Archaeological Monitoring Report
Draft
Paʻaiau Fishpond
Kalauao Ahupuaʻa, ʻEwa District, Island of Oʻahu
TMK (1) 9-8-019:007

Prepared for:

PONO PACIFIC
ECOSYSTEM RESTORATION SERVICES

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Introduction

Project Background

At the request of Pono Pacific Conservation Services, Nohopapa Hawai‘i, LLC. has prepared this archaeological monitoring report for the Vegetation Clearing Project at Pa‘aiau Fishpond (SIHP No. 50-80-09-00108) in the Kalauao Ahupua‘a, ‘Ewa District, Island of O‘ahu, Hawai‘i, TMK: (1) 9-8-019:007 (Figure 1). The project area is depicted on an aerial photograph (Figure 2), a U.S. Geological Survey Topographic Map (Figure 3), and a Tax Map Key (Figure 4). The project area is currently leased by the ‘Ohana Military Communities, LLC.

The purpose of the Vegetation Clearing Project was to remove all mangrove, and other invasive flora growing near, around, and within the walls of the Pa‘aiau Fishpond. The project required the manual removal of mangrove, and invasive trees by use of chain saws, hand saws, and trimmers.

Given the cultural and historical sensitivity of traditional Hawaiian fishponds, the Pa‘aiau Fishpond vegetation clearing project proceeded under an archaeological monitoring program, to ensure the integrity of the historic property. This monitoring report was prepared to document all monitoring efforts and results of this project.

The Monitoring Plan for this project was accepted by the State Historic Preservation Division (SHPD)/Department of Land and Natural Resources (DLNR) in a letter dated August 18, 2014 (LOG NO.: 2014.03039, DOC. NO.: 1408SL07). This monitoring report was prepared per the requirements of HAR Chapter 13-279-5, and it is intended for the review and approval by the SHPD.

Scope of Work

The scope of work for this project included documentation and on-site archaeological monitoring, conducted by Nohopapa Hawai‘i, at Pa‘aiau Fishpond. Monitoring provisions for this project are as follows:

1. Conduct on-site monitoring during the removal of mangrove and other invasive vegetation growing near, around, and within the walls of the Pa‘aiau Fishpond.
2. Photograph, map, document, and GPS points of the site and its associated features.
3. Record the condition of the sites and its associated features after it has been cleared.
4. Prepare a monitoring report to document all archaeological monitoring results and findings.

Environmental Setting

Natural Environment

The project area consists of approximately 6.34-acres located in the traditional Hawaiian land division of Kalauao *ahupua‘a*. Kalauao is bounded on the west by the *ahupua‘a* of Waimalu and to the east by the *ahupua‘a* of ‘Aiea and Hālawa. The Kalauao stream lies approximately 0.10 miles to the northwest and the Aiea Bay lies approximately 0.17 miles to the east of the project area. In general, the project area lies west of the area that is currently known as McGrew Point in Pearl Harbor. Kalauao spring is located near the Pearl Harbor coast, west of the project area.

According to the U.S. Department of Agriculture (USDA) soil survey (Foote et al. 1972) the sediments within the project area consist of Tropaquepts (TR). Soils of the Tropaquepts Series are described as follows:

> Tropaquepts (TR) are poorly drained soils that are periodically flooded by irrigation in order to grow crops that thrive in water. They occur as nearly level flood plains on the islands of Oahu and Maui. Elevations range from sea level to 200 feet. The annual rainall amounts to 20 to 150 inches.
>
> These soils have been flooded for varying lengths of time, and soil development differs in degree from place to place. Generally, the surface layer is about 10 inches thick and is mottled with gray, yellow, and brown. The mottled layer overlies friable alluvium.
>
> Tropaquepts are used for production of taro, rice, and watercress on flooded paddies. (Foote et al. 1972: 121)

The project area receives approximately 30 inches of rain per year (Giambelluca et al. 1986). Vegetation within the project area mainly includes thick growth of mangrove, with some *kiawe, milo*, and other tree species.

Built Environment

The project area is located in a predominantly urban environment. Though the project area has not been altered by modern development military housing, military facilities, and a recreational park surrounds the immediate project area.

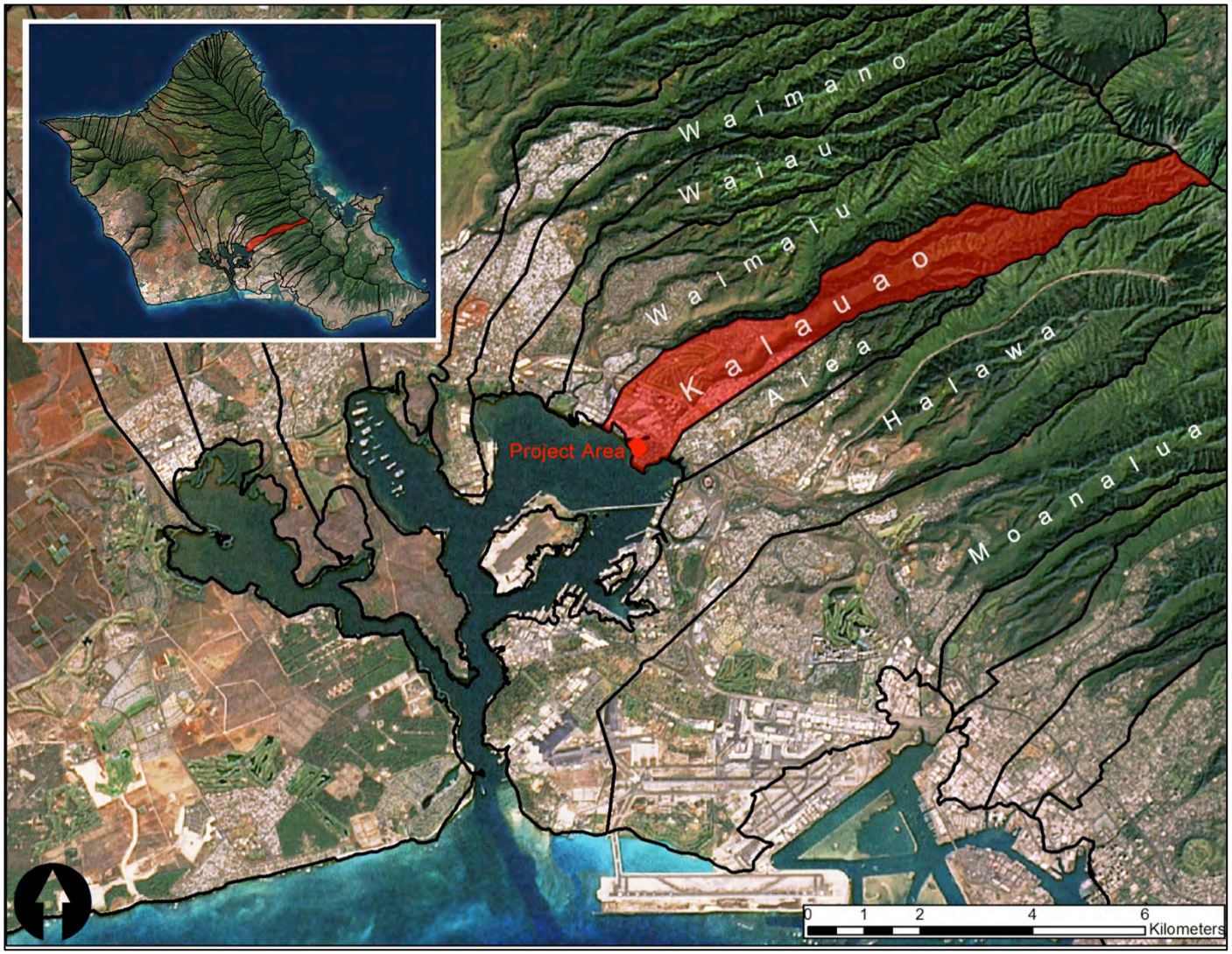


Figure 1. Ahupua‘a map showing the project area situated in Kalauao Ahupua‘a, ‘Ewa District.

Figure 2. Aerial image of Paʻaiau Fishpond and the surrounding features at McGrew Point (Google Earth 2013).

Figure 3. USGS Map with the project area outlined in red. 1998 Waipahu Quad.

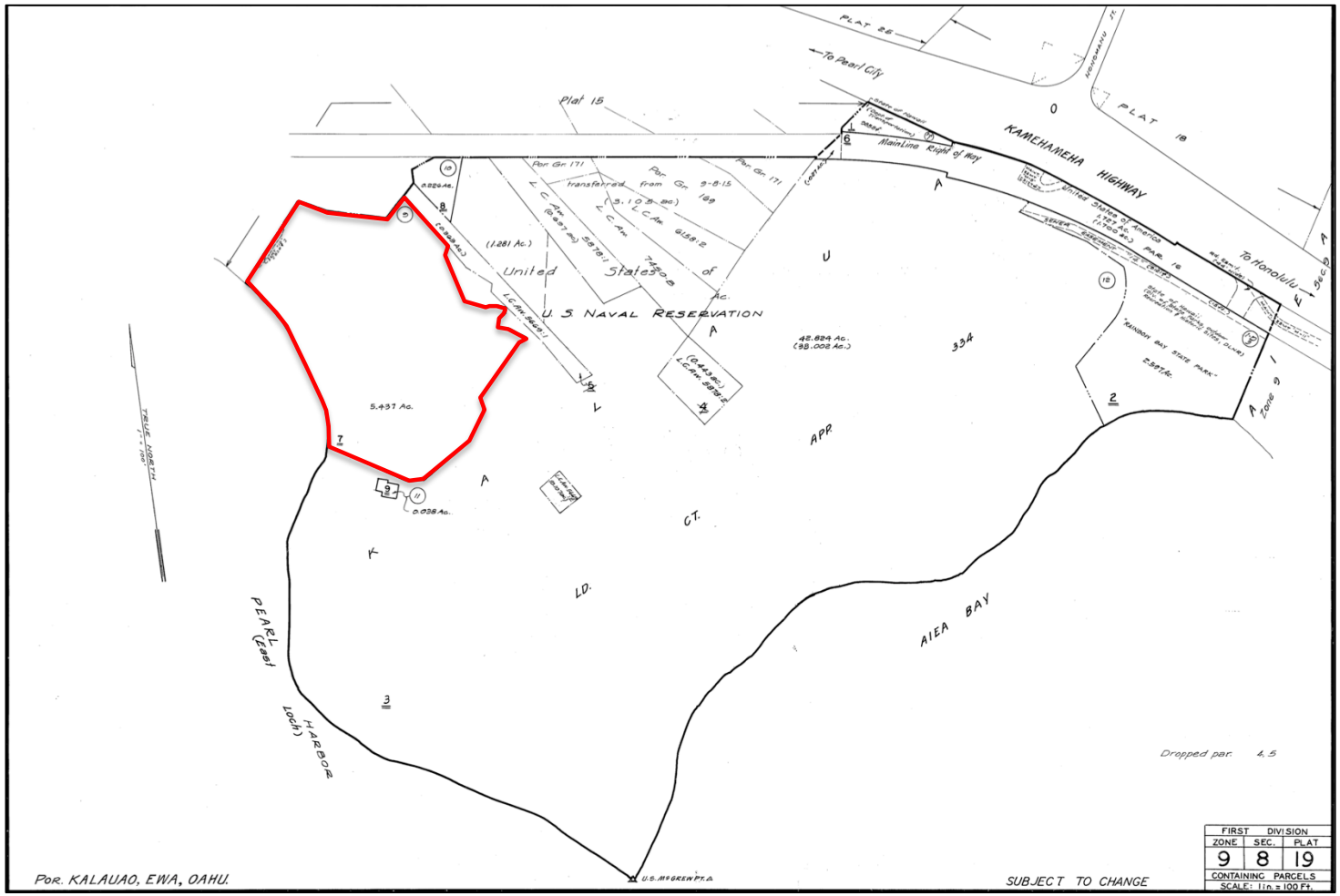


Figure 4. TMK map with the project area outlined in red (Hawai'i TMK 2014).

Figure 5. Aerial image of the mangrove surrounding the fishpond walls.

Methods

Field Methods

Fieldwork was conducted between September 29, 2014 and May 1, 2015 by Nohopapa archaeologists, Kēhau Puou, Kauʻilani Rivera, Pūlama Lima, Dee Castro, and Kēhau Kupihea. Fieldwork required approximately 186 person-days of field effort to complete. All fieldwork was conducted under the general supervision of Kelley Uyeoka, M.A. and Kekuewa Kikiloa, Ph.D. (principal investigators). The archaeological monitoring fieldwork for this project was completed under Nohopapa Hawaiʻis annual archaeological fieldwork permit [15-18], issued by the SHPD per the HAR Chapter 13-282.

Collaboration Efforts

A Hawaiian blessing ceremony with Native Hawaiian practitioners, members of the Aiea community and Hawaiian Civic Club representatives, Pono Pacific crewmembers, Nohopapa Hawaiʻi archaeological monitors, as well as personnel from the Naval Facilities Engineering Command Hawaiʻi was held at Paʻaiau Fishpond before the vegetation activities began. As one of the last remaining fishponds within the Pearl Harbor area, the restoration of Paʻaiau fishpond is not only unique, but it also provides cultural, educational, stewardship, and resource management opportunities that are beneficial for both the local and naval communities. Following the blessing ceremony, a community meeting was held on February 21, 2015 to further discuss restoration plans and processes for the fishpond. Nohopapa Hawaiʻi archaeological monitors were present at the meeting to participate in this discussion, and to share findings that had been observed during archaeological monitoring.

Figure 6. Uncle Shad Kane conducting a blessing ceremony with all involved parties before work at Paʻaiau began.

Background Research

A brief historical review of Kalauao and its surrounding landscape is provided below, to offer a better holistic understanding of the historic use and occupation of the project area. Background research for this report includes: a review of traditional background research; a review of previous archaeological studies on file at SHPD and a review of numerous published and unpublished traditional and ethnohistoric accounts, surveys, maps and photographs of the project area.

Traditional Background Research

Place Names

Traditional Hawaiian place names are often referred to in *ʻōlelo noʻeau* (Hawaiian proverbs), *oli* (chant)*, moʻolelo* (stories/legends)*, and mele* (song). Other sources that have documented traditional Hawaiian place names include historic maps, ethnohistoric accounts, ethnographic surveys, and early historic Land claim records, such as Land Commission Award (LCA) Claims, Grant Claims, and Boundary Commission Testimonies (BCT). The name of a place, and its interpretation, yields the potential to tell a lot about an area. In ancient Hawaiʻi, it was common to name places based on its environment, the resources found in the area, the people that live there, events that happened in the area, and its religious or spiritual associations.

For this project, the particular area that we will focus on is the Kalauao *ahupuaʻa*, and its neighboring areas in the ʻEwa district. The Kalauao *ahupuaʻa* is one of twelve *ahupuaʻa* in the ʻEwa *moku*, or district, on the island of Oʻahu. There are twelve *ʻili ʻāina* (smaller land divisions) within the Kalauao *ahupuaʻa*, which include: Alaenui, Kahawai, Kahawailuna, Kaonohi, Kapua, Kapaele, Kapuaʻi, Kauaopai, Kauapoolei, Kuahulumoa, Opu, and Paʻaiau. The project area is located in the Paʻaiau *ʻili*. Paʻaiau is bounded to the east by the Kapuaʻi *ʻili,* and to the west by the Kauapoolei, Kauaopai, Kapua, Kahawai, Kapaeli, and Alaenui *ʻili*.

There are two different interpretations of the name Kalauao. The first interpretation is the literal translation of the name, which simply means, "the multitude of clouds" (Pukui et al. 1976). The second interpretation comes from a *Chant for Kūaliʻi*, a high chief in ancient Hawaiʻi (Fornander 1916:400). The chant states, "*E ala kāua ua ao-e – o Kalauao* (Let us arise, it is daylight- at Kalauao)". The style in which the chant is written, suggests a possible play on the words "*ala"* (arise) and "*ao"* (daylight), further emphasizing the possible association of the name, Kalauao, with the meaning to rise at daylight. Puʻu Kaiwipoʻo, a peak on the ridge separating Kalauao and Hālawa *ahupuaʻa*, is translated as "the skull hill" (Pukui et al. 1974:197).

The name, Paʻaiau, has no definite meaning however, it is suggested that a more contemporary spelling of the name is: pā-ʻaiau (Soehren 2010), which could result in many different interpretations and translations. For the purposes of this report, the spelling Paʻaiau will be used.

Although the project area lies in the Paʻaiau *ʻili* of the Kalauao *ahupuaʻa*, the general vicinity of the project area is commonly known as the east loch of Pearl Harbor. Traditionally, the Pearl Harbor area was known as, Puʻuloa, which means, "long hill". A more poetic name for the Pearl Harbor area is, *Keawalau-o-Puʻuloa*, which means, "the many harbored-sea of Puʻuloa" (Pukui et al. 1976 and Pukui 1983). Though the reason it was named this is unknown (Sterling and Summers 1978), the name Puʻuloa is very important, as it references the entire south central coast of Oʻahu.

In addition to the general vicinity of the project area, below is a list of features, place names, *moʻo ʻāina* (narrow strip of land, often times less than an *ʻili*), *moʻo kalo* (strip of land where taro was planted), *kōʻele* (small land unit farmed by a tenant for a chief residing in an *ahupuaʻa*), *pōʻalima* (land farmed by tenants for chiefs one day in five), *kūʻula* (stone god used to attract fish), and *ʻili ʻāina* (Lucas 1995) associated in particular with the Kalauao *ahupuaʻa*.

The place names and descriptions in Table 1 were complied from *A Catalog of Hawaiian Place Names: Compiled from the Records of the Boundary Commission and The Board of Commissioners to Quiet Land Titles of the Kingdom of Hawaii* (Soehren 2010). There are no *ʻokina* (glottal stops) or *kahakō* (macrons) used in the list of place names. A feature that is unidentified is referred to as a "place."

Table 1. Place Names of Kalauao Ahupuaʻa

Hawaiian Place Name	**Land Area**
Aialamihi	*moʻo ʻāina* in the *ʻili* of Kauapoolei
Alaeanui	*ʻili ʻāina* of Kalauao
Alapai	*moʻo ʻāina* in the *ʻili* of Kaonohi
Amoole	*moʻo ʻāina* in the *ʻili* of Paaiau
Elani	*loʻi* (taro patch) in the *ʻili* of Kaonohi
Eli	*loko* (pond) in the *ʻili* of Kaonohi
Halawa	*loʻi* in the *ʻili* of Kaonohi
Hiapo	*moʻo* ʻāina in the *ʻili* of Kaonohi
Holoikauai	*loʻi* in the *ʻili* of Paaiau
Holokikoni	*kōʻele* in the moʻo ʻāina of Kamilomilo
Honalo	*moʻo ʻāina* in the *ʻili* of Kapaeli
Honolulu	*moʻo ʻāina* in the *ʻili* of Kaonohi
Kaehaeha	*moʻo ʻāina* in the *ʻili* of Kaonohi
Kaehaehaiki	*moʻo ʻāina* in the *ʻili* of Kaonohi
Kahawai	*ʻili ʻāina* of Kalauao
Kahawailalo	*moʻo ʻāina* in the *ʻili* of Kahawai
Kahawailoi	*moʻo ʻāina* in the *ʻili* of Kahawai
Kahawailuna	*ʻili ʻāina* of Kalauao
Kahikina	*moʻo kalo* in the *moʻo ʻāina* of Kamilomilo
Kahuawai	small waterfall on Kalauao Stream
Kahui	*kōʻele*
Kahulikua	*pōʻalima* in the *ʻili* of Kaonohi
Kaihikapu	*kōʻele* in the *ʻili* of Kaonohi
Kaiioioea	*moʻo kalo* in the *ʻili* of Kahawai
Kalauaha	*moʻo ʻāina* in the *ʻili* of Paaiau
Kalawa	*pōʻalima* in the *ʻili* of Kaonohi
Kalokoele	*moʻo kalo* in the *ʻili* of Kaonohi
Kamaino	house platform in the *ʻili* of Kaonohi
Kamakoa	*moʻo ʻāina* in the *ʻili* of Kaonohi
Kamalua	*moʻo ʻāina* in the *ʻili* of Kaonohi
Kamanalepe	*kōʻele*
Kamiha	*moʻo ʻāina* in the *ʻili* of Kaonohi
Kamilomilo	*moʻo ʻāina* in the *ʻili* of Kaonohi
Kamoolepo	place name
Kaneaea	*moʻo ʻāina* in the *ʻili* of Kaonohi
Kanenelu	*moʻo ʻāina* in the *ʻili* of Paaiau

Kaniu	*loʻi* in the *ʻili* of Paaiau
Kaniu	*moʻo ʻāina* in the *ʻili* of Kaonohi
Kaohia	*moʻo ʻāina* in the *ʻili* of Alaeanui
Kaokai	*loko* in the *ʻili* of Kaonohi
Kaonohi	*ʻili ʻāina* of Kalauao
Kaonohi	*moʻo kalo* in the *ʻili* of Kaonohi
Kapaakai	*moʻo ʻāina* in the *ʻili* of Paaiau
Kapaeakapae	*moʻo ʻāina* in the *ʻili* of Kapaeli
Kapaele	*ʻili ʻāina* of Kalauao
Kapaepaealii	*moʻo ʻāina* in the *ʻili* of Kapukaokiha
Kapahu	*moʻo ʻāina* in the *ʻili* of Kaonohi
Kapuai	*ʻili ʻāina* of Kalauao
Kapukaokiha	*kūʻula* in the *ʻili* of Kaonohi
Kauakapuaʻa	*moʻo ʻāina* in the *ʻili* of Kaonohi
Kaualiilii	*moʻo ʻāina* in the *ʻili* of Kauopae
Kauaopai	*ʻili ʻāina* of Kalauao
Kauapoolei	*ʻili ʻāina* of Kalauao
Kaulu	*moʻo ʻāina* in the *ʻili* of Kauopai
Keokea	*loʻi* in the *ʻili* of Paaiau
Keokiohe	*kōʻele* in the *ʻili* of Kaonohi
Keolai	*moʻo ʻāina* in the *ʻili* of Kapaeli
Keolaiiki	*moʻo ʻāina* in the *ʻili* of Kapaeli
Keolainui	*moʻo ʻāina* in the *ʻili* of Kapaeli
Kiapu	pond
Kipawale	*moʻo kalo* in the *ʻili* of Kaonohi
Koho	*kōʻele* in the *ʻili* of Kaonohi
Kolaia	*kōʻele* in the *ʻili* of Kaonohi
Koloa	*kūʻula* in the *ʻili* of Paaiau
Kuahulumoa	*ʻili ʻāina* of Kalauao
Kuainahawele	*kōʻele*
Kukii	*moʻo ʻāina* in the *ʻili* of Kaonohi
Kumuhahane	*moʻo ʻāina* in the *ʻili* of Kapaeli
Kumuhau	*moʻo kalo* in the *ʻili* of Paaiau
Kumupali	*moʻo ʻāina* in the *ʻili* of Kapaeli
Kumuulu	*moʻo ʻāina* in the *ʻili* of Kauaopai
Kupuloko	*moʻo kalo* in the *ʻili* of Kaonohi
Loko Opu	fishpond
Loko Paaiau	fishpond
Mahulu	*pōʻalima* in the *ʻili* of Kapaeli
Makaokalawa	*moʻo ʻāina* in the *ʻili* of Kaonohi
Makoa	*kūʻula* in the *moʻo ʻāina* of Kamilomilo
Manamana	*moʻo loʻi* in the *ʻili* of Kaonohi
Manukuaha	*kūʻula*
Maunakuaha	hill
Mauuakapuaa	*moʻo kalo* in the *ʻili* of Kaonohi
Mooakua	*moʻo kalo* in the *ʻili* of Kaonohi
Opu	*ʻili ʻāina* of Kalauao
Paaiau	*ʻili ʻāina* of Kalauao
Paauki	*moʻo ʻāina* in the *ʻili* of Kaonohi

Palahauna	*moʻo ʻāina* in the *ʻili* of Kaonohi
Papaiole	*moʻo ʻāina* in the *ʻili* of Kaonohi
Pawiliwili	*moʻo kalo* in the *ʻili* of Kaonohi
Pipilani	*moʻo ʻāina* in the *ʻili* of Paaiau
Poopuaa	*moʻo kalo* in the *ʻili* of Kapaeli

ʻŌlelo Noʻeau

ʻŌlelo Noʻeau, or Hawaiian Proverbs, often present further understanding of traditional ideologies, land use patterns, and practices of specific places. While there were no ʻōlelo noʻeau directly referring to the Kalauao or Paʻaiau areas, many were found relating to the Puʻuloa, Pearl Harbor and ʻEwa areas, and are included in the following text:

Puʻuloa

Alahula Puʻuloa, he alahele na Kaʻahupāhau.

Everywhere in Puʻuloa is the trail of Kaʻahupāhau.

Said of a person who goes everywhere, looking, peering, seeing all, or of a person familiar with every nook and corner of a place. Kaʻahupāhau is the shark goddess of Puʻuloa (Pearl Harbor) who guarded the people from being molested by sharks. She moved about, constantly watching [105]. (Pukui 1983:14)

E hāmau o makani mai auaneʻi.

Hush, lest the wind arise.

Hold your silence or trouble will come to us. When the people went to gather pearl oysters at Puʻuloa, they did so in silence, for they believed that if they spoke, a gust of wind would ripple the water and the oysters would vanish [274]. (Pukui 1983:34)

Hoʻahewa na niuhi ia Kaʻahupāhau.

The man-eating sharks blamed Kaʻahupāhau.

Evil-doers blame the person who safeguards the rights of others. Kaʻahupāhau was the guardian shark goddess of Puʻuloa (Pearl Harbor) who drove out or destroyed all the man-eating sharks [1014]. (Pukui 1983:108)

Hoʻi aku la ka ʻōpua i ke awa lau o Puʻuloa.

*The horizon cloud has gone back to the lochs of Puʻuloa*He has gone home to stay, like the horizon clouds that settle in their customary places [1023]. (Pukui 1983:109)

Ke awa lau o Puʻuloa.

The many-harbored sea of Puʻuloa.

Puʻuloa is an early name for Pearl Harbor [1686]. (Pukui 1983:182)

Mehameha wale no o Puʻuloa, i ka hele a Kaʻahupāhau.

Puʻuloa became lonely when Kaʻahupāhau went away.

The home is lonely when a loved one has gone. Kaʻahupāhau, guardian shark of Puʻuloa (Pearl Harbor), was dearly loved by the people [2152]. (Pukui 1983:234)

Pearl Harbor

Huhui na ʻōpua i Awalau.

The clouds met at Pearl Harbor.

Said of the mating of two people [1126]. (Pukui 1983:126)

Ke kai heʻe nehu o ʻEwa.

The sea where the nehu come in schools to ʻEwa.

Nehu (anchovy) come by the millions into Pearl Harbor. They are used as bait for fishing, or eaten dried or fresh [1721]. (Pukui 1983:185)

ʻEwa

ʻEwa kai lumalumaʻi.

ʻEwa of the drowning sea.

An epithet applied to ʻEwa, where kauwā were drowned prior to offering their bodies in sacrifice [385]. (Pukui 1983:47)

ʻEwa nui a Laʻakona.

Great ʻEwa of Laʻakona.

Laʻakona was a chief of ʻEwa, which was prosperous in his day [386]. (Pukui 1983:47)

Ka iʻa hāmau leo o ʻEwa.

The fish that silences the voice.

The pearl oyster, which has to be gathered in silence [1331]. (Pukui 1983:145)

Ka iʻa kuhi lima o ʻEwa.

The gesturing fish of ʻEwa.

The pipi, or pearl oyster. Fishermen did not speak when fishing for them but gestured to each other like deaf-mutes [1357]. (Pukui 1983:148)

Ku aʻe ʻEwa; Noho iho ʻEwa.

Stand-up ʻEwa; Sit-down ʻEwa.

The names of two stones, now destroyed, that once marked the boundary between the chiefsʻ land (Kuaʻe ʻEwa) and that of the commoners (Noho iho ʻEwa) in ʻEwa Oʻahu [1855]. (Pukui 1983:1855)

Winds and Rains

The Māunuunu is the name of the wind in the Puʻuloa area. The Māunuunu is said to be a strong, blustering type of wind (Nakuina 2005:124).

Moʻolelo

Kaʻahupāhau, the shark guardian of Puʻuloa

In ancient Hawaiʻi, worshiping and caring for family *ʻaumākua* (ancestor gods) was a very common practice. *ʻAumākua* were known to take many different forms, including animal forms like that of a shark (Pukui 1972:36). Emerson provides a long description of the shark *ʻaumākua* below:

> ...perhaps the most universally worshipped of all the aumakua...each locality along the coast... had its special patron shark...well known to all frequenters of the coast. Each of these sharks had its own kahu (keeper) who was responsible for its care and worship. [...] The relationship between a shark god and its kahu was oftentimes of the most intimate and confidential nature. The shark enjoyed the caresses of its kahu as it came from time to time to receive a pig, a fowl, a piece of ʻawa, a malo, or some other token of its kahu's devotion. And in turn it was always ready to aid and assist the kahu. (Sterling and Summers 1978:54)

According to S. Nawaa, Kaʻahupāhau was the name of the shark guardian of Puʻuloa. Nawaʻa provided the following account:

> The mother, who was a chiefess, of Kaʻahupahau was gathering limu in the waters of Pearl Harbor when she had a miscarriage. Thinking the baby was dead she left it in the water to be washed away. Later she went again to gather limu and bitten by a shark. She went to a kahuna [priest] who told her that the shark was Kaʻahupahau who was her own daughter, the baby she thought was dead. [...] It was from that time by command of the mother that all the people of Ewa were to always be protected from sharks whether in Pearl Harbor or outside. (Sterling and Summers 1978:56)

Native Hawaiian historian, S.M. Kamakau wrote about another account discussing the establishment of Kaʻahupāhau as the guardian of Puʻuloa. Kamakau writes:

> Oahu was made a kapu [forbidden] land by this kanawai [law] placed by [the shark gods] Kanehunamoku and Kamohoaliʻi. But their sister Kaʻahupahau broke the law and devoured the chiefess Papio. She was taken and "tried" (hoʻokolokolo) at Ulukaʻa [the realm of these gods], but she escaped the punishment of death. It was her woman kahu who paid the penalty of the law because it was her fault—she reviled Papio. The trouble arose over a papahi lei of ʻilima flowers which belonged to Kaʻahupahau that her kahu was wearing. [The kahu refused to give it to Papio, and] Papio said, "I am going bathing, but when I come back you shall be burned with fire." But Kaʻahupahau devoured Papio before she could carry out her threat, and she was punished for this. That is how Puʻuloa became a [safe] thoroughfare (alahula). After her confinement ended several years later, Kaʻahupahau was very weak. She went on a sightseeing trip, got into trouble, and was almost killed. But she received great help from Kupiapia and Laukahiʻu, sons of Kuhaimoana, and when their enemies were all slain, the kanawai was firmly established. This law—that no shark must bite or attempt to eat a person in Oahu waters—is well known from Puʻuloa to the Ewas. Anyone who doubts my words must be a malihini there. Only in recent times have sharks been known to bite people in Oahu waters or to have devoured them; it was not so in old times. (Kamakau – Pukui, translator, 1968:73)

The Battle of Kaʻahupāhau and Mikololou

E. Lahilahi Webb provides the following account of Kaʻahupāhau, and her battle against a man-eating shark named Mikololou of Hawaiʻi Island, in Fornander and Thrum (2001).

> Mikololou was a malihini shark who came from Hawaiʻi to visit the waters of Puʻuloa (Pearl Harbor), hungry for human flesh. Some of the resident sharks of that locality learned of its desire and so Mikololou entered the

> lochs as far inland as Waipahu, where it met Kaʻahupāhau, whereupon this guardian shark gave orders to get nets to encircle and capture the intruder. (Fornander and Thrum 2001:57)

Mikololou was eventually captured and killed by the people of Puʻuloa. However, because he was a special shark, he came back to life and sought revenge on Kaʻahupāhau. Mikololou gathered many sharks to wage war on Kaʻahupāhau. Webb, further describes the account by stating:

> In revenge for this treatment by Kaʻahupāhau, mikololou collected a large body of sharks at the windward islands to wage war on the presumptious guard of Oʻahu's waters and appeared before the entrance to Puʻuloa where a long and severe fight took place, in which Kaʻahupāhau and her attendants so slaughtered the intruders that only a few escaped. Hence the open thoroughfare of Puʻuloa is the guarded highway of Kaʻahupāhau, whereby the sea of Puʻuloa is safe and peaceful through her law that sharks shall not attack man. (Fornander and Thrum 2001:58)

Kanekuaʻana, the moʻo of Puʻuloa

Kaʻahupāhau was not the only guardian of Puʻuloa. Kanekuaʻana, a *moʻo* (mythical water spirit, often associated with the lizard), was also known to have guarded the area (Sterling and Summers 1978:50). According to S. M. Kamakau (Sterling and Summers 1978):

> Kanekuaʻana guarded all the district of Ewa and the natives from Halawa to Honouliuli had faith in her. She cared specially for those related to her but the blessings that came to them were shared by all. The people of Ewa depended upon her as their guardian to bless them. (Sterling and Summers 1978:51)

Kanekuaʻana was also known to have blessed the people of the ʻEwa district with pearl oysters. Kamakau states:

> When their children were suffering from a scarcity of fish, the relatives of Kanekuaʻana from Halawa to Honouliuli erected waihau (a heiau) for Kanekuaʻana and lighted fires to bring blessings upon the whole people. What kind of fish? The pearl oyster [...] They [pearl oysters] grew right on the mussel shells and thus supplied seafood. (Sterling and Summers 1978:51)

Moses Manu further accredits Kanekuaʻa for the introduction and extinction of the pearl oyster in the Puʻuloa area:

> Kanekuaʻana was a royal lizard whose home was the lochs of Ewa. This was the lizard who was said to have brought the pearl oyster to the sea of Ewa and this was the oyster that was referred to as "the silent ʻfish' of Ewa; do not speak lest a wind arises." [...] In residing there, this lizard was cared for and worshipped by the people for bringing pearl oyster. (Sterling and Summers 1978:50)

After the arrival of Western foreigners and new resource policies in Hawaiʻi, it was said that the oysters began to vanish. Manu further stated:

> The people of the place believe that the lizard was angry because the konohikis imposed kapus, were cross with the women and seized their catch of oysters. So this "fish" was removed to Tahiti and other lands.

> When it vanished a white, toothed thing grew everywhere in the sea of Ewa. (Sterling and Summers 1978:50)

The Legend of Opelemoemoe

Another well-known legend of the area is that of Opelemoemoe. Fornander (1918) provides the following account of a strange man named Opelemoemoe of Kalauao.

> Kalauao in Ewa was where Opelemoemoe made his home. This man performed some very extraordinary things, things the like of which had not been seen before him nor since. He could keep asleep from the first day of the month to the end of the month; but if a thunder storm occurred he would then wake up; otherwise he would keep on sleeping for a whole year [...] Once upon a time Opelemoemoe set out from Kalauao for Puukapolei, where he fell asleep. He slept for a period of nearly ten days. (Fornander 1918: 168)

While he was sleeping two men from Kauaʻi took him as human sacrifice. The men carried his body all the way to Pōkaʻī in Waiʻanae, where their canoes were beached. From there they sailed to Kauaʻi. When they arrived on Kauaʻi, Opelemoemoe was placed on an altar and left as a sacrifice. Fornander further states:

> During all this time Opelemoemoe never once awoke from his sleep. It was noticed that his body did not decay like the rest of the things that were placed on the altar [...] Opelemoemoe was then left on the altar until one day it thundered, when he awoke and found himself tied hand and foot. He then untied himself and got down from the altar. (Fornander 1918:168)

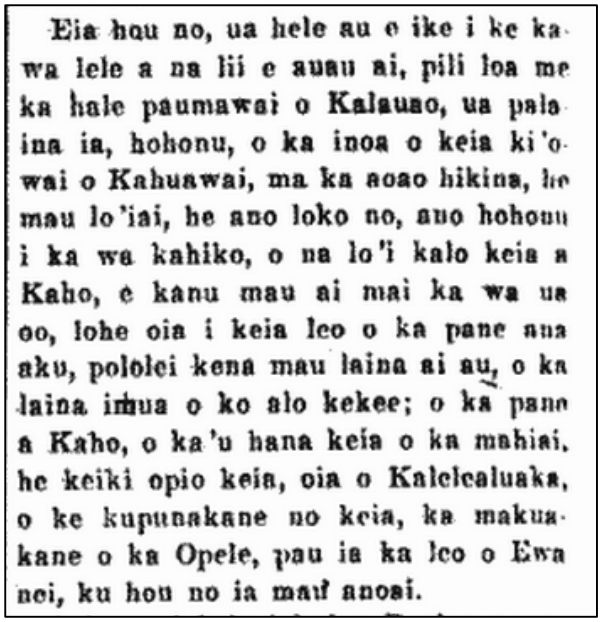
Opelemoemoe then travels to Waimea, Kauaʻi and marries a woman named Kalikookalauae. After he settled down, Opelemoemoe eventually fell back asleep. While sleeping his wife mistakenly thought he was dead, and ordered that he be cast into the sea. Fornander illustrates:

> Opelemoemoe slept on as though he thought he was on land, never once moving. In this sleep the fish came around and ate his skin. After some months had lapsed, during which Opelemoemoe slept on the bottom of the sea, a thunder storm came up and Opelemoemoe awoke. (Fornander 1918:170)

After realizing that he was at the bottom of the ocean, Opelemoemoe swam to the surface and came ashore. He went back to his wife, and though she was very surprised to see him, they continued to live like usual. After some time, his wife conceived a child. It was then that Opelemoemoe said to his wife: "I am returning to Oahu and I want you to keep this my word. If you should give birth to a boy, give him the name Kalelealuaka; and if he grows up he expresses the desire to come in search of me let have this token, a spear" (Fornander 1918:170).

Opelemoemoe returned to Kalauao, and Kalelealuaka was born. Kalelealuaka was a very mischievous child, and sought to find his father. Eventually, Kalikookalauae told the boy where to find Opelemoemoe and gave him the spear. Though he was mischievous Kalelealuaka traveled to Kalauao and found his father working in a taro patch. Kalelealuaka confronted Opelemoemoe, and was finally reunited with his father.

Kahuawai



Eia hou no, ua hele au e ike i ke kawa lele a na lii e auau ai, pili loa me ka hale paumawai o Kalauao, ua pala ina ia, hohonu, o ka inoa o keia ki'owai o Kahuawai, ma ka aoao hikina, he mau lo'iai, he ano loko no, auo hohonu i ka wa kahiko, o na lo'i kalo keia a Kaho, e kanu mau ai mai ka wa ua oo, lohe oia i keia leo o ka pane ana aku, pololei kena mau laina ai au, o ka laina imua o ko alo kekee; o ka pane a Kaho, o ka'u hana keia o ka mahiai, he keiki opio keia, oia o Kalelealuaka, o ke kupunakane no keia, ka makuakane o ka Opele, pau ia ka leo o Ewa nei, ku hou no ia mau anoai.

The following are accounts of the freshwater pond named Kahuawai, located in the Kalauao *ahupua'a*. These accounts are translations, provided by Hammatt et al. (2006), of excerpts from Hawaiian language newspapers. The original newspaper clipping is provided here and is translated as:

"Here is another thing. I went to see the diving place of the chiefs where they used to bathe. It is very close to the pump at Kalauao. It is cemented and deep. The name of this pool is Kahuawai. On the eastern side are some taro patches that are somewhat like ponds. They were deep in the olden days and these were the taro patches owned by Kaho, in which he planted all the time." (W. K. Apuakehau Ka Nupepa Kuokoa July 18, 1919)

Though the exact location of Kahuawai is unknown, Kahuawai is described as "a small waterfall on Kalauao Stream O'ahu, once a favorite resting place exclusively for chiefs" (Soehren 2010).

Overview of Hawaiian Fishponds

One of the many unique ecological characteristics of Hawai'i includes the sustainable practice of aquaculture, in particular the raising of fish in traditional Hawaiian fishponds. Aquaculture studies throughout Polynesia have concluded that this type of fish husbandry was exclusive only to the Hawaiian archipelago, and was exceptionally beneficial in contributing towards Hawai'i's productivity (Kikuchi 1976; Kirch 1985).

This type of aquaculture is truly impressive as the traditional Hawaiian fishpond systems incorporate fish farming practices that extend from the inlands to the sea (Apple and Kikuchi 1977). Kamakau (1976) wrote the following passage describing the relationship between the people and their fishponds:

> Fish of the taro patch ponds gave life to the husband, the wife, the children, and the whole family *'ohana*. When anyone was hungry, the wife would get a few *'o'opu*, or *'opae* or *aholehole*, and some taro leaves to relieve the hunger. If the *malihini* or the *haku 'aina* arrived in the dark of night, the dwellers were prepared; they could quickly get some of the fish *(mo'o mahi)* that had grown fully developed scales and hard heads and the storage container of poi. Then the poi, the *awa* and the *'anae* were placed in front of the *malihini* or the *haku 'aina*—or friends, perhaps.
>
> Thus they lived in the old days and that is why the native sons of places that had taro patches and *pu'uone* fishponds loved the lands where they dwelt. There would be salted fish, too, in containers of large taro leaves. When one awoke in the morning and was ready to eat, the fish was brought forth and the wrappings opened up; taro leaves would have

> wilted and the fish would be shaped like pig tusks. They were laid in a food bowl and one ate until he was full. So too did the native sons love the land where the freshwater ponds, *loko wai* were, for they furnished them with fresh *ʻopae*, crisp *limu-kala-wai*, reddish *ʻoʻopu* roe, and *luʻau*. The people of the old days who lived on such lands lacked nothing. (Kamakau 1976: 50)

Fishpond Types and Stylistic Attributes

The Hawaiian word for fishpond is *loko iʻa*. The term *loko* has many definitions including: pond, lake, and pool (Pukuʻi 1986; Kirch 1985:214). The term *iʻa* translates to mean fish. There are five main types of fishponds that extend from the inlands to the sea. These five types (starting from the most inland) are: 1) *Loko wai*, 2) *Loko iʻa kalo*, 3) *Loko puʻuone*, 4) *Loko kuapā* and 5) *Loko ʻumeiki*. Although Paʻaiau fishpond is considered to be a *loko kuapā* type, a brief summary for each type of fishpond along with its associated features, is provided below.

Loko wai

Loko wai are fresh water fishponds typically found in the wet upland areas (Figure 7). *Loko wai* fishponds were constructed by widening and deepening natural depressions in areas near streams or rivers. In addition to these modifications, ditches were built to divert stream water into these pools creating an enriched ecosystem for fish farming. According to Wyban (1992), *awa*, *ʻoʻopu*, *ʻōpae*, *limu kala wai,* and an unnamed edible mud were traditionally farmed in this type of fishpond.

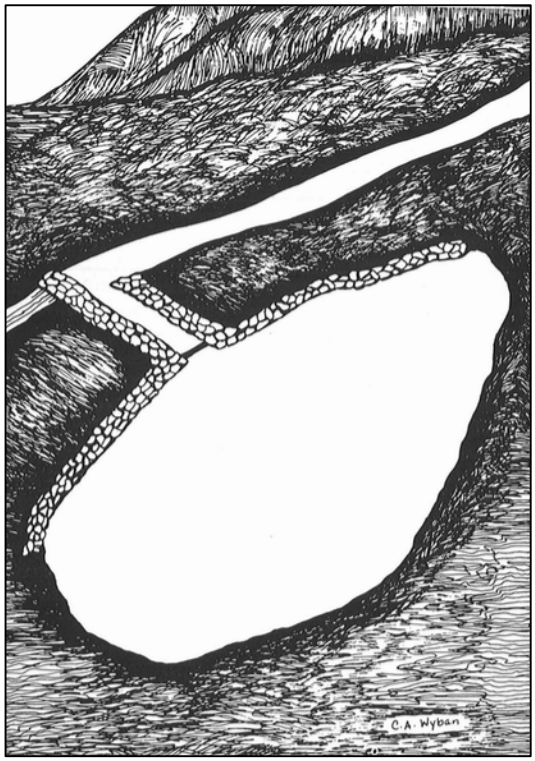


Figure 7. Illustration of a *loko wai*, adapted from Wayban (1992).

Loko iʻa kalo

Loko iʻa kalo are predominantly used for raising kalo and are fresh water ponds (Figure 8). Fishes primarily found within this type of *loko* are species of *ʻoʻopu, āholehole* and *ʻamaʻama*. These varieties of fish are classified as euryhaline fish as they thrive in both fresh and salt water (Yamamoto and Tagawa 2000).

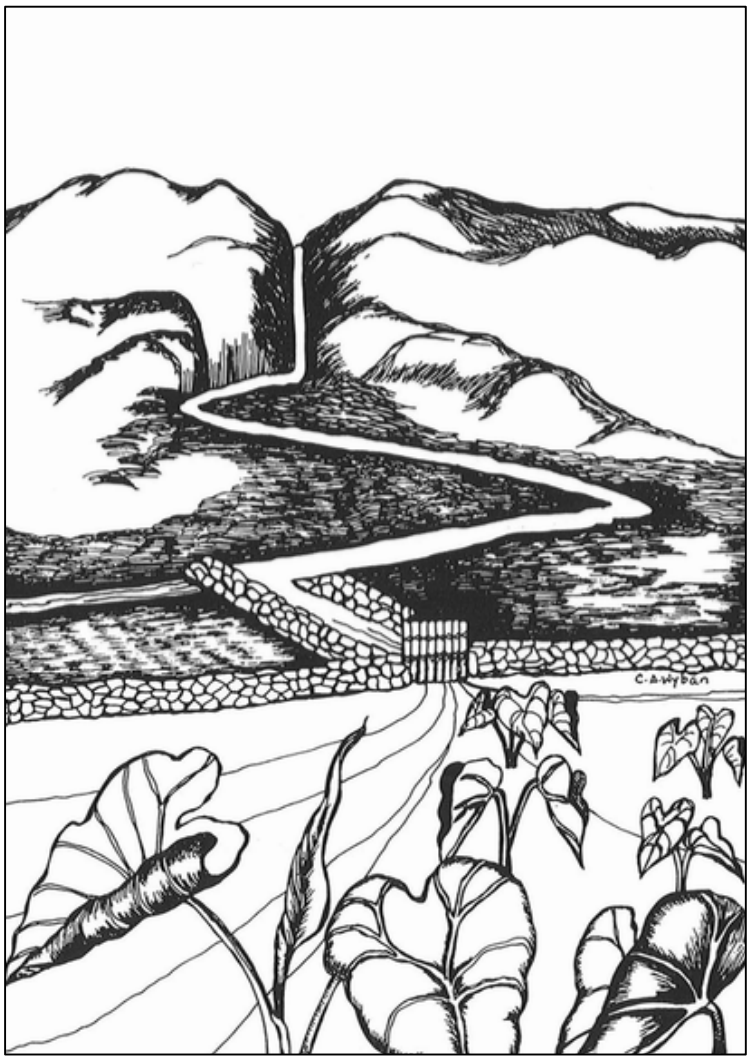


Figure 8. Illustration of a *loko iʻa kalo*, adapted from Wayban (1992).

Loko puʻuone

Loko puʻuone are located along the shoreline and are identified as ponds surrounded by sand dunes that are fed by streams and springs (Figure 9). Although these ponds are technically separated from the sea, these ponds connect to the ocean by *ʻauwai kai*, or saltwater ditches. These brackish water ponds are ideal for raising fish, in particular euryhaline fish like *ʻamaʻama*, and *awa* (Wayban 1992). Kamakau (1976) provided the following description of *loko puʻuone*:

The *puʻuone* ponds near the sea (*loko kai puʻuone)* were much desired by farmers, and these ponds they stocked (*hoʻoholo)* with fish. *Puʻuone* ponds were close to shore ponds, *loko kuapā*, or to the seashore, and next to the mouths (*nuku*) of streams. The farmer cleared away the *mokai* (sedges), *ʻakaʻakai* (bulrushes), and weeds, and deepened the pond piling up the much on the sides, until he had a clean pond. Then he stocked it with *awa* and fish fry, *pua iʻa*, two or three gourds full—until the pond was full of fish. After two or three years the fish from the gourd would have grown to *haʻilima* (18 inches) in length. (Kamakau 1976:50)

Figure 9. Illustration of a *loko puʻuone*, adapted from Wayban (1992).

Loko kuapā

Loko kuapā are the most discussed type of fishpond and are found "in shallow waters on protect reef" (Wayban 1992:114) (Figure 10). *Loko kuapā* were constructed using rocks and coral to build a wall that would essentially enclose a portion of the ocean, creating an area for farming fish. The construction of a *loko kuapā* is very labor intensive and requires a lot of people and energy to complete the task. In addition to building the rock

wall that surround the pooled area different features were also incorporated into the construction of this type of pond, creating a very complex aquacultural system (Summers 1964). Amongst these features included the *mākāhā, or sluice gates*, and a *hale kiaʻi*, or guardhouse.

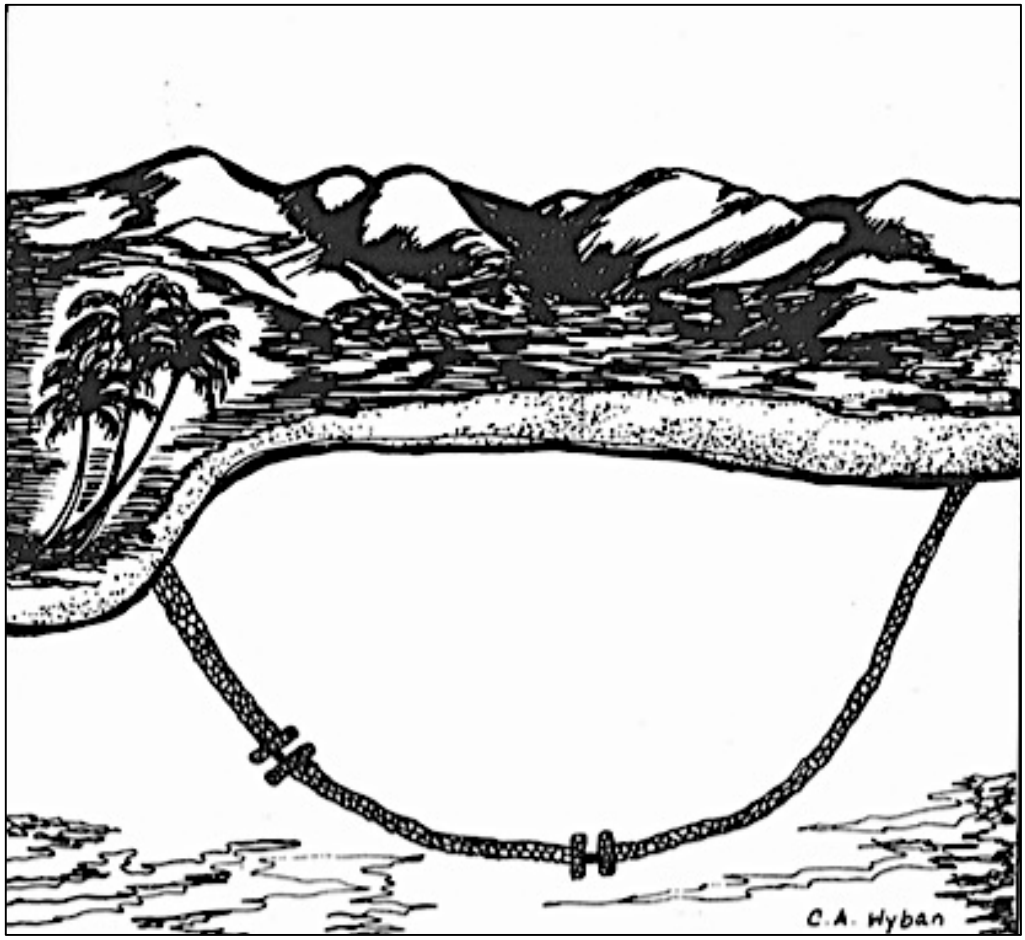


Figure 10. Illustration of a *loko kuapā*, adapted from Wayban (1992).

Mākāhā, were features built within the fishpond walls to help regulate pond water temperature, salinity and depth. This multipurpose innovation was developed by the ancient Hawaiians not only to manipulate water quality, but also to assist in fish stock and harvest as these gates allowed smaller fish to swim into the pond, and kept larger fish from escaping (Summers 1964; Wayban 1992: 13). The traditional *mākāhā* is said to have been one stationary grate (Wayban1992). Kamakau (1869a) reports on the construction of the traditional *mākāhā*, stating:

> When the stone walls of the kuapā banks were completed, then the task remained to find the proper wood for the mākāhā. This was selected by the kahuna of the ʻaumakua who increased the fish in the shore ponds. The wood was either ʻohiʻa or lama, or some other suitable wood. When the wood for the mākāhā was ready, and the proper day had arrived for its construction, the kahuna was fetched to set up the first piece of timber. For this important duty he offered a hog and a dog suitable to this work of inspiring the increase of fish, and appropriate prayers to this work. Then

he reached for a timber and set it up for the mākāhā, and offered a closing prayer. Then the men built the mākāhā, binding it together with ʻie cords. After that they arranged foundation stones with the mākāhā grating and poured in pebbles. It was in this way that all mākāhā were made. (Kamakau 1869a)

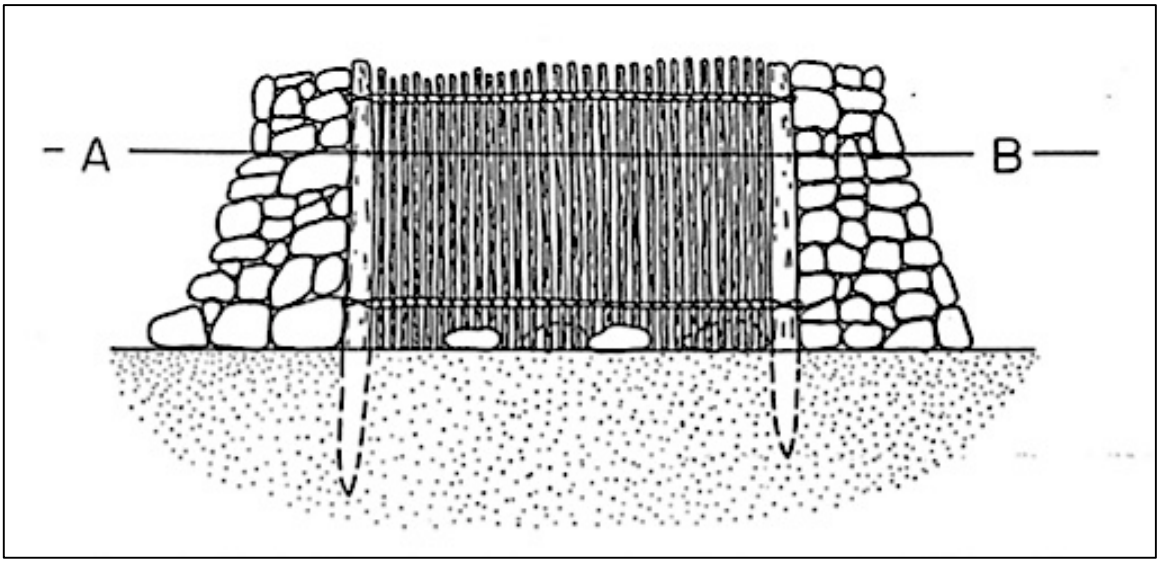


Figure 11. Vertical view of a traditional *mākāhā*. Line A-B indicates mean water level. (Adapted from Summers 1964)

Throughout the years and with the availability of new resources, the traditional *mākāhā* as described by Kamakau (1869a) evolved to incorporate modern materials such as cement and metal. Instead of being one stationary grate, these newer *mākāhā* were composed of two gate systems with moveable parts that would essentially open and close when needed. These types of modified *mākāhā* were observed at Paʻaiau fishpond during the archaeological monitoring of this project, and are discussed in the Results section of this report.

Figure 12. Photo of a modern *mākāhā*, note the double gating system (see arrows) allowing for two movable gates to trap fish between the *mākāhā* (Adapted from Farber 1997:26).

At high tide, large fishes would congregate at the *mākāhā*, making it easy for thieves to pilfer fish from the pond. For this reason, *hale kiaʻi* were built for the *kiaʻi loko* (fishpond keeper). These houses were built atop the wall near *mākāhā* so it was easy for the *kiaʻi* to patrol the pond. The *kiaʻi loko* reported directly to the *konohiki*, headman of an *ahupuaʻa*, and restocked and harvested fish for the *aliʻi,* chief when needed (Henry 1993). As *loko kuapā* were typically used to house fish for those of higher rank, a *kapu,* or taboo, was placed upon certain fish during particular seasons. This *kapu* was also in place at times that fish spawned so that they could naturally replenish the pond (Summers 1964). *Kiaʻi loko* were compensated for their work with fish from the pond that were not made *kapu* to the *aliʻi.*

Sometimes secondary walls were built for smaller fish within the *kuapā* so that they would not fall prey to predators that had made their way into the pond (Kikuchi 1973). Water within a *loko kuapā* was typically saltwater but was also found to receive fresh water by rivers or springs. Because of the abundance of fish that could be raised within these fishponds, they were often reserved to keep fish for those of higher rank (Henry 1993). Kamakau (1976) wrote the following about the types of fish farmed in the *loko kuapā:*

> The usual fishes (*kama'aina*) in the ponds were the *awa*, *'anae*, *ʻawaʻawa*, *kaku*, *aholehole*, *'o'opu 'opae*, *puhi* and other fishes accustomed to living in ponds. But as a result of the prayers of the *kahuna*, some fishes that were not accustomed to living in ponds came in; such fishes as *ulua*, *kahala*, *'o'io*, *palani*, *kumu*, *uhu*, *manini*, p*uwalu*, and some other kinds. The *loko kuapa* would be filled with all kinds of fish. They would cause ripples against the walls, like waves, and this made glad the "hearts" (*na'au*) of the keepers of the pond and of the chiefs whose pond it was (*na li'i nona ka laka*). "The land has life," *Ola ka 'aina*, the keepers would say to them, and they would be pleased as though they were victorious

warriors. (Kamakau 1976:50)

Loko ʻumeiki

Loko ʻumeiki are fish traps found along the shoreline. Similar to the *loko kuapā*, these fishponds were built using rocks and coral to construct a wall, however, the walls built surrounding this loko were built shorter than the high tide mark and instead of having *mākāhā* features, "lanes" were constructed to jut through the wall that allowed fish to swim in and out of the pond when it was not submerged.

Locale and Productivity

Hawaiian Scholar Samuel Kamakau noted, "fishponds were things that beautified the land, and a land with many fishponds was called 'fat'" (1976:47). Prior to the arrival of James Cook and company in 1778, it was estimated that over 480 fishponds were functioning, producing more than two million pounds if fish a year (Kikuchi 1973; Kirch 1985:211). Majority of these functioning fishponds were found on the islands of Oʻahu and Molokaʻi, some of which are still presently evidenced on the landscape. Patrick Kirch summarized how placement of fishponds took place in his book *Feathered Gods and Fishhooks*:

> The extent and distribution of ponds was dictated by the local environment, especially by the presence of broad, shallow reef flats or embayments where ponds could easily be constructed in broad semicircular arcs out from the shoreline. Among the most suitable localities were Kāneʻohe Bay and Pearl Harbor on Oʻahu, and along the southern coastline of Molokaʻi (1985:211).

Within these *loko kuapā*, many varieties of reef fish could be found such as *ʻamaʻama and awa*. Other species of fish could be found in their younger forms as well if they were caught and placed within the pond. Those fish would then feed on the algae growing on the reef and pond walls and subsequently become too large to escape (Henry 1993). Crabs and shrimps could also be found in these ponds, which potentially attracted water birds. Presently, a large majority of these fishponds are now covered in silt and invasive plants such as red mangrove and California grass, and are in no condition to be restored (Kikuchi 1976; Apple and Kikuchi 1977).

Associated Parties

Though it is not certain when the first fishpond was built, *loko kuapā* are mentioned in *moʻolelo* that speak about gods and the very beginning of life in Hawaiʻi. Other *moʻolelo* state certain fishponds to have been built by *menehune*, who were believed to be part of the earliest population of people living in Hawaiʻi. Between the 14th and 19th centuries, however, fishponds became associated with chiefs and a symbol of their power and ability to manage their resources (Summer 1964). Along with the productivity of agriculture, aquaculture was also a physical manifestation of "a chief's political power and ability to control and tap his resources" (Kikuchi 1976:299). Fishponds were so important that they were included in histories of aliʻi as well. The following is an excerpt from Abraham Fornander's (1969) *Ancient History of the Hawaiian People*:

> Kalaimanuia followed her mother, Kukaniloko, as Moi of Oahu. No foreigner or domestic wars appear to have troubled her reign, and little is known of her history. She was born at Kukaniloko, that famous birthplace

> of Hawaiian royalty, and resided most of her time at Kalauao, in the Ewa district, where the foundations of her houses are still pointed out at Kukiiahu and at Paaiau. To her is attributed the building of the great fishponds of Kapaakea, Opu, and Paaiau. Her husband was Lupe Kapukeahomakalii, a song of Kalanuili (k) and Naluehiloikeahomakalii (w), and he is highly spoken of in the legends as a wise and kind man, who frequently accompanied his royal spouse on the customary circuits of inspection of the island, and assisted her in the government and administration of justice. (1969: 269)

Paʻaiau Fishpond

John F. G. Stokes credited the development of Puʻuloa into an area for good fishing to the ʻEwa chief, Keaunui, son of Māweke (Sterling and Summers 1978:47). Keaunui was said to have widened and deepened the channel of Pearl Harbor, as a means of building weirs to better accommodate fish farming practices of the area. Stokes further states that there is a possibility that fish traps and fishponds were already being constructed during that time and provides the following account:

> Then it was that Kalaimanuia, queen of Oahu, was accredited with the building of three fishponds in Pearl Harbor, Kapaakea in Waimalu, the Opu and Paaiau in Kalauao, and her Son Kaihikapu is mentioned as constructing two more in Moanalua near by. (Sterling and Summers 1978:47)

Approximately 25 fishponds and fish traps were recorded, including the Paʻaiau Fishpond (Site 108) in the Puʻuloa area by McAllister in 1933 (Figure 13). The abundance of fishponds and fish traps reflected the rich costal resources once present in the Puʻuloa area. U.S. sailor and explorer, Charles Wilkes, echoes this sentiment in his account of the "Pearl-River Harbour" in 1838-1842. Wilkes stated, "Pearl-River Harbour affords an abundant supply of fine fish. Two species of clams are procured here, called by the natives okupe and olepe" (Sterling and Summers 1978:49).

In 1989 a Cultural Resources Reassessment for the 1989 Ford Island Causeway Study was conducted in the Pearl Harbor Naval Base area. This study documented the different fishponds along the shoreline of Pearl Harbor, including Paʻaiau, and provided the following statement regarding the condition and integrity of the fishponds in the area, "Of the seven sites discussed above, only one, 108-Loko Paaiau still possesses surface integrity. The others, all listed as "filled-in" or "destroyed," have no surface remains (Sinoto 1989:6).

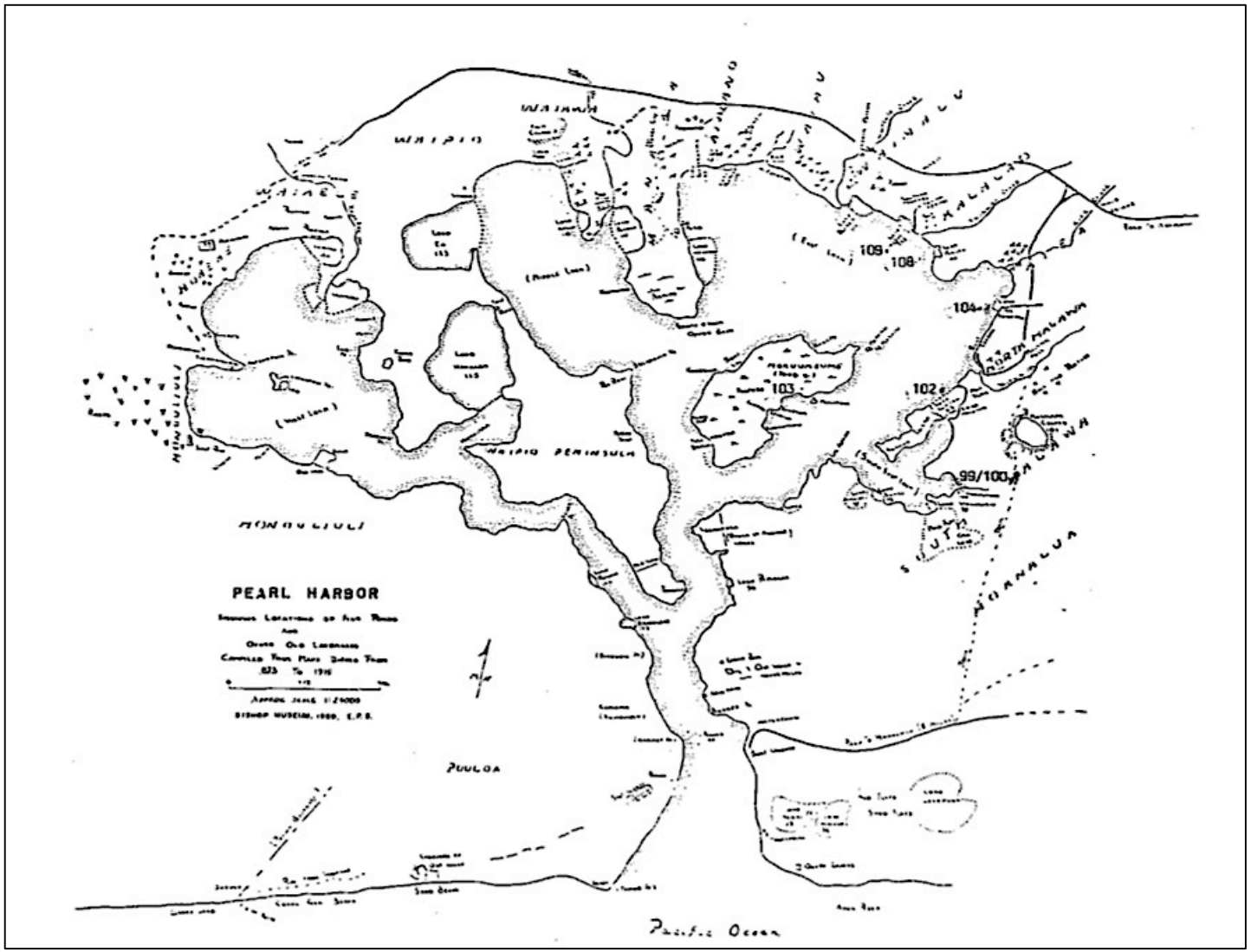


Figure 13. Map of Pearl Harbor with archaeological sites recorded by McAllister in 1933, map adapted from Sterling and Summers (1978).

Historic Era

Early Historic Period

ʻEwa, a Political Center

In A.D. 1320, it was said that Oʻahu was ruled by the sons of the high chief, Māweke (Cordy 2002:21). By A.D. 1400, Oʻahu fell under the rule of chief, Laʻakona. From the 1500s to the 1700s control over the island shifted back and forth between chiefs from different districts of Oʻahu, until Kūaliʻi gained control of the island in the early 1700s. Kūaliʻi reigned as the ruler of Oʻahu until his death in 1778. It was then that Kahahana, a chief form ʻEwa, was selected to rule the island (Cordy 2002:24-41). It was during Kahahana's reign, that ʻEwa became the political center of Oʻahu. ʻEwa continued to be a political center until the 18th century when, Kahekili, a chief from Maui killed Kahahana.

According to Fornander (1996), Kahahana's father, ʻElani, along with other chiefs, plotted to kill Kahekili as well as those that wished to follow him, however Kahekili found out about the plot, and challenged ʻElani and his warriors in the battle known as the *Waipiʻo Kīmopō*, or the Waipiʻo assassination.

The Battle of Kukiʻiahu

Native Hawaiian historian, Samuel M. Kamakau provides the following account of another battle that occurred in the ʻEwa district, between chiefs Kalanikūpule and Kaʻeokūlani. The account is said to have taken place in the Kalauao *ahupuaʻa*, and it also mentions the Paʻaiau area.

> A battle was fought on the plains of Puʻunahawele in which some foreigners were killed by Mare Amara. Natives also fell, and Kalanikūpule was forced to retereat. Some six days later another battle was fought in which Kaʻeo was again victorious. This gain he followed up by approaching further upon ʻEwa, hoping to push on to Waikiki which was at that time the center of government. On December 12, 1794, a great battle was fought on the ground of Kalanimanuia between Kalauao and ʻAiea in ʻEwa. The heights of Kuamoʻo, Kalauao, and ʻAiea were held by the right wing of Kalanikūpule's forces commanded by a warrior named Koa-lau-kani; the shore line of Malie [was held] by the left wing under the command of Ka-mohomoho, Kalanikūpule himself with the main army held the middle ground between ʻAieas and the taro patches; Captain Brown's men were in boats guarding the shoreline. Thus surrounded Kaʻeo found his men fighting at close quarters and cut off by Koa-lau-kani between Kalauao and Kuamooʻo, he was hemmed in on all sides and compelled to meet the onset, which moved like the ebb and flow of the tide. Shots from guns and cannon, thrusts of the sword and spear fell upon his helpers. Kaʻeo with six of his men escaped into a ravine below ʻAiea and might have disappeared there had not the red of his feather cloak been seen from the boats at sea and there shots drew attention to those on land. Hemmed in from above, he was killed fighting bravely. His wives were killed with him, and his chiefs and warriors. This war called Kukiʻiahu, was fought from November 16 to December 12, 1794 at Kalauao in ʻEwa. […]
>
> On the afternoon (of the final day of victory for Kalanikūpule) the dead were gathered together, carried to Paʻaiau, and piled in a great heap. Among the bodies was that of Kahullunuikaʻaumoki, a daughter of Kuʻohu,

> the leading kahuna of Kauai, who had fallen with Kaʻeo and the rest at Kukiʻiahi. Her body had been picked up for dead, carried with the others to Paʻaiau, and left in the heap of corpses. It was about one oʻclock in the afternoon when she fell. At about ten oʻclock that night she was aroused by an owl that flew over her and beat its wings on her head. She opened her eyes as from a deep sleep and found herself lying with the dead in a great heap. (Kamakau 1961:169)

Early Post-Contact Period

Descriptions and maps from early visitors and sailors to Hawaiʻi assist in illustrating what the project area and its environs were like in the 18th to 20th centuries. These descriptions also help depict the changes of land use and occupation in the area as well.

Historical Accounts

In 1793, Captain George Vancouver anchored off the entrance of Pearl Harbor, and described the ʻEwa landscape in the account provided below:

> The part of the island opposite to us was low, or rather only moderately elevated, forming a level country between the mountains that compose the east [Koolau] and west [Waianae] ends of the island. This tract of land was of some extent, but did not seem to be populous, nor to possess any great degree of natural fertility; although we were told that, at a little distance from the sea, the soil is rich, and all the necessaries of life are abundantly produced. …Mr. Whitbey obsesrved [sic], that the soil in the neighborhood of the harbor appeared of a loose sandy nature; the country low for some distance, and, from the number of houses within the harbour, it should seem to be very populous; but the very few inhabitants who made their appearance were an indication of the contrary. (Vancouver 1801, vol. 3:361,363)

In the early 19th century, Archibald Campbell, and English sailor, spent time in Hawaiʻi and provided the following description of the ʻEwa area:

> We passed by foot-paths winding through an extensive and fertile plain, the whole of which is the highest state of cultivation. Every stream was carefully embanked, to supply water for the taro beds. Where there was no water, the land was under crops of yams and sweet potatoes. The roads and numerous houses are shaded by cocoa-nut trees, and the sides of the mountains covered with wood to a great height. We halted two or three times, and were treated by the natives with the utmost hospitality." (Campbell 1819:145)

Campbell's 1819 account also includes a description of the Pearl River area:

> Wymumme, or Pearl River, lies about seven miles farther to the westward. This inlet ex'tends ten or twelve miles up the country. The entrance is not more than a quarter of a mile wide, and is only navigable for small craft; the depth of water on the bar, at the highest tides, not exceeding seven feet; farther up it is nearly two miles across. There is an isle in it, belonging to Manina [Paul Marin], the king's interpreter, in which he keeps a numerous flock of sheep and goats. Pearls and mother-of-pearl shells are found here in considerable quantity. Since the king has learned of their value, he has kept the fishing to himself, and employs divers for the purpose… The flat land along shore is highly cultivated; taro root,

> yams, and sweet potatoes, are the most common crops; but taro forms the chief object of their husbandry, being the principal article of food amongst every class of inhabitants. (Campbell 1819:114-115)

In 1821, Gilber Mathison visited the Puʻuloa area and described the use of the different bays, as well as the fishponds in the area in the narrative provided below:

> [...] The sea here forms a small bay, which has the appearance of a salt-water lake, being landlocked on every side except at the narrow entrance. Two or three small, streams, too insignificant to merit the appellation of rivers discharge their united waters into the bay, which is full six miles in length and two in breadth. The adjoining low country is overflowed both naturally and by artificial means, and is well stocked with tarrow-plantations, bananas, &c. The land belongs to many different proprietors; and on every estate there is a fishpond surrounded by a stone wall, where the fish are strictly preserved for the use of their rightful owners, or tabooed, as the native express it. One of particularly large dimensions belongs to the King. (Mathison 1825:416-417)

In 1825, James Macrae also visited Hawaiʻi and provided the following statement about the Puʻuloa area:

> The neighborhood of the Pearl River is very extensive, rising backwards with a gentle slope towards the woods, but is without cultivation, except round the outskirts to about half a mile from the water. The country is divided into separate farms or allotments belonging to the chiefs, and enclosed with walls from four to six feet high, made of a mixture of mud and stone. (McAllister 1933:31)

In 1828, Captain Jacobus Boelen traveled from Honolulu to ʻEwa, and provided this short narrative of his trip. In particular, Boelen notes the cultivation and shallow reefs of Puʻuloa:

> On 26 February, in the company of some good friends and acquaintances, we made an excursion to what the Indians called the harbor of Oporooa [Puʻuloa], which I believe means approximately "Pearl River"—at least that is what the foreigners call this bay. This is because the Indians sometimes find pearls there, which they offer for sale in Honoruru [Honolulu]. We departed from Honoruru at ten o'clock in the morning in two boats, sailed out of the harbor to sea, and rowed a distance of about three quarters or one league toward the west along the coral reef that encircles the whole south coast of Woahoo [Oʻahu]. We passed over the bar of Oporooa harbor. The bar is no more than ten feet deep at low tide, from which one can conclude that in a rough sea high waves will break against it. Even at high tide the passing of this bar can be very dangerous unless the sea is calm. Therefore, on the advice of our pilot, a native of the island, we remained for a time outside the bar and then rowed hard across it.
>
> We found ourselves in a rectangular bay, or rather a lake with several arms, consisting of several deep bights. Two of the most important of these stretched to the northeast, while the one to the northwest cut the farthest....The soil in this region seemed at first sight to be exceptionally fertile, and the land consisted of meadows and taro and sugar [cane] fields [...]

> We rowed to the end of the harbor of Opooroa, or the so-called Pearl River, and landed with the boats near a small Indian village with the name of Mannonco [...] In the meantime, we strolled through the surrounding land, which everywhere was very fertile, with cultivated fields of tarro, maize, and also sugar cane. (Boelen 1988:64-65)

In 1823-1824, missionary William Ellis recorded a description of the ʻEwa area:

> The plain of Eva is nearly twenty miles in length, from the Pearl River to Waiarua, and in some parts nine or ten miles across. The soil is fertile, and watered by a number of rivulets, which wind their way along the deep water- courses that intersect its surface, and empty themselves into the sea. Though capable of a high state of improvement, a very small portion of it is enclosed or under any kind of culture, and in travelling across it, scarce a habitation is to be seen. (Ellis 1963:7)

In 1831, a botanist name F.J.F Meyen visited the Pearl Harbor area and provided the following report:

> At the mouth of the Pearl River the ground has such a slight elevation, that at high tide the ocean encroaches far into the river, helping to form small lakes which are so deep, that the long boats from the ocean can penetrate far upstream. All around these water basins the land is extraordinarily low but also exceedingly fertile and nowhere else on the whole island of Oahu are such large and continuous stretches of land cultivated. The taro fields, the banana plantations, the plantations of sugar cane are immeasurable. (Meyen 1981:63)

Mid-Nineteenth Century and the Māhele

Māhele Land Tenure and Ownership

The change in the traditional land tenure system in Hawaiʻi began in 1845 with the introduction of The Organic Act. The Organic Act of 1845 and 1846 essentially initiated what is known as the Māhele system, or the division of Hawaiian lands. This new system introduced the concept of private property in the Hawaiian society, and required Hawaiians, commoners and royalty alike, to submit claim to their lands.

In 1848, the crown (Hawaiian government) and the Aliʻi (Royalty) received their land titles, which are known as the Crown Lands. In 1850 a second Māhele was conducted, this time allowing commoners, and others who could prove residency, to put claim to their land. Those with successful claims were awarded with land known as *kuleana* parcels. Though many Hawaiians did not submit or follow through on claims for their lands, the distribution and descriptions of Land Commission Awards (LCAs) can provide significant insight to the patterns of land use, residence, environment, and activities in the project area. A total of 54 LCAs were granted to a total of 38 people within the Kalauao *ahupuaʻa* (Figure 14) (Table 2).

Two other land commission awards worth noting are LCA No. 5888 and LCA No. 9402. LCA No. 5888 borders the north edge of the Paʻaiau Fishpond project area, and LCA No. 5888 borders the project area to the east (Figure 9). LCA No. 5888 was claimed by Kapua, who received .53 acres of land. The award included a *loʻi kalo* (taro patch) and a *pā hale* (house lot) (Figure 15). LCA No. 9402 was awarded to "Hikiau for Lino", which totaled 1.18 acres. The award included two parcels, a *pā hale*, and a *moʻo ʻāina* (Figure 16).

Table 2. Land Commission Awards within Kalauao Ahupua‘a, adapted from Hammatt et al. (2006)

LCA #	Awardee	Location	Area	# of ‘Apana
591	John Meek	Kalauao	1300 acres	1
2494	Julia Kekoa (Kekou)	Kaonohi	4.538	4
5365	Wm. Stevens	Paaiau	62.15 acres	1
5524	L. Konia	Kaonohi	1603 acres	1
5576	Kuawahie	Kaonohi	0.38 acres (incl LCA 9313)	3
5577	Kamakahiki	Kaonohi	1.12 acres (incl LCA 9354)	2
5581	Kalaimanuia	Kaonohi	0.58 acres	2
5583	Kauwaole	Kaonohi	1.332 acres (incl LCA 9303)	1
5651	Kaumiumi	Kaonohi	0.125 acres (with LCA 9382)	1
5669	Kupihea	Paaiau	0.62 acres (incl LCA 5839 & 9346)	2
5817	Kamoku	Kaonohi	0.99 acres	2
5839	Kupihea	Paaiau	0.62 acres (incl LCA 5669 & 9346)	2
5840	Kuohao	Kaonohi	1.32 acres (incl LCA 9308)	2
5844	Puleonui	Kaonohi	0.758 acres (incl LCA 9350)	1
5878	Kukiiahu	Paaiau	2.043 acres (incl LCA 9311 & 9342)	3
5888	Kapua	Paaiau	0.53 acres (incl LCA 9347)	2
5906	Pupue	Kaonohi	0.84 acres (incl LCA 9307)	2
5910	Piko	Kaonohi	1.07 acres (incl LCA 5934)	1
5934	Piko	Kaonohi	1.07 acres (incl LCA 5910)	1
6054	Walehau	Kaonohi	1.243 acres (incl LCA 9321)	1
6090	Makauwila for Kahela Luahalaikai	Kaonohi	0.523 acres (incl LCA 9355)	1
6104	Mahiai	Kaonohi	2.026	1
6156	Nua	Kaonohi	1.318	2
6156B (misreported as 6157B)	Mahoe	Kaonohi	2.23 acres	2
6156 E	Naue	Kaonohi	2.998	3
6158	Pao	Kauaopai	0.522 acres (incl LCA 9289 (misreported as 9239)	2
6184	Ino	Kaonohi	0.985 acres (incl LCA 9296)	2
7450 B	Kaiaka	Kauaopai	1.08 acres	1
8324	Kaleionehu	Alaeanui	-	1
9288	Kaina	Kaonohi	0.406	2
9289 (misreported as 9239)	Pao	Kauaopai	0.522 acres (incl LCA 6158)	2

9296	Ino	Kaonohi	0.985 acres (incl LCA 6184)	2
9297	Kanikela	Kaonohi	0.73 acres	1
9302	Aluli (Kukai, heir)	Kaonohi	0.63 acres	1
9303	Kauwaole	Kaonohi	1.332 acres (incl LCA 5583)	1
9307	Pupue	Kaonohi	0.84 acres (incl LCA 5906	2
9308	Kuohao	Kaonohi	1.32 acres (incl LCA 5840)	2
9311	Kukiiahu	Paaiau	2.043 acres (incl LCA 5878 & 9342)	3
9313	Kuawahie	Kaonohi	0.38 acres (incl LCA 5576)	3
9321	Walehau	Kaonohi	1.243 acres (incl LCA 6054)	1
9322	Ukuiwi	Kaonohi	0.604 acres	1
9342	Kukiiahu	Paaiau	2.043 acres (incl LCA 5878 & 9311)	3
9346	Kupihea	Paaiau	0.62 acres (incl LCA 5669 & 5839)	2
9347	Kapua	Paaiau	0.53 acres (incl LCA 5888)	2
9350	Puleonui	Kaonohi	0.758 acres (incl LCA 5844)	1
9353	Palau	Kaonohi	0.61 acres	2
9354	Kamakahiki	Kaonohi	1.12 acres (incl LCA 5577)	2
9355	Makauwila for Kahela Luahalaikai	Kaonohi	0.523 acres (incl LCA 6090)	1
9382	Kaumiumi	Kaonohi	0.125 acres (with LCA 5651)	1
9393	J. W. Opunui	Kauapololei & Paaiau	0.44 (incl LCA 9394)	1
9394	J. W. Opunui	Kauapololei & Paaiau	0.44 (incl LCA 9393)	1
9400	Hilo for Kaoio	Kaonohi & Manukuaha	1.545 acres	2
9402	Hikiau for Lino	Paaiau	1.18 acres	2
9404	Nowelo	Alaeanui	3.42 acres	

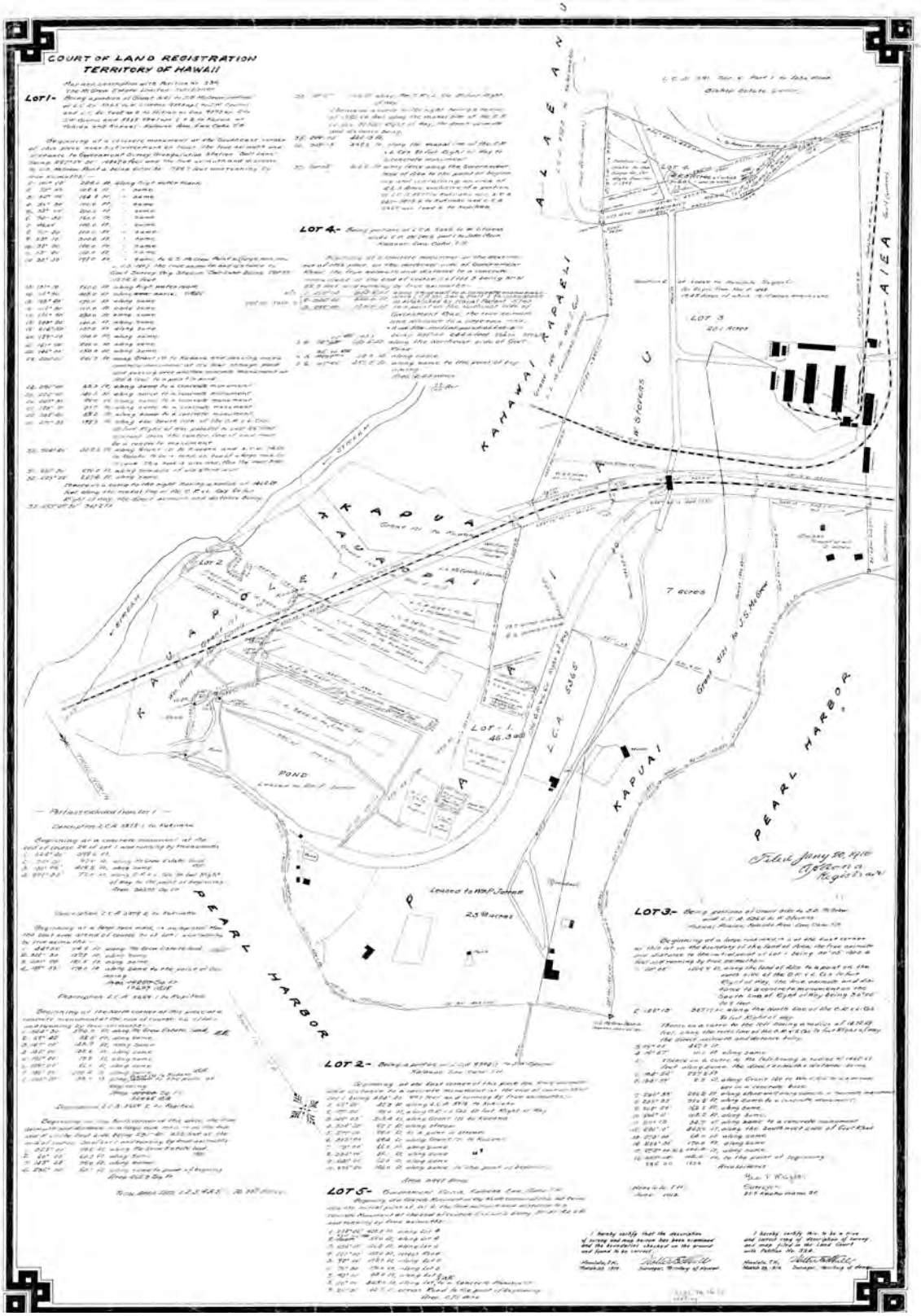


Figure 14. LCA awards in the Pa‘aiau ‘ili, note the location of LCA No. 5888 and 9402 to the project area.

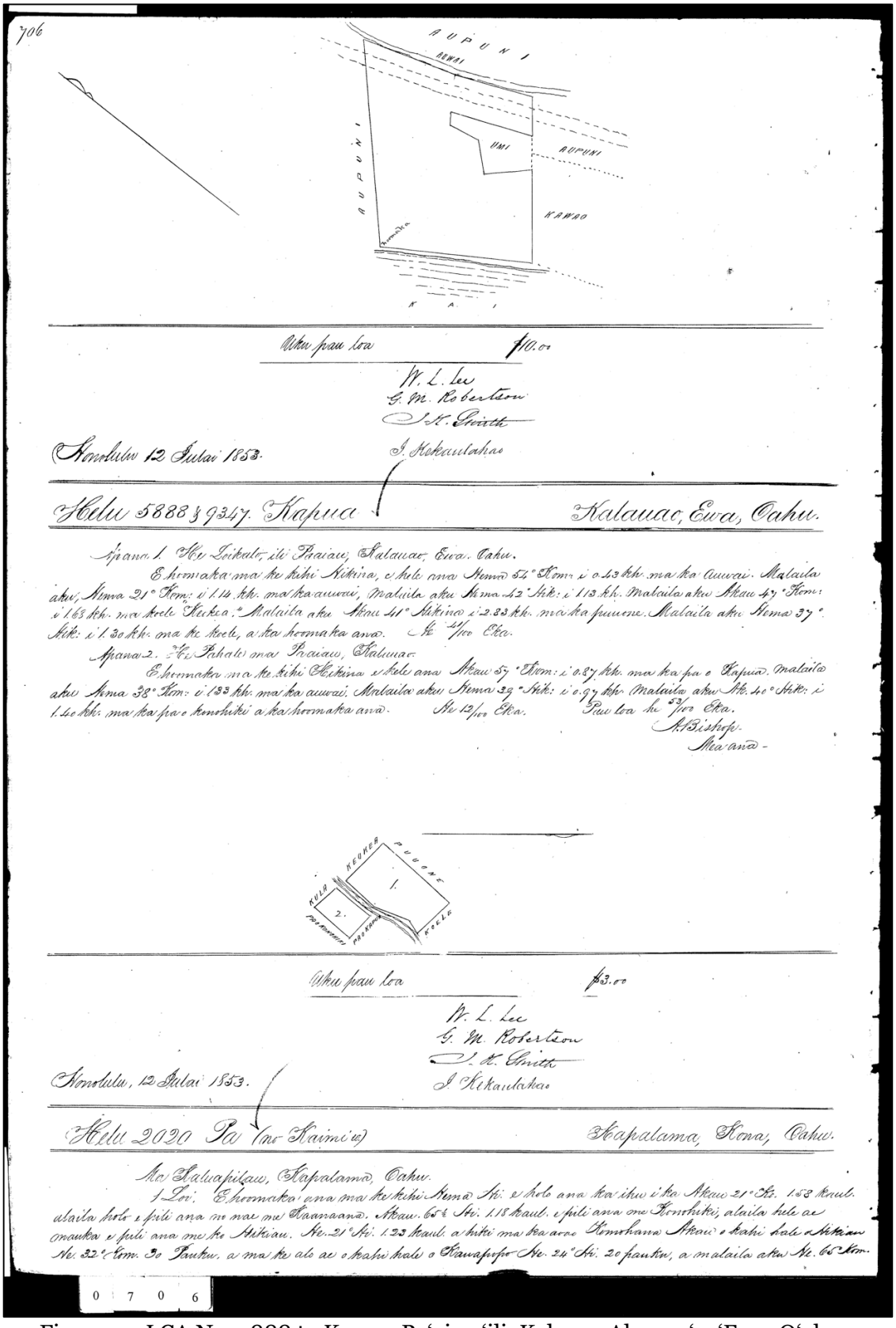


Figure 15. LCA No. 5888 to Kapua, Pa‘aiau ‘ili, Kalauao Ahupua‘a, ‘Ewa, O‘ahu.

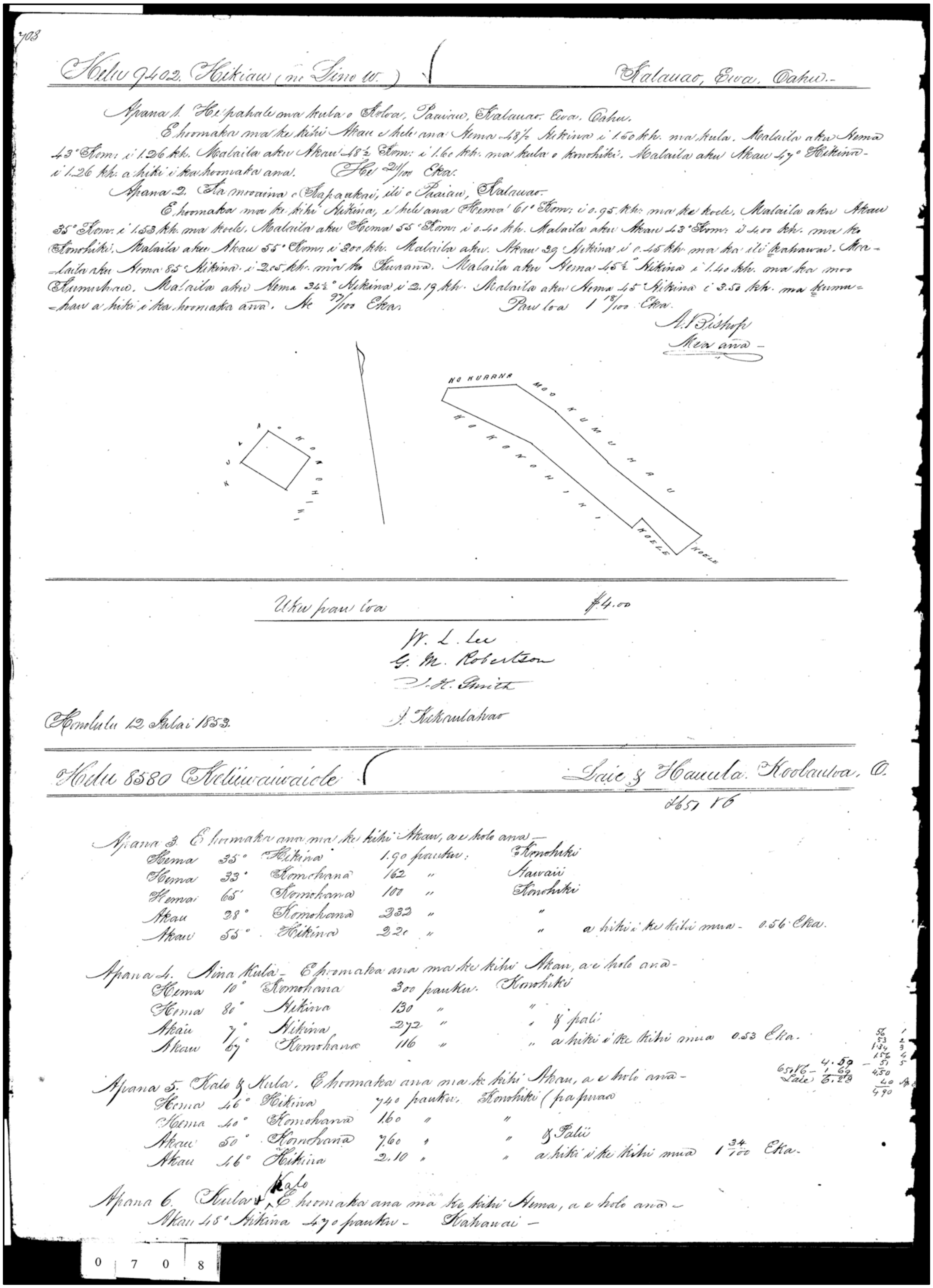


Figure 16. LCA No. 9402 was awarded to “Hikiau for Lino”, Paʻaiau ʻili, Kalauao Ahupuaʻa, ʻEwa, Oʻahu.

The presence of house lots and taro patches further illustrate the traditional use of Kalauao as an agricultural and residential area. Aside from the descriptions provided in the LCA claims, Kalauao was also described as a very cultivated area in the following account:

> The lowlands seaward of the highway and for a short distance inland, now mostly under cane with a few banana groves, were all formerly terraces irrigated from Kalauao stream. Kalauao Gulch was too narrow to have terraces inland. (Handy 1940:81)

An 1873 map by C. J Lyons further emphasizes the land use of the area (Figure 17 and Figure 18), as it depicts the cultivation of rice fields, banana trees, and mudflats in the Kalauao *ahupuaʻa*, further indicating a predominantly agricultural and aquacultural nature of the project area. The only other of the Kalauao *ahupuaʻa* in the nineteenth century is also done by Lyons in 1872 (Figure 19). This map identifies features along the *ahupuaʻa* coastline (i.e., *Kuapā, nuku muliwai, etc.*).

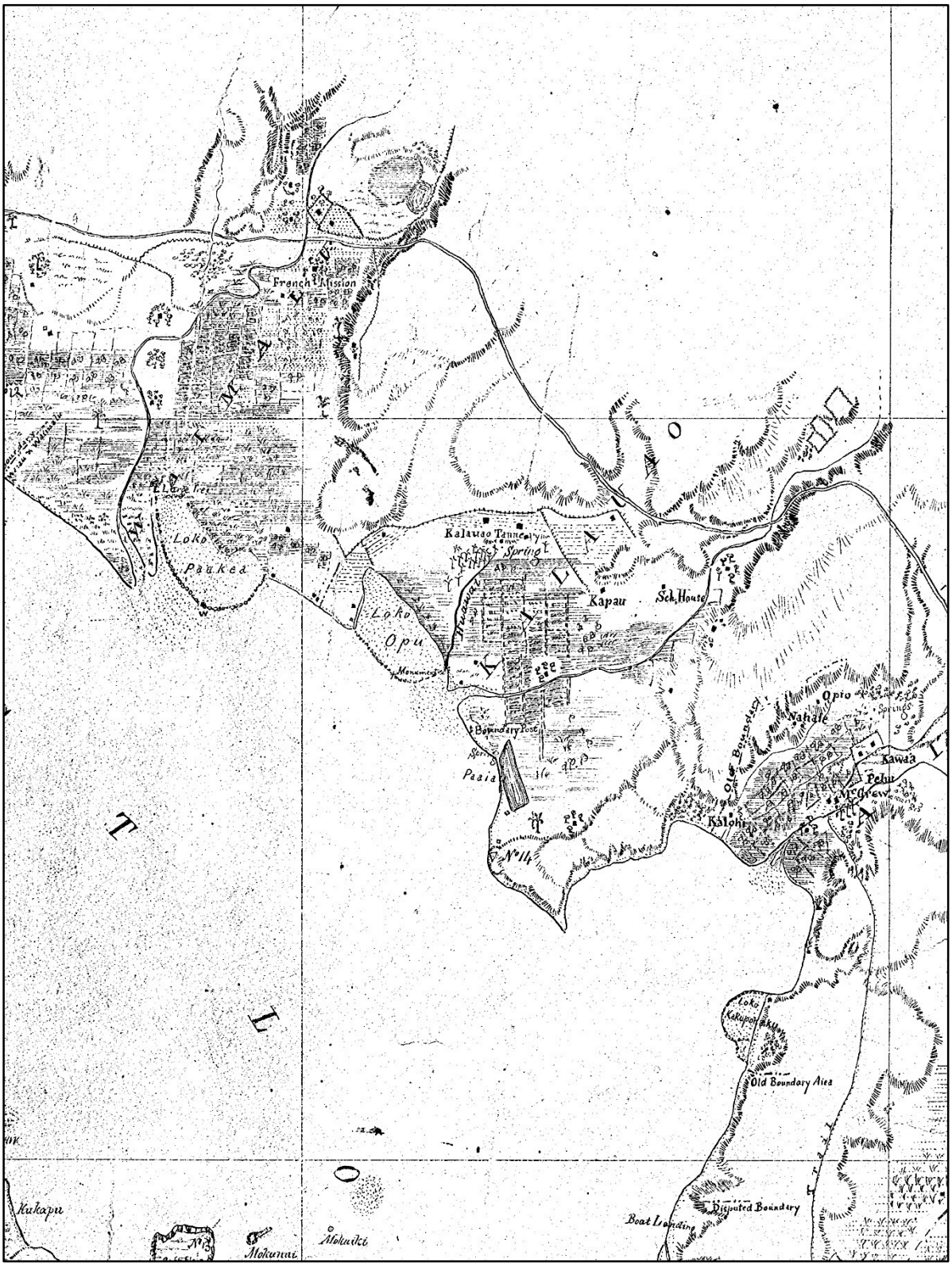


Figure 17. 1873 map of Pearl Lochs and Puʻuloa Entrance, Ewa, Oʻahu by C.J. Lyons, note the agricultural and aquaculture (i.e., fishponds) activity around the project area.

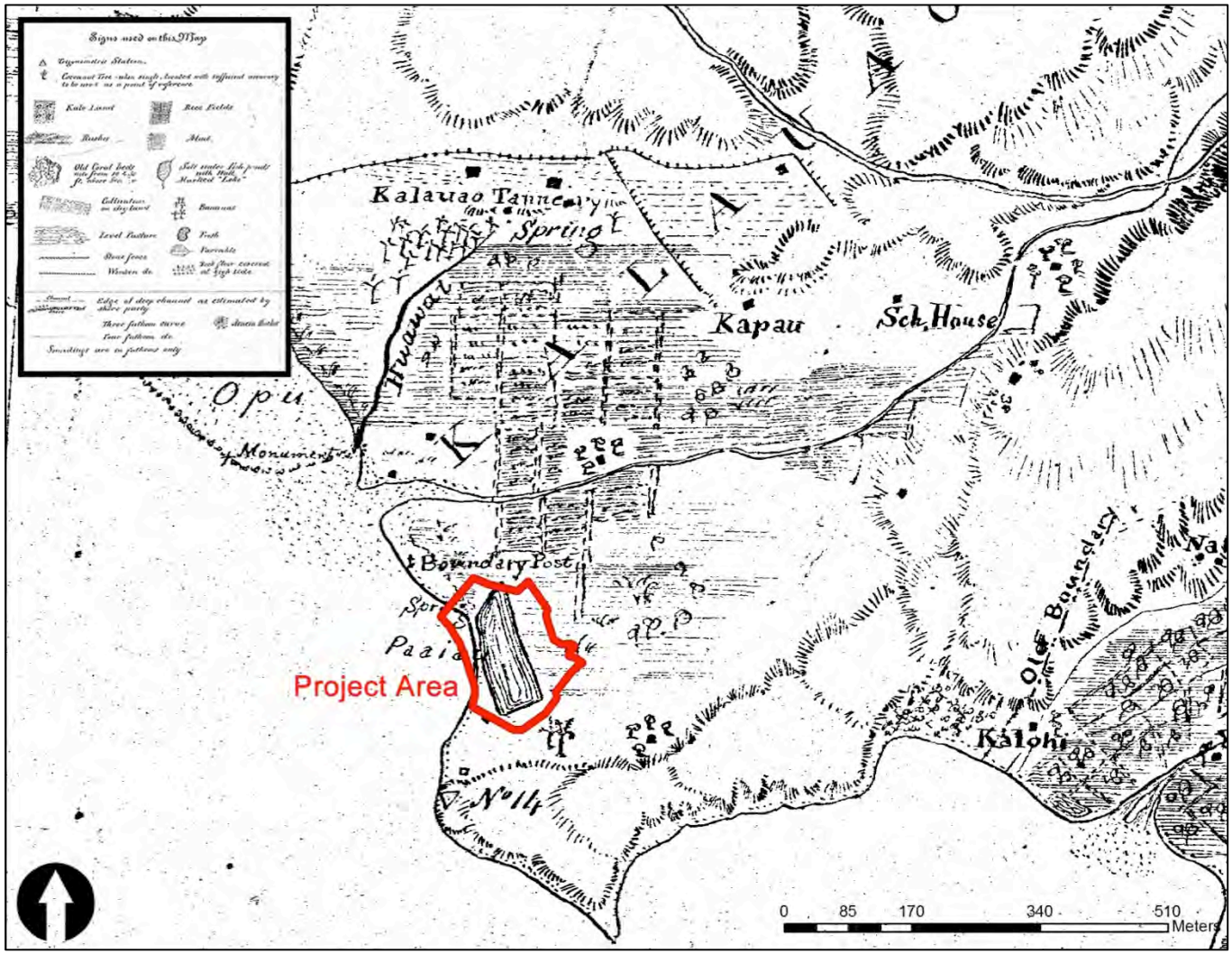


Figure 18. Close-up of the Lyons 1873 map of Pearl Lochs and Pu‘uloa Entrance, Ewa, O‘ahu showing the wide range of resources in the vicinity of Pa‘aiau Fishpond.

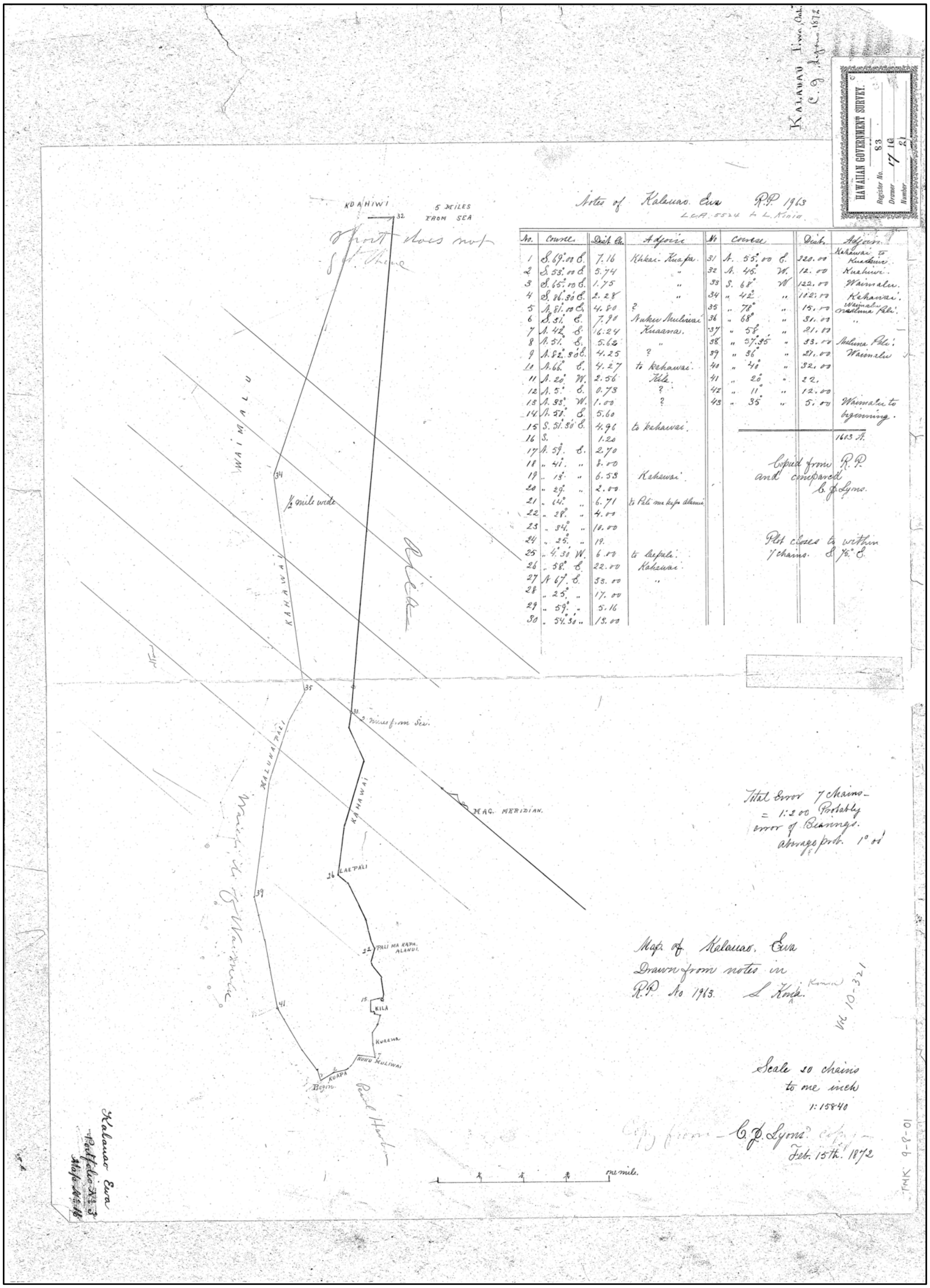


Figure 19. 1872 Lyons map of Kalauao, ʻEwa, Oahu showing the awarded LCA claims, as well as the different features along the Kalauao coastline.

Pearl Harbor as a Naval Base

In 1873, the shores of Pearl Harbor were recommended to the U.S. Secretary of War, as a potential naval base for the U.S. Navy. The recommendation was privately submitted in a report, made by General Schofield. Schofield wrote:

> In case it should become the policy of the Government of the United States to obtain the possession of this harbor for naval purposes, jurisdiction over all the waters of Pearl River with the adjacent shores to the distance of 4 miles from any anchorage should be ceded to the United States by the Hawaiian Government [...]
>
> The cession of Pearl River could probably be obtained by the United States in consideration of the repeal of the duty of Sandwich Island sugar. Indeed, the sugar–planters are so anxious for a reciprocity treaty, or so anxious rather for free trade in sugar with the United States, that many of them openly proclaim themselves in favor of annexation of these islands of the United States. [Sen. Ex. Docs, 52nd Cong. 2nd Sess. No. 77, pp. 150-154, reproduced in Judd 1971:Appendix 3]

In 1889, the Oahu Railway and Land Company (O.R. & L.) developed a railway connecting the city of Honolulu to the outlying areas of O‘ahu (Kuykendall 1967). During the first year operation, the railway extended from the Honolulu Harbor area to ‘Aiea, and by the 1890’s the rail extended from Honolulu to Pearl City. (Kuykendall 1967:100). An 1897 map of the “PEARL RIVER AND LOCHS” illustrates the presence of the railway extending throughout Pearl Harbor lands, passing near the current project area (Figure 20).

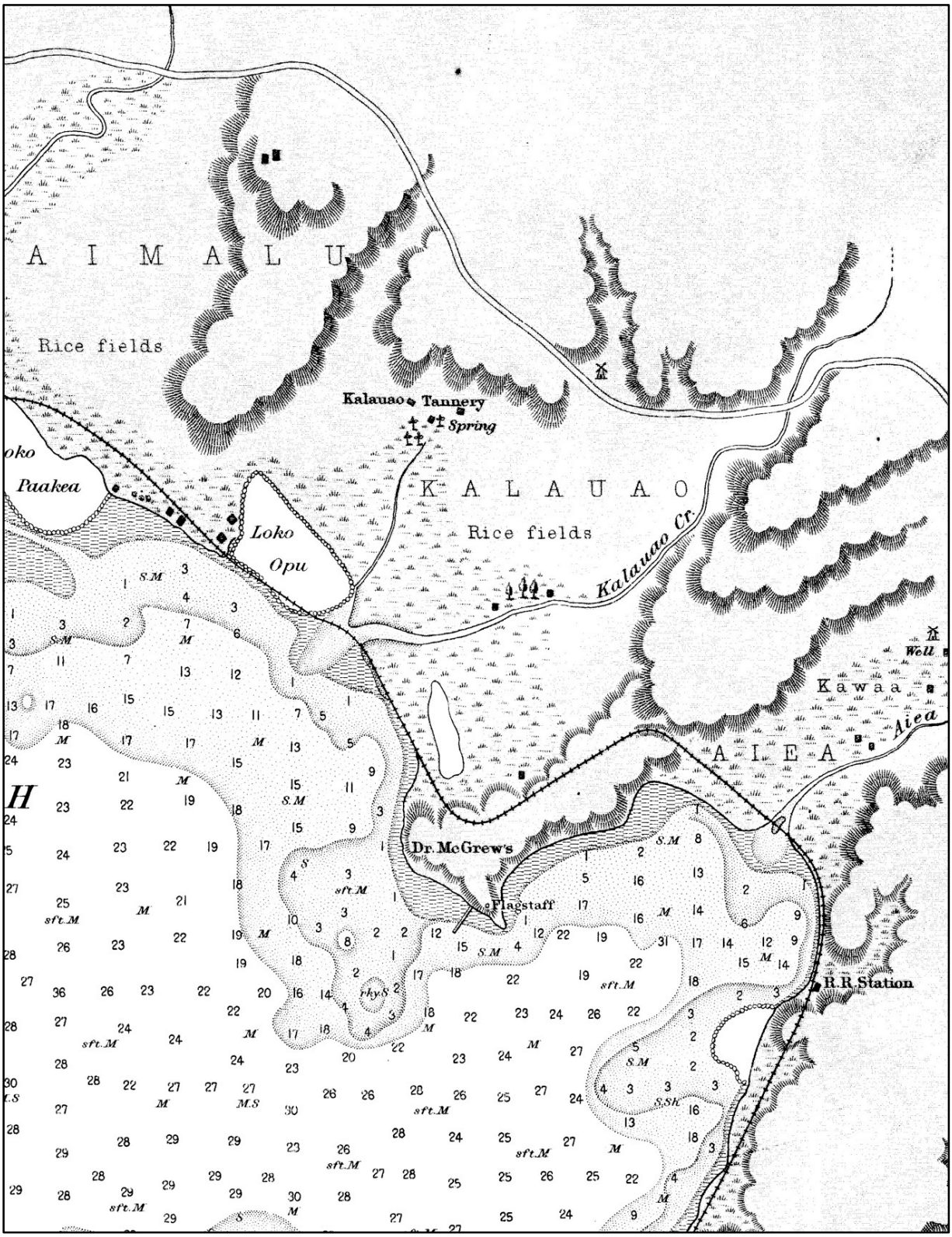


Figure 20. 1897 map of the Pearl River and Lochs, note the cultivation of rice fields near the project area as well as the development of the O.R.&L. railway.

1900- Mid-1900s

After the 1901 Annexation of Hawai‘i, Pearl Harbor fell under the jurisdiction of the U.S. Government, and it continues to be occupied by the U.S. Military today. A 1920 aerial photograph (Figure 21), and an 1927 U.S. Geological Survey map illustrate the changes of the Kalauao ahupua‘a, from an agricultural nature to a more developed nature with roads and houses (Figure 22). By the 1920's it is said that the O.R. & L. railway was used to transport defense materials from Pearl Harbor to the rest of the island (Chiddix and Simpson 2004).

In December 1941, Pearl Harbor was attacked by the Japanese military (Figure 23), marking the beginning of World War II (Spalding 1945). After the war in 1945, the O.R. & L. railway ended, and so did its transportation of military defense materials:

> She had served her country well and proudly during the war, but operating round-the-clock on what little maintenance could be squeezed in, had taken a prodigious hot on the locomotives and track. Traffic stayed for a short time, but soon dropped precipitously as soldiers and sailors went home, military posts were shrunk or razed, and civilians could again get tires, gasoline and new cars. (Chiddix and Simpson 2004: 257)

By 1954, a great amount of development occurred in the project area. The development of the naval station at McGrew Point is a major addition to the once agricultural predominant landscape (Figure 24). In addition to the naval station new roads and buildings, including a hospital, were constructed in the Kalauao *ahupua‘a*.

Modern Land Use and Project area Condition

Today, the vicinity of the current project has varied uses including military housing (Figure 25 and Figure 26), recreational parks, as well as other support facilities for the U.S. Navy. The current status of the Pa‘aiau fishpond is provided below:

> Pa‘aiau has been rated by a Statewide survey as a type II B pond, meaning the wall is in fair to poor condition, or submerged. The pond is heavily silted and vegetation mainly (mangroves) covers and encroaches nearly all of the wall. (State Aquaculture Development Program 1999:6)

The following excerpts are from the field notes of a condition assessment of the fishpond conducted in 1999:

> Water murky both outside and in the interior of the pond. Did not observe any fish inside the pond. Most of the interior par of the pond was irregular and lined with dense mangroves. Pond size looked roughly 80 ft. to 100 ft. by 200ft. The break in the wall was approximately 25 ft. to 30 ft. wide and water was freely exchanged with interior. The break where the wall was previously located was littered with large boulders, probably remnants of the wall. Interior of the pond appeared deep at least 3 to 4 ft. in water depth, though no one checked this out.
>
> The construction of the pond appeared to be classic two-wall design (inside and outside walls of large boulders) with the center or core made up of many, many smaller (1" to 3") stones and coral rubble, so called *ili ili* stones. The wall was overgrown with mangrove and various vegetation and weeds and had a layer of silt and rubble on it. The wall was perhaps 8 ft. across. Though it was very difficult to tell because it was largely covered

over by plants and coral rubble and sand. One relatively modern *makaha* was observed, i.e., cement construction.

The harbor-facing wall was approximately 300 to 400 ft. long. Including the part on the other side of the break that we did not explore. We did not explore the portion of the pond closest to Kam Highway which was very overgrown. The exterior (harbor facing) had little in the way of mangroves extending in front of it and much of it was simply sedimented in and/or covered with vines. This part of the wall, with tightly stacked stones, could be exposed by simply lifting the vines. The interior wall that we explored had 10 ft. to 30 ft. of mangrove extending into the pond. (State Aquaculture Development Program 1999:6-7)

Figure 21. 1920 aerial photograph of Pearl Harbor, note the project area in the middle distance, and Diamond Head at the far left (Bishop Museum Archives).

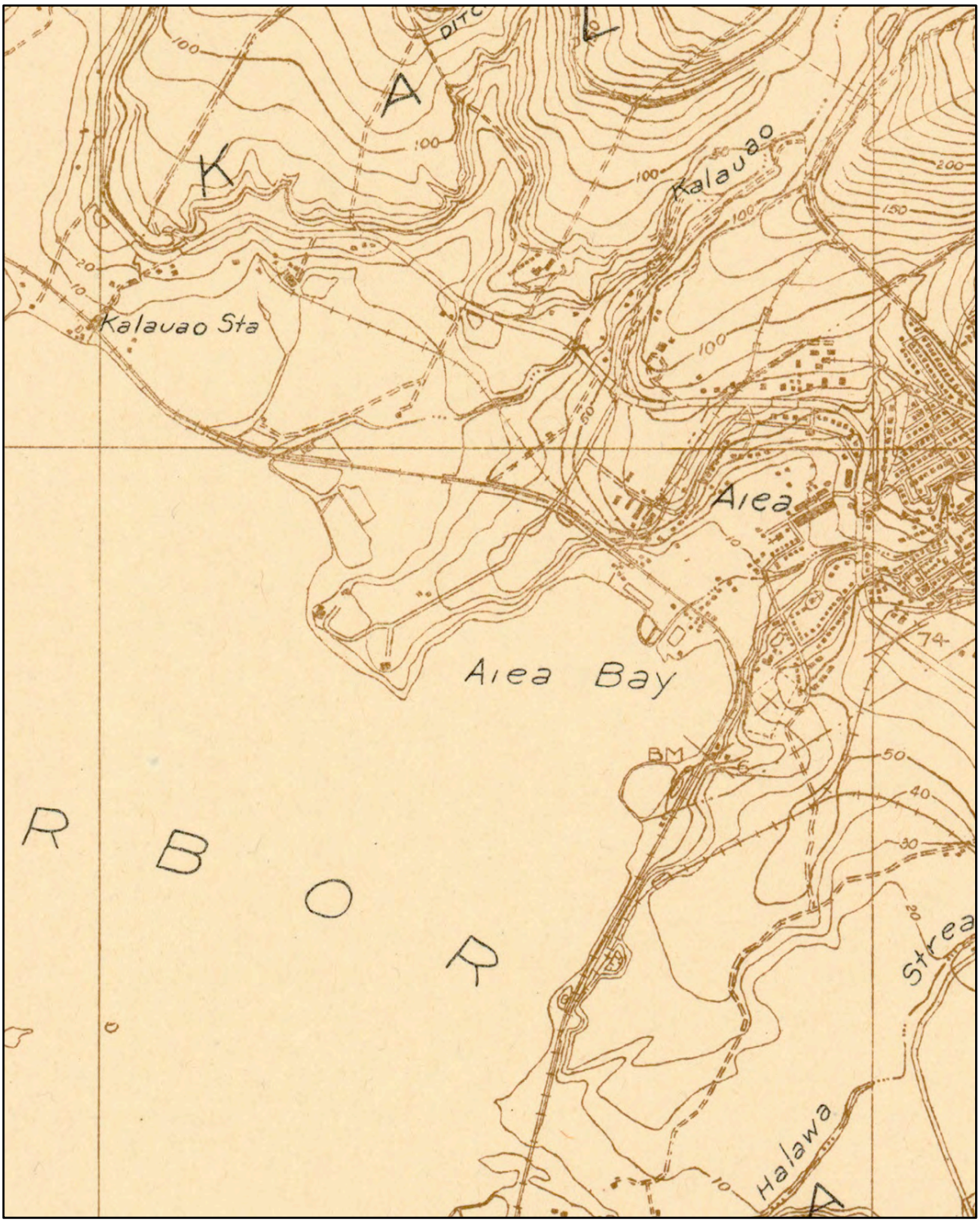


Figure 22. 1927 USGS Waipahu topographic map showing project area, note the development of roads and buildings southeast of the project area.

Figure 23. 1941 photograph of the attack on Pearl Harbor, note the project area near McGrew point (Bishop Museum Archives).

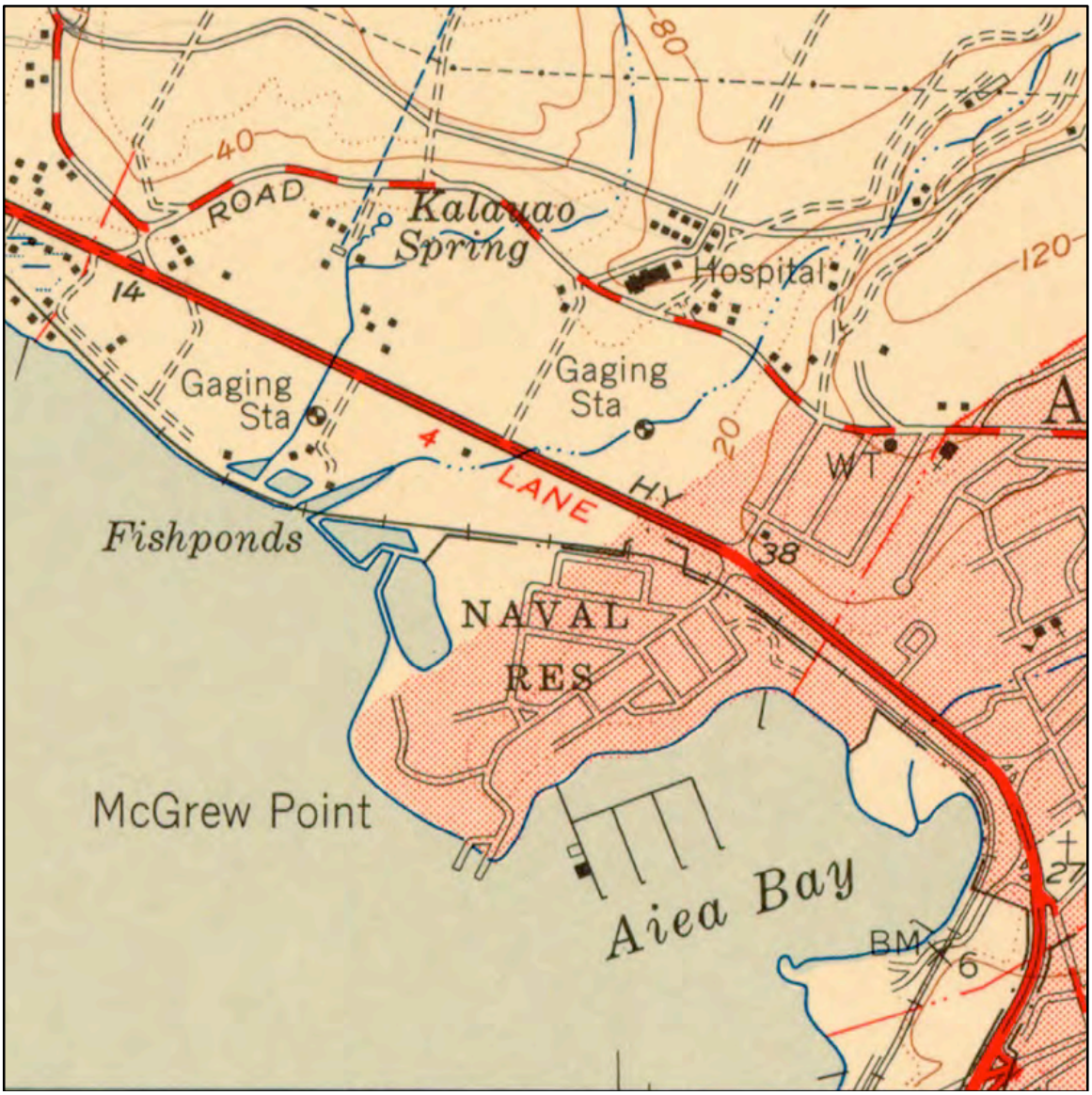


Figure 24. 1954 USGS Waipahu Quad topographic map showing map, note the development of the Naval Reserve near the project area.

Figure 25. 1959 aerial photograph of McGrew point, showing the Paʻaiau fishpond, note the development of the military housing near the project area.

Figure 26. An 1974 photograph of Paʻaiau Fishpond adapted from Apple and Kikuchi (1977:127), note the recreational park in the background of the photograph.

Previous Archaeological Research

Previous archaeological research within the vicinity of the project area is very limited. The earliest island-wide archaeological endeavors was conducted in 1930 by J. Gilbert McAllister (1933). During his survey of the Kalauao *ahupuaʻa*, McAllister identified and documented three sites within the vicinity of the project area (sites 108, 109 & 110) and provided the following summary:

> **Site 108 Loko Paaiau, fishpond at Kalauao.**
>
> Rectangular in shape, roughly 190 by 600 feet, surrounded by land on three sides. The wall on the harbor side is three to four feet wide, two feet high with one mākāhā. The three sides toward the land have been evenly faced with waterworn basalt to a height of about two feet. The pond was evidently fed by the water from the surrounding taro patches. Tradition credits its construction to Kalaimanuia.
>
> **Site 109. Loko Opu, fishpond at Kalauuao.**
>
> Has not been completely filled in. It was 10.5 acres in size and apparently completely surrounded by a wall 2700 feet in extent. It was built by Kalaimanuia.
>
> **Site 110 Kukiiahu, Kalauao.**
>
> Here Kalaimanuia, chiefess of Oʻahu, lived most of the time. Until recently the foundations of her houses were pointed out, according to Kaohe. She is said to have built the fishponds of Kapaakea (Site 111), Opu (Site 109), and Paaiau (Site 108). This is also the land upon which occurred the battle of Kukiʻiahu, in which Kalanikūpule assisted by a "force of armed seamen from the English vessels Jackal and Prince Leboo under the command of Captain Brown," defeated his uncle Kaʻeo, who was proceeding to Kauaʻi with a large force, but turned upon Kalanikūpule in order to divert the energy of his warriors, which was centered upon mutiny.

In 2000, the International Archaeological Research Institute, Inc. (IARII) conducted archaeological studies on the fishponds of Pearl Harbor. The following provides the results of this study:

> Loko Paaiau is a small fishpond located on the west side of McGrew Point at the northeast end of East Loch. This pond is one of the few in the Pearl Harbor area that is not covered by fill. There is about I m of standing water in the pond. The outer pond wall, except for its northeast section, appears mostly intact although overgrown with mangroves.
>
> Because of standing water, coring required use of an inflatable boat platform (Photo 8). This was firmly anchored with lines to the shore and to a pole next to the platform that was firmly implanted in the pond sediment. Two partial cores (Cores 1 and 2) were recovered, along with a full core (Core 3). The latter amounted to an almost 20 m long column of sediment. Cores 1 and 2 penetrated to maximum depths of 453 and 200 cm below the surface, respectively. All cores were placed within 1 to 2 m of each other. Use of a bucket auger was not necessary as there was no fill. Sediment sequences of Cores 1 and 3 are described in Tables 16 and 17, and the profiles of both cores are presented in Figure 9. The profiles

indicate the probable correlations of the sedimentary units in the upper part of the core.

Only Layer II in Core 3, a gleyed silty clay loam, appears to resemble a fishpond layer. Unfortunately, this layer was absent in Core 1. In Core 3, Layer II is 11 cm thick and extends to a depth of only 31 cm below the top of the sediment column. Unlike most other fishpond sediment, Layer II had a much lower than expected ol3c value for its sediment (Table 19). This implies that Layer II may not actually be a fishpond sediment (none of the other 15 radiocarbon determinations on sediment from Loko Paaiau have high ol3c values). Since Loko Paaiau is definitely a fishpond, this result was unexpected. Obviously something is wrong.

Probably the simplest explanation is that fishpond sediments for one reason or another were not preserved at the coring location. Other locations, therefore, should be tested at Loko Paaiau for the presence of fishpond sediments. Another possibility is that Layer II is indeed properly identified as a fishpond layer, but that its o 13c value was strongly influenced by the influx of freshwater and terrestrial organics into the pond, thereby preventing or masking the algal blooms associated with high o 13c values. at Loko Paaiau, and that other locations should be tested in an effort to find such sediments. This, in fact, is probably the more likely scenario, especially since Layer II both looks like a fishpond sediment and occurs at the right depth and during the expected chronological period (see dating discussion below).

The remainder of the Loko Paaiau sequence consists of lagoonal sediments, which alternate between predominantly terrestrial materials (especially basaltic sands), presumably discharged from Kalauao Stream, and marine or mixed marine and terrestrial materials. Layer XXVIII at the base of the core appears to be "ancient alluvium," probably deposited during the low sea stand of the Pleistocene.

Five radiocarbon determinations were made on samples from Core l of Loko Paaiau, and 15 radiocarbon determinations were made on samples from Core 3. The dates are illustrated on the Figure 9 profile, and Tables 18 and 19 list details concerning provenience, sample material, dating results, and calibrations. A graph of the Core 3 calibrated (1 sigma) radiocarbon determinations is provided in Figure 10. (2000:31-33)

Besides the more general archaeological studies conducted by McAllister (1993) and Athens et al. (2000), research indicates only two other archaeological studies were undertaken near the vicinity of the project area (Table 3).

In 1981, the Division of State Parks conducted an archaeological reconnaissance survey at Rainbow Bay State Park. No historic properties were observed during the survey, however the study did indicate presence of subsurface cultural deposits associated with aquaculture (i.e., fishponds) (Yent and Ota 1981).

In 1986, the Bishop Museum conducted an archaeological surface survey for the Pearl Promenade Project, located near the Pearlridge shopping center. During the survey, one historic property was identified (SIHP #50-80-12-9714), the O.R. & L. Railroad right of way. The surface survey also indicated that the area was filled-in, a common result of historic and modern development (Sinoto 1986).

Table 3. Archaeological Studies Located Near or Within the Current Project Area

Source	Nature of Study	Location	Findings
Yent and Ota 1981	Reconnaissance Survey	Proposed Rainbow Bay State Park	No historic properties identified
Sinoto 1986	Archaeological Surface Survey	Pearl Promenade, Aiea	SIHP #50-80-12-9714, the O.R. & L. Railroad right of way

Results of Archaeological Fieldwork

Description of Monitored Area

Loko Paʻaiau consists of approximately 6.34-acres located in the traditional Hawaiian land division of Kalauao *ahupuaʻa*, on the south (*makai*) side of Kamehameha Highway, approximately 0.10 miles southeast of the Kalauao stream, and approximately 0.17 miles west of ʻAiea Bay. Paʻaiau is interpreted as a *loko kuapā* where the east end of the pond is surrounded by land and the west end of the pond opens to the ocean.

Previously Recorded Feature Descriptions

McAllister's (1933) survey done at Paʻaiau identified a rectangular shaped fishpond that was surround by land on three sides, and measured roughly 190 ft. x 600 ft., or 2.62 acres. McAllister further noted that the west fishpond wall (near the harbor) measured three to four feet wide with one *mākāhā*.

Results of Current Monitoring Project

The interior of Loko Paʻaiau was completely overgrown with dense mangrove and other invasive vegetation. The entire interior of the pond, with the exception of a small delta, was also filled with very thick silt. The opening of the delta measured about 10-15 feet wide, and extended about 126 meters long from the northwest end of the pond to the south central end of the pond, encompassing approximately 0.50 acres (Figure 27).

Figure 27. Entrance of the delta. Photo taken to the southwest.

Pono Pacific vegetation removal crewmembers began clearing at the southwest end of the fishpond in October 2014 (Figure 28). Crewmembers cleared the area manually using handsaws, chainsaws, and trimmers. Crewmembers worked very carefully in this area, as advised by the archaeological monitors, to prevent any potential impact to the west pond wall identified by McAllister in 1933 (Figure 29).

Figure 28. Pono Pacific crewmember clearing the south west end of the pond. Photo taken to the north.

As noted by McAllister (1933), the west pond wall measured three to four feet wide, and two feet tall. However, after crewmembers cleared the southwest end of the pond no walls, as described by McAllister, were identified. Instead, a large silt berm was discovered running north-south along the west end of the pond. The silt berm measured about three to four feet wide, and may have possibly covered the wall described by McAllister (Figure 30).

Figure 29. Crewmembers carefully clearing the vegetation in the presumed area of the west fishpond wall. Photo taken to the northwest.

Figure 30. Southwest end of the fishpond after clearing, note the presence of a silt berm in the foreground of the photograph. Photo taken to the north.

By the end November, vegetation removal continued into the southeast end of the pond (Figure 31). No archaeological features were found in this area, however the top of a broken *pōhaku kuʻi ʻai*, or poi pounder, was recovered (Artifact 1) (Figure 32). Crewmembers completed vegetation work in the southeast end of the pond by February 2015, and started clearing the north end of the pond during the same month (Figure 33).

Clearing in the north end of the pond terminated in April 2015 (Figure 34 through Figure 36).

Figure 31. Crewmembers clearing vegetation in the southeast area of the fishpond. Photo taken to the southwest.

Figure 32. Photograph of Artifact 1, the pōheoheo of a broken poi pounder.

Figure 33. Southeast area of the fishpond after clearing, note the presence of the delta in the center of the photograph. Photo taken to the southwest.

Figure 34. Northeast area of the fishpond before vegetation clearing. Photo taken to the south.

Figure 35. Northwest area of the fishpond after vegetation clearing during low tide. Photo taken to the southwest.

Figure 36. Northwest area of the fishpond after vegetation clearing, during high tide. Photo taken to the southwest.

A total of 4.95 acres of vegetation were cleared during this project, exposing seven features along the west end of the fishpond, including the presumed *mākāhā* that was identified in 1933 by McAllister (Feature A). All features were related to aquaculture practices, and were documented in their current state at low tide. A brief summary, along with a plan view image and a photograph for each feature is provided below. In addition, GPS points of existing walls, features, and artifacts identified during archaeological monitoring were recorded and are presented in Table 4, Table 5, Figure 37, and Figure 38.

Aside from the identified features, there were no other visible man-made indications of a fishpond outline. Instead there was a natural silt berm found along the interior of the west fishpond wall, as well as the interior of the northwest portion of the fishpond. However, due to tide fluctuations and the lack of modified features to distinguish the boundaries of the berm, it was difficult for archaeological monitors to accurately plan view map the natural silt berm. The plan view map provided in this report illustrates the west portion of the silt berm as exposed during low tide, however it does not include the full extent of the silt berm boundary.

Table 4. Artifacts identified during Archaeological Monitoring at Paʻaiau Fishpond

Artifact No.	Artifact Type	Material	Measurements length x width x thickness	Description
1	*Pōhaku Kuʻi ʻAi*	Basalt	58mm x 50mm x 38mm	*Pōheoheo* (top knob) of a broken pound pounder. Found on the surface at the southeast end of the fishpond. Artifact was

				photographed and not collected

Table 5. Features associated with Loko Pa‘aiau and their Existing Condition

Feature Letter	Description	Existing Condition
A	Irregularly shaped cement *mākāhā* that measures 0.5 meters by 0.4 meters and is 0.5 meters tall	Fair
B	Alignment made up of mostly boulder sized basalts measuring 33.9 meters long and about 0.6 meters wide	Fair
C	Associated alignment to the south post of Feature A that measures 1.4 meters and about 0.5 meters wide	Fair
D	Associated alignment to the north post of Feature A that measures 1.9 meters and about 0.5 meters wide	Fair
E	*Mākāhā* located near the delta which enters the pond, made up of basalt and concrete. The centers of concrete are raised and measure about 4.2 meters by 2.1 meters. Between the two portions of *mākāhā* still visible are scattered basalt boulders	Fair
F	*Mākāhā* made up of both natural rock and cement. Like Feature E, it is carved out in two separate sections to make divets where the gate would be inserted. Two smaller concrete portions run parallel to this feature	Good
G	*Mākāhā* made up mostly of concrete (85%) with carved out divets. Feature G that measures1 meter by 1 meter and is oriented at a different angle in comparison to the other three *mākāhā* identified within the project area	Good

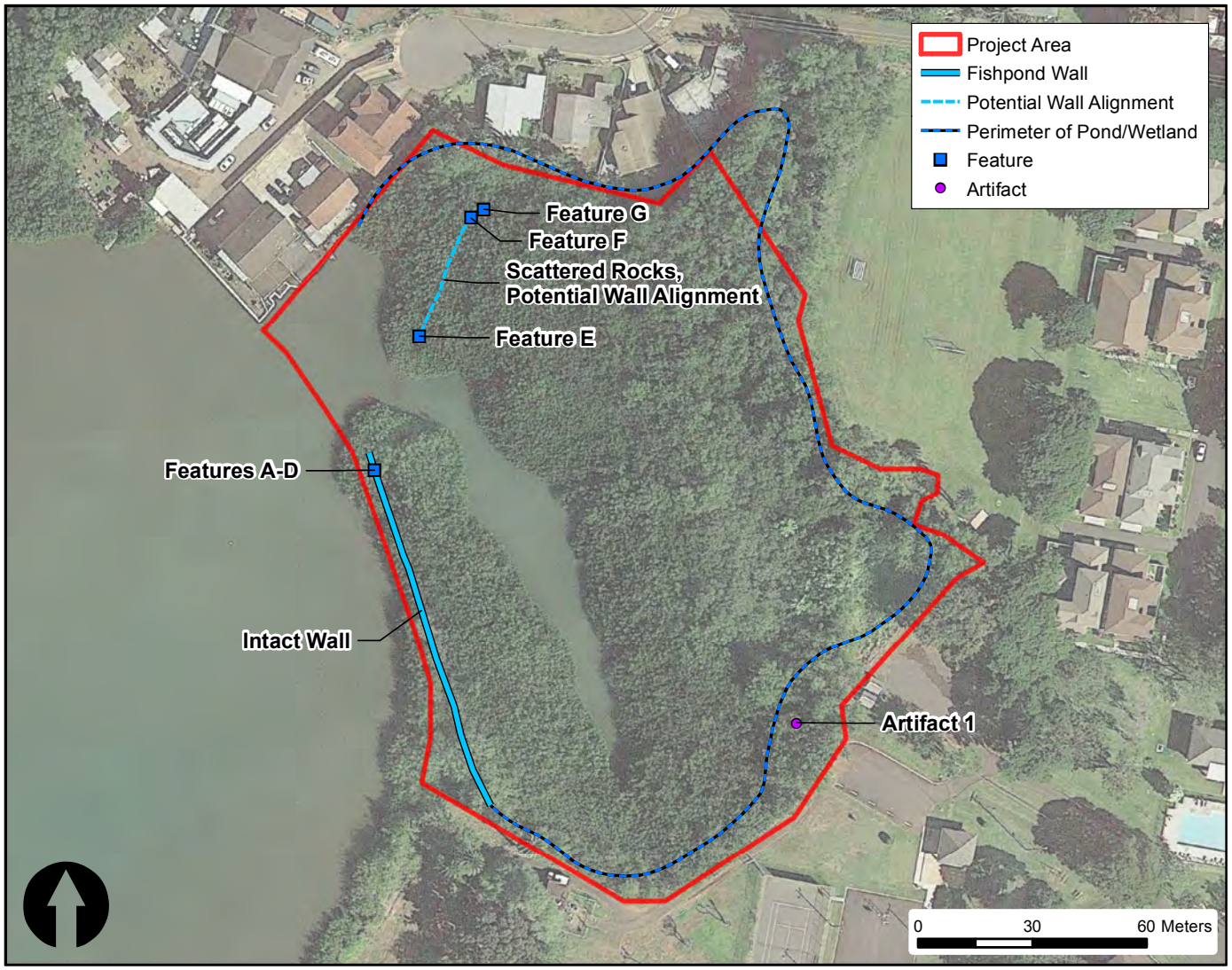


Figure 37. GPS locations of existing walls, features, and artifacts identified during archaeological monitoring at Loko Pa‘aiau.

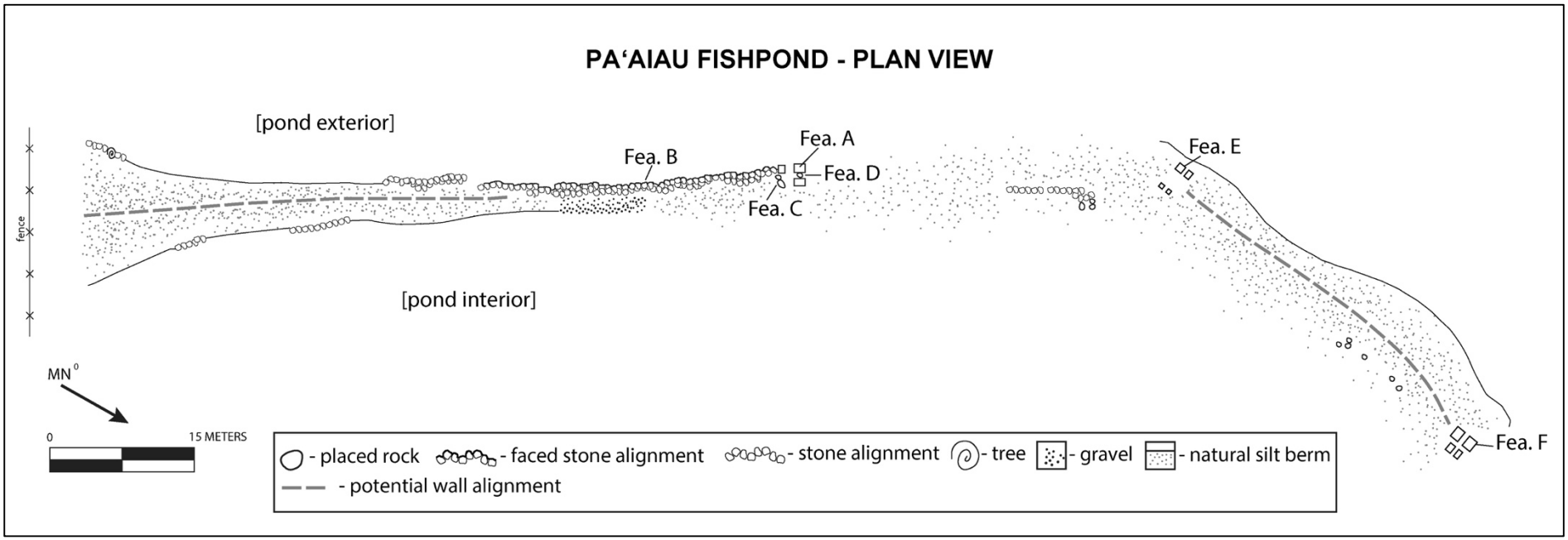


Figure 38. Plan view map of Loko Pa‘aiau.

Feature A is a square shaped mākāhā located at the southwest end of Paʻaiau Fishpond, on the seaward side of the silt berm. The mākāhā measures 0.5m (l) x 0.4m (w) x 0.5m (h), and has been reified by cement. Feature A, is interpreted to have controlled the entrance of fish into the fishpond from the west (Figure 39 through Figure 41).

Figure 39. Photograph of Features A, C, and D. Photo taken to the west.

Feature B was interpreted as a rock alignment abutting the southern edge of Feature A. The alignment extends about 33.9 meters south along the exterior of the southwest silt berm. The alignment itself is mostly made up of boulder-sized rocks and measures 0.5 meters in height and 0.6 meters in width (Figure 40 through Figure 42).

Figure 40. Profile of Feature B. Photo taken to the east.

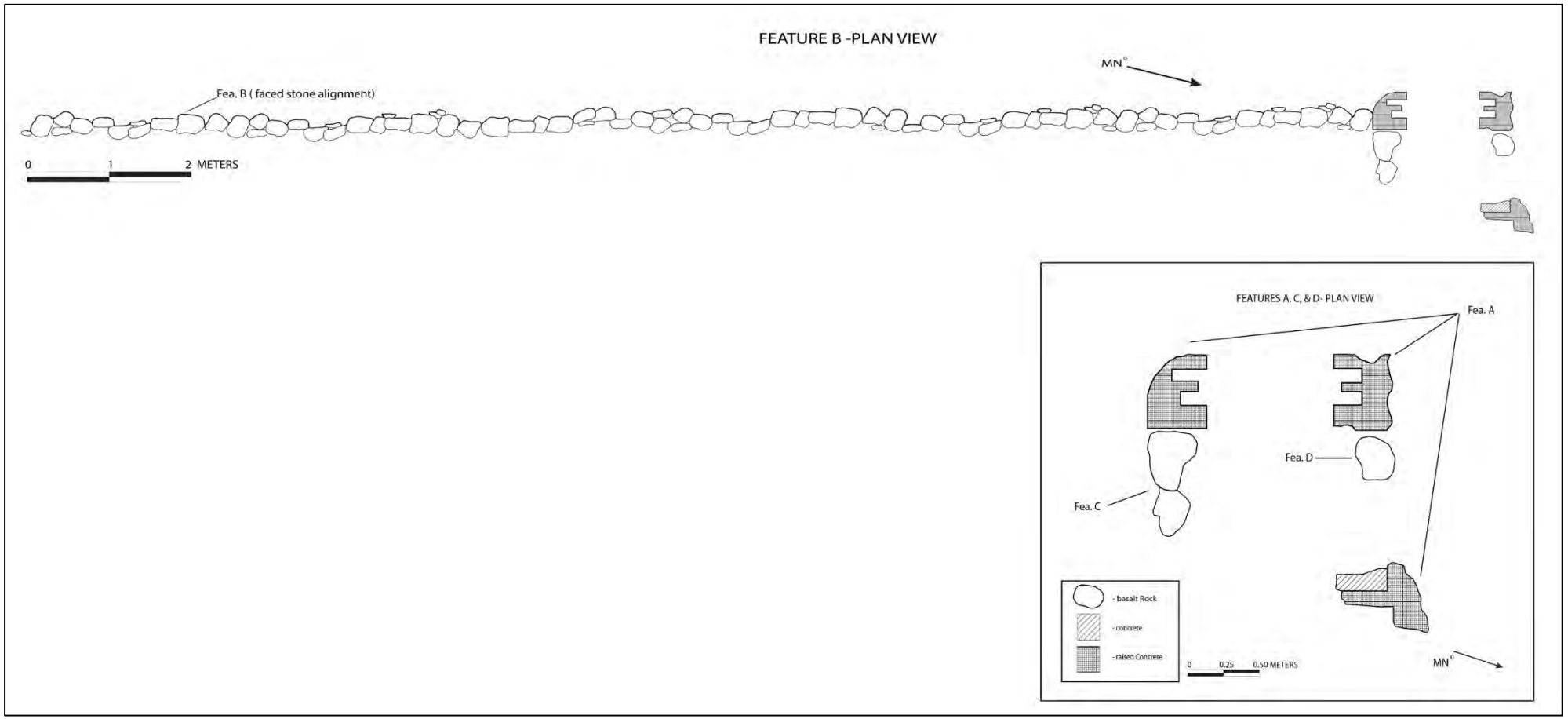


Figure 41. Plan view map of Features A-D.

Figure 42. Photograph of B, rock alignment. Photo taken to the northwest.

Feature C was also interpreted as a rock alignment extending from the southern edge of Feature A. However, it extended along its eastern side and is situated atop the southwest berm. This feature is about 1.4 meters in length and less than 0.5 meters in width. Only 0.5 meters of the alignment height is visible above the ground (Figure 39 and Figure 41).

Feature D is another alignment abutting Feature A. This alignment abuts the northern post of Feature A and extends along its eastern side. This alignment is also situated atop the southwest berm and runs 1.9 meters in length. Feature D is less than 0.5 meters in width and is only visible about 0.5 meters above the ground (Figure 39 and Figure 41).

Feature E is a *mākāhā* located on the northwest silt berm, about 1-2 meters north of the delta opening. Feature E consists of four pieces, which make up the corners of the *mākāhā*. The feature is oriented west to east and lines up with a submerged rock alignment located in the delta. At high tide, the *mākāhā* is barely visible. Furthermore, it appears as if the feature has been reified by cement, and the indentations from the sluice gate are still visible. The *mākāhā* measures about 4.2 meters in length by 2.1 meters in width, with a height of approximately 0.3 meters (Figure 43 through Figure 46).

Figure 43. Photograph of Feature E. Photo taken to the west.

Figure 44. Top half of Feature E. Photo taken to the south, note the entrance of the delta in the background.

Figure 45. Bottom half of Feature E.

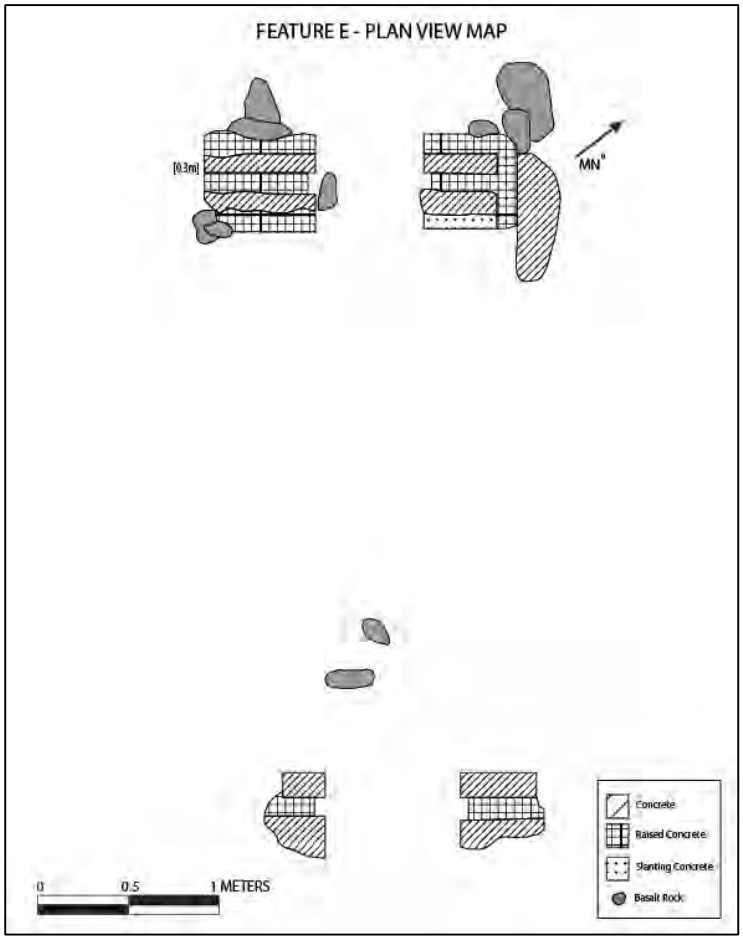


Figure 46. Plan View map of Feature E, *mākāhā*.

Feature F, is another *mākāhā* located atop the northwest silt berm. This feature is composed of natural stone and cement. Feature F differs from Feature E and G as the middle section of the remaining cement slabs are carved out rather than raised for a sluice gate to be inserted as they are in Feature G. Parallel to and just south of these cement slabs are two more "U" shaped cement slabs (Figure 47 and Figure 48).

Figure 47. Photograph of Feature F. Photo taken to the northwest.

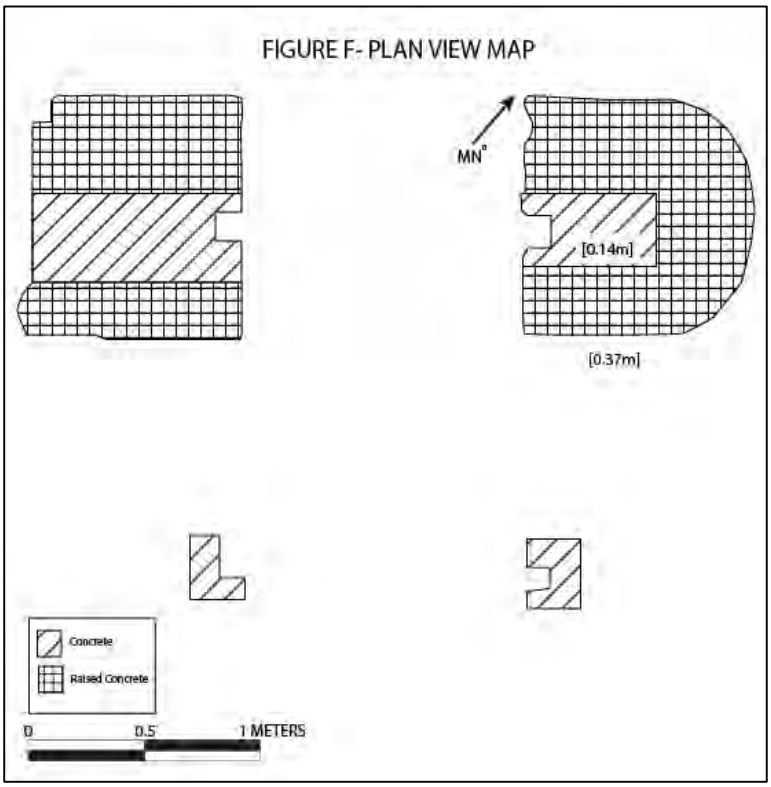


Figure 48. Plan View map of Figure F, *mākāhā*.

Feature G is another *mākāhā*. Though the *mākāhā* is composed of some basalt rocks, this feature is mostly made up of concrete. The indentation where the sluice gate was inserted is in excellent condition and each measure approximately 1 meter by 1 meter. The feature itself is oriented at a different angle from the rest of the fishpond *mākāhā* and is located within what is interpreted to be the interior of the fishpond (Figure 49 and Figure 50).

Figure 49. Photograph of Feature G. Photo taken to the north, notice feature is located within the pond interior.

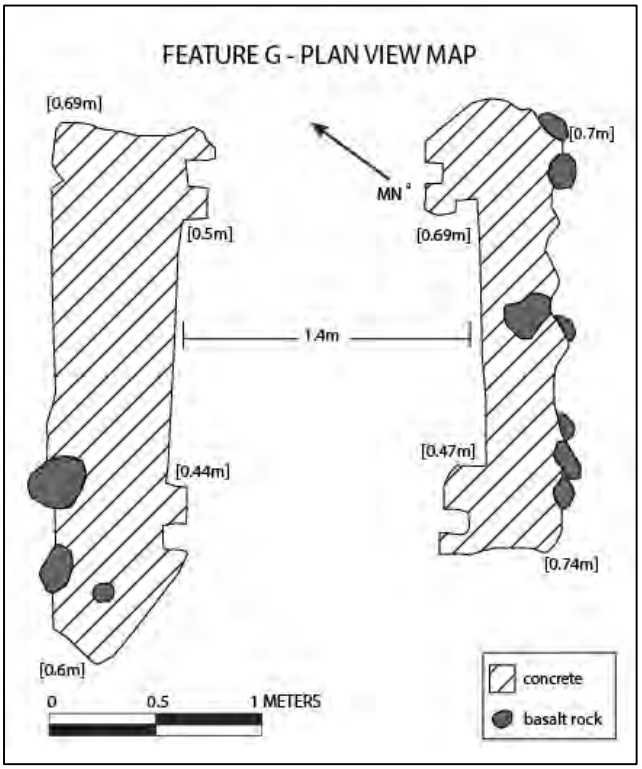


Figure 50. Plan View map of Feature G, *mākāhā*.

Summary and Interpretation

Pa‘aiau fishpond is considered to be a pre-western contact traditional Hawaiian *loko kuapā*. Its construction is credited to Kalaimanuia who was the *mōʻī*, or queen of O‘ahu following the reign of her mother Kukaniloko (Fornander and Stokes 1880). Although the fishpond was constructed during the early pre-western contact era, the vegetation clearing project uncovered undocumented site features including: three rock alignments, and four “modern” *mākāhā*, suggesting post-western contact use and operation of the fishpond.

In addition to these features a silt berm was observed lining the west end of fishpond. Although a large rock wall was previously recorded in the west end of the fishpond (McAllister 1933), no rock walls that matched McAllister’s description were observed during the vegetation removal project. Photos and plan view maps of all the features were recorded, and GPS points of of each feature was taken in order to precisely map its location.

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