

ENVIRONMENTAL ASSESSMENT
YAMADA AND SONS ROCK QUARRY

APPENDIX 2
Archaeological Report

[This page intentionally left blank]

An Archaeological Assessment of a Proposed 37.882-Acre Yamada Quarry Site

TMK: (3) 2-1-013:002 (por.)

Waiākea Ahupua‘a
South Hilo District
Island of Hawai‘i

DRAFT VERSION



Prepared By:

Lauren Kepa‘a
and
Matthew R. Clark, M.A.

Prepared For:

Ron Terry
Geometrician Associates, LLC
P.O. Box 396
Hilo, HI, 96720

September 2019



Archaeology • History • Anthropology • Architectural History

Hilo Office: (808) 969-6066 Fax: (808) 443-0065
507-A E. Lanikaia Street, Hilo, HI 96720

Honolulu Office: (808) 439-8089 Fax: (808) 439-8087
820 Māilani Street, Suite 700, Honolulu, HI 96813

ASM Project Number 32490.00

An Archaeological Assessment of a Proposed 37.882-Acre Yamada Quarry Site

TMK: (3) 2-1-013:002 (por.)

Waiākea Ahupua‘a
South Hilo District
Island of Hawai‘i



EXECUTIVE SUMMARY

At the request of Ron Terry of Geometrician Associates, LLC, on behalf of Yamada & Sons, Inc., ASM Affiliates (ASM) conducted an Archaeological Inventory Survey (AIS) of a proposed quarry and stockpiling site located within Waiākea Ahupuaʻa, South Hilo District, Island of Hawaiʻi. The current study was undertaken in accordance with Hawaiʻi Administrative Rules 13§13–284, and was performed in compliance with the Rules Governing Minimal Standards for Archaeological Inventory Surveys and Reports as contained in Hawaiʻi Administrative Rules 13§13–276. Compliance with the above standards is sufficient for meeting the historic preservation review process requirements of both the DLNR–SHPD and the County of Hawaiʻi Planning Department. According to 13§13-284-5(b)(5)(A) when no archaeological resources are discovered during an AIS, the results of the AIS shall be reported through an Archaeological Assessment. This report contains background information outlining the study area’s physical and cultural contexts, a presentation of previous archaeological work conducted in the vicinity of the study area, and current survey expectations based on that previous work. Also presented are an explanation of the project’s methods and a description of the findings, followed by recommendations and a determination of effect for the proposed project.

Fieldwork for the current study was conducted on April 23, and July 9, 12, and 23, 2019 by ʻIolani K. Kaʻuhane, B.A., Lauren Kepaʻa, Lyle Auld, B.A., Johnny Dudoit, B.A., Ivana Hall, B.A., and Genevieve Glennon, B.A., under the direction of Matthew R. Clark, M.A. (Principal Investigator). Fieldwork consisted of an intensive (100% coverage) pedestrian survey of the entire study area. No archaeological sites or other historic properties of any kind were identified within the study area, and field observations of past ground disturbance, combined with the results of prior studies conducted in the area, indicate that subsurface archaeological resources are unlikely to be encountered in the area proposed for quarry development and expansion. Given the negative findings of the current study with respect to archaeological resources, it is concluded that the Yamada & Sons, Inc. quarry and stockpiling project will not impact any known historic properties. The determination of effect for the proposed project is “no historic properties affected.” With respect to the historic preservation review process of the DLNR-SHPD, our recommendation is that no further work needs to be conducted within the Yamada & Sons, Inc. proposed quarry and stockpiling site prior to or during project implementation. In the unlikely event that any unanticipated archaeological resources are unearthed during development activities, work in the immediate vicinity of the finds will be halted and DLNR-SHPD contacted in compliance with HAR 13§13-280-3.

CHAPTERS

| | Page |
|--------------------------------------------------------------------------------------------------------------------------|-------------|
| 1. INTRODUCTION | 1 |
| STUDY AREA DESCRIPTION | 6 |
| 2. BACKGROUND | 15 |
| CULTURE-HISTORICAL CONTEXT | 15 |
| A Generalized Model of Hawaiian Prehistory | 16 |
| History After Contact | 19 |
| Waiākea 1820-1848: A Land in Transition and Early Historical Accounts..... | 22 |
| The Legacy of the <i>Māhele 'Āina</i> of 1848..... | 24 |
| Commercial Sugar Enterprises in Waiākea, Railroad Development, and Later Historic Accounts | 26 |
| The <i>Tsunami</i> of 1946 and 1960 and the Lands of the Current Study Area During the 20 th Century | 33 |
| PREVIOUS ARCHAEOLOGICAL STUDIES | 36 |
| 3. STUDY AREA EXPECTATIONS..... | 40 |
| 4. FIELDWORK..... | 41 |
| FINDINGS | 41 |
| 5. DETERMINATION OF EFFECT..... | 41 |
| 4. FIELDWORK AND 5. DETERMINATION OF EFFECT..... | 41 |
| REFERENCES CITED..... | 42 |

FIGURES

| | Page |
|------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 1. Study area location..... | 2 |
| 2. Tax Map Key (TMK) (3) 2-1-013 showing location of the current study area (portion of Parcel 002)..... | 3 |
| 3. Google Earth TM satellite image showing the current study area | 4 |
| 4. Map of the proposed quarry and stockpiling site..... | 5 |
| 5. Pana'ewa Drag Strip road with entrance to study area pictured on left, view to the northeast..... | 7 |
| 6. Paved roadway leading into study area from the Pana'ewa Drag Strip road, view to the southeast. | 7 |
| 7. Berm extending along eastern edge of paved roadway that bisects the southern half of study area, view to the southwest..... | 8 |
| 8. Existing quarry site on Parcel D, view to the north with the current study area visible in the background (at the tree line). | 8 |
| 9. Boundary marker at the northeastern corner of the existing quarry site (Parcel D), view to the southeast. | 9 |
| 10. Graded area in the northeastern portion of study area, view to the east. | 9 |
| 11. Modern corrugated aluminum storage sheds and equipment in northeastern corner of study area, view to the northeast. | 10 |

| | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 12. Road accessing the northeastern portion of the study area, view to the east. | 10 |
| 13. Bulldozer cut in eastern portion of study area, view to the northwest. | 11 |
| 14. Typical bulldozer berm within the study area, view to the northeast. | 11 |
| 15. Modern rubbish pile of glass bottles, overview. | 12 |
| 16. Accumulation of modern rubbish in the northeastern corner of study area, view to the southwest. | 12 |
| 17. Geology in the vicinity of the current study area. | 13 |
| 18. Soils in the vicinity of the current study area. | 13 |
| 19. Typical vegetation in previously disturbed portions of the study area, view to the east. | 14 |
| 20. Typical vegetation pattern within the more minimally disturbed, southeastern portion of the study area, view to the northeast. | 14 |
| 21. Portion of a 1901 Hawai‘i Territory Survey Map showing the location of the study area within Waiākea Ahupua‘a (shaded blue) and the South Hilo District. | 16 |
| 22. Portion of 1851 Hawai‘i Registered Map No. 705 by W.M. Webster showing the eastern portion of Waiākea and study area location (outlined in red) relative to the bounds of the Pana‘ewa forest. | 27 |
| 23. Portion of Hawai‘i Registered Map No. 571 by C.J. Lyons (ca. 1870s) of “Central Hawaii Hilo and Hamakua” showing the “Road to Puna” in relation to the current study area within the Pana‘ewa forest and the current study area. | 28 |
| 24. Portion of undated Hawai‘i Registered Map No. 842 by Lyons and Covington of showing “Lands of Hilo Hawaii” showing Hilo Bay and Waiākea Mill in relation to study area (outlined in red). | 29 |
| 25. Portion of Hawai‘i Registered Map No. 1713 from 1893 by E.D. Baldwin showing the northern extent of the Pana‘ewa Woods and approximate location of the study area (outlined in red). | 30 |
| 26. Portion of 1917 USGS Hilo quadrangle map showing current study area (outlined in red) in relation to the “Puna Trail” alignment, Hilo railroad, and Waiākea Mill. | 31 |
| 27. Hawai‘i Consolidated Railway Map of rail system as of November 1923 (Annual Report 1926). | 32 |
| 28. Portion of Hawai‘i Territory Survey plat No. 787 by Jos. Iao ca. May 1920 showing study area (outlined in red) in relation to the Hilo Railroad, Puna Trail, Waiākea House Lots, and Waiākea Mill. | 32 |
| 29. Aftermath from the 1946 tsunami with Waiakea Mill standing near back of Waiākea fishpond, study area vicinity in background (Hawaii Tribune-Herald 2017). | 33 |
| 30. January 16, 1965 USGS aerial photo showing quarry intruding into northern portion of study area (outlined in red). | 34 |
| 31. Portion of a 1977 orthophotoquad showing quarry expansion and network of quarry roads within study area (outlined in red). | 35 |
| 32. Portion of a September 23, 1992 USGS aerial photo showing active quarry site in relation to current study area (outlined in red). | 35 |
| 33. Previous archaeological studies conducted in the vicinity of the current study area. | 38 |

TABLES

| | Page |
|----------------------------------------------------------------------------------------------|-------------|
| 1. Previous archaeological studies conducted in the vicinity of the current study area. | 36 |

1. INTRODUCTION

At the request of Ron Terry of Geometrician Associates, LLC, on behalf of Yamada & Sons, Inc., ASM Affiliates (ASM) conducted an Archaeological Inventory Survey (AIS) of a proposed quarry and stockpiling site located within Waiākea Ahupuaʻa, South Hilo District, Island of Hawaiʻi (Figure 1). The study area comprises a 37.882-acre, T-shaped portion of Tax Map Key (TMK): (3) 2-1-013:002, a 2,407.756-acre, agriculturally-zoned parcel that is owned by the State of Hawaiʻi and leased to the United States Department of Transportation (Figure 2). The proposed quarry site is located adjacent to (northeast of) the existing Yamada quarry (Figures 3 and 4), which was previously the subject of an archaeological field inspection conducted by Rechtman (2006). That adjacent field inspection did not identify any cultural resources, and resulted in a determination of “no historic properties affected” for the existing quarry site by the Department of Land and Natural Resources–State Historic Preservation Division (DLNR–SHPD).

The current study was undertaken in accordance with Hawaiʻi Administrative Rules 13§13–284, and was performed in compliance with the Rules Governing Minimal Standards for Archaeological Inventory Surveys and Reports as contained in Hawaiʻi Administrative Rules 13§13–276. Compliance with the above standards is sufficient for meeting the historic preservation review process requirements of both the DLNR–SHPD and the County of Hawaiʻi Planning Department. According to 13§13-284-5(b)(5)(A) when no archaeological resources are discovered during an AIS, the results of the AIS shall be reported through an Archaeological Assessment. This report contains background information outlining the study area’s physical and cultural contexts, a presentation of previous archaeological work conducted in the vicinity of the study area, and current survey expectations based on that previous work. Also presented are an explanation of the project’s methods and a description of the findings, followed by recommendations and a determination of effect for the proposed project.

1. Introduction

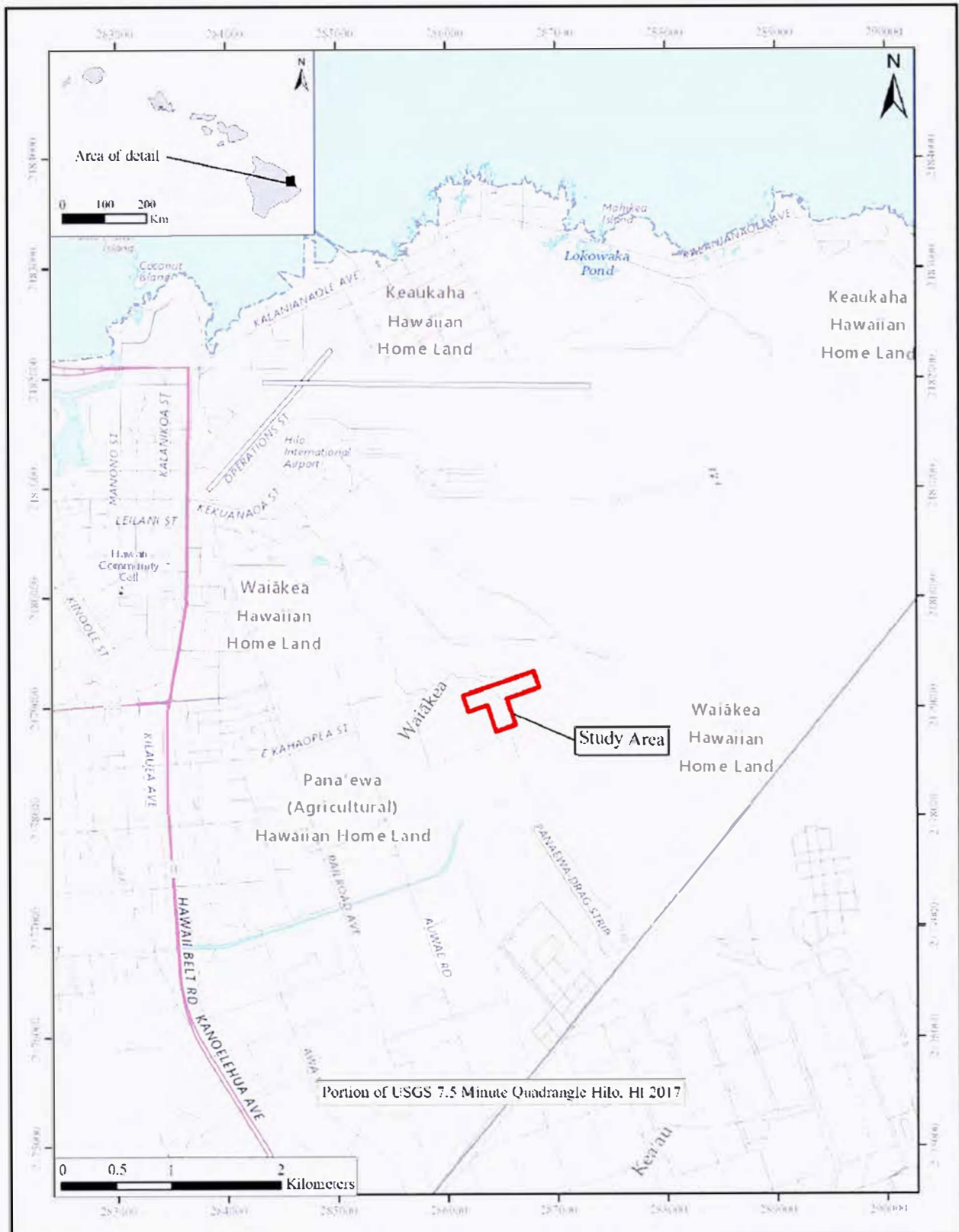


Figure 1. Study area location.

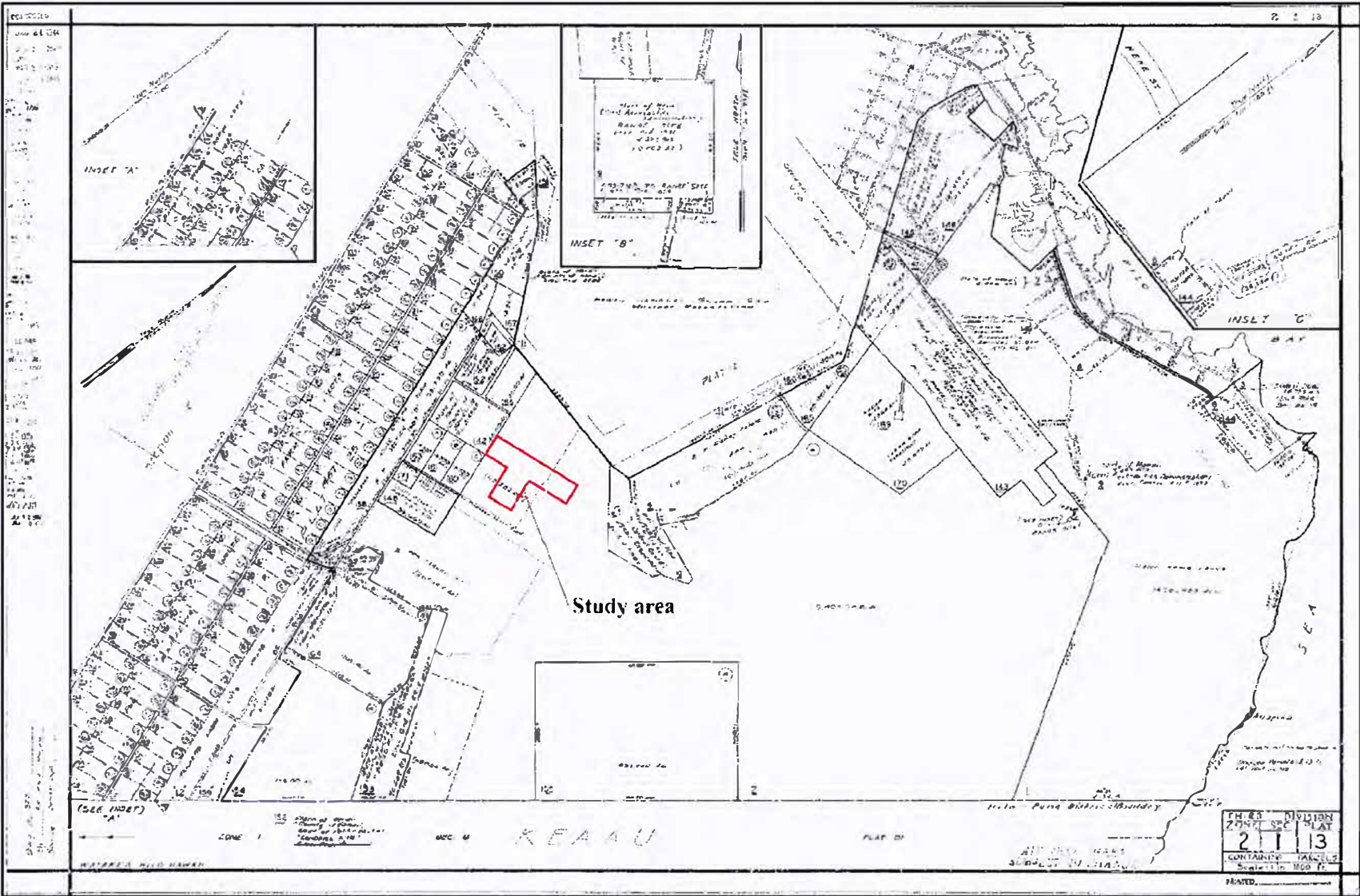


Figure 2. Tax Map Key (TMK) (3) 2-1-013 showing location of the current study area (portion of Parcel 002).



Figure 3. Google Earth™ satellite image showing the current study area.

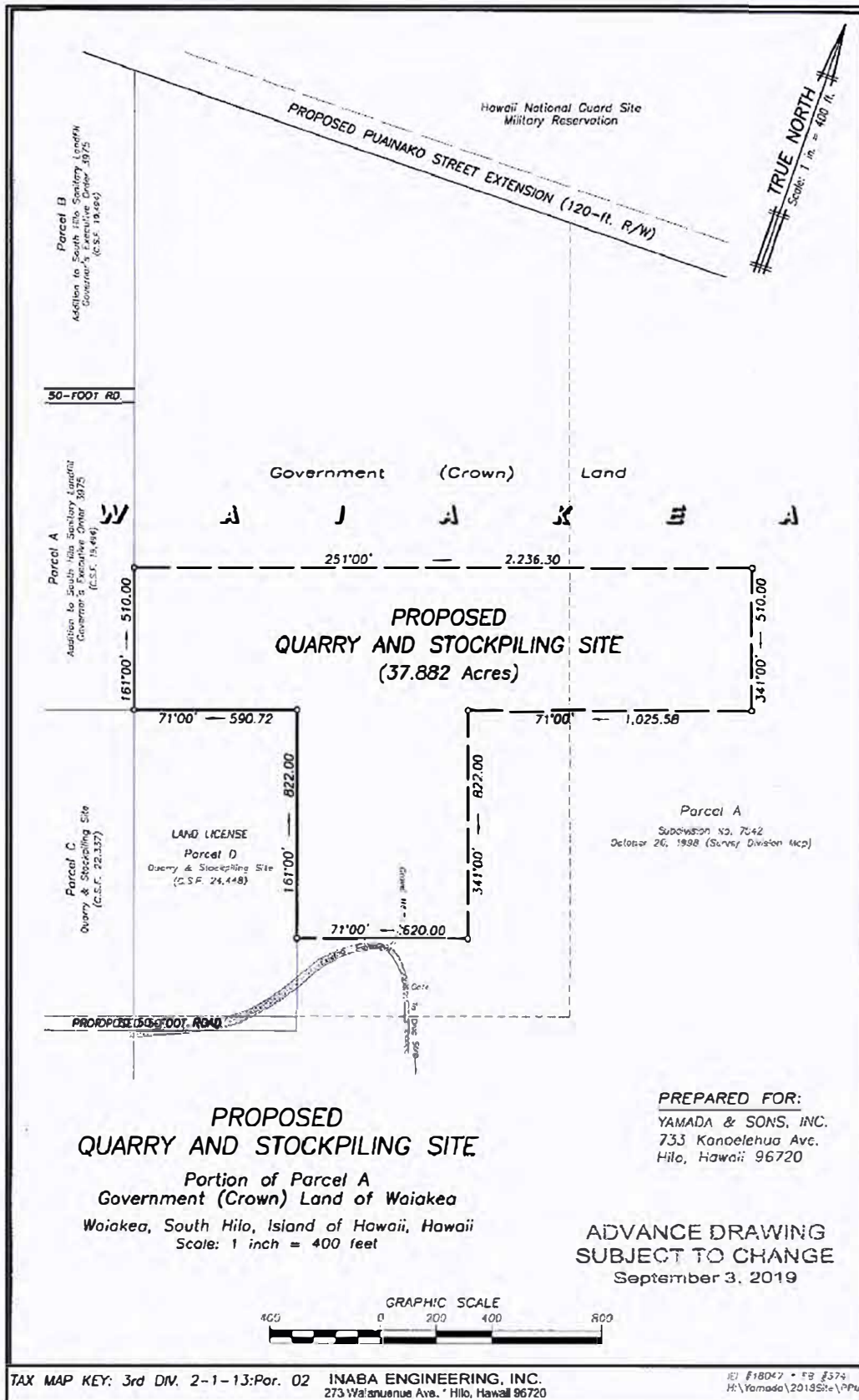


Figure 4. Map of the proposed quarry and stockpiling site.

STUDY AREA DESCRIPTION

The study area encompasses 37.882 acres within the Pana'ewa portion of Waiākea Ahupua'a, South Hilo District, Island of Hawai'i (see Figure 1). The study area is situated at elevations ranging from 80 to 100 feet (24 to 30 meters) above sea level, roughly 4 kilometers inland from the coast. The study area is accessed by a gated, paved road that extends northwest from the Pana'ewa Drag Strip road (see Figure 3). The access road extends northwest from the drag strip road (Figure 5), bisecting the southern portion of the study area into two equal halves (Figure 6), before turning to the northeast. Mechanically-created, earthen berms containing piles of gravel and scattered modern trash (e.g. rubber tires, glass/plastic bottles, car parts, and other assorted rubbish) are present along both of edges of the roadway (Figure 7). To the west, the study area is bounded by an existing 14.99-acre parcel (Parcel D) that is currently used for quarrying and stockpiling purposes by Yamada & Sons, Inc. (Figure 8), and by a section of Parcel A designated as part of the South Hilo Sanitary Landfill property. Large earthen berms, from prior mechanical disturbance, are present along the boundaries with these two properties. The northeastern corner of the existing quarry site (Parcel D) is marked by a metal pipe protected by concrete barriers (Figure 9). The study area is surrounded on the remaining sides by previously disturbed, but currently undeveloped, lands within TMK: (3) 2-1-013:002. The County of Hawai'i-Department of Parks and Recreation's Trap and Skest Range is situated just to the north of the proposed quarry site (see Figure 3), and a large area in the northeastern portion of study area has been previously graded flat and covered with gravel (Figures 10). This graded area, which contains two corrugated aluminum storage sheds that are currently used for the storage purposes (Figure 11), are accessed by an offshoot of the primary paved access road that extends northeast (Figure 12). Other indications of previous disturbance within the study area include bulldozer cuts (Figure 13), berms (Figures 14), push piles, and modern rubbish (Figure 15 and 16), all of which are prevalent, especially within the western and northern portions of the proposed quarry site.

Geologically, the study area is situated on mixed 'a'ā and pāhoehoe lavas flows that originated from Mauna Loa Volcano approximately 1,000 to 2,000 years B.P. (Figure 17). Collectively these lava flows have been designated by Trusdell and Lockwood (2017) as the Pana'ewa picrate flow. Soils that have developed on (and from) these lava flows are classified as Papai extremely cobbly highly decomposed plant material on 2 to 10 percent slopes (428), and Opihikao highly decomposed plant material on 2 to 20 percent slopes (664). The Papai soils are present across the majority of the study area, but a small area of the Opihikao soils, corresponding to the edge of a raised 'a'ā flow, are present in the southwest corner of the proposed quarry site (Figure 18). Both are well-drained, thin, and extremely stony organic soils overlying cobbly substrates (Soil Survey Staff 2019), but the Papai soils are slightly thicker in profile (0-10 inches) than the Opihikao soils (0-3 inches). The terrain is characterized by mostly level to gentle to moderately undulating topography punctuated with the occasional small (culturally-sterile) lava blister, particularly within the more forested area that covers the southeastern portion of the study area. The study area is characterized by a cool climate with a mean annual temperature ranging from 70 to 73 degrees Fahrenheit throughout the year (Soil Survey Staff 2019). Mean annual rainfall in the area averages approximately 3346 millimeters (132 inches), with the majority of rainfall occurring in November and the least occurring in the summer months of May and June (Giambelluca et al. 2013).

Due to the prior mechanical disturbance, vegetation within the study area is comprised primarily of alien species mixed with a few indigenous species within a secondary forest setting (Figure 19). The overstory canopy is formed by such plant species as melochia (*Melochia umbellata*), bingabing (*Macaranga mappia*), autograph trees (*Chusia rosea*), strawberry guava (*Psidium cattleianum*), umbrella trees (*Schefflera actinophylla*), gunpowder trees (*Trema orientalis*), Albizia (*Falcataria Mohuccana*) and hala (*Pandanus tectouris*), while the understory consists of various vines, ferns, and weeds such as Koster's curse (*Clidemia hirta*), philodendron (*Philodendron cordatum*), arthrostemma (*Arthrostemma ciliatum*), honohono grass (*Commelina diffusa*), and various other grasses. The southeastern corner of the study area (generally corresponding to the location of the Opihikao soils; see Figure 18), where the least amount of mechanized clearing appears to have occurred in the past, contains the most intact section of native forest where species such as 'ōhi'a lehua (*Metrosideros polymorpha*), uluhe (*Dicranopteris linearis*), and hala dominate (Figure 20). This vegetation pattern is more indicative of what the traditional landscape in the vicinity of the study area may have looked like prior to the widespread mechanical disturbances that occurred in the twentieth century.



Figure 5. Pana'ewa Drag Strip road with entrance to study area pictured on left, view to the northeast.



Figure 6. Paved roadway leading into study area from the Pana'ewa Drag Strip road, view to the southeast.



Figure 7. Berm extending along eastern edge of paved roadway that bisects the southern half of study area, view to the southwest.



Figure 8. Existing quarry site on Parcel D, view to the north with the current study area visible in the background (at the tree line).



Figure 9. Boundary marker at the northeastern corner of the existing quarry site (Parcel D), view to the southeast.



Figure 10. Graded area in the northeastern portion of study area, view to the east.



Figure 11. Modern corrugated aluminum storage sheds and equipment in northeastern corner of study area, view to the northeast.



Figure 12. Road accessing the northeastern portion of the study area, view to the east.



Figure 13. Bulldozer cut in eastern portion of study area, view to the northwest.



Figure 14. Typical bulldozer berm within the study area, view to the northeast.



Figure 15. Modern rubbish pile of glass bottles, overview.



Figure 16. Accumulation of modern rubbish in the northeastern corner of study area, view to the southwest.

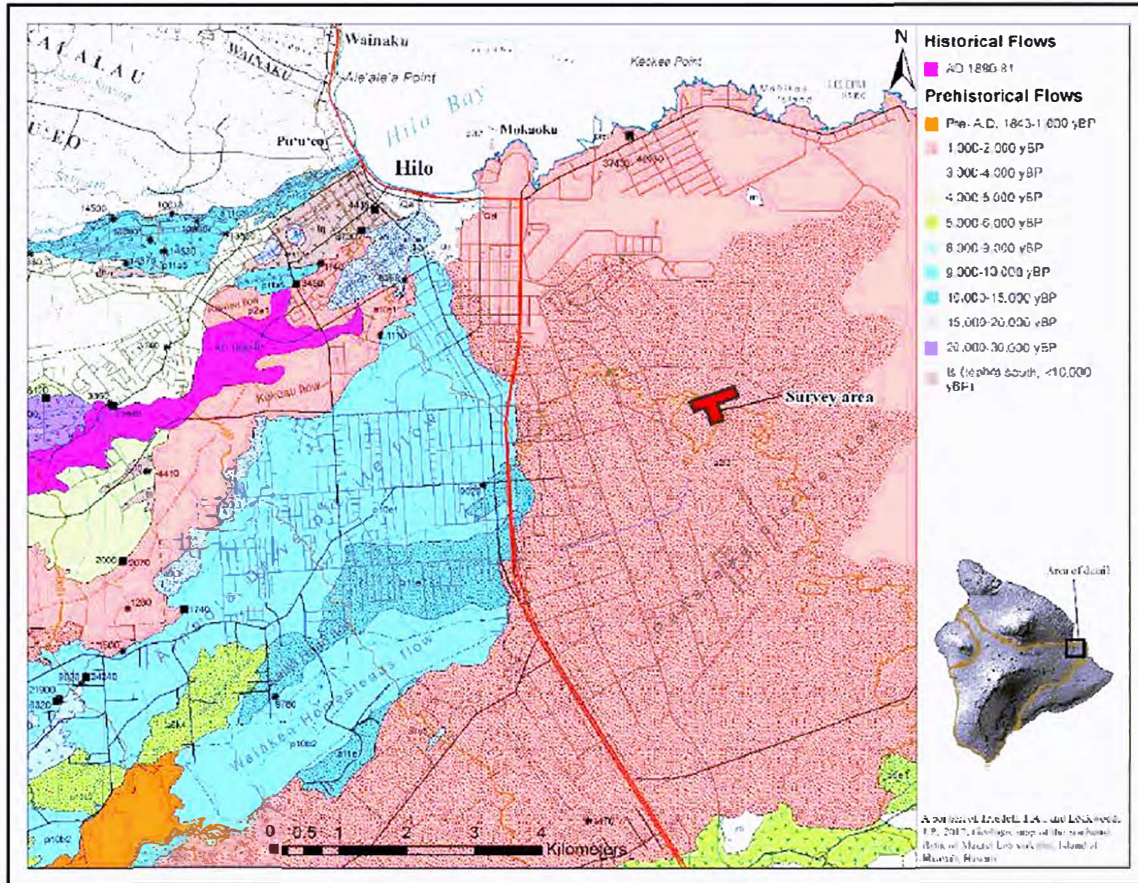


Figure 17. Geology in the vicinity of the current study area. **change SA**

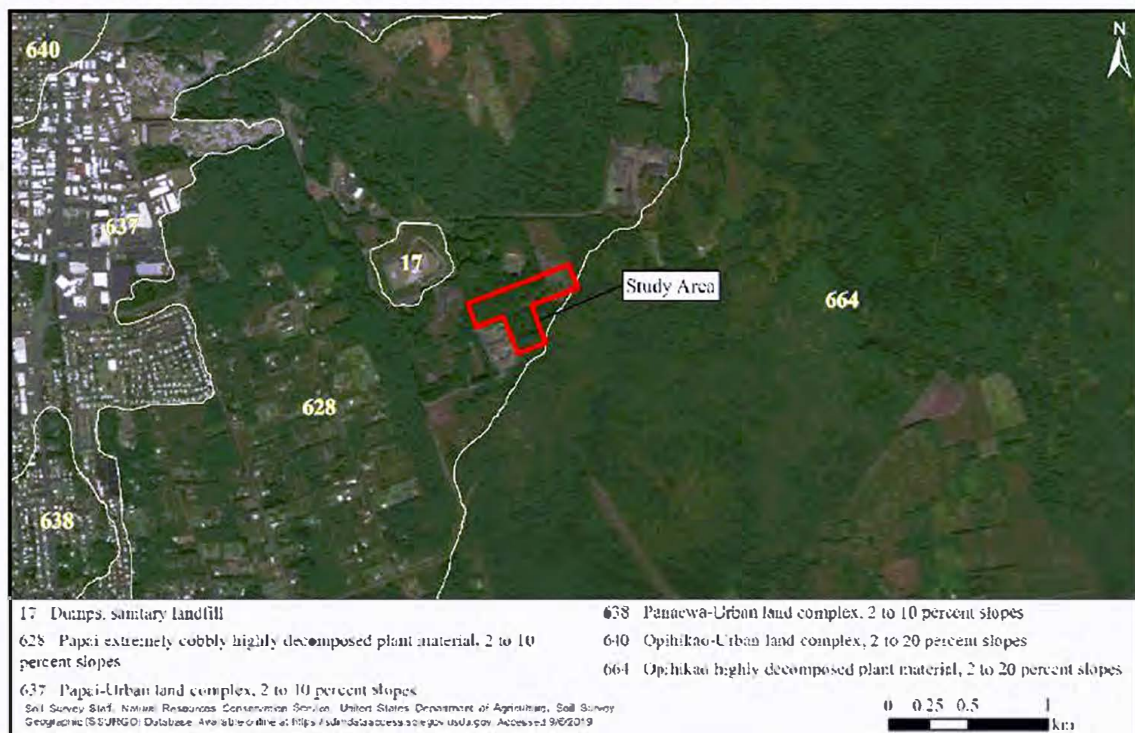


Figure 18. Soils in the vicinity of the current study area.



Figure 19. Typical vegetation in previously disturbed portions of the study area, view to the east.



Figure 20. Typical vegetation pattern within the more minimally disturbed, southeastern portion of the study area, view to the northeast.

2. BACKGROUND

To generate a set of expectations regarding the nature of archaeological resources that might be encountered within the current study area, and to establish an environment within which to assess the significance of any such resources, a general culture-historical context for the region is presented, and the results of previous archaeological studies conducted in the vicinity of the study area summarized.

CULTURE-HISTORICAL CONTEXT

The study area is situated in the Pana'ewa forested region in Waiākea Ahupua'a along the eastern coast of Hawai'i Island, within the present-day district of South Hilo, and the traditional *moku* (district) of Hilo, one of six *moku* of Hawai'i Island (Figure 21). As described by Handy and Handy:

Hilo as a major division of Hawai'i included the southeastern part of the windward coast most of which was in Hamakua, to the north of Hilo Bay. This, the northern portion, had many scattered settlements above streams running between high, forested kula lands, now planted with sugar cane. From Hilo Bay southeastward to Puna the shore and inland are rather barren and there were few settlements. The population of Hilo was anciently as now concentrated mostly around and out from Hilo Bay, which is still the island's principal port. The Hilo Bay region is one of lush tropical verdure and beauty, owing to the prevalence of nightly showers and moist warmth which prevail under the northeasterly trade winds into which it faces. Owing to the latter it is also subject to violent oceanic storms and has many times in its history suffered semidevastation from tidal waves unleashed by earthquake action in the Aleutian area of the Pacific. (1991:538)

Traditionally, the *moku* of Hilo was divided into three *'okana* (land divisions) with place names that have their origins in legendary times. The three divisions are (from north to south): Hilo Palikū, Hilo One, and Hilo Hanakahi. The location of the current study area coincides best with Hilo Hanakahi or "Hilo [land of] chief Hanakahi" (Pukui and Elbert 1986:129), which extends from the Wailoa River to include Keaukaha. According to Pukui et al. (1974:220), the name Waiākea literally translates as "broad waters," likely a reference to the bays and freshwater streams and rivers that water this land. Theodore Kelsey, who conducted ethnographic research in Hilo in 1921, however, suggests (in Maly 1996:6) that "Waiākea was so named 'because you could dig anywhere and find water.'" but Maly (1996:11) alternatively suggests that "The lands of Waiākea were named for the high chief Waiākea-nui-kumuhonua, the brother of Pi'ihonua-a-ka-lani [k] and Pana'ewa-nui-moku-lehua [w]." Indeed, it was related to Kelsey by the surveyor Tom Cook, that the boundaries of this land were established when the sub-chief Waiākea was told by his superior to run around the tract of land that now bears his name (PBM SC Kelsey Box 1.5, July 2, 1921:2 Maly 1996:6).

The abundant marine resources of Hilo Bay, extensive spring-fed fishponds and waterfowl, and wetland and dryland agricultural resources sustained the population of the *moku* of Hilo, and it was to this general environmental setting that the first Polynesians in Hawai'i arrived. Over generations they shaped and utilized the natural environment to provide all they needed for sustenance and survival. In the process they created a uniquely Hawaiian culture that was wholly adapted to the environment. The chronological summary presented below begins with the peopling of the Hawaiian Islands and includes the presentation of a generalized model of Hawaiian Prehistory and a discussion of the general settlement patterns for South Hilo. The discussion of Prehistory is followed by a summary of Historical events in the district that begins with the arrival of foreigners in the islands and then continues with the history of land use in South Hilo after contact. The summary includes a discussion of the changing lifeways and population decline of the early Historic Period, a review of land tenure in the study *ahupua'a* during the *Māhele 'Āina* of 1848, and documentation of the transition to the commercial sugar industry from the last quarter of the nineteenth century into the twentieth century and the development of the Hawaiian Homestead community within Pana'ewa. A synthesis of the Precontact settlement patterns and the Historically documented land use, combined with a review of the findings of previously conducted archeological studies, provides a means for predicting the types of archaeological features that may be encountered within the study area, and forms a basis for assessing the function, age, and significance of any encountered archaeological sites.

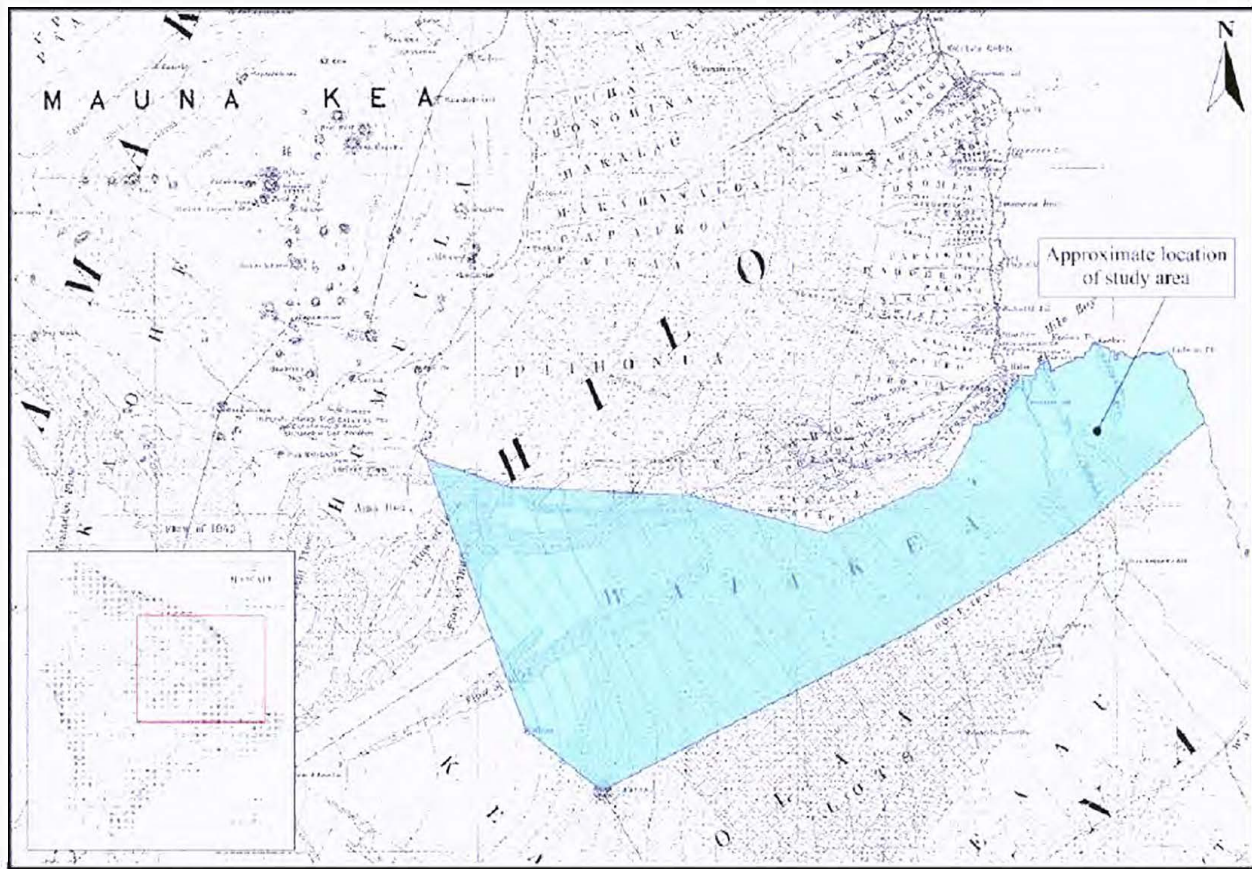


Figure 21. Portion of a 1901 Hawai'i Territory Survey Map showing the location of the study area within Waiākea Ahupua'a (shaded blue) and the South Hilo District.

A Generalized Model of Hawaiian Prehistory

This generalized cultural sequence is based on Kirch's (1985) model and is amended to include recent revisions offered by Kirch (2011) and Athens et al. (2014). The conventional wisdom has been that first inhabitants of Hawai'i Island probably arrived by at least A.D. 300, and focused habitation and subsistence activity on the windward side of the island (Burtchard 1995; Hommon 1986; Kirch 1985). Recent re-evaluation and syntheses of genealogical, oral historical, mythological, and radiometric data by Kirch (2011) and others (Athens et al. 2014; Duarte 2012; Wilmshurst et al. 2011) have convincingly argued that Polynesians may not have arrived in the Hawaiian Islands until at least A.D. 1000, but expanded rapidly thereafter. The implications of this on the currently accepted chronology would alter the timing of the Settlement, Developmental, and Expansion Periods, possibly shifting the Settlement Period to A.D. 1000 to 1100, the Developmental Period to A.D. 1100 to 1350, the Expansion Period to A.D. 1350 to 1650, and the Proto-Historic Period to A.D. 1650-1795. It has been generally reported that the sources of the early Hawaiian population—the Hawaiian Kahiki—were the Marquesas and Society Islands (Emory in Tatar 1982:16–18).

The Settlement Period was a time of great exploitation and environmental modification, when early Hawaiian farmers developed new subsistence strategies by adapting their familiar patterns and traditional tools to their new environment (Kirch 1985; Pogue 1978). Their ancient and ingrained philosophy of life tied them to their environment and kept order. Order was further assured by the conical clan principle of genealogical seniority (Kirch 1984, 2010). According to Fornander (1969), Hawaiians brought from their homeland certain universal Polynesian customs: the major gods Kāne, Kū, Kanaloa, and Lono; the *kapu* system of law and order; cities of refuge; the *'aumakua* concept; various epiphenomenal beliefs; and the concept of *mama*. Conventional wisdom suggests that the first inhabitants of Hawai'i Island focused habitation and subsistence activity on the windward side of the island (Burtchard 1995; Hommon 1986; Kirch 1985). Initial permanent settlements in the islands were established at sheltered bays with access to fresh water and marine resources. Communities shared extended familial relations and there was an occupational focus on the collection of marine resources.

As time passed a uniquely Hawaiian culture developed. The portable artifacts found in archaeological sites of the Development Period of the Hawaiian prehistory reflect not only an evolution of the traditional tools, but some distinctly Hawaiian inventions. The adze (*ko'i*) evolved from the typical Polynesian variations of plano-convex, trapezoidal, and reverse-triangular cross-section to a very standard Hawaiian rectangular quadrangular tanged adze. The two-piece fishhook and the octopus-lure breadloaf sinker are Hawaiian inventions of this period, as are *'ulu maika* stones and *lei niho palaoa*. The later were status items worn by individuals of high rank, which indicates recognition of status differentiation (Kirch 1985). As population expanded in the Hawaiian Islands so did social stratification, which was accompanied by major socioeconomic changes and intensive land modification. Once most of the ecologically favorable zones of the windward and coastal regions of the major islands were settled, the more marginal leeward areas were developed. Migrations to Hawai'i from the Marquesas and Society Islands may have continued throughout the early Settlement and Development Periods (Kirch 1985, 2012). Over a period of several centuries the areas with the richest natural resources became populated and perhaps even crowded, and there was an increasing separation of the chiefly class from the common people. As the environment reached its maximum carrying capacity, the result was social stress, hostility, and war between neighboring groups (Kirch 1985). Soon, large areas of Hawai'i were controlled by a few powerful chiefs.

The Expansion Period is characterized by the greatest social stratification, major socioeconomic changes, and intensive land modification. Most of the ecologically favorable zones of the windward and coastal regions of all major islands were settled and the more marginal leeward areas were being developed. Subsistence patterns intensified as crop farming evolved into large irrigated field systems and expanded into the marginal dry land areas. The greatest population growth occurred during the Expansion Period, and it was during this time that a second major migration settled in Hawai'i, this time from Tahiti in the Society Islands. According to Kamakau (1976), the *kahuna* Pā'ao settled in the islands during the 13th century. Pā'ao was the keeper of the god Kūka'ilimoku, who had fought bitterly with his older brother, the high priest Lonopele. After much tragedy on both sides, Pā'ao was expelled from his homeland in Tahiti by Lonopele. He prepared for a long voyage and set out across the ocean in search of a new land. On board Pā'ao's canoes were thirty-eight men (*kānaka*), two stewards (*kānaka 'ā'īpu'upu'u*), the chief Pili'ka'aica (Pili) and his wife Hina'aukekele, Nāmau'u o Malaia, the sister of Pā'ao, and the prophet Makuaka'ūmana. Kamakau (1991:100–102) told the following story of their arrival in Hawai'i:

Puna on Hawai'i Island was the first land reached by Pā'ao, and here in Puna he built his first heiau for his god Aha'ula and named it Aha'ula [Waha'ula]. It was a luakini. From Puna, Pā'ao went on to land in Kohala, at Pu'uepa. He built a heiau there called Mo'okini, a luakini.

It is thought that Pā'ao came to Hawai'i in the time of the ali'i La'au because Pili ruled as mo'i after La'au. You will see Pili there in the line of succession, the mo'o kū'auhau, of Hanala'anui. It was said that Hawai'i Island was without a chief, and so a chief was brought from Kahiki; this is according to chiefly genealogies. Hawai'i Island had been without a chief for a long time, and the chiefs of Hawai'i were ali'i maka'āinana or just commoners, maka'āinana, during this time.

...There were seventeen generations during which Hawai'i Island was without chiefs—some eight hundred years...The lack of a high chief was the reason for seeking a chief in Kahiki, and that is perhaps how Pili became the chief of Hawai'i. He was a chief from Kahiki and became the ancestor of chiefs and people of Hawai'i Island.

The Pili line's initial ruling center was likely in Kohala, but Cartwright (1933) suggests that Pili resided in and ruled from Waipi'o Valley in the Hāmākua District. Ethnohistorical traditions (Fornander 1880) indicate that valley was associated with at least nine successive Pili line rulers of Hawai'i Island, from Kaha'imoele'a to 'Umi (from roughly A.D. 1460 to 1620). Prior to the establishment of these Pili rulers, Waipi'o was the residential base for powerful local rulers dating back to at least the A.D. 1200s (Cartwright 1933).

Heiau construction flourished during the Expansion Period as religion became more complex and embedded in a sociopolitical climate of territorial competition. Monumental architecture, such as *heiau*, "played a key role as visual markers of chiefly dominance" (Kirch 1990:206). This pattern continued to intensify from A.D. 1500 to Contact (A.D. 1778), and evidence suggests that substantial changes were made to the political system as well. Within Kohala, for example, the Great Wall complex at Koai'e is organized with certain platforms in the complex physically separated from contemporaneous features. Griffin et al. (1971) interpret these separate spaces as symbolizing class stratification.

The period from A.D. 1300–1500 was characterized by population growth as well as expanded efforts to intensify upland agriculture. (Rosendahl 1972) has proposed that settlement in leeward Kohala at this time was related to

seasonal, recurrent occupation, and that coastal sites were occupied in the summer to exploit marine resources, while upland sites were being occupied during the winter months with a primary focus on agriculture. An increasing reliance on agricultural products may have caused a shift in social networks as well, according to Hommon (1976). Hommon argues that kinship links between coastal settlements disintegrated as those links within the *mauka-makai* settlements expanded to accommodate exchange of agricultural products for marine resources. This shift is believed to have resulted in the establishment of the *ahupua'a* system. The implications of this model include a shift in residential patterns from seasonal, temporary occupation, to permanent dispersed occupation of both coastal and upland areas.

The earliest culture-historical knowledge of Hilo comes from legends written by Kamakau (1961) of a 16th century chief 'Umi-a-Līloa (son of Līloa) who at that time ruled the entire island of Hawai'i. Descendants of 'Umi and his sister-wife were referred to as "Kona" chiefs, controlling Ka'ū, Kona, and Kohala, while descendants of 'Umi and his Maui wife were "Hilo" chiefs, controlling Hāmākuā, Hilo, and Puna (Kelly et al. 1981:1). According to Kamakau (1961) both sides fought over control of the island, desiring access to resources such as feathers, *māmaki* tapa, and canoes on the Hilo side; and *wauke* tapa, and warm lands and waters on the Kona side (c.f. Kelly et al. 1981:3).

According to Kirch's (1985) model, the concept of the *ahupua'a* was established sometime during the A.D. 1400s, adding another component to an already well-stratified society. This land unit became the equivalent of a local community, with its own social, economic, and political significance. *Ahupua'a* were ruled by *ali'i 'ai ahupua'a* or lesser chiefs; who, for the most part, had complete autonomy over this generally economically self-supporting piece of land, which was managed by a *konohiki*. *Ahupua'a* generally speaking, are wedge-shaped subdivisions of land that radiate out from the center of the island, typically extending from the mountain into the sea and several hundred yards beyond, which afforded their inhabitant's unlimited access to a diverse subsistence resource base (Cordy 2000). The design of these land divisions ensured that residents could have access to all that they needed to live, with ocean resources at the coast, and agricultural and forest resources in the interior. As long as sufficient tribute was offered and *kapu* (restrictions) were observed, the common people (*maka'āinana*), 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 1992; Malo 1951). Sometime near the end of the 16th century or early in the 17th century, the lands of Hilo were divided into *ahupua'a* that today retain their original names (Kelly et al. 1981:3). Of the twenty plus *ahupua'a* that make up the Hilo district, only two approach this ideal including Waiākea, where the current study area is located. Waiākea, one of the largest *ahupua'a* in all the Hawaiian Islands, stretches from the eastern shores of Hilo Bay up the slopes of Mauna Loa to an elevation of 6,000 feet and is markedly broader than its neighboring *ahupua'a* to the north (see Figure 21).

Entire *ahupua'a*, or smaller portions of the land called *'ili* 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 resource management planning. In this system, the land provided fruits and vegetables and some meat for the diet, and the ocean provided a wealth of protein resources (Rechtman and Maly 2003). The *ahupua'a* were further divided into smaller sections such as the *'ili 'āina, mo'o 'āina, paukū 'āina, kīhāpai, kō'ele, hakuone*, and *kuakua* (Hommon 1986; Pogue 1978). The chiefs of these land units gave their allegiance to a territorial chief or *mō'ī* (king).

Generally speaking, Waiākea *Ahupua'a* was included in a zone of agricultural productivity where scattered dwellings were sometimes present, and forest locations were selectively burned to create clearings for planting crops such as taro, bananas, sugarcane, breadfruit, and *kukui* (McEldowney 1979). Conversely, the Pana'ewa forest portion of Waiākea, in which the current study area is situated, was one of the few forests on the island to nearly reach the ocean in the 1800s (ibid.), supporting the supposition that small-scale agriculture was practiced in forest clearings, as opposed to the burning off of large areas as was practiced in other parts of the *ahupua'a*. Additionally, Maly (1996:4) relates that *waiākea* is the name of a native variety of taro, similar to the better known *lehua* variety, which further attests to the agricultural importance of the Waiākea region. Handy further describes the traditional agricultural landscape and cultivation practices of Waiākea, particularly as it relates to Pana'ewa, as follows:

... I am told that farther seaward in Waiākea, taro is still grown by the ingenious method of heaping up around a taro, which is submerged in water, and held upright by chunk of lava; the stones

presumably accumulate refuse enough to nourish the taro, along with the food taken in by the roots from lava and water.

On the lava strewn plain of Waiakea and on the slopes between Waiakea and Wailuku River, dry taro was formerly planted wherever there was enough soil. There were forest plantations in Pana'ewa and in all the lower fern-forest zone above Hilo town along the course of the Wailuku River. (Handy 1940:125)

By the seventeenth century, large areas of Hawai'i Island (*moku āina* – districts) were controlled by a few powerful *ali'i 'ai moku*. There is island-wide evidence to suggest that growing conflicts between independent chiefdoms were resolved through warfare, culminating in a unified political structure at the district level. It has been suggested that the unification of the island resulted in a partial abandonment of portions of leeward Hawai'i, with people moving to more favorable agricultural areas (Barrera 1971; Schilt and Sinoto 1980). 'Umi a Līloa, a renowned *ali'i* of the Pili line who ruled from Waipi'o Valley, is often credited with uniting the island of Hawai'i under one rule (Cordy 1994). 'Umi's reign lasted until around a.d. 1620, and was followed by the rule of his son, Keawenui a 'Umi, and then his grandson, Lonoikamakahiki (Cordy 1994).

Kirch (1985) places the beginning of the Proto-Historic Period during the rule of Lonoikamakahiki. This was a time marked by both political intensification and stress and continual conquest by the reigning *ali'i*. Wars occurred regularly between intra-island and inter-island politics during this period. By the 1700s, rule of Hawai'i Island was divided among the chiefs of Kona and Hilo (Kamakau 1992). Keawe, a Pili line ruler and the son of Kanaloakapulehu, was the chief of Kohala, Kona, and Ka'ū. When Keawe died, he split the rule of his lands between two of his sons, further dividing the island's chiefdoms: Kalaninui'iamamao became the ruling chief of Ka'ū, and Ke'eaumoku became the ruling chief of Kona and Kohala (Kamakau 1992). Wars between the *ali'i* continued unabated through this transition. Alapa'inui, the son of former Kona war chief Kauauanui a Mahi, desired to take control of Hawai'i Island (Kamakau 1992), and successfully waged war against the chiefs of Kona and Kohala, and eventually took control of Ka'ū and Hilo as well. Alapa'inui ruled for many years, and appointed his son Keawe'ōpala ruler of the island upon his death in 1754 (ibid.: 1992). It was during this time of warfare that Kamehameha was born in the North Kohala District in the *ahupua'a* of Kokoiki, near the *heiau* of Mo'okini (ibid.: 1992). There is some controversy about the year of his birth, but Kamakau (1992:66–68) places the birth event sometime between A.D. 1736 and 1758, most likely nearer to the later date. This period was one of continual conquest by the reigning *ali'i*. In A.D. 1775 Kalani'ōpu'u and his forces, who had already conquered Hāna in eastern Maui, raided and destroyed the neighboring Kaupō District, then launched several more raids on Moloka'i, Lāna'i, Kaho'olawe, and parts of West Maui. It was at the battle of Kalaeoka'ilio that Kamehameha, a favorite of Kalani'ōpu'u, was first recognized as a great warrior and given the name of Pai'ea (hard-shelled crab) by the Maui chiefs and warriors (Kamakau 1992). During the battles between Kalani'ōpu'u and Kahekili (1777–1779), Ka'ahumanu and her parents left Maui to live on the island of Hawai'i (ibid.: 1992). Kalani'ōpu'u was fighting on Maui when the British explorer Captain James Cook first arrived in the islands.

History After Contact

The arrival of foreigners in Hawai'i marks the beginning of the Historic Period. Demographic trends during the later Proto-Historic Period indicate population reduction in some areas, due to war and disease, yet increases in others, with relatively little change in material culture. There was a continued trend toward craft and status specialization, intensification of agriculture, *ali'i* controlled aquaculture, the establishment of upland residential sites, and the enhancement of traditional oral history. The Kū cult, *luakini heiau*, and the *kapu* system were at their peaks, although a western influence was already altering the cultural fabric of the Islands (Kent 1983; Kirch 1985). Foreigners very quickly introduced the concept of trade for profit, and by the time Kamehameha I had conquered O'ahu, Maui and Moloka'i, in 1795, Hawai'i saw the beginnings of a market system economy (Kent 1983). This marked the end of the Proto-Historic Period and the end of an era of uniquely Hawaiian culture.

The Arrival of Captain James Cook and the End of Kalani'ōpu'u's Reign (1778-1782)

British explorer Captain James Cook, in command of the ships *H.M.S. Resolution* and *H.M.S. Discovery*, landed in the Hawaiian Islands on January 18, 1778. The following January 17th [1779], on a return trip to Hawaiian waters, Cook anchored near Ka'awaloa along the north shore of Kealahou Bay in the South Kona District to resupply his ships. This return trip occurred at the time of the annual *Makahiki* festival, and many of chiefs and commoners were gathered around the bay celebrating. It has been suggested that Captain Cook was understood to be the god Lono

himself returned, as men would not normally be allowed to paddle out during the *Makahiki* without breaking the *kapu* and forfeiting all of their possessions (Kamakau 1992). Kalani'ōpu'u, the reigning chief of Hawai'i Island, left a battle with Kahekili on Maui, and after arriving at Kealahou Bay, visited Cook on board the *H.M.S. Resolution*, where they exchanged gifts. Kamehameha, the future ruler of all of Hawai'i, was present at this meeting (Jarves 1847). On February 4th, Cook set sail, but a storm off the Kohala coast damaged the mast of the *H.M.S. Resolution*, and both ships were forced to return to Kealahou Bay to make repairs. With Cook's return many of the inhabitants of Kealahou Bay began to doubt that he actually was the physical manifestation of Lono (Kamakau 1992). Ten days later, a dispute over stolen nails escalated and after one of Cook's boats was stolen, the captain set ashore at Ka'awaloa with six marines to ask Kalani'ōpu'u for its return. When Kalani'ōpu'u denied any knowledge of the theft, Cook tried to take him captive (Kamakau 1992). A fight ensued, and Cook was killed along with four of his men and several natives. Kalani'ōpu'u and his retinue retreated inland. After offering the body of Cook as a sacrifice to the *akua*, some of his bones were returned to the British aboard the *Resolution* (Kamakau 1992), who shortly thereafter returned to sea.

After the death of Captain Cook and the departure of *H.M.S. Resolution* and *Discovery*, Kalani'ōpu'u moved to Kona, where he surfed and amused himself with the pleasures of dance (Kamakau 1992). While he was living in Kona, famine struck the district. Kalani'ōpu'u ordered that all the cultivated products of that district be seized, and then he set out on a circuit of the island. While in Kohala, Kalani'ōpu'u proclaimed that his son Kiwala'ō would be his successor, and he gave the guardianship of the war god Kūka'ilimoku to Kamehameha. However, Kamehameha and a few other chiefs were concerned about their land claims, which Kiwala'ō did not seem to honor (Fornander 1996; Kamakau 1992). The *heiau* of Moa'ula was erected in Waipi'o at this time (ca. A.D. 1781), and after its dedication Kalani'ōpu'u set out for Hilo to quell a rebellion by a Puna chief named 'Imakakolo'a.

'Imakakolo'a was defeated in Puna by Kalani'ōpu'u's superior forces, but he managed to avoid capture and hide from detection for the better part of a year. While the rebel chief was sought, Kalani'ōpu'u went to Ka'ū and erected a *heiau* called Pākini (Kamakau 1992). 'Imakakolo'a was eventually captured and brought to the *heiau*, where Kiwala'ō was to sacrifice him. "The routine of the sacrifice required that the presiding chief should first offer up the pigs prepared for the occasion, then bananas, fruit, and lastly the captive chief" (Fornander 1996:202). However, before Kiwala'ō could finish the first offerings, Kamehameha, "grasped the body of 'Imakakolo'a and offered it up to the god, and the freeing of the tabu for the *heiau* was completed" (Kamakau 1992:109). Upon observing this single act of insubordination, many of the chiefs believed that Kamehameha would eventually rule over all of Hawai'i. After usurping Kiwala'ō's authority with a sacrificial ritual in Ka'ū, Kamehameha retreated to his home district of Kohala. While in Kohala, Kamehameha farmed the land, growing taro and sweet potatoes (Handy and Handy 1972). Kalani'ōpu'u died in April of 1782 and was succeeded by his son Kiwala'ō.

The Rule of Kamehameha I (1782-1819)

After Kalani'ōpu'u died, several chiefs were unhappy with Kiwala'ō's division of the island's lands, and civil war broke out. Kiwala'ō, Kalani'ōpu'u's son and appointed heir, was killed at the battle of Moku'ōhai, South Kona in July of 1782. Supporters of Kiwala'ō, including his half-brother Keōua and his uncle Keaweauhili, escaped and laid claim to the Hilo, Puna, and Ka'ū Districts. According to 'I'i (1963), nearly ten years of almost continuous warfare followed, as Kamehameha endeavored to unite the island of Hawai'i under his rule and conquer the islands of Maui and O'ahu. Keōua became Kamehameha's main rival on the island of Hawai'i, and he proved difficult to defeat (Kamakau 1992). Around 1790, in an effort to secure his rule, Kamehameha began building the *heiau* of Pu'ukoholā at Kawaihae, which was to be dedicated to the war god Kūka'ilimoku (Fornander 1996). When Pu'ukoholā Heiau was completed in the summer of 1791, Kamehameha sent his two counselors, Keaweheulu and Kamanawa, to Keōua to offer peace. Keōua was enticed to the dedication of the Pu'ukoholā Heiau by this ruse and when he arrived at Kawaihae he and his party were sacrificed to complete the dedication (Kamakau 1992). The assassination of Keōua gave Kamehameha undisputed control of Hawai'i Island (Greene 1993). Between 1792 and 1796, after the dedication of Pu'ukoholā, Kamehameha mostly resided at Kawaihae and worked the lands of the Waikōloa-Waimea region (Maly and Maly 2002). By 1796, Kamehameha had conquered all the island kingdoms except for Kaua'i. It wasn't until 1810, when Kaumuali'i of Kaua'i gave his allegiance to Kamehameha, that the Hawaiian Islands were unified under one ruler (Kuykendall and Day 1976). Kamehameha would go on to rule the islands for another nine years. He and his high chiefs participated in foreign trade, but continued to enforce the rigid *kapu* system.

In the twelve years following the death of Captain Cook, sixteen foreign ships (all British and American) called in Hawaiian waters (Restarick 1928). In 1790, two sister ships, the *Eleanora* and the *Fair American*, were trading in Hawaiian waters when a skiff was stolen from the *Eleanora* and one of its sailors was murdered. The crew of the

Eleanora proceeded to slaughter more than 100 natives at Olowalu [Maui]. After leaving Maui, the *Eleanora* sailed to Hawai'i Island, where one of its crew, John Young, went ashore and was detained by Kamehameha's men. The other vessel, the *Fair American*, was captured by the forces of Kamehameha off the coast of North Kona, and in an act of retribution for the Olowalu massacre, they slaughtered all but one crew member, Isaac Davis. Guns and a cannon (later named "Lopaka") were recovered from the *Fair American* and were kept by Kamehameha as part of his fleet (Kamakau 1992). Kamehameha made John Young and Isaac Davis his advisors.

Hilo was one of the larger population centers on the Island of Hawai'i, and also an area frequented by the *ali'i* (Moniz 1994). Captain George Vancouver, an early European explorer who met with Kamehameha I at Waiākea in 1794, recorded that Kamehameha was there preparing for his invasion of the neighbor islands, and that Hilo was an important center because his *peleleu* fleet of 800 canoes were being built there (Moniz 1994:7). The people of Hilo had long prepared for Kamehameha's arrival and collected a large number of hogs and a variety of plant foods, to feed the ruler and his retinue. Kelly et al. (1981) surmise that the people of Hilo had actually prepared for a year prior to Kamehameha's visit and expanded their fields into the open lands behind Hilo to accommodate the increased number of people that would be present. Kelly et al. (1981) also speculate that many of the fish ponds in Waiākea were created to feed Kamehameha, his chiefs, and craftsmen. It was during this early Historic Period of Hawaiian history that Waiākea Ahupua'a became part of Kamehameha I's personal land holdings (Moniz 1994:11).

During the first part of the nineteenth century, Hawai'i's culture and economy continued to change drastically as capitalism and industry established a firm foothold in the islands. The sandalwood (*Santalum ellipticum*) trade, established by Euro-Americans in 1790 and turned into a viable commercial enterprise by 1805 (Oliver 1961), was flourishing by 1810. This added to the breakdown of the traditional subsistence system, as farmers and fishermen were ordered to spend most of their time logging, resulting in food shortages and famine that led to a population decline. Kamehameha, who resided on the Island of O'ahu at this time, did manage to maintain some control over the trade on Hawai'i Island (Kent 1983; Kuykendall and Day 1976).

Upon returning to Kailua in 1812, Kamehameha resided at Kamakahonu, from whence he continued to rule the islands for another nine years. While in Kailua, He and his high chiefs participated in foreign trade, but also continued to enforce the rigid *kapu* system. He ordered men into the mountains of Kona to cut sandalwood and carry it to the coast, paying them in cloth, *kapu* material, food and fish (Kamakau 1992). This new burden added to the breakdown of the traditional subsistence system. Farmers and fishermen were ordered to spend most of their time logging, resulting in food shortages and famine that led to a population decline. Kamakau indicates that, "this rush of labor to the mountains brought about a scarcity of cultivated food. . . The people were forced to eat herbs and tree ferns, thus the famine [was] called Hi-laulele, Haha-pilau, Laulele, Pualele, 'Ama'u, or Hapu'u, from the wild plants resorted to" (ibid.: 1992:204). Once Kamehameha realized that his people were suffering, he "declared all the sandalwood the property of the government and ordered the people to devote only part of their time to its cutting and return to the cultivation of the land" (ibid.: 1992:204).

The Death of Kamehameha I and the Abolition of the Kapu System (1819-1820)

Kamehameha I died on May 8, 1819 at Kamakahonu, and the changes that had been affecting the Hawaiian culture since the arrival of Captain Cook in the Islands began to accelerate. Following the death of a prominent chief, it was customary to eliminate all of the regular *kapu* that maintained social order and the separation of men and women, elite and commoner. Thus, following Kamehameha's death, a period of *'ai noa* (free eating) was observed along with the relaxation of other traditional *kapu*. It was the responsibility of the new ruler and *kahuna* to re-establish *kapu* and restore social order, but at this point in history traditional customs were altered (Kamakau 1992).

The death of Kamehameha was the first step in the ending of the tabus; the second was the modifying of the mourning ceremonies; the third, the ending of the tabu of the chief; the fourth, the ending of carrying the tabu chiefs in the arms and feeding them; the fifth, the ruling chief's decision to introduce free eating (*'ainoa*) after the death of Kamehameha; the sixth, the cooperation of his aunts, Ka-ahu-manu and Ka-heihei-malie; the seventh, the joint action of the chiefs in eating together at the suggestion of the ruling chief, so that free eating became an established fact and the credit of establishing the custom went to the ruling chief. This custom was not so much of an innovation as might be supposed. In old days the period of mourning at the death of a ruling chief who had been greatly beloved was a time of license. The women were allowed to enter the heiau, to eat bananas, coconuts, and pork, and to climb over the sacred places. You will find record of this in the history of Ka-ula-hea-nui-o-ka-moku, in that of Ku-ali'i, and in most of the histories of ancient rulers. Free

eating followed the death of the ruling chief; after the period of mourning was over the new ruler placed the land under a new tabu following old lines. (Kamakau 1992:222)

Immediately upon the death of Kamehameha I, Liholiho (his son and to be successor) was sent away to Kawaihae to keep him safe from the impurities of Kamakahonu brought about from the death of Kamehameha. After purification ceremonies Liholiho returned to Kamakahonu. Instead of re-instating the traditional *kapu*, Liholiho ate the dog meat *kapu* to the women *ali'i*, entered the women's *lauhala* house, and did whatever he desired. While he may have done so during a time when he had not yet reinstated the eating *kapu*, other chiefs present appear to have thought otherwise, and word spread that the *kapu* had been abandoned. Kekuaokalani, caretaker of the war god Kūka'ilimoku, was dismayed by his cousin's (Liholiho) actions and revolted against him, but was defeated.

With an indefinite period of free-eating and the lack of the reinstatement of other *kapu* extending from Hawai'i to Kaua'i, and the arrival of the Christian missionaries shortly thereafter, the traditional religion had been officially replaced by Christianity within a year following the death of Kamehameha I. By December of 1819, Kamehameha II had sent edicts throughout the kingdom renouncing the ancient state religion, ordering the destruction of the *heiau* images, and ordering that the *heiau* structures be destroyed or abandoned and left to deteriorate. He did, however, allow the personal family religion, the *'aumakua* worship, to continue (Kamakau 1992; Oliver 1961).

With the end of the *kapu* system, changes in the social and economic patterns began to affect the lives of the common people. Liholiho moved his court to O'ahu, lessening the burden of resource procurement for the chiefly class on the residents of Hawai'i Island. Some of the work of the commoners shifted from subsistence agriculture to the production of foods and goods that they could trade with early Western visitors. Introduced foods often grown for trade included yams, coffee, melons, Irish potatoes, Indian corn, beans, figs, oranges, guavas, and grapes (Wilkes 1845).

Waiākea 1820-1848: A Land in Transition and Early Historical Accounts

In October of 1819, seventeen Protestant missionaries set sail from Boston to Hawai'i. They arrived in Kailua-Kona on March 30, 1820 to a society with a religious void to fill. Many of the *ali'i*, who were already exposed to western material culture, welcomed the opportunity to become educated in a western style and adopted their dress and religion. Soon they were rewarding their teachers with land and positions in the Hawaiian government. During this period, the sandalwood trade wrought havoc on the lives of the commoners, as they weakened from the heavy production, exposure, and famine just to fill the coffers of the *ali'i*, who were no longer under any traditional constraints (Kuykendall and Day 1976; Oliver 1961). The lack of control of the sandalwood trade was to soon lead to the first Hawaiian national debt as promissory notes and levies were initiated by American traders and enforced by American warships (Oliver 1961) The Hawaiian culture was well on its way towards Western assimilation as industry in Hawai'i went from the sandalwood trade, to a short-lived whaling industry, to the more lucrative, but environmentally destructive sugar industry.

The early 1800s heralded a new era in the Hilo Bay area that was marked by numerous rapid changes. During the first two decades of the nineteenth century, sandalwood was harvested and shipped from Hilo Bay and whaling ships were a common sight as they stopped at Hilo for supplies. Some of the earliest written descriptions of Hilo come from the accounts of the first Protestant Missionaries to visit the island, and early Historic visitors to Hilo noted the beauty and fertility of the region. In 1823, British missionary William Ellis and members of the American Board of Commissioners for Foreign Missions (ABCFM) toured the island of Hawai'i seeking out communities in which to establish church centers for the growing Calvinist mission. Ellis recorded observations made during this tour in a journal, and described the environs of Waiākea as a well-watered place, with some of the heaviest rains and densest fog he had encountered on the island (Ellis 1963). He considered the inhabitants lucky because of their access to well-stocked fishponds, fertile soil, and to the nearby woods which provided a source of lumber. Ellis (1963) estimated that nearly 400 houses were present near the bay, with a population of not less than 2,000 inhabitants with houses clustered along the beach in the dry lowland areas (Cordy 2000:353–354). During his five-day stay, Ellis characterized Waiākea as:

...the most beautiful we have yet seen. . . The whole is covered with luxuriant vegetation, and the greater part of it formed into plantations, where plantains, bananas, sugar-cane, taro, potatoes, and melons, grow to the greatest perfection.

Groves of cocoa-nut and breadfruit trees are seen in every direction loaded with fruit, or clothed with umbrageous foliage. The houses are mostly larger and better built than those of many districts

through which we had passed. We thought the people generally industrious; for in several of the less fertile parts of the district we saw small pieces of lava thrown up in heaps, and potato vines growing very well in the midst of them, though we could scarcely perceive a particle of soil.

There are plenty of ducks in the ponds and streams, at a short distance from the sea, and several large ponds or lakes literally swarm with fish, principally of the mullet kind. The fish in these ponds belong to the king and chiefs, and are tabued from the common people.

Along the stone walls which partly encircle these ponds, we saw a number of small huts, where the persons reside who have the care of the fish, and are obliged frequently to feed them with a small kind of mussel, which they procure in the sands round the bay.

...There are 400 houses in the bay, and probably not less than 2000 inhabitants... (Ellis 1963:337–338)

Ellis eventually set up a mission station in Waiākea that lasted until 1825 before moving to Punahoa 2nd Ahupua'a (Moniz 1994). A large number of churches were commissioned by newly converted *ali'i*, and Missionary journals from this time period describe the growing congregations of people drawn to the Hilo missions. Also in 1825, the H.M.S. *Blonde*, bearing the bodies of Liholiho and his wife Kamāmalu who had both died of measles while in England, arrived in Hilo Bay. Ka'ahumanu declared Hilo Bay would henceforth be known as Byron's Bay in honor of Lord Byron, the Commander of the H.M.S. *Blonde*. During shore-leave Lord Byron stayed at Waiākea, at a large house appropriated by Ka'ahumanu. The officers onboard describe the river of Wailuku and Wailoa as convenient watering places for visiting ships (Kelly et al. 1981:33). Upon leaving Hilo Bay the ship logs neatly summarize the potential of Hilo Bay:

Byron Bay will, no doubt, become the site of the capital of Hawaii. The fertility of the district of Hilo [sic]...the excellent water and abundant fish-pools which surround it, the easy access it has to the sandal-wood district, and also commerce, and the facility it affords for refitting vessels, render it a place of great importance. (Kelly et al. 1981:35)

In June of 1825, an American Protestant missionary by the name of Charles Samuel Stewart visited Hilo. Stewart depicted Hilo as a well-populated residence for natives and missionaries alike:

... The reef runs in a curved direction from the point at the channel, about half a mile to the east, where it joins a romantic little islet covered with cocoanut trees; from that fact, called "Cocoanut island." A small channel runs between this and the main land, which is low, and sweeps round to the western cliffs in a beautifully curved sandy beach of about two miles, making the form of the bay that of a flattened horseshoe. The beach is covered with varied vegetation, and ornamented by clumps and single trees of lofty cocoanut, among which the habitations of the natives are seen, not in a village, but scattered everywhere among the plantations, like farm houses in a thickly inhabited country. The mission houses were pointed out to us, pleasantly situated near the water, about the middle of the curvature forming the head of the bay. At a very short distance from the beach, bread-fruit trees were seen in heavy groves, in every direction, intersected with the pandanus and kukui, or candle-tree, the hibiscus and the acacia, &c. The tops of these rising gradually one above another, as the country gently ascends towards the mountains in the interior, presented for twenty or thirty miles in the southeast a delightful forest scene, totally different in extent from anything I had before witnessed on the islands. (1828:287)

Hilo Bay's protected waters and sandy shores provided a calm and safe alternative for landfall for ocean going vessels involved in whaling and the sandalwood trade. The sandalwood trade was initiated in the 1790s but did not become successful until 1812; Kamehameha held the monopoly on the trade and oversaw its management by his chiefs until his death. Thereafter, King Liholiho's favored chiefs mismanaged the trade, which led to the depletion of the forests and the end of the sandalwood trade by 1830 (Kelly et al. 1981). According to Kelly et al. (1981), historic accounts about whaling suggest that Hilo Bay was not a preferred port for the whalers due to the missionary influence and the resultant lack of liquor and women; sailors preferred Honolulu and Lahaina as ports-of-call. Whaling declined through the mid to later 1800s and came to a halt in 1892. However, industrial development in Hilo did not cease. Sawmills and early sugar plantations provided milled woods and sugar for export. In an 1840 letter, Reverend Titus Coan, who was stationed in Hilo, remarked on the town's growth:

Industry is increasing. Our ports and places of trade begin to put on the air of activity and life. Temporal improvements and comforts are fast increasing at Hilo, that is, near the station. Two stores of goods are opened here, and three sugar-mills have recently gone into operation near us. Sugar-

cane is being planted to a considerable extent; business assumes more tone and energy, and many of the people are approximating towards industry and competence. Probably the amount of cloth worn by the people has increased ten or twenty fold during four years past. Labor is in better demand and wages are rising continually. (Kelly et al. 1981:49)

In 1840, Lieutenant Charles Wilkes, head of the U.S. Exploring Expedition, traveled to Hilo. His narrative provides a similar account to those written by others in earlier times, painting the Hilo settlement as a lush, verdant, and well-watered locale, and remarked upon the agricultural potential of the district, revealing that “the sugar-cane grows here in abundance, and of a large size; coffee succeeds well, as do indigo and the tacca, from which they make a quantity of arrow-root” (Wilkes 1845:223). In addition to mentioning the early commercial sugarcane enterprises that were just emerging in the district, Wilkes further expands on the environs of Hilo and provided an account of his journey from Hilo to Puna through the Pana’ewa forest:

The scene which the island presents as viewed from the anchorage in Hilo Bay, is both novel and splendid: the shores are studded with extensive groves of cocoa-nut and bread-fruit trees, interspersed with plantations of sugar-cane; through these, numerous streams are seen hurrying to the ocean; to this succeeds a belt of some miles in width, free from woods, but clothed in verdure; beyond is a wider belt of forest, whose trees, as they rise higher and higher from the sea, change their characters from the vegetation of the tropics to that of polar regions; and above all tower the snow-capped summits of the mountains. . .

Hilo is a straggling village, and is rendered almost invisible by the luxuriant growth of the sugar-cane, which the natives plant around their houses. A good road has been made through it for the extent of a mile, at one end of which the mission establishment is situated. This consists of several houses, most of which are of modern style, covered with zinc and shingles. One of them however, the residence of the Rev. Mr. Coan, was very differently built, and derived importance in our eyes, from its recalling the associations of home. It was an old-fashioned, prim, red Yankee house, with white sills and casements, and double rows of small windows. No one could mistake the birthplace of the architect, and although thirty degrees nearer the equator than the climate whence its model was drawn, I could not but think it as well adapted to its new as to its original station.

The whole settlement forms a pretty cluster; the paths and roadsides are planted with pine-apples; the soil is deep and fertile, and through an excess of moisture, yields a rank vegetation. . .

The church is of mammoth dimensions, and will, it is said, accommodate as many as seven thousand persons. It is now rapidly falling into decay, and another is in progress of erection. Many of the native houses are surrounded with bread-fruit and cocoa-nut trees, and have a fine view of the bay.

Six miles from Hilo we entered the first wood, and at 6 P.M. we passed, at eight miles distance, the chasm that divides the Hilo from the Puna district. As the darkness set in, we began to experience the difficulties we had anticipated from our late start: the bustle and noise became every moment more audible along the whole line as the night advanced: what added not a little to our discomfort, was the bad road we now had to encounter, rendered worse as each native passed on in the tracks of those preceding him, until at last it became in places quite miry.

(1845:114–118)

The Legacy of the *Māhele* ‘*Āina* of 1848

By the mid-nineteenth century, the ever-growing population of Westerners in the Hawaiian Islands forced socioeconomic and demographic changes that promoted the establishment of a Euro-American style of land ownership. By 1840 the first Hawaiian constitution had been drafted and the Hawaiian Kingdom shifted from an absolute monarchy into a constitutional government. Convinced that the feudal system of land tenure previously practiced was not compatible with a constitutional government, the King (Kamehameha III) and his high-ranking chiefs decided to separate and define the ownership of all lands in the Kingdom (King n.d.). This change was further promoted by missionaries and Western businessmen in the islands who were generally hesitant to enter business deals on leasehold lands that could be taken from them at any time. After much consideration, it was decided that three classes of people each had one-third vested rights to the lands of Hawai’i: the King, the chiefs and *konohiki*, and their tenants (the *maka’āinana* or common people). In 1845 the legislature created the “Board of Commissioners to Quiet Land Titles” (more commonly known as the Land Commission. All land claims, whether by chiefs for entire *ahupua’a*

or by tenants for their house lots and gardens, had to be filed with the Land Commission within two years of the February 14, 1846, but the deadline was extended several times for chiefs and *konohiki* (Soehren 2005).

The King and some 245 chiefs (Kuykendall 1938) spent nearly two years trying unsuccessfully to divide all the lands of Hawai'i amongst themselves before the whole matter was referred to the Privy Council on December 18, 1847 (King n.d.). Once the King and his chiefs accepted the principles of the Privy Council, the *Māhele 'Āina* (Land Division) was completed in just forty days (on March 7, 1848), and the names of all of the *ahupua'a* and *'ili kūpono* (nearly independent *'ili* land division within an *ahupua'a*, that paid tribute to the ruling chief and not to the chief of the *ahupua'a*) of the Hawaiian Islands and the chiefs who claimed them, were recorded in the *Māhele* Book (Soehren 2005). As this process unfolded King Kamehameha III, who received roughly one-third of the lands of Hawai'i, realized the importance of setting aside public lands that could be sold to raise money for the government and also purchased by his subjects to live on. Accordingly, the day after the division with the last chief was recorded in the *Buke Māhele* (*Māhele* Book), King Kamehameha III commuted about two-thirds of the lands awarded to him to the government (King n.d.). Unlike the King, the chiefs and *konohiki* were required to present their claims to the Land Commission to receive their awards (LCAw.). The chiefs who participated in the *Māhele* were also required to provide to the government commutations of a portion of their lands in order to receive a Royal Patent giving them title to their remaining lands. The lands surrendered to the government by the King and chiefs became known as "Government Land," while the lands retained by Kamehameha III became known as "Crown Land," and the lands received by the chiefs became known as "*Konohiki* Land" (Chinen 1958:vii, 1961:13). All lands awarded during the *Māhele* were identified by name only, with the understanding that the ancient boundaries would prevail until the land could be surveyed. This process expedited the work of the Land Commission.

During the *Māhele*, native tenants of the lands that were divided up among the Crown, *Konohiki*, and Government could claim, and acquire title to, *kuleana* parcels that they actively lived on or farmed. The Board of Commissioners oversaw the program and administered the *kuleana* as Land Commission Awards (LCAw.). Claims for *kuleana* had to be submitted during a two-year period that expired on February 14, 1848 to be considered. All of the land claimants were required to provide proof of land use and occupation, which took the form of volumes of native registry and testimony. The claims and awards were numbered, and the LCAw. numbers, in conjunction with the volumes of documentation, remain in use today to identify the original owners and their use of the *kuleana* lands. The work of hearing, adjudicating, and surveying the claims required more than the two-year term, and the deadline was extended several times for the Land Commission to finish its work (Maly 2002). In the meantime, as the new owners of the lands on which the *kuleana* were located began selling parcels to foreigners, questions arose concerning the rights of the native tenants and their ability to access and collect the resources necessary for sustaining life. The "Enabling" or "*Kuleana* Act," passed by the King and Privy Council on December 21, 1849, clarified the native tenants' rights to the land and resources, and the process by which they could apply for fee-simple interest in their *kuleana*. The work of the Land Commission was completed on March 31, 1855. A total of 13,514 *kuleana* were claimed by native tenants throughout the islands, of which 9,337 were awarded (Maly 2002).

Historically, the entire *ahupua'a* of Waiākea was treated as personal land by Kamehameha I and passed on to his son Liholiho. Waiākea was later inherited by chiefess Kaunūohua, a grand-daughter of Keawemauhili and *kahu* of Alexander Liholiho (Kame'elehiwa 1992), who later relinquished the *ahupua'a* during the *Māhele 'Āina*. As a result of the *Māhele*, Waiākea *Ahupua'a* was then set aside as Crown Lands for Kamehameha III. Twenty-six *kuleana* claims, or Land Commission Awards (LCAw.), were registered within Waiākea for house lots and cultivated areas. Most of the LCAw. were located along major inland roads, or centered around the fishponds at the inland edge of Hilo Bay (Devereux et al. 1997; Moniz 1994); none were in the vicinity of the current study area.

In 1862, the Boundary Commission was established to set the legal boundaries of the *ahupua'a* that were awarded during the *Māhele*. The commissioners were authorized to certify the boundaries in 1874. The primary informants for the boundary descriptions were older native residents of the specific areas in question. Many times the boundaries of particular *ahupua'a* were established through the testimony regarding neighboring *ahupua'a*. Such was the case for Waiākea; informants, many of whom were born in the late 1700s, provided boundary data for Kea'au in Puna, Keaulou in Ka'u, Kukuau in South Hilo, and Humu'ula in North Hilo, all of which border Waiākea. In describing the *ahupua'a* boundaries, references are made to coastal landmarks, then current and former residential areas, planting areas (none extending above about 2,000 feet), locations of woods where trees for canoes were acquired (above Hilo at a place called Nehuiki), and areas deep in the forest for bird catching. A point at the summit of Pu'u Kūlanī marks the southwestern corner of Waiākea *Ahupua'a*.

Commercial Sugar Enterprises in Waiākea, Railroad Development, and Later Historic Accounts

The written history of the late nineteenth to the early twentieth century largely reflects news of new settlers, religious endeavors, and commercial agricultural pursuits in the region. In the decades following the *Māhele*, when land became a commodity, Hawaiians were often forced off their house lots (and livelihoods) simply because they lacked the cash with which to make the purchase (of land) or pay the property tax. The creation of private property also resulted in a shift away from the traditional *mauka-to-makai* management of whole *ahupua'a* and conventional transportation methods, as certain industries moved into large swaths of land such as livestock ranching and commercial sugar pursuits in the *mauka* lands of Waiākea. As a result, Hawaiian culture was well on its way towards Western assimilation as industry in Hawai'i transitioned from the boom-and-bust sandalwood trade, to a short-lived whaling industry, to the more lucrative, but environmentally destructive sugar and cattle industries.

One of the primary industries that emerged in Waiākea during the mid to late nineteenth century was commercial sugar cultivation. The Polynesian-introduced *kō* (sugarcane; *Saccharum officinarum*) was grown on all islands, and stands as perhaps the most widely developed and extensively cultivated crop in Precontact Hawai'i. Cultivation of sugar for commerce purposes has had the unfortunate effect of diluting the distinguishing characteristics of Hawaiian cane varieties due to the hybridization of traditional and introduced species. prior to its exploitation for profit, *kō* served as a fixed element in Hawaiian horticulture that served a variety of important uses. *Kō* was traditionally planted in the lowland plains, and Neal (1965) relates that there were approximately 40 named varieties cultivated by the Hawaiians. Included in these is the most common *kō kea* (white cane) which was a typically planted near old homesteads. In general, *kō* is purported to grow well in almost all locales, and was “planted at *kihapai* of sweet potato, dry taro and *wauke*, and on the banks of *lo'i* taro patches; and fields of cultivated plants were beautified by plantings of cane along their banks and borders” (Kamakau 1976:39).

Of great curative value, *kō* was considered especially therapeutic and was included as an essential component of medicinal tonics and compounds (Handy 1940). Aside from its role as an active ingredient in medicines, Abbott (1992) opines that it was sometimes used not as a primary constituent, but rather as a flavoring agent to sweeten distasteful bitter herbs in curative compounds. Alternatively, its sweet juice could also be used in a more insidious manner to conceal and accelerate the effects of various poisons (Lincoln 2017). The juice of the *kō* was considered as a very effective remedy for healing deep cuts and wounds, fractured limbs, and severed body parts, healing the skin leaving no evidence of scar tissue (Kaaiakamanu and Akina 1922; Krauss 1993). It also served chiefly as sustenance, and was eaten as a snack, condiment, and a famine food. The juice of the *kō* could be toasted over the fire and fed to nursing babies, and was used to strengthen children's teeth by chewing (Handy and Handy 1991). From a more utilitarian aspect, *kō* could be used to thatch the interior of houses when *pili* grass or *lauhala* (pandanus) were not abundant (Handy 1940; Malo 1951).

It was not until 1835 that sugar became established commercially in the islands, replacing the waning sandalwood industry, and early sugar enterprises were attempted in South Hilo as early as the 1840s (Kuykendall and Day 1976; Oliver 1961; Wilkes 1845). During the 1860s, Kamehameha IV leased large portions of Waiākea for pastureland and sugarcane cultivation (Moniz 1994). The majority of the eastern portions of Waiākea however, remained outside the region of sugar cultivation, most likely due to the shallow soils therein. Commercial sugarcane cultivation had a profound impact on the *ahupua'a* as a whole, and the declining population of Waiākea began to increase as a result of the industrial and economic growth brought about by the sugar industry (Wolforth 2007). By 1857, there were three sugar mills producing sugar for export in the Hilo area. With the Kingdom-wide economic depression that occurred as a result of the U.S. whaling fleet pulling out of the Hawaiian Islands in 1859, the focus of commercial cultivation shifted from general agriculture to sugarcane (McEldowney 1979). The 1860s not only saw an increase in the appropriation of land by foreigners for commercial sugar cultivation, but additionally in 1861 S. Kipi leased the Crown Lands of Waiākea at the rate of \$600 dollars a year to be used as pasture land for a term of five years (Kelly et al. 1981; Maly 1996). During this time, the study area and lands in the immediate vicinity in Pana'ewa appeared to have been spared by these enterprises, remaining as undeveloped forest lands. One of the earliest maps of Waiākea drawn by W.M. Webster in 1851 shows the boundaries of the Pana'ewa forest in addition to two thoroughfares: the “Road from Oloo to Hilo” west of the study area, and the “Road to Puna” directly to the east of the study area, both of which provided access from Puna to Hilo (Figure 22).

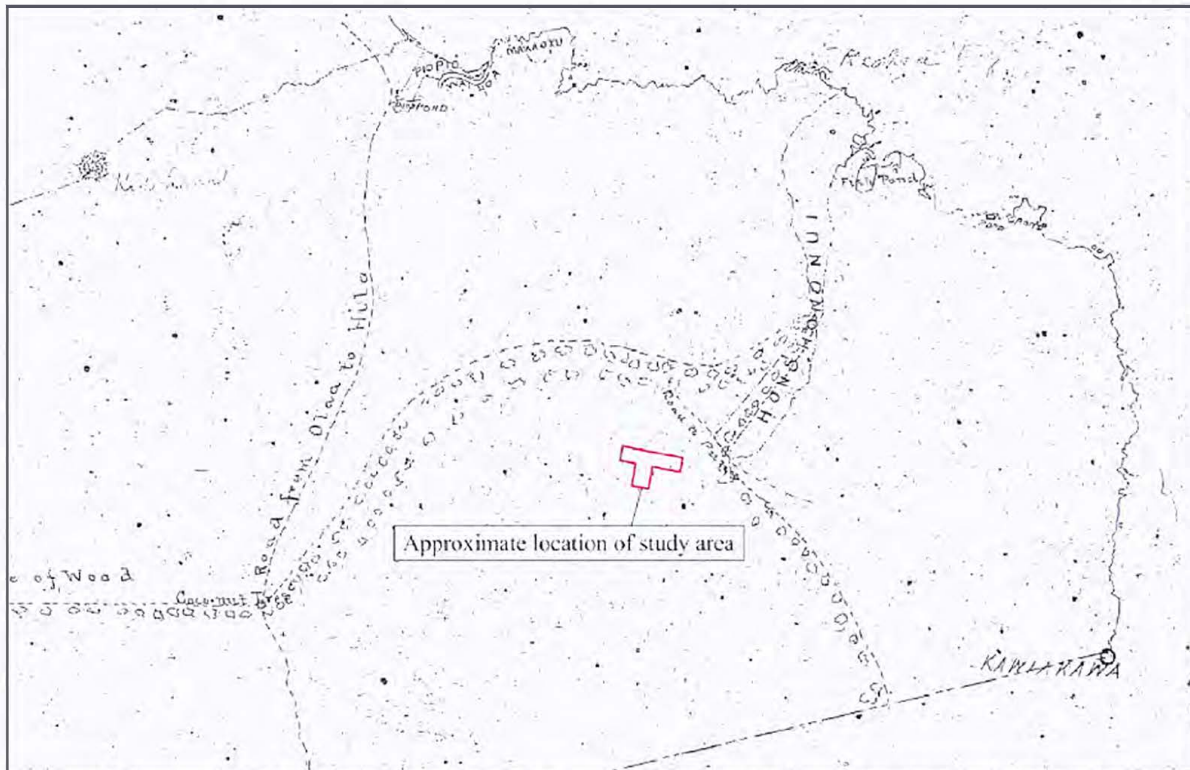


Figure 22. Portion of 1851 Hawai‘i Registered Map No. 705 by W.M. Webster showing the eastern portion of Waiākea and study area location (outlined in red) relative to the bounds of the Pana‘ewa forest.

Although the commercial cultivation of sugar had commenced roughly thirty years prior in South Hilo, it hadn't quite begun to dominate the district yet. Isabella Bird visited Hilo in 1873 and published her experiences in *The Hawaiian Archipelago: Six Months Among the Palm Groves, Coral Reefs, & Volcanoes of the Sandwich Islands* (Bird 1882). Her firsthand accounts of Hilo are dreamy and romanticized; perhaps the most vivid of all foreign accounts regarding the environs of Waiākea and Pana‘ewa. In the following excerpt, she describes the region as thickly vegetated, but makes no mention of sugarcane or burgeoning industrialization in the vicinity of the study area. She does, however, note that “above Hilo, broad lands sweeping up cloudwards, with their sugar cane, *kalo*, melons, pine-apples, and banana groves suggest the boundless liberality of Nature” (Bird 1882:36). Bird also provide a colorful depiction of her journey from Puna to Hilo through the 4-mile-wide Pana‘ewa forest, on either the old Puna Trail or the road to ‘Ōla‘a (see Figure 22; Figure 23) in the vicinity of the study area:

... We had a delicious gallop over the sands to the Waiakea river, which we crossed, and came upon one of the vast lava-flows of ages since, over which we had to ride carefully, as the *pahoehoe* lies in coils, tortuosities, and holes partially concealed by a luxuriant growth of ferns and convolvuli. The country is thickly sprinkled with cocoanut and breadfruit trees, which merge into the dense, dark, glorious forest, which tenderly hides out of site hideous, broken lava, on which one cannot venture six feet from the track without the risk of breaking one's limbs. All these tropical forests are absolutely impenetrable, except to axe and billhook, and after a trail has been laboriously opened, it needs to be cut once or twice a year, so rapid is the growth of vegetation. This one, through the Puna woods, only admits of one person at a time. It was really rapturously lovely. Through the trees we saw the soft steel-blue of the summer sky: not a leaf stirred, not a bird sang, a hush had fallen on insect life, the quiet was perfect, even the ring of our horses hoofs on the lava was a discord. There was a slight coolness in the air and fresh mossy smell. It only required some suggestion of decay, and the rustle of a fallen leaf now and then, to make it an exact reproduction of a fine day in our English October. The forest was enlivened by many natives bound for Hilo, driving horses loaded with cocoanuts, breadfruit, live fowls, *poi* and *kalo*, while others with difficulty urged garlanded pigs in the same direction, all as presents for the king. (Bird 1882:129–130)

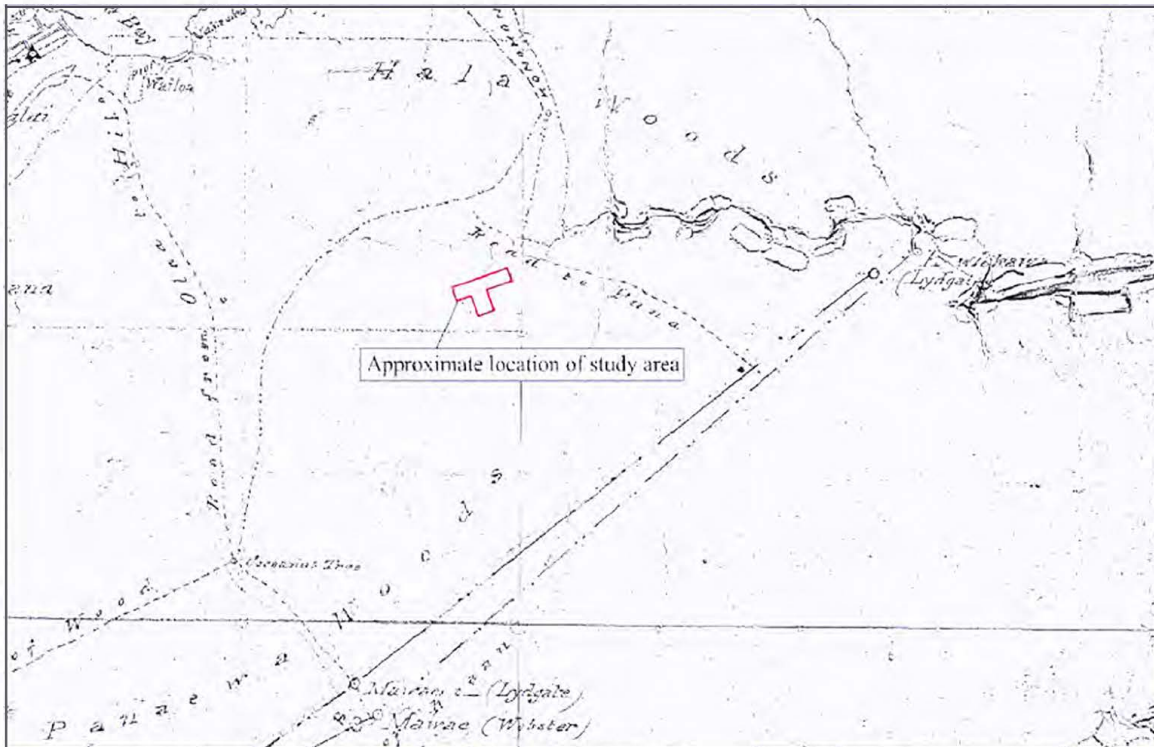


Figure 23. Portion of Hawai'i Registered Map No. 571 by C.J. Lyons (ca. 1870s) of "Central Hawaii Hilo and Hamakua" showing the "Road to Puna" in relation to the current study area within the Pana'ewa forest and the current study area.

Not long after Bird's visit to Waiākea, and following the signing of the 1875 Treaty of Reciprocity, a free-trade agreement between the United States and the Kingdom of Hawai'i which guaranteed a duty-free market for Hawaiian sugar in exchange for special economic privileges for the United States, commercial sugarcane cultivation and sugar production became the central economic focus for the Hilo area. By 1874, Hilo already ranked as the second largest population center in the islands and within a few years the fertile uplands, plentiful water supply, and port combined to make Hilo a major center for sugarcane production and export. In that same year, the first lease for sugarcane cultivation in Waiākea was granted to Rufus A. Lyman for a term of 25 years. The lease granted him all the privileges of the land including the use of the fishponds and the cutting of firewood (Maly 1996). This lease was eventually transferred to the Waiākea Mill Company, founded by Alexander Young and Theo H. Davies, and the Waiākea sugar plantation was established.

In 1879 the Waiākea Mill Company (Figure 24) incorporated and began a commercial sugar operation on about 350 acres of land in Waiākea that they acquired from Lyman northeast of the current study area. The Waiākea sugar mill, also built in 1879, was located at the inland end of Waiākea fish pond, and the company lands extended south from the mill to the uplands of Waiākea Ahupua'a, but did not include the study area. Rather, the lands in and around the study area remained forested and mostly utilized by individuals traversing between Puna and Hilo on the old Puna Trail. an 1883 account by D.H. Hitchcock paints the route as a "miserable muddy trail to the Panaewa woods, and through these woods on a narrow trail, for most of the time overgrown with ai and guava bushes, until the cocoanut grove was reached" (Hitchcock 1897). The thick density of vegetation in the Pana'ewa forest was also noted in an account from the following year:

... little to be seen along the route [to Hilo from Puna], except the luxury of the tropical forest, the beauty of which increases steadily as we approach the town. It is doubtful if its luxuriance can be surpassed by that of any other country in the world.

... The approach from Hilo is the most difficult of all, because it involves the necessity of traversing the belt of forest which lies between the middle slopes of the mountain and the sea. No one can imagine the density and exuberance of tropical vegetation until he has seen it. In truth, the forest

can be penetrated only by hewing a way through it or by traversing a route which has already been cut by main force. (Report of the Director of the United States Geological Survey 1883)

Over the course of the next few years, the Pana'ewa forest remained as it was, but the sugar industry continued to progress. By 1887, railroads operating on steam and animal power were built on some plantations, although some utilized flumes or cable railways to transport cane from the fields to the coast mills. One year later in 1888, the Waiākea Mill Company further increased its land holdings by acquiring a 30-year lease for additional lands in Waiākea. These lands were systematically cleared and planted in sugarcane in the years to come. In 1889, J. Cumming Dewar voyaged on the SS *Nyanza* from Kawaihae to Hilo to meet with the manager of the Waiākea Mill, and succinctly described Hilo and its fields of cane:

After a delightfully fine evening and a smooth passage during the night, we arrived and anchored in Hilo Bay at 10 A.M. on Sunday, January 6. From daybreak till the time of our reaching the port, the scenery as we steamed along the coast was exceedingly attractive. Numerous waterfalls were to be seen precipitating themselves over the cliffs into the sea, whilst ever and anon we passed large plantations of sugar-cane. (Dewar 1892:260–261)

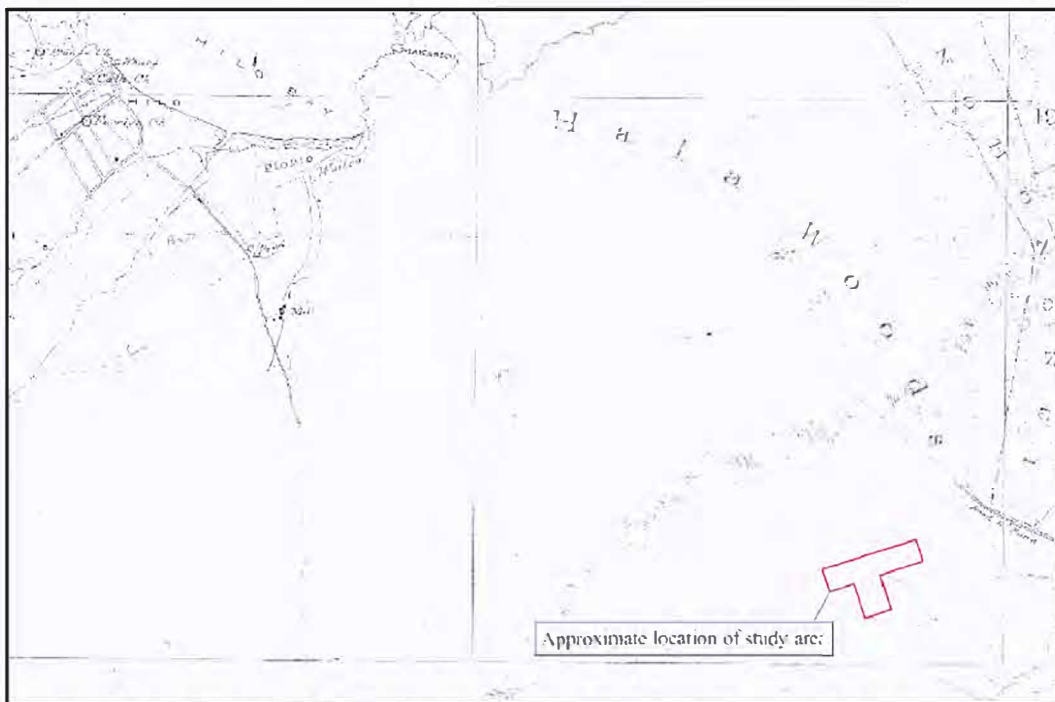


Figure 24. Portion of undated Hawai'i Registered Map No. 842 by Lyons and Covington of showing "Lands of Hilo Hawaii" showing Hilo Bay and Waiākea Mill in relation to study area (outlined in red).

With the annexation of Hawai'i to the United States in 1898 and the granting of Territory status in 1900, Hilo was designated the center of county government in 1905 and remained the second most populated city in the newly formed Territory of Hawai'i. Railroad construction was one of the most important elements of governmental and private sector planning following the Treaty of Reciprocity, as crops and product were still being transported by beast and cart (Dorrance and Morgan 2000). On the Island of Hawai'i, the first major line to be constructed was in North Kohala District, which operated as the Hawaiian Railroad Company. The North Kohala line, however, was envisioned as only the first step toward a much larger system connecting the cane fields of Kohala, Hāmākua, and Hilo with Hilo Harbor, the only protected deep-water port on the island. Beginning in 1899, railroad lines began transporting sugar to the harbor for marine transport, thus Hilo became an important shipping and railroad hub. It was in during this year that the Waiākea Mill Company established a railroad system to carry the cane from the fields to the mill for processing and the Hilo Railroad Company had begun building tracks from Waiākea through the Pana'ewa forest to the 'Ōla'a Sugar Company Mill in the district Puna (Kelly et al. 1981), which would later become part of the Hawai'i Consolidated Railway (HCR). By the early twentieth century, the Waiākea Mill Company had increased the area under sugarcane cultivation in Waiākea to nearly 7,000 acres.



Figure 25. Portion of Hawai'i Registered Map No. 1713 from 1893 by E.D. Baldwin showing the northern extent of the Pana'ewa Woods and approximate location of the study area (outlined in red).

The commercial sugar industry provided most of the cargo transported by HRC, but suffered a sharp decline between the years of 1904-1907, which caused a halt of development in Hilo (Thurston 1913). In response, HRC worked with 'Ōla'a Sugar Company to send a representative to Washington D.C. in 1907 to secure funding for the construction of a breakwater that would allow Hilo Bay to accommodate larger ocean-going vessels. Construction on the breakwater began in 1908 and was still ongoing at the time of Thurston's writing (ca. 1914); the breakwater was finally completed in 1929. In exchange for construction of a breakwater in Hilo Bay, the Hilo Railroad was required to build a new wharf, a one-mile rail extension from Waiākea, and a 50 mile rail extension north to Honoka'a Mill (the Hāmākua Division). The funding of the breakwater by HRC resulted in the extension of the railroad through the populated section north of Hilo all the way to Hakalau and Hāmākua (Figure 27):

When the breakwater project was pending before Congress, opposition was made to the appropriation on account of the limited commerce then being transacted through Hilo harbor.

Assurances were thereupon made by the Hilo Railroad Company, that if the breakwater were constructed, a railroad would be built into the country north of Hilo and suitable wharf facilities provided under the lee of the breakwater. Such assurances had a material effect in securing the appropriation. (ibid.:145)

The extension to Honoka'a would finally connect the sugar mills of South Hilo, North Hilo, and Hāmākua with Hilo's protected harbor. Between June 1909 and December 24, 1911, HRC built 12.7 miles of rail extending from Hilo to Hakalau Mill, crossing many deep gulches and valleys along its route.

Ultimately, the cost of the Hāmākua Division ruined HRC and as a result, they were forced to sell out and reorganize under the name Hawaii Consolidated Railway (HCR) in 1916. Two years later in 1918, the Waiākea Mill Company's lease of Waiākea Ahupua'a expired, and the land fell under new homesteading laws that required the government to lease portions of it to individual homesteaders who would be willing to grow sugarcane. Some of the most fertile lands in Waiākea, to the southwest of the Hawai'i Consolidated Railway right-of-way (and the study area) were subsequently subdivided by the Territory of Hawai'i into house lots, homesteads, and cane lots of various sizes for lease and purchase. It was during this time that the state of the Puna Trail fell into deterioration, and by 1919 it

was said to be largely unutilized, particularly with the advent of automobiles, the development of more accommodating and direct thoroughfares, and increasing industrialization in surrounding areas (Figure 26). The following account chronicles the decaying condition of the trail during this time period, details its construction methods and significance prior to its abandonment, and reveals that in the face of burgeoning urbanization of the area that traditional lifeways persisted nevertheless:

There is, for instance, the old Puna trail—or what is left of it. Few have passed that way since automobiles came into general use, yet it leads through charming ways along the coast beyond the Seaside Club. It is no ordinary trail and bears evidence even in the partial decay of being constructed to withstand much traffic. The sides are carefully walled and the footway set with small stones. It is a picturesque relic and with a complementary compilation of the rich legendry which must be identified with it would make an additional showplace for visitors. The trail winds through primitive and riotous jungle, touches secluded bits of shore and discovers here and there tiny huts in which dwell native Hawaiians who appear to be quite happy in knowing little of the world and caring less.

It is not likely that the lands through which this old trail winds will soon be required for commercial use, as most of it is roughly piled aa or pahoehoe full of pukas, but whatever is done with it there should be a strip reserved by the Government to include portions at least of the old Puna trail. It would be a shame to permit its entire obliteration. (Hilo Daily Tribune 1919)

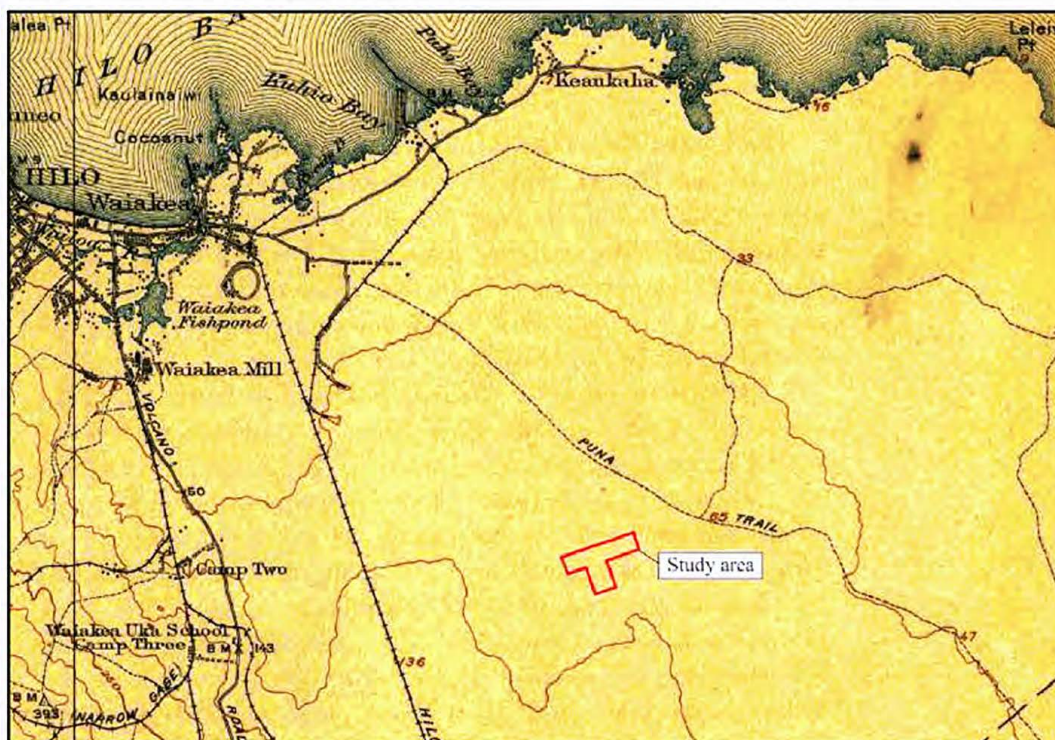


Figure 26. Portion of 1917 USGS Hilo quadrangle map showing current study area (outlined in red) in relation to the “Puna Trail” alignment, Hilo railroad, and Waiākea Mill.

By 1921, the large tracts of land within and below the Pana‘ewa forest were being recognized for their potential as “an agricultural and pastoral region” and it was opined that “in time to come great enterprise will be built up among the kipukas found all through the Panaewa and Puna sections of this island” (Hilo Daily Tribune 1921). Following the establishment of the Waiākea Homesteads (Figure 28), and in an effort to help Native Hawaiians maintain their traditional ties to the land, the federal government of the United States passed the Hawaiian Homes Commission Act and set aside approximately 200,000-acres in the Territory of Hawai‘i as a land trust for homesteading by native Hawaiians (administered by the Hawaiian Homes Commission). Included in this initial distribution of land were two tracts in the Pana‘ewa portion of Waiākea (totaling 2,000 acres) to the west of the current study area. The first awarding of these Hawaiian homestead lots (the Pana‘ewa farm lots) occurred in the 1940s. By the mid-1940s, contractual and legal problems combined with a declining sugar market and the devastating *tsunami* of 1946 led the Waiākea Mill Company to cease operation the following year in 1947.

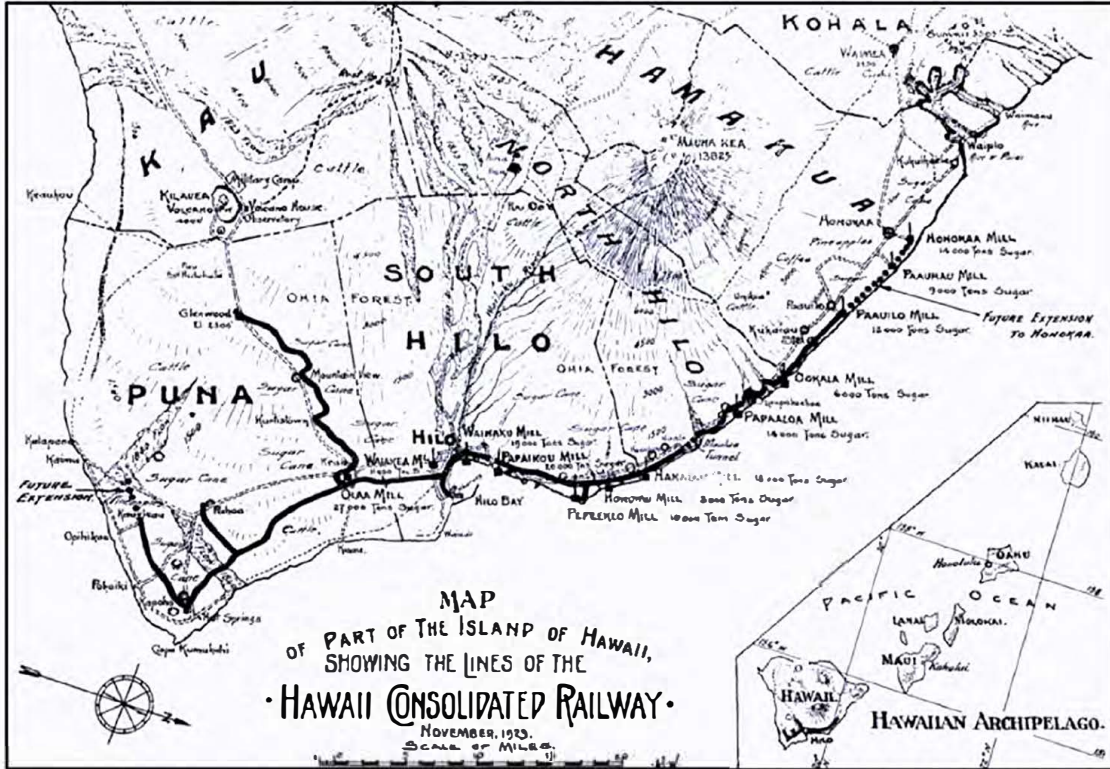


Figure 27. Hawai'i Consolidated Railway Map of rail system as of November 1923 (Annual Report 1926).

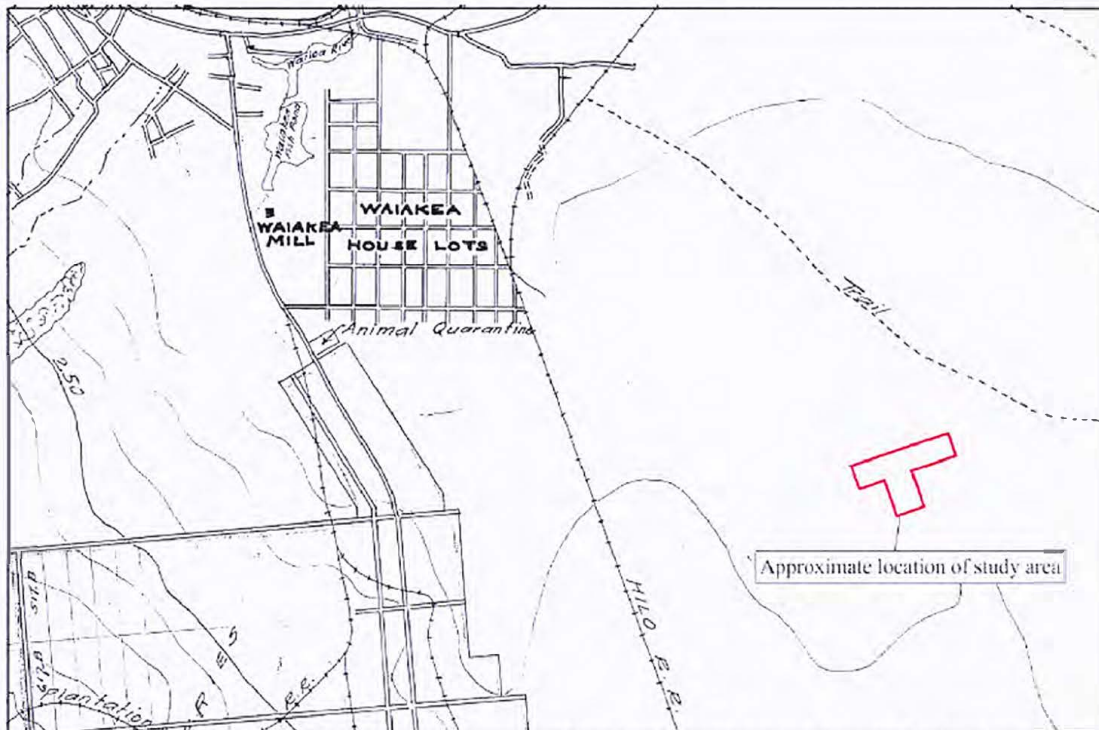


Figure 28. Portion of Hawai'i Territory Survey plat No. 787 by Jos. Iao ca. May 1920 showing study area (outlined in red) in relation to the Hilo Railroad, Puna Trail, Waiākea House Lots, and Waiākea Mill.

The sugar industry brought widespread changes to the Hilo area and drastically altered the traditional landscape of the district. As part of the late nineteenth century development of the sugar plantations and related infrastructure, some of Hilo's largest fishponds (Hanalei, Kalepolepo, Mohouli, Waiāhole, and Hoakumau) were filled in, and many old residences, burial sites, trails, *heiau*, formerly located in the cane fields were destroyed as a result. Throughout the 68 years of its operation, the Waiākea Mill Company was a major force in shaping the economic and social growth of Hilo, and certainly left its mark on both the cultural and physical landscapes of the area.

The *Tsunami* of 1946 and 1960 and the Lands of the Current Study Area During the 20th Century

On April 1, 1946, a *tsunami* triggered by a 7.1 magnitude earthquake in the Aleutian Islands slammed into the north-facing shores of Hawai'i Island. It claimed the lives of 159 people, destroyed more than 500 buildings, and caused millions of dollars in property damage (Figure 29). The coastal community of Waiākea was decimated by the *tsunami* and associated flooding, which inundated an area spanning from central Hilo eastward to Keaukaha. The waves crushed numerous structures and lifted others off their foundations and swept them inland. The *tsunami* dealt a fatal blow to the already struggling HCR. Tracks around the waterfront were entirely washed out and the Hilo Station was wrecked. An entire span of the Wailuku Bridge was torn out and washed out, and Waiākea Town never recovered from the devastation and was never rebuilt.



Figure 29. Aftermath from the 1946 *tsunami* with Waiākea Mill standing near back of Waiākea fishpond, study area vicinity in background (Hawaii Tribune-Herald 2017).

Nine years later in 1955, Robert Yamada leased roughly 380 acres of Honohononui Ahupua'a, *mauka* of Kalaniana'ole Avenue and south of the Hilo airport, as pasture land. Just five years later, on May 23, 1960, a devastating series of eight major *tsunami* waves triggered by an 8.3 earthquake in Chile, South America, swept through Hilo. One year later in 1961, most of Yamada's leased land was chain-dragged, and between 1962 and 1963 the County of Hawai'i exercised eminent domain to acquire numerous parcels of land in the *tsunami* affected areas of Hilo as part of the Hawai'i Redevelopment Agency's Kaiko'o Project. The goal of this project was to "designate lands...for such reuse as will minimize the danger of loss of life or damage to property in areas subject to possible inundation and flooding from future seismic waves" (Hawaii Redevelopment Agency 1965:3). Project activities

2. Background

included not only the acquisition of property, but relocation assistance for affected residents and business owners, property management, demolition and building removal, re-zoning of land use and preparation (clearance, grading, and filling) for new development, and disposition of acquired lands by sale or lease at a fair price for new development. The portion of TMK: (3) 2-1-013:002 that contains the current study area was designated as a 113.382-acre "Borrow Pit Site" as a result of the Hawai'i Redevelopment Agency's Kaiko'o Project. Yamada & Sons, Inc. and the County of Hawai'i also had 40-acre borrow pit sites located to the southwest of the current study area, adjacent to a roughly 192-acre strip of land that was deeded to the Department of Hawaiian Home Lands (DHHL) by the State of Hawai'i on January 8, 1962. Another 40-acre parcel of land adjacent to the northern edge of the borrow pit site eventually became the location of the South Hilo Sanitary Landfill.

By 1965, quarrying activities within the Hawai'i Redevelopment Agency borrow pit had commenced, and had intruded slightly into the northern portion of the current study area (Figure 30). Additionally, extensive quarrying activities were being conducted within the original 40-acre Yamada & Sons, Inc. borrow pit site (west of the study area on TMKs: (3) 2-1-013:160, 161, and 163) at this time. Between 1965 and 1970, the leased lands were also used to stockpile sugarcane bagasse. Five years later in 1975, Yamada & Sons, Inc. reduced the amount of leasehold lands to encompass only 180 acres, of which 150 acres was used for agricultural purposes with 30 acres being used as a quarry site. During that year, most of the leased lands were mechanically cleared and turned to pastureland. In a seven-year span between 1970 and 1977, much of the study area appears to have been cleared of vegetation, and a 1977 orthographic photo-quadrangle indicates that quarrying activities occurring on the original borrow pit had expanded into the southwestern corner of the study area and also across Parcel D (Figure 31). Additionally, the road that bisects the current study area is evident, as is a connector road that extends northwest to southeast across the northern portion of the area of the proposed quarry site. Although activities associated with quarrying of the current study area appear to have ceased by the early 1990s, as evidenced in a 1992 USGS aerial photograph (Figure 32), quarrying activities at the adjacent borrow pit site to the west have continued to this day. Additionally, that operation expanded its scope in 2007 to include the 14.99-acre "Parcel D" situated directly adjacent to the currently proposed quarry and borrow pit site also to the west.

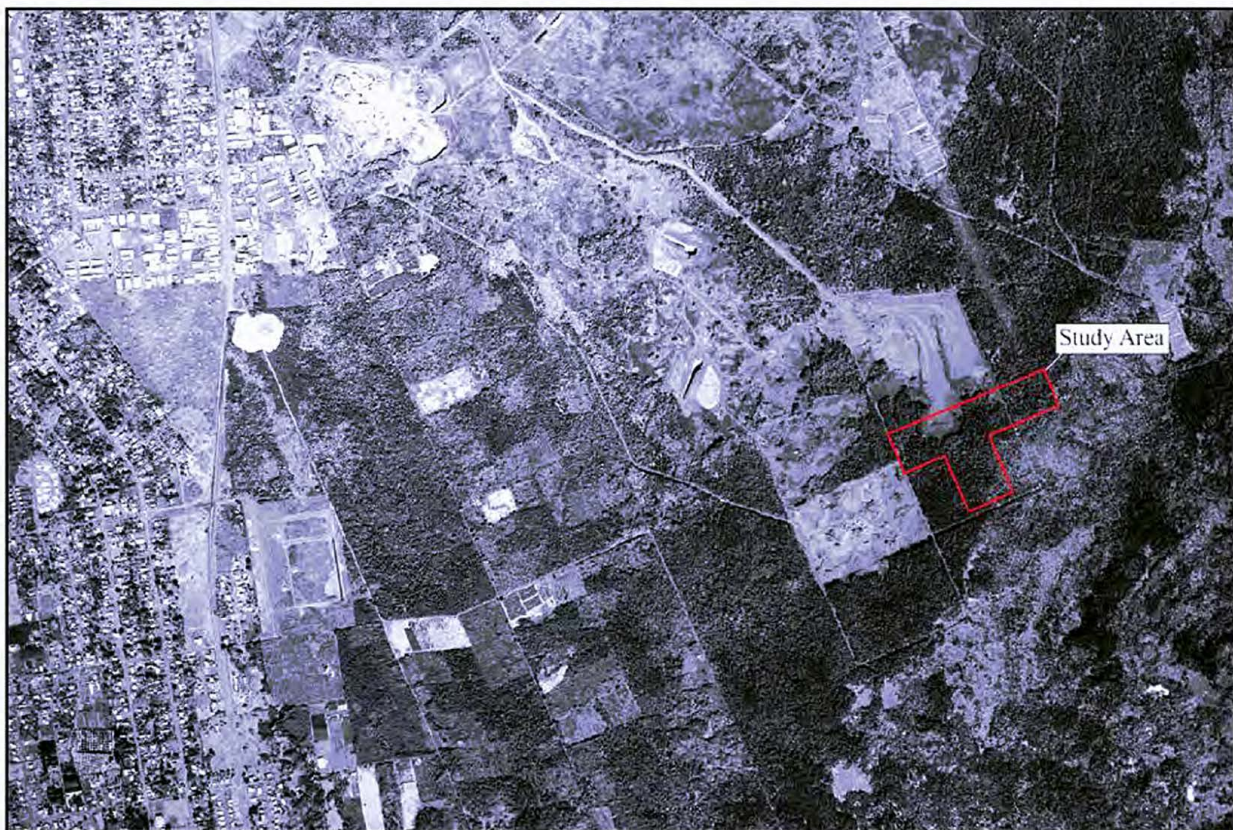


Figure 30. January 16, 1965 USGS aerial photo showing quarry intruding into northern portion of study area (outlined in red).



Figure 31. Portion of a 1977 orthophotoquad showing quarry expansion and network of quarry roads within study area (outlined in red).

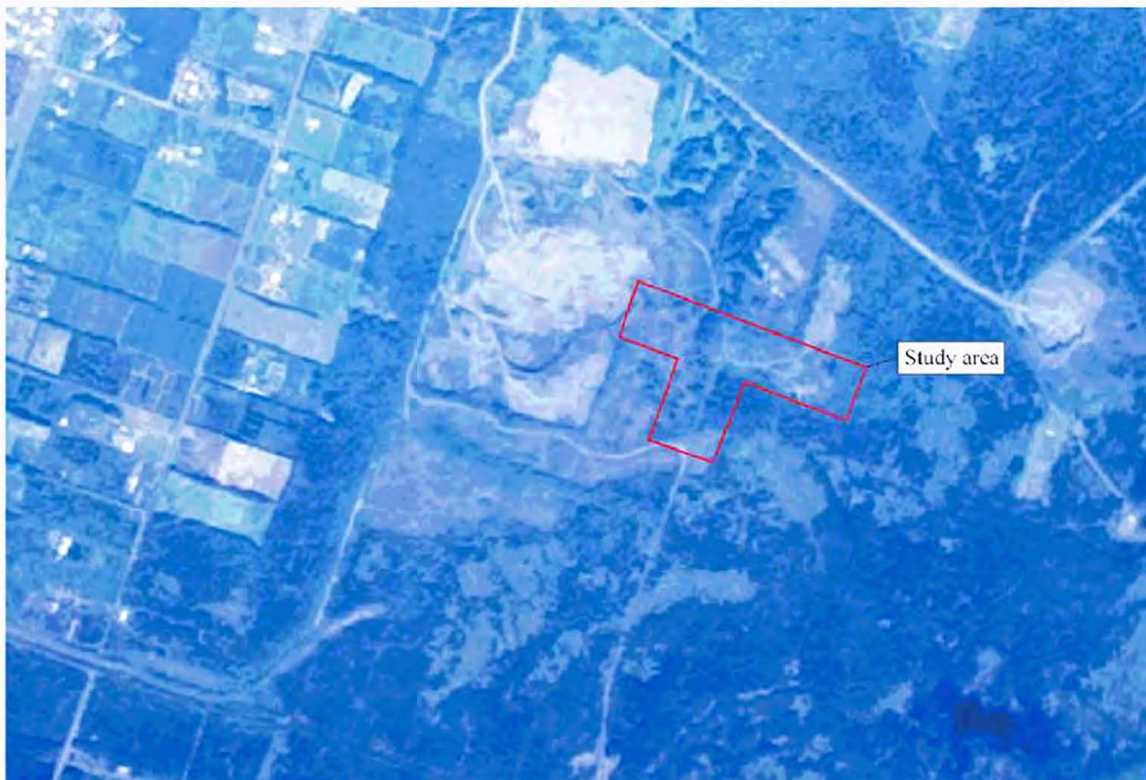


Figure 32. Portion of a September 23, 1992 USGS aerial photo showing active quarry site in relation to current study area (outlined in red).

PREVIOUS ARCHAEOLOGICAL STUDIES

A number of archaeological studies have been previously conducted within Waiākea and the general Hilo region over the years, most of which have occurred north and west of the current study area and concentrated primarily in coastal environs. Collectively, site types previously documented within Waiākea include but are not limited to fishponds, Historic-era military structures, the Puna Trail, temporary and permanent habitation sites, lava tubes, modified sinks, overhang shelters, and Historic sugarcane infrastructure. Numerous archaeological studies specifically conducted within the Pana'ewa section of Waiākea, however, have generally reported a lack of findings (Carson 1999; Escott 2013a, 2013b, 2015, 2016; Hammatt and Tulchin 2007; Haun and Henry 2002; Rechtman 2003, 2006, 2009a, 2009b; Rosendahl 1988a, 2002; Wheeler et al. 2014a). There have been no prior archaeological studies conducted that have included the current study area. The most proximate studies conducted within Waiākea either within or in close proximity to Pana'ewa are presented in Table 1 and Figure 33 and those that have identified findings are discussed in detail below.

Table 1. Previous archaeological studies conducted in the vicinity of the current study area.

| <i>Year</i> | <i>Author</i> | <i>Type of Study</i> |
|-------------|---------------------|-------------------------------------------------------|
| 1974 | Ching and Stauder | Reconnaissance Survey |
| 1979 | Bonk | Archaeological Survey |
| 1997 | Devereux et al. | Reconnaissance Survey |
| 1999 | Carson | Inventory Survey |
| 2000 | Hammatt and Bush | Inventory Survey |
| 2001 | Godby and Tolleson | Data Recovery |
| 2002 | Escott and Tolleson | Inventory Survey |
| 2002 | Haun and Henry | Inventory Survey |
| 2002 | Rosendahl | Reconnaissance Survey |
| 2003 | Rechtman | Archaeological/Limited Cultural Impact Assessment |
| 2006 | Rechtman | Archaeological Assessment |
| 2006 | Wolforth | Inventory Survey |
| 2007 | Tulchin and Hammatt | Archaeological Literature Review and Field Inspection |
| 2009a | Rechtman | Archaeological Survey |
| 2009b | Rechtman | Archaeological Assessment |
| 2013a | Escott | Archaeological Assessment |
| 2013b | Escott | Archaeological Assessment |
| 2014 | Wheeler et al. | Inventory Survey |
| 2015 | Escott | Archaeological Assessment |
| 2016 | Escott | Archaeological Assessment |

Thrum and his associates, W.T. Brigham and J.F. Stokes of the Bishop Museum, compiled information on over 130 *heiau* on Hawai'i Island (Thrum 1908a). However, one must take into consideration that Thrum included data on *heiau* that had already been destroyed prior to his data collection efforts in the early 1900s. Regarding the *heiau* of the Hilo district, Thrum stated: "little evidence of their existence now remains, so complete has been their destruction, but though their stones are scattered, much of their history is yet preserved" (1908b:55).

During the early 1930s, A.E. Hudson (Hudson 1932), working under the aegis of the Bernice Pauahi Bishop Museum, also conducted archaeological investigations in East Hawai'i. He found little in the region surrounding the current area of study, although he noted that "there was an important village and trading center around Hilo Bay" (1932:20), but stated that, "no archaeological remains are to be found within the town of Hilo itself except a few stones which are said to have been taken from heiaus..." (1932:226). Hudson also relates the following account of a previously existing *heiau* in Waiākea near Coconut Island (Mokuola) and another one near the route of the present Kīlauea Avenue:

Of the several heiaus known to have existed in and around Hilo, that at Coconut Island was also a puuhonua.

There is some reason to think that the island itself was the place of refuge and that the heiau was situated on the mainland opposite. Thrum (65-c, p. 40) locates it on the shore opposite the island. Elsewhere (65-d, p. 56) he says:

“Occasional reference is made to Coconut Island (Mokuola) as the place of refuge of the Hilo district, hence its name, Life Island.” Careful inquiry shows that the area of this puuhonua included also a portion of the mainland adjoining. The heiau connected with it, named Makaoku, was of the Luakini class. Its dimensions are unknown though it is said to have had a pyramid of stone 30 feet high as if for a place of observation. The remaining stones were taken by Captain Thos. Spencer for a boat landing about 1860. The northern part of Mokuola is known as Kaulainiwi, being the place where the bones were placed to dry or for airing”.

The present archaeological remains consist of a few single stones in the park opposite the island. Mr. Levi Lyman tells me that although they were found on the mainland they have all been moved in making the park. Quite probably they had also been moved several times previously so they are of no use in reconstructing the outlines of the site. Their only significance is in indicating that the structure was built, at least in part, of large lava blocks, rather than beach boulders. (Hudson 1932:256–257)

Hudson also identified one of the inland *heiau* as being in Waiākea, along the old Hilo/‘Ōla‘a trail (not far from the route of modern-day Kīlauea Avenue):

There was a heiau named Kapaieie near Honokawailani in Waiakea. Bloxam who passed the site on his way from Hilo to the volcano say that its center was marked by a single coconut tree. At the time of his visit nothing remained but ruined walls choked with weeds. He was told that the priests would lie in wait for passersby and dispatch them with clubs. Thrum [1908:40] states that the site was famed in the Hilo-Puna wars but its size and class are unknown. No remains of any kind could be found and no Hawaiians with whom I talked had ever heard of it. (1932:240)

It wasn't until the Hawai'i Island portion of the Statewide Inventory of Historic Places (SIHP) conducted during the early 1970s that detailed recording of archaeological sites in the general vicinity of the current study area began. Records on file at the State Historic Preservation Division reveal that as a part of that study, three sites, all dating to the Historic Period, were recorded to the west/northwest of the study area. These sites included the Hawai'i Consolidated Railway's eight-stall roundhouse, or locomotive garage (Site 7432) located on Kalanikoa Street adjacent to what is currently the County of Hawai'i swimming pool; the “*Tsunami* Clock” (Site 7452) located along Kamehameha Avenue, and the Wailoa River Bridge (Site 7484).

In 1974, the Archaeological Research Center Hawai'i (ARCH; Ching and Stauder 1974) conducted a reconnaissance survey for the proposed 2^{1/2}-mile alignment of a road extending between Keaukaha and the South Hilo/Puna District boundary, located to the southeast of the current study area (Figure 33). As a result of the study, four archaeological sites were identified adjacent to the South Hilo/Puna boundary including a “stacked *pāhoehoe* wall. . . platform/monument burial, animal enclosure and habitation site” (Wheeler et al. 2014a). It was recommended that an Archaeological Inventory Survey (AIS) be undertaken of the proposed development area and that the projected alignment be shifted in an effort to protect archaeological resources.

Five years later in 1979, William Bonk (1979) of the University of Hawai'i at Hilo conducted an archaeological survey of a 39-acre portion of Tract I of the Pana'ewa Hawaiian Home Lands located to the northwest of the current study area (Figure 33). As a result of the survey, two modern features were documented: a segment of a stone wall and a fragment of a wire fence. Additionally, a 15 to 20-foot-wide section of a roadway was identified, which was intermittently marked by short stone alignments. It was concluded by Bonk (1979) that no further work be the recommended treatment.

By the time the 1980s rolled around, stricter environmental regulations led to an increased number of archaeological and cultural studies being conducted in Hilo. In 1981, at the request of the U.S. Army Corps of Engineers, the B.P. Bishop Museum Department of Anthropology prepared a chronological history of Hilo Bay in an effort to assist in future environmental planning (Kelly et al. 1981). Aside from a limited amount of survey work (Clark and Rechtman 2016; McEldowney 1979; Rechtman 2001) previously conducted in the upper forest area of Waiākea, most of the major previous (and more recent) archaeological studies in the *ahupua'a* were conducted within the vicinity of Hilo town (Carson 1999; Hammatt et al. 1993; Hunt et al. 1993; Jennings 1991; Maly 1994; Maly et al. 1994; Rechtman and Henry 1998; Walker 1994)

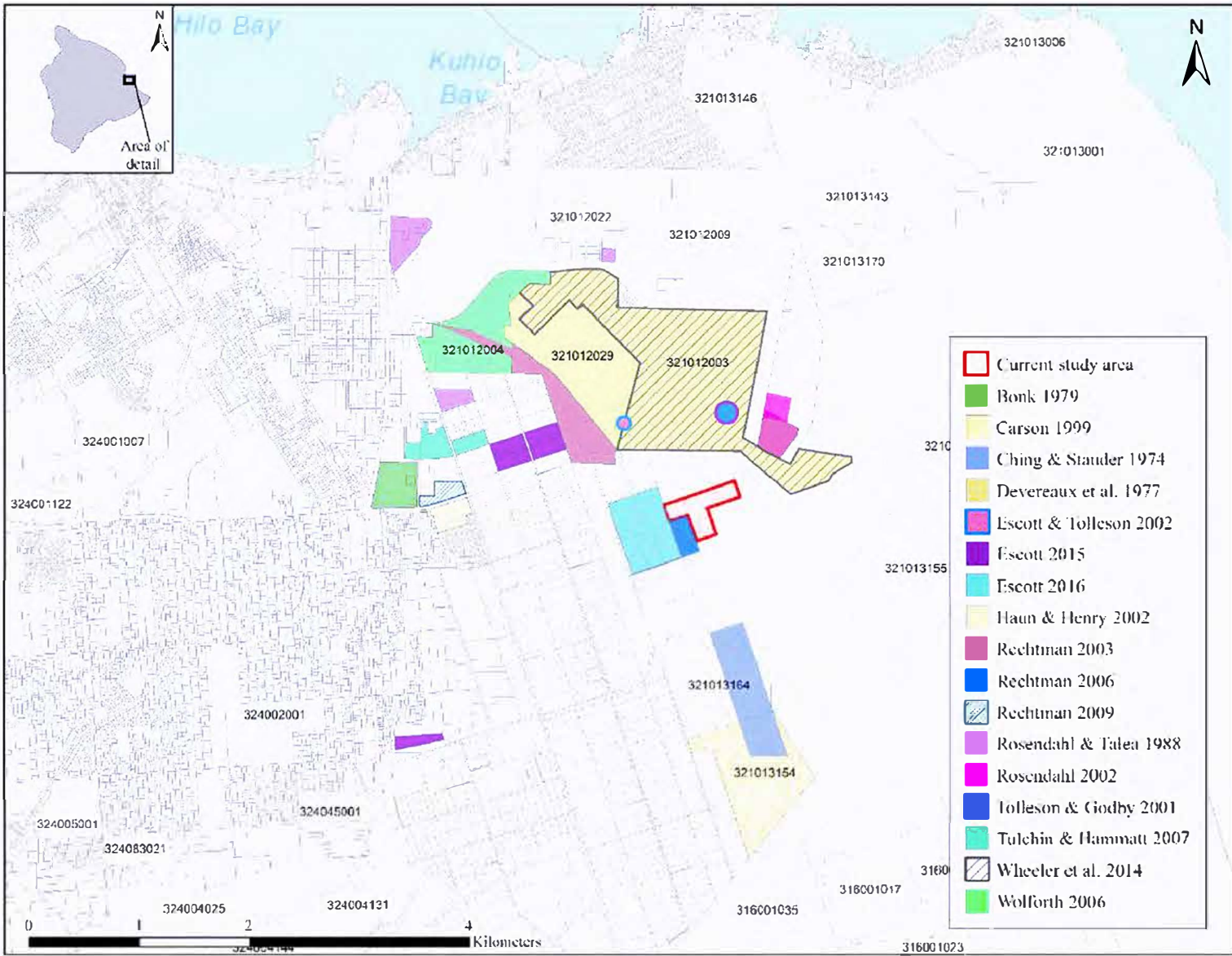


Figure 33. Previous archaeological studies conducted in the vicinity of the current study area.

Collectively, these studies document the ravages that Historic Period land use associated with ranching and sugarcane cultivation (during the 1860s-1940s) and increasing housing development associated with a growing population (from the 1950s through the present) had on the Precontact archaeological record. With an increasing population comes a need for increased infrastructure. The acquisition of local building materials (rock and fill) and solid waste disposal are paramount among the infrastructural needs, and by 1950 the vicinity of the current study area became the focal point for both of these activities.

Since the late 1980s, archaeological studies conducted in close proximity to the current study area have concentrated largely on the development and continual expansion of the Hilo Industrial area, north of the study area. These studies focused primarily revolved around proposed implementation and development of rock quarrying and stockpiling sites, waste sorting locales, industrial plants, and the expansion of the Keaukaha Military Reserve (KMR), (Bush et al. 2000; Devereux et al. 1997; Escott 2013b, 2013a; Escott and Tolleson 2002; Rechtman 2006; Rosendahl 1988a, 1988b, 2002; Tolleson and Godby 2001; Wheeler et al. 2014a)

There have been several archaeological studies conducted within the lands of the Keaukaha Military Reserve (KMR), situated north of the current study area beginning in 1996 when Cultural Surveys Hawai'i, Inc. (CSH; Devereux et al. 1997) conducted a selective archaeological reconnaissance survey of a 500-acre parcel within KMR. Portions of their survey area bordered the current study area to the west, south, and east (Figure 33). As a result of their study, two archaeological sites were identified; however, one of these was subsequently reinterpreted to be a modern bulldozer push pile. The other, temporary site CSH-1, is a C-shaped enclosure located near a Jeep road that was interpreted to have served as a temporary habitation shelter. Devereux et al. (1997) suggested that the Jeep road may have been a remnant of the old Puna Trail (Site 18869), and that the C-shaped shelter may have been an ancillary feature of the trail. In addition to the C-shape, Devereux et al. (1997) also recorded ten historic buildings associated with KMR. No further work was the recommended treatment for the historic buildings. However, it was recommended that a more intensive archaeological inventory survey be conducted within the undisturbed forested areas along what they believed to be the old Puna Trail alignment, located to the northeast of the current study area.

Three years later in 2000, CSH (Bush et al. 2000) returned to the KMR and subsequently conducted a Phase II AIS in forested areas and other sectors that were determined during Phase I fieldwork to have been only minimally impacted by previous disturbance. As a result of their revisit, they fully documented the previously identified C-shape as Site 21657 and interpreted it as being military in origin. Additionally, they identified two new sites: Site 21658, a complex comprised of five *ahu* (rock mounds) interpreted as a location marker for a water source or temporary shelter; and Site 21659, a modified lava blister interpreted as a traditional Hawaiian agricultural feature. Bush and Hammatt (2000) also documented a section of the previously recorded Puna Trail (Site 18869). These sites were re-identified by SCS in 2002 (Escott and Tolleson 2002) during an additional AIS of the KMR (see Figure 33).

One year later in 2001, Scientific Consultant Services, Inc. (SCS; Tolleson and Godby 2001) conducted a survey of a 100 square meter portion of the KMR, north of the current study area (Figure 33) resulting in the identification of a newly identified site complex (Site 21771) consisting of four features (a platform, an enclosure, a possible *imu*, and a meadow) dating to the late 1800s. It was determined that Site 21771 was associated with the construction and maintenance of the Puna Trail, which Tolleson and Godby (2001) opined was widened from a foot trail to a Government Road during this time in order to accommodate horses and wagons. Limited data recovery (excavation of two test units) was undertaken at Site 21771.

In 2006, Scientific Consultant Services, Inc. (Wolforth 2006) conducted an AIS of a 147-acre industrial subdivision for the proposed development of the Mana Industrial Park project situated immediately west of KMR to the northwest of the current study area (Figure 33). Four WWII-era sites were identified within the study area including Site 25538, a Historic breakwater quarry and railroad line and Naval Air Station fuel station; Site 25539, a fuel station road; Site 25540, the southern end of the airport parking area; and Site 25541, a warehouse area. All of the identified sites were found to be characteristic with the known U.S. Navy and Army occupation of the area. No further work was the recommended treatment for all of the sites.

In 2014, Cultural Surveys Hawai'i, Inc. (Wheeler et al. 2014a) conducted an AIS of a 405.3-acre portion of the KMR situated to the north of the current study area, roughly 600 meters north of the study area's northeastern boundary (Figure 33). While it was determined that the majority of KMR had been subject to intensive previous disturbance, the survey fieldwork primarily focused on areas which had been subject to minimal disturbance. As a result of the survey, a total of eleven archaeological sites (Sites 18869, 21657, 21658, 21771, 23273, 30008-30012, and 30038) were documented: four of which were previously identified during the inventory survey conducted by Bush and

Hammatt (2000) and one (Site 21771) that was previously identified by Godby and Tolleson (2001). Specific site types identified during the Wheeler et al. (2014a) study included two segments of the Puna Trail (Site 18869 and Site 30038); a C-shaped enclosure (Site 21657); a complex comprised of five *ahu* (Site 21658); a complex of twelve features associated with potential temporary habitation or agriculture (Site 21771); a remnant segment of a secondary Precontact/early Historic trail (Site 23273); a modified lava tube (Site 30008); a complex comprised of three temporary habitation features associated with a modified outcrop (Site 30009); a complex comprised of five features associated with temporary habitation or agriculture (Site 30010); a two-feature complex of indeterminate function (Site 30011); and a 15-meter-long segment of another secondary kerbed trail (Site 30012). The trail segment designated Site 30038 was interpreted as an intact remnant of the Puna Trail alignment and was assigned a separate site number because it diverts from the modern Jeep road alignment that had been assigned the earlier Puna Trail designation (Site 18869).

Collectively, all of the sites identified during the Wheeler et al. (2014a) study were interpreted either as ancillary features of the Puna Trail or associated with possible intermittent agricultural activities. It was concluded that the section of Waiākea in which KMR was situated was only marginally inhabited during Precontact and Historic times, with traditional settlements being concentrated mostly along the coast. As a result of extensive military-associated modification throughout the twentieth century within KMR, many of the previously extant archaeological sites had been obliterated. While no further work was the recommended treatment for seven of the identified sites, including the segment of the Puna Trail, Wheeler et al. (2014a) did recommend preservation through avoidance (conservation) as the proposed treatment for three sites (Sites 21658, 21771, and 30038) and proposed future subsurface testing for Sites 21771 and 30010. Archaeological monitoring was recommended as a mitigation measure for all ground-disturbing activities, and a subsequent archaeological monitoring plan was prepared (Wheeler et al. 2014b).

3. STUDY AREA EXPECTATIONS

The culture-historical context presented above for the *ahupua`a* of Waiākea and the South Hilo District, combined with the summary of previous archaeological research conducted in the vicinity of the study area, provides a basis for predicting the type and location of archaeological resources that may still be present within the current study area. The study area is situated within what was once known as the Pana`ewa forest, a particular section of Waiākea thick in cultural history and rich in traditional lore, where forest resources would have been collected, and scattered gardens and residences may have been found, during the Precontact Period, but not in large numbers. Development of the lands near the study area accelerated during the late nineteenth century, however, as the commercial sugar industry grew and rail transportation was developed in an effort to facilitate and expand this economic growth. Development within and around the current study area occurred primarily during the mid to late twentieth century following the 1960 *tsunami*, when the land was designated as a borrow site. Previous archaeological studies conducted in the general vicinity of the current study area have shown that while examples of Precontact archaeological resources have been identified within Pana`ewa, features relating to sugarcane cultivation and railway transportation are much more likely to be encountered further inland, and are seldom found within the disturbed lands surrounding the quarry sites. It is highly unlikely that any evidence of Precontact such as ancient foot trails, habitation sites, or agricultural features, or early Historic sites such as house foundations, roads, railroad spurs, or sugarcane related infrastructure will be encountered within the proposed quarry sites, as these lands have been extensively modified by prior grubbing, grading, and quarrying activities.

4. FIELDWORK

Fieldwork for the current study was conducted on April 23, and July 9, 12, and 23, 2019 by 'Iolani K. Ka'uhane, B.A., Lauren Kepa'a, Lyle Auld, B.A., Johnny Dudoit, B.A., Ivana Hall, B.A., and Genevieve Glennon, B.A., under the direction of Matthew R. Clark, M.A. (Principal Investigator). Fieldwork consisted of an intensive (100% coverage) pedestrian survey of the entire study area. The survey crew walked systematic transects across the study area from the existing paved roadway in both an easterly and westerly direction, with spacing between crew members of no more than 15 meters. Garmin 76s handheld GPS units (set to the NAD 83 datum) were utilized by the survey crew to determine the study area boundaries and track transect coverage and spacing. While the vegetation cover was moderately thick in some areas, the ground visibility was generally adequate across the entire study area for identifying any cultural features that may have been present.

FINDINGS

As a result of the current study, no archaeological sites or other historic properties of any kind were identified within the study area, and field observations of past ground disturbance, combined with the results of prior studies conducted in the area, indicate that subsurface archaeological resources are unlikely to be encountered in the area proposed for quarry development and expansion.

5. DETERMINATION OF EFFECT

Given the negative findings of the current study with respect to archaeological resources, it is concluded that the Yamada & Sons, Inc. quarry and stockpiling project will not impact any known historic properties. The determination of effect for the proposed project is "no historic properties affected." With respect to the historic preservation review process of the DLNR-SHPD, our recommendation is that no further work needs to be conducted within the Yamada & Sons, Inc. proposed quarry and stockpiling site prior to or during project implementation. In the unlikely event that any unanticipated archaeological resources are unearthed during development activities, work in the immediate vicinity of the finds will be halted and DLNR-SHPD contacted in compliance with HAR 13§13-280-3.

REFERENCES CITED

- Abbott, I.
1992 *La'au Hawai'i. Traditional Hawaiian Uses of Plants*. Bishop Museum Press, Honolulu, Hawai'i.
- Athens, J. S., T. Rieth, and T. Dyc
2014 A Paleoenvironmental and Archaeological Model-Based Age Estimate for the Colonization of Hawai'i. *American Antiquity* 79(1): 144–155.
- Barrera, W., Jr
1971 Archaeological Excavations and Survey at Keauhou, North Kona, Hawaii. *Departmental Report Series 71-10*. Department of Anthropology, B.P. Bishop Museum, Honolulu.
- Bird, I.
1882 *The Hawaiian Archipelago, Six Months among the Palm Groves, Coral Reefs, and Volcanoes of the Sandwich Islands*. Fifth. John Murray, London.
https://books.google.com/books/about/The_Hawaiian_Archipelago.html?id=uH8FAAAAQAAJ&printsec=frontcover&source=kp_read_button#v=onepage&q=draped&f=false.
- Bonk, W., and A. Haun
1979 An Archaeological Survey of a Portion of Hawaiian Home Lands of Panaewa, Tract Q, Waiakea, South Hilo, Hawaii.
- Burchard, 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. report. Prepared for Belt Collins and Associates and Kamehameha Investment Corporation, Honolulu, Hawai'i.
- Bush, A., H. Hammatt, H. Hammatt, and M. Orr
2000 Archaeological Inventory Survey of Selected Portions of the Hawai'i Army National Guard 503.6 acre Keaukaha Military Reservation, Waiakea Ahupua'a, South Hilo District, Hawai'i Island. Prepared by Cultural Surveys Hawai'i.
- Carson, M.
1999 Archaeological Inventory Survey of the 176-Acre Pana'ewa Campus Site, Waiakea Ahupua'a, Hilo District, Island of Hawai'i (TMK:2-1-13:154). Scientific Consultant Services Project Number 168-1. Prepared for PBR Hawaii, Inc.
- Cartwright, B.
1933 Some Aliis of the Migratory Period. *Bishop Museum Occasional Papers* 10(7): 56–61.
- Chinen, J. J.
1958 *The Great Mahele: Hawaii's Land Division of 1848*. University of Hawaii Press, Honolulu.
1961 *Original Land Titles in Hawaii*. Privately published.
- Ching, F., and C. Stauder
1974 The Archaeology of South Hilo, Hawai'i: Archaeological Reconnaissance and Preliminary Historical Investigation of the Proposed 2 1/2 Mile Alignment (Alt. A) Between Keaukaha and the South Hilo-Puna Boundary. Archaeological Research Center Hawai'i, Inc., Lawai, Kauai.

- Clark, M., and R. Rechtman
2016 Archacological Inventory Survey of a Roughly 26-acre Parcel Located at the Corner of Haihai Street and Ainaola Drive, TMK: (3) 2-4-039:025, Waiākea Ahupua'a, South Hilo District, Island of Hawai'i. ASM Affiliates 25400.01. Prepared for Roy Sonomura, Hilo.
- Cordy, R.
1994 *A Regional Synthesis of Hamakua District, Hawai'i Island*. Historic Preservation Division, DLNR, State of Hawai'i, Honolulu.
2000 *Exalted Sits the Chief, The Ancient History of Hawai'i Island*. Mutual Publishing, Honolulu, Hawai'i.
- Devereux, T., D. Borthwick, H. Hammatt, and M. Orr
1997 Archacological Reconnaissance Survey of Keaukaha Military Reservation, South Hilo District, Hawai'i Island (Hawaii National Guard) 503.6-acre parcel, TMK: 2-1-12:3 and 2-1-13:10. Prepared by Cultural Surveys Hawai'i. Prepared for Earth Tech.
- Dewar, J.
1892 *Voyage of the Nyanza R.N.Y.C. Being the Record of a Three Years' Cruise in a Schooner Yacht in the Atlantic and Pacific, and Her Subsequent Shipwreck*. William Blackwood and Sons, Edinburgh and London.
- Dorrance, W., and F. Morgan
2000 *Sugar Islands: The 165-Year Story of Sugar in Hawaii*. Mutual Publishing, Honolulu, Hawai'i.
- Duarte, T.
2012 Colonization and Prehistory on the Island of Maui: A Radiocarbon Synthesis of Maui Island. M.A. Thesis, Department of Anthropology, University of Hawai'i at Mānoa, Honolulu.
- Ellis, W.
1963 *Journal of William Ellis, Narrative of a Tour of Hawaii, or Owhyee; with remarks on the History, Traditions, Manners, Customs and Language of the Inhabitants of the Sandwich Islands*. Advertiser Publishing Co., Ltd., Honolulu.
- Escott, G.
2013a Archaeological Assessment of a Fifty-Acre Quarry Site in Waiākea Ahupua'a, South Hilo District, Hawai'i Island, Hawai'i [TMK:(3) 2-1-013:004 (Por.)]. Scientific Consultant Services SCS Project Number 1272-2. Prepared for Jas. W. Glover, Ltd, Hilo.
2013b An Archacological Assessment of a Proposed 90-Acre Quarry Site in Waiākea Ahupua'a, South Hilo District, Hawai'i Island, Hawai'i [TMK:(3) 2-1-013:004 (Por.)]. Scientific Consultant Services SCS Project Number 1396-1. Prepared for Jas. W. Glover, Ltd, Hilo.
2015 An Archacological Assessment of Five 10-Acre DHHL Parcels in the Pana'ewa Region of Waiākea Ahupua'a, South Hilo District, Hawai'i Island, Hawai'i [TMK: 2-1-025:006, 007, 047, 048; & 2-1-061:002]. Scientific Consultant Services, Inc. SCS Project Number 1706-1. Prepared for Pioneer Mill Company, LLC, Kea'au.
2016 An Archacological Assessment on 80 Acres of Modern Quarry Land for the Proposed County of Hawai'i Composting Facility in the Pana'ewa Region of Waiākea Ahupua'a, South Hilo District, Hawai'i Island, Hawai'i [TMK: 2-1-013:142, 160, 161, & 163]. Scientific Consultant Services, Inc SCS Project Number 1893-1. Prepared for PBR Hawaii, Honolulu.
- Escott, G., and W. Tolleson
2002 Archacological Inventory Survey at Keaukaha Military Reservation, South Hilo District, Island of Hawai'i, [TMK 2-1-12:3 and 2-1-13:10]. Scientific Consultant Services, Inc.

References Cited

- Fornander, A.
1880 *An Account of the Polynesian Race*. Vol. II. Three volumes vols. Trübner & Co., London.
1969 *An Account of the Polynesian Race: Its Origins and Migrations, and the Ancient History of the Hawaiian People to the Times of Kamehameha I*. Ed. John F. G. Stokes. Charles Tuttle & Co., Inc., Tokyo.
1996 *Ancient History of the Hawaiian People*. Vol. II. Mutual Publishing, Australia.
- Giambelluca, T. W., Q. Chen, A. G. Frazier, J. P. Price, Y.-L. Chen, P.-S. Chu, J. K. Eischeid, and D. M. Delparte
2013 Online Rainfall Atlas of Hawai'i. *Bulletin of the American Meteorological Society* 94(3): 313–316.
- Greene, L.
1993 A Cultural History of Three Traditional Hawaiian Sites on the West Coast of Hawai'i Island. United States Department of the Interior, National Park Service, Denver Service Center.
- Griffin, P. B., P. H. Rosendahl, and H. D. Tuggle
1971 Archaeology of Halawa and Lapakahi: Windward Valley and Leeward Slope. *New Zealand Archaeological Association Newsletter* 14(3): 101–112.
- Hammatt, H., W. Folk, D. Borthwick, and D. Borthwick
1993 Archaeological Survey and Testing of Lands Proposed for Research and Technology, Lots at the University of Hawai'i at Hilo (TMK: 2-4-01:7 and 41). Cultural Surveys Hawai'i, Inc.
- Hammatt, H., and J. Tulchin
2007 Archaeological Literature Review and Field Inspection for na Approximately 22-acre Wal-Mart Expansion Project, Waiākea Ahupua'a, South Hilo District, Hawai'i Island TMK: [3] 2-2-047-059, 072, 074 and [3] 2-1-025:090. Cultural Surveys Hawai'i, Inc. Kailua.
- Handy, E. S. C.
1940 The Hawaiian Planter. *B.P. Bishop Museum Bulletin No. 126*. Bishop Museum Press, Honolulu.
- Handy, E. S. C., and E. G. Handy
1972 Native Planters in Old Hawaii: Their Life, Lore, and Environment. *Bernice P. Bishop Museum Bulletin* 233. Bishop Museum Press, Honolulu.
1991 Native Planters in Old Hawaii: Their Life, Lore, and Environment. *Bernice P. Bishop Museum Bulletin* 233. With the collaboration of Mary Kawena Pukui. Bishop Museum Press, Honolulu.
- Haun, A., and D. Henry
2002 Archaeological Inventory Survey DHHL Project at Panaewa Land of Waiākea, South Hilo District, Island of Hawai'i (TMK: 2-2-47-:01). Haun and Associates, Kea'au, Hawai'i. Haun and Associates. Prepared for M & E Pacific, Inc. Hilo, Kea'au.
- Hawaii Redevelopment Agency
1965 Urban Renewal Plan, Kaiko'o Project No. 4 Hawaii R-4, Hilo, Hawaii. Hilo.
- Hawaii Tribune-Herald
2017 Waves of memories: Stories paint picture of what it was like to experience 1946 tsunami. *Hawaii Tribune-Herald* (Hilo), April 1.
- Hilo Daily Tribune
1919 The Old Puna Trail. *Hilo Daily Tribune*, October 15, p. 2.
1921 Civic Club Hopes to see Keaukaha Lands Opened Up - Many Signers to Petition for Rehabilitation of Huge Tract in Waiakea. *Hilo Daily Tribune*, October 2, p. 1.

- Hitchcock, D. H.
1897 Forty Years' Reminiscences of Life in Hilo, Hawaii. *Hawaii Herald*, April 1.
- Hommon, R.
1976 The Formation of Primitive States in Pre-Contact Hawaii. Ph.D. Dissertation, Department of Anthropology, University of Arizona, Tucson.
1986 Social Evolution in Ancient Hawai'i. In *Island Societies: Archaeological Approaches to Evolution and Transformation*, edited by Patrick Kirch, pp. 55–88. Cambridge University Press, Cambridge, Massachusetts.
- Hudson, A.
1932 The Archaeology of East Hawaii. Bernice P Bishop Museum.
- Hunt, T., M. McDermott, and H. Hammatt
1993 Archaeological Inventory Survey, Puainako Street Extension Project Lands of Waiakea, Kukuau 1 and 2, and Ponahawai, South Hilo District, Island of Hawai'i. Prepared for Okahara & Associates Engineering Consultants, Hilo.
- I'i, J. P.
1963 Fragment of Hawaiian History. *B.P. Bishop Museum Special Publication 70*. Bishop Museum Press, Honolulu.
- Jarves, J.
1847 *History of the Hawaiian Islands: embracing their antiquities, mythology, legends, discovery by Europeans in the sixteenth century, re-discovery by Cook, with their civil, religious and political history, from the earliest traditional period to the present time*. C. E. Hitchcock, Honolulu.
- Jennings, P.
1991 Archaeological Field Inspection Survey, Salvation Army Hilo Parcel, Land of Waiakea, South Hilo District, Island of Hawaii (TMK:3-2-2-039:4). Paul H. Rosendahl, Ph. D., Inc. PHRI Letter Report 911-020691. Prepared for Hilo Temple Corps, the Salvation Army.
- Kaaiakamanu, D. M., and J. K. Akina
1922 *Hawaiian Herbs of Medicinal Value: Found Among the Mountains and Elsewhere in the Hawaiian Islands, and Known to the Hawaiians to Possess Curative and Palliative Properties Most Effective in Removing Physical Ailments*. Board of Health of the Territory of Hawaii.
- Kamakau, S.
1961 *Ruling Chiefs of Hawaii*. Kamehameha Schools Press, Honolulu.
1976 The Works of the People of Old, Na Hana a ka Po'e Kahiko. *B.P. Bishop Museum Special Publication 61*. Bishop Museum Press, Honolulu, Hawai'i.
1991 *Tales and Traditions of the People of Old, Nā Mo'olelo a ka Po'e Kahiko*. Bishop Museum Press, Honolulu, Hawai'i.
1992 *Ruling Chiefs of Hawaii*. Revised edition. Kamehameha Schools Press, Honolulu.
- Kame'leihiwa, L.
1992 *Native Land and Foreign Desires: How Shall We Live in Harmony? = Ko Hawaii Aina a Me Na Koi Puumake a Ka Poe Haole*. Bishop Museum Press, Honolulu.
- Kelly, M., B. Nakamura, and D. Barrère
1981 Hilo Bay: A Chronology History. Department of Anthropology, Bernice P. Bishop Museum. Prepared for U.S. Army Corps of Engineers, Honolulu District.

References Cited

- Kent, N.
1983 *Hawaii: Islands Under the Influence*. University of Hawai'i Press, Honolulu.
- King, R.
n.d. Hawaiian Land Titles. Manuscript. <https://ags.hawaii.gov/wp-content/uploads>.
- Kirch, P.
1984 *The Evolution of the Polynesian Chiefdoms*. Cambridge University Press, New York.
1985 *Feathered Gods and Fishhooks: An Introduction to Hawaiian Archaeology and Prehistory*. University of Hawaii Press, Honolulu.
1990 The evolution of sociopolitical complexity in prehistoric hawaii: an assessment of the archaeological evidence. *Journal of World Prehistory* 4(3): 311–345.
2010 *How Chiefs Became Kings: Divine Kingship and the Rise of Archaic States in Ancient Hawai'i*. University of California Press, Berkeley.
2011 When did the Polynesians Settle Hawai'i? A Review of 150 Years of Scholarly Inquiry and a Tentative Answer. *Hawaiian Archaeology* 12: 3–26.
2012 *A Shark Going Inland Is My Chief: The Island Civilization of Ancient Hawai'i*. University of California Press, Berkeley.
- Krauss, B.
1993 *Plants in Hawaiian Culture*. University of Hawaii Press, Honolulu.
- Kuykendall, R.
1938 *The Hawaiian Kingdom 1778–1854. Foundation and Transformation*. University Press of Hawaii, Honolulu.
- Kuykendall, R., and A. G. Day
1976 *Hawaii: A History; From Polynesian Kingdom to American Statehood*. Prentice-Hall, Englewood Cliffs, New Jersey.
- Lincoln, N.
2017 *Kō: An Ethnobotanical Guide to Hawaiian Sugarcane Cultivars*. University of Hawai'i Press, Honolulu.
- Malo, D.
1951 *Hawaiian Antiquities. B. P. Bishop Museum Special Publication 2*. Second edition. Translator Nathaniel B. Emerson. B. P. Bishop Museum Press, Honolulu.
- Maly, K.
1994 Appendix A: Historical Documentary Research. In *Archaeological Inventory Survey, Chin Chuck Road Project Area, Land of Hakalau Nui, South Hilo District, Island of Hawaii (TMK:2-9-02:23 and 2-9-04:56)*. Paul H. Rosendahl, Ph.D., Inc. Report 1563-111194. Prepared for Mr. Eben Dale, C. Brewer Homes, Inc. c/o PBR Hawaii, Hilo, Hawaii.
- Maly, K.
1996 Historical Documentary Research and Oral History Interviews: Waiākea Cane Lots (12, 13, 17, 18, 19, 20 & 20-A), Land of Waiākea. District of South Hilo, Island of Hawai'i i Kumu Pono Associates Report W01-0795 (III). Prepared for UHH Ho'ōikaka Club, Hilo.
2002 *The Māhele 'Āina (The Land Division) an Overview of Documentation Found in the Claims and Awards of the Māhele*. Kumu Pono Associates, LLC.

- Maly, K., and ● Maly
2002 He Wahi Mo'olelo No Ka 'Āina A Me Nā 'Ohana O Waiki'i Ma Waikōloa (Kalana O Waimea, Kohala). A Me Ka 'Āina Mauna: A Collection of Traditions and Historical Accounts of the Lands and Families of Waiki'i at Waikōloa (Waimea Region, South Kohala), and the Mountain Lands, Island of Hawai'i (TMK Overview Sheet 6-7-01). Kumu Pono Associates Report HiWaikii61-111202. Prepared for Waiki'i Ranch Homeowner's Association, Kamuela, Hawai'i.
- Maly, K., A. Walker, and P. Rosendahl
1994 Archaeological Inventory Survey, Waiākea Cane Lots, Portion of Parcel 6, Land of Waiākea, South Hilo District, Island of Hawaii (TMK: 2-4-57:01). Paul H. Rosendahl, Ph.D. Inc. PHRI Report 1370-12293. Prepared for Roy Takemoto, Hilo.
- McEldowney, H.
1979 Archaeological and Historical Literature Search and Research Design: Lava Flow Control Study, Hilo, Hawai'i. Department of Anthropology, B.P. Bishop Museum. Prepared for the U.S. Army Engineer Division, Pacific Ocean.
- Moniz, J.
1994 Historical and Archaeological Synthesis of Land Use and Settlement Patterns, Waiākea Ahupua'a, Hilo, Hawaii. *Manuscript on file at DLNR-SHPD Hilo Office.*
- Neal, M.
1965 *In Gardens of Hawaii*. Bishop Museum Press, Honolulu.
- Oliver, D.
1961 *The Pacific Islands*. University of Hawaii Press, Honolulu.
- Pogue, J. F.
1978 *Moolelo of Ancient Hawaii*. Translator Charles W. Kenn. Topgallant Press, Honolulu.
- Pukui, M. K., and S. H. Elbert
1986 *Hawaiian Dictionary: Hawaiian-English, English-Hawaiian*. Rev. and enl. ed. University of Hawaii Press, Honolulu.
- Pukui, M. K., S. H. Elbert, and E. Mo'okini
1974 *Place Names of Hawaii*. Revised and Expanded Edition. University of Hawaii Press, Honolulu.
- Rechtman, R.
2001 Archaeological Inventory Survey and Limited Cultural Assessment for the Proposed Wastewater Treatment Facility at Kulani Correctional Facility. Prepared for Geometrician Associates, LLC, Hilo.
2003 Archaeological and Limited Cultural Impact Assessment for the Proposed Regional Solid Waste Sorting Station (TMKs: 3-2-1-12:4 por. and 3-2-1-13:11, 150, 151, 162, 167, 168) RC-0186. Rechtman Consulting, LLC.
2006 Request for Determination of "no historic properties affected" associated with a Roadway and Quarry Site (TMK: 3-2-1-013:002 por. and 3-2-1-013:148) in Waiākea Ahupua'a, South Hilo District, Island of Hawai'i. Rechtman Consulting Report RC-0363. Prepared for Ron Terry, Geometrician Associates, LLC, Hilo.
2009a Archaeological Assessment Survey for the Proposed Hilo Bayfront Trails Project, Pi'ihonua, Punahoa, Pōnāhawai, Kūkūau, and Waiākea ahupua'a, South Hilo District, Island of Hawai'i. Rechtman Consulting Report RC-0649. Prepared for Geometrician Associates LLC, Hilo.

References Cited

- 2009b Request for SHPO Concurrence with a Determination of No Historic Properties Affected Pursuant to the National Environmental Policy Act and in Compliance with Section 106 of the National Historic Preservation Act Kamoleao Laulima Community Resource Center (TMK:3-2-2-47:075) Waiākea Ahupua`a, South Hilo District, Island of Hawai`i. Rechtman Consulting report RC-0607. Prepared for Geometrician Associates LLC, Hilo, Hilo, Hawai`i.
- Rechtman, R. B., 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, Volumes I and II. Rechtman Consulting Report RC-0154. Prepared for Helber Hastert & Fec, Honolulu, Hawai`i.
- Rechtman, R., and J. Henry
1998 University of Hawai`i-Hilo Kāwili Street Development Archaeological Inventory Survey (TMK: 3-2-4-01:5), Waiākea Ahupua`a, South Hilo District, Island of Hawai`i. PHRI Report 1877-100998. Prepared for Inaba Engineering, Inc., Hilo, Hawai`i M3 - Haun & Associates, Hilo.
- Report of the Director of the United States Geological Survey
1883 *Annual Report of the Secretary of the Interior on the Operations of the Department for the Year Ended June 30, 1883. In Four Volumes.* Vol. III. Government Printing Office, Washington.
- Restarick, H.
1928 Historic Kealakekua Bay. *Papers of the Hawaiian Historical Society* 15: 5–20.
- Rosendahl, M.
1988a Archaeological Reconnaissance Survey for Environmental Impact Statement (EIS) Hilo Wastewater Treatment Facility Site. Land of Waiakea, District of South Hilo, Island of Hawaii (TMK:2-1-13:Por.12,13,20,22). Paul H. Rosendahl Inc. PHRI Report 415-050588. Prepared for M & E Pacific, Inc. Hilo.
- Rosendahl, P.
1972 Archaeological Salvage of the Hapuna-Anachoomalu Section of the Kailua-Kawaihae Road (Queen Kahumanu Highway), Island of Hawaii. *Departmental Report Series 72–5*. Department of Anthropology, B. P. Bishop Museum, Honolulu.
- 1988b Archaeological Assessment Survey at 14.99 Acre “Proposed Quarry Site.” Paul H. Rosendahl Inc. PHRI Report 352-040888. Prepared for Westec Services, San Diego, CA.
- 2002 Archaeological Assessment Survey 14.99-Acre “Proposed Quarry Site.” Land of Waiākea, South Hilo District, Island of Hawai`i. Paul H. Rosendahl, Ph. D., Inc. PHRI Report 2293.1-120302. Prepared for Jas. W. Glover, Ltd, Hilo.
- Schilt, R., and A. Sinoto
1980 Limited Phase I Archaeological Survey of Mahukona Properties, North Kohala, Island of Hawaii. Department of Anthropology, Bernice P. Bishop Museum Ms. 013180. Prepared for Belt Collins and Associates, Honolulu.
- Soehren, L.
2005 A Catalog of Hawai`i Place Names Compiled from the Records of the Boundary Commission and the Board of Commissioners to Quiet Land Title of the Kingdom of Hawaii. Part 4: Ka`ū. <http://ulukau.org/cgi-bin/hpn?>, accessed September 14, 2016.
- Soil Survey Staff
2019 Web Soil Survey. *United State Department of Agriculture, Natural Resources Conservation Service.* <http://websoilsurvey.nrcs.usda.gov/>, accessed March 4, 2019.

- Stewart, C. S.
1828 *Journal of a Residence in the Sandwich Islands, During the Years 1823, 1824, and 1825.* H. Fisher, Son, and Jackson, London.
- Tatar, E.
1982 *Nineteenth Century Hawaiian Chant. Pacific Anthropological Records.* Department of Anthropology, B.P. Bishop Museum, Honolulu.
- Thrum, T.
1908a Heiaus and Heiau Sites Throughout the Hawaiian Islands. Island of Hawaii. In *Hawaiian Almanac and Annual for 1909*, edited by Thomas Thrum, pp. 38–47. Thos. G. Thrum, Honolulu.
1908b Tales from the Temples. Part II. In *Hawaiian Almanac and Annual for 1909*, edited by Thomas Thrum, pp. 48–78. Thos. G. Thrum, Honolulu.
- Thurston, L.
1913 *Railroading in Hilo.* In *Hawaiian Almanac and Annual for 1914*, edited by Thomas Thrum. Thos. G. Thrum, Honolulu.
- Tolleson, W., and W. Godby
2001 *From Trail to Road: A Late Historic Way Station On The Puna Trail On The Hawaii Army National Guard Keaukaha Military Reservation, Hilo, Hawaii Island (TMK: 2-1-13 & 10 and 2-1-12:3).*
- Trusdell, F., and J. Lockwood
2017 *Geologic map of the northeast flank of Mauna Loa volcano, Island of Hawai'i, Hawaii. No. 2932-A.* US Geological Survey.
- Walker, A.
1994 *Archaeological Field Inspection, Two Proposed State Prison Sites, Land of Waiakea, South Hilo District, Island of Hawaii (TMK: 3-7-1-03:10).* Paul H. Rosendahl, Ph. D., Inc. Prepared for DMJM Hawaii.
- Wheeler, M., O. Bautista, S. Wilkinson, and H. Hammatt
2014a *Archaeological Inventory Survey and Monitoring Plan, Phase I, Keaukaha Military Reservation (KMR) Hawai'i Army National Guard Facility Waiākea Ahupua'a, South Hilo District, Island of Hawai'i TMKs: [3] 2-1-012:003, 131 and [3] 2-1-013:010.* Cultural Surveys Hawaii CSH Report: WAIAKEA 10. Prepared for Hawaii Army National Guard, ENV Office.
- Wheeler, M., S. Wilkinson, and H. Hammatt
2014b *Archaeological Monitoring Plan, Phase I, Keaukaha Military Reservation (KMR) Hawai'i Army National Guard Facility Waiākea Ahupua'a, South Hilo District, Island of Hawai'i TMKs: [3] 2-1-012:003, 131 and [3] 2-1-013:010.* Cultural Surveys Hawaii CSH Report: WAIAKEA 11. Prepared for Hawaii Army National Guard, ENV Office.
- Wilkes, C.
1845 *Narrative of the United States Exploring Expedition During the Years 1838, 1839, 1849, 1842.* Vol. Volume IV. Lea and Blanchard, Philadelphia.
- Wilmshurst, J., T. Hunt, C. Lipo, and A. Anderson
2011 *High-Precision Radiocarbon Dating Shows Recent and Rapid Colonization of East Polynesia. Proceedings of the National Academy of Sciences* 108: 1815–1820.

References Cited

Wolforth, T.

- 2006 Inventory Survey for the Mana Industrial Park Project: Investigations into the Pana'ewa Forest in Waiākea Ahupua'a, South Hilo District, Hawai'i Island. TMK: (3) 2-1-012:4, 5, 6, 24 (por.), 25, 26, 69 and 2-1-013:151. Scientific Consultant Services, Inc.
- 2007 Cultural Impact Assessment for Hilo Bayfront Master Plan, North Hilo District, Island of Hawai'i. Scientific Consultant Services Inc. Report 771-1. for the County of Hawai'i Department of Parks and Recreation, Hilo.