaiian and taught in the Hawaiian language. In those days, the students were all Hawaiian as well, and the books were in Hawaiian. The students were all Hawaiian… There were many, many Hawaiian students in the schools, no Japanese, Portuguese, or people of other nationalities. Everyone was Hawaiian or part Hawaiian, and there were only a few part Hawaiians.
>
> The schools included the school house at Kīholo where Joseph W. Keala taught, and later J.K. Kaʻailuwale taught there. At the school of Makalawena, J. Kaʻelemakule Sr., who now resides in Kailua, was the teacher. At the Kalaoa School, J.U. Keaweʻake was the teacher. There were also others here, including myself for four years, J. Kainuku, and J.H. Olohia who was the last one to teach in the Hawaiian language. At Kaloko, Miss Kaʻaimahuʻi was the last teacher before the Kaloko school was combined as one with the Honokōhau school where W.G. Kanakaʻole was the teacher. I taught there for two years as well... [Kihe includes additional descriptions on the schools of Kona]
>
> It was when they stopped teaching in Hawaiian, and began instructing in English, that significant changes took place among our children. Some of them became puffed up and stopped listening to their parents. The children spoke gibberish (English) and the parents couldn't understand (*nā keiki namu*). Before that time, the Hawaiians weren't marrying too many people of other races. The children and their parents dwelt together in peace with the children and parents speaking together… [June 5, 1924]
>
> …Now perhaps there are some who will not agree with what I am saying, but these are my true thoughts. Things which I have seen with my own eyes, and know to be true…In the year 1870 when I was substitute teaching at Honokōhau for W.G. Kanakaʻole, I taught more than 80 students. There were both boys and girls, and this school had the highest enrollment of students studying in Hawaiian at that time [in

Kekaha]. And the students then were all knowledgeable, all knew how to read and write.

Now the majority of those people are all dead. Of those things remembered and thought of by the people who yet remain from that time in 1870; those who are here 53 years later, we cannot forget the many families who lived in the various (*ʻāpana*) land sections of Kekaha.

From the lands of Honokōhau, Kaloko, Kohanaiki, the lands of ʻOʻoma, Kalaoa, Haleʻohiʻu, Makaʻula, Kaū, Puʻukala-ʻŌhiki, Awalua, the lands of Kaulana, Mahaiʻula, Makalawena, Awakeʻe, the lands of Kūkiʻo, Kaʻūpūlehu, Kīholo, Keawaiki, Kapalaoa, Puʻuanahulu, and Puʻuwaʻawaʻa. These many lands were filled with people in those days.

There were men, women, and children, the houses were filled with large families. Truly there were many people [in Kekaha]. I would travel around with the young men and women in those days, and we would stay together, travel together, eat together, and spend the nights in homes filled with aloha.

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

Kaloko was the same in those days, but now, it is a land without people. The men, the women, and the children are all gone, they have passed away. Only one man, J.W. Haʻau, remains. He is the only native child (keiki kupa) besides this author, who remains.

At Kohanaiki, there were many people on this land between 1870 and 1878. These were happy years with the families there. In those years Kaiakoili was the haku ʻāina (land overseer)...

Now the land is desolate, there are no people, the houses are quiet. Only the houses remain standing, places simply to be counted. I dwelt here with the families of these homes. Indeed it was here that I dwelt with my kahu hānai (guardian), the one who raised me. All these families were closely related to me by blood. On my fathers' side, I was tied to the families of Kaloko [J.W.H.I. Kihe's father was Kihe, his grandfather was Kuapāhoa, a noted kahuna of Kaloko]. I am a native of these lands.

The lands of ʻOʻoma, and Kalaoa, and all the way to Kaulana and Mahaiʻula were also places of many people in those days, but today there are no people. At Mahaiʻula is where the great fishermen of that day dwelt. Among the fishermen were Poʻokoʻai mā, Pāʻaoʻao senior, Kaʻao mā, Kaiʻa mā, Kaʻāʻīkaula mā, Pāhia mā, and John Kaʻelemakule Sr., who now dwells at Kailua.

Kaʻelemakule moved from this place [Mahaiʻula] to Kailua where he prospered, but his family is buried there along that beloved shore (kapakai aloha). He is the only one who remains alive today… At Makalawena, there were many people, men, women, and their children. It was here that some of the great fishermen of those days lived as well. There were many people, and now, they are all gone, lost for all time.

> Those who have passed away are Kahaʻialiʻi mā, Mamaʻe mā, Kapehe mā, Kauaionuʻuanu mā, Hopulāʻau mā, Kaihemakawalu mā, Kaomi, Keoni Aihaole mā, and Pahukula mā. They are all gone, there only remains the son-in-law of Kauaionuʻuanu, J.H. Mahikō, and Jack Punihaole, along with their children, living in the place where Kauaionuʻuanu and Ahu once lived.
>
> At Kūkiʻo, not one person remains alive on that land, all are gone, only the ʻaʻā remains. It is the same at Kaʻūpūlehu, the old people are all gone, and it is all quiet… [June 12, 1924]

*Ko Keoni Kaelemakule Moolelo Ponoi – Kakau ponoi ia mai no e ia (*The True Story of John Kaʻelemakule – Actually written by him[3]*)*

In the period between 1928 and 1930, John Kaʻelemakule Sr., who was a native of Kekaha, living at Mahaiʻula, Kaulana and Kohanaiki, wrote a series of articles that were published in serial form in *Ka Hōkū o Hawaiʻi*. The story is a rich account of life in Kekaha between 1854 and 1900. Kaʻelemakule's texts introduce us to the native residents of Kekaha, and include descriptions of the practices and customs of the families who resided there. In the following excerpts from Kaʻelemakule's narratives (translated by Kepā Maly), we find reference once again to ʻOʻoma and neighboring lands, and the practices associated with procuring water in this region:

> *"Kekaha Wai Ole o na Kona"* (Waterless Kekaha of Kona)
>
> …We have seen the name "Kekaha wai ole o nā Kona" since the early part of my story in *Ka Hōkū o Hawaiʻi*, and we have also seen it in the beautiful tradition of Mākālei. An account of the boy who dwelt in the uplands of Kekaha wai ʻole, that was told by Ka-ʻohu-haʻaheo-i-nā-kuahiwi-ʻekolu [the penname used by J.W.H.I. Kihe]. I think that certain people may want to know the reason and meaning of this name. So it is perhaps a good thing for me to explain how it came about. The source of it is that in this land of Kekaha even in the uplands, between Kaulana in the north and ʻOʻoma in the south, there was no water found even in the ancient times. For a little while, I lived in the uplands of Kaulana, and I saw that this land of Kekaha was indeed waterless.
>
> The water for bathing, washing one's hands or feet, was the water of the banana stump (*wai pūmaʻia*). The *pūmaiʻa* was grated and squeezed into balls to get the juice. The problem with this water is that it makes one itchy, and one does not really get clean. There were not many water holes, and the water that accumulated from rain dried up quickly. Also there would be weeks in which no rain fell… The water which the people who lived in the uplands of Kekaha drank, was found in caves. There are many caves from which the people of the uplands got water… [September 17, 1929:3]
>
> …The *kūpuna* had very strict *kapu* (restrictions) on these water caves. A woman who had her menstrual cycle could not enter the caves. The ancient people kept this as a sacred *kapu* from past generations. If a woman did not know that her time was coming and she entered the water cave, the water would die, that is, it would dry up. The water

[3] This account was published in serial form in the Hawaiian newspaper *Ka Hōkū o Hawaiʻi*, from May 29, 1928 to March 18, 1930. The translated excerpts in this section include narratives that describe Mahaiʻula and nearby lands in Kekaha with references to families, customs, practices, ceremonial observances, and sites identified in text. The larger narratives also include further detailed accounts of Kaʻelemakule's life, and business ventures. A portion of the narratives pertaining to fishing customs (November 13, 1928 to March 12, 1929), and canoeing practices (March 19 to May 21, 1929) were translated by M. Kawena Pukui, and may be viewed in the Bishop Museum-Hawaiian Ethnological Notes (BPBM Archives).

would stop dripping. This was a sign that the *kapu* of Kāne-of-the-water-of-life (Kaneikawaiola) had been desecrated. Through this, we learn that the ancient people of Kekaha believed that Kāne was the one who made the water drip from within the earth, even the water that entered the sea from the caves. This is what the ancient people of Kekaha wai ʻole believed, and there were people who were *kiaʻi* (guardians) who watched over and cleaned the caves, the house of Kāne… [September 24, 1929:3]

When the *kapu* of the water cave had been broken, the priest was called to perform a ceremony and make offerings. The offerings were a small black pig; a white fish, and *āholehole*; young taro leaves; and *awa*. When the offering was prepared, the priest would chant to Kane:

E Kane i uka, e Kane i kai,	O Kane in the uplands, O Kāne at the shore,
E Kane i ka wai, eia ka puaa,	O Kane in the water, here is the pig,
Eia ka awa, eia ka luau,	Here is the ʻawa, here are the taro greens,
Eia ka ia kea.	Here is the white fish.

Then all those people of the uplands and coast joined together in this offering, saying:

He mohai noi keia ia oe e Kane,	This is a request offering to you o Kāne,
E kala i ka hewa o ke kanaka i hana ai,	Forgive the transgression done by man,
A e hoomaemae i ka hale wai,	Clean the water house (source),
A e hoonui mai i ka wai o ka hale,	Cause the water to increase in the house,
I ola na kanaka,	That the people may live,
Na ohua o keia aina wai ole.	Those who are dependent on this waterless land.
Amama.	It is finished…

[October 1, 1929:3; Kepā Maly, translator]

It is not surprising today, when we hear of caves in which cultural materials are found. Along trails, near residences, and in once remote areas, a wide range of uses occurred. Caves in the Kekaha lands were used to store items, keep planting shoots cool and fresh for the next season, to hide or take shelter in, to catch water, and as burial sites.

Land Tenure in ʻOʻoma and Vicinity

Through the traditions and early historical accounts cited above, we see that there are descriptions of early residences and practices of the native families on the lands of ʻOʻoma and within greater Kekaha. Importantly, we find chiefly associations with the land of ʻOʻoma 2nd, as documented by the residency of the chiefs Kaikioʻewa, Keaweamahi, their families and retainers, while they were serving as the guardians of the young king, Kauikeaouli (Kamehameha III in ca. 1813-1818; Kamakau 1961 and Gov. Kapeau, 1847 in this study). Among the earliest government records documenting residency in ʻOʻoma and vicinity, are those of the *Māhele ʻĀina* (Land Division), Interior and Taxation Departments, Roads and Public Works, and the Government Survey Division.

This section of the study describes land tenure (residency and land use) and identifies families associated with ʻOʻoma and it's neighboring lands. The documentation is presented in chronologically within the following subsections, The *Māhele ʻĀina* (1848): Disposition of ʻOʻoma, Land Grants in ʻOʻoma and Vicinity (1855-1864), The Government Homesteading Program in Kekaha, Field Surveys of J.S. Emerson (1882-1889), and Trails and Roads of Kekaha (Governmental Communications).

A review of the records below reveals that none of the claims by native tenants made during the *Māhele*, or any of the applications for Royal Patent Grants, included lands that are a part of the current development area.

The *Māhele ʻĀina* (1848): Disposition of ʻOʻoma

In Precontact Hawaiʻi, all land, ocean, and natural resources were held in trust by the high chiefs (*aliʻi ʻai ahupuaʻa* or *aliʻi ʻai moku*). The use of land, fisheries and other resources were given to the *hoaʻāina* (native tenants) at the prerogative of the *aliʻi* and their representatives or land agents (*konohiki*), who were considered lesser chiefs. By 1845, the Hawaiian system of land tenure was being radically altered, and the foundation for implementing the *Māhele ʻĀina* was set in place, system of fee-simple right of ownership.

As the *Māhele* evolved, it defined the land interests of Kauikeaouli (King Kamehameha III), some 252 high-ranking *Aliʻi* and *Konohiki*, and the Government. As a result of the *Māhele*, all land in the Kingdom of Hawaiʻi came to be placed in one of three categories: (1) Crown Lands (for the occupant of the throne); (2) Government Lands; and (3) *Konohiki* Lands (cf. Indices of Awards 1929). The "Enabling" or "*Kuleana Act*" of the *Māhele* (December 21, 1849) further defined the frame work by which *hoaʻāina* (native tenants) could apply for, and be granted fee-simple interest in "*Kuleana*" lands (cf. Kamakau in *Ke Au Okoa* July 8 & 15, 1869; 1961:403-403). The *Kuleana Act* also reconfirmed the rights of *hoaʻāina* to access, subsistence and collection of resources necessary to their life upon the land in their given *ahupuaʻa* ("Enabling Act"[4], August 6, 1850 – HSA DLNR 2-4).

In the *Buke Kakau Paa no ka Mahele Aina* (Land Division Book), between Kamehameha III and his supporters, we learn that by the time of the *Māhele ʻĀina*, ʻOʻoma was divided into two *ahupuaʻa*, ʻOʻoma 1st and 2nd. ʻOʻoma 1st was claimed by Moses Kekūāiwa (brother of Kamehameha IV and V, and Victoria Kamāmalu), one of the children of Kīnaʻu and M. Kekūanaoʻa, thus, a grandson of Kamehameha I. ʻOʻoma 2nd was held by Kamehameha III (*Buke Māhele*, January 27, 1848:13-14). On March 8, 1848, Kamehameha III assigned his interest in ʻOʻoma 2nd to the Government land inventory (*Buke Māhele*, 1848:183).

Moses Kekūāiwa died on November 24, 1848, and his father, Mataio Kekūanaoʻa, administrator of the estate, relinquished in commutation, his rights to ʻOʻoma 1st, giving the land over to the Government land inventory (Foreign Testimony Volume 3:408). Thus, both ʻOʻoma 1st and 2nd were assigned to the Government Land inventory (Government Lands - Indices of Awards 1929:10).

In 2000, the Kumu Pono Associates digitized the entire collection of handwritten records from the *Māhele ʻĀina*. Most of the records are in the Hawaiian language, and to-date have not been accurately indexed. An extensive review of all the records identifies only one native tenant who filed a claim of residency and land use in ʻOʻoma during the *Māhele*. The claim—Helu 9162, by Kahelekahi—was not awarded, and except for an entry in Native Register Volume 8 (Figure 5), there is no further record of the claim. Below, is a copy of the original Hawaiian text from the Native Register. The account is of particular interest as Kahelekahi reported that in 1848, he was the only resident in ʻOʻoma:

[4] See also *"Kanawai Hoopai Karaima no ko Hawaii Pae Aina"* (Penal Code) 1850.

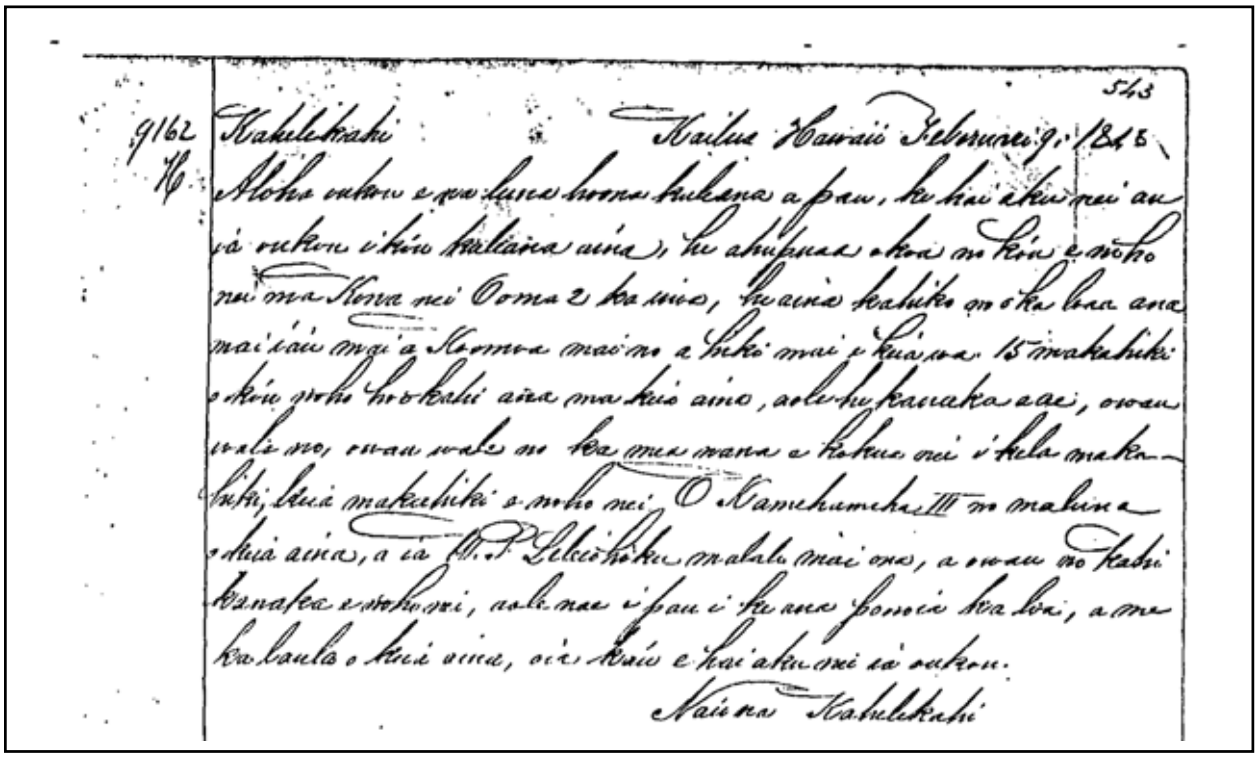


Figure 5. Copy of Native Register Vol. 8:543 Helu 9162, claim of Kahelekahi for *kuleana* at ‘O‘oma.

Kahelekahi – Helu 9162
Kailua, Hawaii February 9, 1848

Greetings to all of you commissioner who quiet land titles, I hereby tell you of my claim for land. I have an entire ahupuaa situated there in Kona, it’s name is Ooma 2. It is an old land gotten by me from Koomoa, and held to this time. For 15 years, I have been the only one residing on this land, there are no other people, only me. I am the only one, there is no one living here to help from one year to the next year. Kamehameha III is the one above, who has this land, and W.P. Leleiohoku is below him, and I am the one man dwelling there. The survey of the length and width of this land is not accurately completed. That is what I have to tell you.

Done by me, Kahelekahi
[Native Register Vol. 8:543; translated by Kepā Maly]

In 1849, S. Haanio, Tax Assessor of North Kona, submitted a report to the Board of Education regarding those individuals who were subject to the Tuesday Tax Laws (*Poalua*), to be worked as a part of the School Tax requirements of the time. At the time of Haanio’s report, three individual families were identified as residents of ‘O‘oma. Residents in the neighboring lands of Kalaoa and Kohanaiki were also listed, they were:

Kalaoa: 1. Kila, 2. Piena, 3. Nakuala, 4. Kupono, 5. Loa, 6. Kaeha, 7. Keliipuipui, 8. Kapuolokai, 9. Kaainoa, 10. Paina, 11. Kalimaonaona, 12. Kaikeleaukai, 13. Kanahele, 14. Kukaani, 15. Kupuai, and 16. Helekahi[5]

[5] Helekahi or Kahelekahi – the one who made a claim for a kuleana in ‘O‘oma during the Māhele (Helu 9162).

> Ooma: 1. Kalua, 2. Kamaka and 3. Mamali
>
> Kohanaiki: 1. Hulikoa, 2. Kaoeno, 3. Honolii and 4. Awa [HSA – Series 262, Hawaii 1849].

Unfortunately, there is no indication of where Kalua, Kamaka, and Mamali were living in ʻOʻoma at the time. Based on traditional patterns of residency in the region, it is likely that they had primary residences in the uplands, near sheltered *māla ʻai* (agricultural fields), and kept near shore residences for seasonal fishing, collection of salt, and other resources of the coastal zone. Of the three names given for ʻOʻoma, descendants of the Kalua and Kamaka lines are known to still be residing in the Kekaha region.

Land Grants in ʻOʻoma and Vicinity (1855-1864)

In conjunction with the *Māhele*, the King also authorized the issuance of Royal Patent Grants to applicants for tracts of land, larger than those generally available through the Land Commission. The process for applications was set forth by the "Enabling Act" of August 6, 1850, which set aside portions of government lands for grants.

> Section 4. Resolved that a certain portion of the Government lands in each Island shall be set apart, and placed in the hands of special agents to be disposed of in lots of from one to fifty acres in fee simple to such natives as may not be otherwise furnished with sufficient lands at a minimum price of fifty cents per acre. [HSA – "Enabling Act" Series DLNR 2-4]

The Kingdoms' policy of providing land grants to native tenants was further clarified in a communication from Interior Department Clerk, A. G. Thurston, on behalf of Keoni Ana (John Young), Minister of the Interior; to J. Fuller, Government Land Agent-Kona:

> *February 23, 1852*
> …His Highness the Minister of the Interior instructs me to inform you that he has and does hereby appoint you to be Land Agent for the District of Kona, Hawaii. You will entertain no application for the purchase of any lands, without first receiving some part, say a fourth or fifth of the price; then the terms of sale being agreed upon between yourself and the applicant you will survey the land, and send the survey, with your report upon the same to this office, for the Approval of the Board of Finance, when your sales have been approved you will collect the balance due of the price; upon the receipt of which at this office, the Patent will be forwarded to you.
>
> <u>Natives who have no claims before the Land Commission have no Legal rights in the soil.</u>
>
> <u>They are therefore to be allowed the first chance to purchase their homesteads.</u> <u>Those who neglect or refuse to do this, must remain dependant upon the mercy of whoever purchases the land: as those natives now are who having no kuleanas are living on lands already Patented, or belonging to Konohikis.</u>
>
> <u>Where lands have been granted, but not yet Patented, the natives living on the land are to have the option of buying their homesteads, and then the grant be located, provided this can be done so as not to interfere with them.</u>
>
> <u>No Fish Ponds are to be sold, neither any landing places.</u>

> As a general thing you will charge the natives but 50 cents pr. acre, not exceeding 50 acres to any one individual.
>
> Whenever about to survey land adjoining that of private individuals, notice must be given them or their agents to be present and point out their boundaries… [Interior Department Letter Book 3:210-211]

Between 1855 and 1864, at least six applications were made for land in the *ahupua‘a* of ‘O‘oma, and four of them were patented. The applications were made by:

Grant	Applicant	Land	Acreage	Book and Year
1590	Kauhini	Hamanamana, Kalaoa and Ooma 1	1,816	8:1855 (canceled)
1599	J. Hall	Ooma 2	101.33	8:1855 (canceled)
1600	Kaakau	Ooma 2	58.5	8:1855
2027	Kameheu	Ooma 2	101.33	11:1856 (same area as Grant 1599)
2031	Koanui	Ooma 1	24.5	11:1856
2972	Kaakau & Kama	Kalaoa 5 & Ooma 1	515	14:1864

[“Index of all Grants Issued…Previous to March 31, 1886;” 1887]

The grants to Ka‘akau and Kameheu in ‘O‘oma 2nd were patented by 1859, as recorded in the following letter:

> *April 8, 1859*
> *S. Spencer, Interior Department Clerk;*
> *to Lot Kamehameha, Minister of the Interior;*
> Lands in Puaa and Ooma 2 in Kona, Hawaii which were sold by the Government Agent:
>
> | | |
> |---|---|
> | Royal Patent 1600, Kaakau 58 50/100 acres in Ooma | $29.25 |
> | Royal Patent 2027, Kameheu, 101 33/100 acres in Ooma | $38.00 |
>
> [HSA – Interior Department, Lands]

In the years following issuance of the first Royal Patents in ‘O‘oma and vicinity, native tenants and others continued to express interest in the lands of ‘O‘oma and neighboring *ahupua‘a*. Applications were made to either lease or purchase portions of the remaining government lands. In 1865, Government Surveyor and Land Agent, S.C. Wiltse, wrote to the Minister of the Interior, describing the condition and status of the lands remaining to the government.

> *September 5, 1865*
> *S.C. Wiltse, Government Surveyor and Land Agent;*
> *to F.W. Hutchinson, Minister of the Interior.*
> Kona Hawaii. Government Lands in this District not Sold;
> also those Sold and Not Patented:
>
> …“Kalaoa 5th”
> Not in the Mahele book but believed to be Gov’t. land. This land above the Govt. Road has been sold and Patented. Below the road I have surveyed 515 acres which was sold by Sheldon to “Kaakau” & “Kama” who payed him $165.00. As no valuation was made of this land per acre by Sheldon I afterwards valued it myself as follows, 300 Ac. at 50 cts. per acre, 215 at 25 cts. per Ac. The balance due according to this valuation

> including Patent was $42.75 which was payed to me in March 1864 and forwarded by me to your office. The survey of this land is in your office. If the payments made are satisfactory, these men would be very glad to get their Patent.
>
> This is a piece of 3rd rate land, used only as goat pasture, no improvements on it. Makai of this survey is about 400 Ac. remaining to the Govt., but of very little value.
>
> "Ooma 1st & 2nd"
> The best part of these lands have been sold, there remains to the Govt. the forest part, 2 or 300 Ac., and the makai part some 1500 Ac., about 500 of which is 3rd rate land, the balance rocks.
>
> "Kohanaiki"
> The forest part of this land is all that remains to the Gov't., this is extensive, extending to the mauka side of the forest. It may contain 1500 to 2000 Ac.
>
> The makai part of this land containing 220 Ac. has been sold both by Sheldon and myself. In April 1863 I was surveying in Kona when "Nahuina" (who lives on the adjoining land of "Kaloko") applied to me to survey the makai part of the Gov't. land Kohanaiki which he wished to purchase. I inquired whether he had applied to Sheldon for this lands (Sheldon was then in Honolulu) he told me that he had not, but would do so immediately, if it was necessary he would go to Honolulu for that purpose. I told him that I was then writing to Sheldon and I would make the application for him which I did, but never got an answer. I wrote several times to him about that time, for information about Gov't. lands, but he declined to answer my letters.
>
> On the 30th of May following, I surveyed said piece of land for "Nahuina." When I was making this survey "Kapena" (who bought this land from Sheldon) was present, and afterwards went to Honolulu and payed Sheldon for this land.
>
> "Nahuina" had the money then to pay for this land, and I told him to keep it until he knew who he was paying it to. I was perfectly satisfied then that Sheldon's transaction as Gov't. land Agt. was not honest. Mr. Sheldon had then been away from Kona nearly three months, he had previous to this resigned his office as Judge and taken up his residence permanently in Honolulu. Afterwards when requested by Mr. S. Spencer to act as land Agt. for Kona, "Nahuina" payed me for this land at 25 cents per Acre. Its only value is for a place for a residence on the beach.
>
> I have been thus particular in giving you the history of this affair, so that you might be able to decide which of the parties were intitled to said land… [HSA – Interior Department, Lands]

Historical records document that the primary use of the *kula* – lowlands in the Kekaha region, was for goat ranching, with limited cattle ranching. Throughout the 1800s, most of the cattle ranching occurred on the *mauka* slopes nearer the old upper government road.

Summary of Land Tenure Described in Grant Records

Grant No.'s 1600 (for Kaakau) and 2031 (for Koanui) are situated on the *mauka* side of the Alanui Aupuni (the Upper Government Road, near present-day Māmalahoa Highway) in 'O'oma 2nd and 1st.

Grant No. 1599 (surveyed for Kauhini), was situated across the *kula* lands from O'oma 1st in the south, to Hāmanamana, in the north. Communications from the 1880s, indicate that the parcel was never patented, though Kauhini had lived in 'O'oma 1st, through the time of his death (before 1888). J.S. Emerson's

Register Map No. 1449, identifies a Triangulation Station in ʻOʻoma 1st as "Kauhini." At almost the same time that Kauhini's grant was surveyed, other grants in Kalaoa and ʻOʻoma covering a portion of the area described under Kauhini's grant were patented to Kakau and Kama (Royal Patent Grant No. 2972). In 1888, this confusing situation was brought to the government's attention in a letter from more than 70 native residents of ʻOʻoma and the larger Kekaha region, when the Minister of the Interior was developing homestead lots for applicants (see communications below).

Grant No. 2027 (for Kameheu), situated in ʻOʻoma 2nd, extends from the *makai* edge of the Upper Government Road, to a short distance below the historic Homestead Road between Kaloko and Kalaoa, at about 900 feet above sea level (see Register Map No. 1449).

ʻOʻoma grantee Kaakau (Grant No. 1600), also held an interest in Grant No. 2972 in the land of Kalaoa 5th and ʻOʻoma 1st, which he shared with his relative, Kama. Historic survey records (in Register Maps and Survey Field Books) do identify "Kama's house" near the Wawaloli pond (Register Map No. 1449) in ʻOʻoma 2nd. The same house is later identified as "Keoki Mao's House" (Register Map No. 1280).

In 1888, government surveyor J.S. Emerson identified Kama as a resident in ʻOʻoma, near the mauka government road (see communication below). This Kama is identified in oral history interviews as being an elder of the Kamaka line, from whom the often-mentioned Palakiko Kamaka and others descend. A temporary beach shelter—in the vicinity of "Kama's House" marked near the shore of ʻOʻoma 2nd on Register Maps 1449 and 1280—remained in use by family members at least until the outbreak of World War II (see interviews with Peter Kaikuaana Park, Geo. Kinoulu Kahananui, and Valentine K. Ako).

While no formal awards or grants of land appear to have been made for the near shore *kula* or beach lands, it is logical to assume that families living in the uplands of the ʻOʻoma and Kalaoa-Kohanaiki *ahupuaʻa*, made regular visits to the near shore lands. The practice of continued travel between upland residences and near-shore shelters, is also described by *kupuna* Peter K. Park, who was born and raised in the *mauka* section of ʻOʻoma, and by other *kupuna* from neighboring lands.

No records indicating that the above Royal Patent Grantees had applied for coastal parcels as a part of their original claims were found while conducting the present research. A further review of the *Māhele* records was also made to determine if any of the grant applicants had been *Māhele* claimants (as is sometimes the case). Their names did not appear in the Register or Testimony volumes for the area.

Ka ʻĀina Kaha–(A Native's Perspective)

In 1875, J.P Puuokupa, a native resident of Kalaoa wrote a letter to the editor of the Hawaiian newspaper, *Ku Okoa*, responding to a letter which had been previously published in the paper (written by a visitor to Kona). The first account apparently described the Kekaha region as a hard land that presented many difficulties to the residents. It was also reported that a drought on Hawaiʻi had significantly impacted crop production, and that a "famine" was occurring. Puuokupa, responded to the account and described the situation as he knew it, from living upon the land. His letter is important as it provides us with an explanation as to why people of the region—including ʻOʻoma—lived mostly in the uplands, for it was there that the rich soils enabled residents to cultivate the land and sustain themselves.

> *Mai Kailua a hiki i Kiholo*–(From Kailua to Kiholo)
> …The people who live in the area around Kailua are not bothered by the famine. They all have food. There are sweet potatoes and taro. These are the foods of these lands. There are at this time, breadfruit bearing fruit at Honokohau on the side of Kailua, and at Kaloko, Kohanaiki, Ooma and the Kalaoas where lives J.P. [the author]. All of these lands are cultivated. There is land on which coffee is cultivated, where taro and sweet potatoes are cultivated, and land livestock is raised. All of us living from Kailua to Kalaoa are not in a famine, there is nothing we lack for the well being of our bodies.

> Mokuola[6] is seen clearly upon the ocean, like the featherless back of the *ʻukeke* (shore bird). So it is in the uplands where one may wander gathering what is needed, as far as Kiholo which opens like the mouth of a long house into the wind. It is there that the bow of the boats may safely land upon the shore. The livelihood of the people there is fishing and the raising of livestock. The people in the uplands of Napuu are farmers, and as is the custom of those people of the backlands, they all eat in the morning and then go to work. So it is with all of the native people of these lands, they are a people that are well off.
>
> …As was said earlier, coffee is the plant of value on these lands, and so, is the raising of livestock. From the payments for those products, the people are well off, and they have built wooden houses. If you come here you shall see that it is true. Fish are also something which benefits the people. The people who make the *pai ai* on Maui bring it to Kona and trade it. Some people also trade their *poi* for the coffee of the natives here… (J.P. Puuokupa, in *Ku Okoa* November 27, 1875; translated by Kepā Maly)

The Government Homesteading Program in Kekaha

Following the *Māhele* and Grant programs of the middle 1800s, it was found that many native tenants still remained on lands for which they had no title. In 1884, the Hawaiian Kingdom initiated a program to create Homestead lots on Government lands—a primary goal being to get more Hawaiian tenants in possession of fee-simple property (Homestead Act of 1884). The Homestead Act allowed applicants to apply for lots of up to 20 acres in size, and required that they own no other land.

On Hawaiʻi, several lands in the Kekaha region of North Kona, were selected and a surveying program was authorized to subdivide the lands. Initially, those lands extended from Kohanaiki to Kūkiʻo. Because it was the intent of the Homestead Act to provide residents with land upon which they could cultivate crops or graze animals, most of the lots were situated near the *mauka* road (near the present-day Māmalahoa Highway) that ran between Kailua and ʻAkāhipuʻu.

Early in the process, native residents of Kekaha soon began writing letters to the Minister of the Interior, observing that 20 acre parcels were insufficient "to live on in every respect." They noted that because of the rocky nature of the land, goats were the only animals that they could raise, and thus, try to make their living (cf. State Archives–Land File, December 26, 1888, and Land Matters Document No. 255; and communications below).

During the first years of the Homestead Program, all of the remaining government lands in the Kekaha region, from Kohanaiki to Kūkiʻo 2nd, had been leased to King David Kalākaua for grazing purposes. The following lease was issued, with the notation that should portions of the land be desired for Homesteading purposes, the King would relinquish his lease:

> *August 2nd 1886*
> *General Lease 364*
> *Between His Majesty Kalakaua;*
> *and Walter M. Gibson, Minister of the Interior*
> [Lease of unencumbered government lands between Kealakehe to Kukio 2nd]:
>
> …Oma [Ooma] No. 1 & 2 – yearly rent Ten dollars…
> Each and every of the above mentioned lands are let subject to the express condition

[6] *Moku-ola* — literally: Island of life — is a poetic reference to a small island in Hilo Bay which was known as a place of sanctuary, healing, and life. By poetic inference, the Kekaha region was described as a place of life and well-being.

> that at any time during the term of this lease, the Minister of the Interior may at his discretion peaceably enter upon, take possession, and dispose of such piece or pieces of land included in the lands hereby demised, as may be required for the purposes of carrying out the terms and intent of the Homestead Laws now in force, or that may be hereafter be enacted during the term of this lease… [State Land Division Lease Files]

By 1889, the demand for homestead lots in ʻOʻoma and other Kekaha lands was so great that King Kalākaua gave up his interest in the lands:

> *January 22, 1889*
> *J.W. Robertson, Acting Chamberlain;*
> *to J.A. Hassinger, Chief Clerk, Interior Department*
> [Regarding termination of Lease No. 364 for lands from Kukio to Kohanaiki]:
>
> …I have the honor to acknowledge the receipt of your communication, of the 17th, instant, informing me that you are directed, by His Excellency the Minister of the Interior, to say, that he desires to take possession of the lands, described in Government Lease No. 364, for Homestead purposes, and requests the surrender of the lease.
>
> His Majesty the King, is willing, for the purpose of assisting in carrying out the Homestead Act, to accede to the terms of the lease, so far as to give up only such portions of the lands, as are suitable to be apportioned off for Homestead purposes.
>
> It has come to the knowledge of His Majesty, that several of the applicants for portions of the above lands, are already in possession of lands elsewhere, and living in comfortable homes. They are not poor people, nor are they entitled to the privilege of obtaining lands under the Homestead Act, but are desirous of obtaining more of such property, for the purpose of selling or leasing to the Chinese, which class is beginning to outnumber the natives in nearly every district…
>
> His Majesty is desirous of retaining the balance of lands, that may be left after the apportionment has been completed; and also desires to lease remnants of other Government lands in that section of the Island…
>
> Reply attached – Dated January 22, 1889:
> The lands of Kohanaiki and Kalaoa and Makaula have been divided up into Homestead lots, and taken up.
>
> Lands marked * are in Emerson's List of lands to be sold. Emerson's List attached.
>
> His Majesty has paid rent to Aug. 22, 1889. Another rent is due in adv. from this date…
>
> | | |
> |---|---|
> | * Kukio 2 | * Maniniowali |
> | * Mahaiula | * Kaulana |
> | * Awalua | Puukala |
> | + Makaula | + Kalaoa 1, 2, 3, 4 & 5 |
> | * Oma 1 & 2 | + Kohanaiki |
>
> Lease cancelled by order – Minister of Int. August 2, 1889 [HSA – Interior Department, Lands]

One of the significant issues that arose with the development of homesteads in the Kekaha region, involved the lands of ʻOʻoma, Kalaoa and Hāmanamana, which had been surveyed for Kauhini in 1855,

under Grant No. 1590. The grant was apparently never patented, and questions regarding the government's authority to divide portions of the ʻOʻoma-Kalaoa-Hāmanamana lands into Homestead lots were raised. Adding to the confusion, in 1888, John A. Maguire was also making his move from Kohala to Kona, and in the process of establishing his Huehue Ranch. One of the lands he reportedly purchased was covered under the unperfected Grant No. 1590. Thus, homestead applicants and program managers met with a wide range of challenges during the program's history.

Homestead Communications

There are a number of letters between native residents (applicants for Homestead lands) and government agents, documenting the development of the homesteading program and residency in Kekaha. Tracts of land in Kohanaiki, ʻOʻoma, Kalaoa and neighboring *ahupuaʻa* were let out to native residents, and eventually to non-native residents as well. Those lands which were not sold to native tenants were sold or leased to ranching interests—most of which came under John A. Maguire of Huehue Ranch.

One requirement of the Homestead Program was that lots which were to be sold as homesteads to the applicants, needed to be surveyed. J.S. Emerson, one of the most knowledgeable and best-informed surveyors to work in Kona, began surveying the Kekaha region homestead lots in 1888. Emerson's letters to Surveyor General, W. D. Alexander, provide valuable historical documentation about the community and land. Writing from ʻOʻoma in April 1888, Emerson spoke highly of the Hawaiian families living on the land; he also described land conditions and weather at the time. In the letter, we find that questions regarding the status of several lands in Kona had arisen, and that John A. Maguire was planning to "settle" in Kona (see communications in Part 4 of this section of the study). Emerson's letters along with those below from the native tenants of the land, provide first hand accounts of the land development of the communities in Kekaha. The following communications are among those found in the collection of the Hawaiʻi State Archives (HSA).

> *May 1888*
> *J.W.H. Isaac Kihe, Jr., et al.; to L.A. Thurston, Minister of the Interior*
> [Petition with 71 signatures, regarding discrepancy in land grant to Kauhini in Kalaoa and Ooma; and desires that said land be divided into Homestead Lots for applicants]:
>
> …We, the undersigned, subjects residing within the boundaries of Kekaha, from Kohanaiki to Makalawena, and Whereas, the land said to belong to Kauhini is within the boundaries above set forth; Whereas, some doubt and hesitancy has come into our minds concerning the things relating to said land of Kauhini, and that it is proper that a very careful investigation be made, because, we have never known said Kauhini to have lands in the Kalaoas and Ooma 1, and because of such doubt, the Government sold some pieces in said land of 687 acres to Kama, Kaakau and Hueu, and they have been living with all the rights for 20 years and over, on pieces that were acquired by them. Therefore, we leave this request before your Excellency, the honorable one, with the grounds of this request:
>
> First: The said land of Kauhini is not a land that is clear in every way, so that it can be shown truthfully and clearly that it belongs to Kauhini and his heirs – said kuleana.
>
> Second: The land said to belong to Kauhini was only surveyed, but the money was not paid, that is the price for the land, only the payment for the survey was paid. We are ready with witnesses to prove this ground, as well as other grounds.
>
> Third: Because of Kama and Kaakau and Hueu's knowing that Kauhini had no true interest in the land, therefore, they bought from the Government some acres of in the piece which Kauhini had surveyed, and the Government readily agreed to sell to them. This is real proof that said land was not conveyed to Kauhini, and the second is that

Kauhini was living right there and he made no protest against the sale by the Government of those 687 acres to Kama (k), Kaakau (k) and Hueu (k), up to the time of his death, and only now has the question been raised through the plat of the survey, and thereby basing the claim that Kauhini had some land.

…We ask your honor that this matter be traced in the Government Departments, so as to find out the truth, there is much trouble and uncertainty about this land.

And our inquiry to be based upon these great questions. Does the land belong to Kauhini? Or to the Government?… [HSA – Interior Department, Lands]

May 16, 1888
Interior Department Clerk; to J.W.H. Isaac Kihe, Jr.:
…I have been directed by the Honorable Minister of the Interior, to say, that your request asking that Kauhini's interest in the lands of Kalaoa & Ooma 1 be investigated, and to let you know the you are wanted to send, or to bring here to Honolulu, 2 or 3 good witnesses, and all the papers found by you or them, concerning this land of Kauhini… [HSA Interior Department Lands]

May 16, 1888
J.F. Brown, Government Surveyor; to L.A. Thurston, Minister of the Interior
[Regarding disposition of Grant No. 1590, to Kauhini for Lands in Hamanamana, Kalaoa, and Ooma; Figure 6]:

…With reference to the letter of inquiry of numerous natives in N. Kona, Hawaii, I beg to report:

That as regards the land belonging to Kauhini, I find that Grant 1590 on record and signed in due form, assigned to Kauhini something over 1800 acres shown in sketch by yellow tinted boundary line. At the bottom of the page however and in different handwriting is the following remark "Memo – this to be cancelled" S.S. (Stephen Spencer)?

Later the grants shown in sketch by blue lines were issued to the parties indicated in the sketch, and this fact together with the memo attached to the Grant, and the statements and beliefs of the natives leads me to think that the Grant to Kauhini was actually cancelled, but of this I have not yet obtained further proof than I have here given… [HSA – Interior Department, Lands]

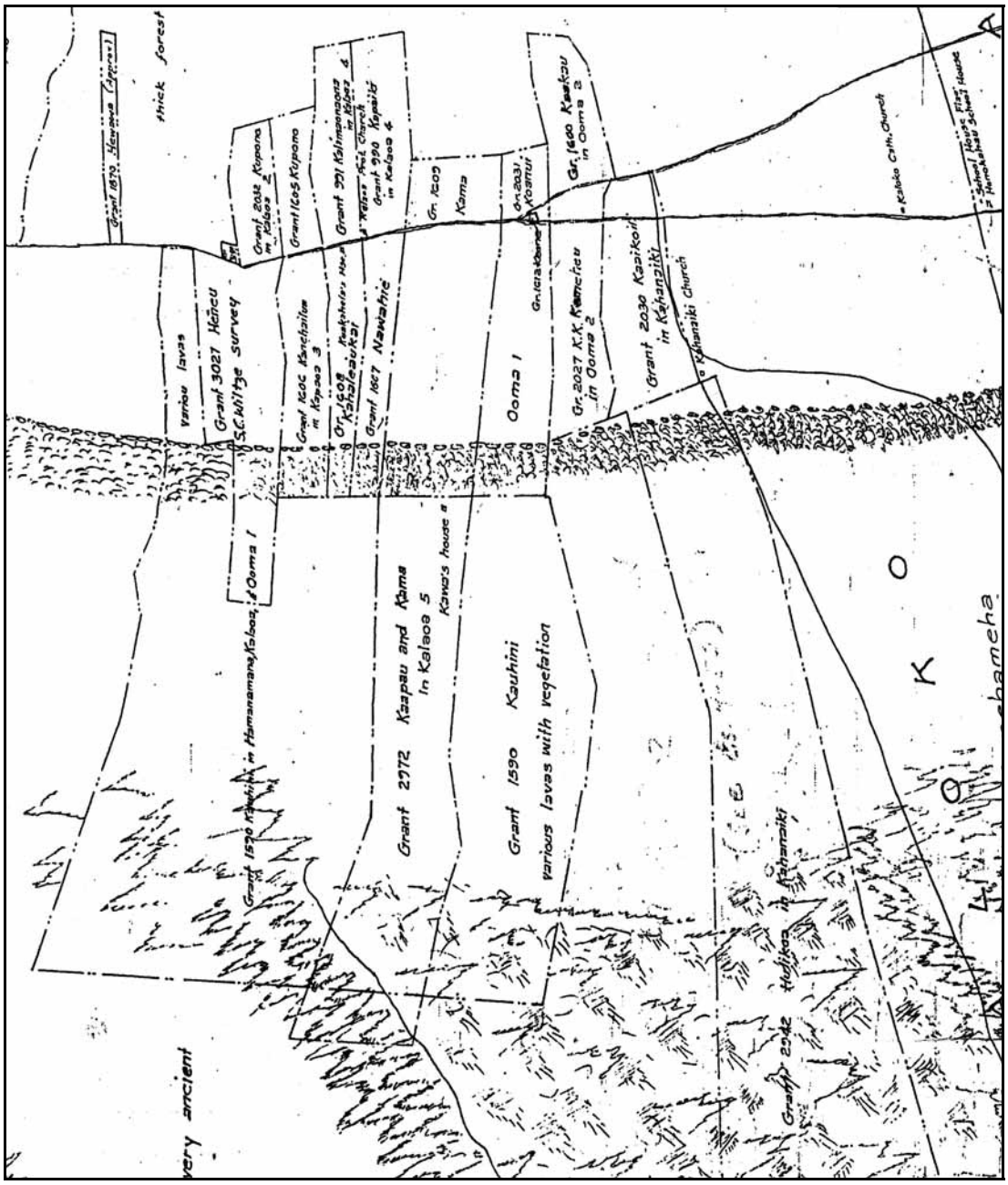


Figure 6. Portion of 1882 Register Map No. 1280 showing original boundaries of Grant No. 1590, to Kauhini.

May 1888 - J.W.H.I. Kihe, Jr.; to L.A. Thurston, Minister of the Interior:
…Oh honorable one, I am ready with the right witnesses to come when I receive the order, and if you agree, oh honorable one, to help with the fares for us on the vessel, and for our support while staying there and coming back.

Proofs are ample to prove that the land belongs to the Government, when I arrive with the witnesses, according to what you wish to be done… [HSA – Interior Department, Lands]

[Applying to purchase remnant lands from Makaula to Ooma 2nd, as a native Hui; and that land not be sold to outsiders.]

…We the undersigned, kamaaina (old residents) who reside from "Makaula" to "Ooma 2," joining "Kohanaiki," hereby petition and we also file this petition with you, and for you to consider and conferring with the Minister of the Interior, whether to consent or refuse the petition which we humbly file, and at the same time setting forth the nature of the land and the boundaries desired.

We ask that all be sold to us as a Hui, that the remnants of all the Government lands from "Hamanamana" to "Ooma 2 (two)," that is from the Government remnant of "Hamanamana, Kalaoa 1, 2, 3, 4, 5, Ooma 1 & 2" running until it meets the sea. Being the remnants remaining from the "Homesteads" lately, and remaining after the sale of the lands formerly sold by the Government, these are the remnants which we wish to buy as a "HUI." If you consent, and also the "Minister of the Interior," for these reasons:

1. The "remnants of Government lands" aforesaid, join our land kuleanas and were lately surveyed, and for that reason we believe it proper that they be sold to us.

2. The "kuleanas" that were surveyed for us are not sufficient to live on in every respect, they are too small, and are not in accordance with the law, that is one hundred acres, (Laws 1888).

3. Because of our belonging to, and being old residents of said places, is why we ask that consent be granted us for the sale to us and not to any one from other places, or we may be put to trouble in the future.

With these reasons, we leave this with you, and for you to approve, and we also adhere to our first offer per acre, and the explanations in regards to said offer.

FIRST: The price per acre to be 10 cents per acre.

SECOND: The nature of the land is rocky and lava stones in all from one and to the other, and there is only one kind of animal which can roam thereon, and it is goats, and that is the only thing to make anything out of, and to benefit us if we acquire it.

THIRD: If this land is acquired by others, they will probably cause us trouble, because the kuleanas which we have got are very small and not enough, not 20 acres of the land were acquired by us; very few of the lots reach 20 acres or more.

And because of these reasons and the explanations herein, we leave before your Excellency for the granting of the consent or not… [HSA – Interior Department, Lands]

ca. February 1889
Petition of J.W.H. Isaac Kihe, Jr. and 21 others;
to L.A. Thurston, Minister of the Interior
[Transmitting first payment for Homestead Land from Makaula to Kohanaiki]:

…We, the ones whose names are below, persons who but for the pieces of "Homestead" lands from Makaula to Kohanaiki, present to you documents of proof and money as first payment of ten ($10.00) dollars in the hands of J. Kaelemakule, the Agent appointed for the "Homestead" lands in North Kona, Hawaii.

We ask that the Agreements be sent up, with the Government for five years to J. Kaelemakule, the Agent here, in number the same as there are names below…

1. J.W.H. Isaac Kihe, Jr.	9. P. Nahulanui	17. Keawehawaii
2. S. Mahauluae	10. Kaukaliinea	18. D. Kaninau
3. D.P. Manuia	11. Kamahiai (w)	19. Mokuaikai
4. S.M. Kaawa	12. C.K. Kapa	20. Nuuanau
5. H.P. Ku	13. P.K. Kanuha	21. S. Kaimuloa
6. W.N. Kailiino	14. J. Haau	22. J. Kaloa
7. Z. Kawainui	15. G. Mao	
8. Kikane	16. J. Pule	

[HSA – Interior Department Document No. 227]

February 18, 1889
J. Kaelemakule, Land Agent; to L.A. Thurston, Minister of the Interior:
I am sending the correct report of the applicants for homestead lands here in North Kona, and their respective names, and the amount they have paid for their initial deposits in order that the agreements will be made correctly…

Pule $10.	Keoki Mao $10.	Mahuluae $10.	Haau $10.
Nuuanu $10.	Manuia $10.	Kaukaliinea $10.	Kamahiai (w) $10.
Kaawa $10.	Kaninau $10.	J. Kaelemakule $10.	Kawainui $10.
Mokuaikai $10.	Keawehawaii $10.	Nahulanui $10.	Kaloa $10.
Haiha $10.	Kapa $10.	Kaumuloa $10.	Isaac Kihe $10.
Kailiino $10.	Kanuha $10.	Ku $10.	Kikane $10.

[HSA – Interior Department, Lands]

October 7, 1889
J. Kaelemakule, Land Agent; to L.A. Thurston, Minister of the Interior:
…The applications of Kahinu and Lilinoe which were sent down during the month of August, please have the lots changed, because the map of Ooma has arrived with new numbers, as follows: Kahinu, Lot 51; Lilinoe, Lot 49, in Ooma 1st … [HSA – Interior Department, Lands]

October 10, 1889
J.W.H. Isaac Kihe, Secretary; to L.A. Thurston, Minister of the Interior:
…I leave some more names who make applications for homestead lands here in North Kona… The places wanted by those named are:

> Pika Kaninau at Ooma 1
> Kahinu at Ooma 2
> Keaweiwi at Ooma 2… [HSA – Interior Department, Lands]

October 28, 1889
J. Kaelemakule, Land Agent; to L.A. Thurston, Minister of the Interior:
…The eight lots in Ooma have all been taken, none are left… These lots have been very quickly taken by the bidders, before the issuance of the notice from the Minister… Bear in mind the agreements for Kahinu and Lilinoe… [HSA – Interior Department, Lands]

December 31, 1890

J.W.H.I. Kihe, Jr.; to C.N. Spencer, Minister of the Interior:
We, the undersigned, who are without homes, and are destitute and have no place to live on, and whereas, the government has permitted all the people who have no lands, and that they receive homesteads, and for that reason, your humble servants make application that our application may be speedily granted which we now place before Your Excellency, that the Government land which was divided and surveyed by Joseph S. Emerson, be immediately sub-divided, the same being portions of Kalaoa 5 and Ooma, on the mauka side of Kama (k), Koanui (k), to the junction with Ooma of Kaakau (k), containing an area of one hundred and fifteen acres (115), and it is those acres which your applicants are applying for before Your Excellency, and where as your applicants are native Hawaiians by birth, residing at Kalaoa, North Kona, Island of Hawaii. And the minds of your servants hope and desire to have a place to live on in the future, and to have a home for all time, and Your Excellency, your servants humbly place their petition with the hope that you will grant this application...

M.E. Kuluwaimaka (k)
H. Hanawahine (k)
D.W. Kanui (k)
Mr. Kahumoku (k)
[HSA – Interior Department, Lands]

July 30, 1890
Petition of Kaihemakawalu and 63 native residents of Kekaha;
to C.N. Spencer, Minister of the Interior
[Requesting that lands available for Homesteading be sub-divided and granted to applicants]:

…We, the undersigned, old-timers living from Kealakehe to Kapalaoa, who are subject to taxes, and who have the right to vote in the District of Kona, Hawaii, and ones who are really without lands, and who wish to place this application before Your Excellency, that all of these Government lands here in North Kona, be given to the native Hawaiians who are destitute and poor, being the lots which were sub-divided by the Government which are lying idle and for which no Agreements have been given out, and also the lots which were granted Agreements and issued in the time when Lorrin A. Thurston was Minister of the Interior, and also the lots which still remain undivided. All of these Government lands are what we are now again asking that the dividing and sub-dividing be continued in these remnants of Government lands, until all of the poor and needy ones are provided for.

Your Excellency, we ask that no consent whatever be given to permitting lands to be acquired by the rich through sale at auction, or by lease, and if there is to be any lease, then to be leased to the poor ones, if they are supplied with homes.

Your Excellency, we ask that you immediately send copies of all agreements of the Government lands which were cut up and sub-divided, which are remaining and have no documents for those lots. And we also ask that a surveyor be sent now to again survey and sub-divide the remaining Government lands, being the Government lands of Kaulana, Mahaiula, Kukio 1 & 2, mauka of the Government Road, and Kalaoa 5 & Ooma 1, mauka of the Government Road, joining Kama's and Koanui's.

And now, Your Excellency, we also ask that all of the pieces of Government land lying idle outside of these lands which have been sub-divided, and lands which are to be sub-divided, applied for above, to be allowed to be leased to use for five cents per acre,

because, they are rocky and pahoehoe lands only left, and the number of acres being about three thousand and over, thereby giving the Government some income from these which have been lying idle and without any value… [HSA – Interior Department, Lands]

June 22, 1893
J. Kaelemakule, Land Agent; to J.A. King, Minister of the Interior:
…I am forwarding you with this, the copy of the agreement of Wm. Harbottle, and some applications as herein below set forth (Figure 7):

107, Kalua (w), for Lot # 59, Map 6, Ooma;
108, G.M. Paiwa, for Lot # 56, Map 6, Ooma;
109, Namakaokalani, for Lot # 58, Map 6, Ooma;
110, Pika Kaninau, for Lot # 57, Map 6, Ooma.

Lot # 57 above set forth, was formerly agreed with D. Kealoha Hoopii, but this applicant left altogether and lived a long time in Kohala, and has done nothing towards the land, and has never signed the agreement to this day. As two years have gone by, I thought it would be better to give the lands to the new applicant… [HSA – Interior Department, Lands]

August 31, 1898
Statement of Leases of Public Lands
Under Control of the Commissioner of Public Lands.…
…Ooma (mauka) 1160 acres – Coffee, wood lands & grazing
Lease No. 432 – Annual rent $60. – Expires August 1st, 1906…
Reservation in lease by which the Gov't. may take up portions suited to settlement. [HSA – F.O. & Ex, 1898 – Public Lands]

In May 1902, the Territorial Survey Office issued Register Map No. 2123, depicting a portion of the Kalaoa-Ooma Homesteads. ʻOʻoma 1st had been divided into 25 lots extending from near the shore (excluding the shore line) to the upper limits of the ahupuaʻa; also excluding the early Royal Patent Grant parcels previously sold to native tenants.

Applicants for land in ʻOʻoma 1st (from *maka*i to *mauka*) included:

- Kanealii – Right of Purchase Lease # 30; Lot 4-B (cancelled);
Kanealii's parcel was just mauka of the shore line exclusion.

- Wm. Keanaaina – Right of Purchase Lease #33; Lot 13 (Patented by Grant No. 5472);
The makai end of Wm. Nuuanu Keanaaina's Grant 5472, is situated at approximately 325 feet above sea level.

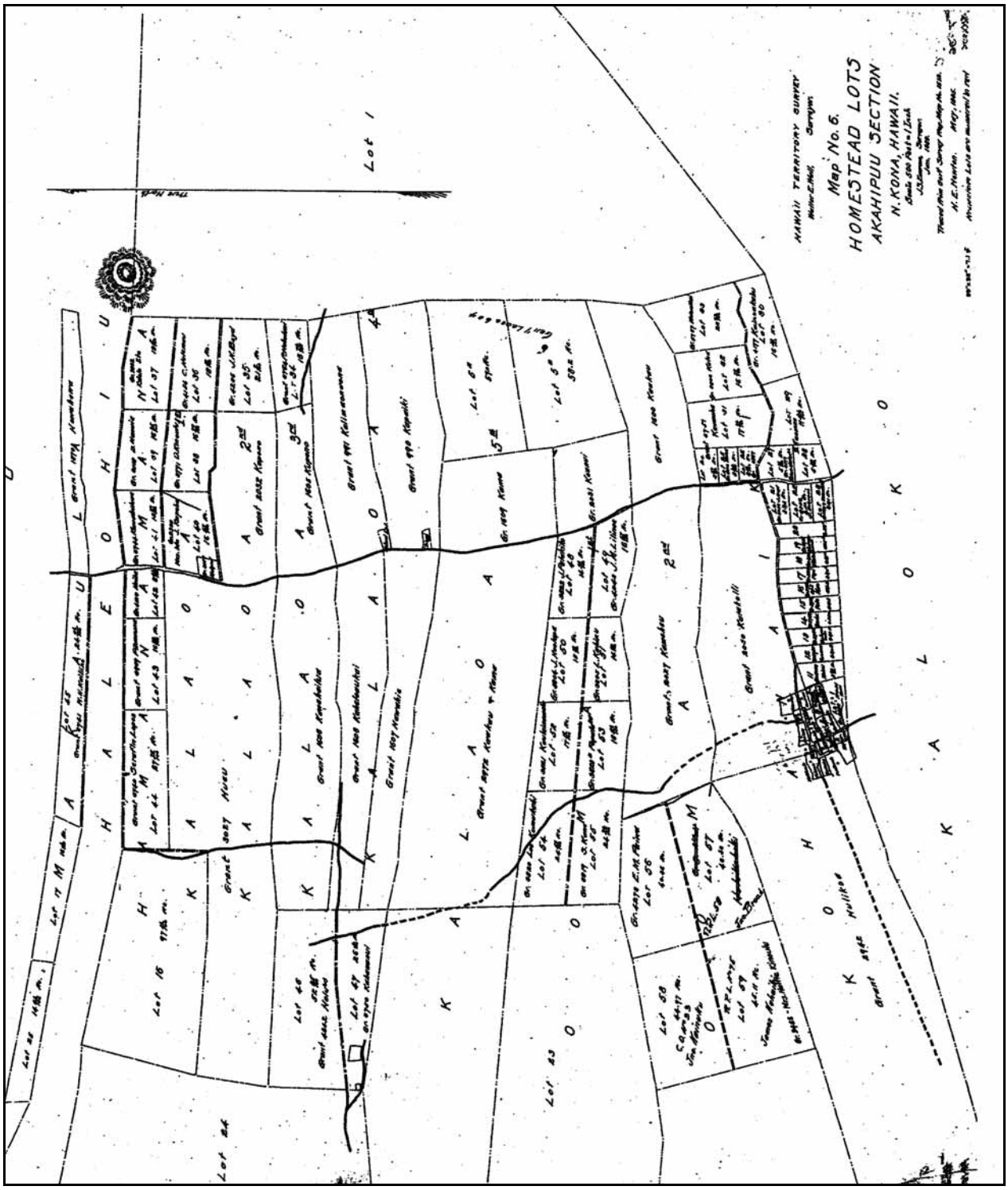


Figure 7. 1902 homestead map No. 6 showing Ooma-Kalaoa Homestead Lots (State Survey Division).

- J. Maiola – Right of Purchase Lease # 28; Lot 14 (cancelled);
J. Maiola's parcel was situated about 525 feet above sea level.

- K. Kama Jr. – Right of Purchase Lease #27; Lot 15
(Patented by Grant No. 5046).
The makai end of K. Kama's Grant No. 5046, is situated at approximately 725 feet above sea level.

Territorial Survey Map No. 6 (Homestead Lots, Akahipuu Section), surveyed by J.S. Emerson in 1889, depicts the eight original homestead lots sold to applicants. The lots are in the area extending from 1,022 feet above sea level to the old Māmalahoa Highway. The lots contained approximately 15 to 25 acres each, and were (*makai* to mauka) sold to:

- S. Kane – Grant No. 3819, Lot 55;
- Loe Kumukahi – Grant No. 3820, Lot 54;
- Papala (w) – Grant No. 3820 B, Lot 53;
- Kaulainamoku – Grant No. 3821, Lot 52
- L. Kahinu – Grant No. 3805, Lot 51
- J. Hoolapa – Grant No. 3804, Lot 50
- J.M. Lilinoe – Grant No. 4343, Lot 49
- J. Palakiko – Grant No. 3822, Lot 48

Except for the Homestead parcels and the two lots patented to Keanaaina and Kama (totaling ten parcels of the available 25 parcels), no other land in ʻOʻoma 1st was sold during this time. The land was retained by the government and portions leased out for grazing (see General Lease No.'s 590 and 604).

ʻOʻoma 2nd was also divided into homestead parcels, but only six lots were made in the subdivision (see Register Map No. 2123). The two *makai* lots consisted of approximately 1,333 acres—the first lot from above the shore to the 1847 *Alanui Aupuni*, containing approximately 302 acres, and the other lot running *mauka* from the same *Alanui Aupuni*, to about the 800 foot elevation (containing approximately 1,031 acres). In 1899, John A. Maguire, founder of Huehue Ranch applied for a Patent Grant on both of the *makai* lots, but he only secured Grant No. 4536, for the lower parcel of 302 acres, in ʻOʻoma 2nd. Maguire's Huehue Ranch did hold General Lease No.'s 1001 and 590 for grazing purposes on the remaining government lands—both below and above the *mauka* highway—in ʻOʻoma 2nd.

Between 700 and 1,100 feet elevation, four Homestead lots were subdivided, containing 40.50 to 45 acres each. Applicants for the lots (*makai* to *mauka*) were:

- James Kuhaiki – Right of Purchase Lease # 75, Lot 59
(Patented to Mrs. Hattie Kinoulu);
- Jno. Kainuku – C.O. No. 33, Lot 58 (not granted by 1902);
- Holokahiki – C.O. No. 11, Lot 57
(cancelled; R.P.L. # 59 to Jno. Broad); and
- E.M. Paiwa – Grant No. 4273, Lot 56.

The notes of survey from Maguire's Grant No. 4536 describes the near shore parcel in ʻOʻoma 2nd (Figure 8). Of particular interest, it also references one of the prominent cultural-historical features on the boundary between ʻOʻoma 2nd and Kohanaiki, an "old ʻKahua hale' on white sand…" The "kahua hale" is an old house site. The notes of survey read:

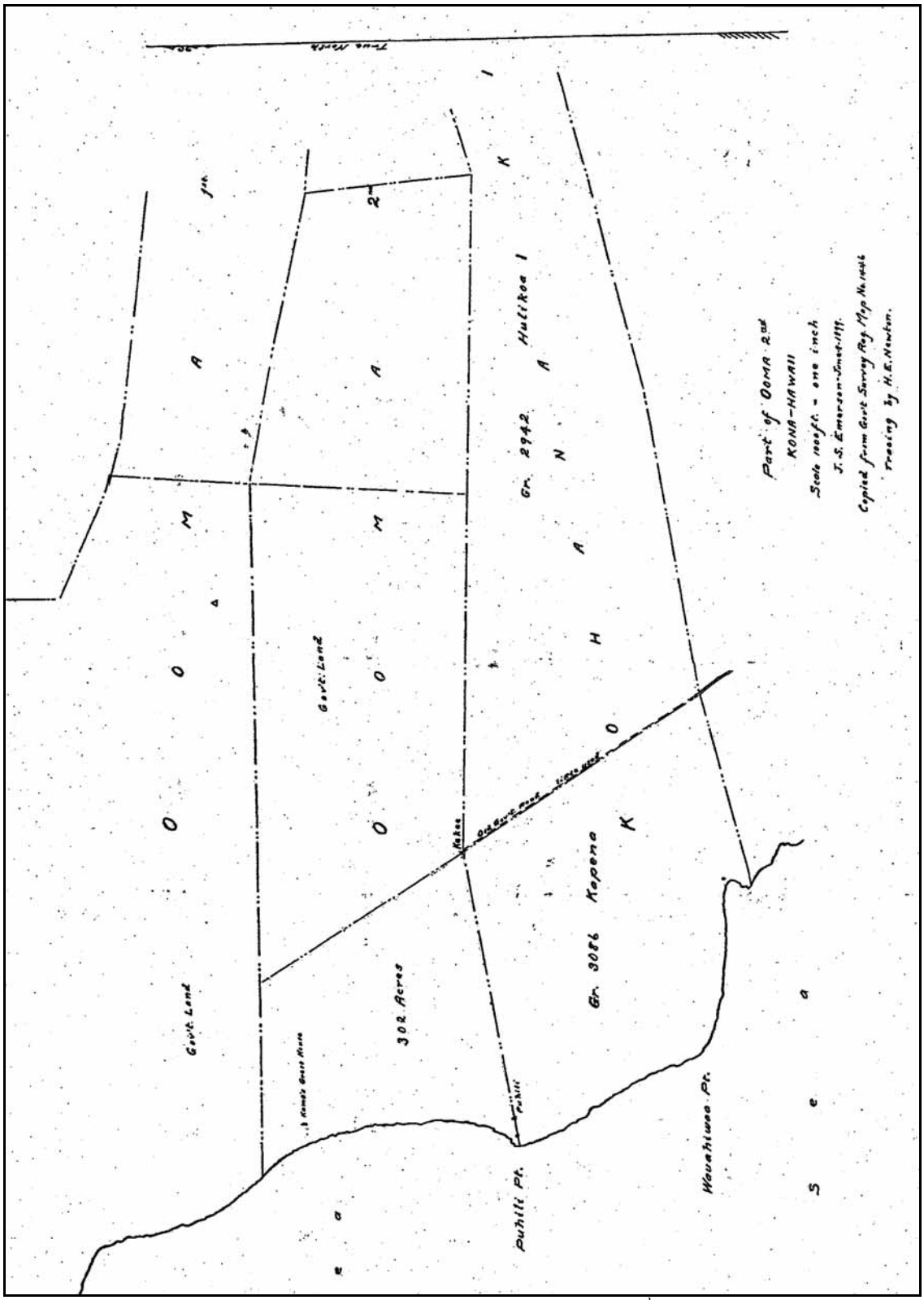


Figure 8. 1899 Grant Map No. 4536 showing *makai* portion of ʻOʻoma 2nd to John A. Maguire.

Grant No. 4536
To J.A. Maguire
Purchase Price $351.00
A Portion of Ooma 2nd, N. Kona, Hawaii Applied for by J.C. Lenhart, June 8, 1899.
Beginning at Puhili Gov't. trig. St. on the boundary between Kohanaiki and Ooma marked by a drill hole in stone 9 feet South of the South corner of an old "Kahua hale" on white sand at a point from which
Akahipuu Gov't. trig. Sta. is N 55º 27' 39" E true 32634.7 feet
Keahole Gov't. Trig. Sta. is N 21º 52' 36" W true 9310.5 ft.
Keahuolu Gov't Trig. Sta. is S 22º 24' 36" E true 20,141.8 ft., and running —
1. S. 79º 26' W. true 298.0 feet along Gr. 3086 Kapena, to a large [mark] on solid pahoehoe by the sea at Puhili Point, thence continuing the same line to the sea shore and along the sea shore to a point whose direct bearing and distance is:
2. N. 4º 54' W. true 4192.0 feet;
3. Due east true 2920.0 feet along Ooma 1st;
4. S. 31º 30' E. true 3920.0 feet along reservation for Gov't. Road 30 feet wide;
5. S 790º 45' W. true 4387.0 feet along Grant 3086 Kapena, to initial point and including an area of 302 acres.

J.S. Emerson, Surveyor
Oct. 10, 1901.

Field Surveys of J.S. Emerson (1882-1889)

Among the most interesting historic Government records of the study area—in the later nineteenth century—are the communications and field notebooks of Kingdom Surveyor, Joseph S. Emerson. Born on O'ahu, J.S. Emerson (like his brother, Nathaniel Emerson, a compiler of Hawaiian history) had the ability to converse in Hawaiian, and he was greatly interested in Hawaiian beliefs, traditions, and customs. As a result of this interest, his letters and field notebooks record more than coordinates for developing maps. While in the field, Emerson also sought out knowledgeable native residents of the lands he surveyed, as guides. Thus, while he was in the field he also recorded their traditions of place names, residences, trails, and various features of the cultural and natural landscape (including the extent of the forest and areas impacted by grazing). Among the lands that Emerson worked in was the greater Kekaha region of North Kona, including the lands of 'O'oma and vicinity.

One of the unique facets of the Emerson field notebooks is that his assistant J. Perryman, was also a sketch artist. While in the field, Perryman prepared detailed sketches that help to bring the landscape of the period to life. In a letter to W.D. Alexander, Surveyor General, Emerson described his methods and wrote that he took readings off of:

> …every visible hill, cape, bay, or point of interest in the district, recording its local name, and the name of the *Ahupuaa* in which it is situated. Every item of local historical, mythological or geological interest has been carefully sought & noted. Perryman has embellished the pages of the field book with twenty four neatly executed views & sketches from the various trig stations we have occupied… [Emerson to Alexander, May 21, 1882; HSA – DAGS 6, Box 1]

Discussing the field books, Emerson also wrote to Alexander, reporting "I must compliment my comrade, Perryman, for his very artistic sketches in the field book of the grand mountain scenery…" (HSA – HGS DAGS 6, Box 1; Apr. 5, 1882). Later he noted, "Perryman is just laying himself out in the matter of topography. His sketches deserve the highest praise…" (ibid. May 5, 1882). Field book sketches and the Register Maps that resulted from the fieldwork provide a glimpse of the country side of more than 100 years ago.

Field Notebooks and Correspondence from the Kekaha Region

The following documentation is excerpted from the field notebooks and field communications of J. S. Emerson. Emerson undertook his original surveys of lands in the Kekaha region in 1882-1883 (producing Register Maps No. 1278 and 1280). Subsequently, in 1888-1889, Emerson returned to Kekaha to survey out the lots to be developed into Homesteads for native residents of ʻOʻoma and vicinity (see above, The Government Homesteading Program in Kekaha). Through Emerson's letters and notes taken while surveying, we learn about the people who lived on the land—some of them identified in preceding parts of the study—and about places on the landscape. The numbered sites and place names cited from the field books coincide with sketches prepared by Perryman, which are shown as figures in the current study.

J.S. Emerson Field Notebook Vol. 111 Reg. No. 253
West Hawaii Primary Triangulation, Kona District
Akahipuu; May 27, 1882
(Figures 9 and 10)

Site # and Comment:

…6 – Koanui's frame house. E.G. In Honokohau – nui.

7 – Aimakapaa Cape. Extremity. In Honokohau-nui.

11 – Beniamina's house (frame). N.G. In Aiopio. In Honokohau-nui.

12 – Beniamina's house No. 2. E.G. In Honokohau-nui.

18 – Lae o Palaha. Between Kaloko and Honokohau-nui.

19 – Awanuka Bay (Haven of rest) Retreat during storms in this dist.

20 – Kealiihelepo's (frame house). N.G. In Kaloko.

21 – Lae Maneo. From the "Maneo" fish in Kaloko.

22 – Kohanaiki Bay. By sea wall of fish pond.

23 – Kaloko-nui fish pond. Tang. S. end by Nuuanu's grass house.

24 – Wall between fish pond of Kaloko nui and iki.

25 – Kaloko iki fish pond. Tang. N. extremity.

Kaloko nui was originally a bay, shut off from the sea by a wall by Kamehameha 1st order.

26 – Kawaimaka's frame house. In Kohanaiki.

27 – Lae o Wawahiwaa. Rock cape. In Kohanaiki.

28 – Keoki Mao's grass house. In Ooma.

29 – Pahoehoe hill. Between Ooma and Kalaoa 5.

30 – Lae o Keahole. Extremity. In Kalaoa 5.

31 – Lae o Kukaenui. Resting place for boats.

32 – Makolea Bay.

33 – Lae o Unualoha.

34 – Pohaku Pelekane.

35 – Lae o Kahekaiao. Kahe-ka-iao – place of the "iao" which abound there. [Notebook 253:33,35]

…Keahole Bay.

Lae o Kalihi in Kalaoa 5.

Wawaloli Bay in Kalaoa 5.

Lae o Kekaaiki.

Limu Koko in Ooma 1.

Lae o Puhili in Kohanaiki.

Lae o Kealakehe in Kealakehe.

Hueu's frame house in Kalaoa 4, makai side of Gov't. Road.

Kuakahela's frame house in Kalaoa 5.

Protestant Church Steeple in Kalaoa 5.

Kama's frame house, N. gable in Ooma 1.

While taking sightings from Keāhole, Perryman prepared additional sketches of the landscape. One sketch on page 69 of the field book (Figure 11) depicts the view up the slope of Hualālai. Dated June 4, 1882, the sketch is of importance as it also depicts Kalaoa Village and church; the upper Government road; Kohanaiki Village; and two trails to the coast, one trail to Honokōhau, and the other near the Kaloko-Kohanaiki boundary. Use of these trails continued through the 1950s.

The other sketch on page 73 of the field book (dated June 8, 1882) depicts the coastline south from Keāhole, to an area beyond Keauhou (Figure 12). Of interest, we see only the near-shore "Trail" in the foreground, with no trail on the *kula* lands. Then a short distance south, a house is depicted on the shore, in the ʻOʻoma vicinity (identified as the house of Kama or Keoki Mao on Emerson's Register Maps). And a little further beyond (south) the house, two trails are indicated—presumably the *Alanui Aupuni* on the *kula* lands to ʻOʻoma, and the near shore trail, seen coming in from Honokōhau.

While surveying the uplands on Hualālai in August 1882, Perryman drew a sketch of the Keāhole-Honokōhauiki coastal lands. This sketch (Figure 13) from field Book No. 254 shows the reverse view of Figure 12. Noting again, that the only trail given at that time, was the near shore trail, running out of Honokōhau-Kaloko, Kohanaiki, ʻOʻoma and on to Keāhole.

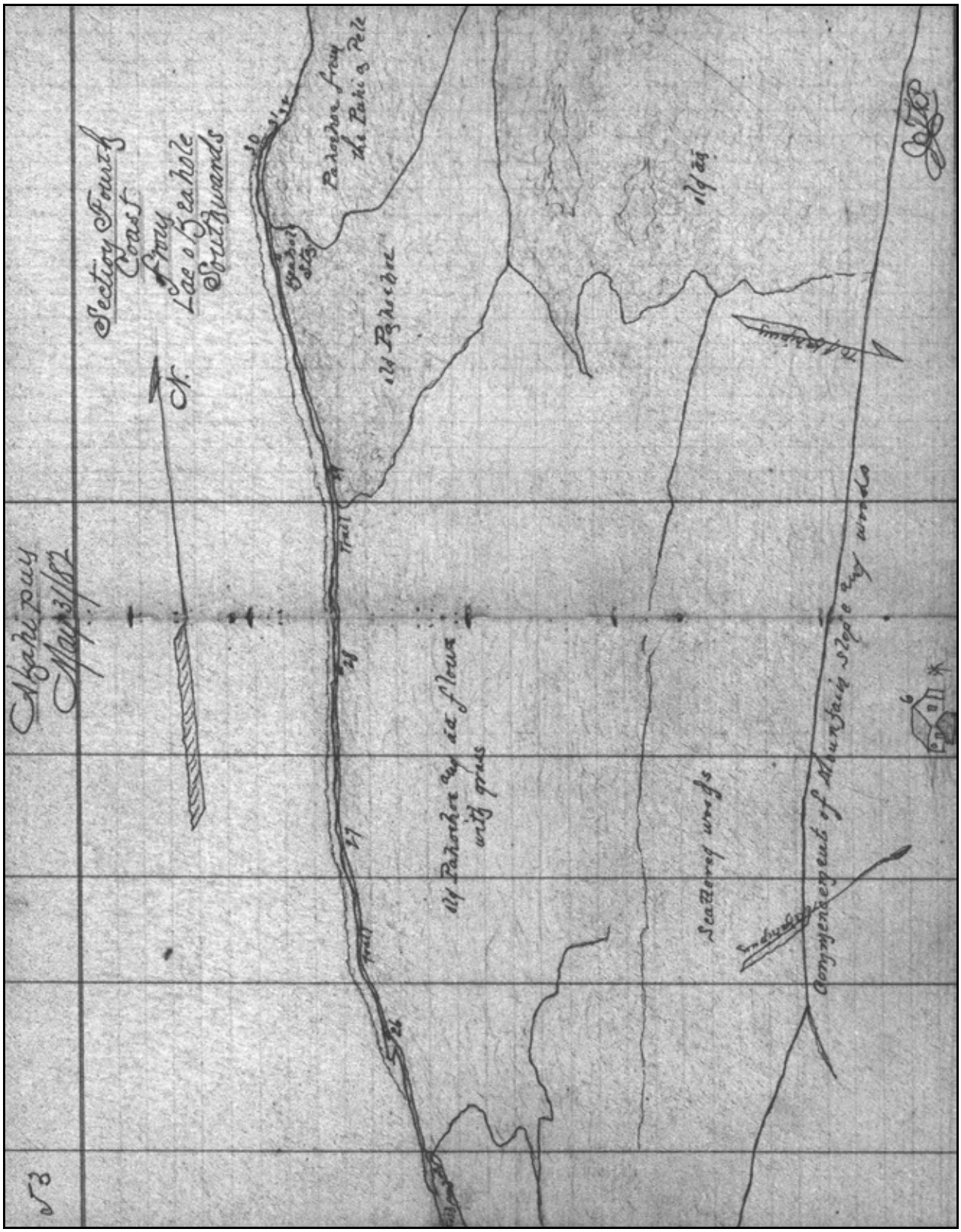


Figure 9. J. S. Emerson, field notebook map, Book 253:53 (State Survey Division).

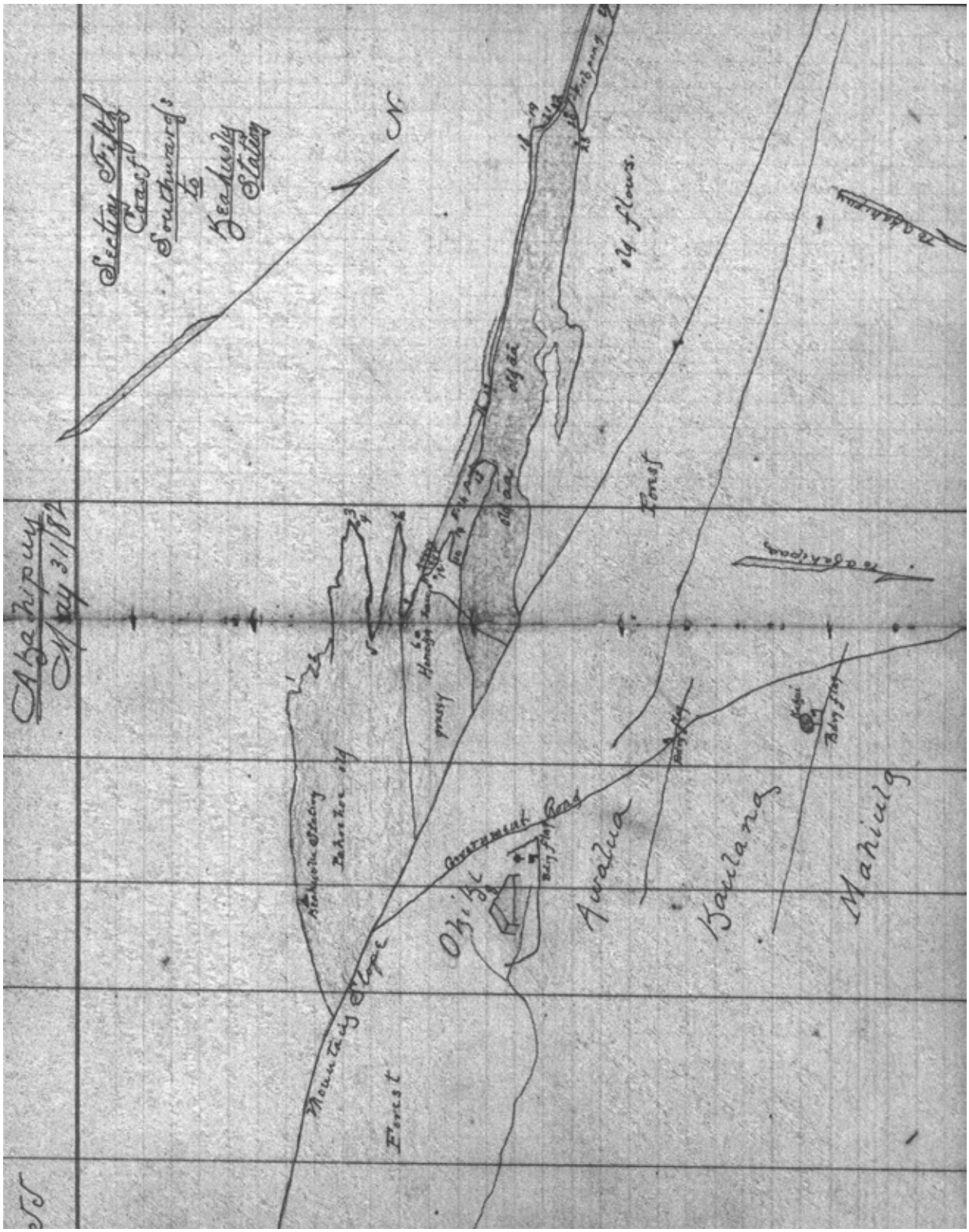


Figure 10. J. S. Emerson, field notebook map, Book 253:55 (State Survey Division).

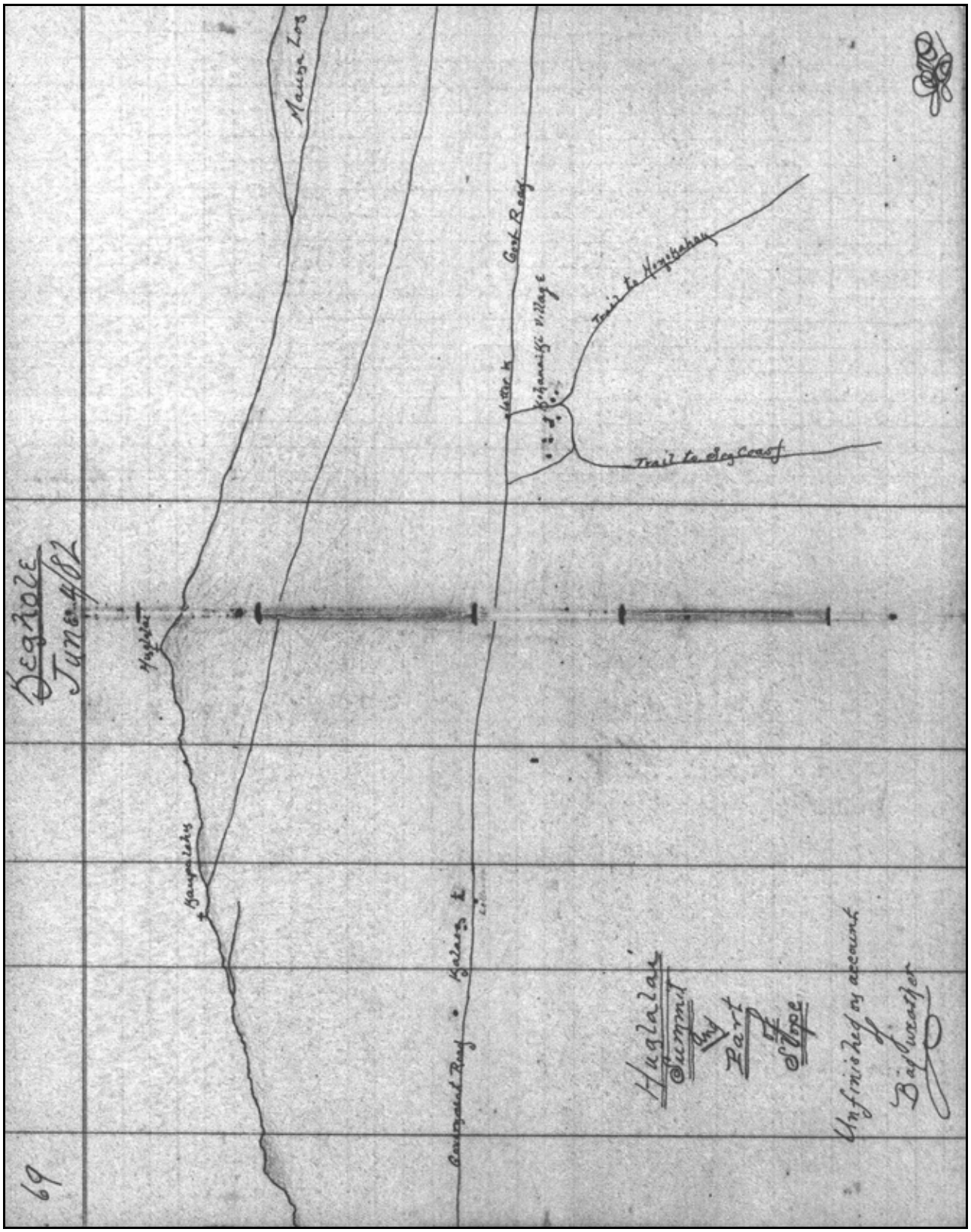


Figure 11. J. S. Emerson, field notebook map, Book 253:69 (State Survey Division).

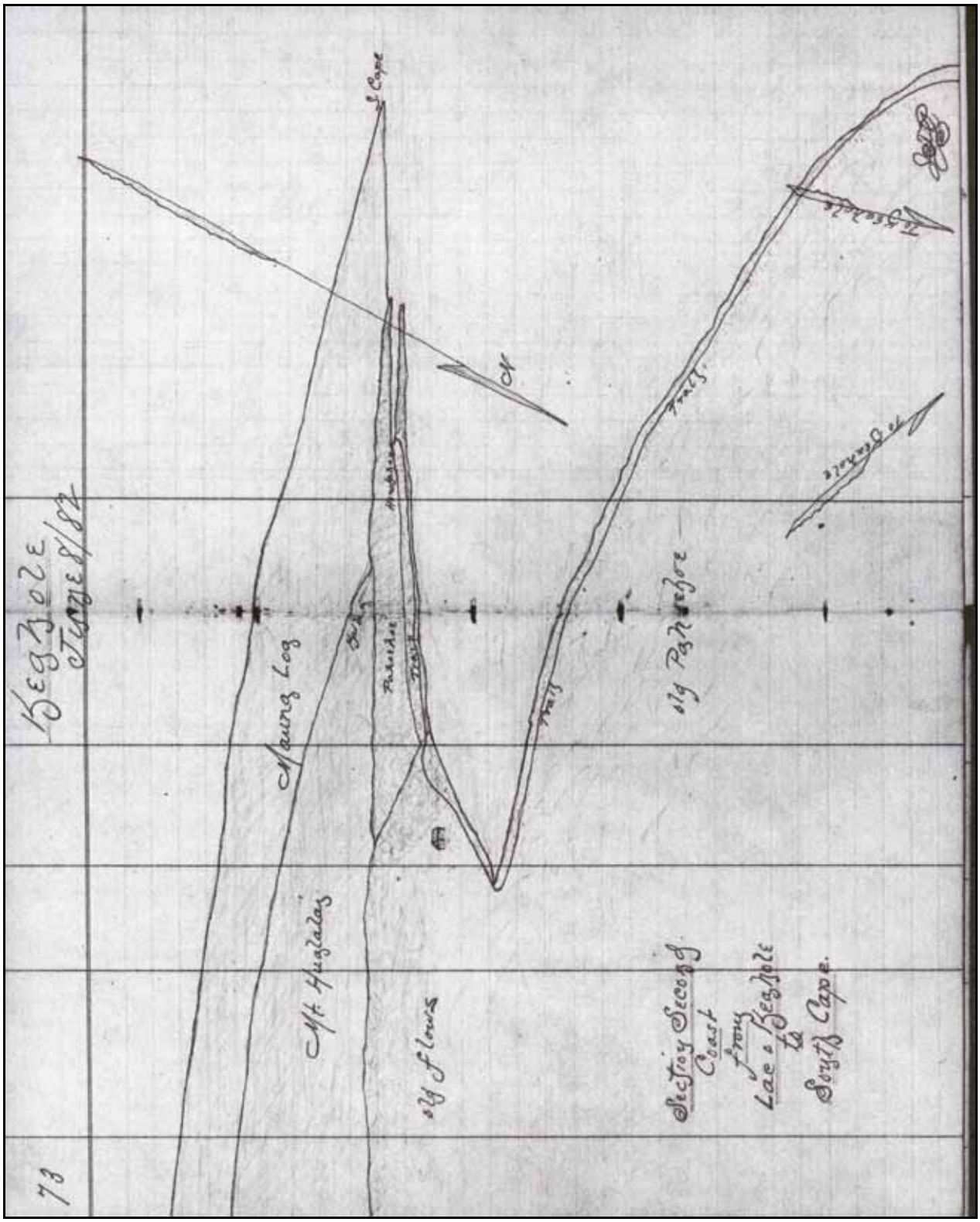


Figure 12. J. S. Emerson, field notebook map, Book 253:73 (State Survey Division).

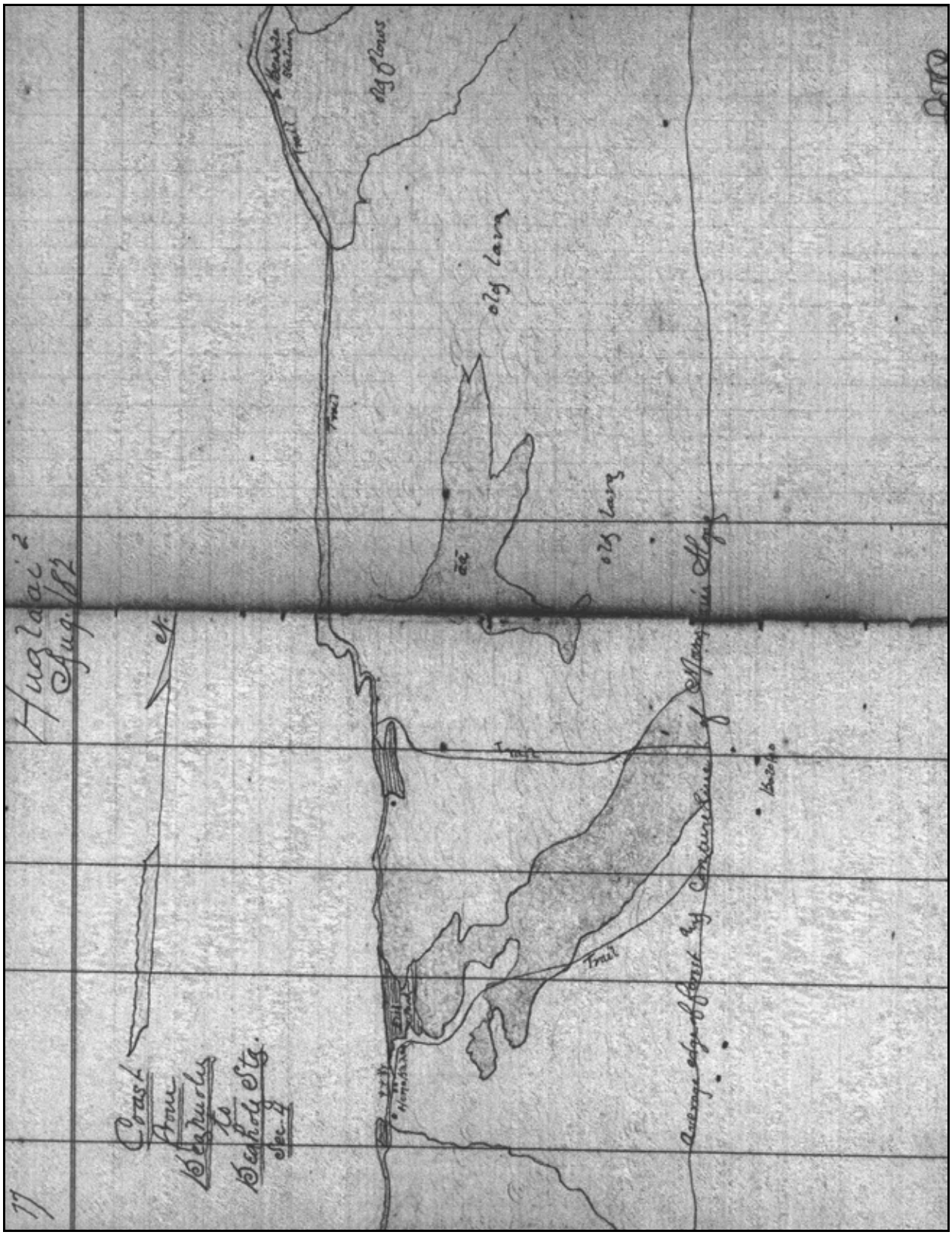


Figure 13. J. S. Emerson, field notebook map, Book 254:77 (State Survey Division).

While surveying the ʻOʻoma and vicinity homestead lots in 1888-1889, Emerson camped near Kama's house in ʻOʻoma 1st. The following communications were sent by Emerson to W.D. Alexander, and tell us more about the people of the land, their beliefs, and commentary on then current events in the Kingdom. Of interest, we also find that J.W.H. Isaac Kihe, whose writing of traditions, and as a representative of the native families in the land application process—which have been cited extensively in this study—is also mentioned in Emerson's narratives.

(Underlining, italics and brackets are inserted to draw attention to certain passages.)

> *April 8, 1888*
> …Our tent is pitched in Ooma on the *mauka* Govt. road at a convenient distance from Kama's fine cistern which supplies us with the water we need. The pasturage is excellent and fire wood abundant. As I write 4:45 P.M. the thermometer is 71º, barometer 28.78. The entire sky is overcast with black storm clouds over the mountains. The rainy season comes late to Kona this year and has apparently just begun. We have had about three soaking rains with a good deal of cloud & drizzle. We are now having a gentle rain which gladdens the residents with water for their cisterns… We have set a large number of survey signals and identified many important corners of Gov't. lands etc. from Puhiapele on the boundary of Kaupulehu to the boundary line of Kaloko. The natives welcome us and do a great deal to help the work along. Tomorrow I expect to go to Kuili station with a transit and make a few observations & reset the old signal... The Kamaainas tell me that Awakee belongs to the Gov't. though I see it put down as LCA 10474 Namauu no Kekuanaoa.
>
> They also tell me that the heirs of Kanaina estate still receive rent for the Ahupuaa of Kaulana, though I have recorded as follows in my book, Kaulana ½ Gov't. per civil Code 379, ½ J. Malo per Mahele Bk. Title not perfected; all Gov't. Please examine into the facts about Kaulana and instruct me as to what I shall do about it. Kealoha Hopulaau rents it and if it is Gov't. land the Gov't. should receive the rent or sell it off as homesteads. It is a desirable piece of land, a part of it at least… [HSA – HGS DAGS 6, Box 2]
>
> *April 17, 1888*
> ...The work is being pushed rapidly and steadily forward. The natives render me most valuable assistance and find all the important corners for me as fast as I can locate them. It is hard getting around on account of the rocks & stones, to say nothing of trees etc., but there is a great deal of really fine land belonging to the Government, admirably adapted to coffee etc. The more I see of it the better it appears.
>
> As to Kaulana, if I hear nothing to the contrary from you, I will leave it all as Gov't. land.
>
> Mr. McGuire [sic] of Kohala, the representative for that district, proposes to settle in Kona. He has bought Grant 1590, Kauhine, in Ooma, Kalaoa etc. and wants the Gov't. to make good to him the amount taken from him by Grants 2972, Kaakau & Kama, and 3027, Hueu, which occupy portions of the same land granted to Kauhine. If his title is good, would it not be just to leave Kaakau & Kama as well as Hueu in possession of their lots where they have lived for over 20 years, and give McGuire an area in adjoining lands equal to that taken from him by these two grants.
>
> It is said that Chas. Achi has written to the natives that Grant 1590, Kauhine, has been cancelled. Will you learn the true state of the case and be so kind as to inform me… [HSA – HGS DAGS 6, box 2 Jan.-Apr. 1888]

In his field book notes, on May 1st, 1888, Emerson noted that he had placed the "Pulehu" station on the "ground by ahu, about 4 feet makai of Kama's goat pen, on the iwi aina between Kalaoa 5 and Ooma 1…" (J.S. Emerson Field Book 291:83).

In the same field book on May 19th, 1888, while surveying the area near the boundary of 'O'oma 1st and 2nd, at the 325 foot elevation, Emerson cited off of a station named "Kahokukahi." The point is "on the entrance of the cave, Kahokukahi… The above is the vertical entrance of a famous *ana kaua*, which extends for a long distance to the E. and to the W…" (J.S. Emerson Field Book 291:137). An "ana kaua" would be a place, where during times of war, people could hide and fortify themselves. Emerson's description indicates that the cave runs some distance *mauka* and *makai* of "Kahokukahi."

On May 23, 1888, Emerson surveyed Pūhili, the boundary between Kohanaiki and 'O'oma 2nd. He observed, "Large [mark] on solid pahoehoe, on bound. bet. Kohanaiki & Ooma, by the sea, near the end of a cape… Station mark, drill hole in stone, 9 ft. S. of the S. corner of an old "kahua hale" on white sand…" (J.S. Emerson Field Book 291:151).

Returning to his "old camp Ooma," in August 1888, Emerson submitted the following letter to Alexander:

> *August 25th, 1888*
> …I have to report that the very intricate and irregular remainder of Gov't. land situated in Kealakehe is cut up into homesteads, ready for the committee to estimate its values. The job has been made unusually long & tedious by the absurd arrangement of the old kuleanas scattered around at random. I have also run out the boundaries of Papaakoko, ready for fencing. Thursday P.M. I made my way through a heavy rain to this place and set up tent in the storm. It rained a good deal every day since and is raining now. In spite of the weather the work of cutting up Ooma 1st goes bravely on. I have a huge umbrella to camp under while it rains. I propose to finish up Ooma 1st & return to Honolulu by the next trip of the *Hall*.
>
> Kailua beach is the great rendezvous for men & asses from all parts of the country when the steamer arrives from Honolulu. It has in consequence become the natural place to tell and hear gossip & news. Here, the sand-lot orator, mounted on a packing box, can address the largest crowd. T.N. Simeona, who stole the church money, keeps the pound and takes care of the court house wanting to make a speech, repaired to the beach last Wednesday morning and is reported to have made a windy harangue to the effect that the King was hewa and that the Ministers were pono! Up to that time he had always been the contemptible too of the King's party and was loud in his denunciation of the Government. I explain this change in his talk by his wish to retain his Gov't. billets & his desire to avoid arrest as a rebel.
>
> A native man told me the other day (Wednesday) that the Cabinet was hewa in two things viz.
>
> 1st They taxed chickens, banana trees and many other things that had not been heretofore taxed.
>
> 2nd They arrested and sent to Molokai many who were not lepers. For these reasons many justified Wilcox for trying to out the ministers.
>
> There is a sturdy old native living at Kaloko named Kealiihelepo, whom I greatly respect. Said he to me "When King Kalakaua returned from his foreign trip he made a

> speech at Kailua and said that 'in foreign lands the foreign God was losing his power. His former worshippers were deserting him. That the old Hawaiian Gods were still mana and them he would worship.'" But said Kealiihelepo "The King was mistaken. Our old Gods were once mighty, but the coming of the foreigner with his Gods has robbed them of their strength. Therefore the King has made the mistake to oppose the God who is now in power, and Jehovah is opposing him. Hence the King's pilikia."
>
> You are entirely justified in calling Kona "that heathen district." [HSA – HGS DAGS 6, box 2 Jan.-Apr. 1888]

On October 14th 1888, Emerson wrote to Alexander, briefing him on conversations he was having with J.W.H. Isaac Kihe, his "encyclopedia," "the son of a famous sorcerer." Later, Emerson used many of the notes taken during his conversations with Kihe, to develop his paper on Hawaiian religion (Emerson 1892). J.W.H. Isaac Kihe, was the son of Kihe, who was the son of Kuapahoa, of Kaloko (notes of J.S. Emerson, September 25, 1915; in collection of the Hawaiian Historical Society). While at 'O'oma, Kihe described the various nature forms taken by the deceased, and their role in the spiritual practices. On October 14th Kihe named for him some of the gods called upon by those who practiced the Kahuna Kuni sorcery.

> *Ooma*
> *October 14, 1888*
> *J.S. Emerson; to W.D. Alexander:*
> …I have just been having a chat with a son of a famous sorcerer, with the following for a summary of what he said.
>
> There are four gods worshipped by murders and sorcerers viz:
>
> (1). Kui-a-Lua, the god of the Lua, Mokomoko, Haihai and other forms of violence.
>
> (2). Uli, the god of the Anaana, Kuni, Hoopiopio and Lawe Maunu.
>
> (3). Kalaipahoa, god of the Hoounauna, Hookomokomo and Hooleilei.
>
> (4). Hiiaka-i-ka-poli-o-Pele, the goddess of the Poi uhane, Apo leo, Pahiuhiu and Hoonoho uhane… [J.S. Emerson, in collection of the Hawaiian Historical Society]

Trails and Roads of Kekaha (Governmental Communications)

Alahele (trails and byways) and *alaloa* (regional thoroughfares) are an integral part of the cultural landscape of Hawai'i. The *alahele* provided access for local and regional travel, subsistence activities, cultural and religious purposes, and for communication between extended families and communities. Trails were, and still remain important features of the cultural landscape.

Traditional and historical accounts (cited in this study) describe at least two traditional trails that were of regional importance which pass through the lands of 'O'oma. One trail is the *alaloa*—parts of which were modified in the 1840s and later, into what is now called the *Alanui Aupuni* (Government Road) or Māmalahoa Trail or King's Highway—that crosses the *makai* (near shore) lands, linking royal centers, coastal communities, and resources together. The other major thoroughfare of this region is "*Kealaehu*" (The path of Ehu), which passes through the uplands, generally a little above the *mauka* Government Road or old Māmalahoa Highway, out to the 'Akāhipu'u vicinity, and then cuts down to Kīholo in Pu'u Wa'awa'a. From Kīholo, the *makai alaloa* and Kealaehu join together as the *Alanui Aupuni*, and into Kohala, passing through Kawaihae and beyond. The *mauka* route provided travelers with a zone for cooler traveling, and access to inland communities and resources. It also allowed for more direct travel between the extremities of North and South Kona (cf. Malo 1951; I'i 1959; Kamakau 1961; Ellis 1963; and *Māhele* and Boundary Commission Testimonies).

In addition to the *alahele* and *alaloa*, running laterally with the shore, there are another set of trails that run from the shore to the uplands. By nature of traditional land use and residency practices, every *ahupua'a* also included one or more *mauka-makai* trail. In native terminology, these trails were generally known as—*ala pi'i uka* or *ala pi'i mauna* (trails that ascend to the uplands or mountain). Some of these trails are described in native accounts and oral history interviews cited in this study.

Along the trails of the Kekaha region of which 'O'oma is a part, are found a wide variety of cultural resources, including, but not limited to residences (both permanent and temporary), enclosures and exclosures, wall alignments, agricultural complexes, resting places, resource collection sites, ceremonial features, *ilina* (burial sites), petroglyphs, subsidiary trails, and other sites of significance to the families who once lived in the vicinity of the trails. The trails themselves also exhibit a variety of construction methods, generally determined by the environmental zone and natural topography of the land. "Ancient" trail construction methods included the making of worn paths on *pāhoehoe* or *'a'ā* lava surfaces, curbstone and coral-cobble lined trails, or cobble stepping stone pavements, and trails across sandy shores and dry rocky soils.

Following the early nineteenth century, western contact brought about changes in the methods of travel (horses and other hoofed animals were introduced). By the mid-nineteenth century, wheeled carts were also being used on some of the trails. In the Kona region portions of both near shore and upland *ala hele-ala loa* were realigned (straightened out), widened, and smoothed over, while other sections were simply abandoned for newer more direct routes. In establishing modified trail—and early road-systems—portions of the routes were moved far enough inland so as to make a straight route, thus, taking travel away from the shoreline.

It was not until 1847, that detailed communications regarding road construction on Hawai'i began to be written and preserved. It was also at that time that the ancient trail system began to be modified and the alignments became a part of a system of "roads" called the "*Alanui Aupuni*" or Government Roads. Work on the roads was funded in part by government appropriations, and through the labor or financial contributions of area residents and prisoners working off penalties (see communications below). Where the *Alanui Aupuni* crosses the lands of 'O'oma, the alignment includes several construction methods, such as being lined with curbstones; elevated; and with stone filled "bridges" in areas that level out the contour of the roadway.

The following letters provide readers with a historical overview of the *Alanui Aupuni*, and travel through 'O'oma and the Kekaha region. Of particular interest to the lands of 'O'oma, are those communications addressing the lower Government Road which passes through the proposed development area.

(Underlining, italics, and square brackets have been added.)

> *June 26, 1847*
> *George L. Kapeau to Keoni Ana*
> I have received your instructions, that I should explain to you about the *alaloa* (roadways), *alahaka* (bridges), lighthouses, markets, and animal pounds. I have not yet done all of these things. I have thought about where the *alanui heleloa* (highways) should be made, from Kailua to Kaawaloa and <u>from Kailua to Ooma, where our King was cared for</u> [7], and then afterwards around the island. It will be a thing of great value, for the roads to be completed. Please instruct me which is the

[7] For the first five years of his life (till ca. 1818), Kauikeaouli was raised at 'O'oma, by Ka-iki-o-'ewa and Keawe-a-mahi *mā* (see Kamakau 1961; and this study).

proper thing for me to do about the *alaloa, alahaka,* and the laying out of the *alaloa*… [HSA – Interior Department Misc., Box 142; Kepā Maly, translator)

August 13, 1847
Governor of Hawaii, George L. Kapeau; to
Premier and Minister of Interior, Keoni Ana
Aloha oe e ka mea Hanohano –
I have a few questions which I wish to ask you. Will the police officers be required to pay, when they do not attend the Tuesday (*Poalua*) labor days? How about parents who have several children? What about school teachers and school agents? Are they not required to work like all other people when there is Government work on the roads and highways?

I believe that school agents, school teachers and parents who have several children, should only go and work on the weeks of the public, and not on the *konohiki* days…

…The roads from Kailua and down the pali of Kealakekua, and from Kailua to Honokohau, Kaloko, Ooma, at the places that were told our King, and from thence to Kaelehuluhulu [at Kaulana in Kekaha], are now being surveyed. When I find a suitable day, I will go to Napoopoo immediately, to confer with the old timers of that place, in order to decide upon the proper place to build the highway from Napoopoo to Honaunau, and Kauhako, and thence continue on to meet the road from Kau. The road is close to the shore of Kapalilua…

The width of the highways around Hawaii, is only one fathom, but, where it is suitable to widen where there is plenty of dirt, two fathoms and over would be all right… If the roads are put into proper condition, there are a lot of places for the strangers to visit when they come here. The Kilauea volcano, and the mountains of Maunaloa, Maunakea, Hualalai.

There is only one trouble to prevent the building of a highway all around, it is the steep gulches at Waipio and Pololu, but this place can be left to the very last… [HSA – Roads, Hawaii]

March 29, 1848
Governor Kapeau; to Minister of the Interior, Keoni Ana:
[Acknowledging receipt of communication and answering questions regarding construction methods used in building the roads.]

…I do not know just what amount of work has been done, but, I can only let you know what has come under my notice.

The highway has been laid from Kailua to Kaloko, and running to the North West, about four miles long, but it is not completely finished with dirt. The place laid with dirt and in good condition is only 310 fathoms.

The highway from Kealakekua to Honaunau has been laid, but is not all finished, and are only small sections… [HSA – Roads, Hawaii]

July 9, 1873
R.A. Lyman; to
E.O. Hall, Minister of the Interior.

Notifies Minister that *the road from Kiholo to Kailua needs repairing*. [HSA – Interior Department – Land Files]

August 14, 1873
R.A. Lyman; to
E.O. Hall, Minister of the Interior:
I have just reached here [Kawaihae] from Kona. I have seen most of the roads in N. Kona, and they are being improved near where the people live. If there is any money to be expended on the roads in N. Kona, I would say that the place where it is most needed is from Kiholo to Makalawena, or the Notch on Hualalai.

This is the main road around the island and is in very bad condition. Hardly anyone lives there, and there are several miles of road across the lava there, that can only be worked by hiring men to do it. There is also a road across a strip of Aa a mile & a half or 2 in length in the south end of S. Kohala next to the boundary of N. Kona, that needs working, and then the road from here [Kawaihae] to Kona will be quite passable… [HSA – Roads, Hawaii]

November 4, 1880
J.W. Smith, Road Supervisor, North Kona; to
A.P. Carter, Minister of the Interior:
…Heretofore I have been paying one dollar per day, but few natives will work for that, they want $1.50 per day. Thus far I have refused to pay more than $1.00 and have been getting men for that sum.

The most urgent repairs are needed on the main road from Kaupulehu to Kiholo, and north of Kiholo to the Kohala boundary, a distance of about 20 miles… [HSA – Roads, Hawaii]

Kailua Nov. 19th, 1880
Geo. McDougall; to
A.P. Carter, Minister of the Interior —
…I noticed among the appropriation passed by the last Legislature, an item of $5000 for Roads in North Kona Hawaii — as I am very much interested about roads in this neighbourhood, I take the liberty to express my opinions what is wanted to put the roads in good repair and give the most satisfaction to all concerned.

The Road from Kailua going north for about eight miles to where it joins the upper Road, has never been made, it is only a mule track winding through the lava. It could cost to make it a good cart road, fully two thousand dollars. And from Kailua to where it joins the South Kona road, about 12 miles was made by Gov. Adams, and is in pretty much the same state as he left it, only a little worse of the ware of 20 years or more, it could cost to make it in good repair about 15 hundred dollars. Then we could have 20 miles of good road… [HSA – Interior Department Letters]

March 21st, 1885
C.N. Arnold, Road Superintendent-in-Chief, Hawaii; to
Charles Gulick, Minister of Interior:
…In accordance with your instructions I beg to hand you the following list of names as being those I would select for Supervisors in the different Road Districts under my charge:

… Judge J.K. Hoapili, North Kona District…

Hoping these parties may meet with your approval… [HSA – Roads, Hawaii]

March 1886
Petition to Charles Gulick, Minister of the Interior:
[Signed by 53 residents of North Kona, asking that the appropriated funds be expended for the Kailua-Kohanaiki Road]:

We the people whose names are below, subjects of the King, residing in North Kona, Island of Hawaii:

The funds have been appropriated by the Legislature for the opening of the road from Kailua to Kohanaiki, therefore, we humbly request that the road be made there. The length of this road being thought of is about five miles more or less. The road that is there at the present time is not fit for either man nor beast.

Your people have confidence that as so explained, you will kindly grant our request, and end this trouble in our District…

[those signing included names of individuals known to have ties to the ʻOʻoma vicinity]: …J. Kamaka, Kuakahela, Kahulanui, & Palakiko… [HSA – Roads Hawaii; Maly, translator]

March 9th, 1887
C.N. Arnold, Road Superintendent-in-Chief, Hawaii; to
Chas. Gulick, Minister of the Interior:
[Arnold provides documentation of the early native trail from Kailua to the upper Kohanaiki region, and its' ongoing use at the time. He also notes that McDougall (resident at Honokōhau) and others are presently in the business of dairy ranching]:

…The enclosed petition [cited above] has just come to hand from North Kona. The petitioners are mistaken when they say that any special appropriation has been made for this road as there has never been a Government road in this part of the District. There is however an old native trail which has always been used as a short cut, from the lower part of the district between Keahou [sic] and Kailua, by persons who were traveling to Kawaihae and Waimea. The opening of a good road here would be a great convenience to the traveling public and also a great accommodation to a great many people who live on, or nearly on the line of it. I may mention among the number, Messrs. McDougall and Clark who are engaged in dairy ranching near the head of the proposed line. I may also mention that I, with Mr. Smith, made a preliminary survey of it, at the request of His Majesty the King, who is also interested in the opening of this road, as it opens up all of His Kailua lands for settlement. I regard the road as necessary for the above reasons.

From the preliminary survey made, I estimate that a wagon road 12 feet wide will cost from Kailua to the *mauka* Govt. road at Kohanaiki $6000. The length of the road is 5 ¾ miles. The elevation of highest point (*mauka* Road) is 1600 feet above tide at Kailua. Mr. Smith Supt. of Public Works has all the notes of the survey, and can give you full information in regard to this matter… [HSA – Roads, Hawaii]

July 14th, 1887
C.N. Arnold, Road Superintendent-in-Chief, Hawaii; to

L.A. Thurston, Minister of the Interior:
…In obedience to your request I beg to hand you the following list of the District Supervisors under my jurisdiction:

…North Kona – Hon. J.K. Nahale; Native… [HSA – Roads Hawaii]

March 8, 1888
J. Kaelemkule; Supervisor, North Kona Road Board; to
L.A. Thurston, Minister of the Interior.
[Ka‘elemakule provides Thurston with an overview of work on the roads of North Kona, and describes the Government roads (*Ala nui Aupuni* or *Ala loa*) which pass through the Kekaha region]:

The road that runs from Kailua to Kohanaiki, on the north of Kailua, perhaps 6 miles. It is covered with aa stone, and is perhaps one of the worst roads here. The Road Board of North Kona has appropriated $200 for work in the worst areas, and that work has been undertaken and the road improved. The work continues at this time. This is one of the important roads of this district, and it is one of the first roads that should be worked on.

The government road or ala loa from upland Kainaliu (that is the boundary between this district of South Kona) [Kealaehu], runs straight down to Kiholo and reaches the boundary of the district adjoining South Kohala, its length is 20 and 30 miles. With a troubled heart I explain to your Excellency that from the place called Kapalaoa next to South Kohala until Kiholo – this is a very bad section of about 8 miles; This place is always damaged by the animals of the people who travel along this road. The pahoehoe to the north of Kiholo called Ke A. hou, is a place that it is justified to work quickly without waiting. Schedule A, attached, will tell you what is proposed to care for these bad places…

Schedule A: [Appropriations needed]
The road from Kailua to Kohanaiki, and then joining with the inland Government Road – $500.

The upland Road from Kainaliu to the boundary adjoining S. Kohala – $1,500.00. [HSA – Roads Hawaii; Kepā Maly, translator]

September 30, 1889
Thos. Aiu, Secretary, North Kona Road Board (for J. Kaelemakule); to
L.A. Thurston, Minister of the Interior.
[Provides Thurston with an overview of work on the roads of North Kona, and identifies individuals who are responsible for road maintenance (cantoniers) in various portions of the district; several of the individuals named were also old residents and applicants for Homestead lots. Of interest, Kaelemakule’s report indicates that maintenance of the Alanui Aupuni which crossed into the kula lands of ‘O‘oma, had not been assigned to anyone. (see report of Dec. 22, 1890)]:

1. In that section of the road which proceeds from Kailua near the shore to Kohanaiki, Mano is the cantonier.
2. That section of the road from Kukuiooohiwai to Keahuolono, Paiwa is the cantonier…
3. That section of road from Kailua to the shore of Honokohau, Keaweiwi is the

cantonier …

4. That section of road from Kukuioohiwai to Lanihau along the upland road, Isaac Kihe is the caretaker…

The work done along these sections is the cutting of brush – guava, lantana and such – which trouble the road, and the removal of bothersome stones… [HSA – Roads Hawaii; Kepā Maly, translator]

December 22, 1890
J. Kaelemkule; Supervisor, North Kona Road Board; to
C.N. Spencer, Minister of the Interior
[Reports on the cantoniers assigned to road work in various sections of North Kona. As in 1889, apparently no one was assigned to the lower Alanui Aupuni through the ʻOʻoma kula lands. Though Kaelemakule did include the road section on the land, extending through Kalaoa, on his attached diagram]:

…I forward to you the list of names of the cantoniers who have been hired to work on the roads of this district, totaling 15 sections; showing the alignment of the road and the length of each of the sections. The monthly pay is $4.00 per month, at one day of work each week. The board wanted to increase it to two days a week, but if that was done, there would not have been enough money as our road tax is only $700.00 for this district… You will receive here the diagram of the roads of North Kona. [HSA – Roads Hawaii; Kepā Maly, translator] (Figure 14)

Twentieth Century Travel in ʻOʻoma and Neighboring lands of Kekaha

Kamaʻāina who have participated in oral history interviews (Rechtman and Maly 2003), describe on-going travel between the uplands and coastal lands of ʻOʻoma and other *ahupuaʻa* in Kekaha. The primary method of travel between 1900 and 1947, was by foot or on horse or donkey, and those who traveled the land, were generally residents of the ʻOʻoma, Kalaoa, Kohanaiki Homesteads and other lands in the immediate vicinity. The old ʻOʻoma Homestead road that borders the current project area to the north, was used during this time. After World War II, retired military vehicles became available to the public, after that time, the *Alanui Aupuni* (Figure 15) and some of the smaller trails along the shore were modified for vehicular traffic.

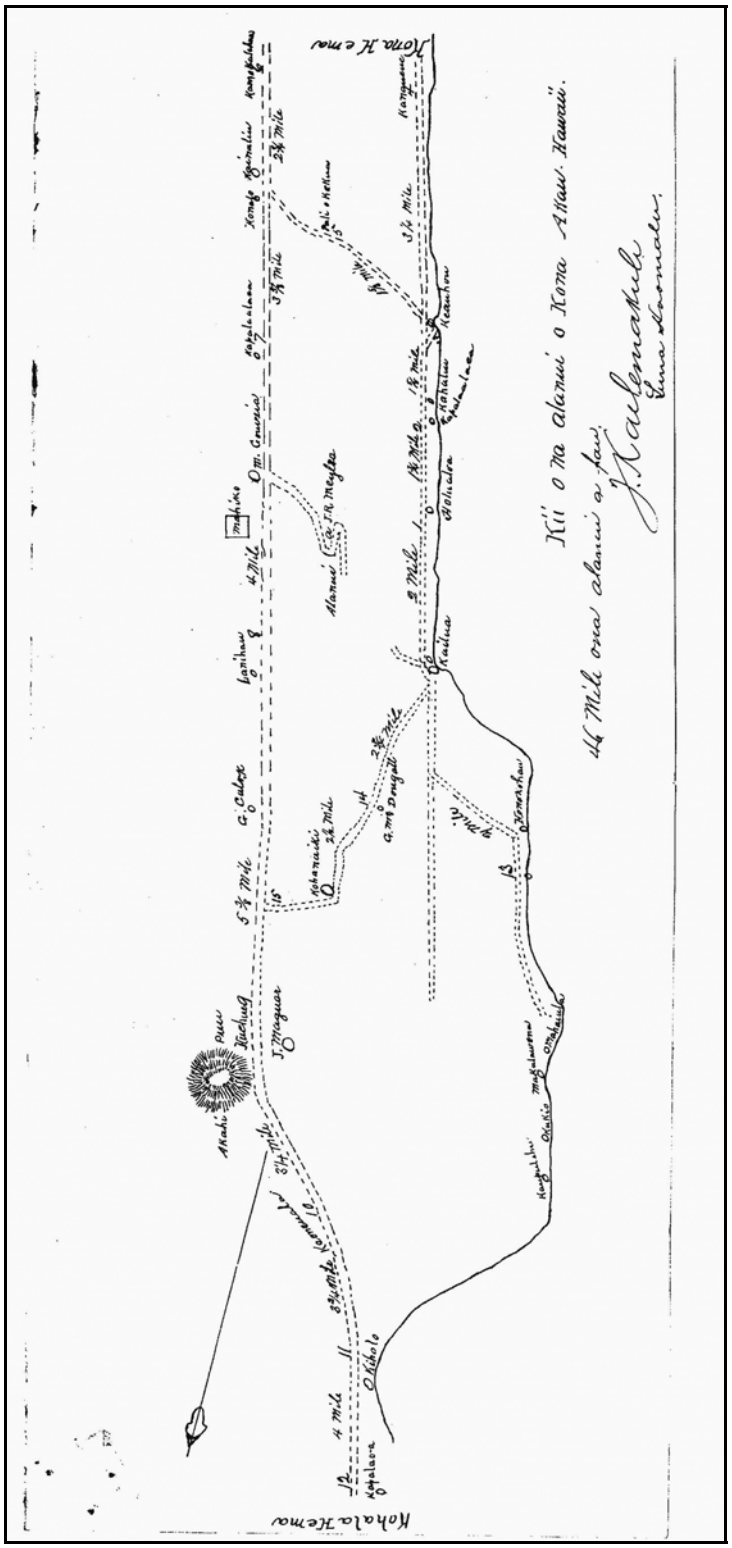


Figure 14. *Kii o na alanui o Kona Akau* (diagram of the roads of North Kona); J. Kaelemakule Sr., Road Supervisor (HSA – Roads, Hawaii; December 22, 1890).

Figure 15. Portion of the *Alanui Aupuni* crossing the *kula* lands of ʻOʻoma 2nd; view to Kohanaiki.

The primary routes of travel through the 1960s, descended from upland Kohanaiki and Kaloko, or came out of Kailua. In the 1950s, Huʻehuʻe Ranch bulldozed a jeep road to the shore at Kaloko. The ranch, and some individuals who went to the shore either as a part of their ranch duties, or for leisure fishing along the coast, used this jeep road. The *Alanui Aupuni* was modified from Kailua, to at least as far as Honokōhau and Kaloko, and remained in use through the 1970s. It was not until the Queen Kaʻahumanu Highway was opened (ca. 1973) that travel across the *kula kai* (shoreward plains) of ʻOʻoma was once again made possible for the general public.

Summary of Oral-Historical Information

In Rechtman and Maly (2003:Volume II) elder *kamaʻāina* of the Kekaha region, tell much the same story as that described in the communications from the period of homestead development, and in the accounts given by J. Puuokupa in 1875 and J.W.H. Isaac Kihe in 1924. By the late 1800s, only a few permanent residence remained along the ʻOʻoma (and Kekaha) coastline. Primary residences were in the uplands, in the vicinity of the old Māmalahoa Highway. In that region, people were able to cultivate a wide range of crops—both native staples and new introductions—with which to sustain themselves, and in some case even as cash crops.

By the middle to late 1800s, the *kula* lands, from around the 900-foot elevation to shore, were primarily used for goat, cattle, and donkey pasturage. The families of the uplands regularly traveled to the coast via trails. This was usually done to go fishing, or to round up cattle, goats, or donkeys. During periods of extreme dry weather, when water resources dried up, the families relied on the brackish water ponds in the near-shore lands. In ʻOʻoma, near Wawaloli, the area marked on J.S. Emerson's Register

Maps 1280 (see Figure 6), as Kama's or Keoki Mao's house, families still took shelter, and drank the water from the spring, through the 1940s. Such was the case at various locations of the coast, between Kohanaiki, ʻOʻoma, Kalaoa, Hoʻonā, Kaulana, and lands further north to Kapalaoa.

An additional oral interview was conducted with *kamaʻāina* Elizabeth Maluihi Ako Lee (Auntie Elizabeth) for the current study. Auntie Elizabeth was born in 1929 and was raised by her *hanai* family, Kahananui, in upland ʻOʻoma. As a child she walked the upland trails and cultivated sweet potatoes on her family land immediately *makai* of the current study parcel. Her family also owned the current study parcel, which they used to graze cattle. Auntie Elizabeth recalled a Korean man living on the current study parcel during the 1930s. The man had a house that burned down ca. 1939 when his *akolehau* still exploded.

AHUPUAʻA SETTLEMENT PATTERNS AND CURRENT SURVEY EXPECTATIONS

Archaeological studies undertaken within the greater North Kona District indicate that initial prehistoric settlement was concentrated primarily along the coast (Cordy 1981, Cordy et al.1991). As coastal populations increased, so did the development of agricultural fields in the upland areas, reaching their greatest extent in the late 1700s. As the fields expanded so did native populations in the upland resource areas. By the sixteenth century temporary and permanent habitations were found at higher elevations within the *ʻapaʻa* zone (Barrera 1991).

In Historic times, with the shift to a market economy and a western style of land ownership in Hawaiʻi, populations shifted from the coast to the upland areas. Much of the old style of agriculture was abandoned in favor of coffee farms and cattle ranches, which have had a significant impact on the Precontact archaeological record.

Based on the Historical information collected by Rechtman and Maly (2003) and the findings of the inventory survey previously conducted on a portion of the current study parcel (Drolet and Schilz 1991) a fairly detailed set of project area expectations can be arrived at. Precontact use of the project area is likely to be marked by diverse agricultural features (including modified outcrops and mounds) and associated habitation sites. The habitation sites could include platforms, enclosures, pavements, or lava tubes. A network of trails would have connected these upland agricultural and habitation areas to each other and to the coast and to more mauka resource areas. Remnants of this trail network may be present within the current project area. If burials are encountered, they are expected to be found within platforms, lava tubes, or concealed lava blisters. Lava tubes may have also been used for water collection and refuge.

Drolet and Schilz (1991) recorded nineteen archaeological sites in the *makai* portion of the current study parcel (see Appendix A). Feature types recorded at these sites included mounds, walls, platforms, and enclosures. Sixteen of the recorded sites appear to have been utilized for Precontact agricultural purposes. The remaining three sites were Historic boundary walls.

Historic use of the current study parcel is likely to be marked by ranching and habitation related sites. Historic feature types could include core-filled walls, enclosures, roads, or house pads. Some of the Historic sites may have been constructed during the latter part of the 19th century by Holokahiki, who originally applied for Lot 57 of the ʻOʻoma Homesteads (the current study parcel). While later Historic sites may have been constructed by John Broad who purchased the parcel as Grant 5912 in 1913. Oral-Historical information indicates that a Korean man lived in the northeastern portion of the study parcel during the 1930s.

Additional oral information (from Mr. Robert E. Lee) pertaining to more recent times indicates that the current study parcel underwent widespread mechanical land clearing in 1994. This land clearing likely had a significant adverse impact on all archaeological resources presently or formerly located on the subject parcel. It is probable that the land clearing destroyed numerous archaeological sites.

FIELDWORK

Fieldwork for the current project was conducted between April 4-13, 2005 by J. David Nelson, B.A., Michael E. Rivera, B.A., Mark J. Winburn B.A., Olivier M. Bautista, B.A., and Christopher S. Hand, B.A., under the supervision of Robert B. Rechtman, Ph.D.

Methods

During the intensive inventory survey of the study area, the entire parcel was subject to north/south pedestrian transects with fieldworkers spaced at 10-meter intervals. When archaeological resources were encountered, they were plotted on a map of the study parcel using Garmin 76s handheld GPS technology (with sub five-meter accuracy), and then (when appropriate) cleared of vegetation, mapped in detail using tape and compass, photographed, and described using standardized site record forms. Sites were also evaluated at that time for the need of subsurface testing.

All test units (TUs) excavated during the current project measured 1 x 1 meter. Excavation of the test units proceeded following natural stratigraphic layers. Where applicable, the layers were excavated in arbitrary 10-centimeter levels. All recovered soil matrix was passed through 1/4-inch mesh screen, and all recovered cultural material was remanded to the laboratory for detailed analysis. Level record forms, filled out for each level of each layer in each unit, were used to record soil descriptions, Munsell color notations, cultural constituents collected, and a general description of the level. Upon completion of a unit, photographs were taken, a profile drawing was prepared, and the unit was back-filled as close to its original specifications as possible.

Recovered cultural material was processed at the Rechtman Consulting, LLC laboratory facility and is currently curated at that location as well. To begin the laboratory process the recovered cultural material was first washed and then separated, by level within individual units, into material classes and separated by species or type (to the lowest taxonomic level possible). An accession number (ACC #) was then sequentially assigned to each group of related items; and the material encompassed by an individual accession number was quantified by the number of identified specimens (NISP), weighed, and when applicable considered for the minimum number of individuals (MNI) present. The findings of the inventory survey along with detailed descriptions of the encountered archaeological resources and the results of subsurface testing are presented below.

Findings

As a result of the current inventory survey three previously recorded archaeological sites (Sites 16106, 16125, and 16126) and twelve newly recorded sites (Sites 24413–24424) were identified on the subject parcel (Table 1). Soil deposition was variable at the recorded sites; there was limited to no soil inside the lava tubes, and at sites containing surface features soil was present within and beneath the architecture and almost non-existant out side the architecture. Four 1 x 1 meter test units were excavated at three of the recorded sites (Sites 24413, 24415, and 24417). Sixteen sites previously recorded on the study parcel by Drolet and Schilz (1991) are no longer present (see Appendix A). These sites, and likely countless other unrecorded sites, were destroyed during widespread mechanical clearing that occurred on the parcel in the middle 1990s. In fact, many of the sites still present within the project area have also been impacted by land clearing activities. Each of the recorded archaeological sites are described in detail below and their locations are shown on Figure 16.

Table 1. Archaeological sites recorded during the current inventory survey.

SIHP No.	*Formal Type*	*Functional Type*	*Age*
16106	Wall	Boundary	Historic
16125	Wall	Boundary	Historic
16126	Wall	Boundary	Historic
24413	Platform	Burial	Precontact
24414	Enclosure	Ranching	Historic
24415	Enclosure	Homesteading	Historic
24416	Wall segments	Ranching	Historic
24417	Enclosure	Habitation	Precontact
24418	Modified outcrop	Agriculture/clearing	Precontact
24419	Trail segment	Trail	Precontact
24420	Lava tube	Habitation	Precontact/Historic
24421	Two mounds	Agriculture/clearing	Precontact
24422	Mound	Homestead remnant	Historic
24423	Wall	Boundary	Historic
24424	Lava tube	Water collection	Precontact/Historic

SIHP Site 16106

Site 16106 is a core-filled wall that runs along the southern boundary of the current study parcel (see Figure 16). This site was originally recorded by Drolet and Schilz (1991) (see Appendix A). Beginning in the southeastern corner of the current study parcel at the southern end of Site 24423 (the eastern boundary wall), Site 16106 runs along the southern property boundary (at 230º) for 220 meters and then turns and continues (at 252º) for 450 meters to the southwestern corner of the parcel. The wall continues *makai* beyond the current project area for approximately 80 meters before terminating in collapse. A bulldozed road parallels this wall to north for its entire length. Site 16106 averages 0.6 meters tall by 0.9 meters wide along much of its length. It is constructed of stacked *pāhoehoe* cobbles that have collapsed in several locations. No cultural materials were observed on ground surface in the vicinity of Site 16106. This Historic boundary wall was likely built sometime after 1913 when the parcel was sold to John Broad as Lot 57 of the ʻOʻoma Homesteads (Grant 5912).

SIHP Site 16125

Site 16125 is a core-filled wall that runs along the western boundary of the current study parcel (see Figure 16). This site was also recorded by Drolet and Schilz (1991) (see Appendix A). The wall stretches for 315 meters along the entire western boundary of the current study parcel. It has been breached in two locations by bulldozer roads and two ten-meter long sections of wall are missing at its northern and southern ends. Bulldozed roads also run parallel to the wall approximately two meters distant from both its eastern and western edges. Site 16125 averages 0.6 meters tall by 0.8 meters wide. It is constructed of stacked *pāhoehoe* cobbles that have collapsed in several locations. No cultural materials were observed on ground surface in the vicinity of Site 16125. This Historic boundary wall was also likely built sometime after 1913 when the parcel was sold to John Broad as Lot 57 of the ʻOʻoma Homesteads (Grant 5912).

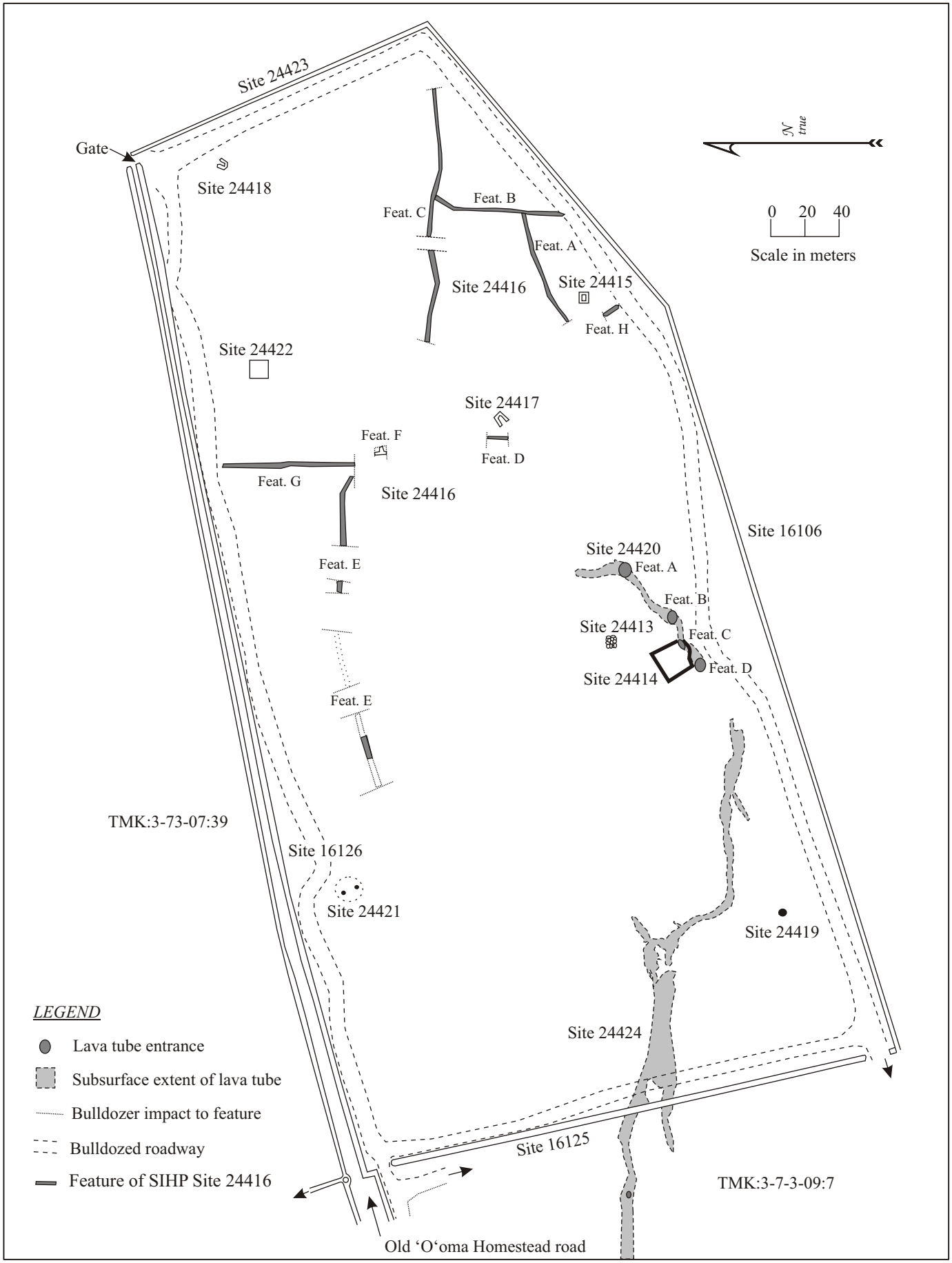


Figure 16. Project area plan view.

SIHP Site 16126

Site 16126 is a core-filled wall that runs along the northern boundary of the current study parcel (see Figure 16). Site 16126 also borders the southern edge of a portion of an old ʻOʻoma Homestead road and a second wall is present along the northern edge of the road (on TMK:3-7-3-7:39) approximately three meters distant. These two walls appear to have been constructed during separate episodes by the individual homestead owners. Drolet and Schilz (1991) also recorded this site originally (see Appendix A). Site 16126 runs along the entire northern boundary of the current study parcel for a distance of approximately 600 meters. At its eastern end a gate connects it to Site 24423 (the eastern boundary wall). At its western end the wall forms a continuous junction with Site 16125 (the western boundary wall). A bulldozed road runs parallel to the wall to the south for its entire length. Site 16126 averages 1.0 meter tall by 0.8 meters wide. It is constructed of stacked *pāhoehoe* cobbles that have collapsed in only a few locations. This Historic boundary wall was likely built at the same time as the other boundary walls surrounding the study parcel — sometime after 1913 when the parcel was sold to John Broad as Lot 57 of the ʻOʻoma Homesteads (Grant 5912).

The old Homestead road that Site 16126 borders was discussed in oral interviews with Kepā Maly by *kupuna* Peter Keikuaʻana Park, who was born in ʻOʻoma in 1918, as the route that was taken from the uplands to the coast (Rechtman and Maly 2003:II-31). In a side note Rechtman and Maly describe the route of the road thusly:

> The road as described by *kupuna* starts *mauka* in ʻOʻoma 2nd, goes *makai* between Homestead lots 58 and 59 [see Figure 7], held for Kuhaiki and Kainuku; then runs north across ʻOʻoma 1st, into Kalaoa and the old Kamaka House, from where it then cuts *makai* to the shore (see Register map No. 2123). (2003:II-32)

Auntie Elizabeth also recalled traveling this trail in the 1930s and 40s to access her family lands and to travel from the upland areas to the coast.

SIHP Site 24413

Site 24413 consists of a platform containing human skeletal remains that is located in the south-central portion of the current project area (see Figure 16). The platform is constructed on terrain that begins to slope fairly steeply to the west, allowing for expansive views to the north, south, and west from the feature's surface. Large bulldozer push piles of cobbles and soil surround the feature to the north, south, and east. Upon initial discovery, Site 24413 was covered by a dense growth of lantana, grass, and various weeds. An alignment along the southern edge of the feature was cleared first revealing loose stacking, and then the entire feature was cleared revealing a jumbled pile of large *pāhoehoe* cobbles with loose stacking along the irregularly-shaped periphery. The platform measures 8.0 meters (north/south) by 5.5 meters (east/west), and has a maximum height of 1.5 meters from ground surface at the southwest corner to the top of the feature in the center (Figure 17).

The southeastern side of Site 24413 (including the entire southern edge and a portion of the eastern edge) consists of loosely stacked cobbles, and sometimes upright slabs, standing two courses high (up to 55 centimeters above ground surface) (Figure 18). In this southern portion the feature's surface is relatively level, covering an area that measures 2.0 meters (north/south) by 4.0 meters (east/west). The north side of this level area steps up 40 to 50 centimeters toward the middle of the feature on to an uneven, mounded surface of large cobbles (Figure 19). This tiering of surfaces may have been more intact (stacked) in the past, but now is mostly collapsed and appears piled, sloping from down from the upper level to the lower level.

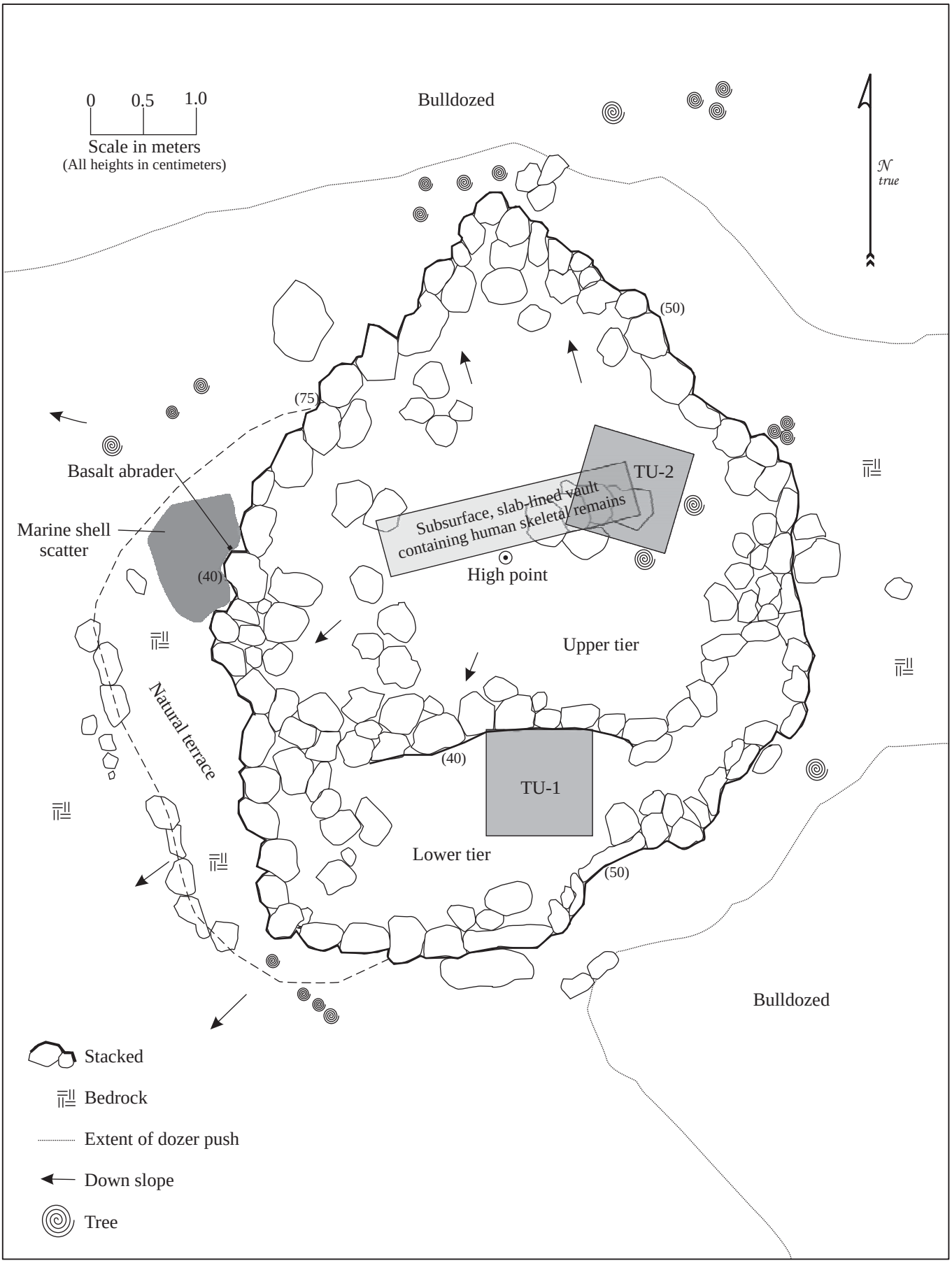


Figure 17. SIHP Site 24413 plan view.

Figure 18. SIHP Site 24413, view to northwest of the southeast corner.

Figure 19. SIHP Site 24413, view to south of platform's upper, northern tier.

The western side of Site 24413 rises above a natural bedrock and thin soil terrace that measures 1.0 meter wide (east/west) by 4.5 meters long (north/south). A concentration of cultural debris, including charcoal, marine shell, and a basalt abrader, was discovered on this natural terrace just west of the feature's edge. Along the western edge of the natural terrace, where ground surface begins to slope steeply to the west, a rough alignment of large *pāhoehoe* cobbles is present. The western edge of the platform is loosely stacked, but largely collapsed. It rises up to 40 to 75 centimeters above the natural terrace to the surface of the feature.

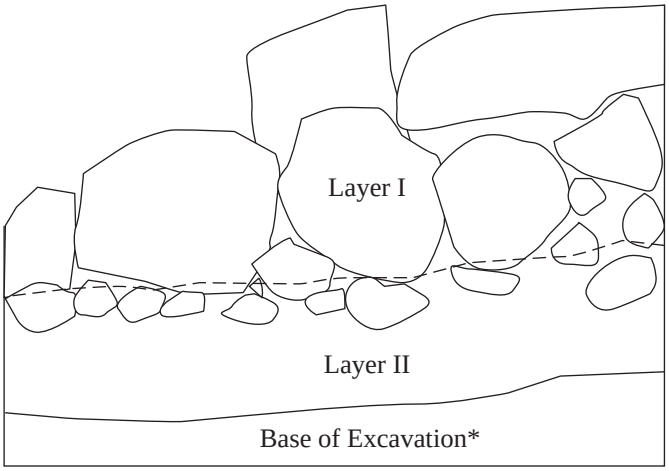
The northeastern side of Site 24413 (including the entire northern edge and a 2.0 meter portion of the eastern edge) consists of an alignment of large *pāhoehoe* cobbles that stands up to 50 centimeters above ground surface. The northern edge is loosely stacked, but the eastern portion is completely collapsed, and may have been hit by a bulldozer. This eastern portion slopes gently from the feature's surface to level bedrock ground surface to the east.

Two 1 x 1 meter test units were excavated at Site 24413, one in the lower tier near the feature's southern edge (TU-1), and another in the east-central portion of the feature's upper tier (TU-2) (see Figure 17). Excavation of TU-1 revealed a two layer stratigraphic profile (Figure 20). Layer I, the architectural layer, consisted of up to 50 centimeters of piled *pāhoehoe* cobbles and boulders that sloped to the south. At a depth of 20 to 40 centimeters beneath the surface of TU-1 very dark brown (10YR 2/2) silt rich with organic material (Layer II) was encountered amongst the architectural layer. This layer was excavated — in two 10-centimeter levels — to a depth of 60 centimeters beneath the surface of TU-1. Excavation of these first two levels of Layer II revealed a large amount of Precontact habitation debris including marine shell (*Cypraea*, *Drupa*, *Cellana*, *Conus*, and *Isognomonidae*), *kukui*, *Sus* (pig) bone, urchin, an urchin spine abrader, and basalt flakes. Coral, waterworn cobbles, and charcoal were also recovered from the unit. Excavation of TU-1 was terminated at the base of the second level of Layer II, when human skeletal remains were encountered at TU-2 within Site 24413 (see below). Upon discovery of the burial all cultural material was returned to TU-1 and it was backfilled as close to its original specifications as possible.

Excavation of TU-2 revealed the presence of a subsurface, slab-lined vault within Site 24413 that contained human skeletal remains (see Figure 20). The vault was discovered at a depth of 50 centimeters below the surface of TU-2 beneath two stratigraphic layers; a 20-30 centimeter thick architectural layer (Layer I), and an approximately 25 centimeter thick soil layer of very dark brown (10YR 2/2) silt (Layer II). A large amount of cultural debris was recovered from these two layers including *kukui*, urchin, marine shell (*Conus* and *Cypraea*), a coral abrader, an adze fragment, basalt flakes, coral, and charcoal. The eastern end of the burial vault was discovered within TU-2, when a single, flat-laid *pāhoehoe* slab was removed from the floor of the unit within Layer II (Figure 21). The removal of this slab revealed a 30-centimeter deep open space that was nearly perfectly rectangular and measured 2.5 meter long (east/west) by 0.5 meters wide (north/south) (Figure 22). The vault was lined with upright slabs that were supporting flat-laid slabs and the floor consisted of very dark gray (7.5YR 3/1) silt rich with cultural debris (Layer III). This soil was excavated to a depth of 27 centimeters (107 centimeters beneath the surface of the unit) where human foot bones were observed. The bones appeared to be articulated. It is likely that the remains were laid flat within the vault area and then covered with the Layer III soil. The skull of the individual is likely present at the western end of the vault. Upon discovery of the burial, the Layer III soil was immediately returned to the vault and the *pāhoehoe* slab covering the vault was returned to its original location. Layers I and II were then returned to the unit and made to resemble their original specifications and DLNR-SHPD was notified of the discovery of human skeletal remains.

Based on the large amount of cultural debris discovered within Site 24413, it is likely that the platform was initially utilized for Precontact habitation purposes and then later converted to a burial feature. The later construction of the vault could account for the mounded appearance of the upper tier of the platform when compared to the lower tier with the level surface. The vault may have been constructed within this original platform surface, and then cobbles were added on top of it to create a burial monument.

TU-1 west wall profile



TU-1, view to west

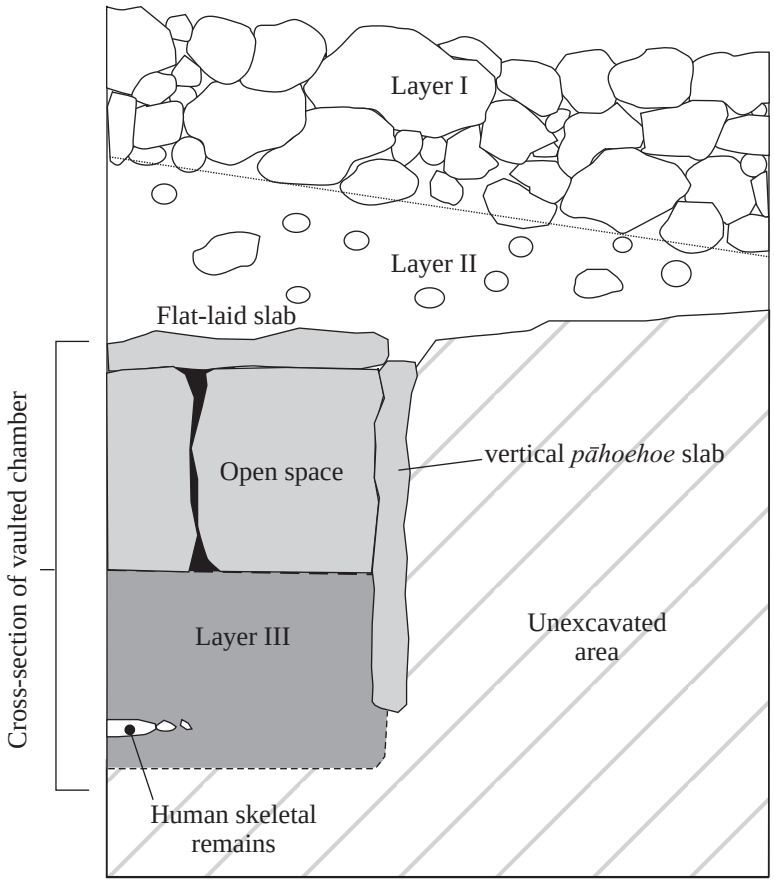
0 10 20
Scale in centimeters

Layer I - Architectural layer consisting of up to 50 centimeters of piled *pāhoehoe* cobbles and boulders that slope to the south.

Layer II - Very dark brown (10YR 2/2) silt, rich with organic material and Precontact habitation debris.

*Excavation of TU-1 terminated due to discovery of human skeletal remains within TU-2 (see below).

TU-2 north wall profiile



0 10 20
Scale in centimeters

Layer I - Architectural layer consisting of 20-30centimeters of piled *pāhoehoe* cobbles and boulders.

Layer II - Very dark brown (10YR 2/2) silt, rich with cultural debris.

Layer III - Very dark gray(7.5YR 3/1) silt, rich with cultural debris; articulated human skeletal remains present.

Figure 20. SIHP Site 24413, TU-1 and TU-2 profiles and TU-1 base of excavation photo.

Figure 21. SIHP Site 24413, TU-2, east end of slab-lined burial vault, overview to south.

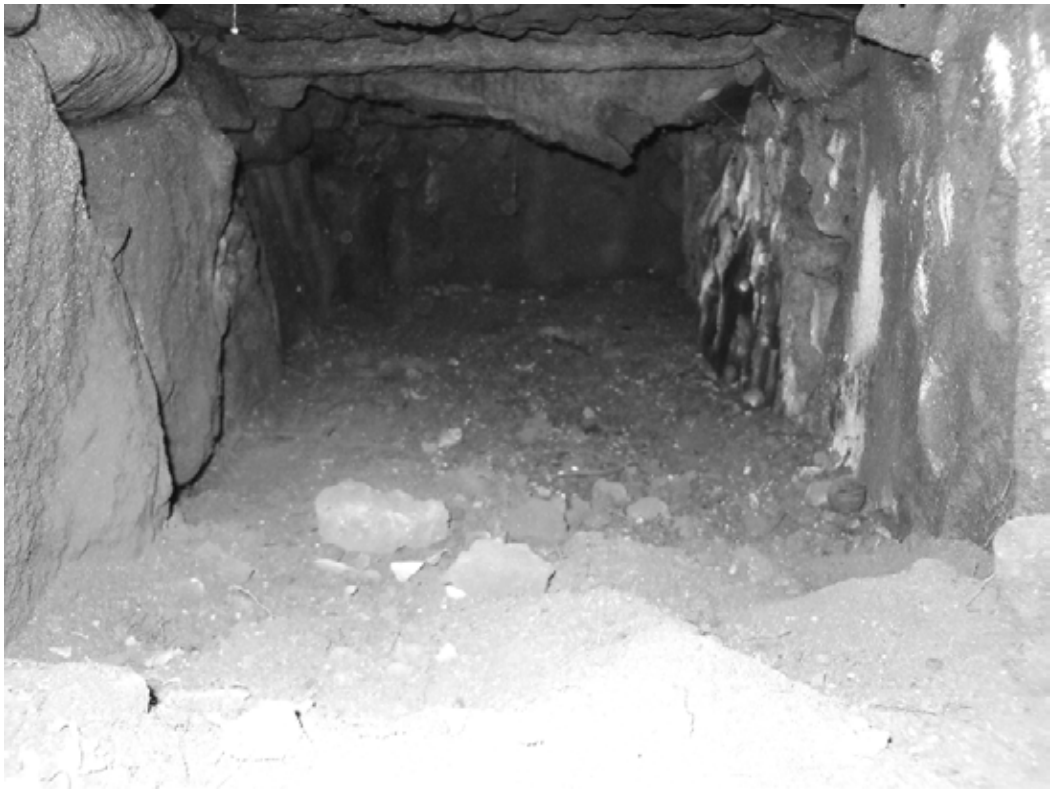


Figure 22. SIHP Site 24413, TU-2, interior of slab-lined burial vault, view to west.

SIHP Site 24414

Site 24414 consists of a Historic enclosure located in the south-central portion of the current project area (see Figure 16). The enclosure appears to have been used for ranching purposes and it may have been constructed during the latter part of the 19th century by Holokahiki, the original applicant for Lot 57 of the ʻOʻoma Homesteads, or by John Broad who purchased the parcel as Grant 5912 in 1913. The southeastern corner of Site 24414 incorporates a natural lava tube sink (Feature C of Site 24420) as part of the enclosure (Figure 23). The enclosure excludes a second sink area (Feature D of Site 24420) located near its southwestern corner. Site 24414 is irregularly shaped. It has the maximum dimensions of 24 meters long (north/south) by 23 meters wide (east west). The walls are core-filled and constructed with upright *pāhoehoe* slabs and stacked cobbles along the edges that retain a fill of smaller cobles within. They stand up to 1.3 meters high, by 1.1 meters wide (Figure 24), but have collapsed in a several locations. There may have formerly been a two meter wide opening to the center of the enclosure's north wall that was later filled in with stacked cobbles and slabs. Other than this area there is no apparent entrance to Site 24414.

Midway along the southern wall of Site 24414, the enclosure crosses a depression created by a collapsed lava tube (Feature C of Site 24420). Ground surface within the enclosure slopes gently to the south into the depression, while the southern edge of the depression rises 2.5 vertical meters to ground surface above. This vertical southern edge of the depression replaces the enclosure wall in the southeastern portion of Site 24414. To the east within the collapsed section of lava tube is an opening to a subsurface chamber (Figure 25). The opening is 4.0 meters wide by 2.7 meters tall. It leads to a chamber that slopes up to the east and measures 11.0 meters long. The eastern end of the chamber, where it opens to another collapsed section of lava tube (Feature B of Site 24420), has been blocked with stacked cobbles to prevent livestock from escaping. By utilizing this natural geologic formation the builders of Site 24414 saved themselves the effort of constructing a wall in the southeastern corner of the enclosure, and they created a shaded area for the livestock. Site 24414 may have been used to contain goats, as several goat bones were present on ground surface within the enclosure, and no other mammal bones were present. No Historic debris was observed on ground surface, but a waterworn cobble, possibly used as a hammerstone, was observed witin Feature C of Site 24420 in the southeastern corner of Site 24414 (see Site 24420 description below).

SIHP Site 24415

Site 24415 is a Historic enclosure located in the eastern portion of the current project area near the southern boundary (see Figure 16). The enclosure measures 4.3 meters long (north/south) by 4.0 meters wide (east/west) (Figure 26). It is constructed with core-filled walls that stand up to 1.1 meter high by 0.8 meters wide. The southern and eastern walls are mostly intact and consist of neatly stacked cobbles (Figure 27), while the northern and western walls are collapsed along their interior edges. There is no obvious entrance into the enclosure. The interior of the enclosure consists of a level floor of small *ʻaʻā* cobbles that is largely obscured by decaying organic material and vegetation. No cultural material was observed on ground surface in the vicinity of the enclosure. A 1 x 1 meter test unit (TU-3) was excavated into this floor in the central portion of Site 24415.

Excavation of TU-3 revealed a single stratigraphic layer (Layer I) resting on bedrock (see Figure 26). Layer I consisted of small *ʻaʻā* cobbles and pebbles mixed with approximately 5% very dark brown (7.5YR 2.5/2) silt throughout. This layer continued beneath the surface of the unit to a depth of 15 to centimeters where *ʻaʻā* bedrock was encountered (Figure 28). Decomposing organic material and grass rootlets were present at the surface of the unit. Two white glass buttons, along with several fragments of *kukui* that appeared to be rodent introduced, were recovered during the excavation of TU-3.

Based on the core-filled wall construction of Site 24415 and the presence of the buttons within TU-3, the enclosure was certainly constructed during Historic times. The relatively intact nature of the enclosure walls suggests that Site 24415 was likely constructed post 1913, perhaps by John Broad who purchased the parcel as Grant 5912. The specific use of this enclosure is unknown, but it may have been ranching related.

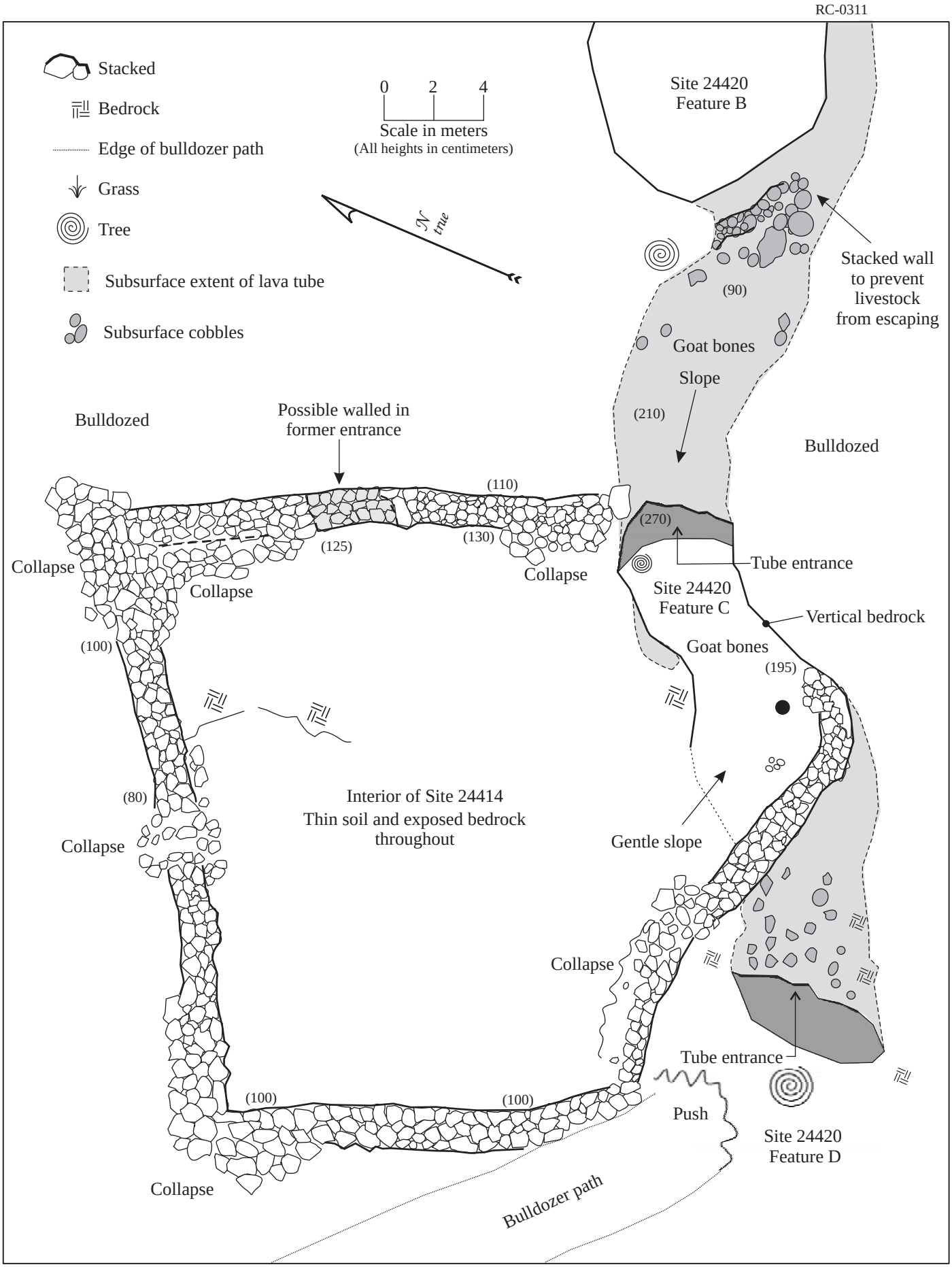
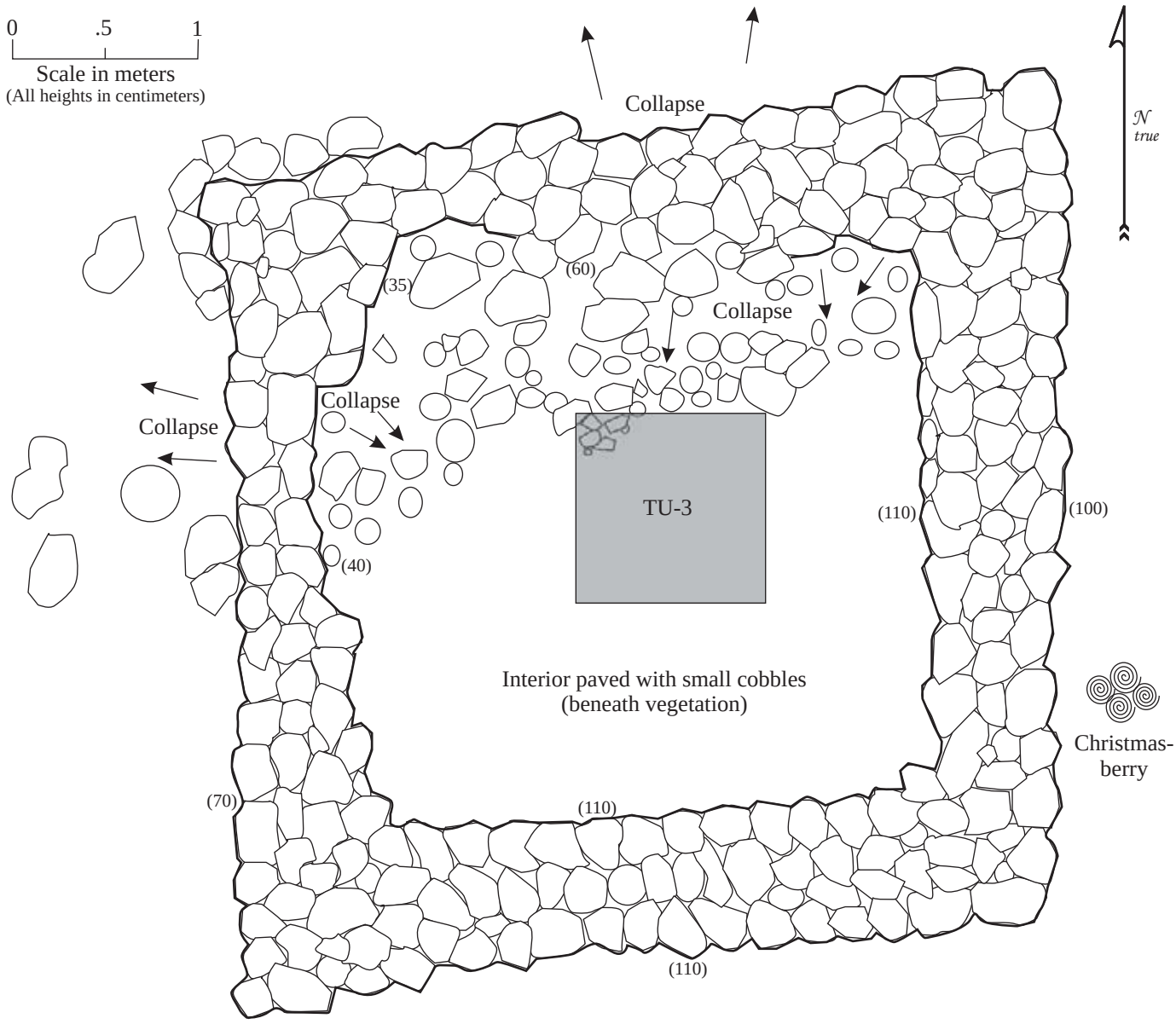


Figure 23. SIHP Site 24414 plan view.

Figure 24. SIHP Site 24414, northwest interior corner of enclosure showing typical wall construction, view to southwest.

Figure 25. SIHP Site 24414, view to east of lava tube in the southeastern corner of the enclosure.



TU-3 south wall profile

<u>Layer I</u> - Small *ʻaʻā* cobbles and pebbles mixed with approximately 5% very dark brown (7.5YR 2.5/2) silt throughout.

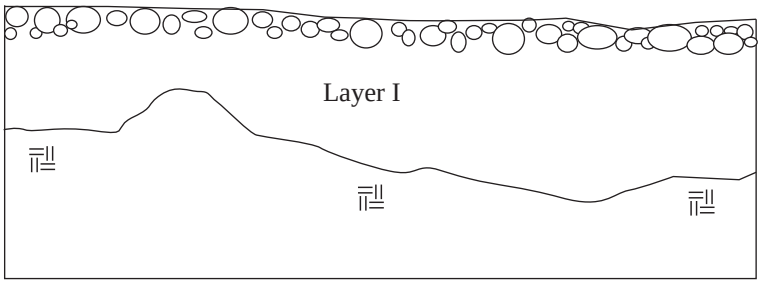


Figure 26. SIHP Site 24415 plan view and TU-3 profile.

Figure 27. SIHP Site 24415, view to southeast of the enclosure's interior northeast corner.

Figure 28. SIHP Site 24415, TU-3 base of excavation, view to south.

SIHP Site 24416

Site 24416 consists of several Historic core-filled wall segments that are present in the eastern and north-central portion of the current project area (see Figure 16). The walls are discussed below as eight separate features (Features A, B, C, D, E, F, G, and H). These segments appear to have formed a series of large interconnected enclosures that may have been used for livestock control purposes. Although these walls are certainly Historic, they may pre-date the boundary walls that surround the current study parcel (Sites 16106, 16125, 16126, and 24423). It is possible that they were constructed during the latter part of the 19th century by Holokahiki, an earlier applicant for Lot 57 of the ʻOʻoma Homesteads than John Broad who purchased the parcel as Grant 5912 in 1913. At least one of the wall segments (Feature G) appears to have continued on to an adjoining parcel to the north, prior to the construction of the northern boundary wall of the current study parcel and the southern boundary wall of that parcel. Widespread mechanical clearing on the current study parcel has largely obliterated the wall segments and obscured their associations, but possible connections between the wall segments are noted below. No cultural material was observed at any of the wall segments.

Feature A

Feature A is located near the southern property boundary in the eastern portion of the current study area (see Figure 16). Beginning at its western end where the wall terminates at bulldozer rubble, Feature A runs roughly east for approximately 70 meters to a point where it abuts, but is not contiguous with, Feature B. Intact sections of Feature A are constructed of stacked *pāhoehoe* cobbles standing four to six courses (up to 75 centimeters) high by approximately 60 centimeters wide (Figure 29). Collapsed sections, which are numerous, measure approximately two meters wide by 50 centimeters tall. At the junction of Features A and B, two large boulders are present and Feature B stands approximately 35 centimeters taller than Feature A. Feature A appears to have been constructed subsequent to Feature B.

Figure 29. SIHP Site 24416, Feature A, view to southwest.

Feature B

Feature B runs north from the northern edge of a bulldozed road located near the southern parcel boundary in the eastern portion of the current project area (see Figure 16). This wall segment measures approximately 80 meters long. Intact sections of Feature B are constructed of stacked *pāhoehoe* cobbles standing three to five courses (up to 90 centimeters) high by approximately 70 centimeters wide (Figure 30). However, Feature B, like Feature A, is collapsed in numerous locations. The northern end of Feature B abuts Feature C. The junction of these two walls is partially collapsed, but appears that Feature B was built subsequent to Feature C.

Figure 30. SIHP Site 24416, Feature B, view to northwest.

Feature C

Feature C runs in a westerly direction from the northern edge of a bulldozed road located in the southeastern corner of the current project area (see Figure 16). This wall segment measures approximately 150 meters long and is intact along much of its length. The wall is constructed of stacked *pāhoehoe* cobbles standing four to six courses (up to 1.2 meters) high by approximately 80 centimeters wide (Figure 31). A bulldozer break bisects the wall segment midway along its length and both ends terminate in bulldozer collapse. Feature C may have continued west to Feature F prior to mechanical clearing on the study parcel.

Figure 31. SIHP Site 24416, Feature C, view to east.

Feature D

Feature D is a short wall segment located in the east-central portion of the current project area (see Figure 16). The segment runs roughly north/south for approximately twelve meters, but only a four-meter section of the wall retains any structural integrity. This partially intact section consists of stacked *pāhoehoe* cobbles that stand 70 centimeters tall by 70 centimeters wide (Figure 32). The remaining eight meters consists of a rough alignment of scattered cobbles that was run over by a bulldozer. It is possible that Feature D, prior to mechanical clearing on the study parcel, continued north to Feature F.

Figure 32. SIHP Site 24416, Feature D, view to west.

Feature E

Feature E is a mostly destroyed wall segment that runs roughly east/west in the north-central portion of the current project area (see Figure 16). Overall, the segment measures 190 meters long, but it is separated into four separate sections by wide swaths of bulldozed land. Feature E is largely collapsed along most of its length, but what few intact sections there are consist of stacked cobbles standing up to six courses (up to 90 centimeters) tall by 85 centimeters wide (Figure 33). Both ends of Feature E terminate in bulldozer rubble. Prior to this mechanical clearing however, Feature E may have continued east to connect with Feature G.

Figure 33. SIHP Site 24416, Feature E, view to west.

Feature F

Feature F consists of the remnant of a junction where three of the wall segments may have met. Feature F is located in the east-central portion of the current project area (see Figure 16). This wall junction is T-shaped and terminates at bulldozing in all three directions. The north/south trending segment of Feature F measures 5.6 meters long and the east/west trending segment measures 2.1 meters long. Feature F is constructed of stacked cobbles standing up 1.1 meters tall by 90 centimeters wide (Figure 34). The junction of the walls has begun to deteriorate, but appears that they were all constructed during the same episode. Feature F may have joined with Feature D to the south, Feature G to the north, and Feature C to the east prior to mechanical land clearing on the study parcel.


Figure 34. SIHP Site 24416, Feature F, view to south.

Feature G

Feature G runs south from the southern edge of a bulldozed road near the northern boundary of the current study parcel nearly to Features E and F (see Figure 16). Feature G runs for approximately 75 meters and is largely intact along most of its length. It is constructed of stacked cobbles standing four to six courses (up to 1.5 meters) high by 80 centimeters wide (Figure 35). Although bulldozed at both ends, Feature G may have continued south to Feature F prior to mechanical land clearing on the current study parcel, and north, off-property, prior to the construction of Site 16126 and the widespread bulldozing.


Figure 35. SIHP Site 24416, Feature G, view to west.

Feature H

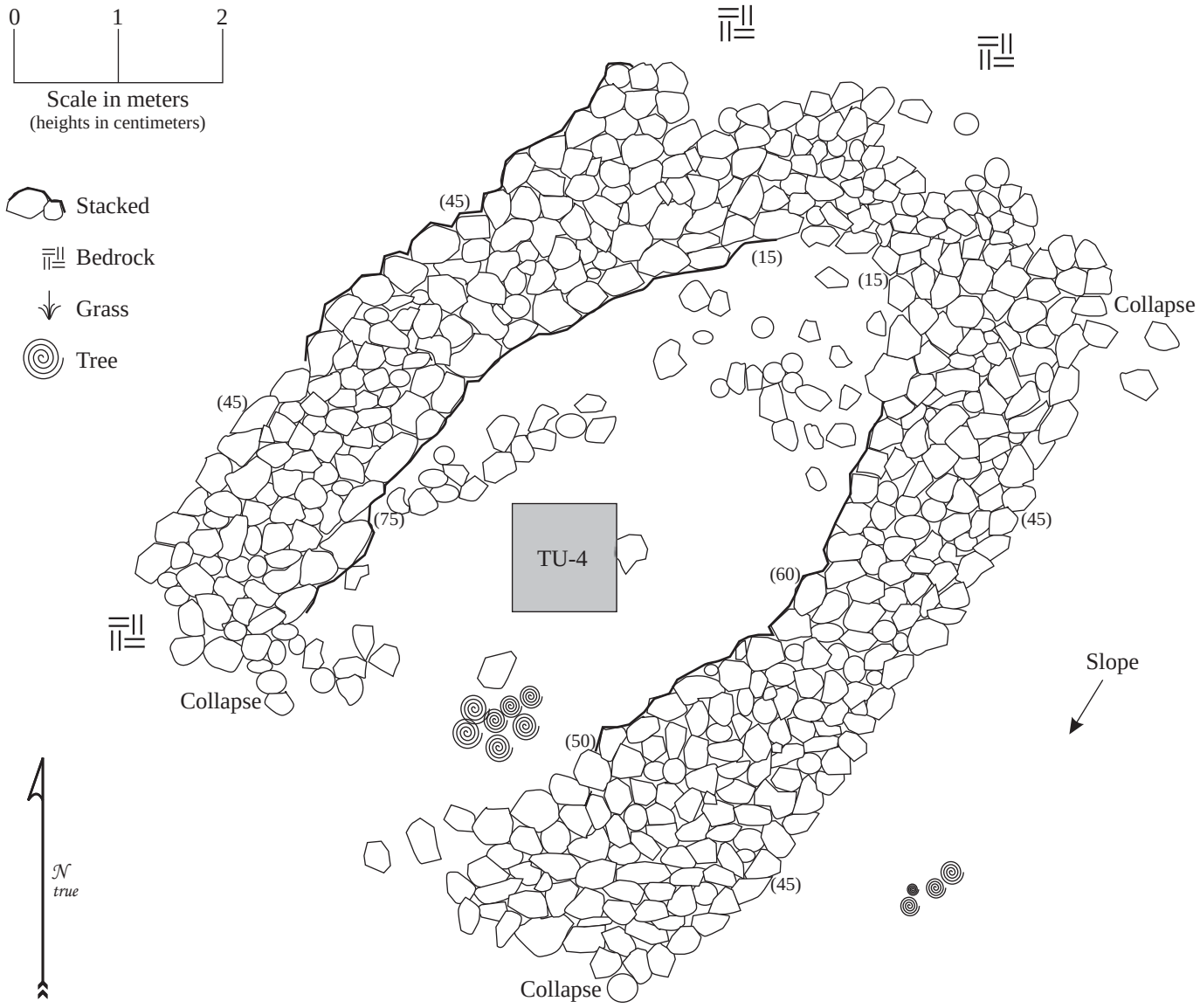
Feature H is a short wall segment located in the eastern portion of the current project area near the southern boundary (see Figure 16). The segment runs roughly north/south for approximately nine meters and is bulldozed at both ends. Feature H is constructed of stacked cobbles standing six to seven courses (up to 1.5 meters) tall by 75 centimeters wide (Figure 36). It is possible that Feature H, prior to mechanical clearing on the study parcel, connected to Feature A at its northern end.

Figure 36. SIHP Site 24416, Feature H, view to southwest.

SIHP Site 24417

Site 24417 is a three-sided enclosure located in the east-central portion of the current project area (see Figure 16). This site is constructed on a level area at the top of a fairly steep slope, affording it an excellent view of the coast. The enclosure opens to the southwest and measures 8.0 meters long by 6.0 meters wide (Figure 37). The walls consist of stacked cobbles that have collapsed in a few locations. Intact sections of the walls stand up to 75 centimeters tall by 1.2 meters wide (Figure 38). The walls generally attain a higher height along their interior edges than along their exterior edges. The central area of the enclosure measures approximately 3.0 meters wide by 6.5 meters long. This area may have formerly been cleared, but it currently contains several cobbles that have collapsed from the walls and a dense growth of vegetation. Noi cultural debris was observed on ground surface in the vicinity of the enclosure. A 1 x 1 meter test unit (TU-4) was excavated in the central portion of Site 24417.

Excavation of TU-4 revealed a single stratigraphic layer (see Figure 37). This soil layer (Layer I) consisted of very dark brown (10YR 2/2) silt containing approximately 25% gravels and small cobbles. Layer I was removed in three arbitrary levels; the uppermost level (Level 1) was excavated to a depth of 20 centimeters beneath the unit's surface due to the presence of grass and a thick root mat, the remaining two levels (Levels 1 and 2) were each 10 centimeters thick. Excavation of TU-4 terminated at bedrock approximately 40 centimeters beneath the unit's surface (Figure 39). Cultural material recovered from TU-4 included marine shell, urchin, volcanic glass, a basalt flake, *kukui*, coral, and scattered charcoal (Table 2). The findings from TU-4 suggest that Site 24417 was utilized during Precontact times for habitation purposes.



TU-4 north wall profile

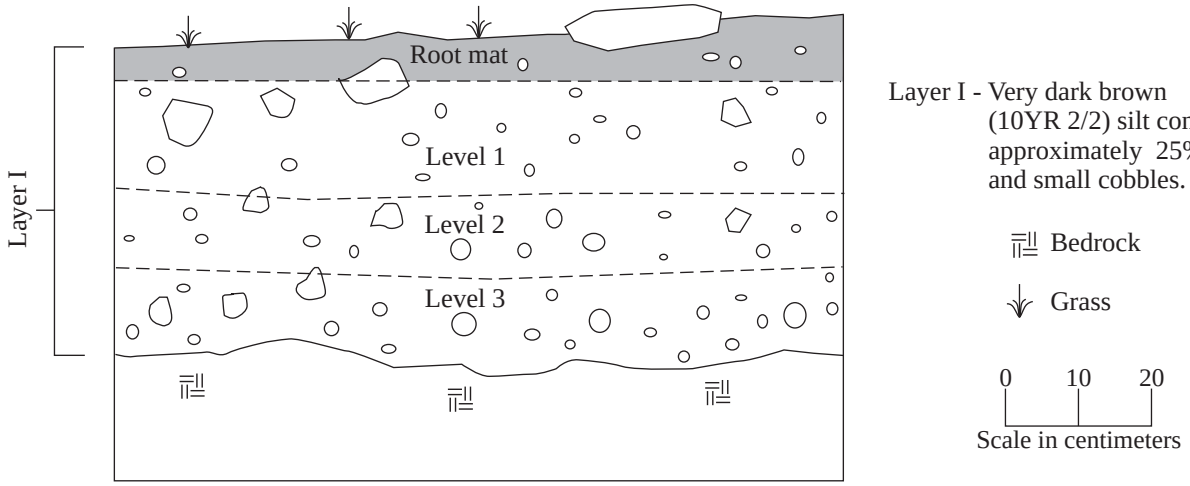


Figure 37. SIHP Site 24417 plan view and TU-4 profile.

Figure 38. SIHP Site 24417, view to northeast of enclosure's interior north wall.

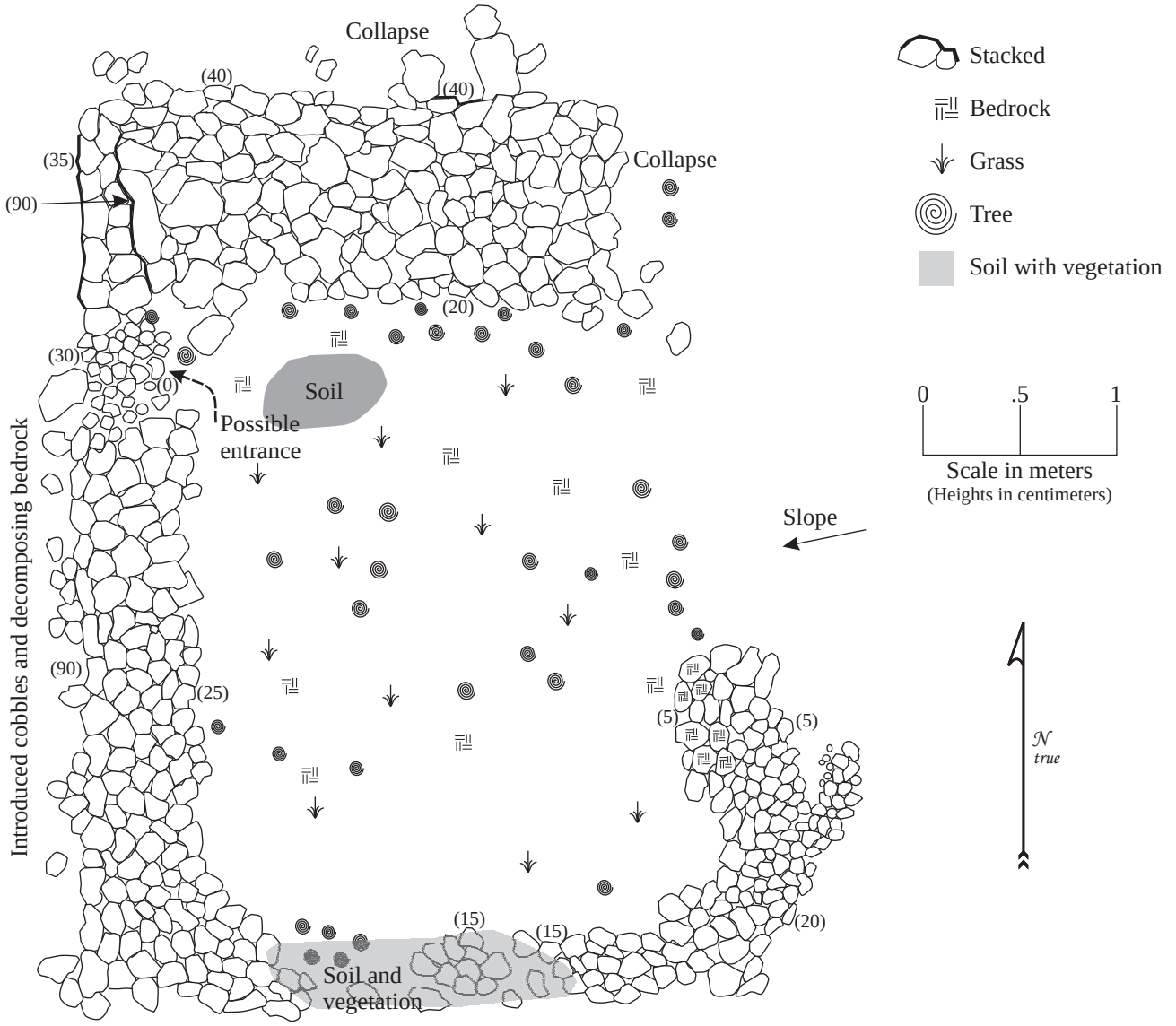
Figure 39. SIHP Site 24417, TU-4 base of excavation view to north.

Table 2. Cultural material recovered from Site 24417, TU-4.

ACC#	*Level*	*Material*	*Species/type*	*Count*	*MNI*	*Weight (g)*
1	1	Volcanic glass	Shatter	6	-	7.0
2	1	Organic	*Kukui*	13	6	39.6
3	1	Shell	*Nerita picea*	3	3	0.4
4	1	Shell	*Drupa*	10	1	2.7
5	1	Shell	*Cypraea*	44	10	50
6	1	Shell	*Conus*	71	5	24.6
7	1	Organic	Charcoal	-	-	4.6
8	1	Shell	*Nerita polita*	3	3	3.7
9	1	Coral	Waterworn	5	-	2.5
10	1	Shell	*Morula*	7	1	3.3
11	1	Shell	*Isognomonidae*	5	1	1.9
12	1	*Echinoderm*	*Echinoidea*	1	1	0.5
13	1	Shell	*Tridacna*	1	1	0.2
14	2	Volcanic glass	Shatter	3	-	1.2
15	2	Organic	Charcoal	-	-	10.5
16	2	Coral	Waterworn	3	-	1.6
17	2	Basalt	Flake	1	-	18.6
19	2	Shell	*Littorina*	1	1	0.1
20	2	Shell	*Drupa*	10	2	3.1
21	2	Shell	*Cypraea*	87	5	55.8
22	2	*Echinoderm*	*Echinoidea*	28	1	3.7
23	2	Shell	*Nerita*	6	2	0.7
24	2	Shell	*Isognomonidae*	8	1	3.4
25	2	Shell	*Conus*	13	2	9.2
27	3	Organic	Charcoal	-	-	3.1
28	3	*Echinoderm*	*Echinodea*	3	1	0.2
29	3	Shell	*Cypraea*	5	1	2.1
30	3	Shell	*Isognomonidae*	2	1	0.7
31	3	Shell	*Conus*	1	-	0.3

SIHP Site 24418

Site 24418 is a modified outcrop located in the northeastern corner of the current project area (see Figure 16). The raised bedrock outcrop measures 8.1 meters long (north/south) by 5.5 meters wide (east/west) (Figure 40). The central portion of the outcrop consists of exposed bedrock that is roughly level. The outcrop has been modified along its northern edge with loosely stacked cobbles forming a rough terrace-like structure that measures 5.5 meters long (east/west) by 2.3 meters wide (north/south) and stands up to ninety centimeters above the surrounding ground surface, but twenty centimeters lower than the top of the outcrop. The northern and western edges of the rough terrace exhibit remnant stacking that is approximately forty centimeters tall. The southern and western edges of the outcrop contain introduced *pāhoehoe* cobbles piled against them that are mixed with decomposing bedrock cobbles. The eastern edge of the outcrop fades into the natural slope of the terrain. Based on the formal attributes of Site 24418 and its rough construction, it appears that the site represents remnant Precontact agricultural feature (Haun and Henry 2003) that was inadvertently spared during widespread mechanical clearing on the current study parcel. Site 24418 likely represents a clearing pile.



SIHP Site 24418 view to west

SIHP Site 24418 view to southwest

Figure 40. SIHP Site 24418 plan view.

SIHP Site 24419

Site 24419 is a short stepping-stone trail segment located in the southwestern corner of the current project area (see Figure 16). The segment is oriented east/west and appears to be a remnant of a trail that once ran *mauka*/*makai* near the southern edge of the project area. The remaining segment measures only two meters long by 0.5 meters wide and consists of six *pāhoehoe* slabs laid flat across a crumbly *pāhoehoe* bedrock outcrop (Figure 41). Three more slabs were observed five meters to the west, but due to the mechanical clearing they could not be positively correlated to the recorded segment. This segment of trail is the only one discovered that escaped widespread mechanical clearing on the current study parcel.

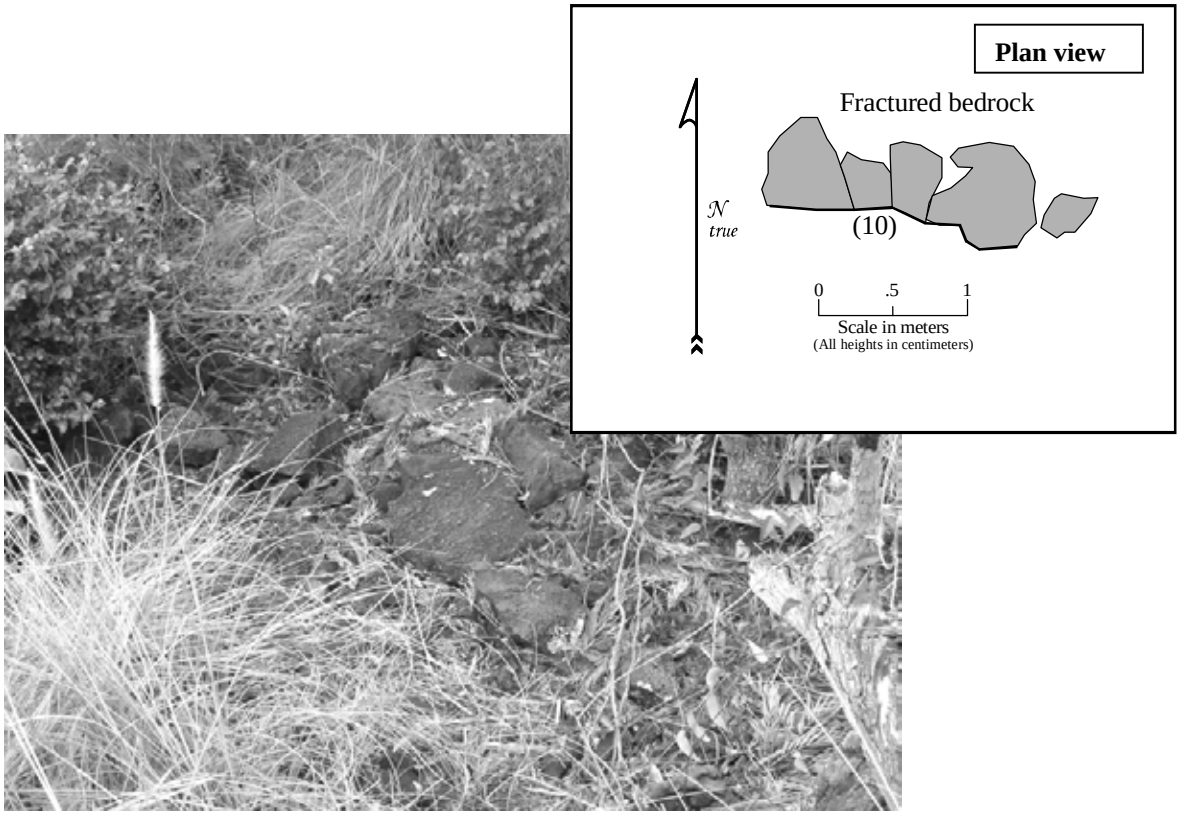


Figure 41. SIHP Site 24419, plan view and view to west.

SIHP Site 24420

Site 24420 consists of four Precontact habitation areas located near four openings (Features A, B, C, and D) within a series interconnected lava tubes. Although the lava tube openings are all connected, they are not all accessible between one another. The lava tube system stretches *mauka*/*makai* for approximately 50 meters near the southern boundary of the current study parcel (see Figure 16). One of two subsurface tube entrances within the opening to Feature A was concealed by a constructed terrace and bulldozer push at the time of discovery (Figure 42). The entrance had to be excavated to access the tube. Feature A also contained a Historic ink bottle, indicating that the feature may have seen at least some Historic use. Features B, C, and D are located near Site 24414 (a Historic enclosure; see description above) and have been significantly impacted by Historic use of the area (Figure 43). Feature C was included as part of the enclosure when it was constructed, and the tube was walled up Historically to prevent livestock from escaping. At Feature A a larger deposit of Precontact habitation debris was observed than at the other three features. Features B and C contain sparse deposits of Precontact habitation debris. No cultural debris was observed within Feature D, but it is included with Site 24420 because it was formerly connected to Feature C prior to the construction of Site 24414. Each of the features of Site 24420 are described in detail below.

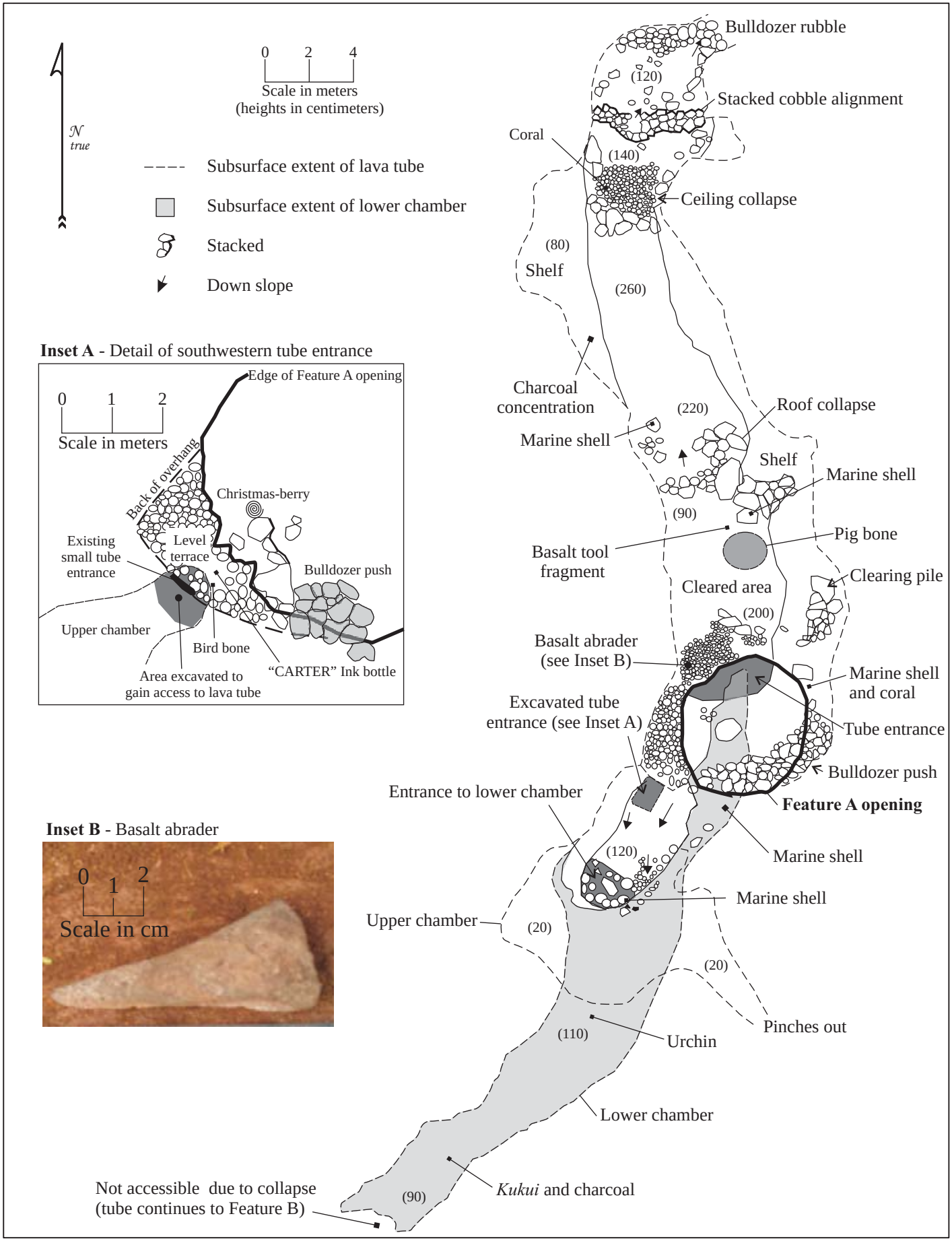


Figure 42. SIHP Site 24420 Feature A plan view.

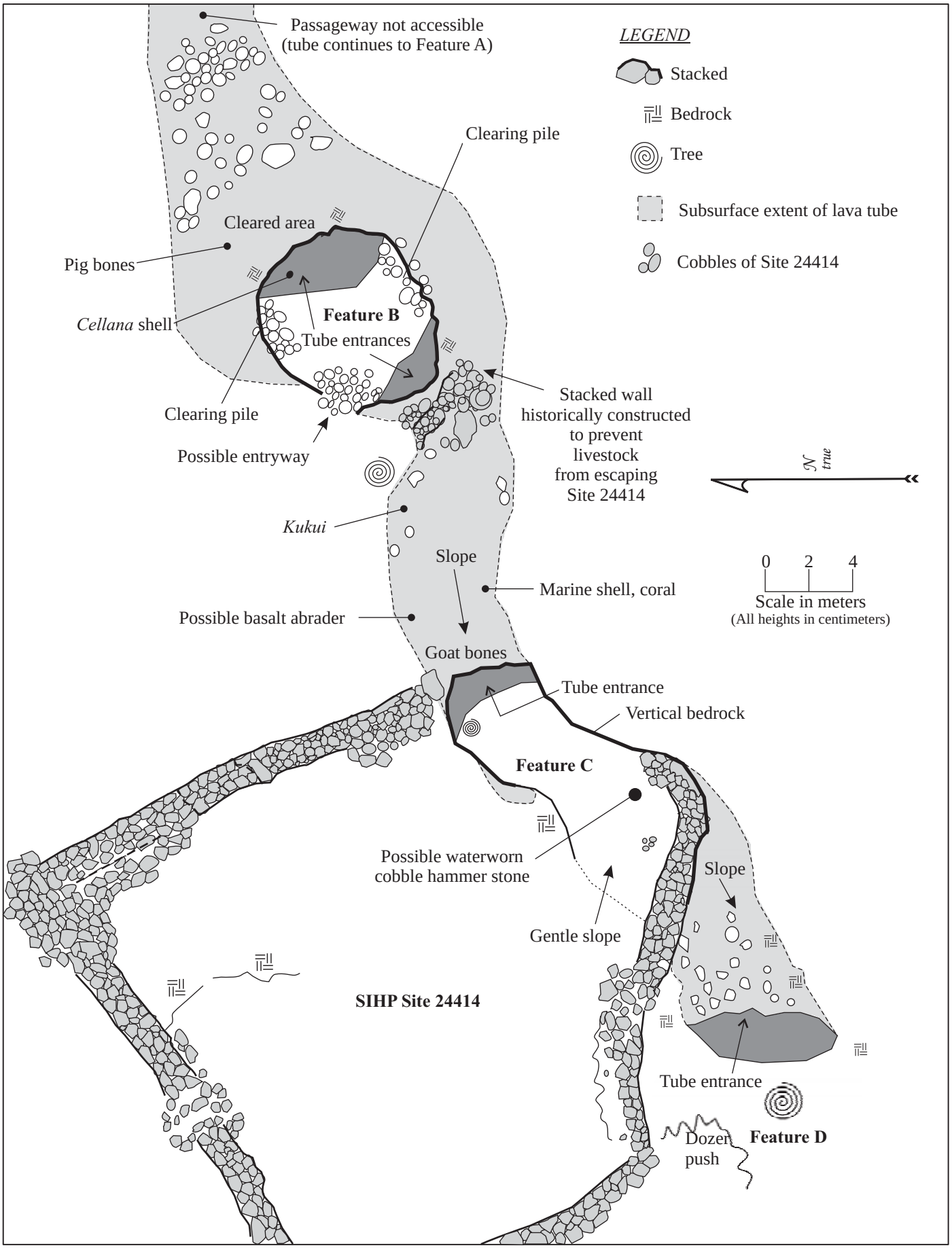


Figure 43. SIHP Site 24420 Features B, C, and D plan view.

Feature A

Feature A consists of the easternmost opening to the Site 24420 lava tube system (see Figure 16). The opening is roughly circular, measuring 6.0 meters in diameter with a maximum depth of 2.0 meters below the surrounding ground surface (Figure 42). The area around Feature A has been completely bulldozed and cobbles have been pushed into the opening. At the time of discovery, the Feature A opening appeared to contain a single subsurface tube entrance along its northern edge and an artificial rock terrace beneath an overhang in its southwestern corner. The terrace measures approximately 6.0 meters long by up to 3.0 meters wide. It has piled cobble edges and a relatively level surface. Christmas-berry was also present within the opening. A round, aqua glass, ink bottle with a cork stopper and an applied finish that had "CARTER" embossed on the base was discovered on the terrace along with a bird bone and a few marine shell fragments. The ink bottle appears to date to the first part of the 20th century (http://www.blm.gov/historic_bottles/). Further investigation at the terrace revealed that it was concealing the entrance to a subsurface lava tube running to the west towards Feature B. A 35-centimeter wide by 10-centimeter tall opening to the tube was observed along the western edge of the terrace where it met bedrock. It may be that the rubble pushed into the Feature A opening by the bulldozer actually concealed the tube entrance, that could have been located just to the southeast of the constructed terrace.

The lava tube entrance along the northern edge of the Feature A opening measures 6.0 meters wide by 1.5 meters tall. The entrance leads to a subsurface passageway, running to the north, that measures roughly 30 meters long by 4.0 to 8.0 meters wide and has floor to ceiling heights ranging from 0.9 meters to 2.6 meters. A lava shelf is present on both sides of the lava tube in sections. Portions of the interior bedrock floor of the tube appear to have been cleared of cobbles and used for habitation. This clearing has resulted in the presence of at least one clearing pile and a stacked cobble alignment (see Figure 42). Cultural material observed within the lava tube included two basalt tool fragments, marine shell fragments, pig (*Sus*) bone, coral, *kukui*, scattered charcoal and a single charcoal concentration on a bedrock shelf. The northern end of the tube ends at cobble and boulder rubble that, based on recent scars on the stones, appears to have been deposited by a bulldozer.

To access the concealed lava tube entrance in the southwestern corner of the Feature A opening, enough rocks were removed from the artificially constructed stone terrace to allow for human access (see Figure 42). Scattered charcoal, *kukui*, and pig (S*us*) bone were identified during the excavation, but not collected. The excavation ceased when the opening reached the proportions of 1.0 meter wide by 50 centimeters tall. The excavated opening was located near the ceiling of the subsurface chamber, approximately 2.0 meters above the tube floor. The tube was entered by sliding down the sloped cobbles that filled the tube entrance. The tube within consisted of two levels, an upper and a lower chamber.

The upper chamber measured approximately 10 meters long by (east/west) by 4.0 meters wide (north/south) with a maximum floor to ceiling height of only 50 centimeters. Two *kukui* nut fragments and some charcoal were observed in this upper chamber. An entrance in the floor of this upper chamber, 6.0 meters southwest of the excavated entrance in the terrace, leads to the lower chamber (see Figure 42). The entrance is only about 50 centimeters wide and it follows sloped cobble rubble approximately 1.4 vertical meters to the floor of the lower chamber. The lower chamber runs approximately 10 meters north from the entry point, beneath the Feature A opening, and approximately 20 meters to the southwest to a point where the passageway becomes blocked with rubble. This point appears to be near where the subsurface recording of Feature B terminated (see description below). The lower chamber averages 3.0 to 4.0 meters wide and has floor to ceiling heights of 1.0 to 1.5 meters. Cultural material observed within this chamber included *kukui*, urchin (*Echinoidea*), and scattered charcoal.

Feature B

Feature B consists of an opening within the Site 24420 lava tube system that is located approximately 30 meters southwest of Features A and approximately 11 meters east of Feature C (see Figure 16). The opening is rounded and it measures approximately 8.0 meters long by 5.0 meters wide by 2.0 to 2.5 meters

deep (see Figure 43). The floor of the opening consists of a roughly level surface of cobbles with two possible clearing piles present. A third pile of cobbles that slopes from the floor of Feature B to ground surface above is located in the southwestern corner of the opening. This pile may have been the access route to the feature. Two entrances to subsurface portions of the Site 24420 lava tube system are present within the Feature B opening, one in its northeastern corner and another in its southwestern corner. In addition to this, an area along the southeastern portion of the opening could have been utilized as an overhang shelter (see Figure 43).

The entrance in the southwestern corner of Feature B is blocked almost immediately by a stacked cobble and slab wall that has collapsed at its southern end. Due to the collapse the barrier can be circumvented to access a subsurface tube leading to the Feature C opening (see description below). This wall appears to be a Historic construction related to Site 24414. The entrance in the northeastern corner of Feature B (Figure 44) accesses a chamber that measures roughly 9.5 meters deep by 6.0 meters wide by 2.5 to 1.5 meters tall from floor to ceiling. The area closest to the entrance has been somewhat cleared of cobbles and contains a thin soil deposit. A single *Cellana* shell and a few pig (*Sus*) bones were discovered within this portion of Feature B. Beyond the cleared area, going *mauka*, the subsurface passageway ends in cobble rubble that has collapsed from the tube ceiling. Although this passageway is not accessible, based on surface projections of the subsurface mapping of Features A and B it appears that the two features are part of the same lava tube system (see Figure 16).

Figure 44. SIHP Site 24420 Feature B, view to east of *mauka* tube entrance.

Feature C

Feature C consists of an opening within the Site 24420 lava tube system that is located approximately 11 meters west of Features B and approximately 9 meters east of Feature D (see Figure 16). The opening is contained within the southeastern corner of Site 24414, a Historic enclosure, and the southern edge of the

opening forms the southern wall of the enclosure (see Figure 43). Ground surface within the enclosure slopes gently to the south into Feature C, while the southern edge of Feature C rises 2.5 vertical meters to ground surface above. To the east within the opening is an entrance to a subsurface chamber (see Figure 25). The entrance measures 4.0 meters wide by 2.7 meters tall. It leads to a chamber that slopes up to the east and measures 11.0 meters long. The eastern end of the chamber, where it opens to Feature B of Site 24420, appears to have been blocked historically with stacked cobbles to prevent livestock from escaping. The southern half of the wall is currently collapsed and subsurface access is possible between Features C and B. The interior of Feature C, near the opening has been somewhat cleared of cobbles. Goat bones, a hand sized waterworn cobble that may have been used as a hammer stone, a possible basalt abrader, coral fragments, *kukui*, and a single unidentified piece of marine shell were observed within Feature C.

Feature D

Feature D consists of the westernmost opening of Site 24420 (see Figure 16). It is located along the southern edge of Site 24414, outside of the enclosure (see Figure 43). The opening measures 8.0 meters long (north/south) by 7.0 meters wide (east/west). Bulldozer pushed cobbles slope into the opening along its western edge and partially fill the base of the opening where a large Christmas-berry tree is growing. The northern and southern edges of the opening consist of exposed bedrock that that rises up to 1.9 vertical meters from the base of the opening to ground surface above. Along the eastern edge of Feature D, a 4.5-meter wide by 2.5-meter tall entrance leads into a subsurface portion of Site 24420 (Figure 45). This section of lava tube measures approximately 8.9 meters long by 4.0 meters wide with a typical floor to ceiling height of 1.1 meters. Ground surface within the tube slopes up to the east and contains numerous scattered cobbles. The eastern end of the tube, where it formerly opened to Feature C, has been blocked by the southern wall of Site 24414. Goat bones were observed within Feature D.

Figure 45. SIHP Site 24420 Feature D, view to east of subsurface tube entrance.

SIHP Site 24421

Site 24421 consists of two small rock mounds (Features A and B) located in the western portion of the current project area near the northern boundary along the southern edge of a bulldozed access road (see Figure 16). The mounds are located on a slightly raised bedrock outcrop that slopes to the west and appears to have been spared during widespread mechanical clearing on the current study parcel. Almost no soil is present in the vicinity of Site 24421. The mounds are located approximately six meters distant from one another. They are both constructed of piled *ʻaʻā* cobbles, have irregular top surfaces, and irregular, sloped sides. The northernmost mound (Feature A) measures 1.4 meters long by 1.1 meters wide by 40 centimeters tall. Feature A is constructed with large cobbles around its perimeter and smaller cobbles filling the interior. The southernmost mound (Feature B) measures 1.8 meters in diameter and stands up to 60 centimeters tall. Feature B consists of piled cobbles of various sizes. Based on the formal attributes of the features of Site 24421, it appears that the site represents remnant Precontact agricultural features (Haun and Henry 2003) that were inadvertently spared during mechanical clearing on the current study parcel. Both features likely represent clearing piles.

SIHP Site 24422

Site 24422 is a partially stacked rock mound located in the northeastern section of the current project area (see Figure 16). The mound measures 3.9 meters long (east/west) by 3.2 meters wide (north/south) and stands up to 75 centimeters high along its stacked western edge (Figure 46). A large mango tree is growing out of the approximate center of the mound. A large amount of Historic debris was observed on ground surface in the vicinity of Site 24422. The debris included a metal washbasin, a metal hoop, a cast iron pot, a kettle, an enamel ware cup, and the undiagnostic, round base of an aqua glass bottle (Figure 47). Based on oral information related by Auntie Elizabeth, Site 24422 appears to be the approximate location of house that was lived in by a Korean man (“Joe Kolia”) during the 1920s to 1930s. According to Auntie Elizabeth the man lived near a large mango tree at the approximate location of Site 24422 (several large mangos are present in the vicinity of Site 24422 that escaped bulldozing) and he used to distill *ti* to make *akolehau*. She related that the still exploded, however, and burned the house down sometime around 1939. Site 24422 seems to represent all that remains of the former residence.

Figure 46. SIHP Site 24422, view to east.

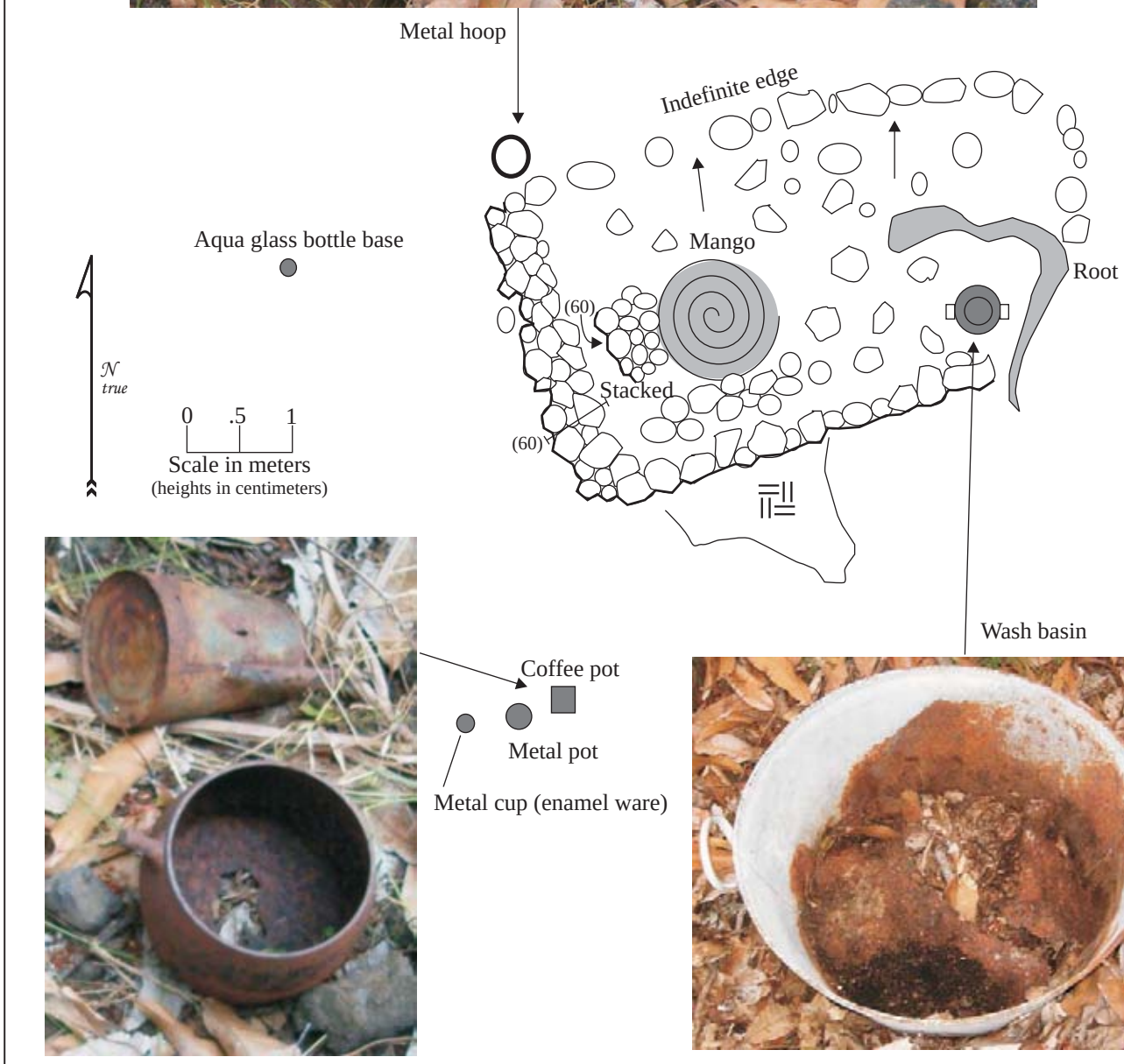


Figure 47. SIHP Site 24422 plan view.

SIHP Site 24423

Site 24423 is a core-filled wall that runs along the eastern boundary of the current study parcel (see Figure 16). The wall measures 180 meters long and averages 80 centimeters tall by 70 centimeters wide. It is constructed of stacked *pāhoehoe* cobbles that have collapsed in several locations. Site 24423 joins Site 16106 at its northern end and is connected by a gate to Site 16126 at its southern end (Figure 48). This Historic boundary wall, like the other boundary walls surrounding the parcel, was likely built sometime after 1913 when the parcel was sold to John Broad as Lot 57 of the ʻOʻoma Homesteads (Grant 5912).

Figure 48. View to northeast of gate connecting SIHP Sites 16126 and 24423.

SIHP Site 24424

Site 24424 is a large lava tube that runs for approximately 65 meters beneath the western portion of the current study parcel (see Figure 16). The entrance to the lava tube is located on TMK:3-7-3-09:7 *makai* of the current project area. Site 24424 does not have an entrance on the current study parcel (Figure 49). Based on artifacts and features recorded within the lava tube, it appears that Site 24424 was used for water collection during Precontact and early Historic times.

The opening to Site 24424 is rather deep and requires a ladder to enter it (Figure 50). The opening measures 2.8 meters long by 1.0 meter wide and it drops approximately 4.0 meters to the tube floor below. Once inside the lava tube a broad subsurface passageway leads both *mauka* and *makai*. Overall the lava tube extends for a distance of approximately 310 meters (120 meters *mauka* and 190 meters *makai* from the entrance) in an easterly/westerly direction (at 254º/74º). The *makai* portion of Site 24424 is located entirely beneath TMK:3-7-3-09:7. Eight features were recorded in the *makai* portion of the lava tube (four rock rings and four small terraces) that are not discussed here but will be reported on when an inventory survey report is prepared for TMK:3-7-3-09:7 (Rechtman Consulting, LLC is currently conducting fieldwork on that parcel).

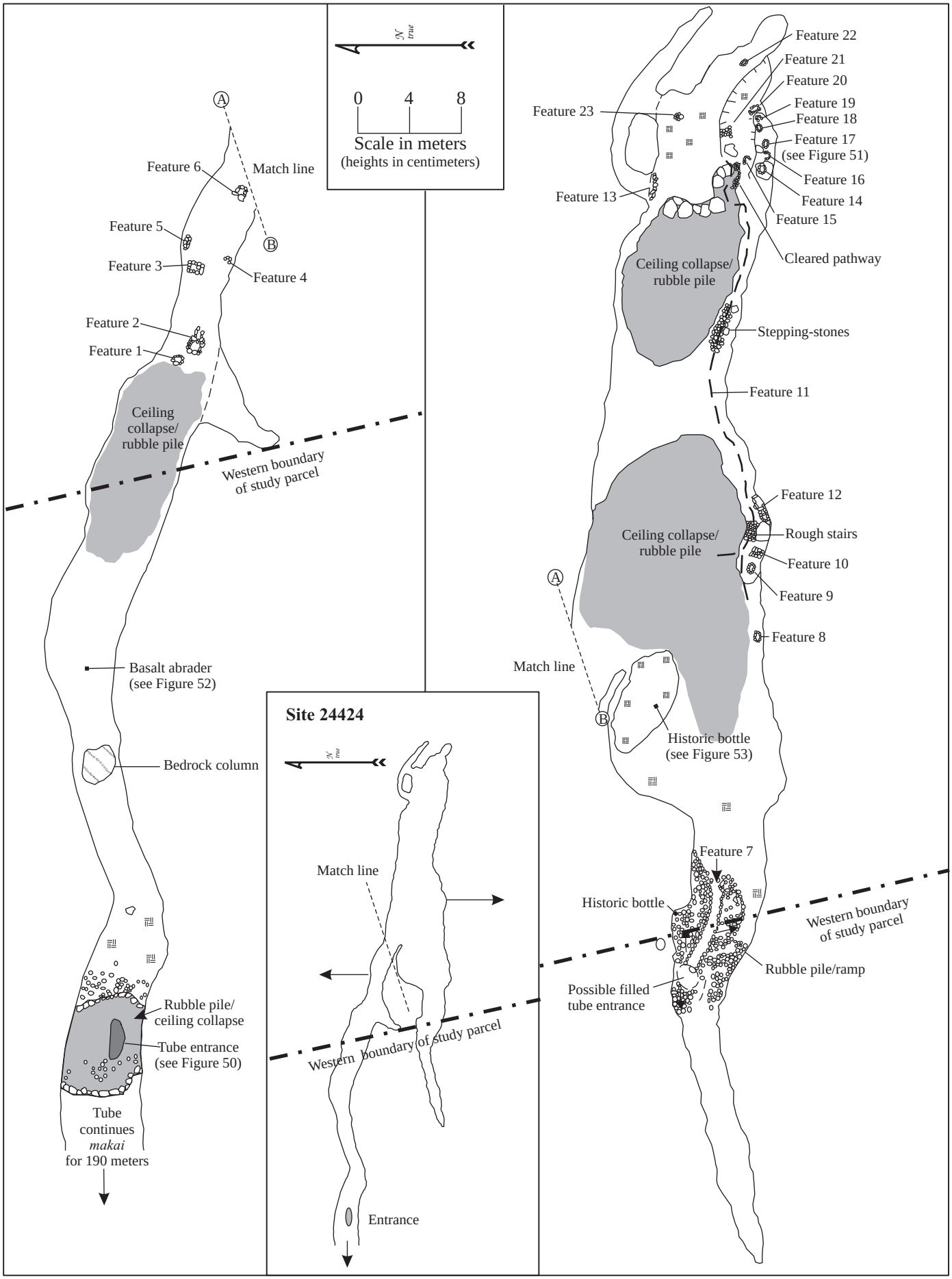


Figure 49. SIHP Site 24424 plan view.

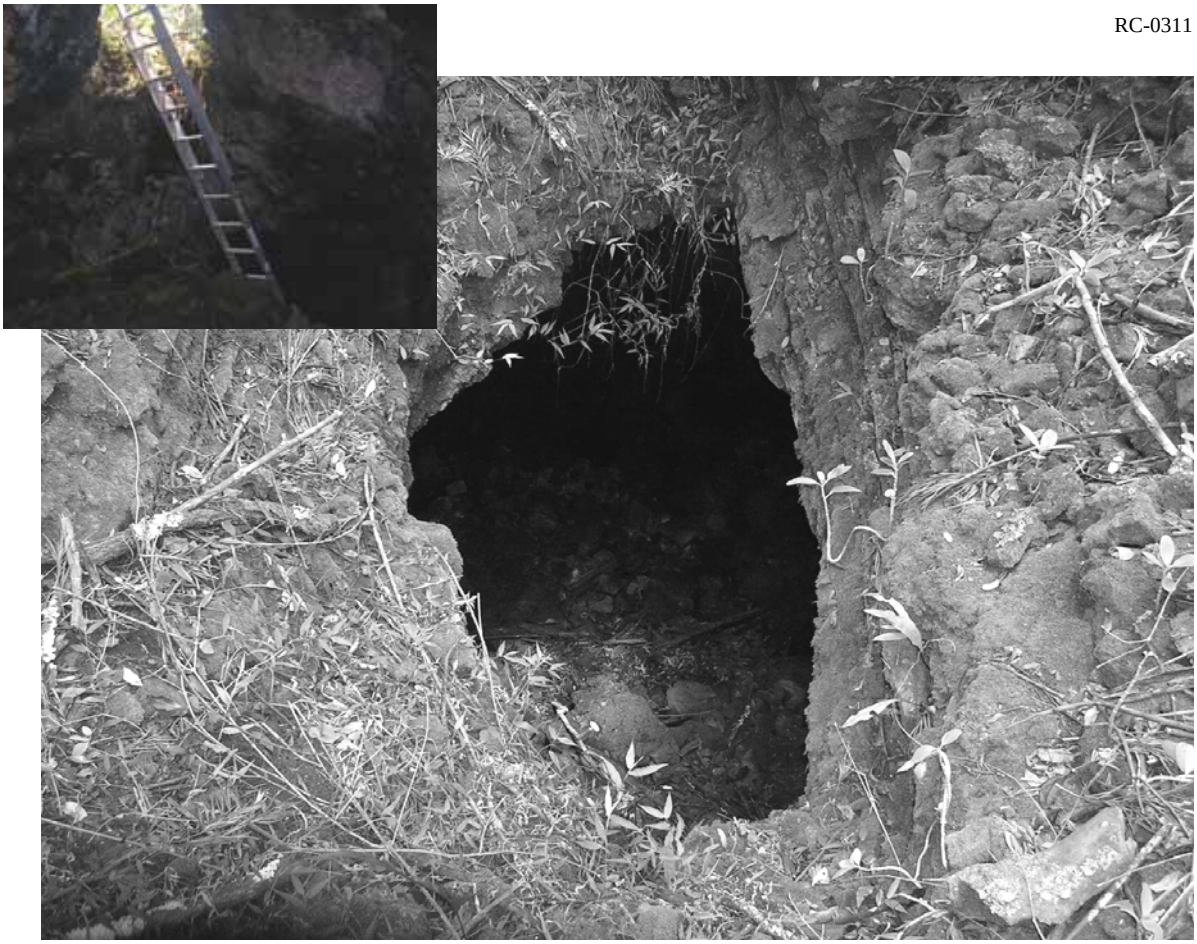


Figure 50. SIHP Site 24424, exterior overview (and interior insert) of tube entrance to west.

Twenty-three features (Features 1-23) were recorded in the *mauka* portion of Site 24424 (the location of each of these features is shown on Figure 49, and they are each discussed in detail below). The features include two trail segments (Features 7 and 11), one of which leads up an earthen ramp to what appears to be a filled in entrance (Feature 7), and twenty-one small rock rings or small rock piles that are invariably located beneath water dripping from the tube ceiling (Features 1-6, 8-10, and 12-24). These informal rock constructions appear to have supported containers used to hold the dripping water (Figure 51). A large amount of charcoal and several burned *kukui* fragments were observed on the tube floor, primarily in the vicinity of these presumed water collection features. The proximity of the charcoal deposits to the recorded features seems to indicate that light sources were placed next to the water collection features during the process of gathering water. In addition to the charcoal and *kukui* a single marine shell fragment (*Cypraea*), a coral fragment, and three isolated artifacts was the only other cultural debris discovered within Site 24424.

The isolated artifacts discovered at Site 24424 included a basalt abrader and two broken bottles (see Figure 49). The basalt abrader is nearly perfectly round with two flat sides (Figure 52). It measures 6.4 centimeters in diameter by 4.5 centimeters thick. Two identical broken Historic bottles were also discovered within Site 24424; both are dark green glass with round, punted bases and applied double bead finishes (Figure 53). Bottles exhibiting these characteristics were typically manufactured during the early 19th century. The presence of the broken bottles within the lava tube seems to indicate that Site 24424 was used into Historic times for water collection purposes. Detailed feature descriptions for the *mauka* portion of Site 24424 follow below.

Figure 51. SIHP Site 24424, typical water collection feature (Feature 17), view to southwest.

Figure 52. SIHP Site 24424, basalt abrader, overview.

Figure 53. SIHP Site 24424, Historic bottle neck, overview.

Feature 1

Feature 1 is a circular ring of small to medium sized cobbles standing one course high by 90 centimeters in diameter that is located in the center of the tube floor (see Figure 49). The ring is located beneath dripping water and charcoal is present on the floor surrounding it. Feature 1 appears to have been used for water collection purposes.

Feature 2

Feature 2 is a roughly square alignment of small to medium sized cobbles with some long slabs present that stands a single course high. A short, double alignment of cobbles also extends east from the eastern edge of the square shape. Feature 2 has the overall dimensions of 1.8 meters long by 1.3 meters wide. The ring is located beneath dripping water to the east of Feature 1 and charcoal is present on the floor surrounding it (see Figure 49). Feature 2 appears to have been used for water collection purposes.

Feature 3

Feature 3 is a roughly rectangular, single-course alignment of medium sized cobbles and slabs measuring 1.3 meters long by 0.6 meters wide. It is located along the northern edge of the tube beneath dripping water (see Figure 49). Feature 3 appears to have been used for water collection purposes.

Feature 4

Feature 4 is a semi-circular alignment of four medium sized cobbles located along the southern edge of the tube beneath dripping water (see Figure 49). Feature 4 measures 0.5 meters in diameter and was likely used for water collection purposes.

Feature 5

Feature 5 consists of slabs stacked against the sloped northern edge of the tube beneath dripping water (see Figure 49). Feature 5 creates a mini-terrace against the bedrock tube wall (0.4 meters tall) with a level surface that measures by 1.0 meter long by 0.5 meters wide. Feature 5 appears to have been used for water collection purposes.

Feature 6

Feature 6 is a roughly rectangular, single-course alignment of medium sized cobbles and slabs measuring 0.9 meters long by 0.5 meters wide. It is located in the center of the tube on the bedrock floor beneath dripping water (see Figure 49). Charcoal is located all around the alignment. Feature 6 appears to have been used for water collection purposes.

Feature 7

Feature 7 is a trail segment that leads up a rubble ramp to a possible filled in surface access in the southern portion of Site 24424 (see Figure 49). The trail segment measures 7.0 meters long by 1.0 meter wide. It leads west from the bedrock floor of the lava tube at its eastern end up a sloped rubble pile to what appears to be a filled in former tube entrance. The filled entrance is located nearly 2.5 vertical meters above the tube floor near the tube ceiling. Feature 7 consists of a cleared soil pathway in the rubble pile that is lined on both sides by the cleared cobbles. A *Cypraea* shell fragment, coral, burned *kukui*, and charcoal was discovered at the eastern end of Feature 7, and a broken Historic bottle was found along the tube wall to the north of the feature.

A similar trail segment, leading up a rubble ramp to a narrow tube entrance, was observed within another lava tube at TMK:3-7-3-09:7. That tube entrance appeared to have been excavated through a naturally rubble filled collapse to create a passageway. A surface projection of the possible filled entrance within Site 24424 places Feature 7 beneath a bulldozed roadway slightly *makai* of the current project area. The area where the filled entrance should have reached the surface was thoroughly inspected, but no sign of a lava tube opening was encountered. It is likely that the entrance was obscurred by a bulldozer when the 4WD road was created on TMK:3-7-3-09:7. When at Feature 7 within Site 24424, vehicle traffic on the 4WD road sounds as though it is right above the entrance and the weight of the vehicle causes the tube ceiling to shake ominously.

Feature 8

Feature 8 is an oval ring of small to medium sized cobbles standing one course high that is located along the southern edge of the tube (see Figure 49). The ring measures 1.0 meter long by 0.6 meters wide. It is located beneath dripping water and charcoal is present on the floor surrounding it. Feature 8 appears to have been used for water collection purposes.

Feature 9

Feature 9 is an oval ring of small to medium sized cobbles standing one course high that is located along the southern edge of the tube (see Figure 49). The ring measures 1.0 meter long by 0.6 meters wide. It is located beneath dripping water and charcoal is present on the floor surrounding it. Feature 9 is nearly identical to Feature 8, and it too appears to have been used for water collection purposes.

Feature 10

Feature 10 is a rectangular construction of piled small to large size cobbles located against the southern edge of the lava tube (see Figure 49). The feature is raised above the tube floor on three sides and it measures 1.3 meters long by 1.0 meter wide and stands up to 30 centimeters tall. It is located beneath dripping water and charcoal is present on the tube floor nearby. Feature 10 appears to have been used for water collection purposes.

Feature 11

Feature 11 is a trail segment located along the southern edge of the lava tube near its eastern end (see Figure 49). The logical route of the trail is traceable between Features 10 and 14, but the actual route could only be positively identified in three sections. A two-meter long section of trail is present at the eastern end of Feature 11 where large cobbles and slabs from a ceiling collapse have been moved to either side of the pathway, creating a cleared space (0.5 meters wide) of small cobbles that allows for easy pedestrian travel. A second, four-meter long section of trail in the central portion of Feature 11 consists of flat-laid slabs across a rubble area. The third traceable section of trail is located at the western end of Feature 11 where two rough steps have been created to allow for easier access up the steep slope of a large pile of collapsed ceiling material. The remaining portions of Feature 11 were likely present on the exposed bedrock floor of the lava tube, or covered over by ceiling collapse, and therefore not traceable. It is probable that the trail once connected one of the two (or both) possible entrances to the lava tube with all the water collection features.

Feature 12

Feature 12 is a roughly rectangular, single-course alignment constructed of upright angular slabs and cobbles. The feature is segmented into two adjoining sections by an upright slab. The eastern section measures 1.2 meters long by 0.6 meters wide, while the western section measures 1.7 meters long by 0.7 meters wide. Feature 12 is located along the southern edge of the lava tube beneath dripping water, and charcoal is located all around the alignment (see Figure 49). Feature 12 appears to have been used for water collection purposes.

Feature 13

Feature 13 is a curvilinear alignment of cobbles located along the northern edge of the lava tube where it branches (see Figure 49). The alignment measures 2.0 meters long by a single course high, and is constructed on the exposed bedrock floor of the tube. The function of Feature 13 is uncertain. It may have been used for water collection purposes (dripping water is present), or it could mark the route of Feature 11 (a trail).

Feature 14

Feature 14 is an oval ring built on top of a large boulder along the southern edge of the lava tube beneath dripping water (see Figure 49). The feature is constructed of a single course of small to medium sized cobbles. It measures 1.0 meter long by 0.7 meters wide. Charcoal is present on the large boulder and within the ring. Feature 14 appears to have been used for water collection purposes.

Feature 15

Feature 15 is an oval ring of small to medium sized cobbles standing one course high that is located along the southern edge of the tube on elevated bedrock (see Figures 49 and 51). The ring measures 0.9 meters long by 0.6 meters wide. It is located beneath dripping water and charcoal is present on the floor surrounding it. Feature 15 appears to have been used for water collection purposes.

Feature 16

Feature 16 is an oval ring of small to medium sized cobbles standing one course high that is located along the southern edge of the tube near its eastern end (see Figure 49). The ring measures 1.3 meters long by 0.7 meters wide. It is located beneath dripping water and charcoal is present on the floor surrounding it. Feature 16 appears to have been used for water collection purposes.

Feature 17

Feature 17 is an oval ring of small to medium sized cobbles standing one course high that is located along the southern edge of the tube near its eastern end (see Figure 49). The ring measures 1.1 meters long by 0.5 meters wide. It is located beneath dripping water and charcoal is present on the floor surrounding it. Feature 17 appears to have been used for water collection purposes.

Feature 18

Feature 18 is an oval ring of small to medium sized cobbles standing one course high that is located along the southern edge of the tube near its eastern end (see Figure 49). The ring measures 1.0 meter long by 0.7 meters wide. It is located beneath dripping water and charcoal is present on the floor surrounding it. Feature 18 appears to have been used for water collection purposes.

Feature 19

Feature 19 is a semi-circular alignment of small to medium sized cobbles standing one course high that is located along the southern edge of the tube in a small alcove (see Figure 49). The alignment measures 0.6 meters long by 0.4 meters wide. It is located beneath dripping water and charcoal is present on the floor surrounding it. Feature 19 appears to have been used for water collection purposes.

Feature 20

Feature 18 is an oval ring of small to medium sized cobbles located along the southern edge of the tube near its eastern end beneath dripping water (see Figure 49). The ring measures 1.0 meter long by 0.8 meters wide. The feature is constructed on a sloped ground surface; the western side of the ring stands two courses high (up to 25 centimeters), while the eastern side is only a single course high. Charcoal is present on the tube floor in the vicinity of the ring. Feature 18 appears to have been used for water collection purposes.

Feature 21

Feature 21 is a roughly rectangular construction of piled small to large size cobbles located against sloped bedrock near the eastern end of the lava tube. The feature is raised above the tube floor on three sides and it measures 1.0 meter long by 0.6 meters wide and stands up to 20 centimeters tall. It is located beneath dripping water and charcoal is present on the tube floor nearby. Feature 21 appears to have been used for water collection purposes.

Feature 22

Feature 22 is an oval ring of small to medium sized cobbles standing one course high that is located near the eastern termination of the lava tube (see Figure 49). The ring measures 1.0 meter long by 0.7 meters wide. It is located beneath dripping water and charcoal is present on the floor surrounding it. Feature 22 appears to have been used for water collection purposes.

Feature 23

Feature 23 is a small pile of cobbles with two slabs present located on bedrock near the eastern termination of the lava tube (see Figure 49). The pile measures 0.8 meters long by 0.6 meters wide and it stands up to 0.3 meters above ground surface. It is located beneath dripping water and charcoal is present on the floor surrounding it. Although the central portion of Feature 23 is filled in, unlike most of the water collection features recorded at Site 24424, it too appears to have been used for water collection purposes.

Summary and Conclusions

As a result of the current inventory survey three previously recorded archaeological sites (Sites 16106, 16125, and 16126) and twelve newly recorded sites (Sites 24413–24424) were identified on the subject parcel. These sites represent nearly continual use of the study parcel from Precontact times (perhaps as early as the 1400s; Haun and Henry 2003:80) to the 1940s. The most recent Historic sites located on the study parcel include the remains of a former residence that was occupied until ca. 1939 (Site 24422), the boundary walls that surround the entire parcel (Sites 16106, 16125, 16126, and 24423), and a small enclosure of undetermined homesteading function (Site 24415). Excavation of TU-3 at Site 24415 revealed the presence of two white glass buttons within the enclosure. All of these sites likely post-date the 1913 sale of the study parcel to John Broad (Grant 5912), and are primarily related to cattle ranching and homesteading.

Other Historic Period sites may have been constructed prior to John Broad's purchase of the property, perhaps by Holokahiki, an earlier applicant for Lot 57 of the ʻOʻoma Homesteads, who may have been living on the land during the latter part of the 19th century. These sites include a large enclosure that may have functioned as a goat pen (Site 24414), and several core-filled wall segments that may have once formed several large enclosures on the property (Site 24416). At least one of the wall segments appears to have continued beyond the boundary walls of the current study parcel prior to their construction. Although these sites were likely constructed earlier than 1913, they probably saw continued use throughout the Historic period and, in part, helped determine where later constructions were placed on the study parcel.

The use of at least two sites on the subject parcel may have spanned Precontact and Historic times. Both of these sites are lava tubes (Sites 24420 and 24424). Site 24420 appears to have been used originally, and primarily, for Precontact habitation. Feature A of Site 24420, where the bulk of habitation seems to have occurred, contained a Historic ink bottle suggesting that that feature was also utilized historically. In addition to this, Features C and D of Site 24420 were incorporated into the construction of Site 24414 (a Historic ranching enclosure), and therefore, were also used during Historic times. Site 24424 appears to have been utilized nearly exclusively for water collection purposes. This deep and massive lava tube does not have an entrance on the current project area, but the *mauka* portion of the lava tube runs beneath the study parcel. Several stone constructions were recorded within the tube that were strategically placed at the locations of dripping water. Two broken bottles discovered within Site 24424 are the only definitive evidence of Historic use of the lava tube.

Water caves like Site 24424 would have enabled populations to live upon the land and sustain life in the arid environment of North Kona. Precontact peoples undoubtedly would have utilized this valuable resource to its fullest possible extent. Knowledge of the cave's location and value may have dwindled during Historic times as the *kamaʻāina* moved off the land and the old style of Hawaiian land management was replaced by a western style of land ownership. Use of the cave for water collection would have become obsolete as the Historic era progressed and new water collection and dispersal technology was brought to the island.

During Precontact times habitation areas may have been chosen in large part based on the availability of potable water. In middle-upland areas of North Kona where there was ample rain (especially during the summer months) and access to drinking water, such as the current project area, people would have built residences and cultivated crops such as sweet potato (Cordy et al. 1991:557). Cordy et al. (1991:558) suggest that the nature of habitation generally occurring within the elevational zone of the current project area was temporary, and perhaps recurrent. It seems logical that the use of these temporary habitations may have been seasonal and related to planting and harvesting times.

Three Precontact habitation sites were recorded within the current project area (Sites 24413, 24417, and 24420). Based on the excavation of TUs 1 and 2 at Site 24413, it appears that that platform functioned as a habitation feature before being converted to a burial feature. Site 24413 is located in the vicinity of Site 24420 (see Figure 16), and the area between and surrounding those two sites may have contained additional habitation features prior to mechanical land clearing on the study parcel. Several coral pieces and marine shell fragments were observed in a disturbed context on ground surface near these Precontact

habitation sites. It is also possible that Site 24414, a nearby Historic enclosure, is constructed of stones taken from earlier constructions. The excavation of TU-4 at Site 24417, a three-sided enclosure, revealed the presence of Precontact habitation debris. This site may have functioned in concert with the larger proposed habitation area in the vicinity of Sites 24413 and 24420, or as part of its own household.

The Precontact residents of these habitation features were likely involved in agricultural pursuits. Two sites remain on the subject parcel—a modified outcrop and two rock piles (Sites 24418 and 24421)—that are remnant of Precontact agriculture. In addition to this, Drolet and Schilz (1991) recorded sixteen sites in the *makai* portion of the current study parcel (see Appendix A) that were also related to Precontact agriculture. Unfortunately, these sites were all destroyed in 1994. The stepping-stone trail segment (Site 24419) recorded in the southwestern portion of the current study parcel may have accessed a network of trails that connected the people living and farming in this middle-upland area to other resource and habitation areas further *mauka* and *makai*.

The widespread mechanical clearing of the current study parcel that occurred in 1994 drastically altered the earlier cultural landscape of the property and made interpretation of connections between sites and features difficult. Earlier archaeological studies by Drolet and Schilz (1991) and Haun and Henry (2003), and historical research and oral interviews compiled by Rechtman and Maly (2003), along with fieldwork currently being conducted by Rechtman Consulting, LLC at two parcels adjacent to the current study parcel, overwhelmingly indicates that the project area was likely blanketed by Precontact agricultural features prior to the land clearing. However, the extent and type of these potential features can only be surmised based on the findings of these other studies.

SIGNIFICANCE EVALUATION AND TREATMENT RECOMMENDATIONS

The above-described archaeological resources are assessed for their significance based on criteria established and promoted by the DLNR-SHPD and contained in the Hawai‘i Administrative Rules 13§13-284-6. These significance evaluations should be considered as preliminary until DLNR-SHPD provides concurrence. For resources to be considered significant they must possess integrity of location, design, setting, materials, workmanship, feeling, and association and meet one or more of the following criteria:

A. Be associated with events that have made an important contribution to the broad patterns of our history;

B. Be associated with the lives of persons important in our past;

C. Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value;

D. Have yielded, or is likely to yield, information important for research on prehistory or history;

E. Have an important traditional cultural value to the native Hawaiian people or to another ethnic group of the state due to associations with traditional cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity.

The significance and recommended treatments for the recorded sites are discussed below and listed in Table 3.

Table 3. Site significance and treatment recommendations.

SIHP No.	*Function*	*Temporal Association*	*Significance*	*Recommended Treatment*
16106	Boundary	Historic	D	No further work*
16125	Boundary	Historic	D	No further work*
16126	Boundary	Historic	A, D	Preservation
24413	Burial	Precontact	D, E	Preservation
24414	Ranching	Historic	D	No further work
24415	Homesteading	Historic	D	No further work
24416	Ranching	Historic	D	No further work
24417	Habitation	Precontact	D	Data recovery
24418	Agriculture/clearing	Precontact	D	Data recovery
24419	Trail	Precontact	D	No further work
24420	Habitation	Precontact/Historic	D	Data recovery
24421	Agriculture/clearing	Precontact	D	No further work
24422	Homesteading	Historic	D	No further work
24423	Boundary	Historic	D	No further work
24424	Water collection	Precontact/Historic	D, E	Preservation

*Previously approved DLNR-SHPD treatment (Drolet and Schilz 1991).

Sites 16106, 16125, and 24423 are all Historic core-filled boundary walls that were likely constructed after 1913. These walls are considered significant under Criterion D for information they have yielded relative to 20th Century land use on the current study parcel. It is argued that research already conducted at these Historic sites has successfully mitigated any potential impacts resulting from the proposed development of the study parcel. Sites 16106 and 16125 have previously approved treatments from Drolet and Schilz (1991) of no further work. The authors of the current study concur with these treatment recommendations and, in accordance, recommend that treatment for Site 24423 also be no further work.

Site 16126, the northern boundary wall of the current study parcel, is also a portion of the southern boundary wall of a Historic ‘O‘oma Homestead road. Although this wall was likely constructed at the same time as the other boundary walls and for a similar purpose, it is considered significant under Criterion A and D because of its dual function of marking the property boundary and lining the Historic roadway. Although Drolet and Schilz (1991) had previously recommended that no further work be conducted at this site, the authors of the current study feel that its association with a potential public right-of-way makes it a good candidate for preservation.

Sites 24414, 24415, 24416, and 24422 are all Historic sites present within the boundaries of the current study parcel. These sites are all considered significant under Criterion D for information they have yielded relative to past land use on the property. It is argued that the information collected during the current study at these Historic sites has successfully mitigated any potential impacts resulting from the proposed development of the study parcel. No further work is the recommended treatment for Sites 24414, 24415, 24416, and 24422.

Site 24413 is a Precontact burial platform containing a slab-lined crypt with articulated human skeletal remains. It appears that this site was used originally for Precontact habitation purposes. Site 24413 is considered significant under Criterion D and E and recommended for preservation. A search for lineal and cultural descendants should be undertaken and a burial treatment plan should be prepared in consultation with any identified descendants and the Hawai‘i Island Burial Council.

Sites 24417, 24418, and 24420 all appear to have been utilized primarily during the Precontact Period. Based on information collected during the current study, Sites 24417 and 24420 seem to have functioned as habitation sites and Site 24418 seems to have served an agricultural purpose. These sites are considered significant under Criterion D for information they have yielded, and are likely to yield, relative to

Precontact life ways on the study parcel. As these sites still retain the potential for further data collection, they are recommended for data recovery. A data recovery plan should be prepared in consultation with DLNR-SHPD.

Sites 24419 and 24421 also appear to be associated with the Precontact use of the current study parcel. Site 24419 is a stepping-stone trail segment and Site 24421 consists of two small rock piles. Both sites are considered significant under Criterion D for information they have yielded relative to Precontact life ways on the study parcel, but are recommended for no further work as widespread mechanical clearing has drastically altered their integrity of setting and limited the potential for any further data collection.

Site 24424 consists of a large lava tube that appears to have been utilized nearly exclusively for water collection purposes. This deep and massive lava tube does not have an entrance on the current project area, but the *mauka* portion of the lava tube runs beneath the study parcel. Site 24424 is considered significant under Criterion D and E because of its association with water collection. The subsurface portion of this tube that runs beneath the current project area is recommended for preservation. A preservation plan should be prepared for Site 24424 (and Site 16126) in consultation with DLNR-SHPD.

REFERENCES CITED

ACHP (Advisory Council on Historic Preservation)
1985 Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review. Draft Report. Advisory Council on Historic Preservation. Washington, D.C.

Armstrong, R. (editor)
1983 *Atlas of Hawaii*. Honolulu: University of Hawaii Press. (Second edition)

Barrera, W., Jr.
1991 Kohanaiki, North Kona, Hawaii Island: Archaeological Inventory Survey and Data Recovery. Chiniago Inc. Prepared for Richard M. Sato and Associates, Honolulu.

Beckwith, M.
1970 *Hawaiian Mythology*. Honolulu: University of Hawaii Press.

Char, W.
1991 Botanical Survey of Honokohau 1 and 2, North Kona District, Island of Hawaii. Prepared for Lanihau Partners, LP.

Cordy, R.
1981 *A Study of Prehistoric Social Change: The Development of Complex Societies in the Hawaiian Islands*. New York: Academic Press.

1986 Fieldcheck of Ooma II Barrera Study. Ms. On file Historic Sites Section DLNR-State Parks.

2000 *Exalted Sits the Chief. The Ancient History of Hawai‘i Island*. Mutual Publishing: Honolulu, Hawai‘i.

Cordy, R., J. Tainter, R. Renger, and R. Hitchcock
1991 An Ahupua‘a Study: The 1971 Archaeological Work at Kaloko *Ahupua‘a*, North Kona, Island of Hawai‘i. *Western Archaeological and Conservation Center Publications in Anthropology* 58. Prepared for the National Park Service, U.S. Department of the Interior.

Drolet, R. and A. Schilz
1991 Final Report Archaeological Inventory Survey O‘oma 2 North Kona, Hawai‘i Island. Ogden Environmental and Energy Services Co.,Inc. Prepared for Helber Hastert & Fee, Honolulu.

Ellis, W.
1963 *Journal of William Ellis*. Honolulu: Advertiser Publishing Co., Ltd.

Emerson, J.S.
1892 “The Lesser Hawaiian Gods.” In Second Annual Report of the Hawaiian Historical Society for the Year 1892, pp. 1-24. Honolulu, Hawaii.

Fornander, A.
1916-1919 Fornander Collection of Hawaiian Antiquities and Folklore. (9 vols.). Honolulu: Bishop Museum Press.

1959 *Selections from Fornander’s Hawaiian Antiquities and Folk-Lore*. S.H. Elbert, editor. The University Press of Hawaii.

1973 *An Account of the Polynesian Race: Its Origin and Migrations*. Tokyo: Charles E. Tuttle Co., Inc.

1996 *Ancient History of the Hawaiian People*. Mutual Publishing, Australia.

Handy, E., E. Handy, with M. Pukui
1972 Native Planters in Old Hawaii, Their Life, Lore, and Environment. *B.P. Bishop Museum Bulletin 233*. B.P. Bishop Museum Press.

Haun, A., and D. Henry
2003 Archaeological Inventory Survey TMK:7-3-7:40 and 41, Land of Oʻoma 1, North Kona District, Island of Hawaii. Prepared for Mr. Sidney Fuke.

Iʻi, J.
1959 Fragments of Hawaiian History. Honolulu: Bishop Museum Press.

Kamakau, S.
1961 Ruling Chiefs of Hawaii. Honolulu: Kamehameha Schools Press.

1964 *Ka Poʻe Kahiko*: The People of Old. *B.P. Bishop Museum Special Publication* 51. Bishop Museum Press, Honolulu.

1976 The Works of the People of Old. *B.P. Bishop Museum Special Publication* 61. Bishop Museum Press, Honolulu.

1991 Tales and Traditions of the People of Old, Nā Moʻolelo a ka Poʻe Kahiko. Bishop Museum Press, Honolulu.

Kelly, M.
1983 *Na Mala O Kona*: Gardens of Kona. A History of Land Use in Kona, Hawaiʻi. Departmental Report Series 83-2. Department of Anthropology, B.P. Bishop Museum, Honolulu. Prepared for the Department of Transportation, State of Hawaii.

Maguire, E.
1926 Kona Legends. Honolulu: Paradise of the Pacific Press.

Malo, D.
1951 Hawaiian Antiquities. Honolulu, B.P. Bishop Museum.

Maly, K. (translator)
ms. "*Mai Kailua a hiki i Kiholo.*" J.P. Puuokupa, in *Ku Okoa* November 27, 1875.

ms. "*Kaao Hooniua Puuwai no Ka-Miki.*" J.W.H.I. Kihe, in *Ka Hoku o Hawaiʻi*, January 8, 1914 - December 6, 1917.

ms. "*Ka Punawai o Wawaloli.*" J.W.H.I. Kihe, in *Ka Hoku o Hawaiʻi*, September 23rd, October 4th & 11th, 1923.

ms. "Na Hoomanao o ka Manawa." J.W.H. Isaac Kihe, in *Ka Hoku o Hawaii*, June 5th & 12th 1924.

ms. "Ka Loko o Paaiea." J.W.H. Isaac Kihe, in *Ka Hoku o Hawaii*, February 5-26, 1914 and May 1-15, 1924.

ms. "Ko Keoni Kaelemakule Moolelo Ponoi." J.W.H. Isaac Kihe, in *Ka Hoku o Hawaii*, Sept. 17 & 24, & Oct. 1, 1929.

McEldowney, H.
1979 Archaeological and Historical Literature Search and Research Design: Lava Flow Control Study, Hilo, Hawai‘i. BPBM Report, Honolulu.

Pukui, M. and A. Korn
1973 *The Echo of Our Song. Chants and Poems of the Hawaiians*. Honolulu: University Press of Hawaii.

Rechtman, R., and K. Maly
2003 Cultural Impact Assessment for the Proposed Development of TMK:3-7-3-9:22, ‘O‘oma 2nd Ahupua‘a, North Kona District, Island of Hawai‘i, Volume I and II. Rechtman Consulting Report RC-0154. Prepared for Helber Hastert & Fee, Honolulu, Hawai‘i.

Reinecke, J.
n.d. Survey of Hawaiian Sites, 1929-1930. Manuscript in Department of Anthropology, B.P. Bishop Museum, Honolulu.

Rosendahl, M.
1989 Archaeological Inventory Survey, Kohana-Iki Resort Water Development Project Area, Land of Ooma 2nd, District of North Kona, Island of Hawaii. PHRI Report 477-011589. Prepared for M & E Pacific, Inc.

Stokes, J., and T. Dye
1991 *Heiau* of the Island of Hawai‘i. *Bishop Museum Bulletin in Anthropology* 2. Bishop Museum Press, Honolulu.

Tatar, E.
1982 Nineteenth Century Hawaiian Chant. *Pacific Anthropological Records No. 33*. Department of Anthropology, B.P. Bishop Museum, Honolulu.

Thrum, T.
1908 Heiaus and Heiau Site Throughout the Hawaiian Islands. Island of Hawaii. Hawaiian Almanac and Annual 1909:38-47. Honolulu.

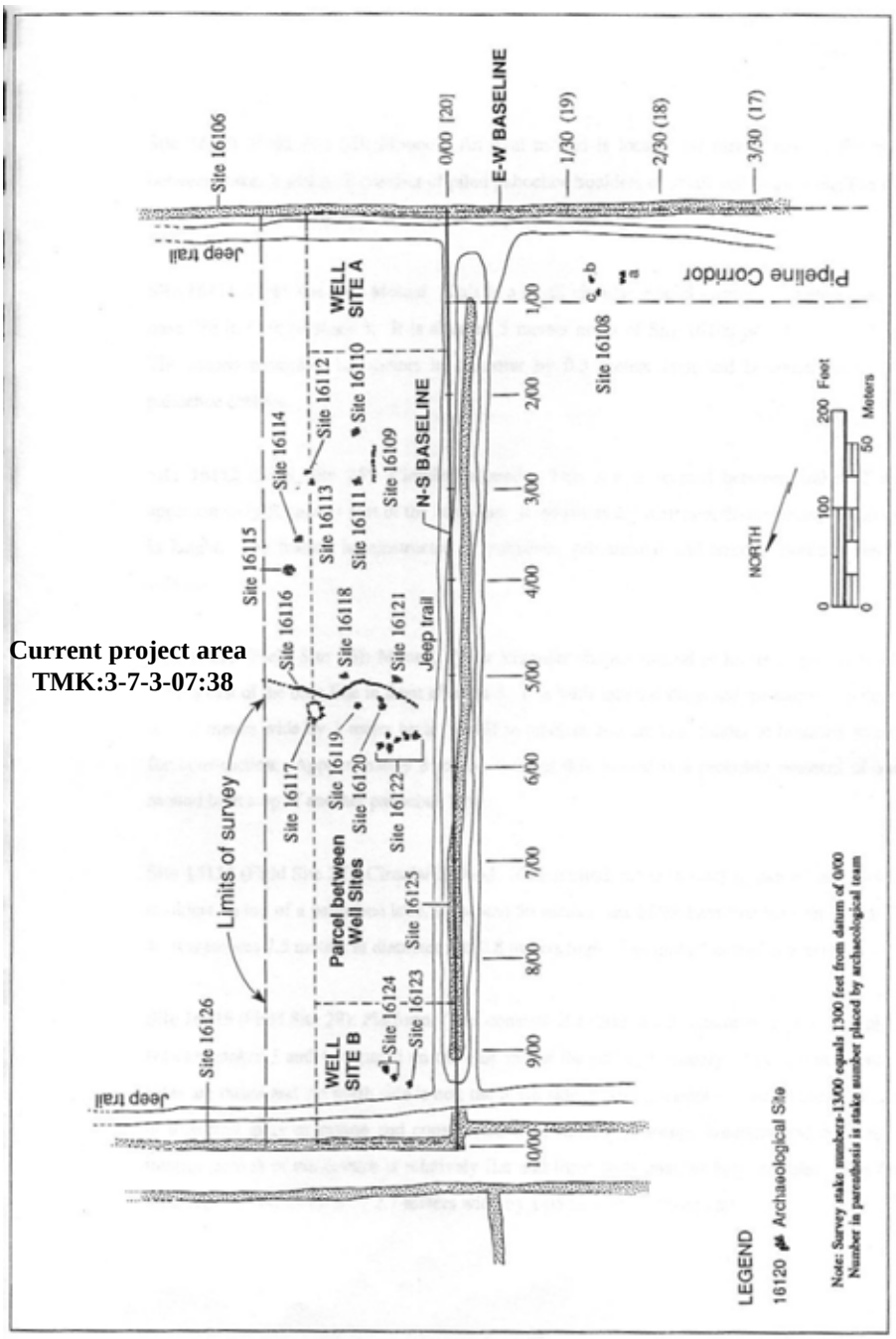
Tomonari-Tuggle, M.
1985 Cultural Resource Management Plan, Cultural Resource Management at the Keauhou Resort. PHRI Report 89-060185. Prepared for Kamehameha Investment Corp.

Walker, A. and P. Rosendahl
1990 Archaeological Inventory Survey, Phase I—Site Identification, Ooma-2 Water System Development Project Area, TMK:7-3-09:5, Land of Ooma 2nd, North Kona District, Island of Hawaii. PHRI Report 802-043090. Prepared for Nansay Hawaii, Inc.

Wolfe, E., and J. Morris
1996 Geological Map of the Island of Hawaii. U.S. Department of the Interior, U.S. Geological Survey.

APPENDIX A –

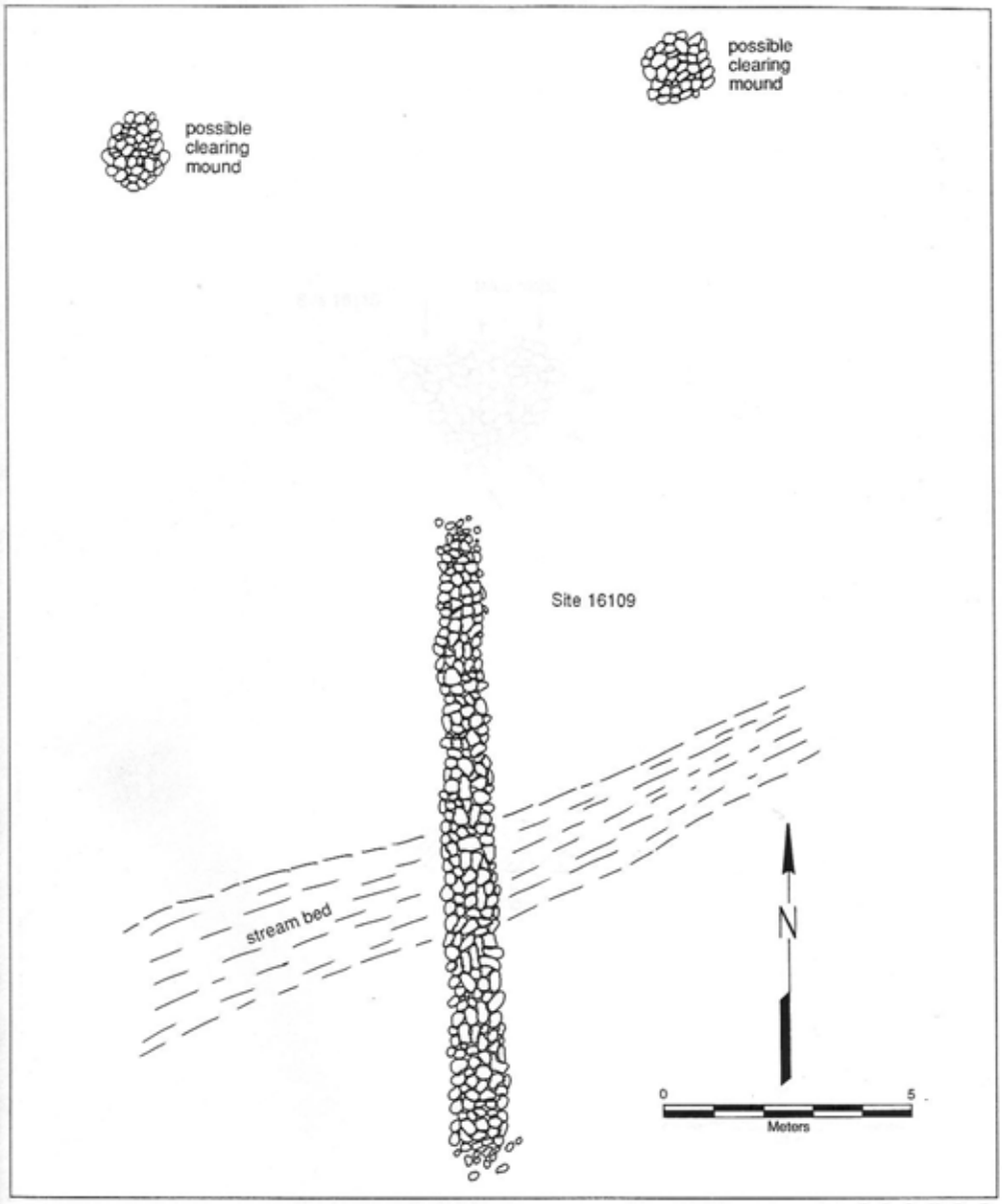
Map and descriptions of archaeological sites previously recorded on the current study parcel by Drolet and Schilz (1991).



Portion of the project area map from Drolet and Schilz (1991:25) showing the *makai* portion of the current study area.

Site 16106 (Field Site 15): Wall. This single feature site feature extends from the upper eastern 1/3 of the corridor and continues outside of the land unit. The first 20 meters has been severely damaged, but it retains much of its original shape. The wall was constructed of stacked pahoehoe cobbles and boulders, and in the well preserved sections, measures 1 meter wide by 0.75m. high.

Site 16109 (Field Site 22): Retaining Wall. This feature is located 25 meters east from the base line between stakes 2 and 3. The wall is oriented north/south and constructed with stacked pahoehoe stone. It measures 12 meters long, 1 meter wide and from 0.4 to 0.6 meters high; it contains 3 to 4 stone courses. The wall crosses perpendicular to a small, dry stream bed and is associated with two possible clearing mounds located 10 meters to the north. The mounds are irregular and small, and may have been naturally formed by erosion along the slope.



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RETAINING WALL, SITE 16109
O'OMA 2

FIGURE
A1

Site 16110 (Field Site 23): Mound. An oval mound is located 30 meters east of the baseline between stakes 2 and 3. It consists of piled pahoehoe boulders of small and large size. The mound measures 3 meters long by 2.5 meters wide by 0.3 meters high.

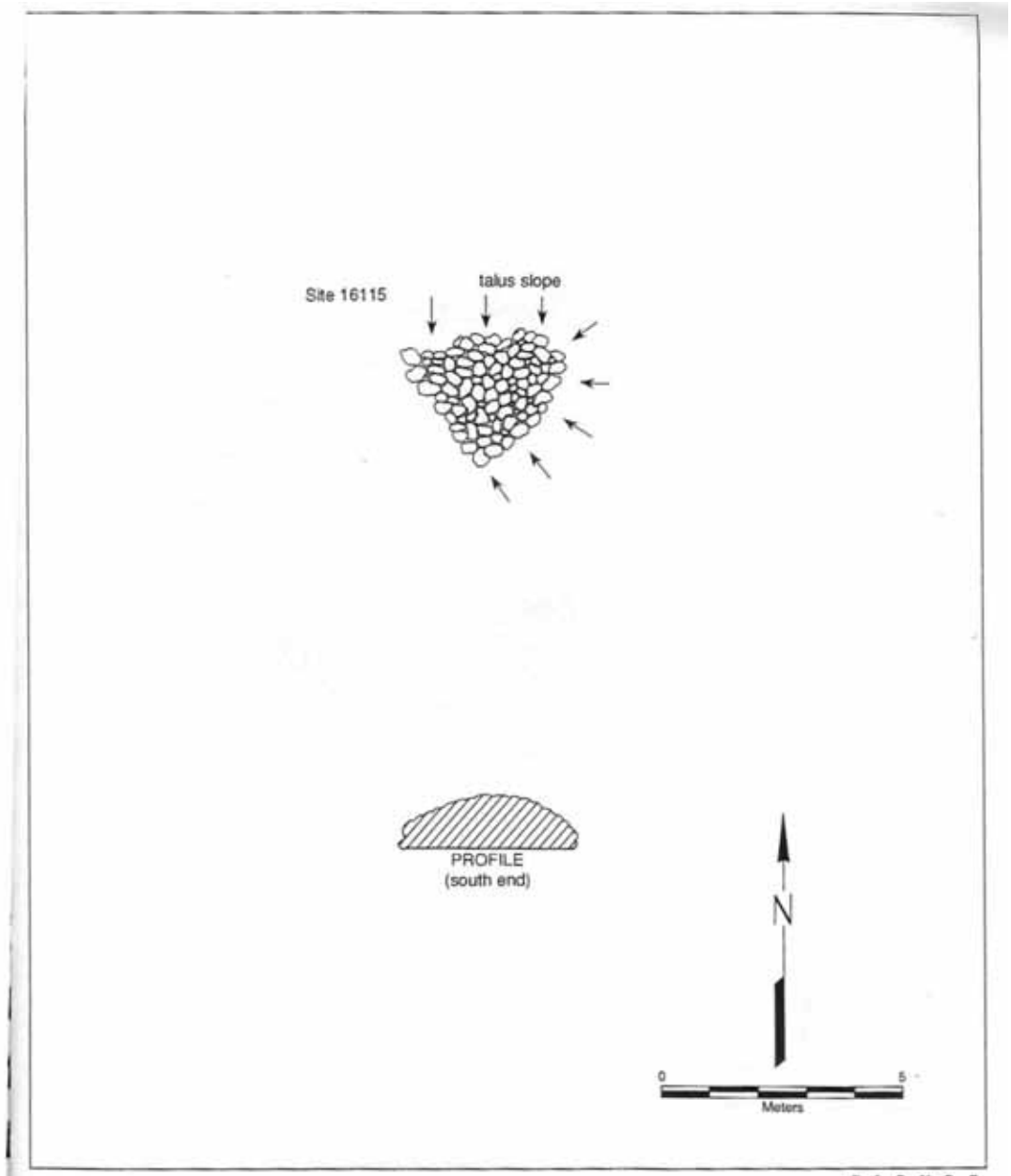
Site 16111 (Field Site 24): Mound. This is a small circular mound located 30 meters east of the base line in front of stake 3. It is situated 5 meters north of Site 16109 at a 60 degree bearing. The mound measures 1.5 meters in diameter by 0.3 meters high and is constructed of piled pahoehoe cobbles.

Site 16112 (Field Site 25): Circular Mound. This site is located between stakes 2 and 3, approximately 50 meters east of the base line. It measures 2.5 meters in diameter and is 0.6 meters in height. The feature is constructed of pahoehoe sub-angular and angular boulders and large cobbles.

Site 16113 (Field Site 26): Mound. This irregular shaped mound is located approximately 50 meters east of the base line in front of stake 3. It is built into the slope and measures 2 meters long by 1.5 meters wide by 1 meter high. Small to medium sub-angular pahoehoe boulders were used for construction. Approximately 8 meters west of this mound is a probable remnant of another mound built atop of another pahoehoe lobe.

Site 16114 (Field Site 27): Circular Mound. This mound, made of stacked pahoehoe cobbles and boulders on top of a pahoehoe lobe, is located 50 meters east of the base line between stakes 3 and 4. It measures 2.5 meters in diameter and 0.8 meters high. The mound is well preserved.

Site 16115 (Field Site 28): Platform. This consists of a three sided, square-shaped, raised platform between stakes 3 and 4, situated on the east end of the survey boundary. The southeast and west sides are raised and the north side is not; the north side is built adjacent to talus slope. It is situated in a natural gully or ravine and constructed with stacked pahoehoe boulders and cobbles. The interior portion of the feature is relatively flat and filled with small to large cobbles. The feature measures 3.5 meters long by 2.7 meters wide by 1.05 high at the south end.



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PLATFORM, SITE 16115
O`OMA 2

FIGURE
A2

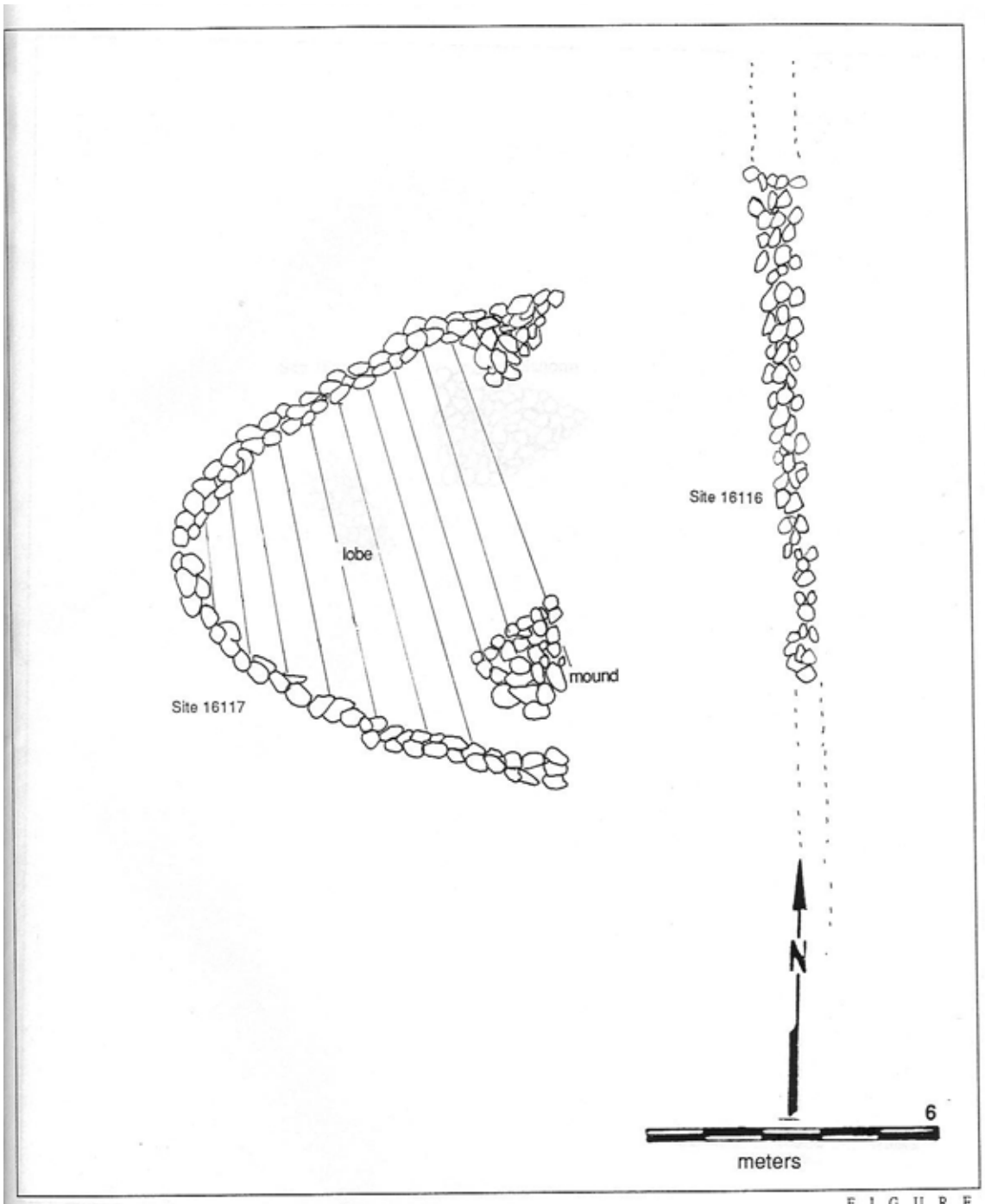
Site 16116 (Field Site 29): Wall. This feature is oriented east/west (*mauka-makai*) and constructed of pahoehoe boulders and cobbles. Although collapsed in many places, it reaches a maximum height of 1 meter and width of between 1 and 2 meters. An overall length for the wall was not determined, although it begins at the road cut, 12 meters east of the baseline, and continues at least twenty meters beyond the eastern boundary of the survey unit. The wall is located between stakes 5 and 6.

Site 16117 (Field Site 32): Enclosure. This feature is located approximately 50 meters from the base line between stakes 5 and 6. The site incorporates a pahoehoe lobe and is built with small to large boulders stacked at the edge of the lobe. Much of the feature has collapsed. It measures 10 meters long by 8 meters wide by 0.5 meters high. The western alignment is one course high and there is an internal feature in the southeastern corner. Site 16116 is located approximately 4 meters to the east, and approximately 10 meters to the west there is stone rubble, perhaps the remains of collapsed features. These disturbed stone concentrations are too poorly defined to be classified as cultural features.

Site 16118 (Field Site 33): Mound. This irregular shaped feature measures 4 meters long by 2.5 meters wide by 0.4 meters high. It is constructed of piled pahoehoe boulders and cobbles. The mound is located between stakes 5 and 6, 5 meters south of Site 16116, and 42 meters east of the baseline.

Site 16119 (Field Site 34): Platform and Mound. This site consists of a triangular shaped platform with an associated mound. It is located approximately 33 meters east of the base line between stakes 5 and 6. The platform is constructed with stacked pahoehoe cobbles and boulders with a relatively flat interior portion. The apex to the bottom measures 3 meters long, the width at bottom is 2 meters, and the height on the east side is 0.4 meters. The mound is located approximately 1.5 meters southwest of the platform and measures 2.5 meters long by 1 meter wide by 0.4 meters high. It is constructed of piled pahoehoe cobbles and boulders.

Site 16120 (Field Site 35): Circular Mound. This feature is located between stakes 5 and 6, two meters north of Site 16116, and 25 meters from the base line. It consists of piled pahoehoe cobbles and boulders and measures 7 meters long by 5 meters wide by 0.4 meters high.



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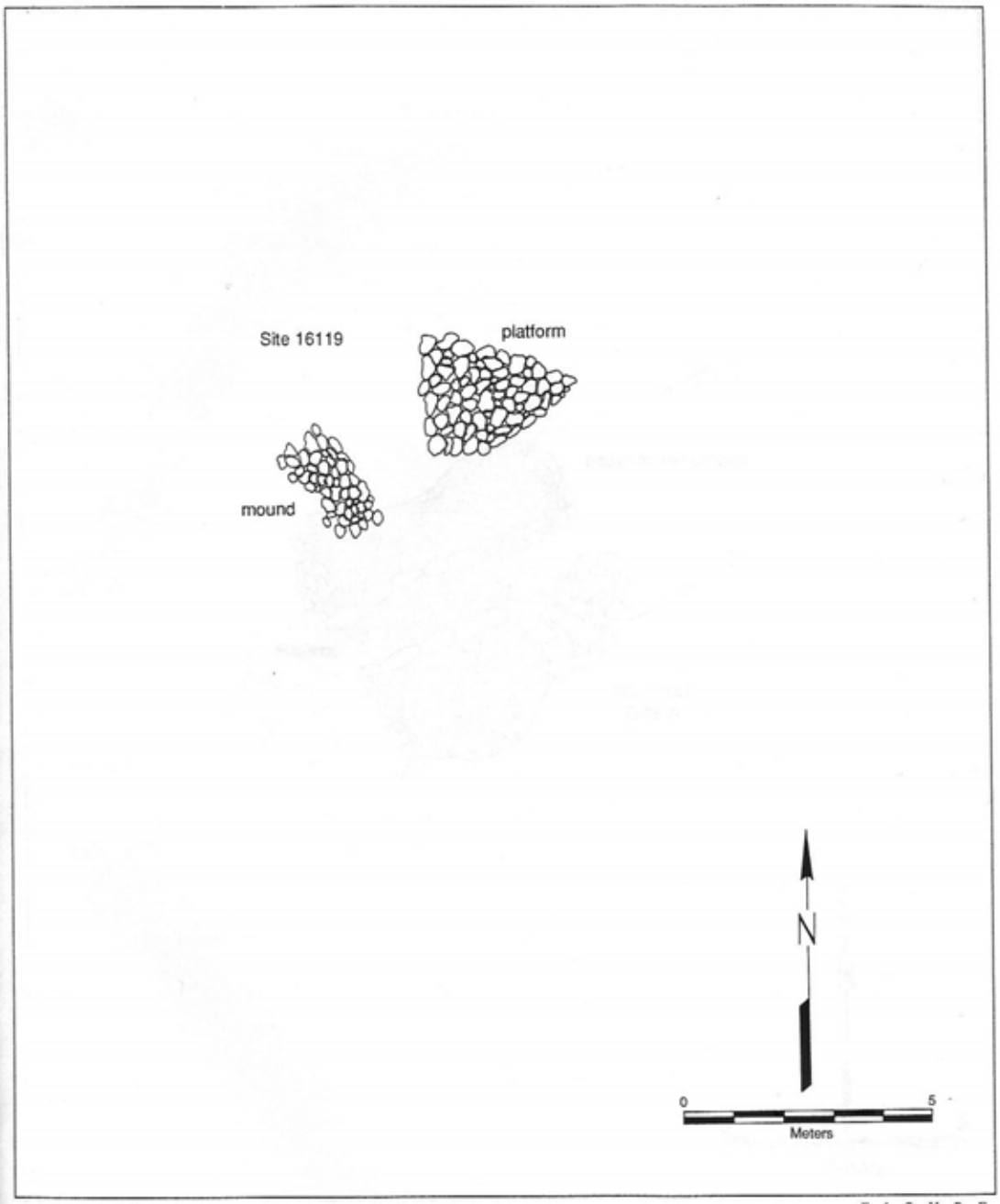
ENCLOSURE AND CIRCULAR MOUND (SITE 16117), WALL (SITE 16116)

FIGURE A3



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PLATFORM AND MOUND, SITE 16119
O`OMA 2

FIGURE
A4

Site 16121 (Field Site 36): Circular Mound: This feature is located between stakes 4 and 5, 25 meters from the base line, and 5 meters south of Site 16116. It measures 5 meters in diameter and 0.8 meters high. Like most other sites here it was constructed of pahoehoe cobbles and boulders.

Site 16122 (Field Site 37): Mound Cluster: This cluster contains six mounds situated along the western end of parcel, between stakes 5 and 6. The entire cluster is situated in an area measuring 15 by 8 meters and is located 12 to 27 meters east of the base line.

Mound A: This is an irregular shaped mound made of pahoehoe cobbles and boulders and constructed along a pahoehoe lobe. It measures 2 meters long by 1 meter wide by 0.3 meters high.

Mound B: This oval shaped mound is located 2 meters south of Mound A. It is built with piled pahoehoe cobbles and boulders and measures 3.5 meters long by 1 meter wide by 0.4 meters high.

Mound C: This is a linear shaped mound located 2 meters southwest of Mound A. It is constructed similar to the others and measures 8 meters long by 1.25 meters wide by 0.3-0.4 meters high.

Mound D: This irregular shaped mound of similar construction is located 2 meters west of Mound C. It measures 3 meters by 1 meter by 0.4 meters high.

Mound E: Another small, circular mound is located 2 meters west of Mound D. It contains piled boulders and cobbles and measures 1.1 meters in diameter and 0.3 meters high.

Mound F: This mound is linear in shape and made of piled boulders and cobbles. It is located 5 meters west of Mound E, at the northwestern end of the survey parcel. It has a north/south alignment. The feature is situated near stake 6, 12 meters from the jeep road and 20 meters from the baseline. The feature measures 2 meters long by 0.6 meters wide by 0.3 meters high.

Site 16123 (Field Site 30): Circular Mound. This mound contains small to large a'a piled cobbles. It measures 1 meter long by 1.5 meters wide by 0.5 meters high. The feature is located 17 meters east of the baseline and 20 meters south of the northern boundary of the survey unit.

Site 16124 (Field Site 31): Linear Mound. This mound contains both a mound feature and an associated modified outcrop placed 8.5 meters to the southeast of the mound. The mound measures 3.5 meters in length, 1 meter wide, and between 0.5 and 0.6 meters high. It is constructed with small to large piled cobbles and some larger boulders. Both the mound and modified outcrop contain *a`a* stone. The site is located 30 meters east of the base line and 30 meters south of the northern boundary of the survey unit.

Site 16125 (Field Site 43): Wall. This is an historic feature, consisting of one of several local property markers constructed during the 1920's and 1930's in this section of the O`oma 2 *ahupua`a*. In relationship to the baseline and jeep trail that parallel the Well Sites A and B, the wall extends approximately 900 feet (270 meters). Originally, the wall connected with two others, Site 16106 on the southern side and Site 16126 on the northern side. Owing to the construction of jeep trails on both the northern and southern side of the property area, the wall has been cut open on each side. Along the north/south baseline, at stake 1 the wall is 7 meters to the west (*makai*) of the baseline. At stake 5 the wall is located 2 meters to the west (*makai*) and at stake 6 it is 1 meter to the west (*makai*). At stake 7 the wall coincides with the baseline and continues until the last stake, stake 10.

Between stakes 9 and 10, the wall has been disturbed by the east-west (*mauka-makai*) jeep trail. Jeep trails, situated only a few meters away, border both sides of Wall 16125. The wall is fairly well preserved, but collapsed in spots. It ranges from 0.3 to 0.80 meters in height and from 0.7 meters to 1 meter wide.

Site 16126 (Field Site 44): Wall. This historic property marker runs perpendicular to, and was originally attached to Site 16125. It is located at stake 10 the final stake along the north/south base line. This stake is the northwest corner of Well Site A. Wall 16126 measures 1 meter high

and 0.8 meters wide. It extends to Site 5699 (Rosendahl 1989) and in its eastern extension, runs several hundred meters to the top of the Lee property line and entry gate. At stake 10 the wall makes a 90 degree turn north for 2 meters, then makes another 90 degree turn east (*mauka*) and continues this direction up the slope. Four meters to the north of Site 16126 there is another stone fence, this is outside the survey limits. One branch parallels Site 16126 up hill to the property gate. Another branch continues parallel to Site 16126 going west (*makai*) and still another branches 90 degrees north from this second wall. Thus, along the northern boundary line of the Lee property, a double stone wall fence was built as part of a larger network of property lines and ranch fences in the local area. The double wall structure may be older than the others and possibly functioned as an access trail through the slope zone during historic times.