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GOVERNOR OF HAWAII

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LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

January 21, 2020

Director
Office of Environmental Quality Control
Department of Health, State of Hawaii
235 S. Beretania Street, Room 702
Honolulu, Hawaii 96813

Subject: Final Environmental Assessment (FEA)
Applicant: Yamada and Sons
Project: Rock Quarry
TMK: (3) 2-1-013:002 portion

Dear Director:

With this letter, the Department of Land and Natural Resources hereby transmits the Final Environmental Assessment and Finding of no Significant Impact (FEA-FONSI) for the proposed sale of a quarry license at public auction on a portion of State lands situated at TMK: (3) 2-1-013:002, in the South Hilo District on the island of Hawaii for publication in the next available edition of the Environmental Notice.

We are submitting the electronic version of the OEQC Publication Form and final environmental assessment both in PDF format simultaneously with this letter through the online submission platform.

If there are any questions, please contact Candace M. Martin at (808) 961-9590 or by email Candace.M.Martin@hawaii.gov.

Sincerely,

Suzanne D. Case
Chairperson

Enclosures

20-198

From: webmaster@hawaii.gov
To: HI Office of Environmental Quality Control
Subject: New online submission for The Environmental Notice
Date: Monday, February 3, 2020 8:55:09 AM

Action Name

YAMADA AND SONS ROCK QUARRY

Type of Document/Determination

Final environmental assessment and finding of no significant impact (FEA-FONSI)

HRS §343-5(a) Trigger(s)

- (1) Propose the use of state or county lands or the use of state or county funds

Judicial district

South Hilo, Hawaiʻi

Tax Map Key(s) (TMK(s))

(3) 2-1-013:002

Action type

Applicant

Other required permits and approvals

Board of Land and Natural Resources: Approval of License for Quarrying • Windward Planning Commission and State Land Use Commission: Special Permit • State DOH: National Pollutant Discharge Elimination System Permit (NPDES) (potential) • County Department of Public Works: Grubbing and Grading Permits

Discretionary consent required

License for use of State land for rock quarry

Approving agency

Department of Land and Natural Resources

Agency contact name

Candace Martin

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United States
Map It

Applicant

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Was this submittal prepared by a consultant?

Yes

Consultant

Geometrician Associates

Consultant contact name

Ron Terry

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Action summary

Yamada and Sons proposes to develop a 37.882-acre portion of a State property for use as a rock quarry. The site is adjacent to their existing quarry, a landfill, a stockpile area, skeet range and baseyard. It is undeveloped and vegetated primarily with large, invasive trees that grew up after decades of surface quarrying. The quarry would allow the manufacture of base course, hot mix asphalt and concrete needed for the construction of many public and private projects. Yamada and Sons would acquire a license with the DLNR and pay royalties to the State. Excavated rock would either be stockpiled on-site or removed and trucked off-site to Yamada and Sons' quarry baseyard located off of Railroad Avenue for crushing/processing and sale. 25,000 tons would be extracted per month, and with the excavation reaching a depth of 80 feet, the quarry is expected to have an active lifetime of roughly thirty years. No

significant water, biological, historic or cultural resources are present.

Reasons supporting determination

Chapter 11-200.1-13, Hawai‘i Administrative Rules, outlines those factors agencies must consider when determining whether an Action has significant effects:

(a) In considering the significance of potential environmental effects, agencies shall consider and evaluate the sum of effects of the proposed action on the quality of the environment.

(b) In determining whether an action may have a significant effect on the environment, the agency shall consider every phase of a proposed action, the expected impacts, and the proposed mitigation measures. In most instances, an action shall be determined to have a significant effect on the environment if it may:

1. Irrevocably commit a natural, cultural, or historic resource. No valuable natural or cultural resource would be committed or lost. Although some remnant native plants are present, no valuable natural or cultural resources would be committed or lost, as the project site contains none. No valuable cultural resources and practices such as forest access, fishing, gathering, hunting, or access to ceremonial sites would be affected in any way.
2. Curtail the range of beneficial uses of the environment. The land has poor potential for other uses as it is unsuited for most agriculture and is surrounded by industrial land uses. Some restriction of future beneficial uses would occur, as the surface rock and soil (already surface quarried in many locations) will be removed, but the quarried area would retain value for future industrial, public and even agricultural uses that did not rely on surface soil.
3. Conflict with the State’s environmental policies or long-term environmental goals established by law. The State’s long-term environmental policies are set forth in Chapter 344, HRS. The broad goals of this policy are to conserve natural resources and enhance the quality of life. The project is minor and fulfills aspects of these policies calling for an improved social environment. It is thus consistent with the State’s long-term environmental policies.
4. Have a substantial adverse effect on the economic welfare, social welfare, or cultural practices of the community and State.. The project would not have any adverse effect on the economic or social welfare of the County or State and would benefit the economy of the Hilo area.
5. Have a substantial adverse effect on public health. The proposed project would be subject to environmental, health and safety permits and restrictions and would not be detrimental to public health in any way.
6. Involve adverse secondary impacts, such as population changes or effects on public facilities. No adverse secondary effects are expected to result from the proposed action.
7. Involve a substantial degradation of environmental quality. The project site would not cause a substantial degradation of environmental quality, and mitigation for storm water runoff, as well as dust emissions, would be required.
8. The proposed project is not one which is individually limited but cumulatively may have considerable effect upon the environment or involves a commitment for larger actions. The project is not related to other activities in the region in such a way as to produce adverse cumulative effects or involve a commitment for larger actions. The only adverse local effects of the project – continuing traffic and minor disturbance to air quality, noise, and visual quality– are very restricted in severity, nature and geographic scale, with limited potential to accumulate with impacts from other actions. Furthermore, the proposed quarry represents a continuation of uses at a directly adjacent location, rather than new impacts to be added. There has been and will continue to be some accumulation of dust, noise and traffic impacts from continuing operations at County solid waste facilities, the Mass Transit baseyard, the public works stockpiling area, and the skeet range and drag strip, all occurring within a half-mile of the proposed quarry. This interaction is already occurring at the same levels, and coordination among these agencies has avoided issues or problems.
9. Have a substantial adverse effect on a rare, threatened, or endangered species, or its habitat. The project site supports overwhelmingly alien vegetation. With timing of vegetation removal/species surveys to avoid impacts to Hawaiian hawks and Hawaiian hoary bats, no impacts to rare, threatened or endangered species of flora or fauna would occur.

10. Have a substantial adverse effect on air or water quality or ambient noise levels. No adverse effects on these resources would occur. Implementation of a Storm Water Pollution Prevention Plan will mitigate impacts to water quality. There are no sensitive receptors in the project area, and hence noise produced would not be detrimental.
11. Have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, sea level rise exposure area, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters. Although the project is located in an area with volcanic and seismic risk, the entire Island of Hawaiʻi shares this risk, and the project is not imprudent to construct. The project site is more than 90 feet above sea level and will not be affected directly by sea level rise.
12. Have a substantial adverse effect on scenic vistas and viewplanes, during day or night, identified in county or state plans or studies. No scenic vistas and viewplanes will be adversely affected by the project.
13. Require substantial energy consumption or emit substantial greenhouse gases. The operation of any aggregate quarry requires energy consumption that because of its nature involves fossil fuels and therefore greenhouse gas emissions. The emissions of the proposed quarry would not be significant on a State scale, as the roughly 2,000 Mtpa CO2-e of emissions would represent only 0.094% of the State of Hawaiʻi's 21.28 million Mtpa CO2-e output. Furthermore, the emissions would not be added to the total, but would represent a continuation of an existing activity of the same scale. It is also important to note that one of the major factors in the greenhouse emissions of the use of aggregates, once they are quarried and processed, is transport to the use site. Transportation of quarry products is relatively costly, greenhouse gas-intensive activity. Therefore, a range of benefits is achieved if a quarry is located close to its markets, as is the case with the proposed quarry location. Yamada and Sons proposed to continue and/or adopt a suite of innovative energy-saving practices endorsed by professional trade organizations for aggregates that can cumulatively substantially reduce greenhouse gas emissions of rock quarries.

For the reasons above, the proposed action would not have any significant effect in the context of Chapter 343, Hawaiʻi Revised Statues and section 11-200.1-13 of the State Administrative Rules.

Attached documents (signed agency letter & EA/EIS)

- Final-EA-Yamada-Rock-Quarry.pdf
- FEA-FONSI-YAMADA.pdf

Shapefile

- The location map for this Final EA is the same as the location map for the associated Draft EA.

Authorized individual

Ron Terry

Authorization

- The above named authorized individual hereby certifies that he/she has the authority to make this submission.

FINAL ENVIRONMENTAL ASSESSMENT

YAMADA AND SONS ROCK QUARRY

Portion of TMK (3rd) 2-1-013:002
Waiākea, South Hilo District, Hawai‘i Island, State of Hawai‘i

February 2020

Prepared for:

Yamada and Sons, Inc.
733 Kanoelehua Avenue
Hilo, Hawai‘i 96720

and

Department of Land and Natural Resources
1151 Punchbowl Street
Honolulu, Hawai‘i 96813

FINAL ENVIRONMENTAL ASSESSMENT

YAMADA AND SONS ROCK QUARRY

Portion of TMK (3rd) 2-1-013:02
Waiākea, South Hilo District, Island of Hawai‘i, State of Hawai‘i

APPLICANT:

Yamada and Sons, Inc.
733 Kanoelehua Avenue
Hilo, Hawai‘i 96720

APPROVING AGENCY:

Department of Land and Natural Resources
1151 Punchbowl Street
Honolulu, Hawai‘i 96813

CONSULTANT:

Geometrician Associates LLC
PO Box 396
Hilo HI 96721

CLASS OF ACTION:

Use of State Land

This document is prepared pursuant to:
The Hawai‘i Environmental Policy Act,
Chapter 343, Hawai‘i Revised Statutes, and
Chapter 11, Title 200.1, Hawai‘i Administrative Rules

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SUMMARY OF THE PROPOSED ACTION, ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Yamada and Sons, Inc. ("Yamada and Sons") proposes to acquire a license to develop a 37.882-acre portion of a State property for use as a rock quarry. The project site is adjacent to existing quarries and is presently vacant, vegetated primarily with large, invasive trees, and undeveloped. Yamada and Sons requires a new quarry because their existing quarry has nearly exhausted its supply of adequate quality material. The quarry would allow the manufacture of engineered products, including base course and components of hot mix asphalt and concrete, that are necessary for the construction of a wide variety of Hawai'i County projects, both public and private. Yamada and Sons would acquire a license with the Department of Land and Natural Resources for use of the site and would pay royalties to the State for materials extracted from the quarry. The proposed quarrying activities would be identical in nature to the ongoing quarrying activities located on adjacent parcels; rock would be excavated with heavy equipment when possible, and when impenetrable rock is encountered, drilling and blasting would be performed. Excavated rock would either be stockpiled on-site or removed and trucked off-site to Yamada and Sons' quarry baseyard located off of Railroad Avenue for crushing/processing and sale. No crushing or sales will be done at the new rock quarry. They anticipate that about 25,000 tons of material would be extracted per month, and with the excavation reaching a maximum depth of about 80 feet, the quarry is expected to have an active lifetime of roughly twenty to thirty years.

Yamada and Sons will prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) to contain sediment and storm water runoff from leaving the project site. Furthermore, construction equipment would be kept in good working condition to minimize the risk of fluid leaks that could enter runoff and groundwater. Significant leaks or spills, if they occur, would be properly cleaned up and disposed of at an approved site. Use of hazardous materials on the site, including materials used for blasting, would require a number of permits and licenses. Also, in order to protect public safety, the quarry will have engineered fill with a 3:1 slope on the edges, a vegetative buffer will be maintained around the periphery of the site, and access routes to the interior of the site will be kept gated.

Surveys have determined that no significant biological, historic or cultural resources are present. If archaeological resources or burials are encountered during land-altering activities associated with construction, work in the immediate area of the discovery will be halted and the State Historic Preservation Division would be contacted.

PART 1: PROJECT LOCATION, DESCRIPTION, AND ENVIRONMENTAL ASSESSMENT PROCESS

1.1 Project Location and Ownership

Yamada and Sons, Inc. ("Yamada and Sons") proposes to acquire a license to develop a rock quarry on undeveloped State lands located adjacent to their existing active quarry near the South Hilo Sanitary Landfill (Figs. 1-3). The project site is a 37.882-acre portion of TMK 2-1-013:002, owned by the State of Hawai‘i, on the eastern edge of Hilo on the Island of Hawai‘i, approximately one mile east of Kanoelehua Avenue (State Highway 11). A portion of the proposed license area is currently part of a larger area under a Revocable Permit to the County of Hawai‘i for use as a skeet range, but within an area not used or needed by the County as part of range operations. Public road access is via Leilani Street, which connects to a County driveway informally called Ammunition Dump Road, which continues past the South Hilo Solid Waste Convenience Center, the East Hawai‘i Regional Sort Station and greenwaste facility, the South Hilo Sanitary Landfill, and the County Mass Transit Agency Baseyard, to the project site. South of this point Ammunition Dump Road continues to the Hilo Dragstrip and associated facilities. Yamada and Sons access the quarry via a shortcut driveway on Ammunition Dump Road from their baseyard, which is located behind Railroad Avenue, thus avoiding traffic impacts on Leilani Street.

1.2 Project Description

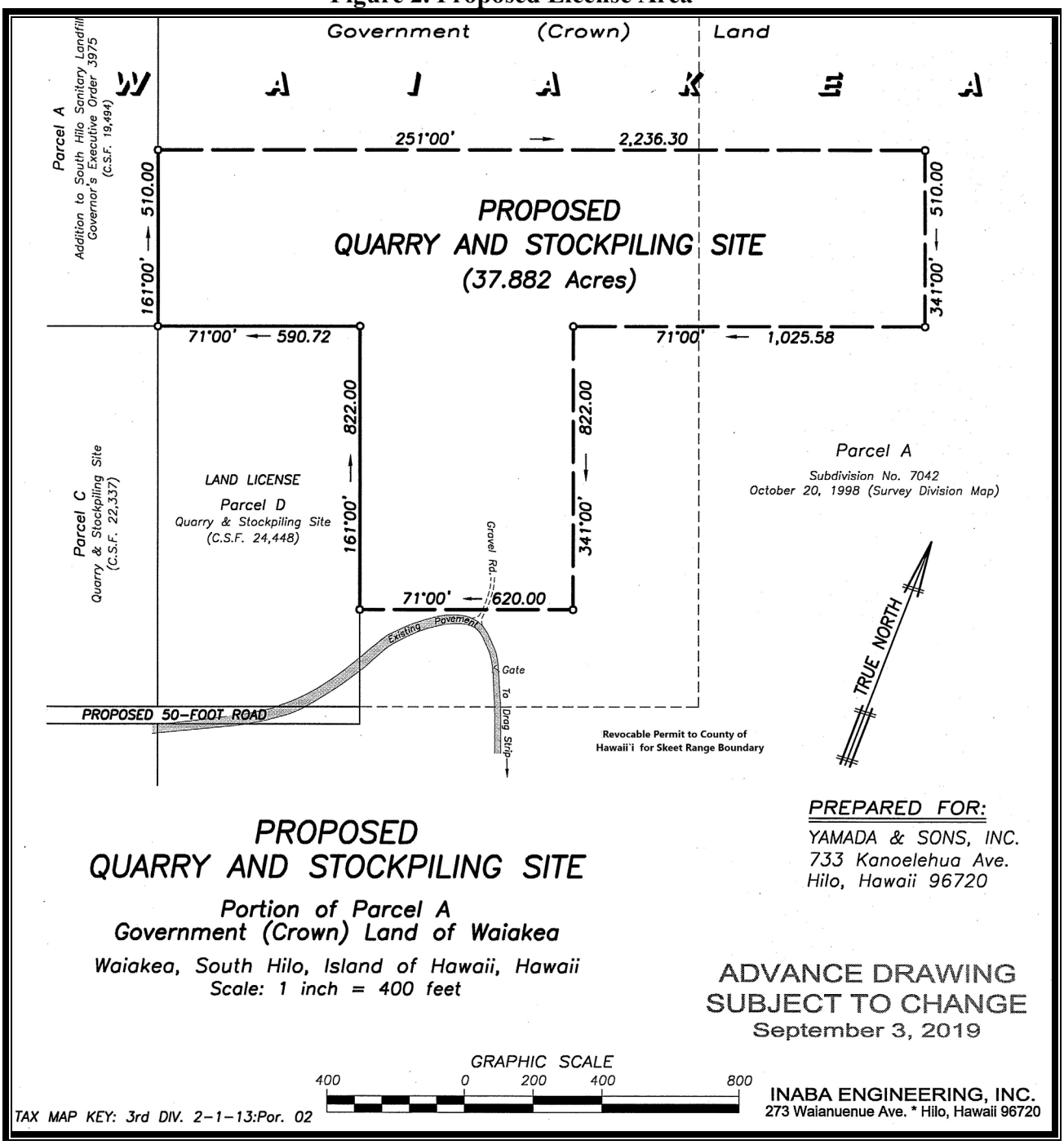
Yamada and Sons requires a new quarry because their existing quarry has nearly exhausted the supply of adequate quality material. The quarry would allow the continuing manufacture of engineered products, including base course and components of hot mix asphalt and concrete, that are necessary for the construction of a wide variety of Hawai‘i County projects, both public and private.

The project site is ideally located for a quarry because the area has a proven rock resource, has all necessary road infrastructure and is situated amidst land uses that already generate substantial noise – quarries, a landfill, a stockpile area, a skeet range, a baseyard and a dragstrip – and the noise it generates will not affect sensitive uses.

Yamada and Sons would acquire a license with the Board of Land and Natural Resources (BLNR) for use of the site and would pay royalties to the State for materials extracted from the quarry. The quarrying activities would be identical to the ongoing quarrying activities located on adjacent sites; rock would be excavated with heavy equipment when possible, and when impenetrable rock is encountered, by drilling and blasting. Excavated rock would either be temporarily stockpiled on-site or immediately removed and trucked off-site to Yamada and Sons' quarry baseyard located off of Railroad Avenue for crushing/processing and sale. No crushing or sales will be done at the new rock quarry. About 25,000 tons of material would be extracted per month, and with the excavation reaching a maximum depth of about 80 feet, the quarry is expected to have an active lifetime of roughly 20-30 years. The quarry will have engineered fill with a 3:1 slope on the edges to avoid a sheer drop and facilitate future use should future suitable

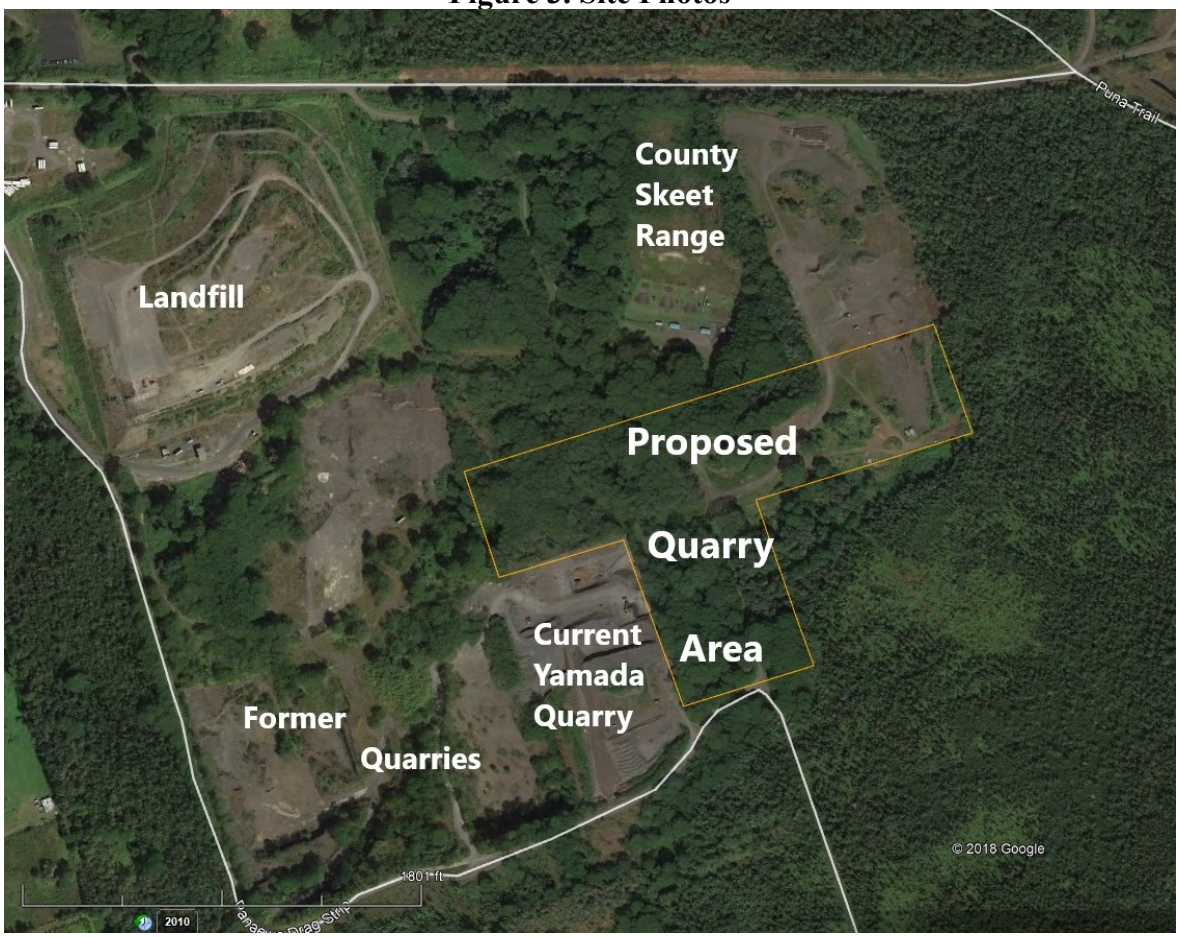
Figure 1. Project Location

Figure 2. Proposed License Area



Source: Adapted from Survey by Inaba Engineering

Figure 3. Site Photos



2a, Above: Aerial image. 2b, Below: Road bisecting area.

Figure 2. Site Photos

2c, Above: Typical Vegetation. 2d, Below: Occasional hala are with invasives.

uses ever be proposed, and a vegetative buffer will be maintained around the periphery of the site. The quarry will take access from the existing Ammunition Dump Road (see Figure 2). Access routes to the interior of the site will be kept gated when not in use.

1.3 Environmental Assessment Process

This Environmental Assessment (EA) process is being conducted in accordance with Chapter 343 of the Hawai‘i Revised Statutes (HRS). This law, along with its implementing regulations, Title 11, Chapter 200.1, of the Hawai‘i Administrative Rules (HAR), is the basis for the environmental impact process in the State of Hawai‘i. According to Chapter 343, an EA is prepared to determine impacts associated with an action, to develop mitigation measures for adverse impacts, and to determine whether any of the impacts are significant according to thirteen specific criteria. Part 4 of this document states the anticipated finding that no significant impacts are expected to occur; Part 5 lists each criterion and discusses conformity of the project with each.

If after considering comments to the Draft EA, the approving agency, the Board of Land and Natural Resources (BLNR), concludes that, as anticipated, no significant impacts would be expected to occur, then it will issue a Finding of No Significant Impact (FONSI), and the action will be permitted to proceed to permits and approvals. If the BLNR concludes that significant impacts are expected to occur as a result of the proposed action, and the applicant decides to proceed with the action, then an Environmental Impact Statement (EIS) must be prepared.

1.4 Public Involvement and Agency Coordination

The following agencies and organizations, which were selected based on their expertise, jurisdiction or presumed interest, were consulted by letter or email in development of this document.

Federal:
- U.S. Department of Transportation, Federal Aviation Administration

State:
- Department of Defense
- Department of Hawaiian Home Lands
- Department of Health
- Department of Land and Natural Resources
- Department of Transportation
- Land Use Commission
- Office of Hawaiian Affairs

County:
- Civil Defense Agency
- County Council
- Department of Environmental Management, Solid Waste and Wastewater Divs.

Department of Parks and Recreation
Department of Public Works
Fire Department
Mass Transit Agency
Planning Department
Police Department

Private:
Keaukaha-Panaʻewa Farmers Association
Kanoelehua Industrial Area Association
Hawaiʻi Island Chamber of Commerce
Sierra Club
Jas. W. Glover Ltd.

Copies of communications received during early consultation are contained in Appendix 1a. Notice of the availability of the Draft EA was published in the September 8, 2019 *OEQC Environmental Notice*. Appendix1b contains written comments on the Draft EA and the responses to these comments. Various places in the EA have been modified to reflect input received in the comment letters; additional or modified non-procedural text is denoted by double underlines, as in this paragraph.

PART 2: ALTERNATIVES

2.1 No Action

Under the No Action Alternative, the quarry operation would not be undertaken. Yamada and Sons would, at some point, be unable to provide rock products, Because quarrying is critical to their business, Yamada and Sons considers the No Action Alternative highly undesirable. While the No Action alternative would avoid direct and physical impacts to the project site, it could lead to shortages of products essential for construction of Hawaiʻi County projects, both public and private, unless alternate sites become available in a timely manner. The State land could then perhaps be used for other purposes, but because of its context between quarries, a landfill and a skeet range, its history of surface quarrying, and its vegetation of large invasive trees, it is suitable for only a limited set of uses, and only then with costly site preparation actions.

2.2 Alternative Quarry Locations and Sizes

If the selected quarry site were unavailable for a license, Yamada and Sons would seek to lease, license or buy another quarry site. A number of factors must be in place for a quarry to be feasible, and additional factors are highly desirable to have for economic or environmental reasons. The site must have appropriate geology with dense bluerock (found within the core of ʻaʻa flows) to supply suitable product, and the history of excavation at adjacent quarries indicates that this rock is available on the proposed quarry. It is also must have ready truck access and no conditions that would preclude or make surface disturbance highly infeasible – e.g., endangered species, significant historic sites, or streams, lakes or wetlands. It is desirable to be relatively

near the major markets for crushed rock and to have no nearby noise, dust or blast-sensitive uses. Relatively few locations have all these characteristics, and as such, major rock quarries in East Hawai‘i are restricted to the area near the Hilo International Airport. Because the proposed project site is highly suitable for the proposed use – known and acceptable rock type, adjacent to ongoing quarry operations and baseyard, away from sensitive resources and land uses – Yamada and Sons has not systematically investigated other location. Any alternative location would likely be nearby to the east or south, where road infrastructure is lacking and more sensitive vegetation is present. Systematic understanding of nearby alternative sites would require detailed investigations that have not been conducted.

A variation of the proposed action would be an alternative quarry size. Initially, a 14.99-acre quarry was investigated, which because of land use regulations in agriculturally classified land, is often the typical quarry size. Early consultation with various parties was conducted on the basis of this size. After discussion with the Hawai‘i County Planning Department, it became apparent that an extended land-use approval process involving the State Land Use Commission would be required regardless of the quarry size, owing to previous quarrying increments on the subject State property. Therefore, Yamada and Sons sought an area for the quarry that could occupy primarily land that had already been disturbed. The optimal size was one that could be quarried at an annual rate that would likely be absorbed by the foreseeable market over a period of about twenty to thirty years, during which time the technological and economic conditions that provide sufficient value to crushed rock would presume to remain reasonably stable. A second early consultation letter was sent out to inform parties of the larger area, then proposed at about 51 acres. Later, after biological and cultural survey, Yamada and Sons decided to exclude areas with somewhat intact ‘ōhi‘a forest. The resulting optimal quarry was on land east and north of the existing Yamada and Sons quarry and was approximately 38 acres. Under these circumstances, although smaller quarry sizes would still be feasible, the proposed area was determined to be optimal.

PART 3: ENVIRONMENTAL SETTING, IMPACTS AND MITIGATION MEASURES

Basic Geographic Setting

The proposed Yamada quarry license area is referred to in this EA as the *project site*. The term *project area* is used to describe the general environs of Waiākea, and, in some cases, the entire South Hilo District.

The project site is located at approximately 90-100 feet in elevation about 3.5 miles southeast of downtown Hilo (see Fig. 1). The surface is gently undulating terrain interrupted by several bulldozer pushpiles and lava ridges. Vegetation is primarily secondary weedy forest with a few native trees, except where bare within a temporary County stockpile/baseyard area and where bisected by access roads. Portions of the project site were surface quarried in the year after the devastating tsunami of 1960 to provide fill for the Kaiko‘o area of Hilo, where the State and County buildings now stand.

Nearby land use is primarily industrial or solid waste related, with some vacant lands and other public uses (see Fig. 1). Uses include:

- Directly adjacent to the east and south: vacant and undeveloped land;
- Directly adjacent to the west: a 15-acre rock quarry operated by Yamada and Sons;
- Directly adjacent to the northeast, Department of Public Works stockpile area;
- Directly adjacent to north: Hilo Trap and Skeet Range;
- The Hawai‘i County Mass Transit Agency baseyard, 1,400 feet to southwest;
- The South Hilo Sanitary Landfill, located about 1,200 feet to the northwest, beyond which are the greenwaste mulching site, a scrap metal salvage facility, the County's Hilo Convenience Center, and the East Hawai‘i Regional Sort Station;
- Keaukaha Military Reservation, located about 1,800 feet to the north, beyond which is the Hilo International Airport;
- The Pana‘ewa Drag Strip and associated facilities, approximately one mile south; and
- About 2,200 feet to the west, beyond three current/former quarries, a strip of Department of Hawaiian Home Lands (DHHL) undeveloped land, beyond which are the Pana‘ewa Farm Lots.

3.1 Physical Environment

3.1.1 Climate, Geology, Soils and Geologic Hazards

Environmental Setting

The average maximum daily temperature in this part of Hilo is approximately 81 degrees F., with an average minimum of 67 degrees, and annual rainfall averages about 130 inches (U.H. Hilo-Geography 1998:57).

The project site is located on the lower flank of Mauna Loa Volcano. The surface consists of basalt lava flows of the Ka‘u Basalt series with an age of 1,500 to 750 years before the present (Wolfe and Morris 1996). The project site contains both ‘a‘ā and pāhoehoe lavas flows. Collectively these lava flows have been designated by Trusdell and Lockwood (2017) as the Pana‘ewa picrate flow. The basalt in the area has proven highly suitable for rock quarries.

The project site soil is classified as Papai extremely stony muck (rPAE), a well-drained, thin (i.e., less than 10" thick) extremely stony organic soil overlying ‘a‘a lava bedrock. These soils are found at elevations ranging from sea level to 1,000 feet and receive between 90 to 150 inches of annual rainfall. Permeability is rapid, runoff is slow, and the erosion hazard is slight for this soil (U.S. Soil Conservation Service 1973). Areas with this soil are mostly covered in woodland, with some small areas used for pasture, orchards, and truck crops. The NRCS classifies it as a class VIIs soil, meaning it has very severe limitations for use for cultivation, and is therefore only useful as pastureland, wildlife or woodland. The agricultural suitability of this soil is considered Class "E" (Very Poor), by the University of Hawai‘i Land Study Bureau's Soil Survey Report (University of Hawai‘i 1965), the lowest possible rating. Notwithstanding these ratings, the project site lies within an area considered in the State of Hawai‘i's (ALISH)

Agricultural Land of Importance classification as “Other Important Agricultural Land”.

The entire Big Island is subject to geologic hazards, especially lava flows and earthquakes. The volcanic hazard as assessed by the U.S. Geological Survey in this area of Hilo is Zone 3 on a scale of ascending risk of Zone 9 to Zone 1 (Heliker 1990:23). The relatively high hazard risk is based on the fact that Mauna Loa is an active volcano. Volcanic hazard Zone 3 areas have had 1-5% of their land area covered by lava or ash flows since the year 1800 but are at lower risk than Zone 2 areas because of their greater distance from recently active vents and/or because the local topography makes it less likely that flows will cover these areas.

The Island of Hawai‘i experiences high seismic activity and is at risk from earthquake damage (USGS 2000), especially to structures that are poorly designed or built, as the 6.7-magnitude quake of 2006 and the 6.9-magnitude quake of 2018 demonstrated for many areas of the island, although the existing quarry was not affected. The project site does not appear to be subject to subsidence, landslides or other forms of mass wasting.

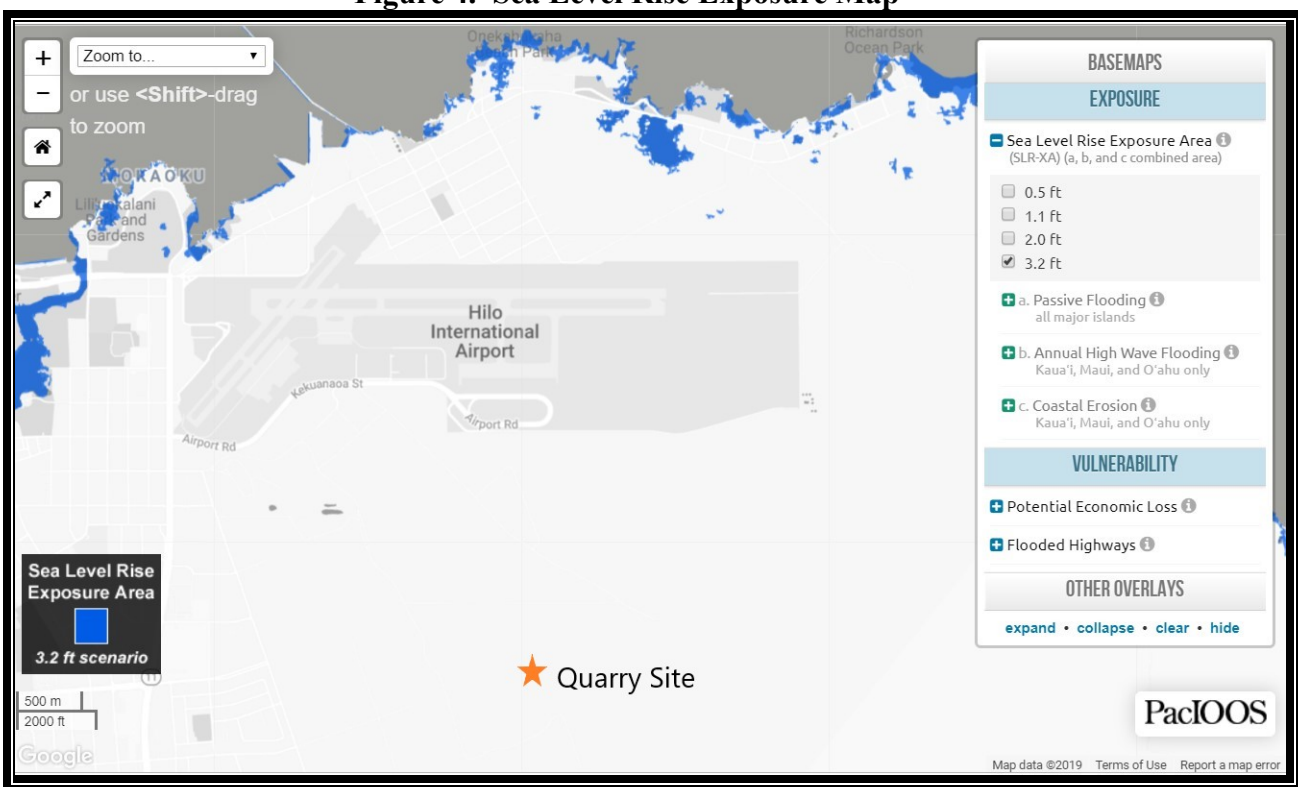
Impacts and Mitigation Measures

The project would alter the geology by removing rock and soil from the surface, much of which has been subject to surface quarrying or material stockpiling in the past and is only marginally suitable for farming. The project site is susceptible to lava flow and seismic hazard. However, as much of East Hawai‘i has similar hazard levels, geologic hazards impose no particular constraints on the proposed action and the project is not imprudent to undertake. All facilities will be built in conformance with the Uniform Building Code’s seismic standards. The quarry will have engineered fill with a 3:1 slope on the edges to avoid a sheer drop and facilitate future use should future suitable uses ever be proposed.

According to the U.S. Environmental Protection Agency (EPA), global climate change could mean an increase in sea level rise that could worsen Hawai‘i’s existing coastal hazards, including waves, hurricanes, and tsunamis, and extreme tides (EPA 2016).

Rainfall in Hawai‘i has been variable in the recent past with some years considerably drier and some much wetter than average. The El Niño Southern Oscillation (i.e., periodic variation in winds and sea surface temperatures in the Pacific, the warming phase of sea temperature known as El Niño and the cooling phase as La Niña) will likely continue to dominate precipitation patterns from year to year in the tropical Pacific. Climate change-related increases in air temperatures will lead to more evaporation and more moisture in the air. As a result, the variability in El Niño-related precipitation is likely to increase, making rainfall predictions difficult (EPA 2016). In addition, increasing numbers and severity of tropical storms are increasing wind speeds. The project, which occurs essentially within a pit, is not one which is vulnerable to creating or being subject to damage by flooding or high winds, and no mitigation is necessary. As shown in Figure 4, the elevation of over 90 feet above sea level and the distance to the sea will protect the area from sea level rises of at least 90 feet, meaning that in the short to medium term of 30 years, there is no risk from sea level rise.

Figure 4. Sea Level Rise Exposure Map



The aggregate material that would be produced by the proposed quarry is critical for construction and thus the social and economic health of Hawai‘i, and there are no feasible substitutes. However, mining, processing and transporting the material is a significant source of energy use, much of it tied to fossil fuels (Carbon Trust 2019). This has implications for carbon use and resulting greenhouse gas emissions.

Greenhouse gases in Earth’s atmosphere absorb the long wave radiation released by the Earth’s surface and then radiate some heat back towards the ground, increasing the surface temperature. Many human activities are increasing the concentration of greenhouse gases, thereby increasingly warming the Earth. The most common and important greenhouse gas we produce is carbon dioxide (CO2). Fossil fuels such as coal, oil and natural gas are the product of ancient deposits of organic matter. When combusted, their stored carbon is released again to the atmosphere at an extremely rapid rate in comparison to the rate at which it became stored. Methane (CH4), nitrous oxide (N2O) and various synthetic gases such as hydrofluorocarbons (HFCs) are also important greenhouse gases. They vary in effect and longevity in the atmosphere, but scientists have developed a system that compares them in equivalent terms to CO2, called equivalent carbon dioxide emissions (CO2-e). A unit of one metric ton of CO2-e is the basic unit used in carbon accounting. An emissions inventory, or ‘carbon footprint’, is calculated as the sum of the emission rate of each greenhouse gas multiplied by the global warming potential. For the purposes of greenhouse gas production from the quarry, CO2 is the only significant source.

Globally, aggregate, including crushed rock, is responsible for about 7% of total global energy consumption, and nearly half of that is consumed by transport of materials both before and after being processed (Mankelow et al 2010). The world faces a challenge in reducing carbon emissions from aggregate production and use, especially considering accelerating demand for commodities and construction materials into the foreseeable future.

Carbon emissions as a result of construction and operation of the project, along with the uses to which the quarried materials are put, are not insubstantial. Although the greenhouse gas output of the proposed Yamada quarry was not specifically calculated, estimates from the large Gold Coast Quarry in Australia, a much larger project that was subject to detailed greenhouse gas auditing, were consulted to gain an idea of the scale (Katestone Environmental Pty Ltd. 2013). That analysis also suggested potential opportunities for mitigating the increase in carbon emissions.

The Gold Coast Quarry has a production capacity of about 2.2 million tons of rock per year, roughly 7.5 times the capacity of the proposed Yamada quarry, and was projected to last almost fifty years. The development and construction phase of the quarrying involved establishing access roads and a facilities area, dams and sediment ponds, vegetation clearing, topsoil and overburden removal, mobile crushing operations, construction of a permanent fixed crushing plant, and set-up of stockpile operations. (Many of these activities will also occur at the Yamada quarry, but the facilities area is already established, and no sediment ponds are required). Greenhouse gas emissions during the construction phase would be mainly from land clearing, fuel usage, electricity consumption and blasting. It should be noted that existing vegetation sequesters carbon and that removing it returns carbon to the atmosphere.

The greenhouse gas analysis considered both direct emissions from sources within the boundary of the facility as a result of the facility's activities, as well as emissions from the offsite production of electricity the facility will consume. Total emissions for the construction phase of the Gold Coast Quarry, which required seven years with variable levels of emissions, were about 27,000 metric tons CO2-e, or about 2,700 metric tons CO2-e per year (Mtpa). The mining, crushing and transport of rock was estimated to involve a steady amount of 10,300 Mtpa CO2-e. The total estimated greenhouse gas emissions per year over the course of the project was thus approximately 13,000 Mtpa CO2-e. By far the largest source was use of electricity and diesel fuel (Ibid).

Only a detailed comparison of the differences and similarities of the Gold Coast and Yamada quarry operations would allow a precise analysis of the greenhouse gas emissions from the latter. However, a rough assessment is readily available. The Yamada quarry rock output would be about 7.5 times smaller than the Gold Coast quarry and would not involve construction of sediment ponds or new crushing facilities, which together would indicate emissions that would be lower by roughly an order of magnitude. Otherwise, the existing land cover in both areas is forest, and operations would be fairly similar. Thus, it is conservatively estimated that emissions for the Yamada quarry would be on the order of 2,000 Mtpa CO2-e or less. To provide some scale, the annual emissions from a typical commuter driving 30 miles round-trip to work in an average car is 4.3 Mtpa. The proposed quarry would thus emit the amount of emissions similar to 465 such commuters. One passenger's share of a 5,000-mile roundtrip airline flight is 2.23 tons

CO2-e Mt; the proposed quarry over the course of the year would emit the same emissions as 870 passengers on such a flight.

The Gold Coast analysis indicated that predicted annual emission rates were not significant on a national or state scale, representing only 0.002% of Australia's estimated greenhouse gas emissions for the year and 0.008% of Queensland's annual emissions. A similar conclusion can be reached about the proposed Yamada quarry, since the roughly 2,000 Mtpa CO2-e of emissions would represent 0.094% of the State of Hawai'i's 21.28 million Mtpa CO2-e output. Furthermore, the emissions *would not be added to the total greenhouse gas emissions of the State* but would represent a continuation of an existing activity of the same scale. It is also important to note that one of the major factors in the greenhouse emissions of the use of aggregates, once they are quarried and processed, is transport to the use site. Transportation of quarry products is relatively costly, greenhouse gas-intensive activity. Therefore, a range of benefits is achieved if a quarry is located close to its markets. This economic and environmental savings is one of the main reasons to locate a quarry focused on the East Hawai'i market near the economic activity centers of Hilo and Puna, rather than in more distant Hamakua or Ka'u.

Despite the lack of significant impacts, and the critical importance of supplying aggregate for construction, it is incumbent on the aggregate industry as well as every business to reduce greenhouse gas emissions to the minimum practicable level. Professional trade organizations for aggregates are developing innovative methods to save energy and reduce greenhouse gas emissions (e.g., see Carbon Trust Organization 2019). The Gold Coast Quarry emissions analysis included among its recommendations the following practices, which have been, are being, or will be adopted by Yamada and Sons in its quarrying operations. Cumulatively, these measures can substantially reduce greenhouse gas emissions of rock quarries.

- Optimize the movement of material onsite to reduce distances traveled and ensure optimal loading of mobile equipment.
- Incorporate energy efficiency goals into procurement criteria for plant items such as crushers and conveyors. Select equipment on a net present value basis that includes operation, maintenance and energy costs. Yamada and Sons have just completed a major project to upgrade the generators for its crusher and AC plant to Tier 4 generators, which are much more fuel efficient and produce fewer emissions. The company also converted its aggregate drier at the AC plant from diesel to propane.
- Design all site buildings to provide adequate worker comfort and heat protection for equipment with minimum electricity requirements. Techniques include (to the extent relevant):
    - o Considering whole-of-life costs in air-conditioning plant selection.
    - o Providing thermally efficient design including building orientation and opportunities for natural ventilation and use of electric fans.
    - o Include shaded outdoor common areas for meals and breaks.
    - o Provide for natural light indoors that minimizes addition to heat load (e.g. use window film).
    - o Install energy efficient lighting, separation of lighting bank controls and automatic timers.

- Consider on-site renewable energy generation to provide part of load requirements on land particularly for infrastructure buildings. Solar power is normally relatively expensive; however, there are sometimes site and load-specific circumstances that make it commercially advantageous, such as reducing peak demand and sharing the benefit of this with the electricity distributor.
- Ensure that water pumping operations are matched with usage requirements to minimize energy use. Choose pumps of appropriate type and capacity for the application.
- Identify activities that can be carried out during off-peak periods to reduce peak demand, this will reduce costs and better utilize electrical infrastructure, an added benefit to electricity suppliers.
- Implement recommended operation, maintenance and replacement regimes for assets and equipment (e.g. conveyors) to ensure that equipment continues to operate to design expectations for energy demand.
- Match processing operations with demand for specific products to avoid over crushing of rock.
- Stage equipment start-up to limit peak demand and associated electricity cost as an integral part of an electricity demand management program.
- Maximize the efficiency of distribution operations through the optimization of delivery schedules matched to vehicle capacity; including the use of articulated haul trucks where practical.
- Ensure lighting is only on when necessary and select energy efficient public lighting (considering whole-of-life costs including maintenance and energy consumption).
- Incorporate driver training and awareness as part of operational requirements. This has been found (Carbon Trust, 2011) to lead to reduced idle time, improved maintenance regimes (e.g. tire pressure), and improved haulage routes all related to fuel efficiency.

3.1.2 Drainage, Water Features and Water Quality

Existing Environment

Floodplain status for the project area has been determined by the Federal Emergency Management Agency (FEMA), which has mapped the area as part of the National Flood Insurance Program's Flood Insurance Rate Maps (FIRM). A summary of applicable Special Flood Hazard Area (SFHA) designations in the Hilo area is as follows:

- Zone A: SFHAs subject to inundation by the 100-year flood. Because detailed hydraulic analyses have not been performed, no base flood elevation or depths are shown.
- Zone AE: SFHAs subject to inundation by the 100-year flood determined in a Flood Insurance Study by detailed methods. Base flood elevations are shown within these zones.
- Zone AH: SFHAs subject to inundation by 100-year shallow flooding (usually areas of ponding where average depths are between 1 and 3 feet. Base flood elevations derived from detailed hydraulic analyses are shown in this zone.
- Zone VE: the 100-year coastal, high hazard flood plain, incorporating storm surges. Base flood elevations derived from detailed hydraulic analyses are shown in this zone.

- Zone X: Areas identified in the community flood insurance study as areas of minimal flood hazard.

The Flood Insurance Rate Maps (FIRM) 885C and 895C (9/16/88) show that the entirety of the proposed project site is in Flood Zone X (http://gis.hawaiinfip.org/FHAT/).

No natural streams, pools, springs, or wetlands are present within at least two miles. The Waiākea-Uka Flood Control Channel that was meant to deal with runoff from Ka‘ahakini Stream is located about a half mile southwest of the project site, and a levee was constructed to keep any flooding away from the quarry and landfill areas (Fig. 1). The location of the levee downslope from the Flood Control Channel suggests it served to define the boundaries of a ponding basin, which was intended to contain flood waters during periods of excessive rainfall. The levee and Flood Control Channel were likely constructed between 1965 and 1981.

Impacts and Mitigation Measure

Because of the limited scale of construction and the environmental setting, the risks for flooding or impacts to water quality are negligible. There does not appear presently to be any risk for flooding from streams or drainage channels. No impacts to stream banks, stream waters, wetlands, or any other waters of the U.S., will occur, as none are located near the project site.

A grading and grubbing permit will be required. This would involve development and implementation of a Storm Water Pollution Prevention Plan (SWPPP) to contain sediment and storm water runoff during quarrying activities. In addition, in order to minimize the potential for sedimentation and erosion, the contractor shall perform all earthwork and grading in conformance with Chapter 10, Erosion and Sediment Control, Hawai‘i County Code. In order to properly manage storm water runoff, the SWPPP will describe the emplacement of a number of Best Management Practices (BMPs) for the project. These BMPs may include measures such as the following:

- Minimization of soil loss and erosion by revegetation and stabilization of slopes and disturbed areas of soil, possibly using hydromulch, geotextiles, or binding substances, as soon as possible after working;
- Minimization of sediment loss by emplacement of structural controls possibly including silt fences, gravel bags, sediment ponds, check dams, and other barriers in order to retard and prevent the loss of sediment from the site;
- Minimizing disturbance of soil during periods of heavy rain;
- Phasing of the project to disturb the minimum area of soil at a particular time;
- Application of protective covers to soil and material stockpiles;
- Construction and use of a stabilized construction vehicle entrance, with designated vehicle wash area that discharges to a sediment pond;
- Washing of vehicles in the designated wash area before they egress the project site;
- Use of drip pans beneath vehicles not in use in order to trap vehicle fluids;
- Routine maintenance of BMPs by adequately trained personnel;
- Coordination of storm water BMPs and wind erosion BMPs whenever possible; and

- Proper cleanup and disposal at an approved site if there are any significant leaks or spills.

The Department of Health, Clean Water Branch stated in a letter of August 6, 2019, in response to early consultation (see Appendix 1a) that the quarry developer may be required obtain an NPDES permit. The State Department of Health is continuing to be consulted as part of the EA process to verify permit requirements and mitigation measures.

3.1.3 Flora, Fauna and Ecosystems

Existing Environment

The natural vegetation of this part of Hilo was most likely lowland rain forest dominated by ʻōhiʻa (*Metrosideros polymorpha*) and hala (*Pandanus tectorius*) (Gagne and Cuddihy 1990). These original communities, however, have been destroyed or heavily degraded by quarrying, cattle grazing, landfills and industrial operations, clearing for farms and residences and other activities. A walk-through biological survey of the project site was performed by biologists Ron Terry, Patrick J. Hart and Layne Yoshida over the course of five days in April and July 2019.

The vegetation of the general area varies from completely disturbed to partially intact to largely intact, depending on the history of past disturbance. The 37.882-acre project site itself is a microcosm of this continuum. About 85% of the project site has been disturbed through surface quarrying, stockpiling, roads and other activities (see Figure 5). Some is still nearly bare, while most is heavily dominated by a dozen or so non-native trees (most of them invasive), including albizia (*Falcataria moluccana*), strawberry guava (*Psidium cattleianum*), Asian melastome (*Melastoma candidum*), cecropia (*Cecropia obtusifolia*), common guava (*Psidium guajava*), macaranga (*Macaranga mappa* and *M. tanarius*), gunpowder tree (*Trema orientalis*) and false kamani (*Terminalia catappa*) (see Figure 2a-c). Non-native pilau maile (*Paederia foetida*), pothos (*Epipremnum aureum*), woodrose (*Merremia tuberosa*) and other vines heavily festoon the trees. The dense canopy allows only a sparse understory of mostly invasive tree seedlings, except at road edges, which contain thick guinea grass (*Megathyrsus maxima*) patches and other weeds. Despite the heavy disturbance there are scattered ʻōhiʻa and hala trees and even the occasional small hala grove. The land to the southeast of the proposed quarry license area is dominated by a mixture of hala, ʻōhiʻa and strawberry guava, with some nearly all native areas of hala or ʻōhiʻa with uluhe fern (*Dicranopteris linearis*) and a variety of grasses, sedges and ferns (only a few of them natives) make up the herb story. Aside from a few ferns, no understory trees, shrubs or herbs typically associated with a healthy lowland ʻōhiʻa forest, such as *Myrsine*, *Diospyros*, *Psychotria*, etc., are present. Although this ʻōhiʻa forest in only marginally intact, it was purposely excluded from the proposed quarry license area.

Table 1 is a list of plant species detected. No listed, candidate or proposed endangered plant species (USFWS 2019) were found during the survey in either area. In terms of conservation value, no botanical resources requiring special protection are present.

Figure 5. Vegetation Types on/near Project Site

During three visits in April 2019, we observed primarily non-native birds – abundant Japanese white-eyes (*Zosterops japonicus*) and common mynas (*Acridotheres tristis*), as well as northern cardinals (*Cardinalis cardinalis*), house finches (*Haemorhous mexicanus*), yellow-fronted canaries (*Serinus mozambicus*), saffron finches (*Sicalis flaveola*), spotted doves (*Spilopelia chinensis*), striped doves (*Geopilia striata*), and house finches (*Carpodacus mexicanus*). The only native bird observed was a Hawaiian hawk (*Buteo solitarius*) flying above the property. This listed endangered bird is very commonly seen in forest, agricultural areas, and even towns throughout East Hawai‘i. It is unlikely that many other species of native forest birds would be expected to use the project site due to its low elevation, alien vegetation and lack of adequate forest resources. However, it is not inconceivable that Hawai’i ‘amakihi (*Hemignathus virens*) are sometimes present, as some populations of this native honeycreeper appear to have adapted to the mosquito-borne diseases of the Hawaiian lowlands. The common migratory shorebird Pacific golden-plover (*Pluvialis fulva*), which is often seen inland in grassy areas, may occasionally be present.

Table 1. Plant Species List on Project Site

Scientific Name	Family	Common Name	Life Form	Status
Acacia confusa	Fabaceae	Formosan Koa	Tree	A
Adiantum hispidulum	Pteridaceae	Rough Maidenhair	Fern	A
Ageratum conyzoides	Asteraceae	Ageratum	Herb	A
Alpinia zerumbet	Zingiberaceae	Shell Ginger	Herb	A
Alstonia macrophylla	Apocynaceae	Devil Tree	Tree	A
Ardisia elliptica	Myrsinaceae	Shoebutton Ardisia	Tree	A
Arundina graminifolia	Orchidaceae	Bamboo Orchid	Herb	A
Asplenium sp.	Aspleniaceae	Asplenium	Fern	I (?)
Asplenium nidus	Aspleniaceae	‘Ēkaha	Fern	I
Begonia reniformis	Begoniaceae	Grape-leaf Begonia	Herb	A
Blechnum appendiculatum	Blechnaceae	Blechnum	Fern	A
Buddleia asiatica	Buddleiaceae	Dog Tail	Shrub	A
Bulbostylis capillaris	Cyperaceae	Bulbostylis	Sedge	A
Castilleja arvensis	Scrophulariaceae	Indian Paintbrush	Herb	A
Cecropia obtusifolia	Cecropiaceae	Cecropia	Tree	A
Chamaecrista nictitans	Fabaceae	Partridge Pea	Herb	A
Chloris sp.	Poaceae	Chloris	Herb	A
Cibotium glaucum	Dicksoniaceae	Hapu‘u Pulu	Fern	E
Citharexylum spinosum	Verbenaceae	Fiddlewood	Tree	A
Citrus sp.	Rutaceae	Citrus	Tree	A
Clidemia hirta	Melastomataceae	Koster’s Curse	Shrub	A
Clusia rosea	Clusiaceae	Autograph Tree	Tree	A
Crotalaria pallida	Fabaceae	Rattlepod	Herb	A
Cucurbita pepo	Cucurbitaceae	Squash	Vine	A
Cuscuta sandwichiana	Cuscutaceae	Kaunaoa	Vine	E
Cuphea carthagenensis	Lythraceae	Tarweed	Herb	A
Cyclosorus dentatus	Thelypteridaceae	Downy Wood Fern	Fern	A
Cyperus halpan	Cyperaceae	Cyperus	Herb	A
Desmodium cajanifolium	Fabaceae	Desmodium	Shrub	A
Desmodium triflorum	Fabaceae	Desmodium	Herb	A
Dicranopteris linearis	Gleicheniaceae	Uluhe	Fern	I
Digitaria sp.	Poaceae	Digitaria	Herb	A
Dioscorea pentaphylla	Dioscoreaceae	Ho‘i	Vine	A
Dissotis rotundifolia	Melastomataceae	Dissotis	Herb	A
Dracaena massangeana	Agavaceae	Corn Plan	Tree	A
Drymaria cordata	Caryophyllaceae	Pipili	Herb	A
Emilia sonchifolia	Asteraceae	Pualele	Herb	A
Epidendrum sp.	Orchidaceae	Epidendrum	Herb	A
Epipremnum aureum	Araceae	Pothos	Vine	A
Eragrostis tenella	Poaceae	Lovegrass	Herb	A
Erechtites hieracifolia	Asteraceae	Fireweed	Herb	A
Euphorbia hirta	Euphorbiaceae	Garden Spurge	Herb	A
Euphorbia hypericifolia	Euphorbiaceae	Graceful Spurge	Herb	A
Falcataria moluccana	Fabaceae	Albizia	Tree	A

Table 1, continued				
Scientific Name	**Family**	**Common Name**	**Life Form**	**Status**
Ficus microcarpa	Moraceae	Banyan	Tree	A
Fimbristylis dichotoma	Cyperaceae	Fimbristylis	Herb	I
Hedychium sp.	Zingiberaceae	Ginger	Herb	A
Hibiscus rosa-sinensis	Malvaceae	Hibiscus	Shrub	A
Hyptis pectinata	Lamiaceae	Comb Hyptis	Shrub	A
Justicia betonica	Acanthaceae	White Shrimp Plant	Shrub	A
Lantana camara	Verbenaceae	Lantana	Shrub	A
Lepisorus thunbergianus	Polypodiaceae	Pleopeltis	Fern	I
Macaranga mappa	Euphorbiaceae	Bingabing	Tree	A
Macaranga tanarius	Euphorbiaceae	Parasol Leaf Tree	Tree	A
Machaerina sp.	Cyperaceae	Machaerina	Herb	I
Macroptilium lathyroides	Fabaceae	Cow Pea	Herb	A
Mangifera indica	Anacardiaceae	Mango	Tree	A
Megathyrsus maximus	Poaceae	Guinea Grass	Herb	A
Melastoma sp.	Melastomataceae	Melastoma	Shrub	A
Melinis minutiflora	Poaceae	Molasses Grass	Herb	A
Melinis repens	Poaceae	Natal Redtop	Herb	A
Melochia umbellata	Sterculiaceae	Melochia	Tree	A
Metrosideros polymorpha	Myrtaceae	‘Ōhi‘a	Tree	E
Miconia calvescens	Melastomataceae	Miconia	Tree	A
Mimosa pudica	Fabaceae	Sleeping Grass	Herb	A
Momordica charantia	Cucurbitaceae	Balsam Pear	Vine	A
Monstera deliciosa	Araceae	Monstera	Vine	A
Musa sp.	Musaceae	Banana	Herb	A
Nephrolepis multiflora	Nephrolepidaceae	Sword Fern	Fern	A
Oplismenus hirtellus	Poaceae	Basket Grass	Herb	A
Paederia foetida	Rubiaceae	Maile Pilau	Vine	A
Pandanus tectorius	Pandanaceae	Hala	Tree	I
Paspalum conjugatum	Poaceae	Hilo Grass	Herb	A
Paspalum urvillei	Poaceae	Vasey Grass	Herb	A
Passiflora edulis	Passifloraceae	Passion Fruit	Vine	A
Pennisetum purpureum	Poaceae	Napier Grass	Herb	A
Phaius tankervilleae	Orchidaceae	Chinese Ground Orchid	Herb	A
Phlebodium aureum	Polypodiaceae	Hare’s Foot Fern	Fern	A
Phymatosorus grossus	Polypodiaceae	Maile Scented Fern	Fern	A
Pityrogramma calomelanos	Pteridaceae	Silver Back Fern	Fern	A
Pluchea carolinensis	Asteraceae	Sourbush	Shrub	A
Polygala paniculata	Polygalaceae	Milkwort	Herb	A
Psidium cattleianum	Myrtaceae	Strawberry Guava	Tree	A
Psidium guajava	Myrtaceae	Guava	Tree	A
Psilotum nudum	Psilotaceae	Moa	Fern Ally	I
Pteris cretica	Pteridaceae	‘Oali	Fern	I
Pycreus polystachyos	Cyperaceae	Sedge	Herb	I

Table 1, continued				
Scientific Name	**Family**	**Common Name**	**Life Form**	**Status**
Ricinus communis	Euphorbiaceae	Castor Bean	Tree	A
Sacciolepis indica	Poaceae	Glenwood Grass	Herb	A
Schefflera actinophylla	Araliaceae	Octopus Tree	Tree	A
Schinus terebinthifolius	Anacardiaceae	Christmas Berry	Shrub	A
Scleria testacea	Cyperaceae	Nutgrass	Herb	I
Spathodea campanulata	Bignoniaceae	Africa Tulip	Tree	A
Sphagneticola trilobata	Asteraceae	Wedelia	Herb	A
Sphenomeris chinensis	Lindsaeaceae	Pala‘a	Fern	I
Sporobolus indicus	Poaceae	Smutgrass	Herb	A
Stachytarpheta jamaicensis	Verbenaceae	Jamaica Vervain	Herb	A
Synedrella nodiflora	Asteraceae	Nodeweed	Herb	A
Terminalia catappa	Combretaceae	False Kamani	Tree	A
Tetrazygia bicolor	Melastomataceae	Tetrazygia	Tree	A
Tibouchina herbacea	Melastomataceae	Cane Tibouchina	Shrub	A
Trema orientalis	Ulmaceae	Gunpowder Tree	Tree	A
Urochloa mutica	Poaceae	California Grass	Herb	A

A = alien, E = endemic, I = indigenous

As with all of East Hawai‘i, several other endangered native terrestrial vertebrates may be present in the general area and may overfly, roost, nest, or utilize resources of the project site. These include the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), the endangered Hawaiian petrel (*Pterodroma sandwichensis*), the endangered band-rumped storm petrel (*Oceanodroma castro*), and the threatened Newell’s shearwater (*Puffinus auricularis newelli*).

Aside from bats, the other mammals in the project area are all introduced species, including feral cats (*Felis catus*), feral pigs (*Sus scrofa*), mongooses (*Herpestes* spp.) and various species of rats (*Rattus* spp.). Several species of non-native reptiles and amphibians may also be present. None are of conservation concern and all are deleterious to native flora and fauna.

Impacts and Mitigation Measures

No rare, threatened or endangered plant species are present. The project site is dominated by alien vegetation, with a few scattered, isolated ‘ōhi‘a trees; the only native vegetation on the property are a few small, scattered hala stands. Construction and use of the quarry would destroy some common native plants, but it would not affect rare, threatened or endangered plants, nor would it intrude into a sensitive native ecosystem.

An issue for construction in properties with ‘ōhi‘a trees has recently surfaced. Two species of fungus called *Ceratocystis lukuohia and C. huliohia* produce a disease that is new to science and new to Hawai‘i – Rapid ‘Ōhi‘a Death (ROD) (Hawai‘i DOFAW 2017). This disease has killed hundreds of thousands of ‘ōhi‘a trees across more than 34,000 acres of the Big Island. It was first discovered in Lower Puna. Although the proposed quarry area is overwhelmingly vegetated with

non-native, invasive trees, some isolated ‘ōhi‘a trees are present in the area planned for quarrying. Projects that harm or relocate ‘ōhi‘a trees can spread the disease, and certain mitigation measures are recommended, although it is important to recognize that treatment protocols are evolving. The following mitigation protocol is proposed and has been supplied to DOFAW for comment as part of the Draft EA review process:

- Prior to clearing the edges of the quarry, any isolated ‘ōhi‘a trees on the boundary will be identified. Any such trees that are not planned for removal on the edges of the quarry will be protected from disturbance entirely or cut and chipped or buried to ensure that they do not present a ready target for ROD infection that could spread to other trees;
- Treat any unavoidable scars on ‘ōhi‘a trees that result from clearing to prevent infestation of the fungus;
- Stack all removed ‘ōhi‘a trees and dispose of by burying or chipping; do not remove from project site. Decontaminate boots and work tools before and after working in an area with ‘ōhi‘a trees;
- Implement any other recommendations imposed as part of the CDUP.

As noted in the DOFAW letter in response to early consultation (see Appendix 1a), another concern for the movement of products is the spread of invasive species, particularly little fire ants and coqui frogs, both of which are rampant in the general area. Coqui frogs are generally not present in the areas actively being quarried and in any case area do not survive the quarrying, transport, and crushing process. Yamada and Sons specifically works to keep the entire operation as free of fire ants as possible, conducting perimeter inspection and treatment, active quarry area treatment and finished product inspection and treatment. Because of this, they have been able to supply crushed rock for use in sensitive areas such as Hawai‘i Volcanos National Park. The Draft EA was to DOFAW and the Big Island Invasive Species Council for comment as part of the Draft EA review process in order to solicit comment and potential additional measures that could reasonably be adopted.

In order to avoid impacts to the endangered but regionally widespread terrestrial vertebrates listed above, Yamada and Sons will commit to several conditions. Specifically, construction will refrain from activities that disturb or remove shrubs or trees taller than 15 feet between June 1 and September 15, when Hawaiian hoary bats may be sensitive to disturbance. If landclearing occurs between the months of March and September, inclusive, a pre-construction hawk nest search by a qualified ornithologist using standard methods will be conducted. If Hawaiian hawk nests are present, no land clearing will be allowed until October, when hawk nestlings will have fledged. Finally, the quarry would agree to shield any exterior lighting from shining upward, in conformance with Hawai‘i County Code § 14 – 50 et seq., to minimize the potential for disorientation of seabirds.

3.1.4 Air Quality, Noise, and Scenic Resources

Environmental Setting

The entire State of Hawai‘i is located within an attainment area (i.e., meeting federal ambient air quality standards), as defined in the Clean Air Act, in accordance with the State Implementation Plan. Air quality in the area is generally excellent, due to its rural nature and minimal degree of human activity, although vog from Kilauea volcano is occasionally blown into this part of the island when this volcano is erupting, which it currently is not. Even during eruptions, the persistent trade winds keep the project area relatively free of vog for most of the year. Nearby quarrying activities generate some dust, which is generally confined to the quarries or immediate areas because of their presence below the elevation of the surrounding land, flanked by dense vegetation.

Noise on the project site is moderate to periodically high due to nearby quarrying activities, the Hilo International Airport, the Mass Transit baseyard, activities at the South Hilo Sanitary Landfill and associated facilities, and a nearby skeet range.

The site is not generally accessible to the public, and no important viewplanes or scenic sites recognized in the Hawai‘i County General Plan are present in the area.

Impacts and Mitigation Measures

Quarrying activities involve excavation, blasting, milling of materials, and the operation of multiple units of heavy equipment. These activities frequently generate noise exceeding 95 decibels at times. However, the nearest homes are about a half mile away to the west, where noise from the nearby elevated landfill and the airport has been a much greater factor than the more distant and sunken quarries. There are no other sensitive receptors near the proposed project site, which instead is surrounded by other quarries, solid waste facilities, a drag strip, a shooting range, and an airport. Because of the topography and nature of quarrying on this landscape, which occurs in a pit that deepens over time as materials are excavated, amidst a dense forest, quarry noise is generally confined to existing quarries and their immediate environment. In fact, Yamada’s quarrying of their existing license area adjacent to the project site will soon cease because of the depletion of appropriate rock and the proposed project will effectively relocate quarrying activities even farther away from sensitive receptors. Because of this context, no noise impacts are expected.

Quarrying activities also have to potential to produce fugitive dust emissions. Mitigation for dust generated during initial clearing operations would be part of the Best Management Practices described above in Section 3.1.2. Water trucks for spraying are available during unusually dry periods, during which operations may generate dust. Offsite dust at the existing crushing location is mitigated for by Best Management Practices that are part of permit conditions for the covered and non-covered source permits presently held by Yamada and Sons for rock crushing and milling equipment. These include, e.g., water sprayers at the crusher. These conditions will

continue to be in place for the new quarry. Yamada and Sons have also periodically cleaned the road of mud left by large vehicle tires, thus avoiding dust generation as the mud dries.

Removal of vegetation (primarily invasive trees) would be required in order to quarry the property. As the general area is already the site of industrial activities including quarrying, these modifications would be in character with adjacent properties. No important viewplanes or scenic sites recognized in the Hawai‘i County General Plan would be affected.

3.1.5 Hazardous Substances, Toxic Waste and Hazardous Conditions

Existing Conditions

Although much of the area appears to have been surface quarried and/or used for stockpiling and marshalling yards in the past, and very minor amounts of trash are present in a few locations, the land use history and site reconnaissance do not suggest the presence of hazardous materials. State databases did not indicate any Underground Storage Tanks (USTs), Leaking Underground Storage Tanks (LUSTs), or records of incidents or releases on the project site or in surrounding properties (https://eha-cloud.doh.hawaii.gov/iheer/#!/viewer).

The South Hawai‘i Sanitary Landfill, which is currently preparing for imminent closure, is located about a half mile northwest.

Impacts

Informal inspection has shown that is unlikely that any potentially hazardous, toxic or radioactive waste would be found on the project site. Reasonable precautions will be undertaken in the context of the project construction Best Management Practices to include provisions for the appropriate reporting to the State and readiness for response and remediation should any such hazardous, toxic, or radioactive material be encountered during the construction phase of the project.

The landfill and other solid waste operations in the vicinity pose no health or safety risks to quarry operations, and the proposed quarry would not affect solid waste operations (several quarries separate the two sites). The landfill is slated within the next year to begin the year-long official closure process. Transportation, storage, and use of hazardous materials at the proposed quarry would may require the following:

- Compliance with applicable federal regulations, including 55 CFR Title 27 (implementing Title XI of the Organized Crime Control Act of 1970) regulating interstate commerce in explosives;
- Licensing for personnel using explosives by the State Department of Labor & Industrial Relations, Occupational Safety & Health Division (DOSH);
- Compliance with applicable State Department of Transportation regulations concerning transportation of hazardous materials on public roadways;

- Compliance with conditions of a generator permit from the State Department of Health, in the case of the non-exempt generation of hazardous waste;
- Compliance with the hazardous material transportation, storage and disposal (TSD) requirements of the Resource Conservation and Recovery Act (RCRA); &
- Compliance with applicable OSHA regulations.

Compliance with the requirements of the above permits, regulations, and licenses will minimize the risk of release of hazardous materials and the risk to workers and the general public.

3.2 Socioeconomic and Cultural

3.2.1 Socioeconomic Characteristics

The project would affect and benefit Hilo and, more generally, East Hawai‘i. Table 2 shows socioeconomic characteristics of Hilo and the County of Hawai‘i from the 2010 U.S. census.

Impacts

The proposed project would have a positive economic impact for Hawai‘i County, particularly in that it would provide essential material for both public and private projects as well as continuing employment for Yamada and Sons employees and businesses dependent upon a steady supply of rock products. The project would also provide revenue for the State of Hawai‘i, through leasing and royalties for material extracted.

The closest current or proposed residential area is the Pana‘ewa Farm Lots, about 2,200 feet to the west. The project was sited to keep former quarries, the current landfill, the Mass Transit baseyard, the County dragstrip, the skeet range, and the airport between itself and any nearby residential or farm lot areas. No adverse effects to any neighborhoods or any residential, recreational, or commercial uses would occur.

Table 2: Selected Socioeconomic Characteristics of Hilo

SUBJECT	NUMBER	PERCENT
SEX AND AGE		
Total population	43,263	100.0
Median age (years)	40.5	(X)
16 years and over	35,193	81.3
65 years and over	7,807	18.0
85 years and over	1,382	3.2
RACE		
Total population	43,263	100.0
One Race	29,199	67.5
White	7,617	17.6
Black or African American	227	0.5
American Indian and Alaska Native	132	0.3
Asian	14,833	34.3
Asian Indian	49	0.1
Chinese	645	1.5
Filipino	2,637	6.1
Japanese	9,550	22.1
Korean	419	1.0
Native Hawaiian	4,467	10.3
Two or More Races	14,064	32.5
Black or African American alone	198	0.5
American Indian and Alaska Native alone	82	0.2
Asian alone	14,450	33.4
Native Hawaiian and Other Pacific Islander alone	5,771	13.3
Some Other Race alone	51	0.1
Two or More Races	11,316	26.2
HOUSEHOLDS BY TYPE		
Total households	15,483	100.0
Family households (families)	10,287	66.4
With own children under 18 years	3,766	24.3
Husband-wife family	7,034	45.4
With own children under 18 years	2,307	14.9
Male householder, no wife present	975	6.3
With own children under 18 years	432	2.8
Female householder, no husband present	2,278	14.7
With own children under 18 years	1,027	6.6

Source: U.S. Census Bureau

3.2.2 Cultural and Historic Resources

A cultural impact assessment of the proposed action and an archaeological inventory survey of the project site were conducted by ASM Affiliates, Inc. The reports are attached as Appendices 2 and 3, respectively, and are summarized in this section. Research for the reports included primary fieldwork, review of archaeological and ethnographical studies and also primary documents including maps and Mahele testimony, and consultation of informants. In the interest of readability, the summary below does not include all scholarly references; readers interested in extended discussion and sources may consult these appendices. Separately, the Office of Hawaiian Affairs, the Keaukaha-Panaʻewa Farmers Association, and the Sierra Club were also consulted by mail as part of the EA to determine whether they had any information on natural or cultural resources that might be present or affected.

Existing Environment

The project site area is situated in the Panaʻewa forest region in Waiākea Ahupuaʻa along the eastern coast of Hawaiʻi Island, within the present-day district of South Hilo, and the traditional *moku* (district) of Hilo, one of six *moku* of Hawaiʻi Island. As described by Handy and Handy:

> Hilo as a major division of Hawaiʻi included the southeastern part of the windward coast most of which was in Hamakua, to the north of Hilo Bay. This, the northern portion, had many scattered settlements above streams running between high, forested kula lands, now planted with sugarcane. From Hilo Bay southeastward to Puna the shore and inland are rather barren and there were few settlements. The population of Hilo was anciently as now concentrated mostly around and out from Hilo Bay... (1991:538)

Traditionally, the *moku* of Hilo was divided into three *ʻokana* (land divisions) with place names that have their origins in legendary times. The three divisions are (from north to south): Hilo Palikū, Hilo One, and Hilo Hanakahi. The location of the project site coincides best with Hilo Hanakahi or "Hilo [land of] chief Hanakahi" (Pukui and Elbert 1986:129), which extends from the Wailoa River to include Keaukaha. According to Pukui et al. (1974:220), the name Waiākea literally translates as "broad waters," likely a reference to the bays and freshwater streams and rivers that water this land. Theodore Kelsey, who conducted ethnographic research in Hilo in 1921, however, suggests (in Maly 1996:6) that "Waiākea was so named ʻbecause you could dig anywhere and find water," but Maly (1996:11) alternatively suggests that "The lands of Waiākea were named for the high chief Waiākea-nui-kumuhonua, the brother of Piʻihonua-a-ka-lani [k] and Panaʻewa-nui-moku-lehua [w]."

The abundant marine resources of Hilo Bay, extensive spring-fed fishponds and waterfowl, and wetland and dryland agricultural resources sustained the population of the *moku* of Hilo, and it was to this general environmental setting that the first Polynesians in Hawaiʻi arrived. Over generations they shaped and utilized the natural environment to provide all they needed for sustenance and survival. In the process they created a uniquely Hawaiian culture that was wholly adapted to the environment. The chronological summary presented below begins with the peopling of the Hawaiian Islands and includes the presentation of a generalized model of

Hawaiian Prehistory and a discussion of the general settlement patterns for South Hilo. This discussion is followed by a brief sampling of the legends and *moʻolelo* (stories) of the area to supplement the understanding of potential cultural resources and practices. This is followed by a summary of Historic-era events in the district that begins with the arrival of foreigners in the islands and then continues with the history of land use in South Hilo after contact. The summary includes a discussion of the changing lifeways and population decline of the early Historic Period, a review of land tenure in the study *ahupuaʻa* during the *Māhele ʻĀina* of 1848, the transition to the commercial sugar industry from the last quarter of the nineteenth century into the twentieth century, and finally the development of the Hawaiian Homestead community within Panaʻewa. This information, coupled with the review of the findings of previously conducted archeological studies discussed in Appendix 3, provided a means for predicting the types and significance of archaeological features that might be found here, as well as a foundation for analysis of cultural resources.

The first inhabitants of Hawaiʻi were believed to be settlers who had undertaken difficult voyages across the open ocean. For many years, researchers have proposed that early Polynesian settlement voyages between Kahiki (the ancestral homelands of the Hawaiian gods and people) and Hawaiʻi were underway by A. D. 300, although recent work suggests that Polynesians may not have arrived in Hawaiʻi until at least A. D. 1000 (Kirch 2012).

The initial inhabitants of Hawaiʻi are believed to have come from the southern Marquesas Islands and settled initially on the windward side, eventually expanding to leeward areas. Early Hawaiian farmers developed new strategies and tools for their new environment. Societal order was maintained by their traditional philosophies and by the conical clan principle of genealogical seniority. Universal Polynesian customs brought from their homeland included the observance of major gods Kane, Ku, and Lono, the *kapu* system of law and order; cities of refuge and the concepts of *mana* and *ʻaumakua*.

The Development Period, believed under Kirch's new concept to have occurred from A. D. 1100 to 1350, brought an evolution of traditional tools, including a variation of the adze (*koʻi*), and some new Hawaiian inventions such as the two-piece fishhook and the octopus-lure breadloaf sinker. That was followed by the Expansion Period (A. D. 1350 to 1650), which saw greater social stratification, intensive land modification, and population growth. This was also the era of the second major migration to Hawaiʻi, this time from Tahiti. Also established during this period was the *ahupuaʻa*, a land-use concept that incorporated all of the eco-zones from the mountains to the shore and beyond. The nominally wedge-shaped *ahupuaʻa* provided a diverse subsistence resource base and added another component to what was already becoming a well-stratified society.

Ahupuaʻa were ruled by *aliʻi ʻai ahupuaʻa* or lesser chiefs and managed by a *konohiki*. *Aliʻi* and *makaʻainana*, or commoners, were not confined to the boundaries of *ahupuaʻa* as resources were shared when a need was identified. *Ahupuaʻa* were further divided into smaller sections such as *ʻili, moʻoʻaina, paukuʻaina, kihapai, koele, hakuone* and *kuakua*. The chiefs of these land units had their allegiance to a territorial chief or *moʻi* (literally translated as king). Waiākea, one of the largest *ahupuaʻa* in all the Hawaiian Islands, stretches from the eastern shores of Hilo Bay up the

slopes of Mauna Loa to an elevation of 6,000 feet and is markedly broader than its neighboring *ahupuaʻa* to the north. As Waiākea Ahupuaʻa encompasses both *mauka* agricultural and forest resources and *makai* fisheries, residents were once able to procure nearly all that they needed to sustain their families and contribute to the larger community from within the land division.

As cultivation extended inland, population growth ensued, as did political and social stresses. During the Proto-Historic Period (A. D. 1650-1795), wars reflective of a complex and competitive social environment are evidenced by *heiau* building. During this period, sometime during the reign of Kalaniopuʻu (A. D. 1736-1758), Kamehameha I was born in North Kohala.

Historical accounts (McEldowney 1979) place the project site in a zone of agricultural productivity, where patches of forest were burned to create an open plain for planting crops such as taro, bananas, sugarcane, breadfruit, and *kukui*, and where scattered dwellings were also present. Handy and Handy (1972) also describe the general region as an agricultural area:

> "On the lava strewn plain of Waiākea and on the slopes between Waiākea and Wailuku River, dry taro was formerly planted wherever there was enough soil. There were forest plantations in Panaewa and in all the lower fern-forest zone above Hilo town along the course of the Wailuku River" (Handy and Handy 1972:539).

McEldowney (1979:20-21) noted that the Panaʻewa forest extended *makai* almost as far as the sea in the early 1800s. This reinforces the idea that rather than large-scale burning to remove forests to provide land for crops as practiced in other parts of Waiākea, farming was conducted in small clearings within the Panaʻewa forest. Nineteenth century maps reproduced in Appendix 3 show the project area *mauka* of the "hala forest" section of the Panaʻewa forest.

Maly (1996a:A-6) translates the name Panaʻewa to mean "crooked or unjust place". The following Hawaiian proverbs recorded by Pukui (1983) recorded the poetic expression of how the ʻōhiʻa lehua blossoms from the Panaʻewa forest would fall into the ocean in great numbers, indicating that this celebrated forest extended to the coast.

> *He kai lū lehua ko Panaʻewa.*
> Panaʻewa shakes down the lehua fringes into the sea.
> Once, when the forest of Panaʻewa extended to the sea, fringes of *lehua* blossoms were seen floating about in the water. (ibid.:74)
>
> *Ke kai kuaʻau lehua o Panaʻewa.*
> The sea where lehua fringes float about in the shallows.
> Long ago, when *lehua* tree grew down to the shore at Puna and Hilo, the fringes of the flower often fell into the sea, reddening the surface. (ibid.:186)

Ethnographer Abraham Fornander noted that Waiākea was known for a specific type of *ʻōhiʻa* called ʻōhiʻa puakea (white-blossom *lehua*), which was named after a beautiful maiden, Puakea,

who lived in Waiākea. In describing the characteristics and traditional uses of this unique type of ʻōhiʻa, Fornander (1918–1919:621–622) wrote:

> This tree has white flowers, and its fruit is also white when it is ripe; it is palatable when eaten. It has one round seed split in two parts; the birds are fond of the nectar of its flowers. The bird snarers used the branches on which the flowers were thick to put their gum on, and when a bird was caught the snarer would call out, "Snared, snared is my bird." The bird must be secured as quickly as possible. Its trunk, as also its branches, is used for firewood.

Although renowned for its extensive and tall stands of ʻōhiʻa lehua, Panaʻewa is also celebrated in many traditional poetic compositions for its *maile* (*Alyxia stellata*), hala (*Pandanus tectorius*), and *ʻ*awa (*Piper methysticum*) that grew in the trees, and an array of native birds. Pukui (1983) retold *ʻōlelo noʻeau* of native species used by the people:

> *Lei Hanakahi i ka ʻala me ka onaona o Panaʻewa.*
> Hanakahi is adorned with the fragrance and perfume of Panaʻewa.
> The forest of Panaʻewa was famous for its *maile* vines and *hala* and *lehua* blossoms, well liked for making *lei*, so Hilo (Hanakahi) was said to be wreathed with fragrance. (ibid:212)
>
> *Na manu leo nui o Panaʻewa.*
> Loud-voiced birds of Panaʻewa.
> Loud talkers. Panaʻewa, Hilo, was famous for its *lehua* forests that sheltered the honey-sucking birds. Here people went to gather *lehua* and *maile*. (ibid.:247)

Reference to the mystical and potent *ʻawa* of Panaʻewa is described in the account of Keaunini (Westervelt 1915). After receiving orders from his brother, Ke-au-miki was sent to fetch small black and white pebbles from Hāʻena in Keaʻau, Puna and *ʻawa* from Panaʻewa. In describing the ʻawa of Panaʻewa, Ke-au-miki's brother explained:

> Get thirteen stones—seven white and six black. Make them fast in a bundle, so they cannot be lost, then come back by Panaʻewa and get awa…which man did not plant, but which was carried by the birds to the trees and planted there.

Ke-au-miki, with his supernatural powers, hastened over the lands of Hāmākua and arrived at Wailuku River where he defeated the *kupua* (demigod) that attempted to block his pathway over the river. Having arrived at Pa-ai-ie [Pāʻieʻie] in Waiākea, Ke-au-miki began his search for the objects that were requested by his brother.

> Then Ke-au-miki rushed over the river and up the precipices, speeding along to Pa-ai-ei, where the long ohia point of Pana-ewa is found, then turned toward the sea and went to Haena, to the place where the little stones aala-manu are found. He picked up the stones and ran to Pana-ewa and got the awa hanging on the tree, tied up the awa and stones and hurried back.

Unfortunately, disturbance on the project site along with rampant growth of invasive species has removed all such valuable flora from the area with the exception of ʻōhiʻa and hala, which are found in a few locations.

Appendix 3 contains a number of *moʻolelo* of the area involving diverse characters including Pele, her sister Hiʻiaka, and fearsome *moʻo* or dragon-like lizards. Other tales compiled by Maly and Maly (2006:13) tell the story of two supernatural brothers:

> … Ka-Miki (The quick, or adept, one) and Maka-ʻiole (Rat [squinting] eyes), who traveled around the island of Hawaiʻi along the ancient ala loa and ala hele (trails and paths) that encircled the island. During their journey, the brothers competed in contests alongside the trails they traveled, and in famed kahua (contest arenas) and royal courts, against ʻōlohe (experts skilled in fighting or in other competitions, such as running, fishing, debating, or solving riddles, that were practiced by the ancient Hawaiians). They also challenged priests whose dishonorable conduct offended the gods of ancient Hawaiʻi. Ka-Miki and Maka-ʻiole were empowered by their ancestress, Ka-uluhe-nui-hihi-kolo-i-uka (The great entangled growth of uluhe fern which spreads across the uplands), a body-form of the goddess Haumea (the creative force of nature—also called Papa and Hina—who was a goddess of priests and competitors).

Fornander's (1918–1919) *Legend of Halemano* described the forested lands of Panaʻewa as the place where Halemano and his wife, Kamalālāwalu set up their home before she was taken by Huaʻā, a chief from Puna. A portion of the story describes their time in Panaʻewa:

> They went from Kohala to Waimea where they spend the night; from this place they continued to Hamakua and spent the night at Kaumoali; from this place they proceeded on to Uluomalama in Waiakea, Hilo Hanakahi where they staid [*sic*]. After living in this place for twenty days, Huaa the king of Puna, heard that Kamalalawalu was in Hilo, so he sent a messenger to Kamalalawalu and she was taken to the king of Puna. When she was being taken by the messenger of Huaa, she instructed her brother Kumukahi to take good care of Halemano.

After Kamalālāwalu was enticed away from her husband and taken captive by Huaʻā, Halemano yearns for her. He is consumed by sorrow and despair dies, only to be brought back to life again by his supernatural sister, Laenihi. Desperate to bring his wife back, Halemano engages his wife in the game of *kilu*. As they play, Halemano attempts to woo her by invoking memories of their time together at Uluomalama and utters a poetic chant describing their home being in Panaʻewa.

Traditional life in Hawaiʻi' took a sharp turn on January 18, 1778 with the arrival of British Capt. James Cook in the islands. During Cook's return trip to Hawaiʻi ten months later, Kamehameha visited Cook aboard his ship the *Resolution* off the east coast of Maui and helped Cook navigate his way to Hawaiʻi Island. Cook exchanged gifts with Kalaniopuʻu at Kealakekua Bay the following January and attempted to leave Hawaiʻi in February. However, his ship immediately sustained damage to a mast in a severe storm off Kohala and returned to Kealakekua, setting the stage for his death on the shores of the bay.

Hilo was one of the largest settlements on the Island of Hawai‘i, and also an area frequented by the *ali‘i*. Captain George Vancouver, an early European explorer who met with Kamehameha I at Waiākea in 1794, recorded that Kamehameha was there preparing for his invasion of the neighbor islands, and that Hilo was an important center because his *peleleu* fleet of 800 canoes was being built there. The people of Hilo had long planned for Kamehameha's arrival and had collected many hogs and a variety of plant foods to feed the ruler and his large retinue. The people of Hilo may have actually prepared for a year prior to Kamehameha's visit and expanded their fields into the open lands behind Hilo to accommodate the increased number of people that would be present.

The early 1800s heralded a new era in Hilo marked by rapid change. During the first two decades, sandalwood began to be harvested and shipped from Hilo Bay, and whaling ships stopping for supplies became common sights. Some of the earliest written descriptions of Hilo come from the accounts of the first Protestant Missionaries to visit the island, who noted the beauty and fertility of the region. In 1823, British missionary William Ellis and members of the American Board of Commissioners for Foreign Missions (ABCFM) toured the island of Hawai‘i seeking out communities in which to establish church centers for the growing Calvinist mission. Ellis recorded observations made during this tour in a journal. He described Waiākea as a well-watered place with some of the heaviest rains and densest fog he had encountered on the island (Ellis 1963). He considered the inhabitants lucky because of their access to well-stocked fishponds, fertile soil, and nearby woods as a source of timber. He estimated that at least 2,000 inhabitants lived in nearly 400 houses clustered along and behind the beach.

Between 1824 and 1848, Hilo became a significant center for the growing population of foreigners. Many were associated with the new stations of American missionaries, the first of which was located within the *‘ili* of Pi‘opi‘o near the bayfront. The first vocational school in what is now the United States was established in Hilo in 1837. Measles and smallpox epidemics decimated the local population and led to a consolidation of settlement along the northern half of the bay.

The *Mahele ‘Aina* took place in 1848, placing all land in Hawai‘i into three categories: Crown Lands, Government Lands and Konohiki Lands. Ownership rights were "subject to the rights of the native tenants," or those individuals who lived on the land and worked it for their subsistence and for their chiefs. Native tenants could claim and acquire title to *kuleana* parcels that they actively lived on or farmed at the time of the Māhele. The Kuleana Act of December 21, 1849 provided the framework by which native tenants could apply for and receive fee-simple interest in their *kuleana* lands from the Land Commission. The Board of Commissioners oversaw the program and administered the lands as Land Commission Awards (LCAw.).

Waiākea Ahupua‘a became part of Kamehameha I's personal land holdings. As a result of the *Mahele* in 1848, nearly all land in this *ahupua‘a* became Crown Lands (for the occupant of the throne). According to Moniz (n.d.:12) 26 *kuleana* claims were registered for lands in Waiākea; most of them were located along fishponds or major inland roads, and none were in the immediate vicinity of the proposed quarry site. Following the *Mahele,* Kamehameha IV leased

large portions of Waiākea (not including the project site) to outside interests for the production of sugar.

A pier built in 1863 near the mouth of the Wailuku River became the focus for trade and commerce. During this time, Hilo Bay was the third most frequented port in Hawai‘i for whaling vessels needing repairs and re-provisioning. Fertile uplands, plentiful water supply, and a good port helped Hilo become a major center for sugarcane production and export, which spanned the era from the 1850s to the 1990s. An important sugarcane center was Waiākea, the site of Waiākea Mill Company and hub of infrastructure. Railroad tracks extended into Puna and Hāmākua across the bayfront (where Bayfront Highway is now aligned), with bridges over the Wailoa and Wailuku Rivers, wharves at Waiākea, and a roundhouse near Ho‘olulu Complex. Construction of the Hilo Breakwater on Blonde Reef took place between 1908 and 1929.

The Pana‘ewa area was very rocky and not utilized for sugarcane or plantation infrastructure. However, by 1921, the large tracts of land within and below the Pana‘ewa forest were being recognized as a potential “agricultural and pastoral region” and it was opined that “in time to come great enterprise will be built up among the kipukas found all through the Panaewa and Puna sections of this island” (Hilo Daily Tribune, October 2, 1921, p. 1). In an effort to help Native Hawaiians maintain their traditional ties to the land, the U.S. Congress passed the Hawaiian Homes Commission Act in 1920. This law set aside approximately 200,000 acres in the Territory of Hawai‘i as a land trust for homesteading by native Hawaiians, to be administered by the Hawaiian Homes Commission. Included in this initial distribution of land were two tracts in Pana‘ewa totaling 2,000 acres located to the west of the project site. The first awarding of these Hawaiian homestead lots – the Pana‘ewa Farm Lots – occurred in the 1940s.

Although far-removed from the Hilo Bayfront, the project site has an important connection to it. On April 1, 1946, a *tsunami* triggered by an earthquake in the Aleutian Islands slammed into the Hawai‘i Island. It claimed the lives of 61 people, destroyed more than 500 buildings, and caused millions of dollars in property damage. The coastal community of Waiākea was decimated by the *tsunami*, which inundated the coast from central Hilo eastward to Keaukaha. The waves crushed numerous structures and lifted others off their foundations and swept them inland. An entire span of the Wailuku Bridge was torn out and washed away. So complete was the destruction that Waiākea Town was never rebuilt. This devastation in Hilo Bay was repeated a mere 14 years later with a tsunami from an earthquake from Chile on May 23, 1960.

Between 1962 and 1963 the County of Hawai‘i exercised eminent domain to acquire numerous parcels of land in the tsunami-affected areas of Hilo as part of the Hawai‘i Redevelopment Agency’s Kaiko‘o Project. The goal of this project was to “designate lands…for such reuse as will minimize the danger of loss of life or damage to property in areas subject to possible inundation and flooding from future seismic waves” (Hawaii Redevelopment Agency 1965:3). Project activities included acquisition of property, relocation assistance for affected residents and business owners, property management, demolition and building removal, re-zoning of land use and preparation (clearance, grading, and filling) for new development, and disposition of acquired lands by sale or lease at a fair price for new development.

The portion of TMK (3) 2-1-013:002 that contains the project site was designated as a 113.382-acre "Borrow Pit Site. Yamada and Sons, Inc., and the County of Hawai‘i also had 40-acre borrow pit sites located to the southwest of the project site, adjacent to a roughly 192-acre strip of land that was deeded to the Department of Hawaiian Home Lands (DHHL) by the State of Hawai‘i on January 8, 1962. Another 40-acre parcel of land adjacent to the northern edge of the borrow pit site eventually became the location of the South Hilo Sanitary Landfill. By 1965, quarrying activities within the Hawai‘i Redevelopment Agency borrow pit had commenced, and had intruded slightly into the northern portion of the project site. Between 1965 and 1970, the leased lands were also used to stockpile sugarcane bagasse. Five years later in 1975, Yamada and Sons reduced the amount of leasehold lands to encompass only 180 acres, of which 150 acres was used for agricultural purposes with 30 acres was being used as a quarry site. During that year, most of the leased lands were mechanically cleared and turned to pastureland.

In a seven-year span between 1970 and 1977, much of the project site appears to have been cleared of vegetation, and a 1977 orthographic photo-quadrangle indicates that quarrying activities occurring on the original borrow pit had expanded into the southwestern corner of the project site (see Figure 31 of Appendix 3). That photo also shows the road that still bisects the project site as well as a now overgrown connector road that extends northwest to southeast across the northern portion of the area of the proposed quarry site. Although activities associated with quarrying of the project site appear to have ceased by the early 1990s, as evidenced in a 1992 USGS aerial photograph (see Figure 32 of Appendix 3), quarrying activities continued and expanded on the 50 acres to the west of the project site. Additionally, that operation expanded its scope in 2007 to include the 14.99-acre "Parcel D" situated directly adjacent to the project site to the west.

Existing Resources, Archaeology and Historic Sites

Fieldwork for the archaeological study was conducted on April 23, and July 9, 12, and 23, 2019. by ‘Iolani K. Ka‘uhane, B.A., Lauren Kepa‘a, Lyle Auld, B.A., Johnny Dudoit, B.A., Ivana Hall, B.A., and Genevieve Glennon, B.A., under the direction of Principal Investigator Matthew R. Clark, M.A. Fieldwork consisted of an intensive (100% coverage) pedestrian survey of the entire project site.

As revealed in the background discussion above, the project site's location in what was once known as the Pana‘ewa forest is within a region area rich in cultural history and traditional lore. On the ground, there would have been scattered gardens and residences and collection of forest resources during the Pre-Western contact period. Intense disturbance of the project site occurred in the decades following the 1960 tsunami, when the land in and around it was designated as a borrow site and intensively cleared and surface-quarried. Previous archaeological studies have shown that while Pre-Western contact archaeological features have been identified within Pana‘ewa, they are seldom found within the highly disturbed lands surrounding the proposed quarry. As fieldwork began, it appeared highly unlikely that Pre-Western contact foot trails, habitation sites, or agricultural features, or early Historic sites such as house foundations, roads, railroad spurs, or sugarcane related infrastructure, would be encountered, as the project site was fully within the area of modern intense disturbance.

As expected in this context, the fieldwork identified no archaeological sites or other historic properties of any kind within the area. Field observation revealed abundant evidence of modern disturbance, including grubbing, grading, and quarrying activities. In addition, the intensity of the ground disturbance, combined with the results of prior studies conducted in the general area, indicate that subsurface archaeological resources are unlikely to be encountered in the area proposed for quarry development and expansion.

Impacts and Mitigation Measures to Archaeological Sites

Given the finding of no archaeological resources, the archaeologists concluded that the proposed quarry and stockpiling project would not impact any known historic properties. The determination of effect for the proposed project is "no historic properties affected." With respect to the historic preservation review process of the DLNR State Historic Preservation Division (SHPD), the archaeologists recommended that no further work needed to be conducted at the project site prior to or during project implementation. The survey was provided to SHPD for their review and comment as part of the Draft EA submittal, and the Final EA was to report on the agency's response. As of January 14, 2020, there has been no response. In the unlikely event that any unanticipated archaeological resources are unearthed during development activities, work in the immediate vicinity of the finds will be halted and SHPD contacted in compliance with HAR 13§13-280-3.

Existing Cultural Resources and Practices

As discussed above, no significant archaeological remains reflecting cultural history or supporting cultural values appear to be present due to the intense disturbance of the area. Furthermore, no caves, springs, *pu'u*, native forest groves, gathering resources or other natural features are present on or near the project site. The vegetation is highly disturbed, dominated by invasive, weedy species, and secondary growth in most areas, and does not contain the quality and quantity of resources that would be important for native gathering.

Appendix 3 details the consultation process for the cultural impact assessment, which involved a notice in the May 2019 *Ka Wai Ola* newspaper of the Office of Hawaiian Affairs (OHA), as well as email, mail, and/or phone outreach to nine individuals and three organizations. These included William Ailā from the Department of Hawaiian Home Lands; Maile Lu'uwai, President of Keaukaha-Pana'ewa Farmers Association; Patrick Kahawaiola'a, President of the Keaukaha Community Association; William Brown, President of the Pana'ewa Hawaiian Home Lands Community Association; and a representative of the Office of Hawaiian Affairs (OHA). This outreach resulted in several brief comments, referrals, or accepted interview requests.

Of the three individuals who were interviewed or supplied detailed comments, Nāko'olani Warrington stated that she has lived on Auwae Road since 1983 and has heard of folks who would gather maile lau li'i from the Pana'ewa forest, but with the expansion of houses and stores, this practice has ceased. With respect on ongoing cultural practices, Nāko'olani stated that "Taking care of our 'āina and our people/family (neighbors taking care of neighbors) since we

are indeed family here in Panaʻewa, just like those practices of old. Here also, we are constantly thinking and working towards making Railroad Avenue safe because the practice of being responsible for safety belongs to us."

Interviews with several other residents with direct experience with the Panaʻewa forest were conducted. On April 23 and July 12, 2019, Grant Kainalu "Nalu" Borges, a Panaʻewa resident and a current board member of the Keaukaha-Panaʻewa Farmers Association (KPFA) was interviewed. Nalu's family is recognized in the community as being one of the first to move into the Panaʻewa Hawaiian Homestead community. Nalu spent the majority of his life in Panaʻewa, where he learned to gather for subsistence and traditional cultural practices. When asked about recommendations for the proposed quarry site, Nalu would like to see all large ʻōhiʻa trees, especially those that do not show signs of ROD, preserved in place. Nalu stated that if the trees cannot be preserved in place then the project managers should contact the Panaʻewa community so that the trees can be collected and repurposed.

An interview was also conducted on July 13, 2019, with Makaʻala Rawlins, another Panaʻewa resident and KPFA board member. Makaʻala is the grandson of Genesis Namakaokalani Lee Loy and Elizabeth Genevieve Luahiwa Hoʻopiʻi and currently lives on the Hawaiian Homestead lot that was granted to his grandparents in the early 1970s. Makaʻala expressed that his grandfather had discovered the ʻawa in a part of the Panaʻewa forest that he utilizes for collecting native plants and seeds. He mentioned that there are many native plants in the area including ʻōhiʻa, maile, and lama. Makaʻala is concerned with the growing development will disturb these undisturbed areas of forest serve as seed banks for the Panaʻewa community.

While the gathering of natural resources from the Panaʻewa forest remains an important part of the cultural practices of this community, no explicit reference was made to such practices occurring in the actual area proposed for the quarry license, which has experienced extreme disturbance, is dominated by invasive trees, and other than isolated ʻōhiʻa and hala trees does not contain other native trees or ʻawa. Because of the proposed location outside intact ʻōhiʻa forest, it is not anticipated that the proposed quarry project will impact these cultural practices, based on the information obtained through the consultation efforts. It is not possible in a quarry that reaches depths of 80 feet to preserve individual trees. As discussed in Section 3.1.3, above, removal of ʻōhiʻa trees is not recommended by DOFAW and will not be allowed in order to restrict the spread of ROD.

Impacts and Mitigation Measures

The cultural impact assessment determined that the proposed development of the quarry will have almost no direct impact on any cultural resources or traditional and customary native Hawaiian practices, because it would occur almost exclusively on disturbed land in non-native forest that lacks crucial gathering resources. However, the assessment further recommended that Yamada and Sons make efforts to preserve or avoid disturbing the small and seemingly healthy portion of intact native ʻōhiʻa forest – even if it lacks important resources other than ʻōhiʻa trees – that is present within the southeast section of the proposed quarry site. Based on community consultation, the preparers of the assessment believed this exclusion would serve to mitigate any

potential impacts to the valued cultural and natural resources that may result from the action. The proposed project would then appear not to impact any culturally valued resources or cultural practices. In response, Yamada and Sons decided to exclude the intact ʻōhiʻa forest and as well as an area south of Ammunition Dump Road with more disturbed vegetation. This resulted in a proposed quarry license area of about 38 acre rather than 51 acres. The KPFA, OHA and SHPD were supplied a copy of the Draft EA, which is also being reviewed by agencies and the general public, in order to help verify or correct the findings contained in the CIA and this EA. No party reviewing the Draft EA supplied any additional cultural information.

3.3 Infrastructure

3.3.1 Utilities

Existing Facilities and Services

There are currently no utility services to the site.

Impacts and Mitigation Measures

Yamada and Sons does not require utilities for the quarry, and the proposed action would not have any impact on existing utilities.

Water that is very occasionally required for dust suppression will be either trucked to the site or provided by catchment. In addition, portable toilets will be provided and maintained for employee use.

3.3.2 Traffic

Existing Environment

The project site is accessed via a two-lane, paved County driveway commonly called Ammunition Dump Road. Yamada and Sons trucks utilize a private access road that leads from the rear of their baseyard along Railroad Avenue to a point along Ammunition Dump Road located just south of the Hilo Convenience Center (see Fig. 1), which avoids affecting traffic on Railroad Avenue, Leilani Street and the busiest portion of Ammunition Dump Road, namely the recycling and transfer station areas.

Impacts and Mitigation Measures

For essentially the same operations as those proposed, Yamada and Sons currently utilizes three to four to five 50-ton rock hauler trucks making three trips per hour between the quarry and their baseyard, between the hours of 7:00 am and 5:00 pm on weekdays, although this schedule varies depending on demand and equipment type. Yamada and Son's trucks utilize a segment of Ammunition Dump Road that is shared only with other quarry operations, the County Mass Transit Agency, the County Drag Strip (which is open only occasionally), as well as greenwaste

haulers and County and commercial trash haulers in transit to and from the South Hilo Sanitary Landfill. Therefore, truck traffic from the proposed project will likely not affect the busiest portion of Ammunition Dump Road, which has traffic from users of the Convenience Center and the Recycling Center.

In a letter of May 29, 2019 in response to early consultation (see Appendix 1a), the Hawai‘i County Department of Environmental Management (DEM) stated that once consolidation and resubdivision of certain properties in and around the South Hilo Sanitary Landfill is complete, the current access road will be dedicated to the County of Hawai‘i and will not be available for off-road rock hauling trucks, and all haulers will be required to use highway-legal equipment to haul materials. As soon as the road is dedicated, Yamada and Sons will switch to tractor-trailers for hauling. Although this will necessitate twice the number of trips as current operations, the level of traffic will still be modest at roughly six trips per hour, and with the landfill closed, traffic may actually be reduced relative to current levels.

In a letter of May 22, 2019 in response to early consultation (see Appendix 1a), the Hawai‘i Department of Transportation, Highways Division (HDOT-H) indicated that the project would not have a significant impact on State highways. HDOT-H also stated that the District Engineer may require mitigation for issues arising from the operation of the quarry or conveyance of material to the baseyard at no cost to the State. As the project will not involve any State highways, it is unlikely that any interaction with State highway facilities would occur, and currently no impacts or mitigation are foreseen.

3.3.3 Airports

The proposed quarry is approximately 1.75 miles from the centerline of Runway 8/26 at Hilo International Airport. For reference, the airport is the same distance or closer to the Banyan Drive hotel zone, the Port of Hilo facilities, and the industrial areas of Hilo. Unlike much of those developed areas, however, the proposed quarry site does not underlie any approach or departure tracks, nor would it contain tall structures.

In a letter of May 22, 2019 in response to early consultation (see Appendix 1a), the Hawai‘i Department of Transportation advised that the applicant consult the Technical Assistance Memorandum by the FAA for guidance and requirements for developments near airports. This documents details the issues that facilities may involve for airports, including attracting hazardous wildlife, posing a glint/glare hazard, or presenting an aerial obstruction hazard to existing flight paths. Certain types of construction projects that propose significant vertical structures or mobile uses are required to file a Notice of Proposed Construction or Alteration with the Federal Aviation Administration (FAA). The proposed project does not appear to require such a notice, and it involves no hazardous wildlife attractants such as standing water, nor any glint or glare hazards or aerial obstructions. No effect to the facilities or operation of Hilo International Airport is anticipated.

3.3.4 Other Public Facilities and Services

All needed public facilities and services are readily present nearby. Police, fire and emergency medical services are available from facilities in Hilo within five road miles. No impact to these services or other public facilities or services would occur.

Most of the proposed license area – about 31 acres – is currently part of a large area that has long been included in a Revocable Permit by the State to the County for use as a skeet range, as partially depicted by the dashed lines in Figure 2. The proposed license area is south of the actual skeet range, as well as its access road and buffer area. Consultation with the Department of Parks and Recreation (P&R) has determined that the area requested for the quarry is not used or needed by the County as part of their skeet range operations. P&R have indicated that it would consent to the removal or withdrawal of this southern acreage from the existing revocable permit. P&R was supplied a copy of the Draft EA for their review and comment.

3.4 Secondary and Cumulative Impacts

Cumulative impacts result when implementation of several projects that individually have limited impacts combine to produce more severe impacts or conflicts in mitigation measures. The only adverse local effects of the project – continuing traffic and minor disturbance to air quality, noise, and visual quality – are very restricted in severity, nature and geographic scale, with limited potential to accumulate with impacts from other actions. Furthermore, the proposed quarry represents a continuation of uses at a directly adjacent location, rather than new impacts to be added. There has been and there will continue to be some accumulation of dust, noise and traffic impacts from continuing operations at County solid waste facilities, the mass transit baseyard, the public works stockpiling area, and the skeet range and drag strip, all occurring within a half-mile of the proposed quarry. This interaction is already occurring at the same levels, and coordination among these agencies has avoided issues or problems.

In the long term, these impacts will be substantially reduced by the impending closure of the South Hilo Sanitary Landfill, which is the primary source of dust, noise and traffic in the area. The County Department of Environmental Management (DEM) will be permanently closing the SHSL in accordance with Resource Conservation and Recovery Act (RCRA) Subtitle D requirements (Hawai‘i County DEM 2018)). Based on the available airspace and current daily loads, the SHSL was expected to reach its permitted maximum capacity in about 2020. Closure will involve installing a final cover system on the top and side slopes of the landfill, installing a new passive landfill gas venting system, and constructing a new storm water detention and infiltration basin and other storm water management structures. Prior to installation of the final cover, the landfill will be slightly regraded and a maintenance access road will be provided along with a perimeter swale to facilitate the control and containment of storm water runoff on-site. Final closure of the landfill is anticipated to cost approximately $20 million, including the costs associated with the ongoing work to prepare the landfill for closure. Once regulatory approvals have been granted, it is estimated that construction will take another 18 months following the issuance of the notice to proceed.

The exact timing of the closure period has not yet been determined. A recent press release from the DEM providing a schedule update was summarized in a local newspaper article:

> The Hawai‘i County Environmental Management Department is currently in the process of finalizing a contract with a construction company to start the work this summer to cover the Hilo landfill with an impermeable liner. It may take a full year. (Hawai‘i Tribune Herald 2019).

Depending on whether the year-long landfill closure process involves more intensive use by heavy vehicles, there may be potential for traffic interaction with the quarry. In general, however, it is expected that landfill closure activities will not generate higher levels of traffic than that associated with the existing landfill. As Yamada and Sons plan to continue to access the project site via their own gated access route, there would be only the continuation of the existing level of industrial traffic even during the closure process, which would not require mitigation other than communication and coordination among all road users, which currently occurs and is expected to continue.

3.5 Required Permits and Approvals

The following permits and approvals would be required:

- Board of Land and Natural Resources: Approval of License for Quarrying
- Windward Planning Commission and State Land Use Commission: Special Permit
- State DOH: National Pollutant Discharge Elimination System Permit (NPDES) (potential)
- County Department of Public Works: Grubbing and Grading Permits

3.6 Consistency with Government Plans and Policies

3.6.1 Hawai‘i State Plan

Adopted in 1978 and last revised in 1991 (Hawai‘i Revised Statutes, Chapter 226, as amended), the Plan establishes a set of themes, goals, objectives and policies that are meant to guide the State’s long-run growth and development activities. The three themes that express the basic purpose of the *Hawai‘i State Plan* are individual and family self-sufficiency, social and economic mobility and community or social well-being. The proposed project is consistent with this plan. Specific relevant sections of the Plan are cited in more detail below.

§226-4. State goals. In order to ensure, for present and future generations, those elements of choice and mobility that ensure that individuals and groups may approach their desired levels of self-reliance and self-determination, it shall be the goal of the State to achieve:

(1) A strong, viable economy, characterized by stability, diversity, and growth, that enables the fulfillment of the needs and expectations of Hawaii’s present and future generations.

(2) A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people.
(3) Physical, social, and economic well-being, for individuals and families in Hawaii, that nourishes a sense of community responsibility, of caring, and of participation in community life.

The proposed project would provide products essential to infrastructural improvements and maintenance in Hawaiʻi County and is therefore important to community well-being and economic mobility. No substantial environmental impact would occur.

§226-6 Objectives and policies for the economy--in general. (a) Planning for the State's economy in general shall be directed toward achievement of the following objectives:

(1) Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaii's people, while at the same time stimulating the development and expansion of economic activities capitalizing on defense, dual-use, and science and technology assets, particularly on the neighbor islands where employment opportunities may be limited.
(2) A steadily growing and diversified economic base that is not overly dependent on a few industries, and includes the development and expansion of industries on the neighbor islands.

(b) To achieve the general economic objectives, it shall be the policy of this State to:
(1) Promote and encourage entrepreneurship within Hawaii by residents and nonresidents of the State.
(2) Expand Hawaii's national and international marketing, communication, and organizational ties, to increase the State's capacity to adjust to and capitalize upon economic changes and opportunities occurring outside the State.
(3) Promote Hawaii as an attractive market for environmentally and socially sound investment activities that benefit Hawaii's people.
(4) Transform and maintain Hawaii as a place that welcomes and facilitates innovative activity that may lead to commercial opportunities.
(5) Promote innovative activity that may pose initial risks, but ultimately contribute to the economy of Hawaii.
(6) Seek broader outlets for new or expanded Hawaii business investments.
(7) Expand existing markets and penetrate new markets for Hawaii's products and services.
(8) Assure that the basic economic needs of Hawaii's people are maintained in the event of disruptions in overseas transportation.
(9) Strive to achieve a level of construction activity responsive to, and consistent with, state growth objectives.
(10) Encourage the formation of cooperatives and other favorable marketing arrangements at the local or regional level to assist Hawaii's small scale producers, manufacturers, and distributors.
(11) Encourage labor-intensive activities that are economically satisfying and which offer opportunities for upward mobility.

(12) Encourage innovative activities that may not be labor-intensive, but may otherwise contribute to the economy of Hawaii.
(13) Foster greater cooperation and coordination between the government and private sectors in developing Hawaii's employment and economic growth opportunities.
(14) Stimulate the development and expansion of economic activities which will benefit areas with substantial or expected employment problems.
(15) Maintain acceptable working conditions and standards for Hawaii's workers.
(16) Provide equal employment opportunities for all segments of Hawaii's population through affirmative action and nondiscrimination measures.
(17) Stimulate the development and expansion of economic activities capitalizing on defense, dual-use, and science and technology assets, particularly on the neighbor islands where employment opportunities may be limited.
(18) Encourage businesses that have favorable financial multiplier effects within Hawaii's economy, particularly with respect to emerging industries in science and technology.
(19) Promote and protect intangible resources in Hawaii, such as scenic beauty and the aloha spirit, which are vital to a healthy economy.
(20) Increase effective communication between the educational community and the private sector to develop relevant curricula and training programs to meet future employment needs in general, and requirements of new or innovative potential growth industries in particular.
(21) Foster a business climate in Hawaii--including attitudes, tax and regulatory policies, and financial and technical assistance programs--that is conducive to the expansion of existing enterprises and the creation and attraction of new business and industry.

Any one business cannot satisfy all objectives of a State‘s economic policy, but the project is not inconsistent with any aspect of the policy and satisfies a number of objectives related to local production, satisfying jobs for local residents, and cooperation between government and the private sector.

§226-13 Objectives and policies for the physical environment--land, air, and water quality.
(a) Planning for the State's physical environment with regard to land, air, and water quality shall be directed towards achievement of the following objectives:

(1) Maintenance and pursuit of improved quality in Hawaii's land, air, and water resources.
(2) Greater public awareness and appreciation of Hawaii's environmental resources.

(b) To achieve the land, air, and water quality objectives, it shall be the policy of this State to:

(1) Foster educational activities that promote a better understanding of Hawaii's limited environmental resources.
(2) Promote the proper management of Hawaii's land and water resources.
(3) Promote effective measures to achieve desired quality in Hawaii's surface, ground, and coastal waters.
(4) Encourage actions to maintain or improve aural and air quality levels to enhance the health and well-being of Hawaii's people.

(5) Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters.
(6) Encourage design and construction practices that enhance the physical qualities of Hawaii's communities.
(7) Encourage urban developments in close proximity to existing services and facilities.
(8) Foster recognition of the importance and value of the land, air, and water resources to Hawaii's people, their cultures and visitors.

The proposed project involves a necessary use of local resources in a sensible location that has been shown through systematic resource surveys to not degrade the environment in any way.

3.6.2 Hawai'i County Zoning and General Plan

Hawai'i County Zoning

The project site is zoned Agricultural (A-20a), where quarrying of an area of 37.882 acres is a permitted activity, but one requiring a Special Permit from the Hawai'i County Planning Commission, which needs subsequent approval from the State Land Use Commission. The Special Permit process would begin after Chapter 343, HRS, is complete.

Hawai'i County General Plan

The General Plan for the County of Hawai'i is a policy document expressing the broad goals and policies for the long-range development of the Island of Hawai'i (County of Hawai'i 2005). The plan was adopted by ordinance in 1989 and revised in 2005 (Hawai'i County Planning Department). The *General Plan* itself is organized into thirteen functional elements. In general, the proposed project would be consistent with the goals, policies and objectives, standards, and principles for several functional areas. This section addresses the consistency of the proposed action with relevant policies of the County.

Economic Goals

- Provide residents with opportunities to improve their quality of life through economic development that enhances the County's natural and social environments.
- Economic development and improvement shall be in balance with the physical, social, and cultural environments of the island of Hawaii.
- Strive for diversity and stability in the economic system.
- Provide an economic environment that allows new, expanded, or improved economic opportunities that are compatible with the County's cultural, natural and social environment.
- Strive for an economic climate that provides its residents an opportunity for choice of occupation.
- Strive for diversification of the economy by strengthening existing industries and attracting new endeavors.
- Strive for full employment.

Economic Policies

- Identify and encourage primary industries that are consistent with the social, physical, and economic goals of the residents of the County.

Environmental Quality Goals:

- Define the most desirable use of land within the County that achieves an ecological balance providing residents and visitors the quality of life and an environment in which the natural resources of the island are viable and sustainable.
- Maintain and, if feasible, improve the existing environmental quality of the island.
- Control pollution.

Environmental Quality Policies:

- Take positive action to further maintain the quality of the environment.

Flood Control and Drainage Goals

- Protect human life.
- Prevent damage to man-made improvements.
- Control pollution.
- Prevent damage from inundation.
- Reduce surface water and sediment runoff.
- Maximize soil and water conservation.

Flood Control and Drainage Policies

- Enact restrictive land use and building structure regulations in areas vulnerable to severe damage due to the impact of wave action. Only uses that cannot be located elsewhere due to public necessity and character, such as maritime activities and the necessary public facilities and utilities, shall be allowed in these areas.
- Development-generated runoff shall be disposed of in a manner acceptable to the Department of Public Works and in compliance with all State and Federal laws.

Flood Control and Drainage Standards

- "Storm Drainage Standards," County of Hawaii, October, 1970, and as revised.
- Applicable standards and regulations of Chapter 27, "Flood Control," of the Hawaii County Code.
- Applicable standards and regulations of the Federal Emergency Management Agency (FEMA).
- Applicable standards and regulations of Chapter 10, "Erosion and Sedimentation

Control," of the Hawaii County Code.
- Applicable standards and regulations of the Natural Resources Conservation Service and the Soil and Water Conservation Districts.

Historic Sites Goals:

- Protect and enhance the sites, buildings and objects of significant historical and cultural importance to Hawai‘i.
- Appropriate access to significant historic sites, buildings and objects of public interest should be made available.

Natural Beauty Goals:

- Protect scenic vistas and view planes from becoming obstructed. Maximize opportunities for present and future generations to appreciate and enjoy natural and scenic beauty.

Land Use Goals:

- Designate and allocate land uses in appropriate proportions and mix and in keeping with the social, cultural, and physical environments of the County.
- Protect and preserve forest, water, natural and scientific reserves and open areas.

Discussion: The project site is ideally located in an area of existing quarrying and solid waste uses lacking sensitive environmental resources or issues such as flooding, streams or wetlands, rare native species, native ecosystems, or scenic views. The proposed quarry would provide much needed construction materials for public and private sector projects, supporting the Big Island economy with a crucial material that is extremely expensive to import. No archaeological sites or cultural sites or practices are present on the property and none will be affected. The project would satisfy all relevant aspects of the General Plans goals, objectives and policies.

The *Hawai‘i County General Plan Land Use Pattern Allocation Guide (LUPAG, Hawai‘i County Planning Department 2006)*. The LUPAG map component of the *General Plan* is a graphic representation of the Plan's goals, policies, and standards as well as of the physical relationship between land uses. It also establishes the basic urban and non-urban form for areas and specifies planned public and cultural facilities, public utilities and safety features, and transportation corridors. The project site is classified as Important Agricultural Lands in the LUPAG. The General Plan defines these as those lands with "better potential for sustained high agricultural yields because of soil type, climate, topography, or other factors" (p. 14-8). Generally, these lands have been identified through maps from the previous General Plan, the U.S. Natural Resource Conservation Service, the UH Land Study Bureau, or similar studies. However, as recognized in the General Plan, some areas so designated may be inappropriately classified because of the scale of previous mapping, and the location of these lands requires verification by more detailed mapping when considering specific land use decisions. It is expected that the Special Permit process will consider the rather poor agricultural potential of the proposed quarry area when considering the permit application.

3.6.3 Hawai‘i State Land Use Law and Coastal Zone Management

Chapter 205 Hawai‘i Revised Statutes, Hawai‘i State Land Use Law

Chapter 205 HRS classifies All land in the State of Hawai‘i into one of four land use categories – Urban, Rural, Agricultural, or Conservation. The property is in the State Land Use Agricultural District. Although the planned quarrying is not a conformant use according of this State Land Use District designation, State Land Use law allows for further definition by County ordinance, which allows for quarrying on agricultural lands. However, as discussed above, a Special Permit from the Hawai‘i County Planning Commission and the Land Use Commission would be required for the proposed use.

The criteria for approving a Special Permit are based on Rule 6 in the Planning Commission Rules. Section 6-6 states that the Planning Commission shall not approve a Special Permit unless it is found that the proposed use (a) is an unusual and reasonable use of land situated within the Agricultural or Rural District, whichever the case may be; and (b) the proposed use would promote the effectiveness and objectives of Chapter 205, Hawai‘i Revised Statutes, as amended. In addition to the above listed criteria, the Planning Commission shall also consider the criteria listed under Section 6-3(b)(5) (A) through (G). This EA is not the venue for detailed analysis of the permit criteria, but the following may be noted:

> Section 6-6 (a): *The proposed use appears to be an unusual and reasonable use of land situated within the Agricultural District*. In recognizing that lands within the Agricultural District might not be best suited for agricultural activities and yet classified as such, and in recognition that certain types of uses might not be strictly agricultural in nature, yet reasonable in such districts, the legislature has provided for the Special Permit process to allow certain unusual and reasonable uses within the Agricultural district. Based on the poor agricultural soil conditions, the availability of much better agricultural land nearby, and the utility of aggregates for not only urban but also agricultural activity, the proposed request may be considered an unusual and reasonable use of agricultural land in this location within the State Land Use Agricultural District.
>
> Section 6-6 (b): *The granting of this request would also appear to promote the effectiveness and objectives of Chapter 205, Hawai‘i Revised Statutes, as amended*. The State Land Use Law and Regulations are intended to preserve, protect and encourage the development of lands for those uses to which they are best suited in the interest of the public welfare of the people of the State of Hawai‘i. In the case of the Agricultural District, the intent is to preserve or keep lands of high agricultural potential in agricultural use. Soils on the project site are identified by the USDA Soil Survey Report as Paipai series (rPAE), which consist of well drained, thin, extremely stony organic soils over fragmented a‘a lava. The Land Study Bureau’s Overall Master Productivity Rating for the site is "E" or “Very Poor” for agricultural production. Notwithstanding, the property is classified as Other Important Agricultural Land by the Department of Agriculture’s ALISH system. As the site is currently vacant and is not in active

agricultural use, the use will not displace any existing agricultural activity or diminish the agricultural potential of the site. It is also important to note that much of the original soil of the area was scraped off and/or placed in push-piles as part of the extensive surface quarrying that occurred in the Kaiko‘o project. Therefore, the proposed use will not adversely affect the preservation and agricultural use of the County`s prime agricultural lands and is not contrary to the objectives sought to be accomplished by the State Land Use Law and Regulations.

Section 6-3(b)(5)(A): *Such use shall not be contrary to the objectives sought to be accomplished by the Land Use Law and Regulations*. The request appears to be considered an unusual and reasonable use of agricultural lands. The requested use will not adversely affect the preservation and agricultural use of the County's prime agricultural land; thus, the request is not contrary to the objectives sought to be accomplished by the State Land Use Law and regulations.

Section 6-3(b)(5)(B) *The desired use would not adversely affect surrounding properties*. The project site is a 37.882-acre portion of an approximately 2,407-acre State-owned parcel. The project site is ideally located in terms of avoiding impacts to surrounding properties because it is situated in the midst of land uses that already generate substantial noise – quarries, a landfill, a shooting range, the Mass Transit baseyard, a stockpile area, and a dragstrip – and the noise it generates will not affect sensitive uses. The closest dwellings are located about half a mile from the proposed quarry site. Potential impacts typically associated with quarry operations include dust and noise. However, these impacts can be mitigated by complying with Department of Health rules and regulations related to air quality and noise. A condition of approval will also limit hours of operation to between 6:00 a.m. to 6:00 p.m., daily.

Section 6-3(b)(5)(C): *Such use shall not unreasonably burden public agencies to provide roads and streets, sewers, water, drainage, school improvements, and police and fire protection*. Access to and from the site is via the two-lane Ammunition Dump Road. The paved portion of the road varies in width but is mostly 30 feet wide and ranges in condition from excellent to poor. The road is currently being straightened and improved by the County for its own purposes. Yamada and Sons estimates that the quarry operation will require use of 4 to 5 rock-hauling trucks (or 8 to 10 tractor trailers) making about three trips per hour between the quarry and the crusher site at its baseyard, which is located between Railroad Avenue and Ammunition Dump Road on TMKs 2-1-025:001, 041, and 042. Traffic will not substantially increase on the Ammunition Dump Road since the new quarry site is replacing another site presently used by Yamada and Sons that is also accessed via the same road using the same trucks and frequency of travel. Electrical and telephone services are not required for the quarry operation. Water for dust suppression will either be trucked to the site or provided by catchment tank. Portable toilets will be provided and maintained for employees to use at the site. Medical, police and fire services are all available nearby in Hilo.

Section 6-3(b)(5)(D) *Unusual conditions, trends, and needs have arisen since district boundaries and regulations were established*. Since the district boundaries and regulations were established in the 1960s and 1970s, the State DLNR has issued several land licenses in the area for quarry operations because this area has proven to be a valuable and critically important source of raw material used in the construction industry. Through the issuance of a Special Permit, a community may establish various "non-agricultural" services that are reasonable but unusual in nature, such as quarries.

Section 6-3(b)(5)(E) *The land upon which the proposed use is sought is unsuited for the uses permitted within the district*. The proposed quarry site is currently not used for agricultural purposes. As previously mentioned the lands are rated "E" or "Very Poor" for agricultural productivity and classified as Other Important Agricultural Land by the ALISH Map. Other Important Agricultural Land is land other than Prime or Unique Agricultural Land that is of statewide or local importance for the production of food, feed, fiber and forage crops. The lands in this classification are important to agriculture in Hawai‘i but exhibit properties such as seasonal wetness, erodibility, limited rooting zone, slope, flooding, or droughtiness, that exclude them from the Prime or Unique Agricultural Land classifications. The soils in this area are not suitable for many types of agricultural uses, which may explain why the site has not historically been used for agricultural purposes although it is classified for such use.

Section 6-3(b)(5)(F) *The use will substantially alter or change the essential character of the land and the present use*. Removal of rock to a depth of 80 feet will substantially alter the essential character of the land, although this vacant land has already been intensively grubbed, graded and surface-quarried over much of its extent. Furthermore, the project site is flanked in several directions by deep quarries and other industrial-type land uses. Therefore, although the character of the project site will be substantially altered, the proposed use is consistent with historical use on the land and nearby land uses. Also, the DLNR land license for the site requires that upon closure or abandonment, the applicant leave the site in a non-hazardous condition that could support other uses.

Section 6-3(b)(5)(G) *The request will not be contrary to the General Plan*. Although the proposed land use does not match the General Plan LUPAG Map "Important Agricultural Land" designation, it does meet many key goals and policies of the General Plan, as discussed in Section 3.6.2.

Furthermore, the request will not have a significant adverse impact to traditional and customary Hawaiian rights. In view of the Hawai‘i State Supreme Court's "PASH" and *"Ka Pa 'akai O Ka ‘Aina"* decisions, the issue relative to native Hawaiian gathering and fishing rights must be addressed in terms of the cultural, historical, and natural resources and the associated traditional and customary practices of the site. Intensive archaeological survey, documentary research and cultural consultation determined that no archaeological sites or cultural resources or practices are present. Biological survey found only a few species of native plants, all of which are common and available for gathering elsewhere. The following findings are expected to be proposed for consideration by the Board of Land and Natural Resources:

(1) *The identity and scope of valued cultural, historical, or natural resources in the proposed license area*. There is no evidence that the flora or fauna in the area are particularly desired or used for cultural practices. The site is not adjacent and/or proximate to the shoreline. As such, gathering of marine life, fishing and coastal access is not an issue. No valued cultural, historic, or natural resources related to traditional and customary practices were identified on the project site, and no traditional and customary native Hawaiian rights are exercised therein.
(2) *The extent to which those resources, including traditional and customary native Hawaiian rights, will be affected or impaired by the proposed action*. No resources or rights are present and none will be affected.
(3) *The feasible action, if any, to be taken by the BLNR to reasonably protect native Hawaiian rights if they are found to exist*. The proposed action will not affect traditional Hawaiian rights and no action is necessary to protect these rights.

Based on the above considerations, it likely that the approval of the request would support the objectives sought to be accomplished by the Land Use Laws and Regulations. As stated above, the consistency of the project with the criteria of the Special Permit will be explored in greater detail in the Special Permit application that will follow the Chapter 343 process.

Chapter 205A, Hawai'i Revised Statutes, Coastal Zone Management Program

HRS 205A defines the coastal zone as "all the lands of the State and the area extending seaward from the shoreline to the limit of the State's police power and management authority, including the United States territorial sea." Accordingly, the project site is located in the coastal zone management area.

The project site is located approximately 2.6 miles *mauka* of the shoreline, at an elevation of 90-100 feet above mean sea level, with no surface drainage to the ocean; quarrying here would not influence coastal process or conditions. The proposed project would also have no impact to coastal recreation opportunities, historic resources, public access, scenic and open space resources, coastal ecosystems, economic uses, coastal hazards, managing development, public participation, beach protection, and marine resources (HAR § 205A-2). Detailed explanations of potential impacts are described above in the environmental impacts sections. As the project site and actions on it are not likely to influence coastal processes or conditions within coastal areas, no potential impacts are anticipated. The property is not situated within the County's Special Management Area (SMA) and would not require an SMA Permit. In sum, no impact to Coastal Zone resources is expected.

PART 4: DETERMINATION

Based on the findings below, and upon consideration of comments to the Draft EA, the applicant expects that the State of Hawai'i, Board of Land and Natural Resources, will determine that the proposed action will not significantly alter the environment, as impacts will be minimal, and that the Board will accordingly issue a Finding of No Significant Impact (FONSI).

PART 5: FINDINGS AND REASONS

Chapter 11-200.1-13, Hawai‘i Administrative Rules, outlines those factors agencies must consider when determining whether an Action has significant effects:

> (a) In considering the significance of potential environmental effects, agencies shall consider and evaluate the sum of effects of the proposed action on the quality of the environment.
>
> (b) In determining whether an action may have a significant effect on the environment, the agency shall consider every phase of a proposed action, the expected impacts, and the proposed mitigation measures. In most instances, an action shall be determined to have a significant effect on the environment if it may:

1. *Irrevocably commit a natural, cultural, or historic resource.* No valuable natural or cultural resource would be committed or lost. Although some remnant native plants are present, no valuable natural or cultural resources would be committed or lost, as the project site contains none. No valuable cultural resources and practices such as forest access, fishing, gathering, hunting, or access to ceremonial sites would be affected in any way.
2. *Curtail the range of beneficial uses of the environment.* The land has poor potential for other uses as it is unsuited for most agriculture and is surrounded by industrial land uses. Some restriction of future beneficial uses would occur, as the surface rock and soil (already surface quarried in many locations) will be removed, but the quarried area would retain value for future industrial, public and even agricultural uses that did not rely on surface soil.
3. *Conflict with the State's environmental policies or long-term environmental goals established by law*. The State's long-term environmental policies are set forth in Chapter 344, HRS. The broad goals of this policy are to conserve natural resources and enhance the quality of life. The project is minor and fulfills aspects of these policies calling for an improved social environment. It is thus consistent with the State's long-term environmental policies.
4. *Have a substantial adverse effect on the economic welfare, social welfare, or cultural practices of the community and State..* The project would not have any adverse effect on the economic or social welfare of the County or State and would benefit the economy of the Hilo area.
5. *Have a substantial adverse effect on public health.* The proposed project would be subject to environmental, health and safety permits and restrictions and would not be detrimental to public health in any way.
6. *Involve adverse secondary impacts, such as population changes or effects on public facilities*. No adverse secondary effects are expected to result from the proposed action.
7. *Involve a substantial degradation of environmental quality*. The project site would not cause a substantial degradation of environmental quality, and mitigation for storm water runoff, as well as dust emissions, would be required.

8. *The proposed project is not one which is individually limited but cumulatively may have considerable effect upon the environment or involves a commitment for larger actions.* The project is not related to other activities in the region in such a way as to produce adverse cumulative effects or involve a commitment for larger actions. The only adverse local effects of the project – continuing traffic and minor disturbance to air quality, noise, and visual quality– are very restricted in severity, nature and geographic scale, with limited potential to accumulate with impacts from other actions. Furthermore, the proposed quarry represents a continuation of uses at a directly adjacent location, rather than new impacts to be added. There has been and will continue to be some accumulation of dust, noise and traffic impacts from continuing operations at County solid waste facilities, the Mass Transit baseyard, the public works stockpiling area, and the skeet range and drag strip, all occurring within a half-mile of the proposed quarry. This interaction is already occurring at the same levels, and coordination among these agencies has avoided issues or problems.
9. *Have a substantial adverse effect on a rare, threatened, or endangered species, or its habitat.* The project site supports overwhelmingly alien vegetation. With timing of vegetation removal/species surveys to avoid impacts to Hawaiian hawks and Hawaiian hoary bats, no impacts to rare, threatened or endangered species of flora or fauna would occur.
10. *Have a substantial adverse effect on air or water quality or ambient noise levels.* No adverse effects on these resources would occur. Implementation of a Storm Water Pollution Prevention Plan will mitigate impacts to water quality. There are no sensitive receptors in the project area, and hence noise produced would not be detrimental.
11. *Have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, sea level rise exposure area, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.* Although the project is located in an area with volcanic and seismic risk, the entire Island of Hawai‘i shares this risk, and the project is not imprudent to construct. The project site is more than 90 feet above sea level and will not be affected directly by sea level rise.
12. *Have a substantial adverse effect on scenic vistas and viewplanes, during day or night, identified in county or state plans or studies.* No scenic vistas and viewplanes will be adversely affected by the project.
13. *Require substantial energy consumption or emit substantial greenhouse gases.* The operation of any aggregate quarry requires energy consumption that because of its nature involves fossil fuels and therefore greenhouse gas emissions. The emissions of the proposed quarry would not be significant on a State scale, as the roughly 2,000 Mtpa CO2-e of emissions would represent only 0.094% of the State of Hawai‘i’s 21.28 million Mtpa CO2-e output. Furthermore, the emissions would not be added to the total, but would represent a continuation of an existing activity of the same scale. It is also important to note that one of the major factors in the greenhouse emissions of the use of aggregates, once they are quarried and processed, is transport to the use site. Transportation of quarry products is relatively costly, greenhouse gas-intensive activity. Therefore, a range of benefits is achieved if a quarry is located close to its markets, as is the case with the proposed quarry location. Yamada and Sons proposed to continue

and/or adopt a suite of innovative energy-saving practices endorsed by professional trade organizations for aggregates that can cumulatively substantially reduce greenhouse gas emissions of rock quarries.

For the reasons above, the proposed action would not have any significant effect in the context of Chapter 343, Hawai‘i Revised Statues and section 11-200.1-13 of the State Administrative Rules.

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ENVIRONMENTAL ASSESSMENT

YAMADA AND SONS ROCK QUARRY

APPENDIX 1a
Comments in Response to Early Pre-Consultation

Note: Early consultation was conducted twice, once on April 19, 2019, for the original 14.99-acre proposal, and again on July 23, 2019, when the area of interest was increased to 51.92 acres. Both consultation letters are included in this appendix, along with the responses that were submitted for each. Subsequently, the proposed size was reduced to 37.882 acres, all within the 51.92-acre footprint, which did not trigger the need for further consultation.

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geometrician
ASSOCIATES, LLC
integrating geographic science and planning

phone: (808) 969-7090 PO Box 396 Hilo Hawai'i 96721 rterry@hawaii.rr.com

April 18, 2019

Dear Neighboring Property Owner or Agency/Organization Official:

Subject: Early Consultation for Environmental Assessment for Yamada and Sons, Inc. License on State Land for Quarrying Purposes, South Hilo District, Island of Hawai'i, TMK 2-1-013:002 (por.)

I have been contracted by Yamada and Sons, Inc. (Yamada & Sons), to prepare an Environmental Assessment (EA) in compliance with Chapter 343, Hawai'i Revised Statutes. Yamada & Sons proposes to acquire a license to develop a 14.99-acre portion of a State property for use as a rock quarry. The project site is adjacent to existing quarries and is presently vacant and undeveloped. Yamada & Sons requires a new quarry because their existing quarry will soon exhaust its supply of adequate quality material. The quarry would allow the manufacture of engineered products, including base course and components of hot mix asphalt and concrete, that are necessary for the construction of a wide variety of Hawai'i County projects, both public and private. Yamada & Sons would acquire a license with the Department of Land and Natural Resources for use of the site and would pay royalties to the State for materials extracted from the quarry. The proposed quarrying activities would be identical in nature to the ongoing quarrying activities located on adjacent parcels; rock would be excavated with heavy equipment when possible, and when impenetrable rock is encountered, drilling and blasting would be performed. Excavated rock would either be stockpiled on-site or removed and trucked off-site to Yamada & Sons' quarry baseyard located off of Railroad Avenue for crushing/processing and sale. No crushing or sales will be done at the new rock quarry. They anticipate that about 25,000 tons of material would be extracted per month, and with the excavation reaching a maximum depth of about 80 feet, the quarry is expected to have an active lifetime of roughly ten years or more.

An EA is necessary because the property is State land and a license for quarrying purposes is not an exempt action under the State's EIS rules at Hawai'i Administrative Rules 11-200-8. Once complete, the EA will accompany the application for the quarry license. The areas of investigation in the EA will include but not be limited to the following: water quality assurance; wastewater treatment; flora, fauna, and ecosystems; traffic impacts; geology, soils, and hazards; flooding and drainage impacts; social, cultural and community impacts; and historic sites. This letter is to share information about the project and request your input on site conditions, issues that you wish to be addressed in the EA, and any other concerns you may have.

Please contact me at 808-969-7090 or by email at rterry@hawaii.rr.com if you have any questions or require clarification. Kindly indicate whether you wish to receive notice of the availability of the Draft EA when it is completed.

Sincerely,

Ron Terry

Ron Terry, Principal
Geometrician Associates

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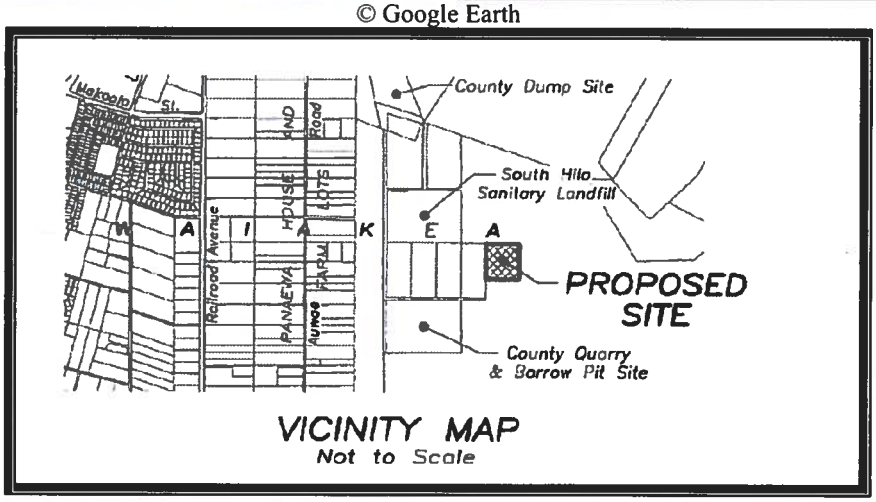

Harry Kim
Mayor

Paul K. Ferreira
Police Chief

Kenneth Bugado Jr.
Deputy Police Chief

County of Hawai`i

POLICE DEPARTMENT
349 Kapiolani Street • Hilo, Hawai`i 96720-3998
(808) 935-3311 • Fax (808) 961-8865

April 25, 2019

Mr. Ron Terry, Principal
Geometrician Associates, LLC
P. O. Box 396
Hilo, HI 96721

Dear Mr. Terry:

SUBJECT: EARLY CONSULTATION FOR ENVIRONMENTAL ASSESSMENT FOR YAMADA AND SONS, INC. LICENSE ON STATE LAND FOR QUARRYING PURPOSES, SOUTH HILO DISTRICT, ISLAND OF HAWAII; TMK 2-1-013:002 (POR.)

Staff, upon reviewing the provided documents, does not anticipate any significant impact to traffic and/or other public safety concerns.

Thank you for allowing us the opportunity to comment. We will not be requesting a copy of the assessment once completed.

If you have any questions, please contact Captain Kenneth Quiocho, South Hilo Patrol, at (808)961-2214 or via email at Kenneth.quiocho@hawaiicounty.gov.

Sincerely,

MITCHELL K. KANEHAILUA, JR.
ASSISTANT POLICE CHIEF
AREA I OPERATIONS BUREAU

KQ:lli/19HQ0460

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

JOSH GREEN
LT. GOVERNOR
STATE OF HAWAII

WILLIAM J. AILA, JR
ACTING CHAIRMAN
HAWAIIAN HOMES COMMISSION

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS

P. O. BOX 1879
HONOLULU, HAWAII 96805

May 15, 2019

Mr. Ron Terry
Geometrician Associates, LLC
PO Box 396
Hilo, Hawai'i 96721

Dear Mr. Terry:

Subject: Early Consultation for Environmental Assessment for Yamada and Sons, Inc., License on State Land for Quarrying Purposes, South Hilo District, TMK 2-1-003:002 (portion)

The Department of Hawaiian Home Lands acknowledges receiving the request for comments on the above-cited project. After reviewing the provided material, this project is located adjacent to DHHL's land holdings in Pana'ewa on Hawai'i Island. DHHL lands are located to the north east, east, south, and west of the parcel where this project is proposed. We have the following comments.

Based on the limited information provided, and the projects close proximity to DHHL's Pana'ewa Homesteads, there is a concern that quarry activities could impact air and noise quality. These should be included in the EA. Additionally, DHHL would like the EA to discuss how the proposed quarry activities compare to the current and historic levels of activity at the existing quarry.

As Yamada and Sons develops their environmental impact assessment documentation, it is important that DHHL's beneficiaries are informed of potential impacts, proposed mitigations, and evaluation of alternatives to the location and scope proposed. DHHL and homestead associations located in Pana'ewa should be included in future consultation conducted regarding this project. A state-wide list of DHHL homesteads is located at https://dhhl.hawaii.gov/homestead-associations/. In addition, DHHL encourages Yamada and Sons and its agents to consult with (N)native Hawaiian organizations when preparing environmental assessments in order to better assess potential impacts to cultural and natural resources, access and other rights of Native Hawaiians.

Mahalo for the opportunity to provide comments. If you have any questions, please contact Malia Cox, at 620-9485 or via email at malia.m.cox@hawaii.gov.

Aloha,

William J. Aila Jr., Acting Chairman
Hawaiian Homes Commission

DAVID Y. IGE
GOVERNOR

JADE T. BUTAY
DIRECTOR

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LYNN A.S. ARAKI-REGAN
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:
DIR 0399
STP 8.2672

May 22, 2019

Mr. Ron Terry
Principal
Geometrician Associates, LLC
PO Box 396
Hilo, Hawaii 96721

Dear Mr. Terry:

Subject: Yamada and Sons, Inc Quarry
Early Consultation for Environmental Assessment
Hilo, Hawaii
TMK: (3) 2-1-013:002 (por.)

The State of Hawaii Department of Transportation (DOT) understands that Yamada and Sons, Inc. is proposing to acquire a license to develop a 14.99-acre portion of State property for use as a rock quarry. DOT's comments on the proposed project are as follows:

Airports Division (DOT-A)

1. The proposed quarry site is approximately 1.75 miles from the Runway 8/26 centerline at Hilo International Airport (ITO). The site is next to an existing quarry operation and does not underlie any approach or departure flight tracks. All projects within 5 miles from State of Hawaii airports are advised to read the Technical Assistance Memorandum (TAM) for guidance with development and activities that may require further review and permits. The TAM can be viewed at this link: http://files.hawaii.gov/dbedt/op/docs/TAM-FAA-DOT-Airports_08-01-2016.pdf

   The TAM provides a comprehensive list of Federal Aviation Administration advisory circulars and DOT guidance and requirements for developments close to airports.

2. DOT-A recommends that the project be coordinated with Hawaii Airports District Assistant Manager, Mr. Steven Santiago at ITO to ensure compliance with existing regulations.

Highways Division

1. The proposed action is not anticipated to have a significant impact to State highways.

2. The Highways Division, Hawaii District Engineer may require mitigation for issues arising from the operation of the quarry or conveyance of material to the baseyard at no cost to the State.

If there are any questions, please contact Mr. Blayne Nikaido of the Statewide Transportation Planning Office at (808) 831-7979 or via email at blayne.h.nikaido@hawaii.gov.

Sincerely,

for JADE T. BUTAY
Director of Transportation

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 24, 2019

Geometrician Associates, LLC
Attention: Mr. Ron Terry
P.O. Box 396
Hilo, Hawaii 96721

via email: rterry@hawaii.rr.com

Dear Mr. Terry:

SUBJECT: Early Consultation for Environmental Assessment for Proposed Rock Quarry located at Waiakea, South Hilo District, Island of Hawaii; TMK: (3) 2-1-013:002 (por.) on behalf of **Yamada & Sons, Inc.**

Thank you for the opportunity to review and comment on the subject matter. The Land Division of the Department of Land and Natural Resources (DLNR) distributed or made available a copy of your request pertaining to the subject matter to DLNR's Divisions for their review and comments.

At this time, enclosed are comments from the (a) Engineering Division. (b) Commission on Water Resource Management, and (c) Land Division – Hawaii District on the subject matter. Should you have any questions, please feel free to contact Darlene Nakamura at (808) 587-0417 or email: darlene.k.nakamura@hawaii.gov. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosures
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

RECEIVED
LAND DIVISION
2019 MAY -2 AM 10:54
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

April 25, 2019

MEMORANDUM

FROM

TO

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
__Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
__Office of Conservation & Coastal Lands
X Land Division – Hawaii District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Early Consultation for Environmental Assessment for Proposed Rock Quarry
LOCATION: Waiakea, South Hilo District, Island of Hawaii; TMK: (3) 2-1-013:002 (por.)
APPLICANT: Geometrician Associates, LLC on behalf of **Yamada & Sons, Inc.**

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit comments by **May 20, 2019.**

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Darlene Nakamura at 587-0417 or by email at darlene.k.nakamura@hawaii.gov. Thank you.

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed: _____
Carty S. Chang, Chief Engineer
Print Name: _____
Date: 5/1/19

Attachments
cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji
Ref: Early Consultation for Environmental Assessment for Proposed Rock Quarry
Location: Waiakea, South Hilo District, Island of Hawaii
TMK(s): (3) 2-1-013:002 (por.)
Applicant: Geometrician Associates, LLC on behalf of Yamada & Sons, Inc.

COMMENTS

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high risk areas). State projects are required to comply with 44CFR regulations as stipulated in Section 60.12. Be advised that 44CFR reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards.

The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood Hazard Zones are designated on FEMA's Flood Insurance Rate Maps (FIRM), which can be viewed on our Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT).

If there are questions regarding the local flood ordinances, please contact the applicable County NFIP coordinating agency below:

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7253.
- Kauai: County of Kauai, Department of Public Works (808) 241-4846.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: 5/1/19

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

RECEIVED LAND DIVISION 2019 MAY -6 AM 10:47 DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

RECEIVED COMMISSION ON WATER RESOURCE MANAGEMENT 2019 APR 26 AM 9:57

April 25, 2019

MEMORANDUM

TO: **DLNR Agencies:**
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
X Engineering Division
___Div. of Forestry & Wildlife
___Div. of State Parks
X Commission on Water Resource Management
___Office of Conservation & Coastal Lands
X Land Division – Hawaii District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Early Consultation for Environmental Assessment for Proposed Rock Quarry
LOCATION: Waiakea, South Hilo District, Island of Hawaii; TMK: (3) 2-1-013:002 (por.)
APPLICANT: Geometrician Associates, LLC on behalf of **Yamada & Sons, Inc.**

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit comments by **May 20, 2019.**

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Darlene Nakamura at 587-0417 or by email at darlene.k.nakamura@hawaii.gov. Thank you.

( ) We have no objections.
( ) We have no comments.
(x) Comments are attached.

Signed: /s/ M. Kaleo Manuel

Print Name: Deputy Director

Date: May 2, 2019

Attachments
cc: Central Files

FILE ID: EPP.5098.8
DOC ID: 21498

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON

BRUCE S. ANDERSON, PH.D.
WILLIAM D. BALFOUR, JR.
KAMANA BEAMER, PH.D.
MICHAEL G. BUCK
NEIL J. HANNAHS
PAUL J. MEYER

M. KALEO MANUEL
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

May 2, 2019

REF: RFD.5098.8

TO: Mr. Russell Tsuji, Administrator
Land Division

FROM: M. Kaleo Manuel, Deputy Director
Commission on Water Resource Management

SUBJECT: Early Consultation for Environmental Assessment for Proposed Rock Quarry

FILE NO.: RFD.5098.8
TMK NO.: (3) 2-1-013:002 (por.)

Thank you for the opportunity to review the subject document. The Commission on Water Resource Management (CWRM) is the agency responsible for administering the State Water Code (Code). Under the Code, all waters of the State are held in trust for the benefit of the citizens of the State, therefore all water use is subject to legally protected water rights. CWRM strongly promotes the efficient use of Hawaii's water resources through conservation measures and appropriate resource management. For more information, please refer to the State Water Code, Chapter 174C, Hawaii Revised Statutes, and Hawaii Administrative Rules, Chapters 13-167 to 13-171. These documents are available via the Internet at http://dlnr.hawaii.gov/cwrm.

Our comments related to water resources are checked off below.

☐ 1. We recommend coordination with the county to incorporate this project into the county's Water Use and Development Plan. Please contact the respective Planning Department and/or Department of Water Supply for further information.

☐ 2. We recommend coordination with the Engineering Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

☐ 3. We recommend coordination with the Hawaii Department of Agriculture (HDOA) to incorporate the reclassification of agricultural zoned land and the redistribution of agricultural resources into the State's Agricultural Water Use and Development Plan (AWUDP). Please contact the HDOA for more information.

☐ 4. We recommend that water efficient fixtures be installed and water efficient practices implemented throughout the development to reduce the increased demand on the area's freshwater resources. Reducing the water usage of a home or building may earn credit towards Leadership in Energy and Environmental Design (LEED) certification. More information on LEED certification is available at http://www.usgbc.org/leed. A listing of fixtures certified by the EAP as having high water efficiency can be found at http://www.epa.gov/watersense.

☐ 5. We recommend the use of best management practices (BMP) for stormwater management to minimize the impact of the project to the existing area's hydrology while maintaining on-site infiltration and preventing polluted runoff from storm events. Stormwater management BMPs may earn credit toward LEED certification. More information on stormwater BMPs can be found at http://planning.hawaii.gov/czm/initiatives/low-impact-development/

☐ 6. We recommend the use of alternative water sources, wherever practicable.

☐ 7. We recommend participating in the Hawaii Green Business Program, that assists and recognizes businesses that strive to operate in an environmentally and socially responsible manner. The program description can be found online at http://energy.hawaii.gov/green-business-program.

☐ 8. We recommend adopting landscape irrigation conservation best management practices endorsed by the Landscape Industry Council of Hawaii. These practices can be found online at http://www.hawaiiscape.com/wp-content/uploads/2013/04/LICH_Irrigation_Conservation_BMPs.pdf.

- [ ] 9. There may be the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.
- [ ] 10. The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit is required prior to use of water. The Water Use Permit may be conditioned on the requirement to use dual line water supply systems for new industrial and commercial developments.
- [ ] 11. A Well Construction Permit(s) is (are) are required before the commencement of any well construction work.
- [ ] 12. A Pump Installation Permit(s) is (are) required before ground water is developed as a source of supply for the project.
- [ ] 13. There is (are) well(s) located on or adjacent to this project. If wells are not planned to be used and will be affected by any new construction, they must be properly abandoned and sealed. A permit for well abandonment must be obtained.
- [ ] 14. Ground-water withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.
- [ ] 15. A Stream Channel Alteration Permit(s) is (are) required before any alteration can be made to the bed and/or banks of a steam channel.
- [ ] 16. A Stream Diversion Works Permit(s) is (are) required before any stream diversion works is constructed or altered.
- [ ] 17. A Petition to Amend the Interim Instream Flow Standard is required for any new or expanded diversion(s) of surface water.
- [ ] 18. The planned source of water for this project has not been identified in this report. Therefore, we cannot determine what permits or petitions are required from our office, or whether there are potential impacts to water resources.

- [x] OTHER: The EA will address wastewater treatment; however, what will be the source of water to create the wastewater and how will the wastewater be disposed?

If you have any questions, please contact W. Roy Hardy of the Commission staff at 587-0225.

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
LAND DIVISION
2019 MAY 13 AM 11:11
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

April 25, 2019

RECEIVED
LAND DIVISION
HILO, HAWAII
2019 APR 29 A 9:21

MEMORANDUM

TO: **DLNR Agencies:**
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
_X_Engineering Division
___Div. of Forestry & Wildlife
___Div. of State Parks
_X_Commission on Water Resource Management
___Office of Conservation & Coastal Lands
_X_Land Division – Hawaii District
_X_Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Early Consultation for Environmental Assessment for Proposed Rock Quarry
LOCATION: Waiakea, South Hilo District, Island of Hawaii; TMK: (3) 2-1-013:002 (por.)
APPLICANT: Geometrician Associates, LLC on behalf of **Yamada & Sons, Inc.**

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit comments by **May 20, 2019.**

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Darlene Nakamura at 587-0417 or by email at darlene.k.nakamura@hawaii.gov. Thank you.

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed: _____

Print Name: GORDON C. HEIT

Date: 5/9/19

Attachments
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

75 Aupuni Street, Room 204
Hilo, Hawaii 96720
PHONE: (808) 961-9590
FAX: (808) 961-9599

May 9, 2019

MEMORANDUM

TO: Russell Y. Tsuji, Administrator

FROM: Gordon C. Heit, Hawaii District Land Agent

SUBJECT: Pre-Assessment Consultation – Proposed Rock Quarry

LOCATION: Waiakea, South Hilo, Island of Hawaii, TMK: (3) 2-1-013:portion of 002

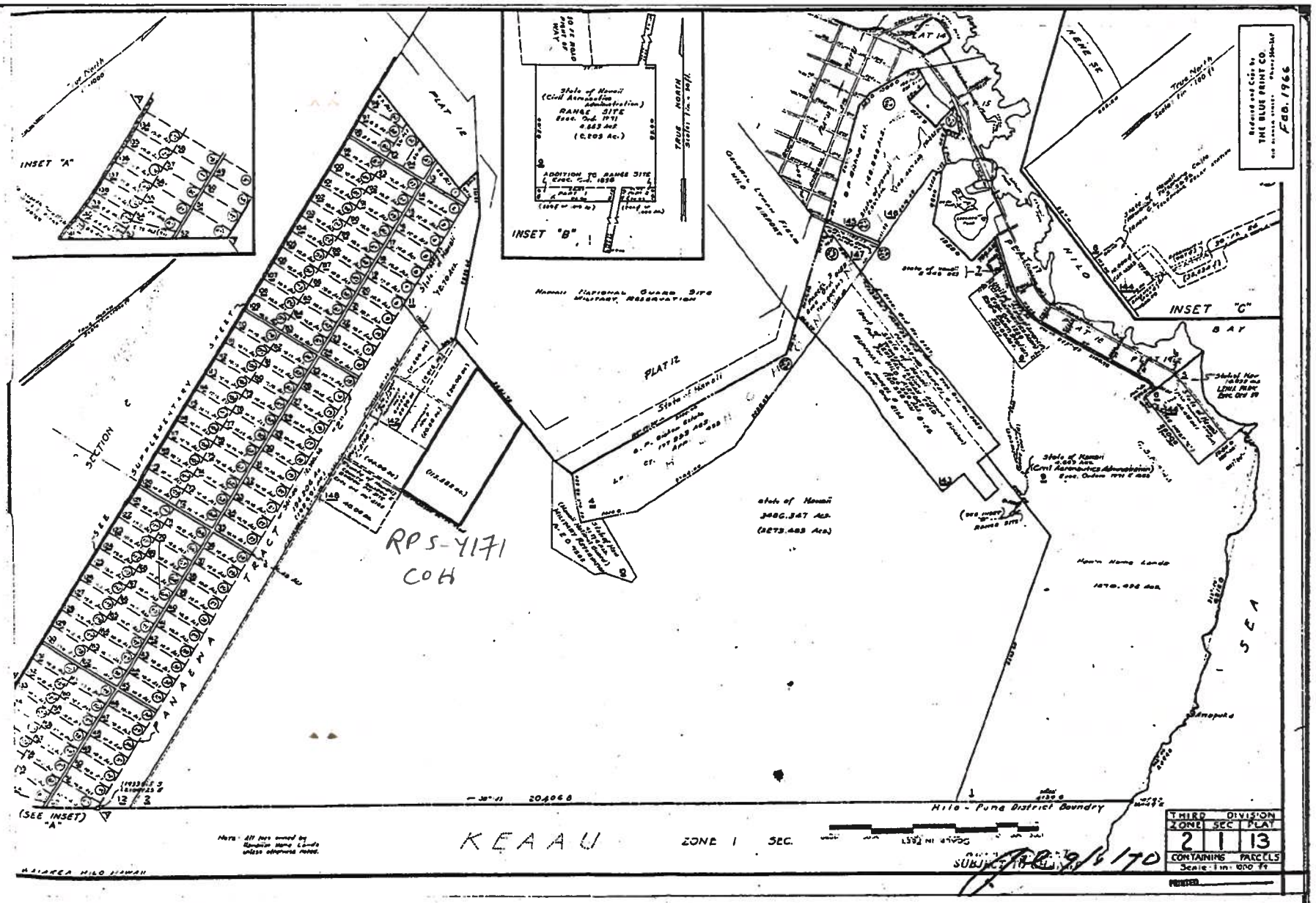
APPLICANT: Geometrician Associates, LLC on behalf of Yamada and Sons, Inc.

Pursuant to your request for comments on the above matter, we offer the following:

The proposed location for the rock quarry identified above is within land partially encumbered under the Revocable Permit No. S-4171 to the County of Hawaii for public skeet shooting range purposes:

The Land Division will provide further comments when the Draft Environmental Assessment is available for review.

Please contact me should you have any questions.


INSET "A"
INSET "B"
INSET "C"
State of Hawaii (Civil Aeronautics Administration) RANGE SITE
ADDITION TO RANGE SITE
TRUE NORTH
Hawaii National Guard Site Military Reservation
PLAT 12
PLAT 13
PLAT 14
State of Hawaii
State of Hawaii 3486.347 Ac. (3673.483 Ac.)
State of Hawaii (Civil Aeronautics Administration)
Hilo - Puna District Boundry
SECTION C
SUPPLEMENTARY SHEET
TRACT
PANAEWA
HILO
BAY
SEA
Reduced and Copied by THE BLUE PRINT CO.
FEB. 1966
RPS-4171
COH
KEAAU
ZONE 1 SEC.
THIRD DIVISION
ZONE 2 SEC 1 PLAT 13
CONTAINING PARCELS
Scale 1 in 1000 ft
SUBJECT TO RPS 9/6/70
MAUKAKA HILO HAWAII

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
SOLID WASTE DIVISION
COUNTY OF HAWAI'I - 345 KEKUANAO'A ST., STE 41 - HILO, HI 96720
Tel: (808) 961-8270 **Fax:** (808) 961-8553
Website: www.hawaiizerowaste.org

May 29, 2019

Geometrician Associates, LLC
PO Box 396
Hilo, HI 96721
Mr. Ron Terry, Principal

Subject: Early Consultation for Environmental Assessment for Yamada and Sons, Inc. License on State Land for Quarry Purposes, South Hilo District, Island of Hawai'i, TMK 2-1-013:002(por.)

Dear Mr. Terry,

This letter is in response to letter dated April 18, 2019 in response to the subject matter state above. The County is currently in the final stages of completing the consolidation/resubdivision of various parcels within and around the South Hilo Sanitary Landfill. At completion of the consolidation/resubdivision tasks, the State will issue a new EO. One of the component of the consolidation/resubdivision is the creation of a road lot that will be dedicated to the County to become ROW which will end the use of off-road rock haulers. For the purpose of this EA, the applicant is advised that once quarrying operations for the subject parcel becomes active, applicant must use highway legal equipment to haul materials.

Please inform our office when the Draft EA has been published by the OEQC.

Should you have quests or comments regarding this response letter, please contact Solid Waste Division Chief Gregory Goodale at 808-961-8516 or by email at gregory.goodale@hawaiicounty.gov.

Sincerely,

Gregory Goodale
Division Chief

Hawai'i County is an equal opportunity provider and employer.

DAVID Y. IGE
Governor

MIKE MCCARTNEY
Director

LAND USE COMMISSION
Department of Business, Economic Development & Tourism
State of Hawai`i

DANIEL E. ORODENKER
Executive Officer

April 29, 2019

Mr. Ron Terry, Principal
Geometrician Associates, LLC
P. O. Box 396
Hilo, Hawai`i 96721

Subject: Early Consultation for Environmental Assessment for Yamada and Sons, Inc.
License on State Land for Quarrying Purposes
South Hilo District, Island of Hawai`i, TMK 2-1-013: 002 (por.)

Dear Mr. Terry:

We are in receipt of your letter dated April 18, 2019, requesting our comments on the subject project. We understand that the project will involve the development of a 14.99-acre rock quarry on State-owned land in Hilo, Hawai`i. The quarry is expected to provide rock material for a variety of construction products, including base course and components of hot mix asphalt and concrete. Heavy equipment would be used for excavation and drilling and blasting would be undertaken as necessary. We further understand the excavated rock will either be stockpiled onsite or removed and transported offsite to the Applicant's quarry baseyard for crushing, processing, and eventual sale. As State-owned land, the Applicant plans to acquire a license with the Department of Land and Natural Resources for use of the site and in turn pay royalties to the State for materials extracted from the quarry. An active lifespan of approximately ten years is expected for the quarry.

Based on review of the Land Use District Boundaries Map (H-66), the proposed quarry site, as represented on the vicinity map, is designated within the State Land Use Agricultural District. As quarries are not permitted within said district, a district boundary amendment or special permit would be required to establish the quarry on the site. The EA should identify what land use entitlement will be sought for the quarry. In addition, your letter states that the quarry site is located adjacent to similar quarries currently in operation. We note one of these quarries was

235 SOUTH BERETANIA STREET • SUITE 406 • HONOLULU, HAWAI`I 96813 • TEL: (808) 587-3822 • FAX: (808) 587-3827
EMAIL: dbedt.luc.web@hawaii.gov
MAILING ADDRESS: P. O. Box 2359, Honolulu, Hawai`i 96804

recently approved by the Land Use Commision ("LUC") in Docket No. SP14-404/Jas W. Glover, Ltd. ("Glover Quarry") on an 85.338-acre site.

According to the applicable tax map, the subject parcel consists of approximately 2,407.756 acres. As you know, there is a 15-acre statutory threshold that demarcates what boundary amendments and special permits are considered by the LUC and the respective counties. The 14.99-acre quarry site is just under this threshold, and therefore as proposed would require consideration only by the County of Hawai`i. Unlike the aforementioned Glover Quarry, we believe this action represents a deliberate act of parcelization in defiance of the spirit and intent of the State Land Use Law promulgated under Hawai`i Revised Statutes chapter 205. It also completely disregards the potential impacts of the quarry on areas of statewide concern, including but not limited to the transportation infrastructure and the ambient air and aural quality of the area. We note that among the concerns expressed about the adjacent Glover Quarry were the possibility of threatened or endangered avian species as well as archaeological features on the site. We believe these areas would not have been comprehensively addressed and mitigated had it not been before the LUC for approval.

Given the above, we request that the Applicant follow the example of the Glover Quarry and reconsider the size of the proposed quarry site. In the alternative, we request that the EA at a minimum provide a thorough discussion of (1) the cumulative impacts of the quarry and the neighboring active quarry operations and non-agricultural uses on the areas of statewide concern identified above and (2) the measures that will be implemented to mitigate such impacts.

Finally, we request that our office receive notice of the availability of the Draft EA when it is completed.

We have no further comments to offer at this time. Should you have any questions or require further clarification, please call our office at 587-3822.

Sincerely,

Daniel E. Orodenker
Executive Officer

geometrician
ASSOCIATES, LLC
integrating geographic science and planning

phone: (808) 969-7090 PO Box 396 Hilo Hawai'i 96721 rterry@hawaii.rr.com

July 23, 2019

Dear Neighboring Property Owner or Agency/Organization Official:

Subject: REVISED Early Consultation for Environmental Assessment for Yamada and Sons, Inc. License on State Land for Quarrying Purposes, South Hilo District, Island of Hawai'i, TMK 2-1-013:002 (por.)

This letter supplements a letter of April 18, 2019, that was sent to you concerning Yamada and Sons' proposed license of State land in Hilo for quarrying operations. The extent of the proposed license has been expanded from 14.99 to 51.192 acres, to allow for a longer quarrying period. A map of the area proposed for quarrying, along with a map of the area previously proposed, is provided below.

As stated previously, the project site is adjacent to existing quarries and is presently vacant and undeveloped. Yamada & Sons requires a new quarry because their existing quarry will soon exhaust its supply of adequate quality material. The quarry would allow the manufacture of engineered products, including base course and components of hot mix asphalt and concrete, that are necessary for the construction of a wide variety of Hawai'i County projects, both public and private. Yamada & Sons would acquire a license with the Department of Land and Natural Resources for use of the site and would pay royalties to the State for materials extracted from the quarry. The proposed quarrying activities would be identical in nature to the ongoing quarrying activities located on adjacent parcels; rock would be excavated with heavy equipment when possible, and when impenetrable rock is encountered, drilling and blasting would be performed. Excavated rock would either be stockpiled on-site or removed and trucked off-site to Yamada & Sons' quarry baseyard located off of Railroad Avenue for crushing/processing and sale. No crushing or sales will be done at the new quarry. They anticipate that about 25,000 tons of material would be extracted per month, and with the excavation reaching a maximum depth of about 80 feet, the quarry is expected to have an active lifetime of roughly thirty years or more. It is expected that the Drag Strip Access Road would be rerouted.

An EA is necessary because the property is State land and a license for quarrying purposes is not an exempt action under the State's EIS rules at Hawai'i Administrative Rules. Once complete, the EA will accompany the application for the quarry license. The areas of investigation in the EA will include the following: water quality assurance; wastewater treatment; flora, fauna, and ecosystems; traffic impacts; geology, soils, and hazards; flooding and drainage impacts; social, cultural and community impacts; and historic sites. This letter is to share information about the project and request your input on site conditions, issues that you wish to be addressed in the EA, and any concerns you may have.

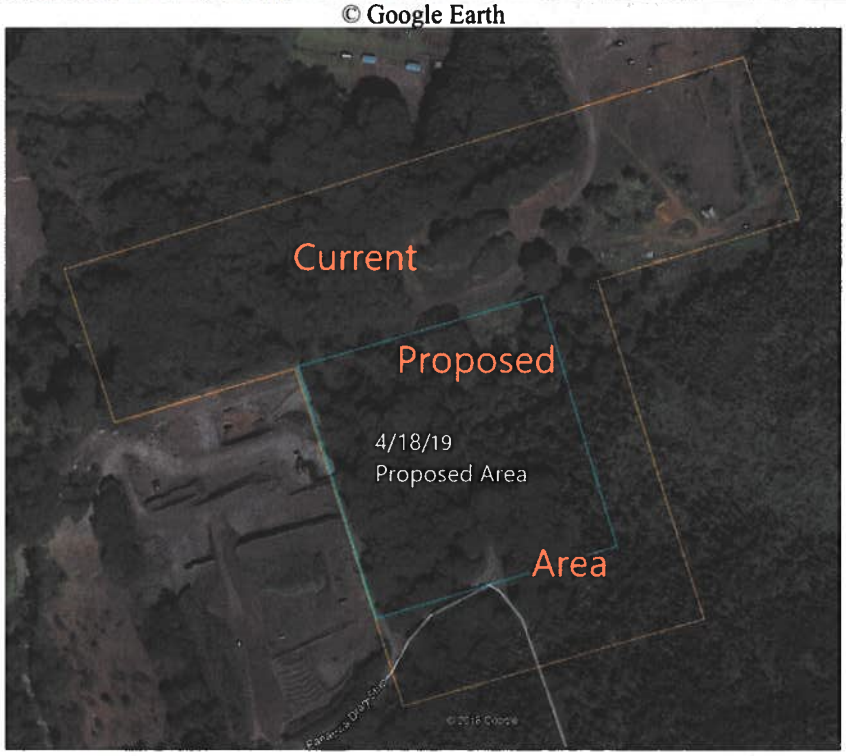
Please contact me at 808-969-7090 or by email at rterry@hawaii.rr.com if you have any questions or require clarification. Kindly indicate whether you wish to receive notice of the availability of the Draft EA when it is completed.

Sincerely,

Ron Terry

Ron Terry, Principal
Geometrician Associates

© Google Earth



Harry Kim
Mayor

Paul K. Ferreira
Police Chief

Kenneth Bugado Jr.
Deputy Police Chief

County of Hawai`i

POLICE DEPARTMENT
349 Kapiolani Street • Hilo, Hawai`i 96720-3998
(808) 935-3311 • Fax (808) 961-8865

August 5, 2019

Mr. Ron Terry, Principal
Geometrician Associates, LLC
P. O. Box 396
Hilo, HI 96721

Dear Mr. Terry:

SUBJECT: EARLY CONSULTATION FOR ENVIRONMENTAL ASSESSMENT FOR YAMADA AND SONS, INC., LICENSE ON STATE LAND FOR QUARRYING PURPOSES, SOUTH HILO DISTRICT, ISLAND OF HAWAII, TMK 2-1-013:002 (POR.)

Staff, upon reviewing the provided documents with the additional land portion being allocated for use, does not anticipate any significant impact to traffic and/or other public safety concerns.

Thank you for allowing us the opportunity to comment. We will not be requesting a copy of the assessment once completed.

If you have any questions, please contact Captain Kenneth Quiocho, South Hilo Patrol, at (808)961-2214 or via email at Kenneth.quiocho@hawaiicounty.gov.

Sincerely,

JAMES B. O'CONNOR
ASSISTANT POLICE CHIEF
AREA I OPERATIONS BUREAU

KQ:lli /19HQ0460

DAVID Y. IGE
GOVERNOR

JADE T. BUTAY
DIRECTOR

Deputy Directors
LYNN A.S. ARAKI-REGAN
DEREK J. CHOW
ROSS M. HIGASHI
EDWIN H. SNIFFEN

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:
DIR 0756
STP 8.2730

August 12, 2019

Mr. Ron Terry
Principal
Geometrician Associates, LLC
PO Box 396
Hilo, Hawaii 96721

Dear Mr. Terry:

Subject: Yamada and Sons, Inc. Quarry
Revised Early Consultation for Environmental Assessment (EA)
Hilo, Hawaii
TMK: (3) 2-1-013:002 (por.)

The Hawaii Department of Transportation (HDOT) understands that Yamada and Sons, Inc. has expanded their previous proposal to acquire a license to develop a 14.99-acre portion of State property for use as a rock quarry. The new proposal is now for 51.192 acres to allow for a longer quarrying period.

HDOT has reviewed the revised early consultation request for the expanded area and wishes to inform you that our prior comments in letter STP 8.2672 dated May 22, 2019 (attached), remains valid.

Please notify us of the availability of the draft EA when it is completed. Further review and additional comments may be provided once HDOT has the opportunity to review the draft EA.

If there are any questions, please contact Mr. Blayne Nikaido of the Statewide Transportation Planning Office at (808) 831-7979 or via email at blayne.h.nikaido@hawaii.gov.

Sincerely,

JADE T. BUTAY
Director of Transportation

Attachment

DAVID Y. IGE
GOVERNOR

JADE T. BUTAY
DIRECTOR

Deputy Directors
LYNN A.S. ARAKI-REGAN
DEREK J. CHOW
ROSS M. HIGASHI
EDWIN H. SNIFFEN

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:
DIR 0399
STP 8.2672

May 22, 2019

Mr. Ron Terry
Principal
Geometrician Associates, LLC
PO Box 396
Hilo, Hawaii 96721

Dear Mr. Terry:

Subject: Yamada and Sons, Inc Quarry
Early Consultation for Environmental Assessment
Hilo, Hawaii
TMK: (3) 2-1-013:002 (por.)

The State of Hawaii Department of Transportation (DOT) understands that Yamada and Sons, Inc. is proposing to acquire a license to develop a 14.99-acre portion of State property for use as a rock quarry. DOT's comments on the proposed project are as follows:

Airports Division (DOT-A)

1. The proposed quarry site is approximately 1.75 miles from the Runway 8/26 centerline at Hilo International Airport (ITO). The site is next to an existing quarry operation and does not underlie any approach or departure flight tracks. All projects within 5 miles from State of Hawaii airports are advised to read the Technical Assistance Memorandum (TAM) for guidance with development and activities that may require further review and permits. The TAM can be viewed at this link: http://files.hawaii.gov/dbedt/op/docs/TAM-FAA-DOT-Airports_08-01-2016.pdf

   The TAM provides a comprehensive list of Federal Aviation Administration advisory circulars and DOT guidance and requirements for developments close to airports.

2. DOT-A recommends that the project be coordinated with Hawaii Airports District Assistant Manager, Mr. Steven Santiago at ITO to ensure compliance with existing regulations.

Highways Division

1. The proposed action is not anticipated to have a significant impact to State highways.

2. The Highways Division, Hawaii District Engineer may require mitigation for issues arising from the operation of the quarry or conveyance of material to the baseyard at no cost to the State.

If there are any questions, please contact Mr. Blayne Nikaido of the Statewide Transportation Planning Office at (808) 831-7979 or via email at blayne.h.nikaido@hawaii.gov.

Sincerely,

for JADE T. BUTAY
Director of Transportation

Harry Kim
Mayor

Wil Okabe
Managing Director

West Hawai'i Office
74-5044 Ane Keohokālole Hwy
Kailua-Kona, Hawai'i 96740
Phone (808) 323-4770
Fax (808) 327-3563

County of Hawai'i
PLANNING DEPARTMENT

Michael Yee
Director

Duane Kanuha
Deputy Director

East Hawai'i Office
101 Pauahi Street, Suite 3
Hilo, Hawai'i 96720
Phone (808) 961-8288
Fax (808) 961-8742

August 23, 2019

Mr. Ron Terry
Geometrician Associates
P.O. Box 396
Hilo, HI 96721

Dear Mr. Terry:

SUBJECT: Comments for Early Consultation for Environmental Assessment for Yamada & Sons, Inc. License on State Land for Quarrying Purposes
Tax Map Key: (3) 2-1-013: portion on 002, South Hilo, Hawai'i

This is in response to your letter dated July 26, 2019 requesting early consultation comments for an environmental assessment being prepared for the expansion of the license to allow quarrying on 51.192 acres of land on the above referenced property, which is owned by the State of Hawai'i. The project site is adjacent to existing quarries and is presently vacant and undeveloped.

1. The subject property is 2,407.756 acres in size, is zoned Agricultural (A-20a and A-5a) by the County of Hawai'i and designated as Agricultural by the State Land Use Commission. Section 25-5-72(c)(5) of the Hawai'i County Code, Chapter 25, Zoning, lists "excavation or removal of natural building materials or minerals, for commercial use" as requiring a Special Permit in the State Land Use Agricultural district. On January 6, 2011, Special Permit No. 10-000110 was approved by the Planning Commission to Yamada & Sons, Inc. to allow for the establishment of a quarry and related uses on a 14.99-acre portion of the subject property. A Special Permit will be required to increase the area from 14.99 acres to 51.192 acres from the State Land Use Commission as the request involves an area over 15 acres in size.

2. The General Plan Land Use Pattern Allocation Guide (LUPAG) map designations for the property are Important Agricultural Land (ial), Extensive Agriculture (ea) and Industrial (ind).

3. The property is not located within the Special Management Area (SMA) and the proposed use is approximately 3 miles from the nearest coastline.

4. The Land Study Bureau rates the soil type in the area as "E" or "Very Poor".

5. There is a reference on Subdivision No. 7042 that the proposed location of the quarry is in proximity to the Waiākea-uka flood control project.

We have no further comments at this time. Please forward us a copy of the draft EA for review. If you have any questions, please feel free to contact Jeff Darrow at 961-8158.

Sincerely,

MICHAEL YEE
Planning Director

JWD:mad
P:\wpwin60\CH343\2019\Yamada & Sons Quarry\LTerry-PreEADraftConsul-Yamada&SonsQuarry.docxc

cc: SPP 10-000110

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

August 23, 2019

Geometrician Associates, LLC
Attention: Mr. Ron Terry
P.O. Box 396
Hilo, Hawaii 96721

via email: rterry@hawaii.rr.com

Dear Mr. Terry:

SUBJECT: REVISED Early Consultation for Environmental Assessment for **Yamada and Sons, Inc.** License on State Land for Quarry Purposes located at Waiakea, South Hilo, Island of Hawaii; TMK: (3) 2-1-013:002 (por.)

Thank you for the opportunity to review and comment on the subject matter. The Land Division of the Department of Land and Natural Resources (DLNR) distributed or made available a copy of your request pertaining to the subject matter to DLNR's Divisions for their review and comments.

At this time, enclosed are comments from the (a) Engineering Division, (b) Division of Forestry & Wildlife, and (c) Commission on Water Resource Management on the subject matter. Should you have any questions, please feel free to contact Darlene Nakamura at (808) 587-0417 or email: darlene.k.nakamura@hawaii.gov. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosures
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
LAND DIVISION
2019 AUG -7 AM 10:30

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

July 31, 2019

MEMORANDUM

'19 AUG 01 PM02:35 ENGINEERING

FROM

TO

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
__Office of Conservation & Coastal Lands
X Land Division – Hawaii District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: REVISED Early Consultation for Environmental Assessment for **Yamada and Sons, Inc.** License on State Land for Quarry Purposes
LOCATION: Waiakea, South Hilo, Island of Hawaii; TMK: (3) 2-1-013:002 (por.)
APPLICANT: Geometrician Associates, LLC

Transmitted for your review and comment is information on the above-referenced subject matter. The proposed project was revised to include a larger area, longer license term, and rerouting of the Drag Strip Access Road. Please submit any comments by **August 22, 2019.**

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Darlene Nakamura at 587-0417 or by email at darlene.k.nakamura@hawaii.gov. Thank you.

( ) We have no objections.
(✓) We have no additional comments.
( ) Comments are attached.

Signed: _____

Print Name: Carty S. Chang, Chief Engineer

Date: 8/5/19

Attachments
cc: Central Files

2059

DAVID Y. IGE
GOVERNOR OF HAWAII

RECEIVED
LAND DIVISION
AUG 20 AM 11:14
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

July 31, 2019

MEMORANDUM

~~TO:~~ From

DLNR Agencies:
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
___Div. of State Parks
X Commission on Water Resource Management
___Office of Conservation & Coastal Lands
X Land Division – Hawaii District
X Historic Preservation

~~FROM:~~ To:
Russell Y. Tsuji, Land Administrator

SUBJECT: **REVISED** Early Consultation for Environmental Assessment for **Yamada and Sons, Inc.** License on State Land for Quarry Purposes

LOCATION: Waiakea, South Hilo, Island of Hawaii; TMK: (3) 2-1-013:002 (por.)

APPLICANT: Geometrician Associates, LLC

Transmitted for your review and comment is information on the above-referenced subject matter. The proposed project was revised to include a larger area, longer license term, and rerouting of the Drag Strip Access Road. Please submit any comments by **August 22, 2019.**

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Darlene Nakamura at 587-0417 or by email at darlene.k.nakamura@hawaii.gov. Thank you.

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed: _____

Print Name: **DAVID G. SMITH, Administrator**

Date: 8/19/19

Attachments
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

AUG 2 0 2019

MEMORANDUM *Log no. 2059*

TO: RUSSELL Y. TSUJI, Administrator
Land Division

FROM: DAVID G. SMITH, Administrator DGS

SUBJECT: **Division of Forestry and Wildlife Comments on the Early Consultation for Environmental Assessment for Yamada and Sons, Inc. License on State Land for Quarry Purposes.**

The Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) has received your inquiry regarding the revised early consultation for the Draft Environmental Assessment for the Yamada and Sons, Inc. quarrying license request in Hilo on the island of Hawai'i, TMK: (3) 2-1-013:002 (por.). The proposed license would allow an expansion of quarrying from 14.99 to 51.192 acres on undeveloped State-owned land for a longer quarrying period of 30 years or more. Excavation activities would involve heavy equipment, drilling, and blasting, and reach a maximum depth of approximately 80 feet. The existing Hilo Drag Strip access road would be rerouted.

The State listed Hawaiian Hoary Bat or 'Ōpe'ape'a (*Lasiurus cinereus semotus*) has the potential to occur in the vicinity of the project area and may roost in nearby trees. Site clearing should be timed to avoid disturbance during the bat birthing and pup rearing season (June 1 through September 15). If this cannot be avoided, woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed without consulting DOFAW. Barbed wire should be avoided for any construction because bat mortalities have been documented as a result of becoming ensnared by barbed wire during flight.

The State listed Hawaiian Hawk or 'Io (*Buteo solitarius*) may occur in the project vicinity. DOFAW recommends surveying the area to ensure no Hawaiian Hawk nests are present if trees are to be cut.

DOFAW recommends minimizing the movement of plant or soil material between worksites. Soil and plant material may contain invasive fungal pathogens (e.g. Rapid 'Ōhi'a Death), vertebrate and invertebrate pests (e.g. Little Fire Ants, Coqui Frogs), or invasive plant parts that could harm our native species and ecosystems. We recommend consulting the Big Island Invasive Species Committee at (808) 933-3340 in planning, design, and construction of the project to learn of any high-risk invasive species in the area and ways to mitigate spread. All

equipment, materials, and personnel should be cleaned of excess soil and debris to minimize the risk of spreading invasive species. Gear that may contain soil, such as work boots and vehicles, should be thoroughly cleaned with water and sprayed with 70% alcohol solution to prevent the spread of Rapid ʻŌhiʻa Death and other harmful fungal pathogens.

DOFAW requests to receive notification of the Draft Environmental Assessment when completed. We appreciate your efforts to work with our office for the conservation of our native species. Should the scope of the project change significantly, or should it become apparent that threatened or endangered species may be impacted, please contact our staff as soon as possible.

If you have any questions, please contact Jim Cogswell, Wildlife Program Manager at (808) 587-4187 or James.M.Cogswell@hawaii.gov.

DAVID Y. IGE
GOVERNOR OF HAWAII

RECEIVED
LAND DIVISION
2019 AUG 22 AM 10:43
DEPT. OF NATURAL RESOURCES
STATE OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

July 31, 2019

MEMORANDUM

RECEIVED
COMMISSION ON WATER
RESOURCE MANAGEMENT
2019 AUG -1 PM 2:31

TO: **DLNR Agencies:**
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
___Div. of State Parks
X Commission on Water Resource Management
___Office of Conservation & Coastal Lands
X Land Division – Hawaii District
X Historic Preservation

FR:

TO:

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: **REVISED** Early Consultation for Environmental Assessment for **Yamada and Sons, Inc.** License on State Land for Quarry Purposes
LOCATION: Waiakea, South Hilo, Island of Hawaii; TMK: (3) 2-1-013:002 (por.)
APPLICANT: Geometrician Associates, LLC

Transmitted for your review and comment is information on the above-referenced subject matter. The proposed project was revised to include a larger area, longer license term, and rerouting of the Drag Strip Access Road. Please submit any comments by **August 22, 2019.**

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Darlene Nakamura at 587-0417 or by email at darlene.k.nakamura@hawaii.gov. Thank you.

( ) We have no objections.
( ) We have no comments.
(x) Comments are attached.

Signed: /s/ M. Kaleo Manuel

Print Name: Deputy Director

Date: August 21, 2019

Attachments
cc: Central Files

FILE ID: RFD 5201.8
DOC ID: 21745

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON

BRUCE S. ANDERSON, PH.D.
KAMANA BEAMER, PH.D.
NEIL J. HANNAHS
WAYNE K. KATAYAMA
PAUL J. MEYER

M. KALEO MANUEL
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

August 21, 2019

REF: RFD.5201.8

TO: Mr. Russell Tsuji, Administrator
Land Division

FROM: M. Kaleo Manuel, Deputy Director
Commission on Water Resource Management

SUBJECT: REVISED Early Consultation for Environmental Assessment for Yamada and Sons, Inc. License on State Land for Quarry Purposes

FILE NO.: RFD.5201.8
TMK NO.: (3) 2-1-013:002 (por.)

Thank you for the opportunity to review the subject document. The Commission on Water Resource Management (CWRM) is the agency responsible for administering the State Water Code (Code). Under the Code, all waters of the State are held in trust for the benefit of the citizens of the State, therefore all water use is subject to legally protected water rights. CWRM strongly promotes the efficient use of Hawaii's water resources through conservation measures and appropriate resource management. For more information, please refer to the State Water Code, Chapter 174C, Hawaii Revised Statutes, and Hawaii Administrative Rules, Chapters 13-167 to 13-171. These documents are available via the Internet at http://dlnr.hawaii.gov/cwrm.

Our comments related to water resources are checked off below.

☐ 1. We recommend coordination with the county to incorporate this project into the county's Water Use and Development Plan. Please contact the respective Planning Department and/or Department of Water Supply for further information.

☐ 2. We recommend coordination with the Engineering Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

☐ 3. We recommend coordination with the Hawaii Department of Agriculture (HDOA) to incorporate the reclassification of agricultural zoned land and the redistribution of agricultural resources into the State's Agricultural Water Use and Development Plan (AWUDP). Please contact the HDOA for more information.

☐ 4. We recommend that water efficient fixtures be installed and water efficient practices implemented throughout the development to reduce the increased demand on the area's freshwater resources. Reducing the water usage of a home or building may earn credit towards Leadership in Energy and Environmental Design (LEED) certification. More information on LEED certification is available at http://www.usgbc.org/leed. A listing of fixtures certified by the EAP as having high water efficiency can be found at http://www.epa.gov/watersense.

☒ 5. We recommend the use of best management practices (BMP) for stormwater management to minimize the impact of the project to the existing area's hydrology while maintaining on-site infiltration and preventing polluted runoff from storm events. Stormwater management BMPs may earn credit toward LEED certification. More information on stormwater BMPs can be found at http://planning.hawaii.gov/czm/initiatives/low-impact-development/

☒ 6. We recommend the use of alternative water sources, wherever practicable.

☒ 7. We recommend participating in the Hawaii Green Business Program, that assists and recognizes businesses that strive to operate in an environmentally and socially responsible manner. The program description can be found online at http://energy.hawaii.gov/green-business-program.

☐ 8. We recommend adopting landscape irrigation conservation best management practices endorsed by the Landscape Industry Council of Hawaii. These practices can be found online at

http://www.hawaiiscape.com/wp-content/uploads/2013/04/LICH_Irrigation_Conservation_BMPs.pdf.

[X] 9. There may be the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

[ ] 10. The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit is required prior to use of water. The Water Use Permit may be conditioned on the requirement to use dual line water supply systems for new industrial and commercial developments.

[ ] 11. A Well Construction Permit(s) is (are) are required before the commencement of any well construction work.

[ ] 12. A Pump Installation Permit(s) is (are) required before ground water is developed as a source of supply for the project.

[ ] 13. There is (are) well(s) located on or adjacent to this project. If wells are not planned to be used and will be affected by any new construction, they must be properly abandoned and sealed. A permit for well abandonment must be obtained.

[ ] 14. Ground-water withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.

[ ] 15. A Stream Channel Alteration Permit(s) is (are) required before any alteration can be made to the bed and/or banks of a steam channel.

[ ] 16. A Stream Diversion Works Permit(s) is (are) required before any stream diversion works is constructed or altered.

[ ] 17. A Petition to Amend the Interim Instream Flow Standard is required for any new or expanded diversion(s) of surface water.

[ ] 18. The planned source of water for this project has not been identified in this report. Therefore, we cannot determine what permits or petitions are required from our office, or whether there are potential impacts to water resources.

[X] OTHER: The proposed water source(s) and projected water demands for the project, both potable and non-potable, should be identified and the calculations used to estimate demands should be provided. A discussion of the potential impacts on water resources and other public trust uses of water should be included, and any proposed mitigation measures described. Water conservation and efficiency measures to be implemented should also be discussed.

If you have any questions, please contact Lenore Ohye of the Commission staff at 587-0216.

DAVID Y. IGE
GOVERNOR OF HAWAII

BRUCE S. ANDERSON, Ph.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
EMD/CWB

08003PCH.19

August 6, 2019

Mr. Ron Terry
Geometrician Associates, LLC
P.O. Box 396
Hilo, Hawaii 96721

Dear Mr. Terry:

SUBJECT: Early Consultation for Environmental Assessment for Yamada and Sons, Inc. License on State Land for Quarrying Purposes
South Hilo District, Island of Hawaii, Hawaii
TMK(s): 2-1-013:002 (por.)

The Department of Health (DOH), Clean Water Branch (CWB), acknowledges receipt of your request for comment, dated July 23, 2019, requesting early consultation comments on your project. The DOH-CWB has reviewed the subject document and offers these comments. Please note that our review is based solely on the information provided in the subject document and its compliance with the Hawaii Administrative Rules (HAR), Chapters 11-54 and 11-55. Geometrician Associates, LLC. (Applicant) may be responsible for fulfilling additional requirements related to our program. We recommend that you also read our standard comments on our website at: http://health.hawaii.gov/epo/files/2013/05/Clean-Water-Branch-Std-Comments.pdf.

1. Any project and its potential impacts to State waters must meet the following criteria:

   a. Antidegradation policy (HAR, Section 11-54-1.1), which requires that the existing uses and the level of water quality necessary to protect the existing uses of the receiving State water be maintained and protected.

   b. Designated uses (HAR, Section 11-54-3), as determined by the classification of the receiving State waters.

   c. Water quality criteria (HAR, Sections 11-54-4 through 11-54-8).

2. You may be required to obtain National Pollutant Discharge Elimination System (NPDES) permit coverage for discharges of wastewater, including storm water runoff, into State surface waters (HAR, Chapter 11-55). For NPDES general permit coverage, a Notice of Intent (NOI) form must be submitted at least 30 calendar days before the commencement of the discharge. An application for an NPDES individual permit must be submitted at least 180 calendar days before the commencement of the discharge. To request NPDES permit coverage, you must submit the applicable form ("CWB Individual NPDES Form" or "CWB NOI Form") through the e-Permitting Portal and the hard copy certification statement with the respective filing fee ($1,000 for an individual NPDES permit or $500 for a Notice of General Permit Coverage). Please open the e-Permitting Portal website located at: https://eha-cloud.doh.hawaii.gov/epermit/. You will be asked to do a one-time registration to obtain your login and password. After you register, click on the Application Finder tool and locate the appropriate form. Follow the instructions to complete and submit the form.

3. If your project involves work in, over, or under waters of the United States, it is highly recommended that you contact the Army Corp of Engineers, Regulatory Branch (Tel: 835-4303) regarding their permitting requirements.

   Pursuant to Federal Water Pollution Control Act [commonly known as the "Clean Water Act" (CWA)], Paragraph 401(a)(1), a Section 401 Water Quality Certification (WQC) is required for "[a]ny applicant for Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may **result** in any discharge into the navigable waters..." (emphasis added). The term "discharge" is defined in CWA, Subsections 502(16), 502(12), and 502(6); Title 40 of the Code of Federal Regulations, Section 122.2; and HAR, Chapter 11-54.

4. Please note that all discharges related to the project construction or operation activities, whether or not NPDES permit coverage and/or Section 401 WQC are required, must comply with the State's Water Quality Standards. Noncompliance with water quality requirements contained in HAR, Chapter 11-54, and/or permitting requirements, specified in HAR, Chapter 11-55, may be subject to penalties of $25,000 per day per violation.

5. It is the State's position that all projects must reduce, reuse, and recycle to protect, restore, and sustain water quality and beneficial uses of State waters. Project planning should:

   a. Treat storm water as a resource to be protected by integrating it into project planning and permitting. Storm water has long been recognized as a source of irrigation that will not deplete potable water resources.

What is often overlooked is that storm water recharges ground water supplies and feeds streams and estuaries; to ensure that these water cycles are not disrupted, storm water cannot be relegated as a waste product of impervious surfaces. Any project planning must recognize storm water as an asset that sustains and protects natural ecosystems and traditional beneficial uses of State waters, like community beautification, beach going, swimming, and fishing. The approaches necessary to do so, including low impact development methods or ecological bio-engineering of drainage ways must be identified in the planning stages to allow designers opportunity to include those approaches up front, prior to seeking zoning, construction, or building permits.

b. Clearly articulate the State's position on water quality and the beneficial uses of State waters. The plan should include statements regarding the implementation of methods to conserve natural resources (e.g., minimizing potable water for irrigation, gray water re-use options, energy conservation through smart design) and improve water quality.

c. Consider storm water Best Management Practice (BMP) approaches that minimize the use of potable water for irrigation through storm water storage and reuse, percolate storm water to recharge groundwater to revitalize natural hydrology, and treat storm water which is to be discharged.

d. Consider the use of green building practices, such as pervious pavement and landscaping with native vegetation, to improve water quality by reducing excessive runoff and the need for excessive fertilization, respectively.

e. Identify opportunities for retrofitting or bio-engineering existing storm water infrastructure to restore ecological function while maintaining, or even enhancing, hydraulic capacity. Particular consideration should be given to areas prone to flooding, or where the infrastructure is aged and will need to be rehabilitated.

If you have any questions, please visit our website at: http://health.hawaii.gov/cwb, or contact the Engineering Section, CWB, at (808) 586-4309.

Sincerely,

Alec Wong

ALEC WONG, P.E., CHIEF
Clean Water Branch

CH:ms

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ENVIRONMENTAL ASSESSMENT

YAMADA AND SONS ROCK QUARRY

APPENDIX 1b
Comments to Draft EA and Responses

[This page intentionally left blank]

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 21, 2019

Geometrician Associates
Attn: Ron Terry
PO Box 396
Hilo, Hawaii 96721

via email: rterry@hawaii.rr.com

Dear Mr. Terry:

SUBJECT: Draft Environmental Assessment for the Proposed **Yamada and Sons Rock Quarry** located at Waiakea, South Hilo, Island of Hawaii; TMK: (3) 2-1-013:002 por.

Thank you for the opportunity to review and comment on the subject matter. The Land Division of the Department of Land and Natural Resources (DLNR) distributed or made available a copy of the request pertaining to the subject matter received from your agent, Geometrician Associates, to DLNR's Divisions for their review and comments.

At this time, enclosed are comments from the (a) Engineering Division, (b) Commission on Water Resource Management, and (c) Land Division-Hawaii District. Should you have any questions, please feel free to contact Darlene Nakamura at (808) 587-0417 or by email at darlene.k.nakamura@hawaii.gov. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)
cc: Central Files
Candace Martin, DLNR-Land Division via email: candace.m.martin@hawaii.gov

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

October 25, 2019

MEMORANDUM

2019 OCT 29 AM 11:02

TO: FROM

DLNR Agencies:
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
__Office of Conservation & Coastal Lands
X Land Division – Hawaii District
X Historic Preservation

FROM: TO Russell Y. Tsuji, Land Administrator
SUBJECT: Draft Environmental Assessment for the proposed **Yamada and Sons Rock Quarry**
LOCATION: Waiakea, South Hilo, Island of Hawaii; TMK: (3) 2-1-013:002 por.
APPLICANT: Geometrician Associates on behalf of Yamada and Sons, Inc.

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit any comments by **November 20, 2019.**

The DEA can be found on-line at: http://health.hawaii.gov/oeqc/ (Click on The Environmental Notice in the middle of the page.)

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Darlene Nakamura at 587-0417 or by email at darlene.k.nakamura@hawaii.gov. Thank you.

( ) We have no objections.
(✓) We have no additional comments.
( ) Comments are attached.

Signed: _____

Print Name: Carty S. Chang, Chief Engineer

Date: 10/29/19

Attachments
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
LAND DIVISION
2019 NOV 15 AM 8:20
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

RECEIVED
COMMISSION ON WATER RESOURCE MANAGEMENT
2019 OCT 25 PM 2:38

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

October 25, 2019

MEMORANDUM

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
__Office of Conservation & Coastal Lands
X Land Division – Hawaii District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Draft Environmental Assessment for the proposed **Yamada and Sons Rock Quarry**
LOCATION: Waiakea, South Hilo, Island of Hawaii; TMK: (3) 2-1-013:002 por.
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If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Darlene Nakamura at 587-0417 or by email at darlene.k.nakamura@hawaii.gov. Thank you.

( ) We have no objections.
( ) We have no comments.
(x) Comments are attached.

Signed: /s/ M. Kaleo Manuel

Print Name: Deputy Director

Date: November 12, 2019

Attachments
cc: Central Files

FILE ID: RFD.5201.8
DOC ID: 21972.1

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON

BRUCE S. ANDERSON, PH.D.
KAMANA BEAMER, PH.D.
MICHAEL G. BUCK
NEIL J. HANNAHS
WAYNE K. KATAYAMA
PAUL J. MEYER

M. KALEO MANUEL
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

November 12, 2019

REF: RFD.5201.8

TO: Mr. Russell Tsuji, Administrator
Land Division

FROM: M. Kaleo Manuel, Deputy Director
Commission on Water Resource Management

SUBJECT: Draft Environmental Assessment for the Proposed Yamada and Sons Rock Quarry

FILE NO.: RFD.5201.8
TMK NO.: (3) 2-1-013:002

Thank you for the opportunity to review the subject document. The Commission on Water Resource Management (CWRM) is the agency responsible for administering the State Water Code (Code). Under the Code, all waters of the State are held in trust for the benefit of the citizens of the State, therefore all water use is subject to legally protected water rights. CWRM strongly promotes the efficient use of Hawaii's water resources through conservation measures and appropriate resource management. For more information, please refer to the State Water Code, Chapter 174C, Hawaii Revised Statutes, and Hawaii Administrative Rules, Chapters 13-167 to 13-171. These documents are available via the Internet at http://dlnr.hawaii.gov/cwrm.

Our comments related to water resources are checked off below.

☐ 1. We recommend coordination with the county to incorporate this project into the county's Water Use and Development Plan. Please contact the respective Planning Department and/or Department of Water Supply for further information.

☐ 2. We recommend coordination with the Engineering Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

☐ 3. We recommend coordination with the Hawaii Department of Agriculture (HDOA) to incorporate the reclassification of agricultural zoned land and the redistribution of agricultural resources into the State's Agricultural Water Use and Development Plan (AWUDP). Please contact the HDOA for more information.

☐ 4. We recommend that water efficient fixtures be installed and water efficient practices implemented throughout the development to reduce the increased demand on the area's freshwater resources. Reducing the water usage of a home or building may earn credit towards Leadership in Energy and Environmental Design (LEED) certification. More information on LEED certification is available at http://www.usgbc.org/leed. A listing of fixtures certified by the EAP as having high water efficiency can be found at http://www.epa.gov/watersense.

☒ 5. We recommend the use of best management practices (BMP) for stormwater management to minimize the impact of the project to the existing area's hydrology while maintaining on-site infiltration and preventing polluted runoff from storm events. Stormwater management BMPs may earn credit toward LEED certification. More information on stormwater BMPs can be found at http://planning.hawaii.gov/czm/initiatives/low-impact-development/

☐ 6. We recommend the use of alternative water sources, wherever practicable.

☐ 7. We recommend participating in the Hawaii Green Business Program, that assists and recognizes businesses that strive to operate in an environmentally and socially responsible manner. The program description can be found online at http://energy.hawaii.gov/green-business-program.

☐ 8. We recommend adopting landscape irrigation conservation best management practices endorsed by the Landscape Industry Council of Hawaii. These practices can be found online at http://www.hawaiiscape.com/wp-content/uploads/2013/04/LICH_Irrigation_Conservation_BMPs.pdf.

- [X] 9. There may be the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.
- [ ] 10. The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit is required prior to use of water. The Water Use Permit may be conditioned on the requirement to use dual line water supply systems for new industrial and commercial developments.
- [ ] 11. A Well Construction Permit(s) is (are) are required before the commencement of any well construction work.
- [ ] 12. A Pump Installation Permit(s) is (are) required before ground water is developed as a source of supply for the project.
- [ ] 13. There is (are) well(s) located on or adjacent to this project. If wells are not planned to be used and will be affected by any new construction, they must be properly abandoned and sealed. A permit for well abandonment must be obtained.
- [ ] 14. Ground-water withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.
- [ ] 15. A Stream Channel Alteration Permit(s) is (are) required before any alteration can be made to the bed and/or banks of a steam channel.
- [ ] 16. A Stream Diversion Works Permit(s) is (are) required before any stream diversion works is constructed or altered.
- [ ] 17. A Petition to Amend the Interim Instream Flow Standard is required for any new or expanded diversion(s) of surface water.
- [ ] 18. The planned source of water for this project has not been identified in this report. Therefore, we cannot determine what permits or petitions are required from our office, or whether there are potential impacts to water resources.

- [ ] OTHER:

If you have any questions, please contact Lenore Ohye of the Commission staff at 587-0216.

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

RECEIVED
LAND DIVISION
2019 NOV -5 AM 7:55

DEPT. OF LAND AND NATURAL RESOURCES
STATE OF HAWAII
2019 OCT 28 A 11: 11

RECEIVED
LAND DIVISION
HILO, HAWAII

October 25, 2019

MEMORANDUM

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
__Office of Conservation & Coastal Lands
X Land Division – Hawaii District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Draft Environmental Assessment for the proposed **Yamada and Sons Rock Quarry**
LOCATION: Waiakea, South Hilo, Island of Hawaii; TMK: (3) 2-1-013:002 por.
APPLICANT: Geometrician Associates on behalf of Yamada and Sons, Inc.

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit any comments by **November 20, 2019.**

The DEA can be found on-line at: http://health.hawaii.gov/oeqc/ (Click on The Environmental Notice in the middle of the page.)

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Darlene Nakamura at 587-0417 or by email at darlene.k.nakamura@hawaii.gov. Thank you.

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed: [signature]

Print Name: GORDON C. HEIT

Date: 11/4/19

Attachments
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

75 Aupuni Street, Room 204
Hilo, Hawaii 96720
PHONE: (808) 961-9590
FAX: (808) 961-9599

November 4, 2019

MEMORANDUM

TO: Russell Y. Tsuji, Administrator

FROM: Gordon C. Heit, Hawaii District Land Agent

SUBJECT: Draft Environmental Assessment – Proposed Rock Quarry

LOCATION: Waiakea, South Hilo, Island of Hawaii, TMK: (3) 2-1-013:portion of 002

APPLICANT: Geometrician Associates, LLC on behalf of Yamada and Sons, Inc.

With regards to your request for comments on the above matter, we offer the following:

The subject property will be sold at public auction pursuant to the Hawaii Revised Statutes §171-54 – Land license, that states in part, the Board of Land and Natural Resources may issue land licenses affecting public lands for a period not to exceed twenty years. No land shall be disposed of except at public auction as provided in this chapter.

The proposed location for the rock quarry identified above is within land partially encumbered under the Revocable Permit No. S-4171 to the County of Hawaii for public skeet shooting range purposes: The successful bidder will work with the County on the withdrawal and subdivision of the portion of land within the revocable permit as identified in the Draft Environmental Assessment.

Please contact me should you have any questions.

geometrician
ASSOCIATES, LLC
integrating geographic science and planning

phone: (808) 969-7090 PO Box 396 Hilo Hawaii 96721 rterry@hawaii.rr.com

January 17, 2020

Candace Martin, Land Agent
Hawaii Island District, Land Division
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Dear Ms. Martin:

Subject: Comments on Draft Environmental Assessment (DEA) for YAMADA AND SONS ROCK QUARRY, Portion of TMK (3rd) 2-1-013:002, Waiākea, South Hilo District, Hawai'i Island

I am in receipt of comment memos on the Draft EA provided by various DLNR units, as well as comment letters from other agencies, organizations and individuals.

In the interest of a complete record, I would first like to acknowledge no comment and/or no additional comments in DLNR memos circulated by the Land Division. We acknowledge here the *no-additional comment* remark of the Engineering Division conveyed by memo of October 23, 2019. Concerning the memos from the other DLNR units, we offer the following responses.

Commission on Water Resources Management

1. We recommend the use of best management practices (BMP) for stormwater management to minimize the impact of the project to the existing area's hydrology while maintaining on-site infiltration and preventing polluted runoff from storm events. Stormwater management BMPs may earn credit toward LEED certification.

RESPONSE: As stated in the EA, because of the limited scale of construction and the environmental setting, the risks for flooding or impacts to water quality are negligible. There does not presently appear to be any risk for flooding from streams or drainage channels. No impacts to stream banks, stream waters, wetlands, or any other waters of the U.S., will occur, as none are located near the project site.

A grading and grubbing permit will be required. This would involve development and implementation of a Storm Water Pollution Prevention Plan (SWPPP) to contain sediment and storm water runoff during quarrying activities. In addition, in order to minimize the potential for sedimentation and erosion, the contractor shall perform all earthwork and grading in conformance with Chapter 10, Erosion and Sediment Control, Hawai'i County Code. In order to properly manage storm water runoff, the SWPPP will describe the emplacement of a number of Best Management Practices (BMPs) for the project.

2. There may be the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

RESPONSE. The nature of the use would appear unlikely to produce any appreciable groundwater impacts. The applicant is not aware of any evidence to date that 50-plus years of quarrying in the same general area has produced any impacts to groundwater. Neither the Department of Land and Natural Resources or the Department of Health have heretofore expressed specific concerns during the licensing or permitting processes, or subsequently during quarrying operations. Notwithstanding, the applicant understands that the Department of Health may impose conditions upon the use.

Land Division

1. The proposed location for the rock quarry identified above is within land partially encumbered under the Revocable Permit No. S-4171 to the County of Hawaii for public skeet shooting range purposes. The successful bidder will need to work with the County on the withdrawal and subdivision of the portion of land within the revocable permit as identified in the Draft EA.

RESPONSE: Project planner Harry Yada has confirmed through subsequent discussions with the Land Division that subdivision is not required for a quarrying land license, as a license is a disposition for resource removal and not a permanent land use in the usual sense. However, the County's pursuit of a long term disposition of the remaining skeet range would appear to require subdivision. Should the County pursue a long-term land disposition, Yamada and Sons are aware that if they obtain the license, they should be prepared to cooperate with the County in its efforts to withdraw and subdivide the land for the public skeet shooting range. Yamada and Sons have already been coordinating with the County to ensure that the proposed quarry boundaries do not unduly impact the shooting range and are prepared for further consultation at the appropriate time.

In regard to the comment letters from non-DLNR parties, please see the attached letters. Thank you for circulating the EA for review by DLNR and other agencies. If you have any questions about the EA, please contact me at (808) 969-7090; for questions about matters concerning the application for a land license, please contact Harry Yada, Project Planner, at (808) 640-7813.

Sincerely,

Ron Terry, Principal
Geometrician Associates

Cc: Kaleo Manuel, CWRM; Carty Chang, Engineering; Gordon Heit, Land Division
Harry Yada, Shellby Yamada

From: Cab General <Cab.General@doh.hawaii.gov>
Sent: Friday, November 8, 2019 2:17 PM
To: Martin, Candace M <candace.m.martin@hawaii.gov>; rterry@hawaii.rr.com
Subject: DOH Clean Air Branch Comments on Draft EA for Yamada & Sons Rock Quarry, Waiakea

Aloha

Thank you for the opportunity to provide comments on the subject project. Please see our standard comments at:
https://health.hawaii.gov/cab/files/2019/04/Standard-Comments-Clean-Air-Branch-2019.pdf

Please let me know if you have any questions.

Barry Ching
Clean Air Branch
Hawaii Department of Health
(808) 586-4200

geometrician

ASSOCIATES, LLC
integrating geographic science and planning

phone: (808) 969-7090 PO Box 396 Hilo Hawaii 96721 rterry@hawaii.rr.com

January 17, 2020

Barry Ching
Clean Air Branch
Hawaii Department of Health
Cab.General@doh.hawaii.gov

Dear Mr. Ching:

Subject: Comments on Draft Environmental Assessment (DEA) for YAMADA AND SONS ROCK QUARRY, Portion of TMK (3rd) 2-1-013:002, Waiākea, South Hilo District, Hawai'i Island

Thank you for your comment email dated November 8, 2019. In answer to your specific comments:

1. Reference to DOH-CAB standard comments at:
https://health.hawaii.gov/cab/files/2019/04/Standard-Comments-CleanAir-Branch-2019.pdf

RESPONSE: We reviewed the standard comments as part of EA preparation. We noted in the EA that quarrying activities involve excavation, blasting, offsite crushing of materials, and the operation of multiple units of heavy equipment, which can produce engine emissions and fugitive dust. The potential for noise and dust is one of the reasons that the quarry was sited far away from sensitive uses, in an area a half-mile away from homes, surrounded by other quarries, solid waste facilities, a drag strip, a shooting range, and an airport. The topography and nature of quarrying on this landscape, which occurs in a pit that deepens over time as materials are excavated, helps further reduce air quality impact. Mitigation for dust generated during initial clearing operations would be part of the Best Management Practices described in Section 3.1.2 of the EA. Water trucks for spraying are available during unusually dry periods, during which operations may generate dust. Offsite dust at the existing crushing location is mitigated for by Best Management Practices that are part of permit conditions for the covered and non-covered source permits presently held by Yamada and Sons for rock crushing equipment. These include, e.g., water sprayers at the crusher. These conditions will continue to be in place for the new quarry. Yamada and Sons have also periodically cleaned the road of mud left by large vehicle tires, thus avoiding dust generation as the mud dries.

We very much appreciate your review of the document. If you have any questions about the EA, please contact me at (808) 969-7090.

Sincerely,

Ron Terry, Principal
Geometrician Associates

Cc: Candace Martin, Harry Yada, Shellby Yamada

Harry Kim
Mayor

Wil Okabe
Managing Director

West Hawai'i Office
74-5044 Ane Keohokalole Hwy
Kailua-Kona, Hawai'i 96740
Phone (808) 323-4770
Fax (808) 327-3563

County of Hawai'i

PLANNING DEPARTMENT

Michael Yee
Director

Duane Kanuha
Deputy Director

East Hawai'i Office
101 Pauahi Street, Suite 3
Hilo, Hawai'i 96720
Phone (808) 961-8288
Fax (808) 961-8742

November 5, 2019

Ron Terry
c/o Geometrician Associates
PO Box 396
Hilo, HI 96721

Aloha Mr. Terry

Subject: **Comments on the Draft Environmental Assessment (DEA) and Anticipated Finding of No Significant Impact (AFONSI) for the Proposed Yamada and Sons Rock Quarry Expansion Project**
Landowner: **State of Hawai'i**
Location: **Waiākea, South Hilo District, County of Hawai'i, Hawai'i**
Tax Map Key: **(3) 2-1-013:002**

The County of Hawai'i Planning Department (PD) is in receipt of your Draft Environmental Assessment (DEA) and Anticipated Finding of No Significant Impact (AFONSI) for the proposed Yamada and Sons Rock Quarry Expansion Project located on the subject parcel. For your reference, the 2,407.75-acre parcel is currently zoned Agricultural 20-acres (A-20a) by the County of Hawai'i, and within the State Land Use (SLU) Agricultural District. The General Plan Land Use Pattern Allocation Guide LUPAG) designates the specific project area of the parcel as Important Agricultural Lands (ial) and possibly areas of Extensive Agriculture (ea) for the most eastern portion of the project area boundary. No portion of the project area is located within the County of Hawai'i Special Management Area (SMA).

On January 6, 2011, Special Permit No. 10-000110 was approved by the Planning Commission to Yamada and Sons, Inc. to allow for the establishment of a quarry and related uses on a 14.99-acre portion of the subject property.

The Planning Department includes the following comments that should be addressed by the applicant prior to completing the Final Environmental Assessment (FEA):

- Staff notes that a Special Permit will be required for this new proposal to increase the quarry operation area from 14.99-acres to 52.87-acres (addition of 37.88-acres) from the State Land Uses Commission (LUC) since the request involves an area over 15-acres in size.

- According to comments provided to the applicant by the Commission on Water Resource Management (CWRM) in letters dated August 21, 2019 and May 2, 2019, a request for a discussion of proposed water sources, wastewater, and project water demands was provided. It appears there is no discussion on potable water sources and uses, as well as managing wastewater (if necessary). Please include a discussion of the quarries current and proposed water usage demands as well as wastewater treatment protocols (i.e., truck washing, bathrooms).

- It was reported that "modern rubbish" was located within the proposed project area. The Planning Department requests that the applicant work to remove as much "modern rubbish" as possible from the new lease area and dispose of it in an approved refuse facility.

If there are any questions regarding this letter, please contact Alex J. Roy at 808-961-8140 or via email at alex.roy@hawaiicounty.gov

Sincerely,

RK MICHAEL YEE
Planning Director

AJR:mads
\wpwin60\alex_roy\ea_eis_review\yamada rock quarry\pd_r4c_yamada_rock_quarry_dea.docx

cc: DLNR – Land Division (Hawaii District)

geometrician

ASSOCIATES, LLC
integrating geographic science and planning

phone: (808) 969-7090 PO Box 396 Hilo Hawaii 96721 rterry@hawaii.rr.com

January 17, 2020

Michael Yee, Director
Hawai‘i County Planning Dept.
101 Pauahi Street, Suite 3
Hilo HI 96720

Dear Mr. Yee:

Subject: Comments on Draft Environmental Assessment (DEA) for YAMADA AND SONS ROCK QUARRY, Portion of TMK (3rd) 2-1-013:002, Waiākea, South Hilo District, Hawai‘i Island

Thank you for your comment letter dated November 5, 2019. In answer to your specific comments:

1. On January 6, 2011, Special Permit No. 10-000110 was approved by the Planning Commission to Yamada and Sons, Inc. to allow for the establishment of a quarry and related uses on a 14.99-acre portion of the subject property. Staff notes that a Special Permit will be required for this new proposal to increase the quarry operation area from 14.99-acres to 52.87-acres (addition of 37.88-acres) from the State Land Uses Commission (LUC) since the request involves an area over 15 acres in size.

RESPONSE: The need for Special Permit is noted in several places in the EA. Yamada and Sons will coordinate with your office at the conclusion of the Chapter 343 and license auction processes to prepare and process a Special Permit application.

2. According to comments provided to the applicant by the Commission on Water Resource Management (CWRM) in letters dated August 21, 2019 and May 2, 2019, a request for a discussion of proposed water sources, wastewater, and project water demands was provided. It appears there is no discussion on potable water sources and uses, as well as managing wastewater (if necessary). Please include a discussion of the quarry’s current and proposed water usage demands as well as wastewater treatment protocols (i.e., truck washing, bathrooms).

RESPONSE: Section 3.1.1 of the EA notes that no appreciable amount of water is needed - very small quantities are occasionally sprayed via a water tanker for dust suppression - and no wastewater will be produced, as the facility will utilize a portable toilet, as it does currently. Usually, there is only one (1) employee working at the rock quarry site full time so these measures have been more than sufficient. There is no need for any water pipelines or plumbing and no wastewater lines. Trucks will not be washed on the site. There will be no additional demand on the aquifer, wastewater or stormwater systems.

3. It was reported that “modern rubbish” was located within the proposed project area. The Planning Department requests that the applicant work to remove as much rubbish as possible from the new lease area and dispose of it in an approved refuse facility.

RESPONSE: Yamada and Sons will work with DLNR to properly dispose of rubbish (most of which was emplaced as part of County projects in the 1960s) during quarry excavation, as they have consistently done for all previous quarries.

We very much appreciate your review of the document. If you have any questions about the EA, please contact me at (808) 969-7090.

Sincerely,

Ron Terry, Principal
Geometrician Associates

Cc: Candace Martin, Harry Yada, Shellby Yamada

Dean Fukuchi
1220 Puhau St
Hilo HI 96720

8 Nov 2019

State of Hawaii
Dept of Land and Natural Resources
Attn: Candance M. Martin,
PO Box 621
Honolulu Hawaii 96809

Subject: Sale of a Quarry License at Public Auction on State lands situated at (3) 2-1-013 :002

References:
a. 2019-10-23-HA-DEA- Yamada and Sons Rock Quarry
b. 2007-02-08-HA-FEA- Yamada and Sons Quarry

It appears reference a. project is being resubmitted without any lesson learned from an earlier submission made as reference b. project.

It is my understanding the major issue in the past and today, is the applicant uses of explosive in close proximity of an existing land fill site, would contribute to the expansion of the underground fissure cracks and cause the land fill to release leachate into the ground water table below.

The protection of ground water needs to be addressed to prevent further unnecessary contamination from occurring.

Sincerely,

Signed
Dean Fukuchi

geometrician

ASSOCIATES, LLC
integrating geographic science and planning

phone: (808) 969-7090 PO Box 396 Hilo Hawaii 96721 rterry@hawaii.rr.com

January 17, 2020

Dean Fukuchi
1220 Puhau St
Hilo HI 96720

Dear Mr. Fukuchi:

Subject: Comments on Draft Environmental Assessment (DEA) for YAMADA AND SONS ROCK QUARRY, Portion of TMK (3rd) 2-1-013:002, Waiākea, South Hilo District, Hawai'i Island

Thank you for your comment letter dated November 8, 2019. In answer to your specific comments:

1. Need to address applicant's uses of explosive in close proximity of an existing land fill site, which would contribute to the expansion of the underground fissure cracks and cause the landfill to release leachate into the ground water table below. The protection of ground water needs to be addressed to prevent further unnecessary contamination from occurring.

RESPONSE: Blasts are directed for maximum effect on the targeted rock source. For example, when the quarry operators are close to the perimeter of the quarry, they place the explosives in such a position so as to direct the force so it fractures the exposed face in the quarry and blows in towards the center of the quarry. If blasting somewhere closer to the middle of the quarry, they to direct the force of the blast inward and upward to maximize the fracturing of the rock while minimizing the footprint of where the blasted rock lies. In both the applicant's and the explosives technician's extensive experience, significant fracture of the rock does not occur farther than 300 feet in the targeted direction from the blasting site, and would not occur beneath or on the landfill, which is over 500 feet away.

More importantly, the lava flow geology in all of Pana'ewa is full of natural cracks and interconnected pores and is thus slowly but fully permeable to rainwater. All rainwater that is not evapotranspired percolates from the surface, through unsaturated rock to the water table, and out to sea through fully saturated rock. This percolation does not rely on manmade fractures in the rock. If this were not true, water would rapidly fill up all the pore space near the surface and create lakes which would then outlet via streams that would flow to the sea. Leachate from the landfill flows along with all other percolated rainfall out to sea. The project would cause no noticeable effects to the aquifer or surface water quality.

We very much appreciate your review of the document. If you have any questions about the EA, please contact me at (808) 969-7090.

Sincerely,

Ron Terry, Principal
Geometrician Associates

Cc: Candace Martin, Harry Yada, Shellby Yamada

UNIVERSITY OF HAWAI'I AT MĀNOA

Institute for Astronomy
Office of the Director

November 8, 2019

Via U.S. mail and email:

Department of Land and Natural Resources
P.O. Box 521
Honolulu, HI 96809

Attention: Ms. Candace Martin

Re: Draft Environmental Assessment (AFNSI)
Yamada and Sons Rock Quarry
TMK: (3) 2-1-013:0002

Dear Ms. Martin:

Thank you for the opportunity to comment on the Draft Environmental Assessment for the proposed Yamada and Sons Rock Quarry referenced above (published October 23, 2019), specifically with respect to issues and concerns regarding light pollution.

The University of Hawai'i Institute for Astronomy (IfA) conducts research in astronomy using telescopes located on Haleakalā and Maunakea and operated by IfA and our partner institutions. Both Haleakalā and Maunakea are among the best sites in the world for astronomical facilities because of their elevation, clear skies, favorable atmospheric conditions, and low levels of light pollution. Hawai'i-based observatories have played major roles in the advancement of astronomy and astrophysics for over 50 years and are well positioned to remain at the forefront of astronomical research for decades to come.

Because of the outstanding quality and productivity of these facilities, IfA is acutely concerned about negative impacts on astronomy from increased light pollution. Our work to combat light pollution has also brought us into contact with others concerned about light pollution for other reasons, including impacts on wildlife (particularly seabirds) and on human health.

With that background, we offer the following comments:

The draft EA does not provide enough information to comment on the adverse effect that the facility will have on the astronomical observatories on Maunakea. It merely mentions the possibility that select energy efficient lighting will be used. The type of light is not mentioned. The amount of light is not mentioned. Our experience has shown that quarries that operate at night can be tremendously damaging to the dark night sky. Limiting operations at the quarry to daytime operations would avoid this problem. If night time operation is intended, then lighting used must conform with the County of Hawai'i listing ordinance, which is presently undergoing a major revision.

Any new or additional artificial light at night has an adverse effect on astronomical observations by increasing the night sky brightness. Nearly all observations performed by the telescopes on Maunakea are sky-background limited. This means that there is a natural sky brightness coming from airflow and zodiacal light. Artificial light increases the sky brightness, thereby decreasing the sensitivity of the telescopes.

Lights can have an adverse effect on astronomical observations by incrementally increasing the night sky brightness, effectively making the telescope smaller and less sensitive.

Appropriate steps to reduce the impact on the observatories would include:

1. Use NO light at night. This is the preferred approach. If no light is used, then there would be no impact on the observatories.
2. Using lights that are activated by motion sensors, in a manner such that no light is emitted when no one is at the facility. Our understanding is that most of the activity at the facility will be during the daytime, so we believe that use of only lights that are activated by motion will be a good step to reduce impact on the observatories. We also believe that this strategy will improve security compared to static lighting because presence of a light will indicate presence of a person who should not be there.
3. Any lighting at the facility must follow the Hawai'i County lighting ordinance. Note that revisions to the county lighting ordinance are presently being discussed, and may occur in the next few months. All lighting must be fully shielded. This means that all lighting fixtures must emit zero light above the horizontal plane.
4. The minimum possible amount of outdoor lighting should be used. Motion sensor activated lighting is strongly preferred. Blue light is most harmful to the observatories, so blue-deficient lighting should be exclusively selected. The best choices are filtered LED lights, or amber LED lights. Under no circumstances should high-intensity discharge lamps such as metal halide be used; fluorescent lights also must be avoided. Both of these types of lamps use mercury and emit light at wavelengths that is very damaging to astronomy.
5. White light should be avoided because the blue component of white light is very damaging to astronomy. White light should only for used for tasks that require full color rendition, and is not appropriate for parking lots or security lighting. White light should always have a Correlated Color Temperature of 2700 K or below.

Thank you for your consideration of these comments and attention to IfA's concerns. If you have questions or need further detail regarding these comments, please do not hesitate to contact the undersigned or Richard Wainscoat (rjw@hawaii.edu).

Very truly yours,

Robert McLaren
Interim Director

cc: Mr. Harry Yada, Yamada & Sons
Mr. Ron Terry, Geometrician Associates

geometrician

ASSOCIATES, LLC
integrating geographic science and planning

phone: (808) 969-7090 PO Box 396 Hilo Hawaii 96721 rterry@hawaii.rr.com

January 17, 2020

Dr. Robert McLaren, Interim Director
University of Hawai‘i Institute for Astronomy
2680 Woodlawn Drive
Honolulu HI 96822

Dear Dr. McLaren:

Subject: Comments on Draft Environmental Assessment (DEA) for YAMADA AND SONS ROCK QUARRY, Portion of TMK (3rd) 2-1-013:002, Waiākea, South Hilo District, Hawai‘i Island

Thank you for your comment letter dated November 8, 2019. In answer to your specific comments:

1. The draft EA does not provide enough information to comment on the adverse effect that the facility will have on the astronomical observatories on Maunakea. It merely mentions the possibility that select energy efficient lighting will be used. The type of light is not mentioned. The amount of light is not mentioned. Our experience has shown that quarries that operate at night can be tremendously damaging to the dark night sky.

RESPONSE: As stated in the EA, the quarry currently operates and is expected to continue to operate in daytime hours only. The discussion of lighting in the EA is related mainly to indoor lighting for offices. All exterior lighting of office facilities conforms to the Hawai‘i County outdoor lighting ordinance. Although lighting will not occur within the quarry, Yamada and Sons takes notes of your recommendations concerning the spectra and quantity of lighting in the context of its other operations.

We very much appreciate your review of the document. If you have any questions about the EA, please contact me at (808) 969-7090.

Sincerely,

Ron Terry

Ron Terry, Principal
Geometrician Associates

Cc: Candace Martin, Harry Yada, Shellby Yamada

DAVID Y. IGE
GOVERNOR

JADE T. BUTAY
DIRECTOR

Deputy Directors
LYNN A.S. ARAKI-REGAN
DEREK J. CHOW
ROSS M. HIGASHI
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:
STP 19-115
STP 8.2790

November 22, 2019

Mr. Ron Terry
Principal
Geometrician Associates, LLC
P.O. Box 396
Hilo, Hawaii 96721

Dear Mr. Terry:

Subject: Yamada and Sons, Inc Quarry
Draft Environmental Assessment
Hilo, Hawaii
TMK: (3) 2-1-013:002 (por.)

The State of Hawaii, Department of Transportation (DOT) understands that Yamada and Sons, Inc. proposes to lease land from the Department of Land and Natural Resources that is adjacent to their existing quarry operation for the purpose of continuing their quarry operation. DOT's comments on the subject project are as follows:

Airports Division

1. Page 37 (PDF Reader, p. 48) states that "the proposed project does not appear to require such a notice (of Proposed Construction or Alteration with the Federal Aviation Administration), and it involves no hazardous wildlife attractants, glint or glare hazards or aerial obstructions. No effect to the facilities or operation of Hilo International Airport (ITO) is anticipated."

   Although the project involves no hazardous wildlife attractants, if conditions such as standing water attracts wildlife, Yamada and Sons shall mitigate the wildlife attractant to ensure flight safety to ITO.

2. Please coordinate project development activities with Mr. Steven Santiago, ITO Airport District Manager, to ensure compliance with existing regulations.

Highways Division

Since the proposal is to continue an existing operation from roughly the same vicinity and make use of County roads for quarry operations between the applicant's quarry and their quarry base yard on Railroad A venue, this activity will not impact our State highway facilities.

If there are any questions, please contact Mr. Blayne Nikaido of the Statewide Transportation Planning Office at (808) 831-7979 or via email at blayne.h.nikaido@hawaii.gov.

Sincerely,

JADE T. BUTAY
Director of Transportation

geometrician

ASSOCIATES, LLC
integrating geographic science and planning

phone: (808) 969-7090 PO Box 396 Hilo Hawaii 96721 rterry@hawaii.rr.com

January 17, 2020

Jade Butay, Director
State Of Hawai‘i
Department Of Transportation
869 Punchbowl Street
Honolulu HI 96813-5097

Dear Mr. Butay:

Subject: Comments on Draft Environmental Assessment (DEA) for YAMADA AND SONS ROCK QUARRY, Portion of TMK (3rd) 2-1-013:002, Waiākea, South Hilo District, Hawai‘i Island

Thank you for your comment letter dated November 22, 2019. In answer to your specific comments:

Airports Division

1. Page 37 states that the proposed project does not appear to require a Notice of Proposed Construction or Alteration with the Federal Aviation Administration, and it involves no hazardous wildlife attractants, glint or glare hazards or aerial obstructions. No effect to the facilities or operation of Hilo International Airport (ITO) is anticipated. Although the project involves no hazardous wildlife attractants, if conditions such as standing water attracts wildlife, Yamada and Sons shall mitigate the wildlife attractant to ensure flight safety to ITO.

RESPONSE: The applicant understands these requirements, anticipates no wildlife attractants or other hazards, and the Final EA has been augmented to discuss the fact that the project will not involve standing water.

2. Please coordinate project development activities with Mr. Steven Santiago, ITO Airport District Manager, to ensure compliance with existing regulations.

RESPONSE: If and when Yamada and Sons receives its license to conduct quarrying on the property, they will conduct additional coordination with the airport manager. If another bidder obtains the license, they will be provided with this documentation.

Highways Division

1. Since the proposal is to continue an existing operation from roughly the same vicinity and make use of County roads for quarry operations between the applicant's quarry and their quarry base yard on Railroad Avenue, this activity will not impact State highway facilities.

RESPONSE: Thank you for this confirmation.

We very much appreciate your review of the document. If you have any questions about the EA, please contact me at (808) 969-7090.

Sincerely,

Ron Terry, Principal
Geometrician Associates

Cc: Candace Martin, Harry Yada, Shellby Yamada

ENVIRONMENTAL ASSESSMENT

YAMADA AND SONS ROCK QUARRY

APPENDIX 2
Archaeological Report

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

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

Waiākea Ahupuaʻa
South Hilo District
Island of Hawaiʻi

DRAFT VERSION

Prepared By:

Lauren Kepaʻa
and
Matthew R. Clark, M.A.

Prepared For:

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

September 2019

ASM Project Number 32490.00

ASM affiliates

Archaeology • History • Anthropology • Architectural History

Hilo Office: (808) 969-6066 Fax: (808) 443-0065
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An Archaeological Assessment of a Proposed 37.882-Acre Yamada Quarry Site

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

Waiākea Ahupuaʻa
South Hilo District
Island of Hawaiʻi

ASM affiliates

EXECUTIVE SUMMARY

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

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

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1. INTRODUCTION

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

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

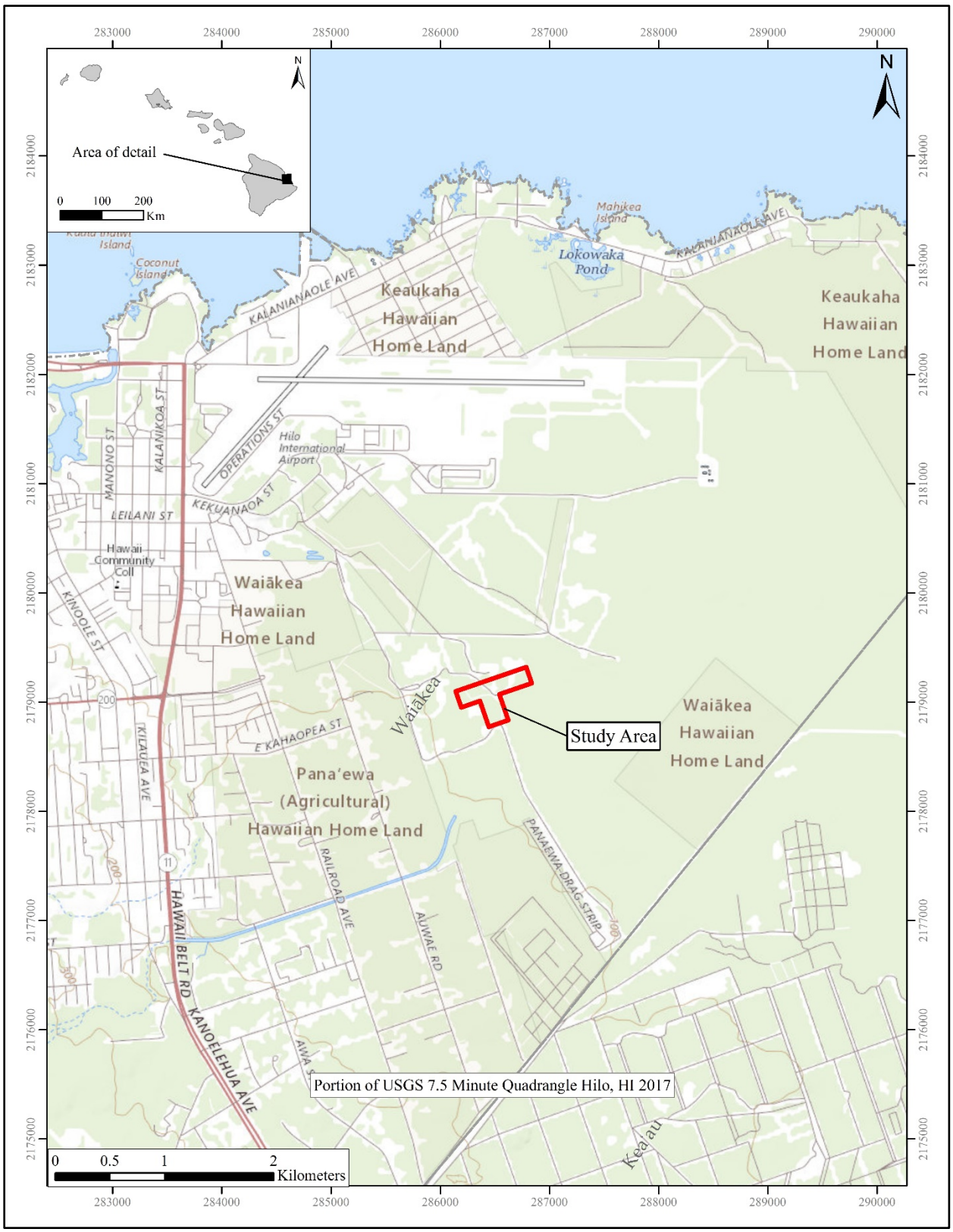

Figure 1. Study area location.

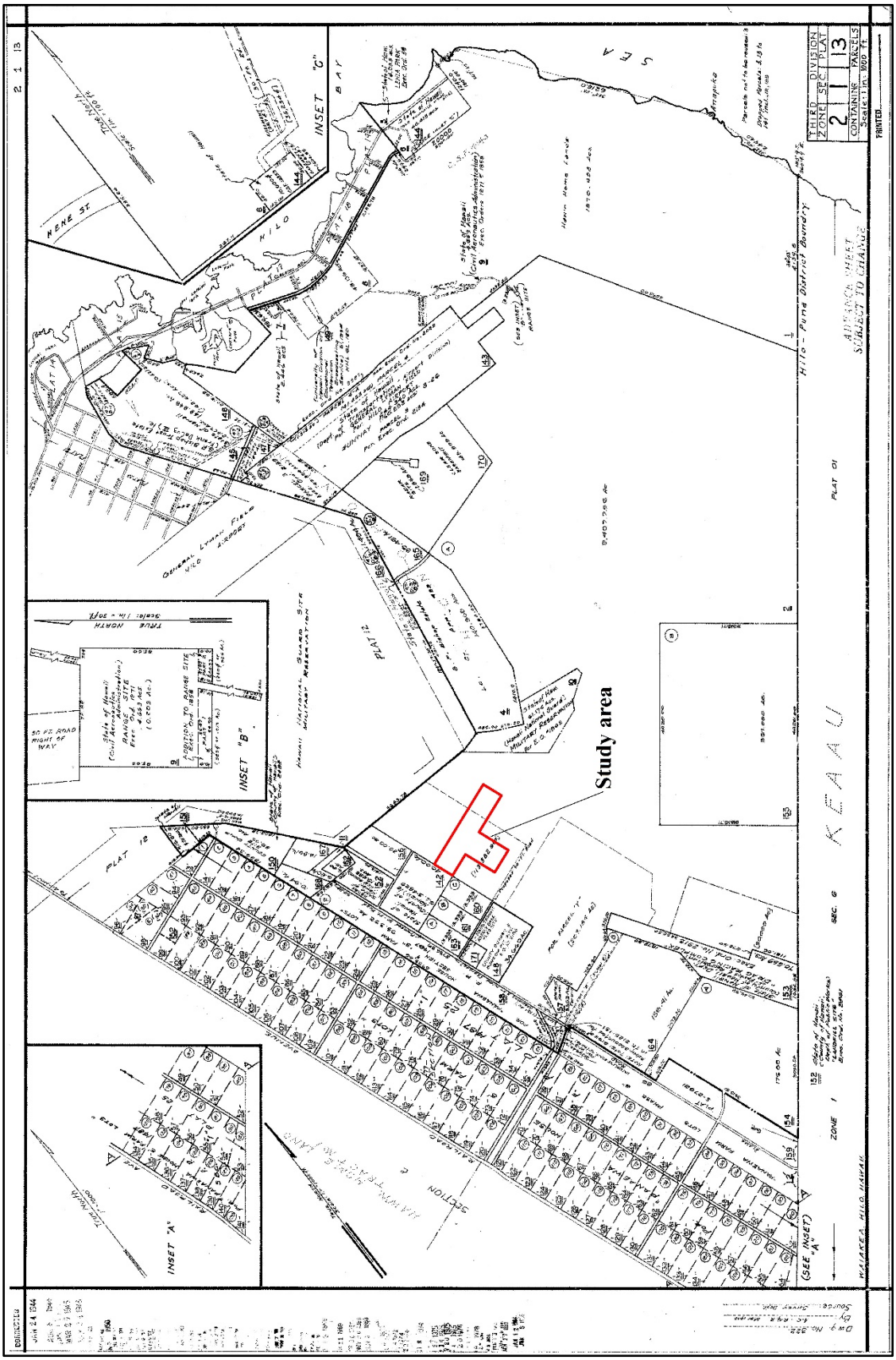

Figure 2. Tax Map Key (TMK) (3) 2-1-013 showing location of the current study area (portion of Parcel 002).

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

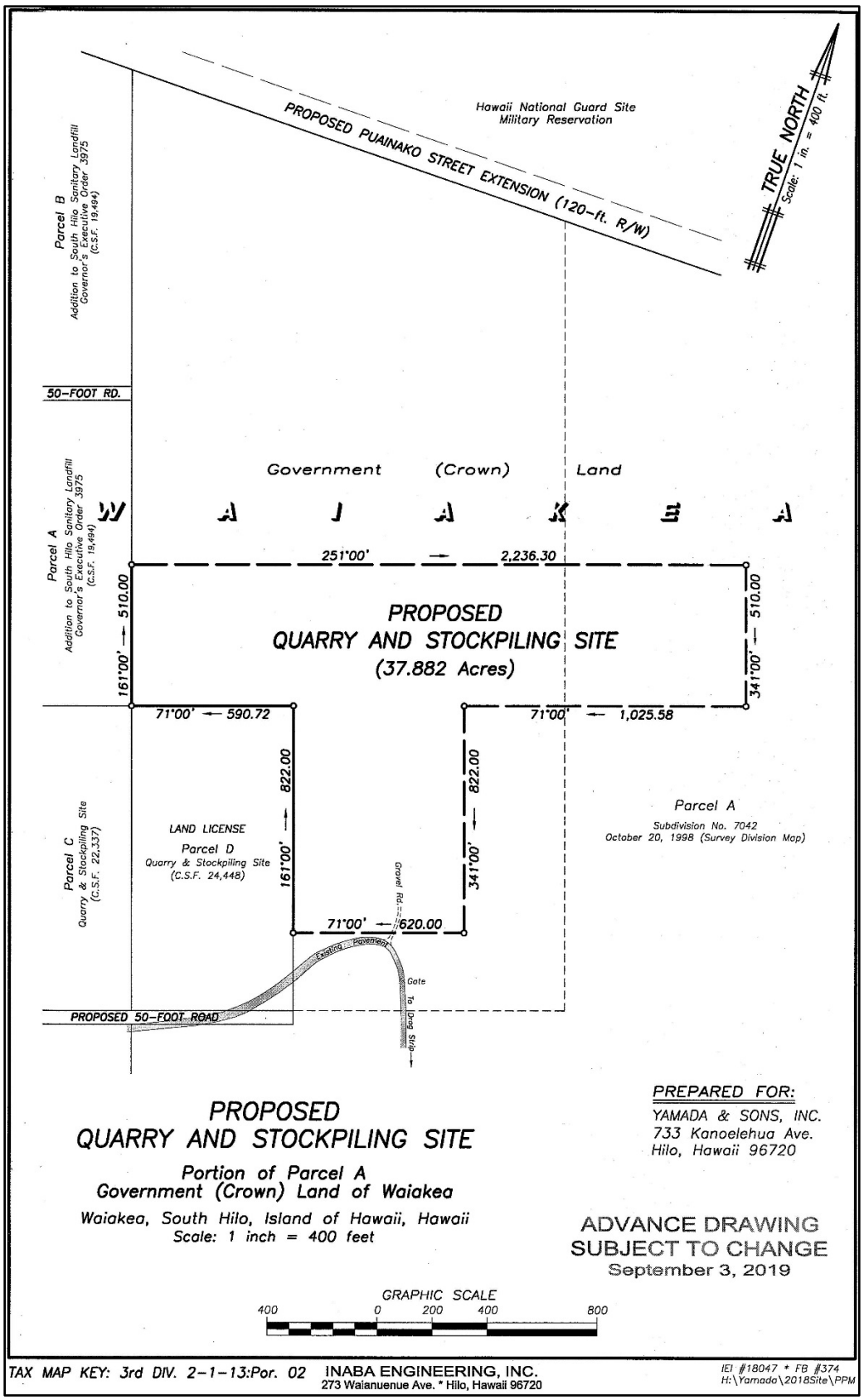

Figure 4. Map of the proposed quarry and stockpiling site.

STUDY AREA DESCRIPTION

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

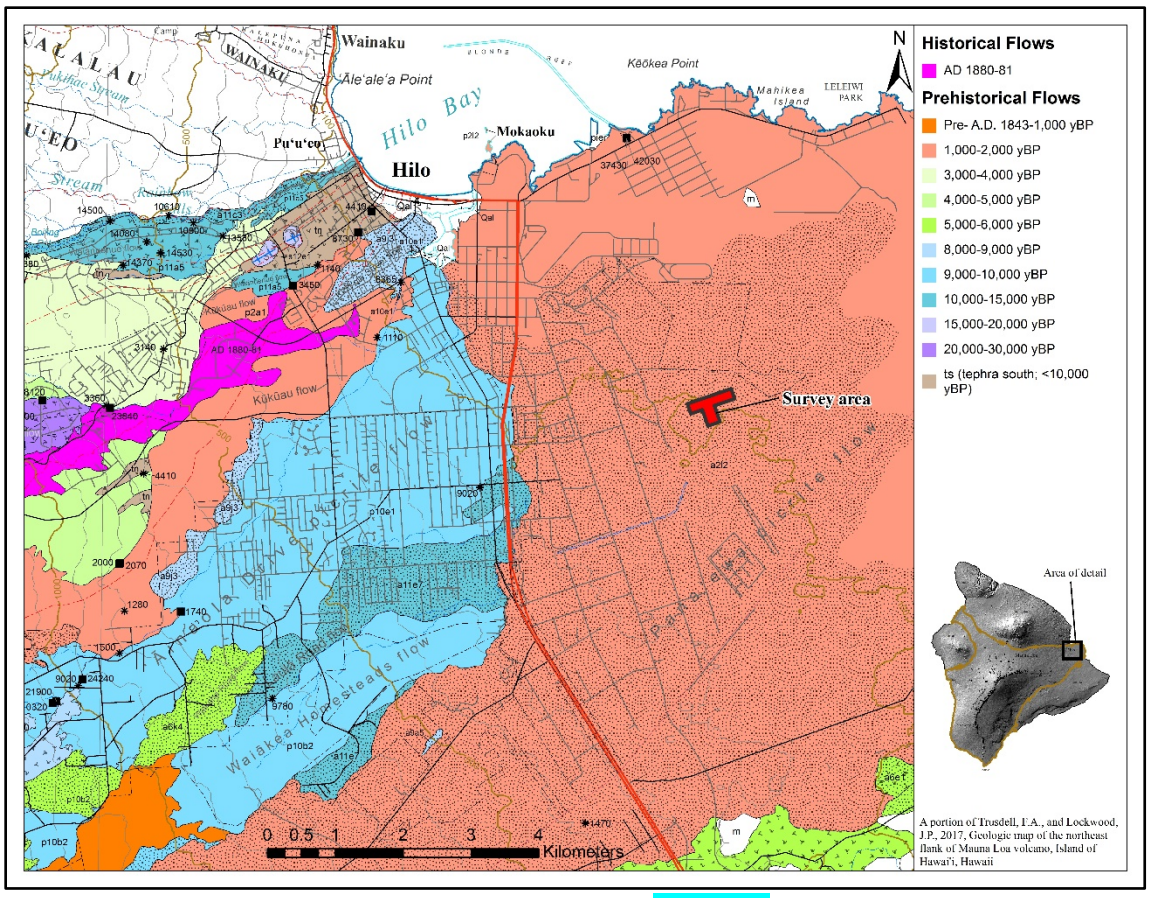

Figure 17. Geology in the vicinity of the current study area. change SA

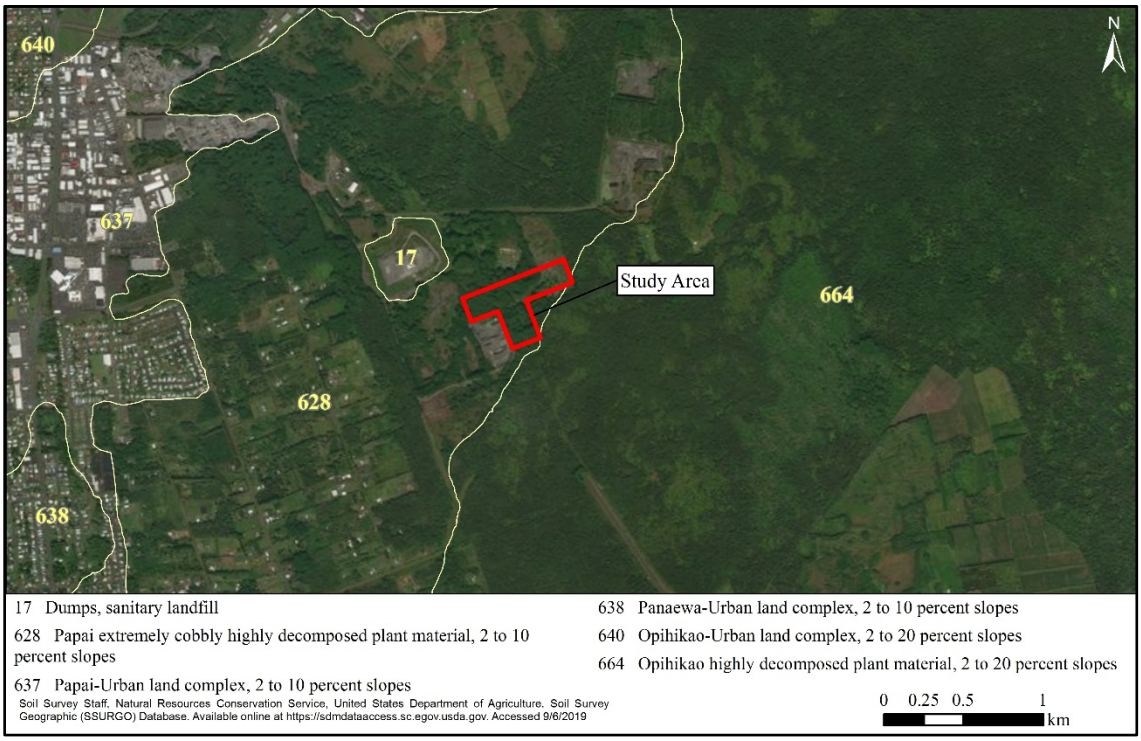

Figure 18. Soils in the vicinity of the current study area.

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

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

2. BACKGROUND

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

CULTURE-HISTORICAL CONTEXT

The study area is situated in the Panaʻewa forested region in Waiākea Ahupuaʻa along the eastern coast of Hawaiʻi Island, within the present-day district of South Hilo, and the traditional *moku* (district) of Hilo, one of six *moku* of Hawaiʻi Island (Figure 21). As described by Handy and Handy:

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

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

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

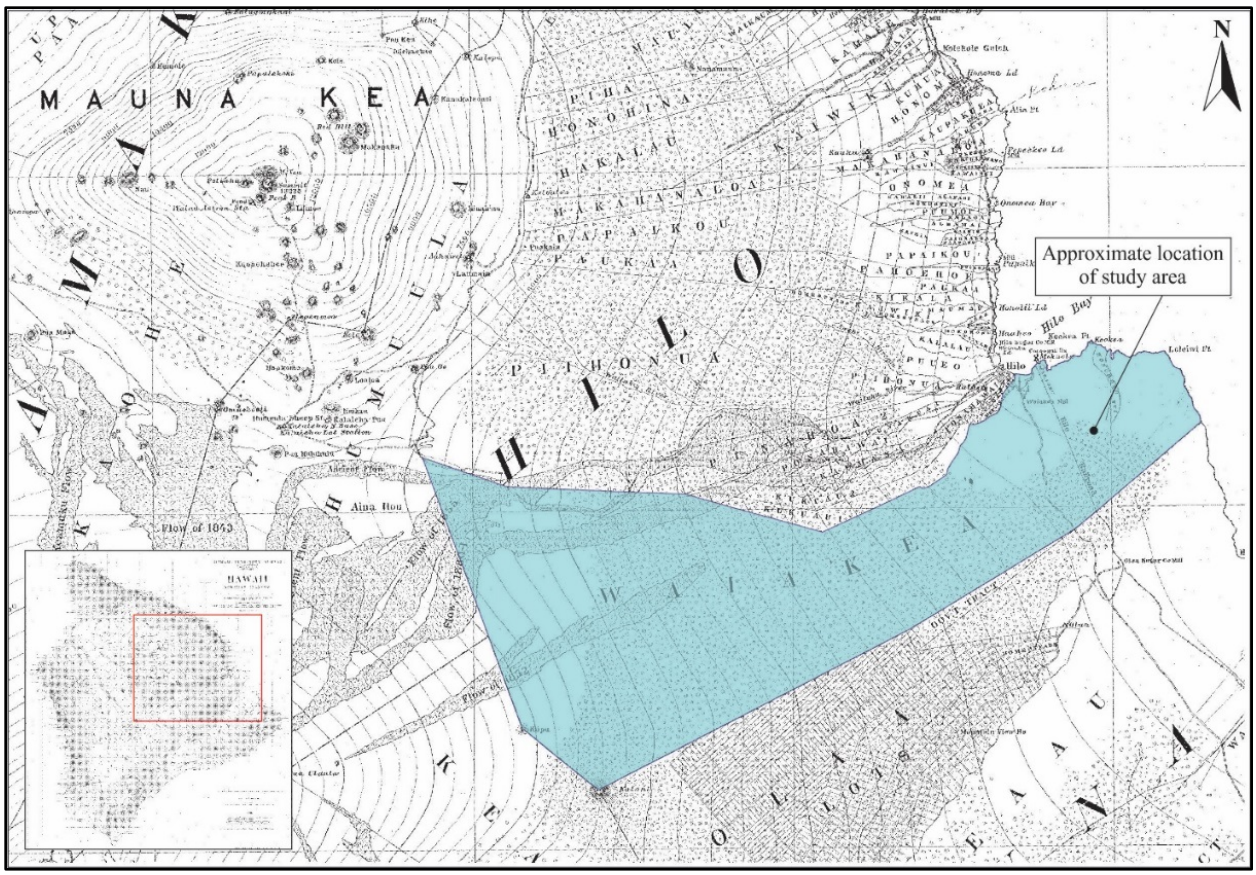

Figure 21. Portion of a 1901 Hawai‘i Territory Survey Map showing the location of the study area within Waiākea Ahupua‘a (shaded blue) and the South Hilo District.

A Generalized Model of Hawaiian Prehistory

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

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

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

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

> Puna on Hawai‘i Island was the first land reached by Pā‘ao, and here in Puna he built his first heiau for his god Aha‘ula and named it Aha‘ula [Waha‘ula]. It was a luakini. From Puna, Pā‘ao went on to land in Kohala, at Pu‘uepa. He built a heiau there called Mo‘okini, a luakini.
>
> It is thought that Pā‘ao came to Hawai‘i in the time of the ali‘i La‘au because Pili ruled as mo‘i after La‘au. You will see Pili there in the line of succession, the mo‘o kū‘auhau, of Hanala‘anui. It was said that Hawai‘i Island was without a chief, and so a chief was brought from Kahiki; this is according to chiefly genealogies. Hawai‘i Island had been without a chief for a long time, and the chiefs of Hawai‘i were ali‘i maka‘āinana or just commoners, maka‘āinana, during this time.
>
> …There were seventeen generations during which Hawai‘i Island was without chiefs—some eight hundred years…The lack of a high chief was the reason for seeking a chief in Kahiki, and that is perhaps how Pili became the chief of Hawai‘i. He was a chief from Kahiki and became the ancestor of chiefs and people of Hawai‘i Island.

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

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

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

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

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

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

Entire *ahupuaʻa*, or smaller portions of the land called *ʻili* were generally under the jurisdiction of appointed *konohiki* or lesser chief-landlords, who answered to an *aliʻi-ʻai-ahupuaʻa* (chief who controlled the *ahupuaʻa* resources). The *aliʻi-ʻai-ahupuaʻa* in turn answered to an *aliʻi ʻai moku* (chief who claimed the abundance of the entire district). Thus, *ahupuaʻa* resources supported not only the *makaʻāinana* and *ʻohana* who lived on the land, but also contributed to the support of the royal community of regional and/or island kingdoms. This form of district subdividing was integral to Hawaiian life and was the product of strictly adhered to resource management planning. In this system, the land provided fruits and vegetables and some meat for the diet, and the ocean provided a wealth of protein resources (Rechtman and Maly 2003). The *ahupuaʻa* were further divided into smaller sections such as the *ʻili ʻāina, moʻo ʻāina, paukū ʻāina, kīhāpai, kōʻele, hakuone*, and *kuakua* (Hommon 1986; Pogue 1978). The chiefs of these land units gave their allegiance to a territorial chief or *mōʻī* (king).

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

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

> presumably accumulate refuse enough to nourish the taro, along with the food taken in by the roots from lava and water.
>
> On the lava strewn plain of Waiakea and on the slopes between Waiakea and Wailuku River, dry taro was formerly planted wherever there was enough soil. There were forest plantations in Panaʻewa and in all the lower fern-forest zone above Hilo town along the course of the Wailuku River. (Handy 1940:125)

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

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

History After Contact

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

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

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

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

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

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

The Rule of Kamehameha I (1782-1819)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

> …the most beautiful we have yet seen. . . The whole is covered with luxuriant vegetation, and the greater part of it formed into plantations, where plantains, bananas, sugar-cane, taro, potatoes, and melons, grow to the greatest perfection.
>
> Groves of cocoa-nut and breadfruit trees are seen in every direction loaded with fruit, or clothed with umbrageous foliage. The houses are mostly larger and better built than those of many districts

> through which we had passed. We thought the people generally industrious; for in several of the less fertile parts of the district we saw small pieces of lava thrown up in heaps, and potato vines growing very well in the midst of them, though we could scarcely perceive a particle of soil.
>
> There are plenty of ducks in the ponds and streams, at a short distance from the sea, and several large ponds or lakes literally swarm with fish, principally of the mullet kind. The fish in these ponds belong to the king and chiefs, and are tabued from the common people.
>
> Along the stone walls which partly encircle these ponds, we saw a number of small huts, where the persons reside who have the care of the fish, and are obliged frequently to feed them with a small kind of mussel, which they procure in the sands round the bay.
>
> …There are 400 houses in the bay, and probably not less than 2000 inhabitants… (Ellis 1963:337–338)

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

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

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

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

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

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

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

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

> The scene which the island presents as viewed from the anchorage in Hilo Bay, is both novel and splendid: the shores are studded with extensive groves of cocoa-nut and bread-fruit trees, interspersed with plantations of sugar-cane; through these, numerous streams are seen hurrying to the ocean; to this succeeds a belt of some miles in width, free from woods, but clothed in verdure; beyond is a wider belt of forest, whose trees, as they rise higher and higher from the sea, change their characters from the vegetation of the tropics to that of polar regions; and above all tower the snow-capped summits of the mountains. . .
>
> Hilo is a straggling village, and is rendered almost invisible by the luxuriant growth of the sugar-cane, which the natives plant around their houses. A good road has been made through it for the extent of a mile, at one end of which the mission establishment is situated. This consists of several houses, most of which are of modern style, covered with zinc and shingles. One of them however, the residence of the Rev. Mr. Coan, was very differently built, and derived importance in our eyes, from its recalling the associations of home. It was an old-fashioned, prim, red Yankee house, with white sills and casements, and double rows of small windows. No one could mistake the birthplace of the architect, and although thirty degrees nearer the equator than the climate whence its model was drawn, I could not but think it as well adapted to its new as to its original station.
>
> The whole settlement forms a pretty cluster; the paths and roadsides are planted with pine-apples; the soil is deep and fertile, and through an excess of moisture, yields a rank vegetation. . .
>
> The church is of mammoth dimensions, and will, it is said, accommodate as many as seven thousand persons. It is now rapidly falling into decay, and another is in progress of erection. Many of the native houses are surrounded with bread-fruit and cocoa-nut trees, and have a fine view of the bay.
>
> Six miles from Hilo we entered the first wood, and at 6 P.M. we passed, at eight miles distance, the chasm that divides the Hilo from the Puna district. As the darkness set in, we began to experience the difficulties we had anticipated from our late start: the bustle and noise became every moment more audible along the whole line as the night advanced: what added not a little to our discomfort, was the bad road we now had to encounter, rendered worse as each native passed on in the tracks of those preceding him, until at last it became in places quite miry.
>
> (1845:114–118)

The Legacy of the *Māhele ʻĀina* of 1848

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

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

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

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

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

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

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

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

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

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

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

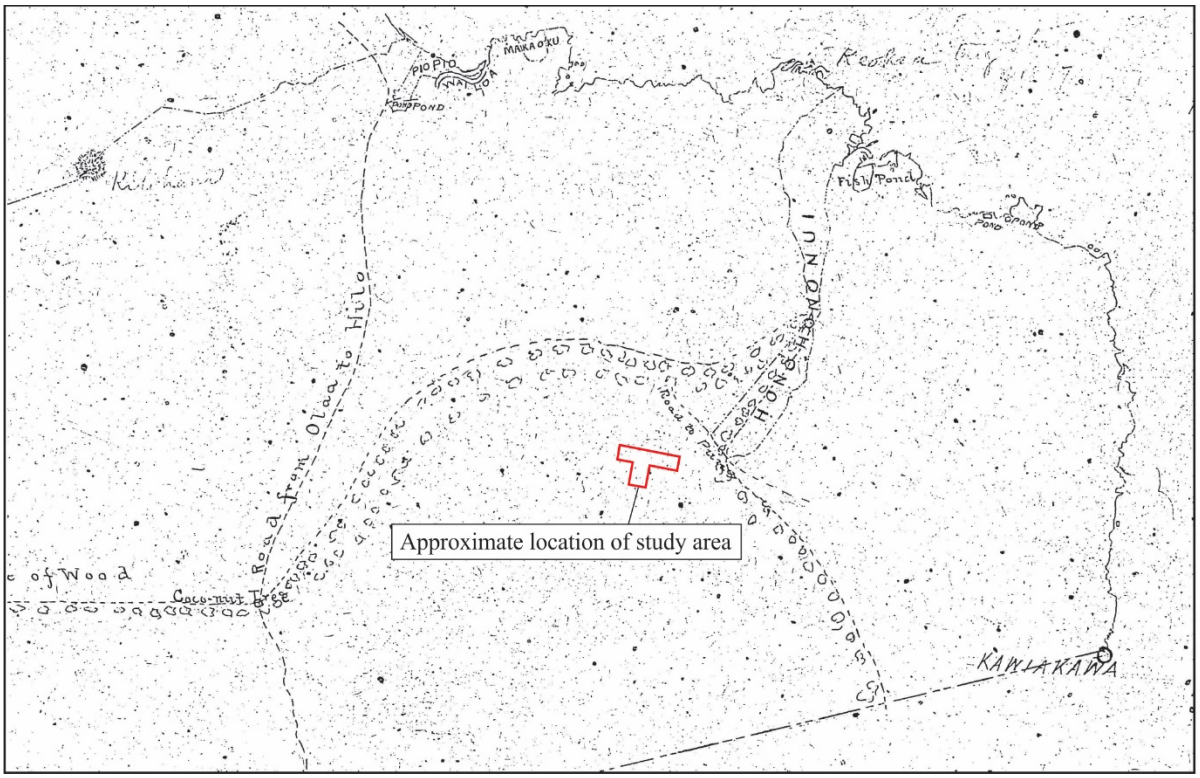

Figure 22. Portion of 1851 Hawai‘i Registered Map No. 705 by W.M. Webster showing the eastern portion of Waiākea and study area location (outlined in red) relative to the bounds of the Pana‘ewa forest.

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

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

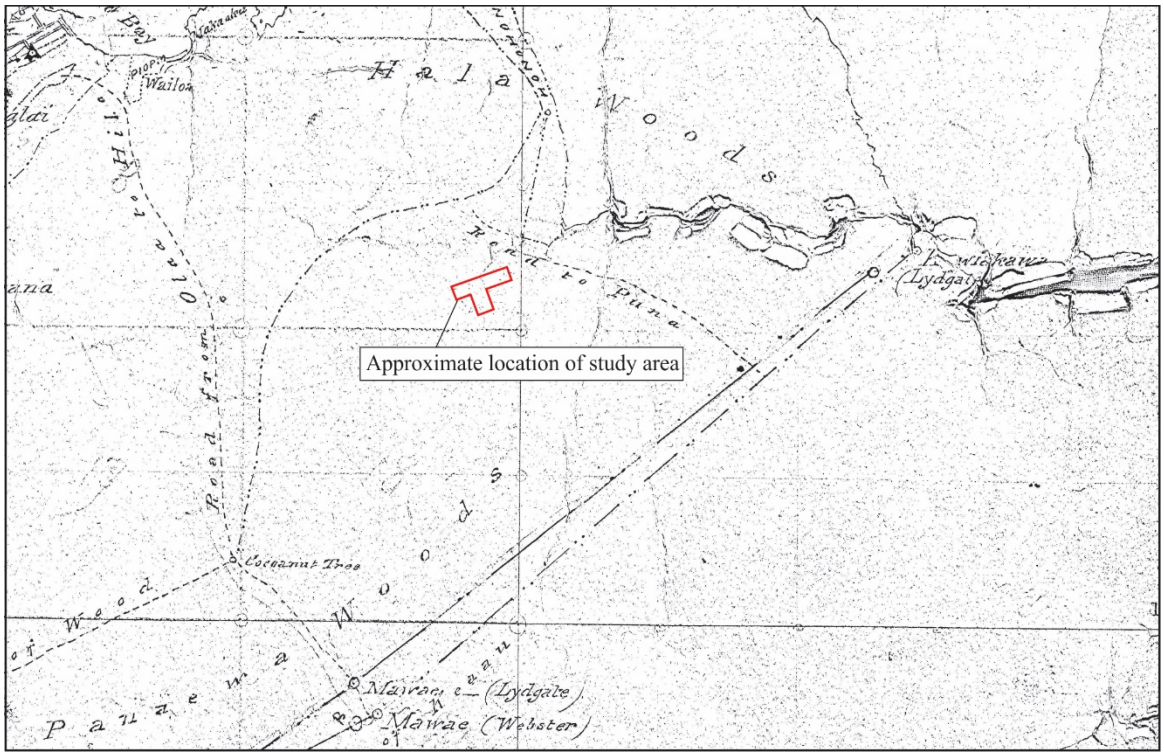

Figure 23. Portion of Hawai‘i Registered Map No. 571 by C.J. Lyons (ca. 1870s) of “Central Hawaii Hilo and Hamakua” showing the “Road to Puna” in relation to the current study area within the Pana‘ewa forest and the current study area.

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

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

> . . . little to be seen along the route [to Hilo from Puna], except the luxury of the tropical forest, the beauty of which increases steadily as we approach the town. It is doubtful if its luxuriance can be surpassed by that of any other country in the world.
>
> . . . The approach from Hilo is the most difficult of all, because it involves the necessity of traversing the belt of forest which lies between the middle slopes of the mountain and the sea. No one can imagine the density and exuberance of tropical vegetation until he has seen it. In truth, the forest

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

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

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

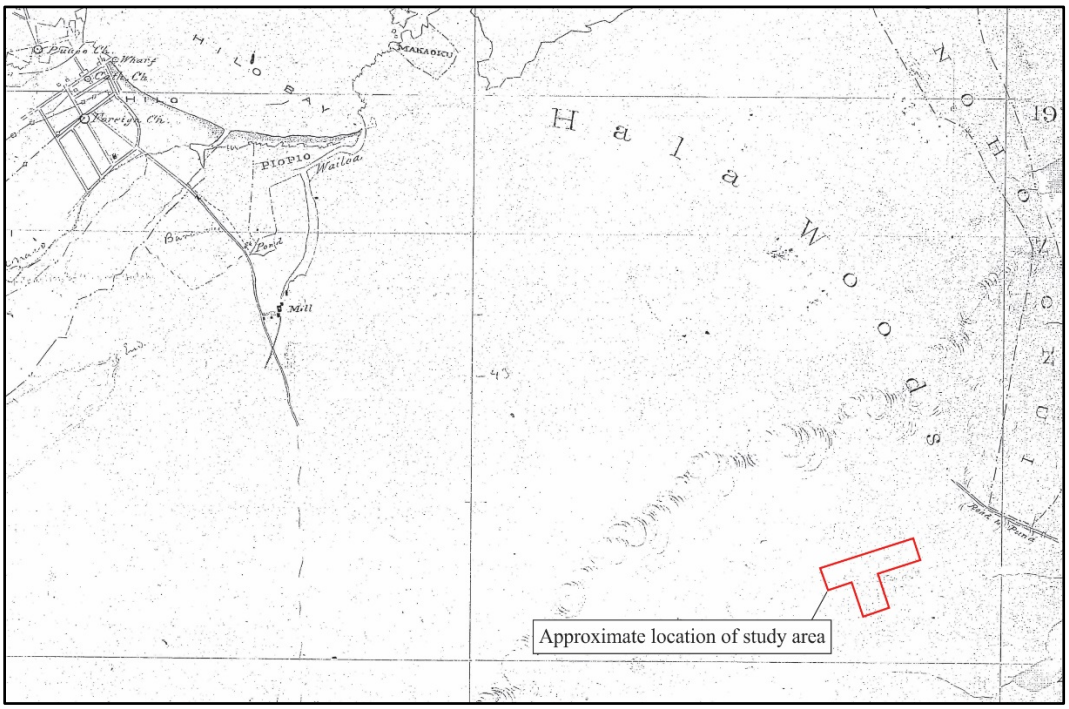

Figure 24. Portion of undated Hawaiʻi Registered Map No. 842 by Lyons and Covington of showing "Lands of Hilo Hawaii" showing Hilo Bay and Waiākea Mill in relation to study area (outlined in red).

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

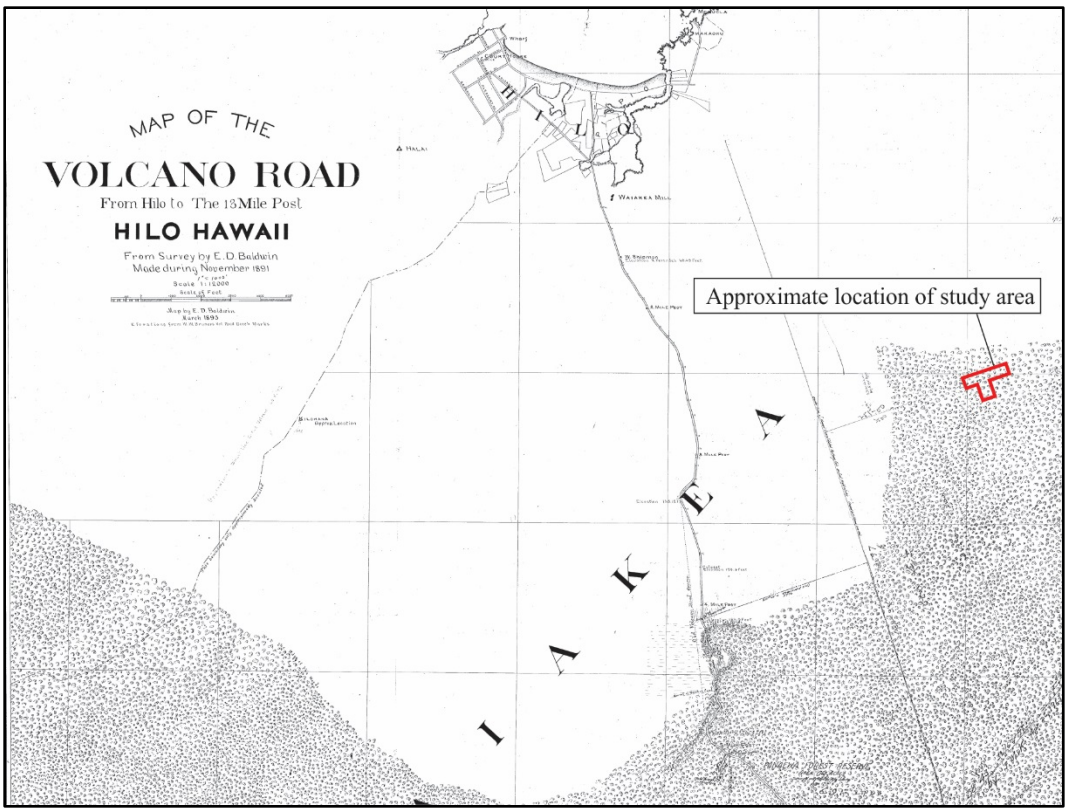

Figure 25. Portion of Hawai‘i Registered Map No. 1713 from 1893 by E.D. Baldwin showing the northern extent of the Pana‘ewa Woods and approximate location of the study area (outlined in red).

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

> When the breakwater project was pending before Congress, opposition was made to the appropriation on account of the limited commerce then being transacted through Hilo harbor.
>
> Assurances were thereupon made by the Hilo Railroad Company, that if the breakwater were constructed, a railroad would be built into the country north of Hilo and suitable wharf facilities provided under the lee of the breakwater. Such assurances had a material effect in securing the appropriation. (ibid.:145)

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

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

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

> There is, for instance, the old Puna trail—or what is left of it. Few have passed that way since automobiles came into general use, yet it leads through charming ways along the coast beyond the Seaside Club. It is no ordinary trail and bears evidence even in the partial decay of being constructed to withstand much traffic. The sides are carefully walled and the footway set with small stones. It is a picturesque relic and with a complementary compilation of the rich legendry which must be identified with it would make an additional showplace for visitors. The trail winds through primitive and riotous jungle, touches secluded bits of shore and discovers here and there tiny huts in which dwell native Hawaiians who appear to be quite happy in knowing little of the world and caring less.
>
> It is not likely that the lands through which this old trail winds will soon be required for commercial use, as most of it is roughly piled aa or pahoehoe full of pukas, but whatever is done with it there should be a strip reserved by the Government to include portions at least of the old Puna trail. It would be a shame to permit its entire obliteration. (Hilo Daily Tribune 1919)

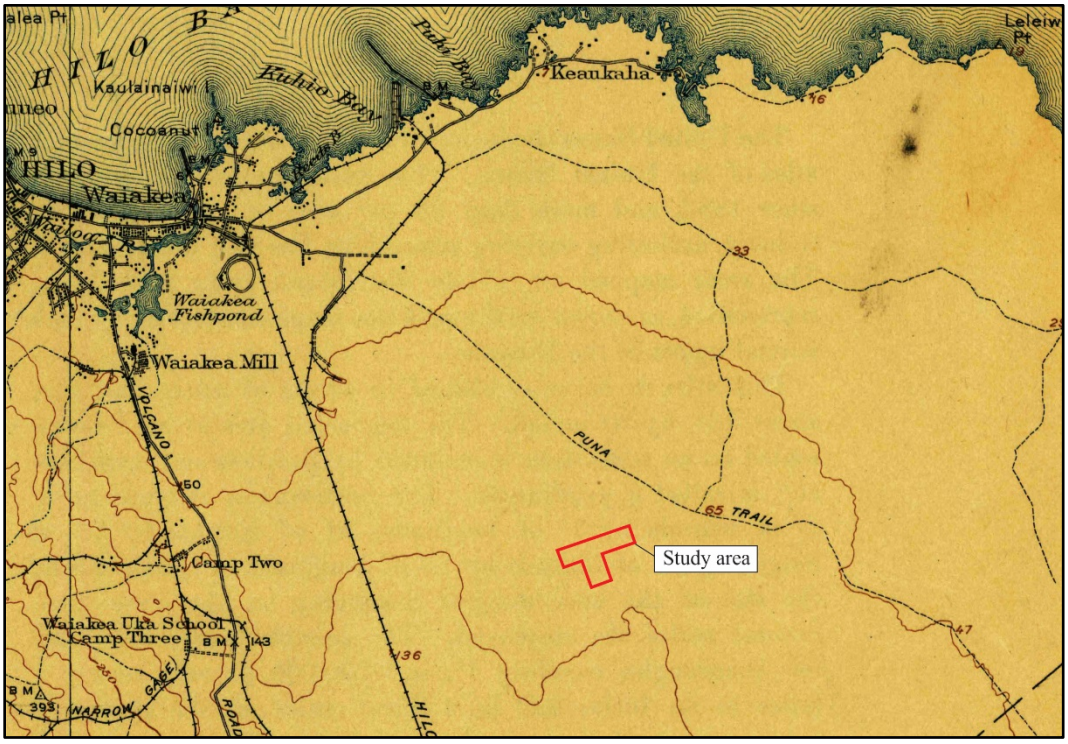

Figure 26. Portion of 1917 USGS Hilo quadrangle map showing current study area (outlined in red) in relation to the "Puna Trail" alignment, Hilo railroad, and Waiākea Mill.

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

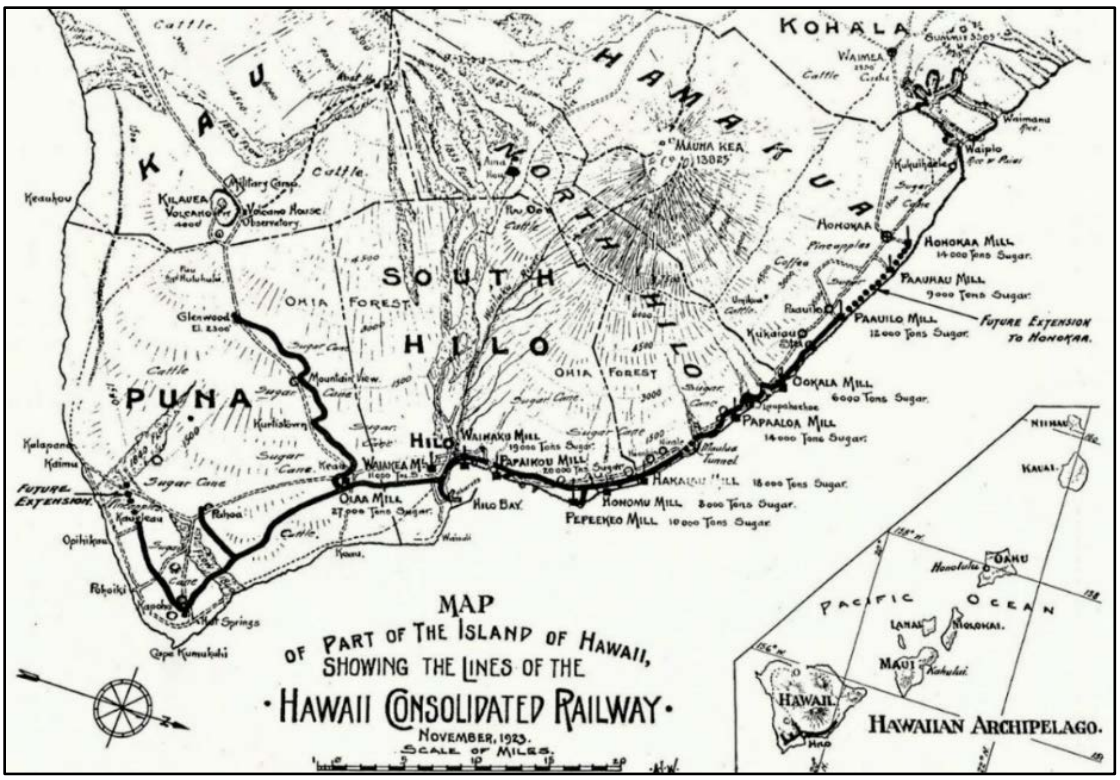

Figure 27. Hawai‘i Consolidated Railway Map of rail system as of November 1923 (Annual Report 1926).

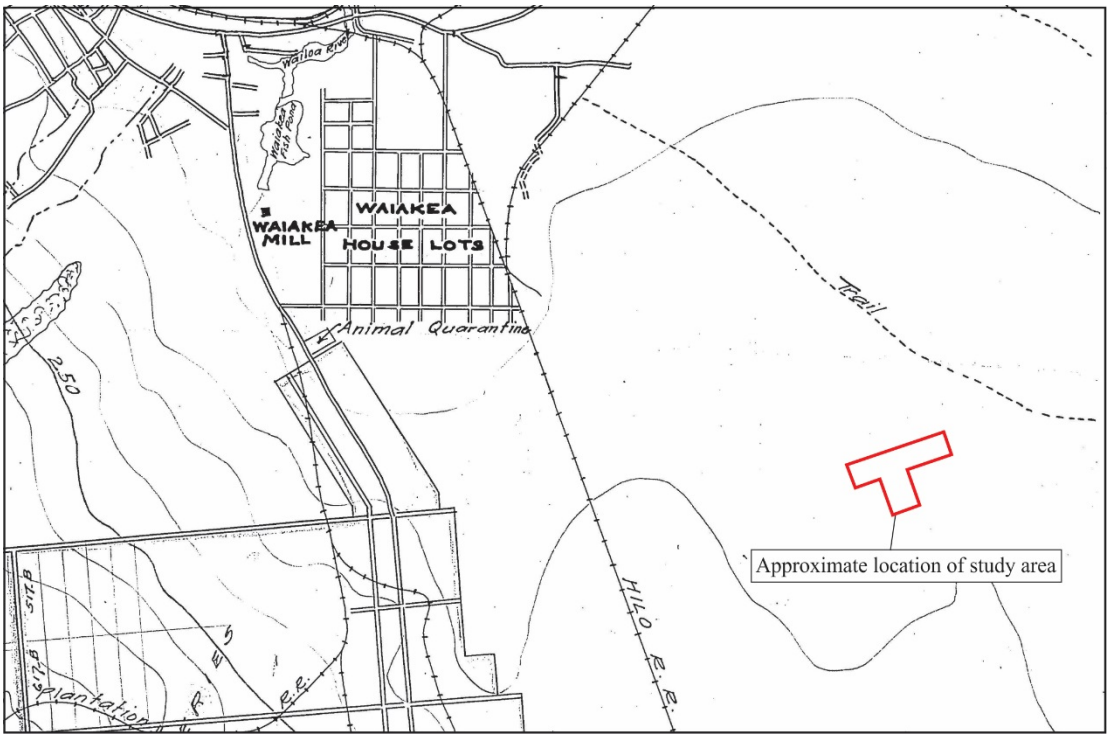

Figure 28. Portion of Hawai‘i Territory Survey plat No. 787 by Jos. Iao ca. May 1920 showing study area (outlined in red) in relation to the Hilo Railroad, Puna Trail, Waiākea House Lots, and Waiākea Mill.

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

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

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

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

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

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

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

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

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

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

PREVIOUS ARCHAEOLOGICAL STUDIES

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

Table1. Previous archaeological studies conducted in the vicinity of the current study area.

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

Thrum and his associates, W.T. Brigham and J.F. Stokes of the Bishop Museum, compiled information on over 130 *heiau* on Hawaiʻi Island (Thrum 1908a). However, one must take into consideration that Thrum included data on *heiau* that had already been destroyed prior to his data collection efforts in the early 1900s. Regarding the *heiau* of the Hilo district, Thrum stated: "little evidence of their existence now remains, so complete has been their destruction, but though their stones are scattered, much of their history is yet preserved" (1908b:55).

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

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

> There is some reason to think that the island itself was the place of refuge and that the heiau was situated on the mainland opposite. Thrum (65-c, p. 40) locates it on the shore opposite the island. Elsewhere (65-d, p. 56) he says:
>
> > "Occasional reference is made to Cocoanut Island (Mokuola) as the place of refuge of the Hilo district, hence its name, Life Island." Careful inquiry shows that the area of this puuhonua included also a portion of the mainland adjoining. The heiau connected with it, named Makaoku, was of the Luakini class. Its dimensions are unknown though it is said to have had a pyramid of stone 30 feet high as if for a place of observation. The remaining stones were taken by Captain Thos. Spencer for a boat landing about 1860. The northern part of Mokuola is known as Kaulaineiwi, being the place where the bones were placed to dry or for airing".
>
> The present archaeological remains consist of a few single stones in the park opposite the island. Mr. Levi Lyman tells me that although they were found on the mainland they have all been moved in making the park. Quite probably they had also been moved several times previously so they are of no use in reconstructing the outlines of the site. Their only significance is in indicating that the structure was built, at least in part, of large lava blocks, rather than beach boulders. (Hudson 1932:256–257)

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

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

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

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

Five years later in 1979, William Bonk (1979) of the University of Hawaiʻi at Hilo conducted an archaeological survey of a 39-acre portion of Tract 1 of the Panaʻewa Hawaiian Home Lands located to the northwest of the current study area (Figure 33). As a result of the survey, two modern features were documented: a segment of a stone wall and a fragment of a wire fence. Additionally, a 15 to 20-foot-wide section of a roadway was identified, which was intermittently marked by short stone alignments. It was concluded by Bonk (1979) that no further work be the recommended treatment.

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

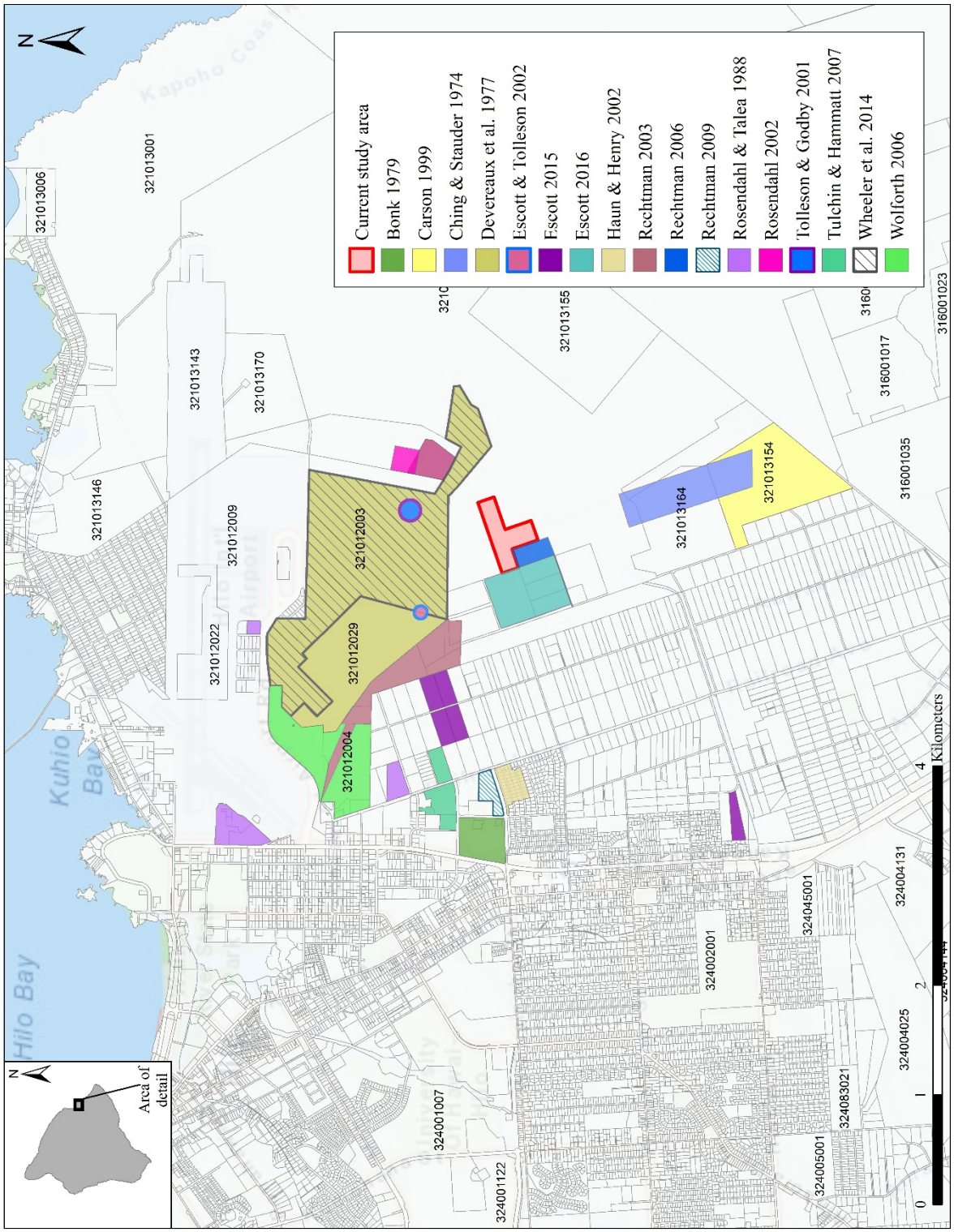

Figure 33. Previous archaeological studies conducted in the vicinity of the current study area.

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

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

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

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

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

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

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

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

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

3. STUDY AREA EXPECTATIONS

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

4. FIELDWORK

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

FINDINGS

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

5. DETERMINATION OF EFFECT

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

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ENVIRONMENTAL ASSESSMENT

YAMADA AND SONS ROCK QUARRY

APPENDIX 3
Cultural Impact Assessment

Note: The CIA was prepared on the basis of a quarry size of 51.92 acres, which was subsequently reduced to 37.882 acres, all within the 51.92-acre footprint. The action was undertaken in part because of recommendations of the CIA to avoid the area of partially intact native forest. It was not necessary to adjust most of the text of the CIA, but the conclusions section on Page 64-65 was adjusted to reflect the reduced area and impact of the project.

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A Cultural Impact Assessment for a Proposed 50.192-acre Yamada Quarry Site

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

Waiākea Ahupuaʻa
South Hilo District
Island of Hawaiʻi

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APPENDIX

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1. INTRODUCTION

At the request of Ron Terry of Geometrician Associates, LLC on behalf of Yamada & Sons, Inc. (the applicant), ASM Affiliates (ASM) has prepared this Cultural Impact Assessment (CIA) to inform a Hawai‘i Revised Statues (HRS) Chapter 343 Environmental Assessment (EA) for a proposed 50.192-acre quarry and stockpiling site located within a portion of State owned lands (Tax Map Key: (3) 2-1-013:002 por.) in Waiākea Ahupua‘a, South Hilo District, Island of Hawai‘i (Figures 1 and 2). The proposed quarry site comprises a portion of a 2,407.756-acre agriculturally-zoned parcel currently owned by the State of Hawai‘i (leased to the United States Department of Transportation) and is located within a 113.382-acre portion of the subject parcel that was designated as a “Borrow Pit Site” during the early 1960s. The proposed project area is situated directly east of a 14.99-acre parcel (Parcel D) that is currently used by Yamada & Sons, Inc. for quarrying and stockpiling purposes (Figures 3 and 4).

This CIA study is intended to inform an HRS Chapter 343 Environmental Assessment (EA) conducted in compliance with HRS Chapter 343; pursuant to Act 50 and in accordance with the Office of Environmental Quality Control (OEQC) *Guidelines for Assessing Cultural Impact*, adopted by the Environmental Council, State of Hawai‘i, on November 19, 1997. Act 50, which was proposed and passed as Hawai‘i State House of Representatives Bill No. 2895 and signed into law by the Governor on April 26, 2000, specifically acknowledges the State’s responsibility to protect native Hawaiian cultural practices. Act 50 further states that environmental assessments . . . should “assess the effects of a proposed action on the cultural practices of the community and State” and that . . . “native Hawaiian culture plays a vital role in preserving and advancing the unique quality of life and the ‘aloha spirit’ in Hawai‘i.” Articles IX and XII of the state constitution, other state laws, and the courts of the State impose on governmental agencies a duty to promote and protect cultural beliefs, practices, and resources of native Hawaiians as well as other ethnic groups. Article IX, section 9 of the state constitution gives the State the power to “preserve and develop the cultural, creative and traditional arts of the various ethnic groups.” While Article XII, section 7 of the state constitution requires the State to “protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by ahupua‘a tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778, subject to the right of the State to regulate such rights.”

This report is divided into five main sections, beginning with an introduction and a general description of the project area location, followed by a detailed culture-historical background for Waiākea Ahupua‘a and a presentation of prior studies that have been conducted within the vicinity of the proposed project area; all of which combine to provide a physical and cultural context for the proposed quarry site. The results of the consultation process are then presented, along with a discussion of potential impacts as well as appropriate actions and strategies to mitigate any such impacts. Lastly, section five contains a post-study update that details the actions taken by the applicant following the submission of the draft CIA, which resulted in a reduction of the size of the proposed quarry site from 51.192 acres to 37.882 acres. The applicant’s decision to reduce the size of the proposed quarry site is a mitigative action to avoid adversely impacting a seemingly healthy portion of intact *‘ōhi‘a* forest as well as the Drag Strip road; the former of which was found to be a valued cultural resource. This section also includes a revised discussion of findings and conclusions.

Figure 1. A portion of 2017 U.S.G.S. 7.5 minute Hilo quadrangle showing project area location.

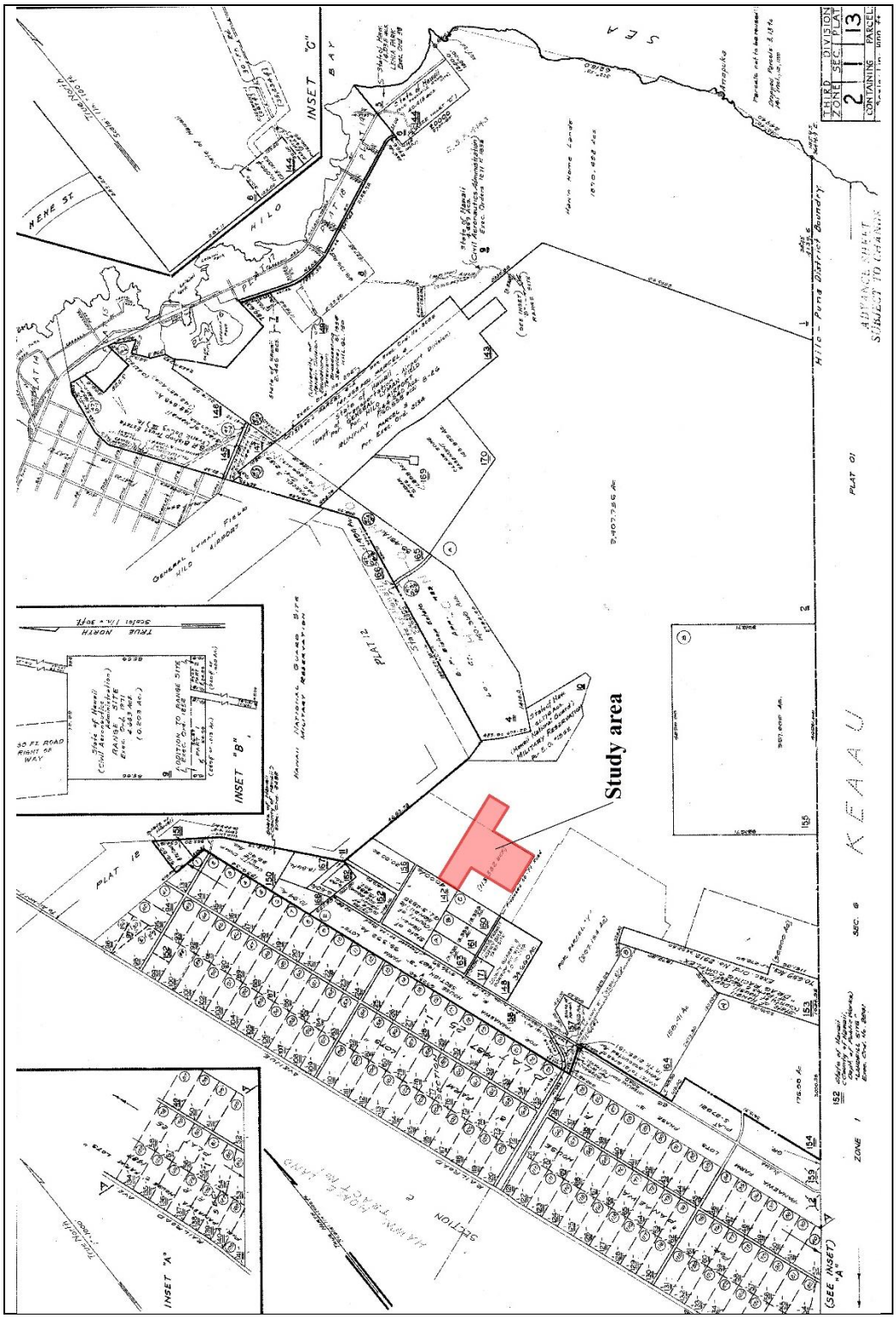


Figure 2. Tax Map Key (3) 2-1-013 showing the location of the current study parcel (002).

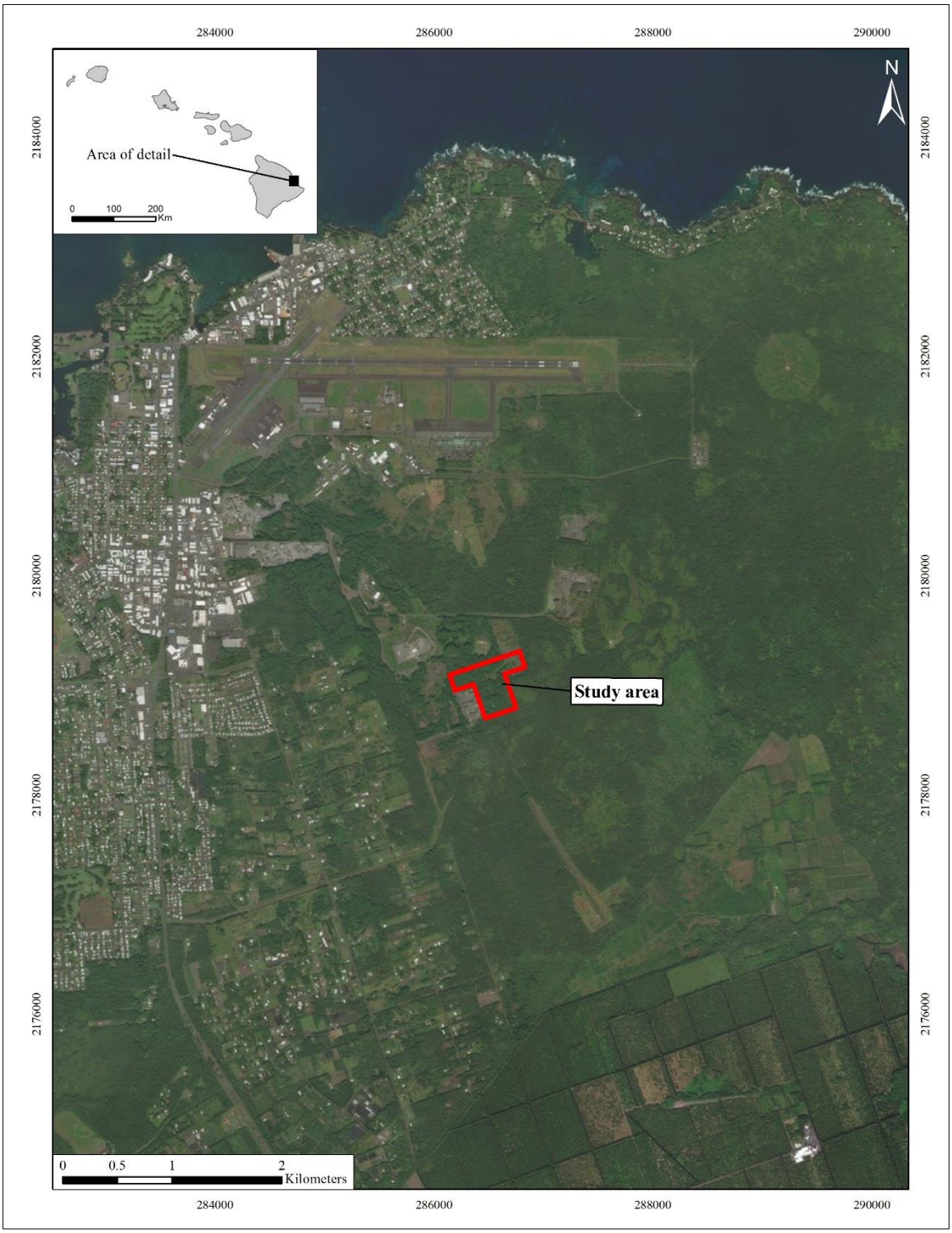


Figure 3. Google Earth™ satellite image showing the study area location (outlined in red).

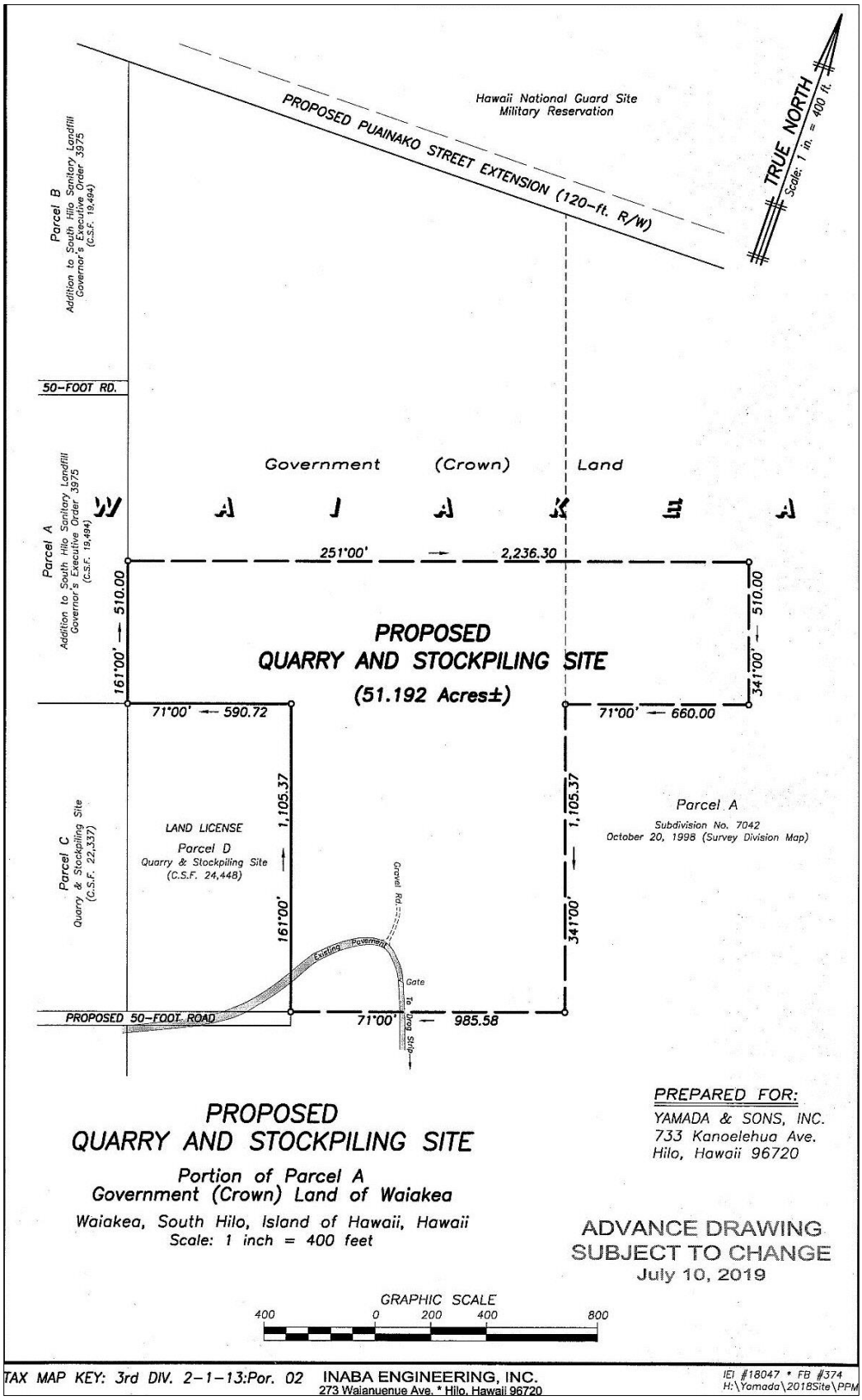


Figure 4. Proposed site plan for quarry and stockpiling site.

PROJECT AREA DESCRIPTION

The project area encompasses 50.192-acres situated in the Panaʻewa portion of Waiākea Ahupuaʻa, South Hilo District, Island of Hawaiʻi (see Figure 1). It is situated on the eastern flank of Mauna Loa Volcano at elevations ranging from 80 to 100 feet (24 to 30 meters) above sea level and is roughly four kilometers inland from the coast (see Figure 1). The project area is accessed by a gated, paved road that extends northwest from the Panaʻewa Drag Strip road (see Figure 3). The access road extends northwest from the drag strip road (Figure 5), bisecting the southern portion of the project area into two equal halves (Figure 6), before turning to the northeast. Mechanically-created, earthen berms containing piles of gravel and scattered modern trash (e.g. rubber tires, glass/plastic bottles, car parts, and other assorted rubbish) are present along both of edges of the roadway (Figure 7). To the west, the project area is bounded by an existing 14.99-acre parcel (Parcel D) that is currently used by Yamada & Sons, Inc. for quarrying and stockpiling purposes (Figure 8), and by a section of Parcel A designated as part of the South Hilo Sanitary Landfill property. Large earthen berms, from prior mechanical disturbance, are present along the boundaries with these two properties. The northeastern corner of the existing quarry site (Parcel D) is marked by a metal pipe protected by concrete barriers (Figure 9). The project area is surrounded on the remaining sides by previously disturbed, but currently undeveloped, lands within TMK: (3) 2-1-013:002. The County of Hawaiʻi-Department of Parks and Recreation's Trap and Skeet Range is situated just to the north of the proposed quarry site (see Figure 3), and a large area in the northeastern portion of project area has been previously graded flat and covered with gravel (Figure 10). This graded area, which contains two corrugated aluminum storage sheds that are currently used for the storage purposes (Figure 41), are accessed by an offshoot of the primary paved access road that extends northeast (Figure 41). Other indications of previous disturbance within the study area include bulldozer cuts (Figure 41), berms (Figure 41), push piles, and modern rubbish (Figures 15 and 16), all of which are prevalent, especially within the western and northern portions of the proposed quarry site.

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

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

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

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

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

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

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

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

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

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

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

Figure 16. Accumulation of modern rubbish in the northeast corner of project area, view to the southwest.

Vegetation

Due to the prior mechanical disturbance, vegetation within the project area is comprised of numerous alien species mixed with a few indigenous and endemic species within a secondary forest setting (Figure 17). The overstory canopy is formed by plant species such as melochia (*Melochia umbellata*), bingabing (*Macaranga mappa*), autograph trees (*Clusia rosea*), strawberry guava (*Psidium cattleianum*), umbrella trees (*Schefflera actinophylla*), gunpowder trees (*Trema orientalis*), Albizia (*Falcataria Moluccana*) and *hala* (*Pandanus tectouris*). The understory consists of various vines, ferns, and weeds such as Koster's curse (*Clidemia hirta*), philodendron (*Philodendron cordatum*), arthrostema (*Arthrostemma ciliatum*), *honohono* grass (*Commelina diffusa*), and various other grasses. The southwestern corner of the project area (generally corresponding to the location of the Opihikao soils; see Figure 21), where the least amount of mechanized clearing appears to have occurred in the past, contains the most intact section of native forest where species such as *ʻōhiʻa lehua* (*Metrosideros polymorpha*), *uluhe* (*Dicranopteris linearis*), and *hala* dominate (Figures 18 and 19). This vegetation pattern is indicative of what the landscape in the vicinity of the study area would have looked like prior to the widespread mechanical disturbances that occurred in the 20th century.

Soils and Geology

Geologically, the project area is situated on mixed *ʻaʻā* and *pāhoehoe* lavas flows originating from Mauna Loa Volcano approximately 1,000 to 2,000 years B.P. (Figure 20). Collectively these lava flows have been designated by Trusdell and Lockwood (2017) as the Panaʻewa picrate flow. Soils that have developed on (and from) these lava flows are classified as Papai extremely cobbly highly decomposed plant material on 2 to 10 percent slopes (428), and Opihikao highly decomposed plant material on 2 to 20 percent slopes (664). The Papai soils are present across the majority of the project area, but a small area of the Opihikao soils, corresponding to the edge of a raised *ʻaʻā* flow, are present in the southwest corner (Figure 21). Both are well-drained, thin, and extremely stony organic soils overlying cobbly substrates (Soil Survey Staff 2019), but the Papai soils are slightly thicker in profile (0-10 inches) than the Opihikao soils (0-3 inches). The terrain is characterized by mostly level to gentle to moderately undulating topography punctuated with the occasional small culturally-sterile lava blister, particularly within more forested sections in the eastern half of the study area. Mean annual rainfall in the area averages approximately 3346 millimeters (132 inches), with the majority of rainfall occurring in November and the least occurring in the summer months of May and June (Giambelluca et al. 2013). The project area vicinity is characterized by a cool climate with a mean annual temperature ranging from 70 to 73 degrees Fahrenheit throughout the year (Soil Survey Staff 2019).

Figure 17. Typical vegetation in previously disturbed area consisting of non-native species, view to the east.

Figure 18. Typical native-dominant vegetation pattern in minimally disturbed areas, view to the northwest.

Figure 19. Typical undergrowth of *uluhe* in a minimally disturbed area, view to the northeast.

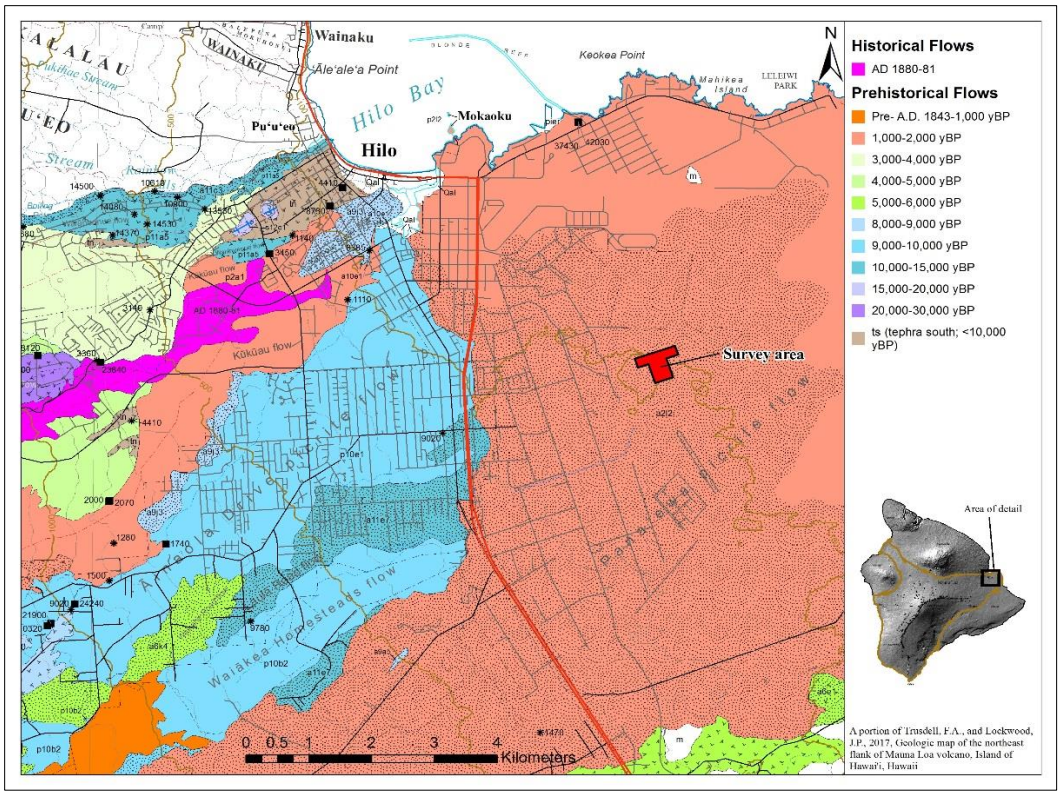


Figure 20. Geology of current project area with parcel outlined in red.

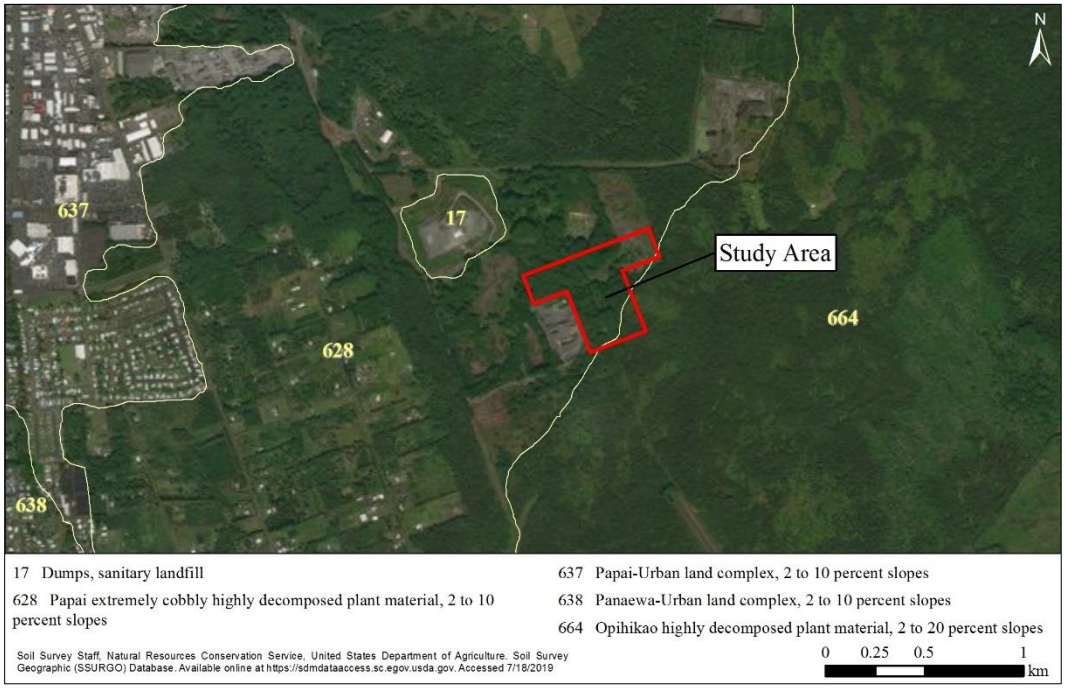


Figure 21. Soils in the vicinity of the current project area.

2. BACKGROUND

This section of the report includes a discussion of the culture-historical background for the project area and a synthesis of relevant prior research. This information is presented to provide a comprehensive understanding of the cultural significance of the study area and general vicinity and to establish an analytical basis for the assessment of any potential cultural impacts. The ability to assess the cultural significance of the current study area parcel is contingent upon developing (at a minimum), a comprehensive understanding of the *ahupuaʻa* in which the study area is located. As will be demonstrated in the ensuing section and particularly with the traditional Hawaiian legendary accounts, a consideration of the broader region and island landscape is also required at times. The culture-historical context presented below for Waiākea Ahupuaʻa is based on original research conducted by ASM at various online repositories as well as physical repositories including the University of Hawaiʻi at Hilo Moʻokini Library, State Historic Preservation Division library, and the Hawaiʻi State Archives.

CULTURAL-HISTORICAL CONTEXT

The chronological summary presented below begins with the peopling of the Hawaiian Islands and a generalized model of Hawaiian Prehistory followed by a summary of Historic events in the Hawaiian Islands after the arrival of foreigners. The discussion continues with a presentation of legendary and historical references to Waiākea Ahupuaʻa. This summary includes oral traditions and first-hand Historic accounts recorded by visitors and missionaries related to Waiākea and at times the culturally significant Panaʻewa forest. Land use practices and significant historical events in the study area vicinity are also presented, including commercial sugar cultivation, the development of the railroad, and the establishment of the nearby Hawaiian Homestead community of Keaukaha and Panaʻewa, as well as the construction of the Hilo Airport and the quarry site. A synthesis of previous relevant archaeological and cultural studies are also discussed.

A Generalized Model of Hawaiian Prehistory

While the question of the timing of the first settlement of Hawaiʻi by Polynesians remains unanswered, several theories have been offered that derive from various sources of information (i.e., genealogical, oral-historical, mythological, radiometric). However, none of these theories is today universally accepted (c.f., Kirch 2011). What is more widely accepted is the answer to the question of where Hawaiian populations came from and the transformations they went through on their way to establish a uniquely Hawaiian culture. The initial settlement in Hawaiʻi is believed to have

originated from the southern Marquesas Islands (Emory in Tatar 1982). During these early times, Hawai‘i’s inhabitants were primarily engaged in subsistence-level agriculture and fishing (Handy and Handy 1991). This was a period of great exploitation and environmental modification when early Hawaiian farmers developed new subsistence strategies by adapting their familiar patterns and traditional tools to their new environment (Kirch 1985; Pogue 1978). Their ancient and ingrained philosophy of life tied them to their environment and kept order; which was further assured by the conical clan principle of genealogical seniority (Kirch 1984). According to Fornander (1880), the Hawaiians brought from their homeland certain universal Polynesian customs and belief: the major gods Kāne, Kū, and Lono; the *kapu* system of law and order; cities of refuge; the *‘aumakua* concept; and the concept of *mana*. The initial permanent settlements were established at sheltered bays with access to freshwater and marine resources. These communities shared extended familial relations and there was an occupational focus on the collection of marine resources. Over a period of a few centuries, the areas with the richest natural resources became populated and perhaps even crowded, and there was increasing separation of the chiefly class from the common people. As populations increased so did societal conflict, which resulted in war between neighboring groups (Kirch 1985). Soon, large areas of Hawai‘i were controlled by a few powerful chiefs.

As time passed, a uniquely Hawaiian culture developed. The portable artifacts found in archaeological sites of this next period reflect an evolution of the traditional tools and distinctly Hawaiian inventions. The adze (*ko‘i*) evolved from the typical Polynesian variations of plano-convex, trapezoidal, and reverse-triangular cross-section to a very standard Hawaiian rectangular quadrangular tanged adze. The two-piece fishhook and the octopus-lure breadloaf sinker are Hawaiian inventions of this period, as are ‘*ulu maika* stones and *lei niho palaoa* (ivory pendant). The latter was a status item worn by those of high rank, indicating a trend toward greater status differentiation (Kirch 1985). As the population continued to expand so did social stratification, which was accompanied by major socioeconomic changes and intensive land modification. Most of the ecologically favorable zones of the windward and coastal regions of all major islands were settled and the more marginal leeward areas were being developed. During this expansion period, additional migrations to Hawai‘i occurred from Tahiti in the Society Islands. Rosendahl (1972) has proposed that settlement at this time was related to seasonal, recurrent occupation in which coastal sites were occupied in the summer to exploit marine resources, and upland sites were occupied during the winter months, with a focus on agriculture. An increasing reliance on agricultural products may have caused a shift in social networks as well; as Hommon (1976) argues, kinship links between coastal settlements disintegrated as those links within the *mauka-makai* settlements expanded to accommodate the exchange of agricultural products for marine resources. This shift is believed to have resulted in the establishment of the *ahupua‘a* system sometime during the A.D. 1400s (Kirch 1985), which added another component to an already well-stratified society. The implications of this model include a shift in residential patterns from seasonal, temporary occupation, to the permanent dispersed occupation of both coastal and upland areas.

Adding to an already well-stratified society was the development of the *ahupua‘a*—the principle land division that functioned for both taxation purposes and furnished its residents with nearly all of the fundamental necessities from which they sustained themselves. The *ahupua‘a* became the equivalent of a local community, with its own social, economic, and political significance and served as the taxable land unit during the annual *Makahiki* procession (Kelly 1956). During this annual procession, the highest chief of the land sent select members of his retinue to collect tribute in the form of goods from each *ahupua‘a*. The *maka‘āinana* (commoners) who resided in the *ahupua‘a* brought their share of tribute and offerings to an *ahu* (altar) that was symbolically marked with the image of a *pua‘a* (pig). *Ahupua‘a* were ruled by *ali‘i ‘ai ahupua‘a* or chiefs who controlled the *ahupua‘a* resources; who, for the most part, had complete autonomy over this generally economically self-supporting piece of land (Malo 1951). *Ahupua‘a* lands were in turn, managed by an appointed *konohiki* or lesser chief-landlord (ibid.). The *ali‘i-‘ai-ahupua‘a*, in turn, answered to an *ali‘i ‘ai moku* (chief who claimed the abundance of the entire district) (ibid.). Thus, *ahupua‘a* resources supported not only the *maka‘āinana* and *‘ohana* (families) who lived on the land but also contributed to the support of the royal community of regional and/or island kingdoms. *Ahupua‘a* are land divisions that typically incorporated all of the eco-zones from the mountains to the sea and for several hundred yards beyond the shore, assuring a diverse subsistence resource base (Hommon 1986). Although the *ahupua‘a* land division typically incorporated all of the eco-zones, their size and shape varied greatly (Cannelora 1974). This form of district subdividing was integral to Hawaiian life and was the product of resource management planning that was strictly adhered to. In this system, the land provided fruits and vegetables and some meat for the diet, and the ocean provided a wealth of protein resources (Rechtman and Maly 2003). In communities with long-term royal residents, divisions of labor (with specialists in various occupations on land and in the procurement of marine resources) were also strictly enforced.

By the 17th century, large areas of Hawai‘i Island were controlled by a few powerful *ali‘i ‘ai moku*. There is island-wide evidence to suggest that growing conflicts between independent chiefdoms were resolved through

warfare, culminating in a unified political structure at the district level. It has been suggested that the unification of the island resulted in a partial abandonment of portions of leeward Hawai‘i, with people moving to more favorable agricultural areas (Barrera 1971; Schilt and Sinoto 1980). ‘Umi a Līloa, a renowned *ali‘i* of the Pili line, is often credited with uniting the Island of Hawai‘i under one rule during the Precontact Period (Cordy 1994). ‘Umi-a-Līloa is also credited with formalizing the land division system on Hawai‘i Island and separating the various classes of chiefs, priests, and laborers (Beamer 2014; Cordy 2000; Kamakau 1992). Upon the death of ‘Umi-a-Līloa, Hawai‘i Island came under the control of his eldest son Keli‘iokāloa-A-‘Umi (Cordy 2000), whose reign is marked by his mistreatment of the lesser chiefs and commoners. His reign was short-lived and by the early-18th century, Hawai‘i Island fell under the control of Alapa‘inui, who assembled a robust army and assigned his closest potential usurpers (his nephews Keawema‘uhili, Kalani‘ōpu‘u, and Keōua) as generals in his militia. The prodigious ‘Ī clan, spread across the districts of Ka‘ū, Puna, Hilo, and portion of Hāmākua was also a powerful force and threat to Alapa‘i campaign (Cordy 2000). As Alapa‘i gathered his forces to strike back at Kekaulike, the *ali‘i nui* of Maui, the high ranking *ali‘i wahine* (chiefess) Keku‘iapoiwa made her way to Kokoiki, Kohala and give birth to Pai‘ea, the birth name of Kamehameha (ibid.). Kamehameha was reared in the traditions and customs of the ancient chiefs and trained under some of the most skilled warriors of that time including Kekūhaupi‘o. Upon Alapa‘i’s death, his eldest son Keawe‘ōpala was named heir to his father’s kingdom.

By the mid-18th century, the young and determined Kamehameha directed his efforts toward consolidating Hawai‘i Island under his rule. To accomplish this monumental task, Kamehameha continued his training under his more experienced kin namely Kalani‘ōpu‘u, who was the *ali‘i nui* of Hawai‘i Island (‘Ī‘ī 1959). During Kalani‘ōpu‘ū’s reign, the first foreign vessels arrived in Hawaiian waters captained by the British explorer, James Cook. Cook first landed at Waimea, Kaua‘i in 1778 and in 1779, he anchored just off the shore of Kealakekua Bay, Kona, Hawai‘i. Aboard these ships were innovative technologies and diseases unknown to the inhabitants of these islands. Items such as metal, nails, guns, canons, and the large foreign vessels themselves stirred the interest of the *ali‘i* and *maka‘āinana* alike. Acquisition of these technological advancements came through barter. This resulted in the *ali‘i* gaining possession of such items that ultimately set traditional Hawaiian warfare in new trajectory; one that would be forged by none other than Kamehameha. Wars occurred regularly between intra-island and inter-island polities during this period. It was during this time of warfare that Kamehameha, who would eventually rise to power and unite all the Hawaiian Islands under one rule (Kamakau 1992).

A Brief History of Hawai‘i After Western Contact

Hawaiians first significant encounter with Europeans marked the end of the Precontact Period and the beginning of the Historic Period. With the arrival of foreigners, Hawai‘i’s culture and economy were drastically altered. Demographic trends during this period indicate population reduction in some areas, due to war and disease, yet increases in others, with relatively little modification of material culture. There was a continued trend toward craft and status specialization, intensification of agriculture, *ali‘i* controlled aquaculture, upland residential sites, and the enhancement of traditional oral history. The traditions associated with Kū including *luakini heiau*, and the *kapu* system were at their peaks, although Western influence was already altering the cultural fabric of the Islands (Kent 1983; Kirch 1985). Foreigners very quickly introduced the concept of trade for profit, and by the time Kamehameha I had conquered O‘ahu, Maui, and Moloka‘i, in 1795, Hawai‘i saw the beginnings of a market system economy (Kent 1983). This marked the end of an era of uniquely Hawaiian culture. Some of the work of the commoners shifted from subsistence agriculture to the production of foods and goods that they could trade with early visitors. Introduced foods often grown for trade with Westerners included yams, coffee, melons, potatoes, corn, beans, figs, oranges, guava, and grapes (Wilkes 1845).

On May 8th, 1819, Kamehameha, who had seen the impacts brought about by foreign introductions, died at his royal residence at Kamakahonu in Kailua-Kona and named his son ‘Iolani Liholiho heir to his kingdom (Kamakau 1992). By May 21st ‘Iolani Liholiho (Kamehameha II) at the age of twenty-one began his rule. As traditional custom dictated and to allow for all people to rightfully mourn the loss of their chief, all *kapu* were relaxed following the death of a chief (ibid.). It was the responsibility of the new ruler to conduct the proper rituals and ceremonies to reinstate all *kapu*. However, Liholiho’s attempts to reinstate the long-standing *kapu* system was futile and the future of the *kapu* system stood in a state of uncertainty. *Kuhina Nui* (Premier), Ka‘ahumanu (the wife of Kamehameha and the *hānai* (adopted) mother of Liholiho) and his biological mother Keōpūolani lured the young chief back to Kona and the *kapu* system was symbolically abolished when Liholiho ate in the presence of his mothers. While Liholiho, his mothers and other chiefs favored the complete abolishment of the *kapu* system, others including Kekuaokalani and his followers prepared to wage war, determined to have the ancient laws reinstated. After several failed attempts at negotiation, Liloliho’s army led by Kalaimoku went head-to-head against the forces of Kekuaokalani in the Battle of

Kuamoʻo (Fornander 1918–1919). Western weaponry had already permeated traditional Hawaiian warfare and Kekuaokalani, who stood behind the ancient laws of the land was killed by gunfire on the battlefield alongside his wife Manono, thereby extinguishing the last public display of resistance. The abolishment of the *kapu* system in 1819, began to undermine the very foundations upon which traditional Hawaiian culture was formed. Adding to an already socially and politically fractured society was the arrival of Protestant missionaries who saw it to be their destiny to fill the spiritual void of the Hawaiian people.

In October of 1819, just five months after the death of Kamehameha, the first American Protestant missionaries aboard the Brig. *Thaddeus* left Boston, Massachusetts and by March 30th, 1820, they sailed to Kawaihae on the northwest coast of Hawaiʻi Island (Hawaiian Mission Children's Society 1901). Having heard of the overturning of the ancient *kapu* system, these early missionaries formed close alliances with some of Hawaiʻi's royalty, including Kaʻahumanu who held a tremendous amount of political power. Starting in 1823, these early missionaries, one of which included William Ellis (1917) set out into the remote parts of the islands in search of suitable locations for future mission stations and within a few short years, mission stations were being constructed outside of the main town centers. Christian beliefs quickly spread and soon established a firm foothold in the islands. The missionaries quickly discovered that many Hawaiians were selective about what aspects of Christianity they were willing to adopt. In striving for complete conversion, the missionaries with the help of the *aliʻi* implemented laws that enforced Euro-American beliefs on the Hawaiian people. To an extent, this furthered the efforts of the missionaries. Despite these massive cultural changes, many Hawaiians continued to hold to their ancient beliefs, especially those associated with their relationship to the land. Throughout the remainder of the 19th century, introduced diseases and global economic forces continued to degrade the traditional life-ways of the Hawaiian people.

WAIĀKEA AHUPUAʻA, PANAʻEWA, AND THE GREATER HILO DISTRICT

The current project area is within the traditional *ahupuaʻa* of Waiākea, whose name has been literally translated by Pukui et al. (1974:220) as "broad waters." Noted Hawaiian Historian and Ethnographer Kepā Maly (1996a:A-5) adds to this translation, noting that the name can also be translated to mean "expansive—much water." Maly (ibid.:A-5) goes on to explain that "in Hawaiian culture, water was the source of wealth"…and that reference to *wai* (fresh water) figuratively expresses the traditional value of these lands. The *ahupuaʻa* of Waiākea extends from the coast and is bounded on the north by Kūkūau 1st Ahupuaʻa. Waiākea shares its southern boundary with two *ahupuaʻa* of the Puna District, Keaʻau at its southeast end and ʻŌlaʻa at its southwest end. Waiākea is bound as its westernmost end by Humuʻula Ahupuaʻa (located in the Hilo District) and Keauhou Ahupuaʻa (located in the Kaʻū District).

Waiākea Ahupuaʻa is one of the many *ahupuaʻa* that together comprise the traditional *moku* (district) of Hilo, which is one of six *moku* on Hawaiʻi Island. The Hawaiian *ʻōlelo noʻeau* (proverbial saying), "*Hilo, mai Mawae a ka pali o Maulua*" (Pukui 1983:108) details the extent of the Hilo District spanning from Māwae, a large fissure and boundary marker separating Hilo from the Puna District at the south end and Maulua, a gulch separating Hilo from the Hāmākua District at its north end. Handy and Handy (1991:538) provides a general description of the district and describes the principle settlement areas of the district:

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

Traditionally, the *moku* of Hilo was divided into three *ʻokana* (sub-districts) with place names that have their origins in legendary times. The three *ʻokana* are (from north to south): Hilo Palikū—characterized by its upright cliffs, this area of Hilo extends north of the Wailuku River to Kaʻula Gulch. The *ʻōlelo noʻeau*, "*Hilo iki, pali ʻeleʻele*" describes this sub-district noted for its greenery, rain, and mists (Pukui 1983:107). The second *ʻokana* is Hilo One—or sandy Hilo, which extends along the shoreline of Hilo Bay between the Wailoa and Wailuku rivers; and finally, Hilo Hanakahi—the land region extending south of Wailoa River to include Keaukaha and Panaʻewa (Edith Kanakaʻole Foundation 2012; Pukui 1983). The current study area is within the *ʻokana* of Hilo Hanakahi, a subdistrict often celebrated in many *mele* (song) composed for Hilo, with the infamous line "*Hilo Hanakahi, i ka ua Kani-lehua*" translated as "Hilo [land of] chief Hanakahi and of the rain that gives drink to *lehua* flowers" (Pukui and Elbert

1986:129). Another *ʻōlelo noʻeau* describing Hanakahi and the rains of Hilo reads, "*Luʻuluʻu Hanakahi i ka ua nui*" translated as "[w]eighted down is Hanakahi by the heavy rain" (Pukui 1983:219). Pukui (ibid.) expands on this saying, noting that "Hanakahi, Hilo was named for a chief of ancient times. This expression was much used in dirges to express heaviness of the heart, as tears pour like rain." The source of these *ʻokana* are found in the legendary account titled "*Kaʻao Hoʻoniua Puʻuwai no Ka-Miki"* ("The Heart Stirring Story of Ka-Miki") published in Hilo's Hawaiian language newspaper *Ka Hōkū O Hawaiʻi* between January 8th, 1914, through December 6th, 1917. Maly, who compiled and translated this lengthy account explains that:

> The narratives were written by John Wise and J.W.H.I Kihe, noted Hawaiian scholars of the late 1800s and eartly 1900s, historians who also collaborated on the translations of Abraham Fornander's collection. The authors used place names as the line with which to tie together fragments of site-specific stories that had been handed down over the generations. Thus, while in many cases, the personification of individuals and their associated place names may not be "ancient," the site documentation within the story is of great value. (Maly 1996a:A-4)

In that portion of the legend that references the Hilo area, Ka-Miki and his companions, Maka-ʻiole and Keahialaka, continue their journey circumnavigating Hawaiʻi Island coming out of the Puna District into Hilo. In drawing from this legendary account, Maly (1996a:A-2) notes that Waiākea Ahupuaʻa was named in honor of the high chief Waiākea-kumu-honua, a brother of Panaʻewa-nui-moku-lehua (female) and Piʻihonua-a-ka-lani (male). While the aforemention accounts provide a possible origin of the naming of Waiākea, Maly (1996a:A-2), in relating a personal account from Clarence Mokuʻōhai Medeiros, mentions that *waiākea* "is also a native variety of taro, similar to the better known *lehua*, but with black streaks along the edges of the stalks." Maly also provides the following translation of ethnographic notes taken by Theodore Kelsey during an interview with Mrs. Kamakakuikalani in 1921 that explains how the *ahupuaʻa* of Waiākea was established:

> Kapapala and Waiakea were sub-chiefs who were told by their superior to run around the tracts of land bearing their names (from Tom Cook, surveyor) (BPBM SC Kelsey Box 1.5, July 2, 1921:2 in Maly 1996a:A-11)

Kelsey also related that "Waiākea was so named 'because you could dig any where [sic] and find water'" (Maly 1996a:A-11). The names of the legendary people of this area are commemorated in the place names for several land units (both the *ahupuaʻa* and their components including *ʻili*) that comprise portions of the Hilo District. The lands of Hilo was further divided into *ahupuaʻa* that today retain their original names (Kelly et al. 1981). These lands include but are not limited to the subject *ahupuaʻa* of Waiākea—which forms the southernmost boundary of the Hilo District in addition to Punahoa, Ponahawai, Kūkūau, and Piʻihonua, all of which are found between Waiākea and the massive Wailuku River (Figure 22).

Waiākea Ahupuaʻa: A Center of Chiefly Occupation

According to legendary and historical accounts, the rich and fertile lands of Waiākea were deeply cherished by the chiefs. Several traditional accounts make passing reference to Waiākea as the birthplace and residence of chiefs. In Fornander's (1916–1917) the *Legend of Kapuaokaoheloai*, Kū and Hina, who are recognized as paramounts gods, had two children, their son Hookaakaaikapakaakaua and their daughter Kapuaokaoheloai. Fornander (ibid.:540-541) writes, "*O Waiakea, i Hilo ka aina, o ka mua ke kaikunane, o ka muli ke kaikuahine, he mau alii lakou no Hilo*" to which he translated as "The brother was the first born and the sister the last. These people were of high chief rank of Hilo." Various historical accounts also expound on this with multiple references to select places within Waiākea as royal residences.Sometime after the rule of the late 16th century chief, ʻUmi-a-Līloa, select portions of Waiākea, where bodies of freshwater are ever-present, were set aside as semi-automonous land units known as *ʻili kūpono* or *ʻili kū* (Brandt 2017; Cordy 2000:200). These *ʻili kūpono* (independent land divisions) paid tribute directly to an *aliʻi nui* (high chief) rather than to the *aliʻi-ʻai-ahupuaʻa* (chief who controlled the *ahupuaʻa* resources) and required its inhabitants to pay a labor tax (Beamer 2014). Curtis J. Lyons, who worked as surveyor for the Hawaiian Kingdom government during the late 19th century and early 20th century further expounds on the political implication of this unique type of land division, writing:

> The *ili kupono*, on the contrary, was nearly independent. The transfer of the ahupuaa to a new chief did not carry with it transfer of the *ili kupono* contained within its limits. The chiefs previously holding the ili kupono continued to hold them, whatever the change in the ahupuaa chief, having their own koeles (chiefs' patches,) worked by their retainers. There was however, a slight tribute of work due to the ahupuaa chief; sometimes one or two days in the month; sometimes even less, or only certain days in the year. (Lyons 1875:119)

Within Waiākea are three *ʻili kūpono*, namely Piʻopiʻo, Makaokū, both of which are adjacent to Hilo Bay and located further east is Honohononui (see Figure 41) (Brandt 2017; Edith Kanakaʻole Foundation 2012). The proposed quarry site is located approximately 0.4 miles (0.7 kilometers) southwest of the ʻ*ili kūpono* of Honohononui, which in itself has a rich history and is associated with the powerful ʻĪ chiefs that ruled over Hilo and its adjacent districts during the 15th century (Cordy 2000; Edith Kanakaʻole Foundation 2012). Similarly, Piʻopiʻo has a long history of being a royal residence as Stephen Desha (2000:76), who was a prolific writer, senator, and pastor during the early 19th century refers to Piʻopiʻo as "a place of residence of chiefs from ancient times", and mentiond that Keawemauhili's wife, Ululani had her residence there. During Alapaʻinui's reign, Keōua (Kamehameha I's father) died at Piʻopio in 1752, and later Keōua's brother, Kalaniʻōpuʻu also lived and died at Piʻopiʻo (Kamakau 1992). Kamakau (1992), Thrum, and Fornander also makes reference to Piʻopiʻo in the account of ʻUmi-a-līloa where they describes a gathering at Kanukuokamanu, the northeastern point of Piʻopiʻo. It was at Kanukuokamanu that the chiefs and people gathered for a celebration where "there was hula dancing, games of hiding stones (*papuhene*), tossing a half-coconut at a mark (*kilu*), and *loku…* (Kamakau 1992:15) It was at Kanukuokamanu that ʻUmi-a-līloa had his encounter with his wife, ʻIʻiwalani, the fine daughter of Kulukulua, the chief of Hilo (Thrum 1923). After the night's festivities had come to an end, ʻUmi-a-līloa approached his wife and inquired about her royal pendant necklace that was made of *wiliwili* (*Erythrina sandwicensis*) wood. In an act to demonstrate his disapproval of the material from which her necklace was made, ʻUmi-a-līloa broke ʻIʻiwalani's necklace and with deep sadness and regret, the woman told her father about her husband's insulting actions. This incident eventually led to a war between the two chiefs and ʻUmi-a-līloa of Hāmākua became acknowledged as the chief of Hilo.

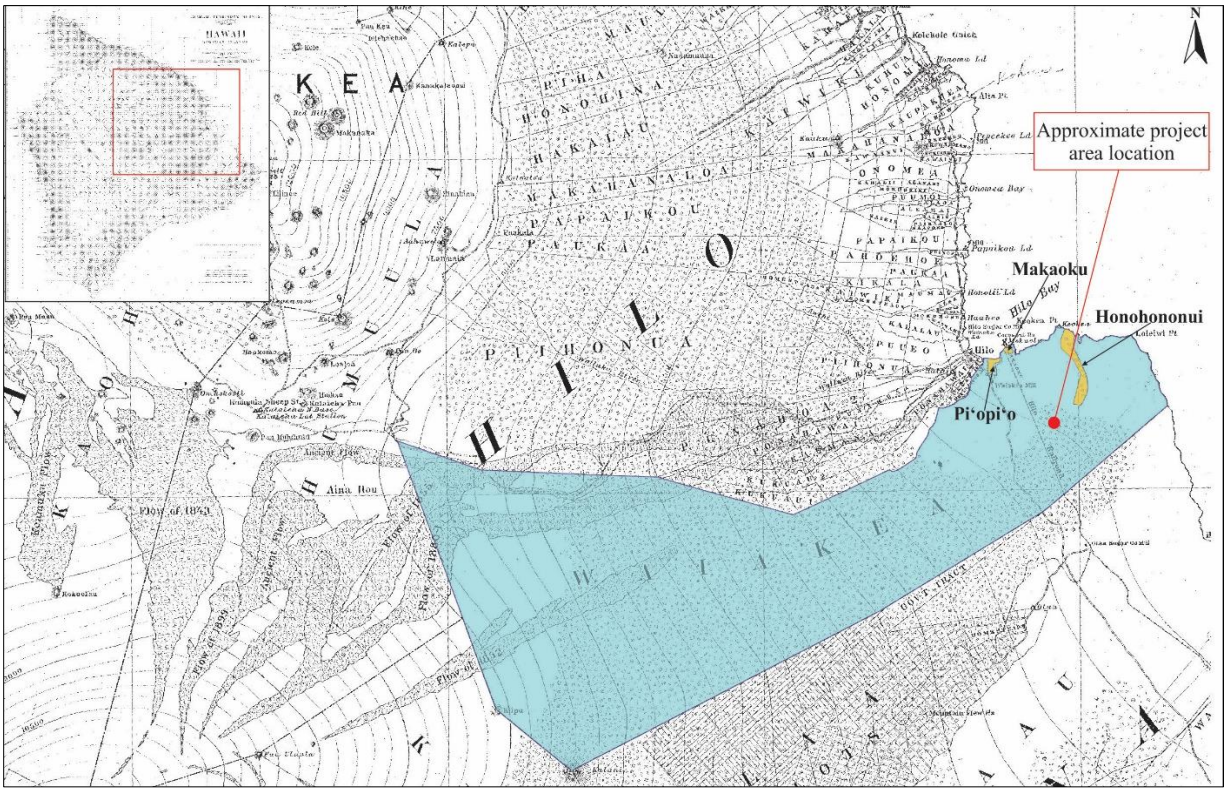
According Kamakau (1961) ʻUmi's conquest began with his defeat of the Hilo chiefs and that his reign lasted until around ca. A.D. 1620, and was followed by the rule of his son, Keawenui a ʻUmi, who ruled Hamākua, Puna, and Hilo from his royal residence in Hilo. ʻUmi's descendants continued to rule until Alapaʻinui, a descendant of the Mahi family of Kohala, conquered the island in the early 1700s (Cordy 2000). During the reign of Alapai, Johna Papa ʻĪʻī, a Hawaiian historian who served in the royal court of Kamehameha recounts:

> Alapai, ruler of Hawaii [from c. 1730-1754] and great uncle of Kamehameha, and his wife Keaka took charge of him [Kamehameha]. Some years later, Alapai and his chiefs went to Waiolama [a river separating Waiākea from Kukuau Ahupuaʻa] in Hilo, where Keoua Kupuapaikalani, the father of Kamehameha, was taken sick and died. Before Keoua died he sent for Kalaniopuu, his older half brother and the chief of Kau, to come and see him. Keoua told Kalaniopuu that he would prosper through Kamehameha's great strength and asked him to take care of the youth, who would have no father to care for him. Keoua warned Kalaniopuu, saying, "Take heed, for Alapai has no regard for you or me, whom he has reared." After this conversation, Keoua allowed his brother to go, and Kalaniopuu left that night for Puaaloa [situated in the Panaʻewa portion of Waiākea].
>
> As Kalaniopuu neared Kalanakamaa [in Waiākea], he heard the death wails for Keoua and hastened on toward Kalepolepo [near Piʻopiʻo] where he had left his warriors, There they were attacked by Alapai's men, who had followed Kalaniopuu from Hilo. First the warriors from the lowland gained, then those from the upland . . . Kalaniopuu continued his journey and at midnight reached Puaaloa, where he arranged for the coming battle. The next day all went as he had planned. His forward armies led the enemy into the forest of Paieie, where there was only a narrow trail, branchy on either side and full of undergrowth. There his men in ambush rose up against the enemy warriors, and his rear armies closed in behind them.
>
> When news reached Alapai that his warriors had been destroyed, he sent another company of warriors to meet Kalaniopuu at Mokaulele on the outer road, which was an ancient road, known from the time of remote antiquity. (ʻĪʻī 1959b:3–4)

Kamakau also relates the following account which makes reference to Waiākea being the choice lands for the late 18th century Hawaiʻi Island chiefs. Kamakau (1992:152) writes that after the battle of Koapapa between Kamehameha and Keoua, in which neither side was victorious:

> Keoua retired to Hilo; Kamehameha went back to Waipiʻo and Kohala. At Hilo Keoua divided the land among his chiefs and warriors; the fat mullet of Waiakea and Piʻopiʻo became theirs.

The following year, Keoua was killed and Kamehameha retained the fertile lands of Waiākea in addition to Piʻihonua, and Punahoa. Kamehameha later passed Waiākea to his son and heir, Liholiho (Kamehameha II), which he retained until his death in 1824 at which point the lands were passed to Kaunuohua, the granddaughter of the Hilo chief, Keawemauhili (Maly 1996a). Kaunuohua held these lands until the 1848 Māhele ʻĀina, which is discussed in a later section of this report.


Approximate project area location
Makaoku
Honohononui
Pi'opi'o
Hilo Bay
Hilo
Onomea Bay
Papaikou Ld.
Honolii Ld.
Kolekole Gulch
Alina Hou
Flow of 1843
Flow of 1859
Flow of 1881
Flow of 1880
Flow of 1855
Flow of 1852
Flow of 1868

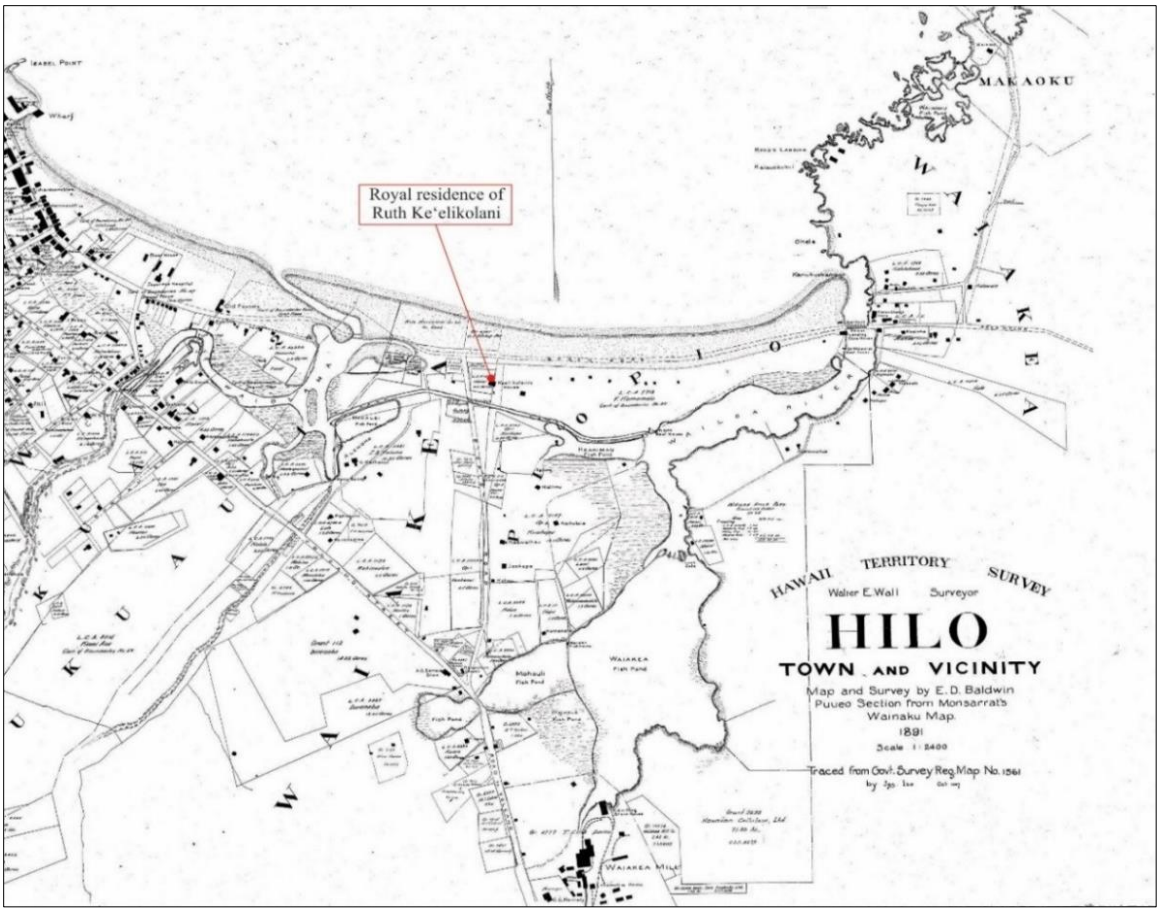


Figure 23. A portion of Hawaiʻi Registered Map No. 1561 from Baldwin in 1891 shows the extensively settledcoastal lands of Waiākea with the royal residence of Ruth Keʻelikōlani in the *ʻili kūpono* of Piʻopiʻo. Project area not depicted on map.

Marine Resources, Fishponds, and Agricultural Practices of Waiākea

Of the Hilo *ahupuaʻa* located south of Wailuku River, only Piʻihonua and Waiākea provided access to the full range of resources stretching from the sea up to 6,000 feet along the slopes of Mauna Kea and Mauna Loa respectively. The abundant marine resources of Hilo Bay, extensive spring-fed fishponds and waterfowl, and wetland and dryland agricultural resources helped to sustain the population of the *moku* of Hilo. Marine-based subsistence was strongly linked to social organization. Strict *kapu* were enforced, which dictated when and where certain varieties of fish such as *ʻōpelu* and *aku* could be caught. A dedicated *aku* fishing ground or *koʻa* known as Maka-o-Kū was located on the shore of the Waiākea Peninsula, near present-day Mokuola, also known as Coconut Island (Maly 1996b).

As with other areas in Hawaiʻi, the fishponds in this *ahupuaʻa* were carefully managed and restricted for *aliʻi* use only. Theoretically, access rights to fishing areas and ocean resources were defined by *ahupuaʻa* boundaries, with residents of a specific *ahupuaʻa* only taking fish within their own land division. However, in the case of Waiākea Ahupuaʻa, the Waiākea fishery extended straight across Hilo Bay, allowing residents of the adjacent *ahupuaʻa* only limited rights to the fishery (Kelly et al. 1981). Kelly et al. (ibid.) note that historically, the ocean resources of Hilo Bay were vital to everyday subsistence, and citing Kamakau (1976:59–60), describe various fishing techniques:

> … with basket traps; with hook and line… by drugging. A man could also fish with his hands, or with crab or shrimp nets, or with a pole from a ledge or the seashore or catch fish in tide pools with a scoop net, or go along the seashore with a net, or set a fishline; or search for fish with a small basket trap or draw a net over sandy spots in the sea or up onto the shore; or drive fish into nets by splashing; or with a pole. But these were not expert ways of fishing; they were just for the taking of fish to make living more pleasurable…

The traditional fishing methods of Waiākea that were used to snare small fish, shrimps, and crabs are also noted in a poetical saying recorded by Pukui (1983:318):

> *Waiakea pepeiao pulu ʻaha.*
> Waiakea of the ears that hold coconut-fiber snares.
> Snares for small fish, shrimp, or crabs were made of coconut midrib and the fiber from the husk of the nut. When not in use the snare was sometimes placed behind the ear as one does a pencil. This saying is applied to one who will not heed—he uses his ears only to hold his snare.

Fornander (1918–1919) associates this poetical expression to Kulukulua, a chief that ruled over Hilo during the time of ʻUmi-a-līloa as described in the *Legend of Kuapakaa.* In this legend, the young Kuapakaʻa of Molokaʻi insultingly calls out to the various chief of Hawaiʻi Island. In one such chant, Kuapakaʻa verbally degrades Kulukulua, by challenging his status as a chief and associating him with the task of commoners including the catching of shrimp with snares. Kuapakaʻa called out to the Hilo chief in the following manner:

O ua ʼlii o makou o Hilo, o Kulukulua, aohe alii	Our chief of Hilo, Kulukulua, is not a chief [by birth];
He pahelehele opae no Waiakea;	He is a snarer of the shirmps of Waiakea;
A pau ke pahelehele ana,	After the snaring,
Kau ae la i ka pulu niu i ka pepeiao.	He places the outside covering of the coconut on his ears.
O ke kee no hoi ia o ia aina,	This is the fault of the land;
O ka ai ana ia Hilo,	But since he became possessed of Hilo.
Olele ia ai he ʼlii.	He is called a chief.
(Fornander 1918–1919:85)	(ibid.:84)

Extensive fishponds were cultivated in the vicinity of Hilo Bay, where spring-fed and walled-off inland ponds whose yields were reserved solely for the highest of *aliʻi*. Kamehameha I was known to send runners from Kawaihae, Kohala and Kailua, Kona to fetch live mullet from Waiākea. Fornander elaborated on this relating that Kamehameha sent his fastest runners, Makoa and Kāneakaʻehu to "Hilo to get mullet from the pond of Waiākea, on the boundary adjoining Puna" (Fornander 1918–1919:490). The largest of these ponds, Waiākea is located to the northwest of the current study and is fed by Waiākea and Wailoa River (see Figure 23). Religious rituals accompanied the creation and maintenance of these fishponds, which according to a historic account from 1823, were surrounded by small huts for their caretakers (Kelly et al. 1981). Caretakers had small huts alongside the fishponds, from where they guarded the fish against theft or being killed by pigs and dogs (Kamakau 1976). In 1846, early missionary, Chester Smith Lyman recorded the following scenes at the fishponds in Waiākea:

> June 30. Just after leaving the village we passed the royal fish ponds on the left. These are connected with the bay and contain the finest mullet in large quantity… July 30. P.M. … They are of brackish water, rise and fall with the tide… They are generally shallow, but in places of considerable depth. The fine mullet with which they are filled are tabu to all but Royal hooks or nets, and thoʼ they are innumerable and large, neither natives nor foreigners can often get a taste of them. (Lyman 1846 cited in Kelly et al. 1981:14)

The delicious fish of the Waiākea fishpond are referred to in various early accounts, such as a story concerning Kamehameha, who intended to make war on Keawemauhili. In response, Keawemauhili in an attempt to avoid war sent Kamehameha the "…sweet-tasting *ʻanae* of Waiākea pond and the fat *awa* in the center of the fishpond…" (Desha 2000:161). In Westervelt's (1915:191) story of Keaunini, he tells of how "the people feasted on the mullet of Lolakea and the baked dogs of Hilo and the humpbacked mullet of Waiakea…" Waiākea's fishponds were also said to be favorites of Hiʻiakaikapoliopele and her elder sister Pele. These two sisters are also figured in a story that describes why the goddess Hiʻiakaikapoliopele caused the deadly ash fall that killed Keōua's army when they passed near the volcano. According to a seer at the time, "the goddess was angry at Keōua for not offering her some of the "fat mullet of Waiākea" (Desha 2000:279).

Agricultural resources were essential to the residents of Waiākea. The Hawaiian proverb "*Hilo ʻai lūʻau"* makes reference to the significance of taro consumption and according to Pukui (Pukui 1983:107) when storms made it impossible to obtain fish, the people of Hilo depended on cooking the entire taro plant. Historical accounts analyzed by McEldowney (1979) indicate that much of Waiākea was in a zone of agricultural productivity. Pukui et al. (1974) relates the following account of a legendary man named ʻUlu, who lived in Waiākea when a bout of famined came over the land. He died of starvation and was laid to rest near a stream. The following morning, there was an *ʻulu* (breadfruit) tree filled with fruits growing where he was buried, thereby ending the famine (1974:219–220). Thrum

(1923) also related this same account, which was reported to him by early Hilo missionary, Henry M. Lyman, and provides additional details. Thrum reports that a large deluge known as Kahinalii swept over the land which left the earth bare of fruits with only *koa* and *ʻōhiʻa* remaining. Thrum adds:

> But, during the reign of the second king after the flood, there lived at Waiakea a man by the name of Ulu, and he had a young son named Mokuola. This child was small and sickly; and his parents felt great sorrow for the pains which he suffered in consequence of eating the gross food which nature had so scantily furnished for their sustenance. Every morning his father would paddle out in his little canoe, and draw the fish-net through the still waters of the bay, if perchance he might catch a tender mullet or an opelu for his dear son; while at evening the kind mother would wrap her boy in a sheet of yellow kapa, and, when the sea-breeze gave way to the cool mountain wind, go down to the wet rocks on the sea-beach in search of limpets and mussels for her child's supper. In spite, however, of their fondest attention, little Mokuola grew thinner and weaker from day to day, so that his parents quite began to despair of his life. (Thrum 1923:235–236)

Unable to bear their son's condition, ʻUlu spoke with his wife and told her that he would seek the help of the gods Kāne and Kanaloa. The following morning, ʻUlu made his way before dawn to Puʻueo to pray and offer sacrifices at a temple. During the ritual, ʻUlu learned from the gods how the child of Wākea (sky father) was buried outside of their home and from which sprouted a *kalo* plant. Inspired by this, ʻUlu returned home and informed his wife of his desire to be laid to rest near their home. ʻUlu then provided instructions to his wife:

> When the breath is all gone from my body, and my spirit has departed to the realms of Milu, carefully bury my head near the spring of running water. Plant my heart and entrails before the door of the house. My feet, my arms and legs, hide away in the same manner. Then lie down upon the couch where we two have so often reposed, and listen during the watches of the night; but go not forth before the sun has reddened the morning sky. If, in the silence of the night, you shall hear sounds as of falling leaves and flowers, and afterward as of heavy fruit dropping to the ground, know then that my prayer has been granted, and that the life of our son shall be saved. (ibid.:238-239)

The woman lamented at her husband's request and after ʻUlu took his last breaths, she fulfilled his request and the following morning, she was woken by the sound of falling fruit, which she used to restore life back to their son, Mokuola.

The productivity of the land is described by missionary William Ellis while visiting Waiākea in 1823. In describing the scene that lay before him, Ellis relates the following for Waiākea:

> …the most beautiful we have yet seen….The whole is covered with luxuriant vegetation, and the greater part of it formed into plantations, where plantains, bananas, sugar-cane, taro, potatoes, and melons, grow to the greatest perfection.
>
> Groves of cocoa-nut and breadfruit trees are seen in every direction loaded with fruit, or clothed with umbrageous foliage. The houses are mostly larger and better built than those of many districts through which we had passed. We thought the people generally industrious; for in several of the less fertile parts of the district we saw small pieces of lava thrown up in heaps, and potato vines growing very well in the midst of them, though we could scarcely perceive a particle of soil.
>
> There are plenty of ducks in the ponds and streams, at a short distance from the sea, and several large ponds or lakes literally swarm with fish, principally of the mullet kind. The fish in these ponds belong to the king and chiefs, and are tabued from the common people.
>
> Along the stone walls which partly encircle these ponds, we saw a number of small huts, where the persons reside who have the care of the fish, and are obliged frequently to feed them with a small kind of mussel, which they procure in the sands round the bay.
>
> …There are 400 houses in the bay, and probably not less than 2000 inhabitants… (Ellis 1963:337–338)

In addition to the cultivation of dry taro, wet taro was cultivated on mounds built into the existing marshlands along the Wailoa River behind the sand dunes of Hilo Bay using the *kipi* or *kipikipi* method, which resulted in a landscape of raised islands and ditches (Maly 1996b). The development of *kipi kalo* originates from Hilo in the swamps of Waiākea Handy and Handy (1972). Handy and Handy (1972) describe how the *kipi* method was implemented by:

> …heaping up, above the surface of the water, long mounds (*kipi* or *kipikipi*) of soil upon the tops and sides of which the cuttings were planted. (1972:91)

Handy and Handy (1972:539) also describe the general region of Waiākea and the forested areas of Panaʻewa as an agricultural area:

> On the lava strewn plain of Waiakea and on the slopes between Waiakea and Wailuku River, dry taro was formerly planted wherever there was enough soil. There were forest plantations in Panaewa and in all the lower fern-forest zone above Hilo town along the course of the Wailuku River.

Maly (1996b:A-2) also makes reference to a 1922 article from the Hawaiian Language newspaper, *Ka Nūpepa Kūʻokoʻa*, where planting on *pāhoehoe* lava flats in the Panaʻewa forest is described:

> There are *pahoehoe* lava beds walled in by the ancestors in which sweet potatoes and sugar cane were planted and they are still growing today. Not only one or two but several times forty (*mau kaʻau*) of them. The house sites are still there, not one or two but several times four hundred in the woods of the Panaewa. Our indigenous bananas are growing wild, these were planted by the hands of our ancestors.

The Forested Lands of Panaʻewa

The project area is situated in an inland zone of Waiākea known as Panaʻewa characterized by its dense forest that blankets the eastern part of the *ahupuaʻa* and extends towards the Puna District. The extent of this massive forest is depicted in several historical maps. These maps situate the project area at the northeast edge of the Panaʻewa forest. Figure 41, below is a map from 1851 drafted by W. M. Webster showing the route of the old volcano road (located to the west of the project area) in addition to a "Road to Puna" which passed along northeast corner of the study area into the Puna District, and includes notes about the "woods." A second map from 1891 prepared by C. J. Willis (Figure 25) shows the project area situated between the "Hala Woods" to the north and "Panaewa Forest" to the south. Figures 41 and 25 also shows the relative location of the three *ʻili kūpono* (Piʻopiʻo, Makaokū, and Honohononui) decribed above to the study area. A third map from 1893 prepared by E. D. Baldwin (Figure 26) shows the route of the old Volcano Road and makes reference to the "Panaewa Woods" and the upper Waiākea Forest.

Maly (1996a:A-6) translates the name Panaʻewa to mean "crooked or unjust place" and describes its location to be "a land section of Waiākea, on the Puna side of Kāwili." McEldowney (1979) notes that the Panaʻewa forest was one of the few forests on the island to reach the ocean. The following Hawaiian proverbs recorded by Pukui (1983) poetically expresses how the *ʻōhiʻa lehua* (*Metrosideros polymorpha*) blossoms from the Panaʻewa forest would fall into the ocean in great numbers, indicating that this celebrated forest extended to the coast.

> *He kai lū lehua ko Panaʻewa.*
> Panaʻewa shakes down the lehua fringes into the sea.
> Once, when the forest of Panaʻewa extended to the sea, fringes of *lehua* blossoms were seen floating about in the water. (ibid.:74)
>
> *Ke kai kuaʻau lehua o Panaʻewa.*
> The sea where lehua fringes float about in the shallows.
> Long ago, when *lehua* tree grew down to the shore at Puna dn Hilo, the fringes of the flower often fell into the sea, reddening the surface. (ibid.:186)

Fornander (1918–1919) also notes that Waiākea was known for a specific type of *ʻōhiʻa* known as the *ʻōhiʻa puakea* (white-blossom *lehua*), which was named after a beautiful maiden, Puakea who lived in Waiākea. In describing the characteristics and traditional uses of this unique type of *ʻōhiʻa*, Fornander (1918–1919:621–622) writes:

> This tree has white flowers, and its fruit is also white when it is ripe; it is palatable when eaten. It has one round seed split in two parts; the birds are fond of the nectar of its flowers. The bird snarers used the branches on which the flowers were thick to put their gum on, and when a bird was caught the snarer would call out, "Snared, snared is my bird." The bird must be secured as quickly as possible. Its trunk, as also its branches, is used for firewood.

Although renowned for its extensive and tall stands of *ʻōhiʻa lehua*, Panaʻewa is also celebrated in many traditional poetic compositions for its *maile* (*Alyxia stellata*), *hala* (*Pandanus tectorius*), and *ʻawa* (*piper methysticum*) that grew in the trees, and an array of native birds. Pukui (1983) enumerates on the endemic taxa of this area that were utilized by the people, writing:

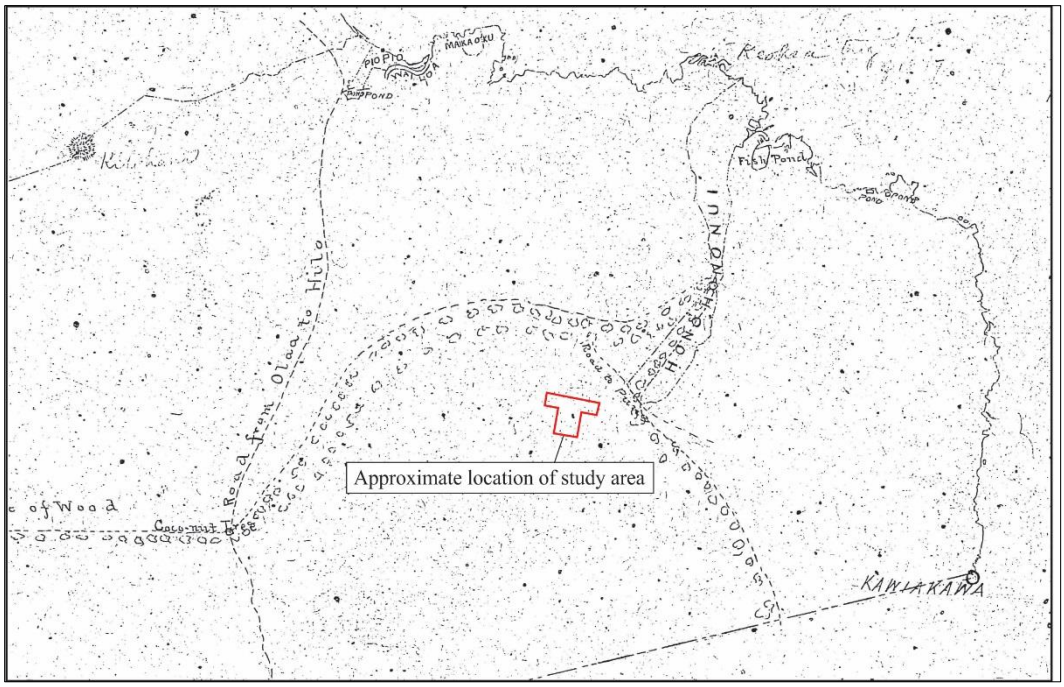


Figure 24. Portion of 1851 Hawai‘i Registered Map No. 705 by W.M. Webster showing the eastern portion of Waiākea and the study area location (outlined in red) realtive the *‘ili kūpono* of Honohononui, Pi‘opi‘o and Makaokū within the bounds of the Pana‘ewa forest.

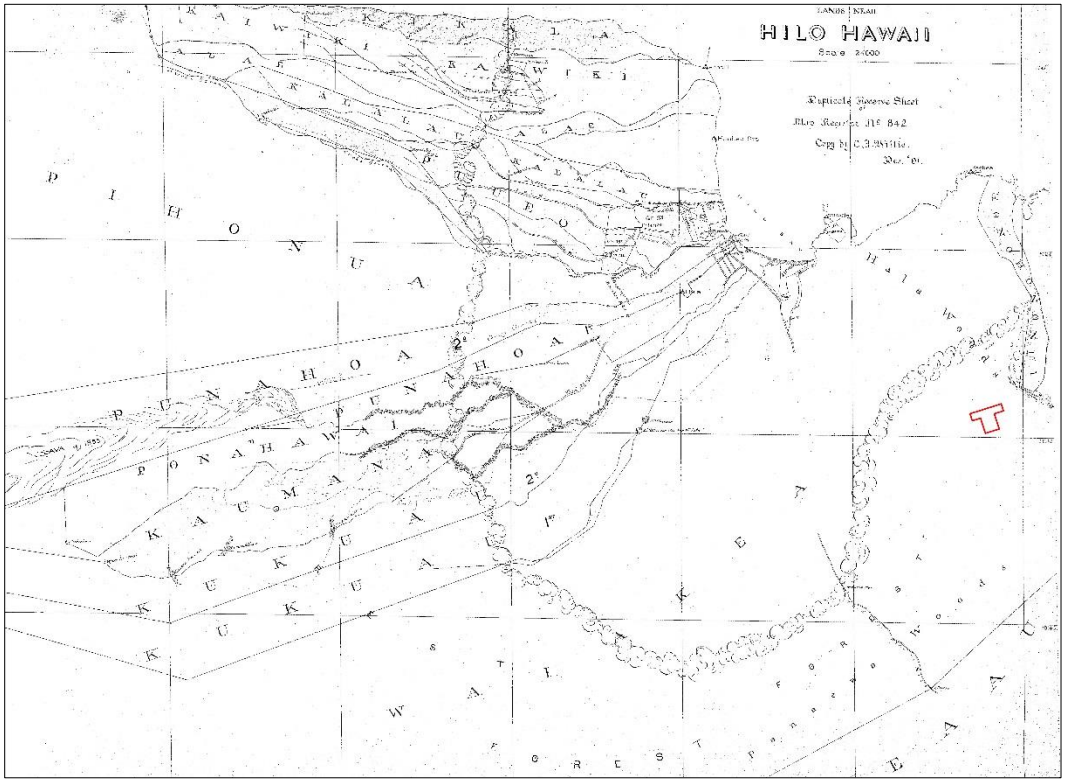


Figure 25. Hawai‘i Registered Map No. 842 by C. J. Willis in 1891, showing the study area (outlined in red) and the extent of the Pana‘ewa Forest with notes on the “hala woods” and “Panaewa Woods.” The three *‘ili kūpono* are also depicted.

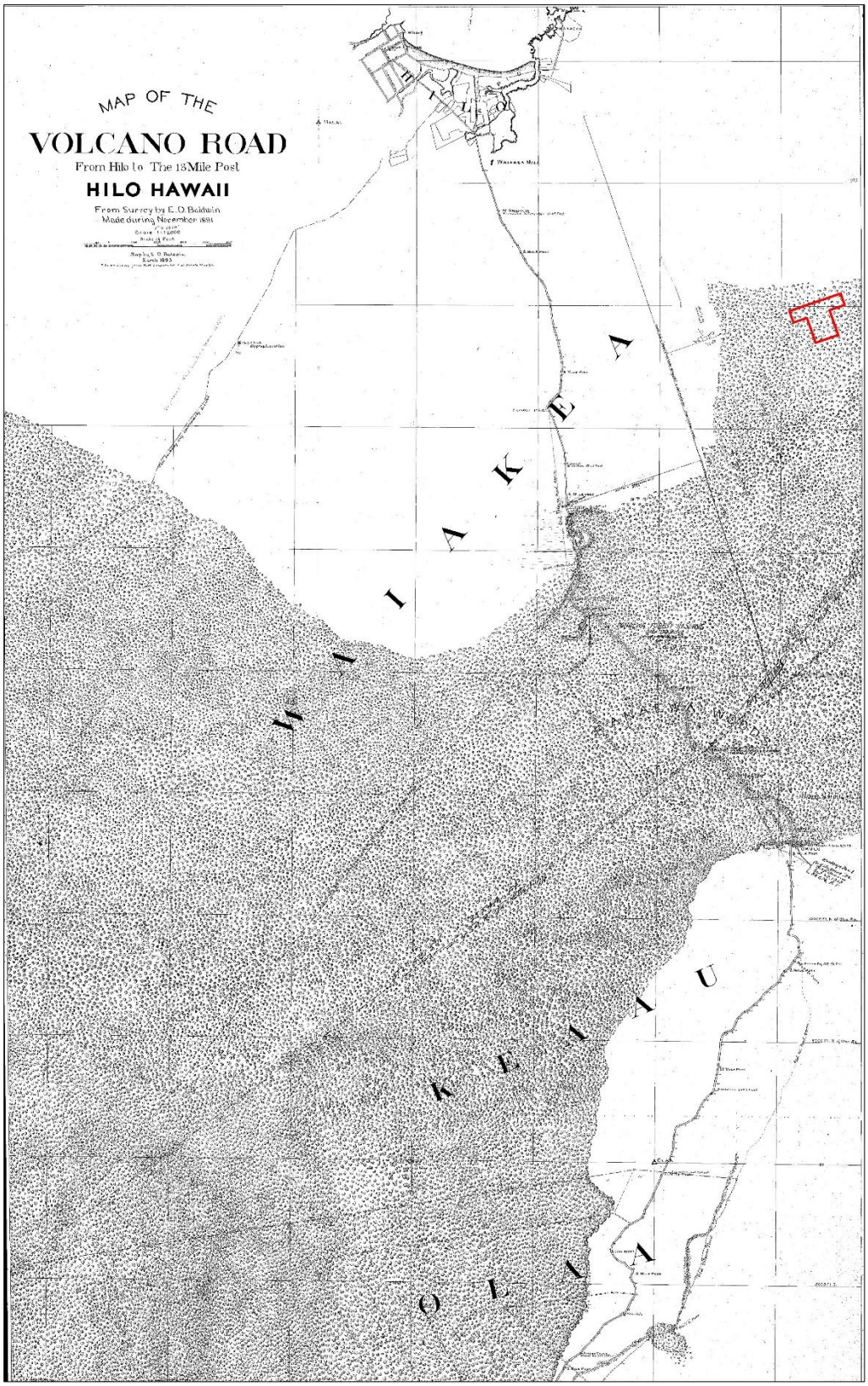


Figure 26. Hawai‘i Registered Map No. 1713 by E. D. Baldwin in 1893 showing the extent of the Pana‘ewa and upper Waiākea forest.

> *Lei Hanakahi i ka ʻala me ka onaona o Panaʻewa.*
> Hanakahi is adorned with the fragrance and perfume of Panaʻewa.
> The forest of Panaʻewa was famous for its *maile* vines and *hala* and *lehua* blossoms, well liked for making *lei*, so Hilo (Hanakahi) was said to be wreathed with fragrance. (ibid:212)
>
> *Na manu leo nui o Panaʻewa.*
> Loud-voiced birds of Panaʻewa.
> Loud talkers. Panaʻewa, Hilo, was famous for its *lehua* forests that sheltered the honey-sucking birds. Here people went to gather *lehua* and *maile*. (ibid.:247)

Reference to the mystical and potent *ʻawa* of Panaʻewa is described in the account of Keaunini (Westervelt 1915). After receiving orders from his brother, Ke-au-miki was sent to fetch small black and white pebbles from Hāʻena in Keaʻau, Puna and *ʻawa* from Panaʻewa. In describing the ʻawa of Panaʻewa, Ke-au-miki's brother explained:

> Get thirteen stones—seven white and six black. Make them fast in a bundle, so they cannot be lost, then come back by Panaʻewa and get awa…which man did not plant, but which was carried by the birds to the trees and planted there.

Ke-au-miki then with his supernatural powers, hastened over the lands of Hāmākua and arrived at Wailuku River where he defeated the *kupua* (demigod) that attempted to block his pathway over the river. Having arrived at Pa-ai-ie [Pāʻieʻie] in Waiākea, Ke-au-miki began his search for the objects that were requested by his brother.

> Then Ke-au-miki rushed over the river and up the precipices, speeding along to Pa-ai-ei, where the long ohia point of Pana-ewa is found, then turned toward the sea and went to Haena, to the place where the little stones aala-manu are found. He picked up the stones and ran to Pana-ewa and got the awa hanging on the tree, tied up the awa and stones and hurried back.

A traditional legendary account titled "*He Kaao no Pikoiakaalala, ke Keiki Akamai i ka Pana*" describes the traditional practice of bird catching which took place in the Panaʻewa forest. Published in a series of articles printed in the Hawaiian language newspaper, *Ka Nūpepa Kūʻokoʻa*, between December 16, 1865, through March 10, 1866, the author S. M. Kaui provides insight into this practice. Born to ʻAlalā and Koukou on the island of Kauaʻi, their son Pīkoiakaʻalalā becomes adept at *pana pua* (shooting with bow and arrow) and was able to shoot rats and birds from great distances. As a preamble to the telling of this story, Maly and Maly (2004:8) writes:

> The tradition is set is the late 1500s when Keawe-nui-a-ʻUmi, the king of Hawaiʻi Island, was in need of an expert to shoot some supernatural *ʻelepaio* birds that continually interrupted the work of his canoe makers in the uplands of ʻŌlaʻa and Hilo.
>
> Keawe-nui-a-ʻUmi learned of Mainele, a champion in the sport of *pana pua*, who resided on Oʻahu, and promised him that if he could rid the forest of the enemy *ʻelepaio*, he could wed his daughter, the beautiful Keakalaulani.

Although Mainele boasted greatly of his skill, it was soon learned that could not kill the birds. As this story unfolded, Waiākea, a steward of Keawe-nui-a-ʻumi befriended the great shooter, Pīkoiakaʻalalā. The skilled Pīkoiakaʻalalā requested that Waiākea not tell anyone who he was and the two began their work ridding the upland forest of the mischevious birds. That portion of the story naming the birds that were caught by Pīkoiakaʻalalā in the lands of Panaʻewa and in the uplands of ʻŌlaʻa reads:

> *Eia na inoa pakahi o na manu a Pikoiakaalala i pana ai i mea ai no ka wa maka pahu o Hilo. O ka Oo, ka Iiwi, ka Ou, ka Akakane, ka Amakihi, a me ka Mamo, o na manu ai-lehua no a pau o ka uka i Olaa a me ka nahele laau loloa o Panaewa; oia mau manu ka ke keiki Pikoiakaalala i panai, a o ka Waiakea hoi ia e haawi aku ai i ke alii nui me na lii malalo iho, na kaukaualii, na puali, me na koa a me na kanaha hoi o ke alii.*
>
> Here are the names of the birds which Pikoi-a-ka-ʻalalā shot during his time in Hilo; the ʻŌʻō, ʻIʻiwi, ʻŌʻū, ʻAkakane, ʻAmakihi, and the Mamo, the birds which eat of the lehua blossoms in the uplands of ʻŌlaʻa, and the long-treed forest of Panaʻewa. Those were the birds shot by Pīkoi-a-ka-ʻalalā, and given to Waiākea to the king, the chiefs below him, the attendant chiefs, the warriors and the men of the chief. (Maly and Maly 2004:9)

The abundance and frequency of rain in Panaʻewa is another celebrated natural feature that is enumerated in several traditional expressions:

> *Ka ua kinai lehua o Panaʻewa.*
> The rain that bruises the lehua blossoms of Panaʻewa.

> Both *lehua* and rain are commonly found in Panaʻewa. (Pukui 1983:169)
>
> *Ka ua lū lehua o Panaʻewa.*
> The lehua-shedding rain of Panaʻewa.
> The heavy rain of the *lehua* forests of Panaʻewa in Hilo, Hawaiʻi. Famed in chants of old. (ibid.:172)

It is through these resources and natural wonders that Kānaka Maoli constructed their relationship to the lands of Panaʻewa. According to native scholars both of whom live in Panaʻewa, Pualani Kanakaʻole-Kanahele and the late Edward Kanahele in their report, *Panaʻewa: Cultural Description Of Indigenous Hawaiian Life*, all literary sources describe the healthy condition of the forest, which was comprised predominately of large *ʻōhiʻa lehua* trees. Such an understanding is derived from the traditional terms used to refer to this forests. Mr. and Mrs. Kanahele enumerate on these descriptions noting:

> Panaʻewa is synonymous with [the terms] uliuli, moku lehua and ulu lehua o Panaʻewa. Uliuli translates as dark, dense and very green that again translates as healthy. Moku lehua and ulu lehua reveals that Panaʻewa's dominate canopy is ʻōhiʻa lehua. The poetic description of Panaʻewa as a lehua grove or a island is visually correct. (Kanahele and Kanahele n.d)

Furthermore, the many *moʻolelo* describing the *ʻōhiʻa lehua* in Panaʻewa are closely associated with Pele, the deity of lava and creator of earthly matter and her younger sister, Hiʻiakaikapoliopele, whose divine energy is associated with revegetating the barren lava flows created by her sister and other volcanic siblings (Kanahele 2011). According to Mr. and Mrs. Kanahele, the Panaʻewa forest lies within the domain of these two goddesses.

> It [*ʻōhiʻa lehua*] is the first hardwood tree to grow on fresh lava and it acts as an agent to break down the lava, making it palatable for other forest plants to grow around or under it beginning the cycle of life for flora and fauna. It is considered at almost the same level of the creation cycle as Pele and Hiʻiaka because it is an initiator. (Kanahele and Kanahele n.d)

In addition to this forest's close association with Pele and Hiʻiaka, this forest is also said to the boundary between the domain of Pele and her rival lover, Kamapuaʻa. After engaged in a tumultuous relationship with Kamapuʻa, the pig deity, he and Pele establish land boundaries as a means to end their feud. Kamapuaʻa was given domain over the lush northern part of the island, and Pele the southern, volcanically active section (Fornander 1918–1919). Westervelt (1916:53) relates that during his tumultuous relationship with Pele, "the islands were divided between the two demi-gods, and an oath of divine solemnity was taken by them." Westervelt goes on to explain that "they set apart a large portion of the island of Hawaii for Pele, and the eastern shore from Hilo to Kohala and all the island northwest of Hawaii as the kingdom over which Kamapuaa might establish rulers" (ibid.).

Other traditional accounts also relate the naming of this forest after the infamous *moʻo* deity, Panaʻewa, who resided in the thick forest grove. In explaining the nature of traditional *moʻo* deities and its association to fresh water, Mr. and Mrs. Kanahele writes::

> The imagery of this moʻo or lizard is the equivalent of a large dragon-type character. The moʻo is considered a water creature who lives in or is part of a watery landscape. The relevance of the moʻo and forest adds another descriptive dimension to this forest and that is, this forest is wet and soggy. (ibid.)

Kanahele and Kanahele (n.d) provided the following chant that describes the Panaʻewa forest and tells of the origins of its name. That portion of the chant reads:

I ka ulu lehua o Panaʻewa	In the lehua grove of Panaʻewa
He ulu lehua Kaulana kēia no Hilo	This is indeed a famous lehua grove of Hilo
A, ua loaʻa mai kona inoa	And its name was obtained
Ma muli o kekahi kupua	From a demigod
Nona ka inoa o Panaʻewa	From him was the name, Panaʻewa
A, ʻo ia ke kiaʻi o ua wahi nei.	And, he is the guardian of this forest

While the accounts presented above details the many celebrated resources and features of this forest, its namesake is derived from a malevolent *moʻo* (lizard-like deity) Panaʻewa that inhabited and kept close guard over this forest (Hoʻoulumāhiehie 2006a). The following section presents the various *moʻolelo* that makes reference to Panaʻewa as well as the greater Waiākea Ahupuaʻa.

Select Moʻolelo for Panaʻewa and the Waiākea Ahupuaʻa

Traditional *moʻolelo* (stories, tales, and myths) and *mele* (songs) aids in understanding the cultural landscape. Such accounts often tell of traditional land use and practices of an area and provides narratives to articulate the values and expressions of the people's relationships to their lands and environment. While an abundance of native and historical accounts exists for the greater Waiākea region, this section of the study will focus primarily on Panaʻewa as it is that land areas in which the proposed quarry site is located. Associated *moʻolelo* include, the battle between Hiʻiaka and the *moʻo* Panaʻewa, *Kaʻao Hoʻoniua Puʻuwai no Ka-Miki* (Heart Stirring Story of *Ka-Miki*), and *Ke Kānāwai Māmalahoe* (the Law of the Splintered Paddle).

The Battle Between Hiʻiakaikapoliopele and the Moʻo, Panaʻewa

In legendary accounts, *moʻo* are often depicted as fearsome and meddlesome, while in other accounts they are portrayed as friendly and even helpful (Beckwith 1970). According to Kamakau, the *moʻo* most commonly referred to in Hawaiian folklore differ from the typical house or rock lizard. Kamakau notes that the bodies of mythical *moʻo* were "extremely long and terrifying" (Kamakau 1964:82). In *Pele and Hiʻiaka A Myth From Hawaii*, Hiʻiaka, the heroine of the journey slays numerous malevolent *moʻo* throughout the island chain while en route to Kauaʻi to retrieve her sister's lover (Emerson 1997). Hiʻiaka's connection to Panaʻewa is most explicit in *Ka Moʻolelo O Hiʻiakaikapoliopele*, authored by Hoʻoulumāhiehie Hoʻoulumāhiehie's version was initially published in the Hawaiian language newspaper *Ka Naʻi Aupuni* between the years 1905-1906. Throughout the early 21st century, Hawaiian language scholar, Puakea Nogelmeier compiled the individual chapters written by Hoʻoulumāhiehie, translated each page of text, and published it in a double volume (one in Hawaiian and the other in the English) (Hoʻoulumāhiehie 2006b, 2006a). Nogelmeier notes that Hoʻoulumāhiehie's version is one of twelve known published accounts of *Ka Moʻolelo O Hiʻiakaikapoliopele*, of which select portions specific to Panaʻewa are summarized and presented below.

The story begins with Pele and her siblings who traveled from their home-land of Kahiki until reaching Hawaiʻi island where Pele had made her permanent home in Puna. After settling on Hawaiʻi Island, Pele and her siblings ventured down to Hāʻena in Keaʻau to bathe in the sea. While there, Pele was overcome with the desired to sleep. She informed her youngest sister, Hiʻiaka not to allow any of their siblings to awaken her. Hiʻiaka consented to her sister's commands. In her dream state, Pele followed the sound of a *pahu* (drum), which carried her spirit to the island of Kauaʻi, where she saw and met a striking man named Lohiʻau. The two met and fell madly in love, however, given that Pele was in her spirit form, she made it clear to Lohiʻau that she must return to her home but would send someone to fetch him. Pele's long sleep was cause for concern and although tempted to awaken her sister, Hiʻiaka held true to her sister's commands.

Finally, Pele roused from sleep and called upon each of her sisters where she made a proposition, asking which one of them would fetch her dream lover Lohiʻau from Kauaʻi. Knowing Pele's tempestuous temper, each feared possible repercussions and refused to go. After being denied by all but one sister, her youngest sister, Hiʻiaka appeared to her. The irascible Pele demanded that Hiʻiaka travel to Kauaʻi to fetch Lohiʻau, and sent her on her way with strict instructions. Hiʻiaka was not to take him as her husband, she was not to touch him, and she was to take no longer than forty days on her journey. While Hiʻiaka agreed to her sister's demands, she realized that in her absence, Pele would become incensed with a burning and vehement fury and destroy whatever she desired. So Hiʻiaka set forth two stipulations; her beloved *ʻōhiʻa lehua* grove was to be spared from destruction, and Pele was to protect her dear friend Hōpoe in her absence. In this version of the story, Hōpoe is described as a young girl from Keaʻau that was skilled at riding the surf of Hāʻena, and the one who taught Hiʻiaka the art of *hula*. Pele agreed to Hiʻiaka's requests, and Hiʻiaka departed on her journey to retrieve Pele's lover. In a sympathetic act, Pele bestowed supernatural powers upon Hiʻiaka so that she would be protected against the dangers she would undoubtedly meet along the way. In preparing for her journey, Hiʻiaka left for the uplands of Puna to perform a ceremony at Kīlauea. While there, Hiʻiaka met Wahineʻōmaʻo, who ended up joining Hiʻiaka on her journey.

After departing Puna, Hiʻiaka and her traveling companion Wahineʻōmaʻo reached Kuolo in Keaʻau, Puna District—a place that boarded the Panaʻewa forest. Having learned her from her parents that Panaʻewa was a place of certain death for travelers, Wahineʻōmaʻo turned to Hiʻiaka and expressed her concern and offered a second route of travel along the coast. Aware of the potential dangers that loomed ahead, Hiʻiaka insited that they pass through the "lehua groves of Panaʻewa" (Hoʻoulumāhiehie 2006a:50). Upon reaching Kūkulu, a high place in the Panaʻewa forest, the two women were observed by Kūkulukukui and Kapuakoaiʻa, the guardian birds for the chiefly *moʻo* Panaʻewa. The two guards quickly went to Panaʻewa to report the presence of Hiʻiaka, "the champion, the dynamic one of the

lightning skirt from Kīlauea" (ibid.:51). After hearing the news of Hiʻiaka's presence in the forest, Panaʻewa retorted the following:

> "What matter would be the doom she might bring, if it truly is she who had entered the lehua groves here in Panaʻewa.
>
> She and her people should know that the chiefs of Hilo have no regard for them.
>
> And my kapu, my sacred law, is firmly set, that no man or woman may arrogantely tread amid the lehua trees of Panaʻewa without my consent. But as to those stone-eating, land-eating, lehua-grove eating women, I would never allow them to enter here into Panaʻewa. If it turns out that is not Hiʻiaka, but some local women from up by the shoreside of Hilo, then say nothing and you two can allow her to go along this road to get to Waiākea." (ibid.:52)

Just as Kapuakoaiʻa finished speaking to Panaʻewa, Hiʻiaka's voice was heard echoing through the forest, where she recited the following chant requesting permission from Panaʻewa to pass through his forest:

ʻO Panaʻewa nui moku lehua	Great Panaʻewa of the lehua groves
ʻŌhiʻa kupu hāoʻeoʻe	ʻŌhiʻa that reach upwards in spikes
I ka ua lehua ʻula	In the red lehua rain
Hō mai ana hoʻi ua alanui	Grant us the pathway
Noʻu nei, no Hiʻiakaikapoliopele	For me, indeed, Hiʻiakaikapoliopele
E aloha mai! E uē kāua.	Offer us welcome! Let us share our tears of joy.
(Hoʻoulumāhiehie 2006b:54)	(Hoʻoulumāhiehie 2006a:52)

Angered by Hiʻiaka's request, Panaʻewa sharply responded:

> "You have no pathway here in Panaʻewa. You are an arrogant woman, coming down from inland Puna, a marginal land used up by the gods, and you proudly assume this to be your road to travel. Certainly you know that Panaʻewa is a sacred forest, not to be wantonly traversed by the stone-eaters. There is no road here. As though your eyes didn't see that the road for travel is seaward of Hāʻena." (Hoʻoulumāhiehie 2006a:52)

Having heard Panaʻewa's discourteous remarks, Wahineʻōmaʻo turned to Hiʻiaka and again reminded her of the coastal trail which would be easy to travel but Hiʻiaka remained firm and insisted they pass through the forest. Having hear the mighty growl and harsh retorts of Panaʻewa, Hiʻiaka prepared herself and her companion for the impending danger that the merciless Panaʻewa would unleash on them. Here Panaʻewa:

> Then devoured all of the cooked taro corms and the broiled taro leaves that the sentinels had brought. When sated, the moʻo commanded the two sentinels, Kūkulukukui and Kapuakoaiʻa, to go and cut the heads of all of the flying ghost (spirits) in Panaʻewa and to flood the path that Hiʻiaka and company were advancing upon with their blood. (ibid.:53)

Hiʻiaka then prepared Wahineʻōmaʻo for the imminent danger stating:

> "Listen, hold fast to my skirt. Hold on tight, and don't let your grip loosen, or you will be swept away by the tide of blood from Panaʻewa. Wherever I go, you must come along. We will know defeat in the dawn hours, but Panaʻewa will lose in the twilight of evening. As we go along, if you hear the roar of voices echoing through Panaʻewa forest, recognize that the red tide of the moʻo, Panaʻewa, had begun to flow. This will tempter my skirt, once it's been soaked in the red waters."

In a short time, the women found themselves caught in the red flood of Panaʻewa with nothing more than their chins bobbing above the red waters. Fearful of whether they would survive, Wahineʻōmaʻo cried out to her companion. Hiʻiaka quickly replied, "hold your breath my friend…I shall call upon our elder sister, our brothers and our ancestors." Responding to their sister's cries, Pele and their brother Lonomakua began to stoke the fires of Kīlauea and in no time, thick smoke blanketed the slopes of Maunaloa, Maunakea, and Hualālai and darkness fell over the *lehua* filled forest of Panaʻewa. Clinging on to life, Hiʻiaka again called out in chant:

Panaʻewa nui moku lehua	Panaʻewa, wildwood of lehua
ʻŌhiʻa kupu hāoʻeoʻe i ka lani	ʻŌhiʻa that grows jaggerdly toward the heaven
I ka ua, lehua ʻula i ka ua	In the rain, scarlet lehua in the rain
I ka wī a ka manu, ua pō ē	At the twitter of the birds, night has come
Pō wale Hilo i ka uahi o kū (kuʻu) ʻāina	Hilo is darkened by the smoke of my land
Ola ia kini, ke ʻā maile ke ahi.	Those multitudes will survive, for the fires are ablaze.
(Hoʻoulumāhiehie 2006b:58)	(Hoʻoulumāhiehie 2006a:56)

Pele sent billows of smoke to her sister and informed her to summon the help of their brothers. Knowing that to defeat Panaʻewa would require more than what Hiʻiaka was capable of, she cried out her powerful brothers, Kauilanuimakaʻehaikalani, Kamohoaliʻi, Kahuilaokalani, Kaʻekaokalani, and to Kāneikawaiola to send down their clouds and water. As Hiʻiaka beconed her siblings for help, they responded by sending torrential rain from the heavens, flashing their lightining across the sky, and violently shaking the earth. As the waters rushed into the domain of Panaʻewa, the trees were pushed over and the mightly waters swept over the pitiless *moʻo.* Unable to withstand the powerful torrents, Panaʻewa shapeshifted, transforming himself into a *lehua* tree and later into an *ʻamaʻumaʻu* fern to no avail. Panaʻewa could not fight back against the raging waters and his body and spirit grew weak. Recognizing that the only way out of this disaster was to reconcile with Hiʻiaka, the fading Panaʻewa called out asking to be spared. Hiʻiaka refused his pleas, stating:

> "If that is it,"… then you shall not be spared, for you have been evil to me in response to the fair request that I made of you. You shall die, though the lehua grove of Panaʻewa shall live on, as a commemorative forest for the people here in Hilo. (Hoʻoulumāhiehie 2006a:57)

Panaʻewa was seized by the water and his lifeless body carried out to the depth of the ocean where it was devoured "whole into the belly of a big-mouthed fish" (ibid.). With their path now cleared of the malevolent *moʻo*, Panaʻewa, Hiʻiaka and her companion carried on with their journey. As they were exiting the forest, Hiʻiaka then turned to Wahineʻōmaʻo and exclaimed:

> "We have faced the red water and the white waters here in Panaʻewa. We have donned the lei of red lehua and the white lehua of this place, and now we shall leave here and go to the shore of Waiākea. We will encounter many baneful ones in these places prior to reaching Waiākea. There is Pāʻieʻie, a supernatural woman, and Puaʻaloa, a supernatural male; Kaʻiliahiahi, a woman, and Puʻumoho, a male; Nāʻū is a woman, as is Haili, while Kūʻēhoʻopiokalā is a male; Maʻū is the wife of Makaliʻi; Kapakapakaua is a male, and Honokawailani is also male. However, if I pray diligently and the heed me, then our descent through these places towards the sea should be safe, but if they pay no mind to my plea for compassion, then they shall be made victims of this magical skirt of mine." (Hoʻoulumāhiehie 2006a:58–59)

From Hoʻoulumāhiehie's narrative, we learn of the *lehua*-filled Panaʻewa forest which was closely guarded by the *moʻo*, Panaʻewa, and his bird guards, Kūkulukukui and Kapuakoaiʻa, was a forest for those of Hilo. We also learn of two main trails that connected Waiākea to Puna, with the longer route passing along the coast and the shorter but more tretchrous one cutting through the Panaʻewa forest. This narrative also describes the forest being demolished by red and white waters, perhaps a reference to a volcanic eruption, which was later extinguished by a great flood of water. Additionaly, from the preceeding quote, we learn of other *moʻo* that dwelled within Waiākea. Some of these names have been retained today as place names. Additional information for Panaʻewa and the epic battle with Hiʻiaka have been compiled and described in the ensuing paragraphs.

In *Hawaiian Legends of Volcanos*, Panaʻewa was a very strong reptile-man who could change forms from animal to man as he desired and would guard the paths through the forest (Westervelt 1916). Panaʻewa allowed some to pass through his forest, but for the others, he brought fog, rain, and wind in attempts to capture travelers, to rob them of their possessions, and in some cases consume those who entered his forest (1916). Westervelt adds that "those who knew about Panaʻewa brought offerings of awa to drink, taro and red fish to eat, tapa for mats, and malos, or girdles" (1916:99). This encounter with Panaʻewa was Hiʻiaka's first obstacle in her journey.

While Emerson's (1997) version of the story shares a similar premise, his account provides other details not described in Hoʻoulumāhiehie's (2006b, 2006a) version—details that relate the tragic death of the fallen to geological formations found in Panaʻewa. Emerson reports that Panaʻewa did not want Hiʻiaka to pass through, so he brought upon thick blinding fog, freezing cold rains, and winds strong enough to bend down the trees and smite Hiʻiaka. Emerson continues:

> The warriors of Pana-ewa, who—in imitation of their chief—had for the most part taken the guise of trees and other natural objects, found themselves from the first fettered and embarrassed by a tangle of parasitic vines, so that their thrusts against Hiiaka were of little avail. Now comes the onset of the Pele gods in the tempest-forms of hurricane, lightning, hail, and watery cloud-bursts that opened heaven's flood-gates. Against these elemental forces the dryad-forms of Pana-ewa's host could not stand for a moment. Their tree-shapes were riven and torn limb from limb, engulfed in a swirling tide that swept them down to the ocean and far out to sea.
>
> Two staunch fighters remained, Kiha, who had chosen to retain the honest dragon-form; and Puaʻa-loa, a creature, like Kama-puaʻa, in the demi-shape of a boar, whom Pana-ewa, at the scent of

> disaster, had thrust into the confinement of a secret cave. This manner of retreat saved the twain from the immediate disaster by flood but not from the vengeance of Pele's army. Detected in their lairs, they were slain and their petrified bodies are pointed out to this day in verification of this story.
>
> The fate of Pana-ewa himself was most tragical. He no sooner had taken the form of a kukui tree than he found himself over laid and entangled with meshes of parasitic growth; he could neither fight nor fly. The spot on which he stood sank and became a swamp, a lake, a sink; the foundations on which its bottom rested were broken up and fell away. Pana-ewa, swallowed up in the gulf, was swept out to sea and perished in the waves- Kane-lu-honua had broken up the underlying strata and made of the place a bottomless sink.
>
> (A reef is pointed out in the ocean opposite Papaʻi which is the remains of the body of the moʻo Pana-ewa.) (Emerson 1997:45)
>
> The victory for Hiiaka was complete. Hawaii for once, and for all time, was rid of that pestilential, man-eating, moʻo band headed by Pana-ewa who, from the time of Pele's coming, had remained entrenched in the beautiful forest-land that still bears the name—Pana-ewa. (ibid.:46)

While account described above describes Panaʻewa as a male *moʻo*, the following account relates Panaʻewa to be a female guardian and chiefess of the forest. This account is described in more detail below as related in the account of Ka-Miki.

Panaʻewa Described in the Legend of Halemano

The forested lands of Panaʻewa is further described in Fornander's (1918–1919) *Legend of Halemano* as the place where he and his wife, Kamalālāwalu set up their home before she was taken by Huaʻā, a chief from Puna. Those portions of the story describing their time in Panaʻewa reads thusly:

> They went from Kohala to Waimea where they spend the night; from this place they continued to Hamakua and spent the night at Kaumoali; from this place they proceeded on to Uluomalama in Waiakea, Hilo Hanakahi where they staid [*sic*]. After living in this place for twenty days, Huaa the king of Puna, heard that Kamalalawalu was in Hilo, so he sent a messenger to Kamalalawalu and she was taken to the king of Puna. When she was being taken by the messenger of Huaa, she instructed her brother Kumukahi to take good care of Halemano.

After Kamalālāwalu was enticed away from her husband and taken captive by Huaʻā, Halemano yearns for her. His sorrow and despair consumes his being and he dies, only to be brought back to life again by his supernatural sister, Laenihi. Deparate to bring his wife back, Kamalālāwalu and Halemano find themselves engaged in the game of *kilu*. Halemano in an attempt to woo her by envoking memories of their time together at Uluomalama utters the following chant, which describes their home being in Panaʻewa:

Noho i Hilo i o maua hale—e,	We once lived in Hilo, in our own home,
He hale noho i Panaewa e;	Our home that was in Panaewa.
Maewaewa i ka hale kuleana ole,	For we had suffered in the home that was not ours,
Hookahi no kuleana o kuu kino e.	For I had but one friend, myself.
He kini, he lehu, kahawai o Hilo e,	The streams of Hilo are innumerable,
Pali kui ka hale a ke aloha i alo ai.	The high cliffs was the home where we lived.
Auwe kuu wahine o na lehua o Mokupane!	Alas, my love of the lehua blossoms of Mokupane!
O ia lehua pauku me ka hala e,	The lehua blossoms were braided with the hala blossoms,
Hala ka ukana a ke aloha o ka leo.	For our love for one another was all we had.
Hele kunihi ka ua ma Leleiwi,	The rain only fell at Leleiwi,
Kokolo hele i na hala o Pomaikai,	As it came creeping over the hala trees at Pomaikai,
Akahi la a ke aloha i pepehi ai.	At the place where I was punished through love.
Auwe! Kuu wahine—a!	Alas, O my love!
Kuu wahine mai ke kawa lele o Piikea;	My love from the leaping cliffs of Piikea;
Mai ka wai lumalumai kanaka o Wailuku,	From the waters of Wailuku where the people are carried under,
A kaua i alo aku ai i na pali kinikini o Hilo,	Which we had to go through to get to the many cliffs of Hilo,
O ia mau pali anoano kanaka ole,	Those solemn cliffs that are bare of people,
	Peopled by you and I alone, my love,

Hoolaukanaka i ka wahine—e! You, my own love!
Kuu wahine hoi e!

Ka'ao Ho'oniua Pu'uwai no Ka-Miki (Heart Stirring Story of Ka-Miki)

References to Pana'ewa and other places in Waiākea and Hilo are also mentioned in the legendary account titled "*Ka'ao Ho'oniua Pu'uwai no Ka-Miki"* ("The Heart Stirring Story of Ka-Miki") published in Hilo's Hawaiian language newspaper *Ka Hōkū O Hawai'i* between January 8, 1914 through December 6, 1917 and translated by Maly (1996a). Ka-Miki and his companions, Maka-'iole and Keahialaka, continue their journey circumnavigating Hawai'i Island on foot along the *ala loa* (trails) and relates the gurdian and cheifess of Pana'ewa forest, the competitive nature of the Hilo chiefs, as well as associates legendary characters with specific places. That portion of the story describing their journey through Pana'ewa and into Waiākea area reads:

> ...Ka-Miki, Maka-'iole and their companion Keahialaka departed from the compound of Kapu'euhi (in 'Ōla'a) and descended the *ala loa* towards Hilo to continue their journey. The travelers arrived at a large compound and community, where they saw a man coming towards them with a club. This man was Kūkulu-a-hāne'e-a-hina-pū [Kūkulu]. Kūkulu was a guardian of the chiefess and lands called Pana'ewa-nui-moku-lehua [Great Pana'ewa of the *lehua* forest]. Pana'ewa was a sacred chiefess of Hilo and sister of the chiefs Waiākea-nui-kumu-honua and Pi'ihonua-a-ka-lani.
>
> The chiefess' compound and surrounding community were forbidden to strangers, and Kūkulu regularly killed unaware travelers [thus the name "Unjust place"]. Kūkulu challenged Ka-Miki *mā* but he was quickly defeated, and Ka-Miki left him there as an example to other *'ōlohe* and to receive his due justice. Ka-miki *mā* then continued their journey into Hilo, seeking out 'Ūpēloa, Ku'u-aho-hilo-loa, and Haili-kula-manu.
>
> The lands of Waiākea were named for the high chief Waiākea-nui-kumuhonua, the brother of Pi'ihonua-a-ka-lani [k] and Pana'ewa-nui-moku-lehua [w]. After departing from Pana'ewa, Ka-Miki *mā* met Haili-kula-manu, who was a guardian of Waiākea. Haili led Ka-Miki and his companions to his chief's compound at Kalepolepo. Arrangements were made for Ka-Miki to compete with the *'ōlohe* – experts of Waiākea, with the events to be held at the *kahua* [contest site] at Kalepolepo. 'Ūpēloa the champion, land administrator and war councilor of Waiākea, and an expert fighter with *'ōka'a lā'au* [war clubs] was called to Kalepolepo.
>
> The *kūkini* Ku'u-aho-hilo-loa went throughout the region announcing that contests would be held at Kalepolepo, and in a short time the entire area was filled with people, all wondering who would attempt competing against 'Ūpēloa. Ka-Miki *mā* were then called to the arena, thus Ka-Miki, looking the the very image of the war club of Ka-uluhe-nui-hihi-kolo-i-uka, entered the *kahua* and the contest rules were set. It was agreed that the method of competition would be *'ōka'a lā'au* [war club fighting], and that the loser would be killed and baked in an *imu*.
>
> 'Ūpēloa exited the *hālau mokomoko* [contestants long house] with great agility and speed, and the crowd cried out with excitement at his ability. 'Ūpēloa also held his finely worked club, which was called *'Ohi-ka-lau-o-ke-pāhili*. The club was also called *Ka-piko-o-Wākea*. 'Ūpeloa was so strong, that no competitors had ever stood up to him. As 'Ūpēloa and Ka-Miki stood on the *kahua*, readying to fight, Pi'ikea, the spear fighting expert of the chief Nā-mau'u-a-Pā'ao asked, "O youth, where is your club that you may stand against the spear fighting warrior of the chief Waiākea-nui-kumuhonua?"
>
> Ka-Miki answered, "I have no club. My only weapon is my hands, but I have learned to use the war club from my club fighting teacher. I have used green *hau* spears, stripped like the *maile* [*Alyxia olivaeformis*], I have used clubs made of the *uhiuhi* [*Mezoneuron kauaiensis*] and the *koai'e* [*Acacia koaia*], the resonant clubs made of the resilient *kauila* [*Alphitonia ponderosa*] trees which grow at Pu'ukapele [Kaua'i]; my expertise covers all manner of war club fighting . . . and protecting myself from the top of my head to the bottoms of my feet."
>
> 'Ūpēloa then told Ka-Miki, "If you could truly escape from my club, your knowledge would be great, beyond compare. But coming here with this boasting, you are full of deceit and impertinence like no other, and you will not be spared from my club."

Pi‘ikea then went to the edge of the *kahua*, and asked ‘Ūpēloa to wait a short time before fighting so that he might go get his club for Ka-Miki to use. ‘Ūpēloa responded, “No! You are not his teacher, you are not the alternate for this errant youth, that you should give him your club. He says that his hands and fingers are adequate. Unless you wish to be his *moepu‘u* [death companion], you will stop this waste of time. Pi‘ikea if you are stubborn about it, you and this youth shall both be the pigs that quench the fires of the *imu* today.” Ka-Miki called to Pi‘ikea, “I greatly appreciate your consideration, but it has been taken as a waste of time.” With that, ‘Ūpēloa leapt to attack Ka-Miki in the manner of *Ka-piko-o-Wākea*, thinking that he would strike Ka-Miki with the blow. Ka-Miki leapt over ‘Ūpēloa and struck his hand. Because of the force of this blow, ‘Ūpēloa lost his club and it flew to Maka-‘iole who caught the club and held it.

‘Ūpēloa moved to attack Maka-‘iole, but Ka-Miki leapt in front of ‘Ūpēloa and commanded him to back off and maintain the requirements of the contest. ‘Ūpēloa did not heed the command because he was so outraged, and he reached to grab Ka-Miki, thinking to break him into little pieces. Ka-Miki then stepped behind ‘Ūpēloa and grabbed him by the thighs. He then picked ‘Ūpēloa up and threw him from the arena before Maka-‘iole and Keahialaka. Keahialaka then grabbed ‘Ūpēloa and bound him. Ka-Miki then called out to ‘Ūpēloa with a place-name saying that commemorates his name to this day:

> *Ka manu o Kaupe‘a ke ‘ope‘ope ala i ka ulu hala o ‘Ūpēloa e*—The bird of Kaupe‘a [‘Ūpeloa himself] is all bundled up like the pandanus which grows at grows at ‘Ūpēloa.

Waiākea heard that ‘Ūpēloa had been defeated and was greatly surprised that his war counselor and war club fighting expert had fallen. Waiākea then called to his messenger Kapunakō to go get Kaūmana, the foremost teacher of *lua, ha‘iha‘i, kākā lā‘au* [bone breaking fighting, and spear fighting], and all manner of fighting and bring him to the *kahua*. Upon arriving before his chief, Kaūmana asked Waiākea to send his messenger Kapunakō, to bring Kalanakāma‘a, Kaūmana’s foremost student, to join him at the *kahua* of Kalepolepo.

[The land of] Kalanakāma‘a was named for Kalana-kāma‘a-o-uli, the foremost *‘ōlohe* student of Kaūmana, and champion of Waiākea. Kalanakāma‘a was the ward of Kīpuka ‘āhina [k], Hale-aloha [w] and Hale-loulou [k], who dwelt above Hilo at Kipuka ‘āhina.

When Kapunakō arrived before Kīpuka ‘āhina, he spoke about the great rains and rivers of Hilo, a poetic reference to the many skilled *‘ōlohe* for which Hilo was famed. It was in this way that Kapunakō described the overwhelming skills of Ka-Miki and his victory over ‘Ūpēloa. Kīpuka ‘āhina then asked—*‘ōlelo no‘eau*:

> *Māmā Hilo i ka wai?*- Is Hilo lightened of [without] its water?

Kapunakō responded—*‘Ae māmā Hilo i ka wai ‘ole, ua kau i ka lani ka holo [wa‘a] ua o Hilo, na ka Mālualua e ki‘i ala i pulu ka liko o ka lehua a me ka māmane*!—Indeed one can move swiftly through *Hilo*, for the streams are without water, the water trough [i.e., the clouds] of Hilo are set in the heavens. It is the *Mālualua* which fetches moisture for the budding *lehua* and *māmane*.

Kīpuka ‘āhina then asked in amazement—*Nawai e nele o Hilo i ka wai? He lau ka pu‘u, mano ka ihona, he kini nā kahawai o Hilo, e ‘au i ka wai o Hilo a pau ke aho*!—Who could possibly make Hilo destitute of water? There are *lau* [400, poetically many] hills, *mano* [4,000, many] places to descend, and *kini* [40,000, many] streams to cross, indeed one is worn out swimming through the waters of Hilo!

It was in this way that Kīpuka ‘āhina learned that a master *‘ōlohe* had come to Hilo challenging its many *‘ōlohe*. Using his *ipu hōkiokio* [gourd nose flute], Kīpuka ‘āhina awakened Kalanakāma‘a, for this was the only way in which Kalanakāma‘a could be safely awakened, or he would kill who ever awakened him.

Kalanakāma‘a joined his teacher Kaūmana, and met with the assembly at Kalepolepo. Carrying his club *Pūpū-kani-oe-i-ka-ua-o-Hilo* [Land-snail singing in the rain of Hilo], Kalanakāma‘a entered the *kahua* with Kaūmana and a great cry arose praising the abilities of these Hilo champions. Ka-Miki and Kalanakāma‘a exchanged taunts, Ka-Miki stated that Kalanakāma‘a would become the *kāma‘a lau-‘i i hili kuanaka ‘ia* [twined ti leaf sandals] that Ka-Miki wore upon his feet. Outraged, Kalanakāma‘a leapt to attack Ka-Miki with his club *Pūpū-kani-oe-i-ka-ua-o-Hilo*, Ka-Miki leapt

out of the way, and took ʻŪpēloa's club from Maka-ʻiole. Seeing his student miss, Kaūmana called out to Kalanakāmaʻa telling him how to strike Ka-Miki – *ʻōlelo noʻeau:*

> *Kau i ka lani ka holoua o Hilo, hilo ʻia i ke aho a ka ua he ʻIo ka hauna lāʻau e kiʻi ai, aʻohe wahi pāʻole, pā ma ke poʻo a hōʻea i nā wāwae, pā no pau ka ʻoni, ʻoni no he aīwaiwa ia, he hialōloa no ka naele, alaila hoʻi hou ka hauna lāʻau a ke koa kua makani.* Placed in the heavens is the water trough of Hilo, entwined in the cordage of the rains, *ʻIo* [Hawk] is the war club strike to use, for there is no place that can't be hit. Strike at the head and reach to the feet, for once struck, there will be no movement. If there is any movement, he is indeed a skilled expert of the depths [deepest knowledge], then return and strike again in the manner of the wind swept koa tree.

Ka-Miki then attacked Kalanakāmaʻa and quickly over came him, Kaūmana then leapt to the *kahua* and was beaten as well. After Ka-Miki defeated Kaūmana, word spread throughout the region, and Piʻihonua, Waiākea's brother called his council together, wondering how they might help regain the honor of Hilo from this stranger.

Hanakāhi told Piʻihonua that it would be best not to fight. Piʻihonua then said that perhaps it had been a mistake to honor Hanakāhi with his title as champion, and marriage to ʻOhele. Hanakāhi told Piʻihonua all of the things that Nā-Mauʻu-a-Pāʻao had told Piʻikea about Ka-Miki, and said it would be unwise to compete, and thus leave all of the champions of Hilo in disgrace.

Hanakāhi himself was a master *ʻōlohe* trained by Maulua, of Hilo-Palikū. He was skilled in *kākālāʻau* [spear fencing], *pololū* [long spear fighting], *ihe laumeki* [barbed spear fighting], and all manner of knowledge. Hanakāhi told his chief, "It is my desire to go before them [Ka-Miki *mā*], not in the manner of a competitor, but in the spirit of friendship, and to learn from them the things which they have been taught by their teachers. If I succeed, I will be the foremost *ʻōlohe* of all Hilo, and I will serve as their guide as they journey from one border of Hilo to the next border of Hilo." Hanakāhi then asked his chief, "Do you agree?" Piʻihonua told Hanakāhi to go and compete first, then if he was securely bound, to surrender and ask for friendship.

Hanakāhi approached Kalepolepo, and the contest between Ka-Miki and himself was announced. *ʻŌkaʻa .lāʻau* [club-spear fighting] was selected as the method of fighting, and when Hanakāhi asked Ka-Miki, "How shall the victory be determined?" Ka-Miki said, "By the breaking of one's spear."
Ka-Miki greatly admired the nature of Hilo-Hanakāhi, and as they competed, Ka-Miki dodged each of the thrusts. To those gathered at the *kahua*, it was as if Ka-Miki was the teacher and Hilo-Hanakāhi was the student. Hilo-Hanakāhi tried each technique he had learned from his teacher, but was unable to score against Ka-Miki. Worn out, Hilo-Hanakāhi collapsed and was taken off of the *kahua*, borne in a net. Hilo-Hanakāhi acknowledged the nature and skills of Ka-Miki and surrendered to him, thus *ke ʻahi kananā* [the fierce tuna] of Hilo befriended Ka-Miki *mā* upon the *kahua*. (Maly 1996a:A-6-9)

Hilo-Hanakahi returned to the chief Piʻihonua and they spoke of the events which had taken place at Kalepolepo. Piʻihonua then sent his messenger to invite Ka-Miki *mā* to his compound in the manner of *ʻaikāne* (companions). Ka-Miki *mā* were well hosted by Piʻihonua, and Ka-Miki asked Hilo-Hanakāhi to accompany them to the border of Hilo and Kaʻula in Hāmākua. Thus Hilo-Hanakāhi traveled with Ka-Miki *mā* through out the rest of Hilo. (Maly 1996a)

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

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

in Hawai‘i went from the sandalwood trade, to a short-lived whaling industry, to the more lucrative, but environmentally destructive sugar industry.

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

> …the most beautiful we have yet seen. . . The whole is covered with luxuriant vegetation, and the greater part of it formed into plantations, where plantains, bananas, sugar-cane, taro, potatoes, and melons, grow to the greatest perfection.
>
> Groves of cocoa-nut and breadfruit trees are seen in every direction loaded with fruit, or clothed with umbrageous foliage. The houses are mostly larger and better built than those of many districts through which we had passed. We thought the people generally industrious; for in several of the less fertile parts of the district we saw small pieces of lava thrown up in heaps, and potato vines growing very well in the midst of them, though we could scarcely perceive a particle of soil.
>
> There are plenty of ducks in the ponds and streams, at a short distance from the sea, and several large ponds or lakes literally swarm with fish, principally of the mullet kind. The fish in these ponds belong to the king and chiefs, and are tabued from the common people.
>
> Along the stone walls which partly encircle these ponds, we saw a number of small huts, where the persons reside who have the care of the fish, and are obliged frequently to feed them with a small kind of mussel, which they procure in the sands round the bay.
>
> …There are 400 houses in the bay, and probably not less than 2000 inhabitants… (Ellis 1963:337–338)

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

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

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

> . . .The reef runs in a curved direction from the point at the channel, about half a mile to the east, where it joins a romantic little islet covered with cocoanut trees; from that fact, called “Cocoanut island.” A small channel runs between this and the main land, which is low, and sweeps round to the western cliffs in a beautifully curved sandy beach of about two miles, making the form of the bay that of a flattened horseshoe. The beach is covered with varied vegetation, and ornamented by clumps and single trees of lofty cocoanut, among which the habitations of the natives are seen, not in a village, but scattered everywhere among the plantations, like farm houses in a thickly inhabited

> country. The mission houses were pointed out to us, pleasantly situated near the water, about the middle of the curvature forming the head of the bay. At a very short distance from the beach, bread-fruit trees were seen in heavy groves, in every direction, intersected with the pandanus and kukui, or candle-tree, the hibiscus and the acacia, &c. The tops of these rising gradually one above another, as the country gently ascends towards the mountains in the interior, presented for twenty or thirty miles in the southeast a delightful forest scene, totally different in extent from anything I had before witnessed on the islands. (1828:287)

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

> Industry is increasing. Our ports and places of trade begin to put on the air of activity and life. Temporal improvements and comforts are fast increasing at Hilo, that is, near the station. Two stores of goods are opened here, and three sugar-mills have recently gone into operation near us. Sugar-cane is being planted to a considerable extent; business assumes more tone and energy, and many of the people are approximating towards industry and competence. Probably the amount of cloth worn by the people has increased ten or twenty fold during four years past. Labor is in better demand and wages are rising continually. (Kelly et al. 1981:49)

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

> The scene which the island presents as viewed from the anchorage in Hilo Bay, is both novel and splendid: the shores are studded with extensive groves of cocoa-nut and bread-fruit trees, interspersed with plantations of sugar-cane; through these, numerous streams are seen hurrying to the ocean; to this succeeds a belt of some miles in width, free from woods, but clothed in verdure; beyond is a wider belt of forest, whose trees, as they rise higher and higher from the sea, change their characters from the vegetation of the tropics to that of polar regions; and above all tower the snow-capped summits of the mountains. . .
>
> Hilo is a straggling village, and is rendered almost invisible by the luxuriant growth of the sugar-cane, which the natives plant around their houses. A good road has been made through it for the extent of a mile, at one end of which the mission establishment is situated. This consists of several houses, most of which are of modern style, covered with zinc and shingles. One of them however, the residence of the Rev. Mr. Coan, was very differently built, and derived importance in our eyes, from its recalling the associations of home. It was an old-fashioned, prim, red Yankee house, with white sills and casements, and double rows of small windows. No one could mistake the birthplace of the architect, and although thirty degrees nearer the equator than the climate whence its model was drawn, I could not but think it as well adapted to its new as to its original station.
>
> The whole settlement forms a pretty cluster; the paths and roadsides are planted with pine-apples; the soil is deep and fertile, and through an excess of moisture, yields a rank vegetation. . .
>
> The church is of mammoth dimensions, and will, it is said, accommodate as many as seven thousand persons. It is now rapidly falling into decay, and another is in progress of erection. Many of the native houses are surrounded with bread-fruit and cocoa-nut trees, and have a fine view of the bay.
>
> Six miles from Hilo we entered the first wood, and at 6 P.M. we passed, at eight miles distance, the chasm that divides the Hilo from the Puna district. As the darkness set in, we began to experience

> the difficulties we had anticipated from our late start: the bustle and noise became every moment more audible along the whole line as the night advanced: what added not a little to our discomfort, was the bad road we now had to encounter, rendered worse as each native passed on in the tracks of those preceding him, until at last it became in places quite miry.
>
> (1845:114–118)

The Māhele ʻĀina of 1848

By the mid-19th century, the ever-growing population of Westerners in the Hawaiian Islands forced socioeconomic and demographic changes that promoted the establishment of a Euro-American style of land ownership. By 1840 the first Hawaiian constitution had been drafted and the Hawaiian Kingdom shifted from an absolute monarchy into a constitutional monarchy. Convinced that the feudal system of land tenure previously practiced was not compatible with a constitutional government, the *Mōʻī* Kauikeaouli and his high-ranking chiefs decided to separate and define the ownership of all lands in the Kingdom (King n.d.). The change in land tenure was further endorsed by missionaries and Western businessmen in the islands who were generally hesitant to enter business deals on leasehold lands that could be revoked from them at any time. After much consideration, it was decided that three classes of people each had one-third vested rights to the lands of Hawaiʻi: the *Mōʻī* (monarch), the *aliʻi* (chiefs) and *konohiki* (land agents), and the *makaʻāinana* (common people or native tenants).

In 1845 the legislature created the Board of Commissioners to Quiet Land Titles (more commonly known as the Land Commission), first to adopt guiding principles and procedures for dividing the lands and granting land titles, and then to act as a court of record to investigate and ultimately award or reject all claims brought before them. All land claims, whether by chiefs for entire *ahupuaʻa* or by tenants for their house lots and gardens, had to be filed with the Land Commission within two years of the effective date of the Act (February 14, 1848) to be considered. This deadline was extended several times for the *aliʻi* and *konohiki*, but not for commoners (Alexander 1920; Soehren 2005).

The *Mōʻī* and some 245 *aliʻi* (Kuykendall 1938) spent nearly two years trying unsuccessfully to divide all the lands of Hawaiʻi amongst themselves before the whole matter was referred to the Privy Council on December 18, 1847 (King n.d.). Once the *Mōʻī* and his *aliʻi* accepted the principles of the Privy Council, the *Māhele ʻĀina* (Land Division) was completed in just forty days (on March 7, 1848), and the names of all of the *ahupuaʻa* and *ʻili kūpono* (nearly independent *ʻili* land division within an *ahupuaʻa*) of the Hawaiian Islands and the chiefs who claimed them, were recorded in the *Buke Mahele* (also known as the *Māhele* Book) (Buke Mahele 1848; Soehren 2005). As this process unfolded the *Mōʻī*, who received roughly one-third of the lands of Hawaiʻi, realized the importance of setting aside public lands that could be sold to raise money for the government and also purchased by his subjects to live on. Accordingly, the day after the division when the last chief was recorded in the *Buke Māhele* (*Māhele* Book), the *Mōʻī* commuted about two-thirds of the lands awarded to him to the government (King n.d.). Unlike the *Mōʻī*, the *aliʻi* and *konohiki* were required to present their claims to the Land Commission to receive their Land Commission Award (LCAw.). The chiefs who participated in the *Māhele* were also required to provide commutations of a portion of their lands to the government to receive a Royal Patent that gave them title to their remaining lands. The lands surrendered to the government by the *Mōʻī* and *aliʻi* became known as "Government Land," while the lands that were personally retained by the *Mōʻī* became known as "Crown Land," and the lands received by the *aliʻi* became known as "*Konohiki* Land" (Chinen 1958:vii, 1961:13). Most importantly, all lands (Crown, Government, and *Konohiki* lands) identified and claimed during the *Māhele* were "subject to the rights of the native tenants" therein (Garavoy 2005:524). Finally, all lands awarded during the *Māhele* were identified by name only, with the understanding that the ancient boundaries would prevail until the land could be formally surveyed as this process expedited the work of the Land Commission.

Prior to the *Māhele ʻĀina*, the entire *ahupuaʻa* of Waiākea was retained as the personal lands of Kamehameha, which he passed to his son and heir Liholiho. Waiākea was later inherited by chiefess Kaunuohua, a grand-daughter of Keawemauhili and *kahu* of Alexander Liholiho (Kameʻeleihiwa 1992), who later relinquished the *ahupuaʻa* during the *Māhele ʻĀina* to the Crown. As a result of the *Māhele*, Waiākea Ahupuaʻa was retained as Crown Lands for Kamehameha III. Although no *kuleana* awards were claimed or granted within Panaʻewa, twenty-six *kuleana* claims (LCAws.) were granted within Waiākea for houselots and cultivation plots. With the exception of the claim made for Honohononui, all remaining LCAws. were located along major inland roads or centered around the fishponds located inland of Hilo Bay (Devereux et al. 1997; Moniz 1994). The *ʻili kūpono* of Piʻopiʻo and Honohononui were claimed in their entirety by Kekuanāoʻa on behalf of his chiefly daughter, Victoria Kamāmalu. Table 3 below synthesizes all of the land claims that were granted within Waiākea Ahupuaʻa and Figure 27, shows the location of these LCAws. relative to the study area.

Table 1. Land Commission Awards within Waiākea.

LCAw. No	*Awardee*	*Acres*	*Royal Patent No.*
2327	Barenaba	12.25	7601
1279	Halai	0.60	8191
4004	Hale	4.25	2756
2663	Kahue	3.75	8063
2281	Kaiana	10.25	5713
11050-B	Kaihenui	5.19	4365
1333	Kalolo	2.25	5625
8854	Kalua	3.40	1908
1738	Kaluhikaua	2.98	1146
7713	V. Kamāmalu	‘ili kū of Pi‘opi‘o and Honohononui	4475
8803	Kamanuhaka	1.02	1927
1-F	Kapu	1.60	2769
11174	Kealiko	1.0	8216
2402	Keaniho	5.0	6790
5018/10505	Keawe	0.24	1913
4344	Kuaio	1.22	6973
9982	Leoi	0.80	1874
4738-B	Lolo	1.27	6632
1-E	Mahoe	4.46	1147
4737	Moealoha	1.03	7616
4785	Nakai	1.05	1121
2603	Napeahi	1.30	1148
4737-B	Wahine	1.01	6984
11173	Wahinealua	2.50	7135
10004	Wahinenohoihilo	1.69	2768

Figure 27. Location of Land Commission Awards within Waiākea with study area outlined in red.

Boundary Commission Testimony

In 1862, the Boundary Commission was established to set the legal boundaries of the *ahupuaʻa* that were awarded during the *Māhele*. The commissioners were authorized to certify the boundaries in 1874. The primary informants for the boundary descriptions were older native residents of the specific areas in question. Many times the boundaries of particular *ahupuaʻa* were established through the testimony regarding neighboring *ahupuaʻa*. Such was the case for Waiākea; informants, many of whom were born in the late 1700s, provided boundary data for Keaʻau in Puna, Keauhou in Kaʻu, Kukuau in South Hilo, and Humuʻula in North Hilo, all of which border Waiākea. In describing the *ahupuaʻa* boundaries, references are made to coastal landmarks, then current and former residential areas, planting areas (none extending above about 2000 feet), locations of woods where trees for canoes were acquired (above Hilo at a place called Nehuiki), and areas deep in the forest for bird catching. A point at the summit of Puʻu Kūlani marks the southwestern corner of Waiākea Ahupuaʻa. Puʻu Kūlani, as a named prominent landscape feature that is referenced in legend and chant (Maly and Maly 2004).

The Transformation of Crown Lands (post-1893)

The late 19th century was a tumultuous time for the Kingdom of Hawaiʻi as the 8th reigning monarch, Queen Liliʻuokalani faced serious pressure from American businessmen to abdicate her throne. On January 17, 1893, a small group of American businessmen and sugar moguls backed by a U.S. consul and marines illegally attacked the Hawaiian Kingdom government and the sovereign, Queen Liliʻuokalani (Beamer 2014). This group, consisting of thirteen men referred to themselves as the Committee of Safety and following the overthrow, they proclaimed to be the Provisional Government that would manage the affairs of the Hawaiian Kingdom (Beamer 2014; Van Dyke 2008). The overthrow of the Hawaiian Kingdom government had a rippling effect that cause major instability for the Hawaiian nation and severely impacted the way Crown lands were allocated, such as those in Waiākea Ahupuaʻa. Van Dyke (2008:153) states that "some also believed that abrogation of the Monarchy would open up the Government and Crown Lands for exploitation." This belief was publicized as early as 1872 by Standford B. Dole, the acting President for the Providional Government. In an article published in the *Pacific Commercial Advertiser* (1872:2) newspaper, Dole asserted that preserving Crown lands as inalienable under an 1865 Statute was a "mistaken policy." Dole believed that maintaining Crown lands as inalienable hampered the economic development of the islands and augued that these

lands should be made available to foreigners for homesteading (Van Dyke 2008). Following the overthrow in 1893, sizable portions of the previously inallenable Crown lands were divided and sold as Government land grants to both foreign and native residents alike. A large number of land grants that were awarded during this time were centered around the more populated coastal section of Waiākea near the Waiākea fishpond and Wailoa river (see Figure 23).

The 1894 *Biennial Report of the Commissioner of Crown Lands* compiled by Curtis P. Iaukea, described land use across the extent of the entire Waiākea Ahupuaʻa. From his descriptions we learn that the *mauka* portions of Waiākea were heavily utilized for sugarcane cultivation and that the vast region above the cane fields consisted of excellent coffee lands. Additionally, marine based resources were highly valuable and that the forest extended 2 miles short of the coastline. Iaukea's description is presented below in its entirety:

> Waiakea.—This head embraces all that land lying on the south side of Hilo and extending from the sea to the slop of Mauna Loa, far above the forest belt, a distance of 15 miles. The land on the coast is very rocky excepting about the bay at the mouth of the Waiakea River, a tract of about 100 acres, which is very valuable. The portions along the volcano road and above or mauka of it are somewhat rocky, but the soil is very rich and is mostly under the cultivation of cane by the Waiakea Mill Company. This section contains about 3,000 acres of good cane land. Above this and extending into the forest, which is very dense, is a vast region of excellent coffee land, equally as good as the Olaa lands. A good road connects the plantation with Hilo town. The sugar from the mill is boated down the Waiakea River about half a mile to the landing. A very good fishery belongs to the land, and several excellent fish ponds. There are no running streams on the land, but several fine springs, especially at the seacoast. The ohia forest extends to within a mile of the coast and 2 miles to the Waiakea side of the harbor. Area, about 95,000 acres (Iaukea 1894:1334)

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

The written history of the late-19th to the early-20th century largely reflects news of new settlers, religious endeavors, and commercial agricultural pursuits in the region. In the decades following the *Māhele ʻĀina*, when land became a commodity, Hawaiians were often forced off their house lots (and livelihoods) simply because they lacked the cash with which to make the purchase (of land) or pay the property tax. The creation of private property also resulted in a shift away from the traditional *mauka*-to-*makai* management of whole *ahupuaʻa* and conventional transportation methods, as certain industries moved into large swaths of land such as livestock ranching and commercial sugar pursuits in the *mauka* lands of Waiākea. As a result, Hawaiian culture was well on its way towards Western assimilation as industry in Hawaiʻi transitioned from the boom-and-bust sandalwood trade, to a short-lived whaling industry, to the more lucrative, but environmentally destructive sugar and cattle industries.

One of the primary industries that emerged in Waiākea during the mid to late-19th century was commercial sugar cultivation. The Polynesian-introduced *kō* (sugarcane; *Saccharum officinarum*) was grown on all islands, and stands as perhaps the most widely developed and extensively cultivated crop in Precontact Hawaiʻi. Cultivation of sugar for commerce has had the unfortunate effect of diluting the distinguishing characteristics of Hawaiian cane varieties due to the hybridization of traditional and introduced species. Prior to its exploitation for profit, *kō* served as a fixed element in Hawaiian horticulture that served a variety of important uses. *Kō* was traditionally planted in the lowland plains, and Neal (1965) relates that there were approximately forty named varieties cultivated by the Hawaiians. Included in these is the most common *kō kea* (white cane) which was a typically planted near old homesteads. In general, *kō* is purported to grow well in almost all locales, and was "planted at *kihapai* of sweet potato, dry taro and *wauke*, and on the banks of *loʻi* taro patches; and fields of cultivated plants were beautified by plantings of cane along their banks and borders" (Kamakau 1976:39).

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

It was not until 1835 that sugar became established commercially in the islands, replacing the waning sandalwood industry, and early sugar enterprises were attempted in South Hilo as early as the 1840s (Kuykendall and Day 1976; Oliver 1961; Wilkes 1845). During the 1860s, Kamehameha IV leased large portions of Waiākea for pastureland and sugarcane cultivation (Moniz 1994). The majority of the eastern portions of Waiākea however, remained outside the region of sugar cultivation, most likely due to the shallow soils therein. Commercial sugarcane cultivation had a profound impact on the *ahupuaʻa* as a whole, and the declining population of Waiākea began to increase as a result of the industrial and economic growth brought about by the sugar industry (Wolforth 2007). By 1857, there were three sugar mills producing sugar for export in the Hilo area. With the Kingdom-wide economic depression that occurred as a result of the U.S. whaling fleet pulling out of the Hawaiian Islands in 1859, the focus of commercial cultivation shifted from general agriculture to sugarcane (McEldowney 1979). The 1860s not only saw an increase in the appropriation of land by foreigners for commercial sugar cultivation, but additionally in 1861 S. Kipi leased the Crown Lands of Waiākea at the rate of $600 dollars a year to be used as pasture land for a term of five years (Kelly et al. 1981; Maly 1996). During this time, the study area and lands in the immediate vicinity in Panaʻewa appeared to have been spared by these enterprises, remaining as undeveloped forest lands. One of the earliest maps of Waiākea drawn by W.M. Webster in 1851 shows the boundaries of the Panaʻewa forest in addition to two thoroughfares: the "Road from Olaa to Hilo" west of the study area, and the "Road to Puna" directly to the east of the study area, both of which provided access from Puna to Hilo (see Figure 24).

Although the commercial cultivation of sugar had commenced roughly thirty years prior in South Hilo, it hadn't quite begun to dominate the district yet. Isabella Bird visited Hilo in 1873 and published her experiences in *The Hawaiian Archipelago: Six Months Among the Palm Groves, Coral Reefs, & Volcanoes of the Sandwich Islands* (Bird 1882). Her firsthand accounts of Hilo are dreamy and romanticized: perhaps the most vivid of all foreign accounts regarding the environs of Waiākea and Panaʻewa. In the following excerpt, she describes the region as thickly vegetated, but makes no mention of sugarcane or burgeoning industrialization in the vicinity of the study area. She does, however, note that "above Hilo, broad lands sweeping up cloudwards, with their sugar cane, *kalo*, melons, pine-apples, and banana groves suggest the boundless liberality of Nature" (Bird 1882:36). Bird also provide a colorful depiction of her journey from Puna to Hilo through the 4-mile-wide Panaʻewa forest, on either the old Puna Trail or the road to ʻŌlaʻa (see Figure 24; Figure 28) in the vicinity of the study area:

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

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

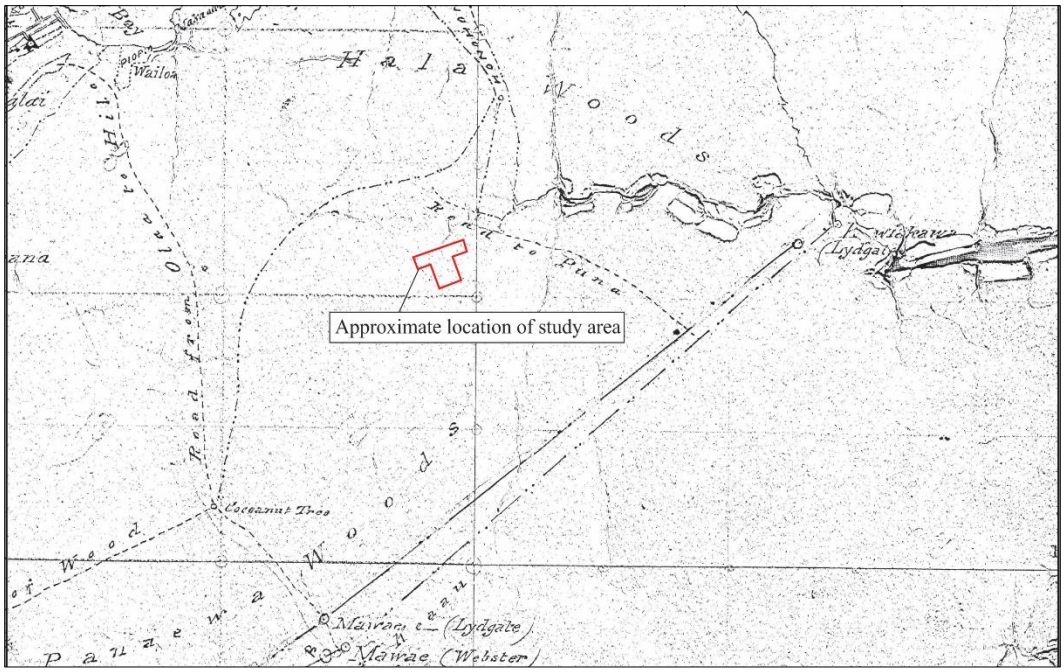


Figure 28. Portion of Hawai‘i Registered Map No. 571 by C.J. Lyons (ca. 1870s) of “Central Hawaii Hilo and Hamakua” showing the “Road to Puna” in relation to the current study area within the Pana‘ewa forest and the current study area.

In 1879 the Waiākea Mill Company incorporated and began a commercial sugar operation on about 350 acres of land in Waiākea that they acquired from Lyman northeast of the current study area. The Waiākea sugar mill, also built in 1879, was located at the inland end of Waiākea fish pond and by 1931, Hawaiian Cane Products opened a canec plant next to the mill (Rechtman and Lang 2009) (Figures 29 and 30). The company’s sugar lands extended south from the mill to the uplands of Waiākea Ahupua‘a, but did not include the study area. Rather, the lands in and around the study area remained forested and mostly utilized by individuals traversing between Puna and Hilo on the old Puna Trail. an 1883 account by D.H. Hitchcock paints the route as a “miserable muddy trail to the Panaewa woods, and through these woods on a narrow trail, for most of the time overgrown with ai and guava bushes, until the cocoanut grove was reached” (Hitchcock 1897). The thick density of vegetation in the Pana‘ewa forest was also noted in an account from the following year:

> . . . little to be seen along the route [to Hilo from Puna], except the luxury of the tropical forest, the beauty of which increases steadily as we approach the town. It is doubtful if its luxuriance can be surpassed by that of any other country in the world.
>
> . . . The approach from Hilo is the most difficult of all, because it involves the necessity of traversing the belt of forest which lies between the middle slopes of the mountain and the sea. No one can imagine the density and exuberance of tropical vegetation until he has seen it. In truth, the forest can be penetrated only by hewing a way through it or by traversing a route which has already been cut by main force. (Report of the Director of the United States Geological Survey 1883)

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

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

Figure 29. Waiākea Mill and canec plant located near the Waiākea Fishpond in 1932, study area not shown (National Archives and Records Administration).

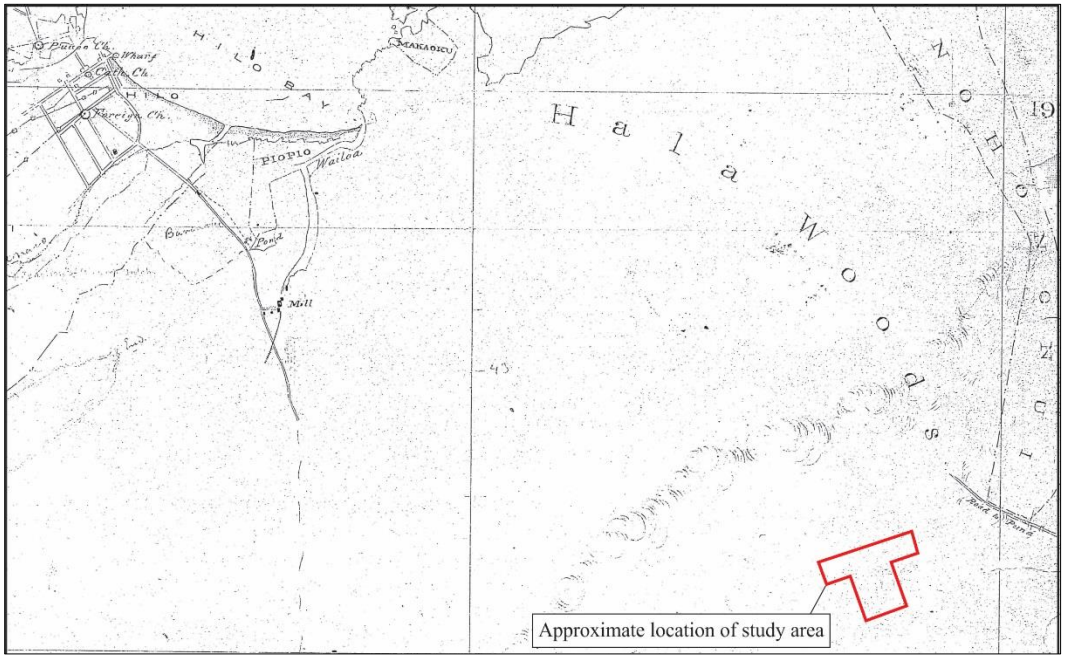


Figure 30. Portion of undated Hawai‘i Registered Map No. 842 by Lyons and Covington of showing “Lands of Hilo Hawaii” showing Hilo Bay and Waiākea Mill in relation to study area (outlined in red).

With the annexation of Hawai‘i to the United States in 1898 and the granting of Territory status in 1900, Hilo was designated the center of county government in 1905 and remained the second most populated city in the newly formed Territory of Hawai‘i. Railroad construction was one of the most important elements of governmental and private sector planning following the Treaty of Reciprocity, as crops and product were still being transported by beast and cart (Dorrance and Morgan 2000). On the Island of Hawai‘i, the first major line to be constructed was in North Kohala District, which operated as the Hawaiian Railroad Company. The North Kohala line, however, was envisioned as only the first step toward a much larger system connecting the cane fields of Kohala, Hāmākua, and Hilo with Hilo Harbor, the only protected deep-water port on the island. Beginning in 1899, railroad lines began transporting sugar to the harbor for marine transport, thus Hilo became an important shipping and railroad hub. It was in during this year that the Waiākea Mill Company established a railroad system to carry the cane from the fields to the mill for processing and the Hilo Railroad Company had begun building tracks from Waiākea through the Pana‘ewa forest to the ‘Ōla‘a Sugar Company Mill in the district Puna (Kelly et al. 1981), which would later become part of the Hawai‘i Consolidated Railway (HCR). By the early-20th century, the Waiākea Mill Company had increased the area under sugarcane cultivation in Waiākea to nearly 7,000 acres.

The commercial sugar industry provided most of the cargo transported by HRC, but suffered a sharp decline between the years of 1904-1907, which caused a halt of development in Hilo (Thurston 1913). In response, HRC worked with ‘Ōla‘a Sugar Company to send a representative to Washington D.C. in 1907 to secure funding for the construction of a breakwater that would allow Hilo Bay to accommodate larger ocean-going vessels. Construction on the breakwater began in 1908 and was still ongoing at the time of Thurstons’ writing (ca. 1914); the breakwater was finally completed in 1929. In exchange for construction of a breakwater in Hilo Bay, the Hilo Railroad was required to build a new wharf, a one-mile rail extension from Waiākea, and a 50 mile rail extension north to Honoka‘a Mill (the Hāmākua Division). The funding of the breakwater by HRC resulted in the extension of the railroad through the populated section north of Hilo all the way to Hakalau and Hāmākua (see Figure 26):

> When the breakwater project was pending before Congress, opposition was made to the appropriation on account of the limited commerce then being transacted through Hilo harbor.
>
> Assurances were thereupon made by the Hilo Railroad Company, that if the breakwater were constructed, a railroad would be built into the country north of Hilo and suitable wharf facilities provided under the lee of the breakwater. Such assurances had a material effect in securing the appropriation. (ibid.:145)

The extension to Honoka‘a would finally connect the sugar mills of Hilo, and Hāmākua with Hilo’s protected harbor. Between June 1909 and December 1911, HRC built 12.7 miles of rail extending from Hilo to Hakalau Mill, crossing many gulches and valleys along its route. Ultimately, the cost of the Hāmākua section ruined HRC and they were forced to sell out and reorganize under the name Hawaii Consolidated Railway (HCR) in 1916. Two years later in 1918, the Waiākea Mill Company’s lease of Waiākea lands expired, and the land fell under new homesteading laws that required the government to lease portions of it to individual homesteaders who would be willing to grow sugarcane. Some of the most fertile lands in Waiākea, to the southwest of the HCR right-of-way (and the study area) were later subdivided by the Territory of Hawai‘i into house lots, homesteads, and cane lots of various sizes for lease and purchase. It was during this time that the Puna Trail (Figure 31) fell into deterioration, and by 1919 it was said to be largely unutilized, particularly with the advent of automobiles, the development of more accommodating and direct thoroughfares, and increasing industrialization in surrounding areas. The following account chronicles the decaying condition of the trail during this time, details its construction methods, and significance prior to its abandonment, and reveals that in the face of burgeoning urbanization that traditional lifeways persisted nevertheless:

> There is, for instance, the old Puna trail—or what is left of it. Few have passed that way since automobiles came into general use, yet it leads through charming ways along the coast beyond the Seaside Club. It is no ordinary trail and bears evidence even in the partial decay of being constructed to withstand much traffic. The sides are carefully walled and the footway set with small stones. It is a picturesque relic and with a complementary compilation of the rich legendry which must be identified with it would make an additional showplace for visitors. The trail winds through primitive and riotous jungle, touches secluded bits of shore and discovers here and there tiny huts in which dwell native Hawaiians who appear to be quite happy in knowing little of the world and caring less.
>
> It is not likely that the lands through which this old trail winds will soon be required for commercial use, as most of it is roughly piled aa or pahoehoe full of pukas, but whatever is done with it there should be a strip reserved by the Government to include portions at least of the old Puna trail. It would be a shame to permit its entire obliteration. (Hilo Daily Tribune 1919)

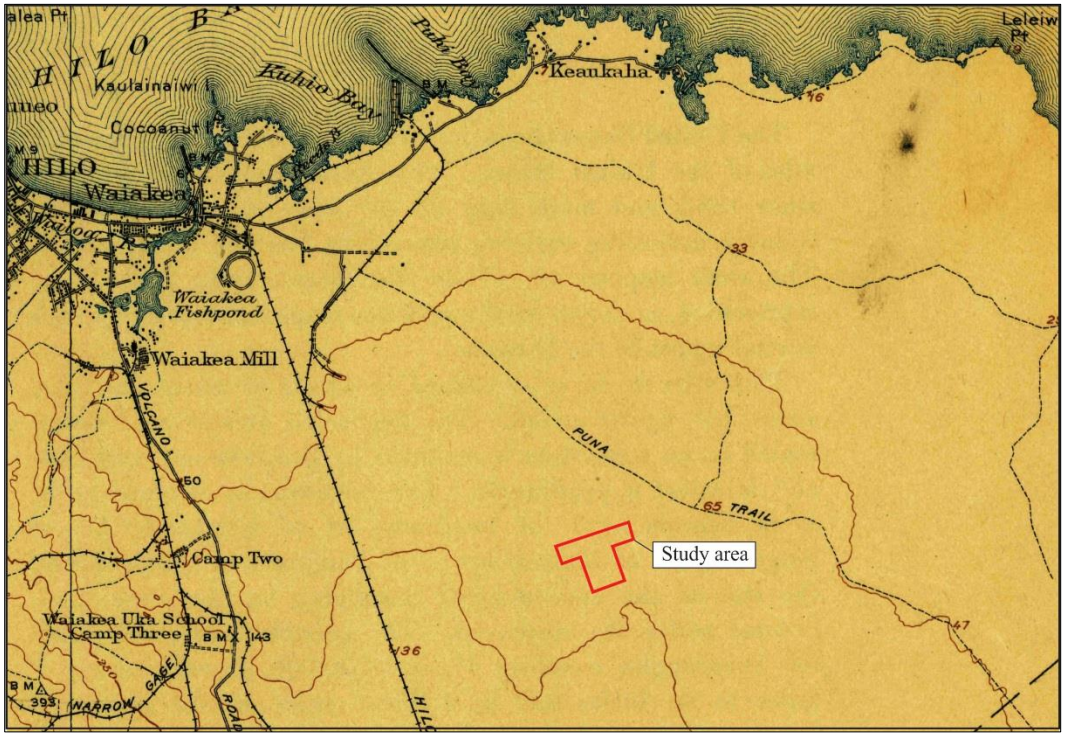


Figure 31. Portion of 1917 USGS Hilo quadrangle map showing current study area (outlined in red) in relation to the "Puna Trail" alignment, Hilo railroad, and Waiākea Mill.

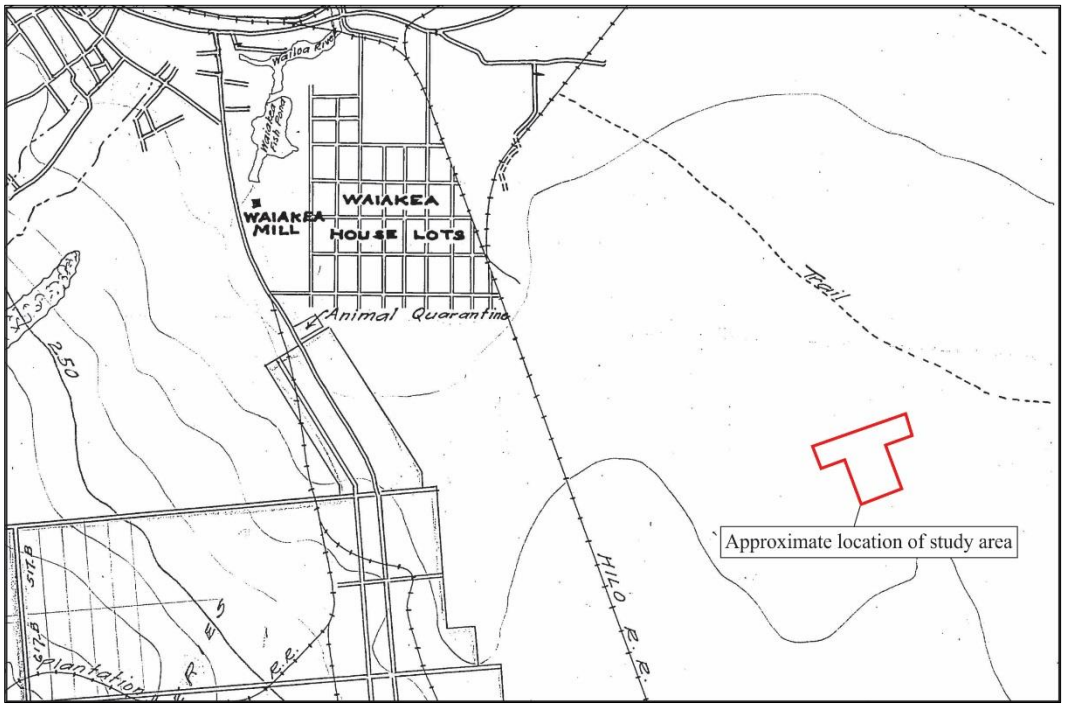


Figure 32. Portion of Hawai'i Territory Survey plat No. 787 by Jos. Iao ca. May 1920 showing study area (outlined in red) in relation to the Hilo Railroad, Puna Trail, Waiākea House Lots, and Waiākea Mill..

By 1921, the large tracts of land within and below the Panaʻewa forest were being recognized for their potential as "an agricultural and pastoral region" and it was opined that "in time to come great enterprise will be built up among the kipukas found all through the Panaewa and Puna sections of this island" (Hilo Daily Tribune 1921). Around this time, the Waiākea Homesteads were established (Figure 32). The sugar industry brought widespread changes to the Hilo area and drastically altered the traditional landscape of the district. As part of the late nineteenth century development of the sugar plantations and related infrastructure, some of Hilo's largest fishponds were filled in, and many old residences, burial sites, trails, *heiau*, formerly located in the cane fields were destroyed as a result. Throughout the 68 years of its operation, the Waiākea Mill Company was a major force in shaping the economic and social growth of Hilo, and certainly left its mark on both the cultural and physical landscapes of the area. By the mid-1940s, contractual and legal problems combined with a declining sugar market and the devastating *tsunami* of 1946 led the Waiākea Mill Company to cease operation the following year in 1947.

Creation of the Panaʻewa Hawaiian Homesteads and the Hilo Airport

In an effort to help address the indignities faced by Native Hawaiians following the overthrow of the Hawaiian monarchy in 1893, Prince Johah Kūhiō Kalanianaʻole in his capacity as a U.S. Congressman passed legislation for the Hawaiian Homes Commission Act (HHCA) in 1921, which set aside approximately 200,000-acres in the Territory of Hawaiʻi as a land trust for homesteading by Native Hawaiians with a blood quantum of 50% or more (Hasager and Kelly 2001; Hawaiian Home Lands 2016). These lands were to be administered by the Hawaiian Homes Commission. With regard to the lands chosen to be developed under the HHCA, Hasager and Kelly (2001:8) explain:

> Some of the lands were specifically designated by section 203 of the act, and the rest was to be chosen by the Hawaiian Homes Commission (HHC) from lands designated "available lands." The original selection of "available lands" were by *ahupuaʻa* or *ʻili* (traditional land divisions) name only (according to Kanaka Maoli tradition, in fact), but from each area thus selected were withdrawn lands in sugar cultivation, forest reserves, and under public uses including previous homestead agreements.

According to HHCA of 1920, in the Waiākea portion of the Hilo District, three major tracts of public lands (inclusive of Crown and Government lands) were chosen; a section in Panaʻewa and two other sections in Waiākea-Kai or Keaukaha (labeled as "Tract 1" and Track 2" in Figure 33). In 1924, some 621 acres of nearly barren land was set aside for the creation of the Kuhio Settlement located along the coastal section of Waiākea (see Figure 33). The Kuhio Settlement, later dubbed the Keaukaha Homestead, was the second homestead community after the Kalamaʻula Homestead on Molokaʻi to be established following the passage of the 1921 HHCA. These two communities (the Kalamaʻula Homestead and Kuhio Settlement) were the first of its kind to pioneer and determine the success of the HHCA. The first fifty-two native Hawaiian residents were granted leases with the Kuhio Settlement and by 1929, roughly 240 lots were distributed to homesteaders (Dayton 2004; Kapuni-Reynolds 2015). These early residents ultimately transformed this once barren land into a highly productive community thereby dispelling the negative criticism about Kūhiō's HHCA.

In April of 1925, via Executive Order 186, some 100 acres of land in Waiākea, south of the Keaukaha Homestead, was set aside for the creation of the Hilo Airport. (knonw historically as the General Lyman Field and today as the Hilo International Airport). Work for the airport commenced on July 17, 1925, with prisoners using hand tools to clear and level the ground. By 1927, coral dredged material from the Hilo Wharf was used as the top dressing for the landing strip and used to fill a section of the old Puna Trail, givng both the run way and road a bright white appearance (Figure 41). Although the airport was dedicated in 1928, over the ensuing decades, the airport continued to expand into the Keaukaha Homestead, which wiped out some 300 homestead lots and displaced many homesteaders, some of whom relocated to Panaʻewa (Dayton 2004).

By the 1940s, the first farm lots in Panaʻewa were awarded and some families from Keaukaha held farm lots where they grew various agricultural crops to generate income (Brandt personal communication, 2019). Other families that had been displaced by the airport expansion also relocated to Panaʻewa. It was not until 1976 that the Panaʻewa House and Farm lots were formally mapped (Hawaiian Home Lands 2016). Figure 35 below shows the original extent of the Panaʻewa House and Farm lots, which was divided into two main sections that totaled 1,660 acres. In 1964 the Hawaiian Homestead Commission set aside adjacent lands as industrial/commercial lots to generate revenue (ibid.). Throughout the remainder of the 19th (especially after the devastating 1960 tsunami) and 20th century the Hawaiian Homelands in Panaʻewa continued to expand to include additional residental and commercial/industrial lots. In 2016, the the Hawaiian Home Commission reports that with the Panaʻewa tract, there are some 1,615 acres set aside as Farm Lots; 114 acres used as residential lots; 396 acres zoned for industrial/agriculture; and some 1,027 acres of unencumbered lands (ibid.:23).

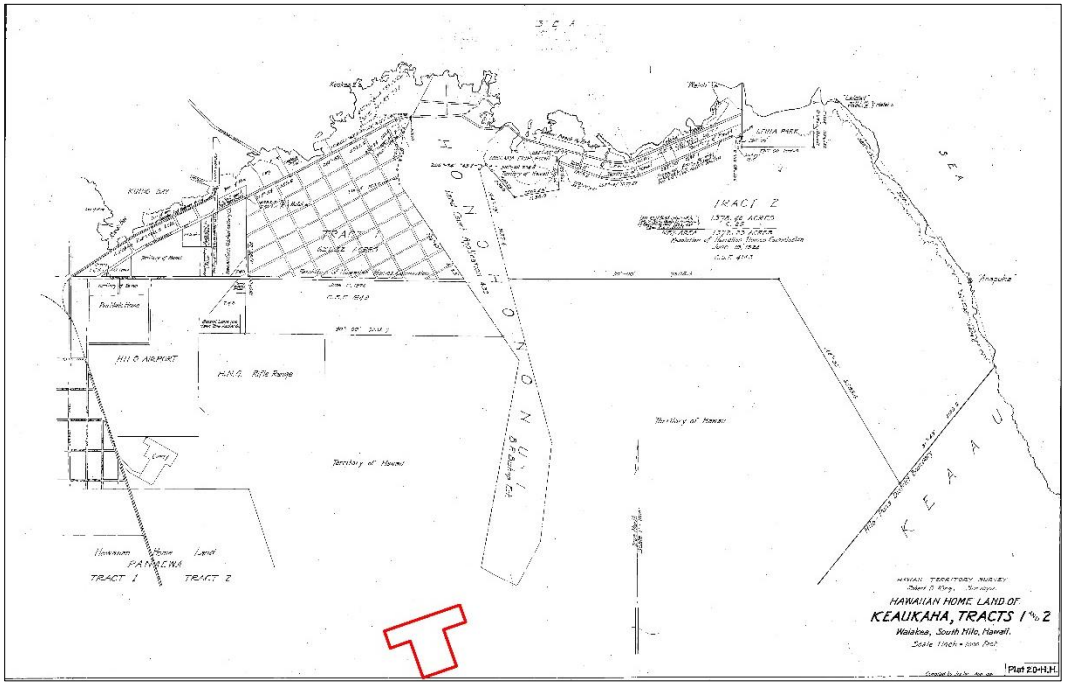


Figure 33. August 1931 map by Jos. Iao showing two tracts of Hawaiian Home Lands in Keaukaha with study area outlined in red.

Figure 34. General Lyman Field and Puna trail decked with white coral dredge material. Note the Kuhio Settlement to the right of General Lyman Field. Study area not shown in photo (Hawaii Aviation 2019)

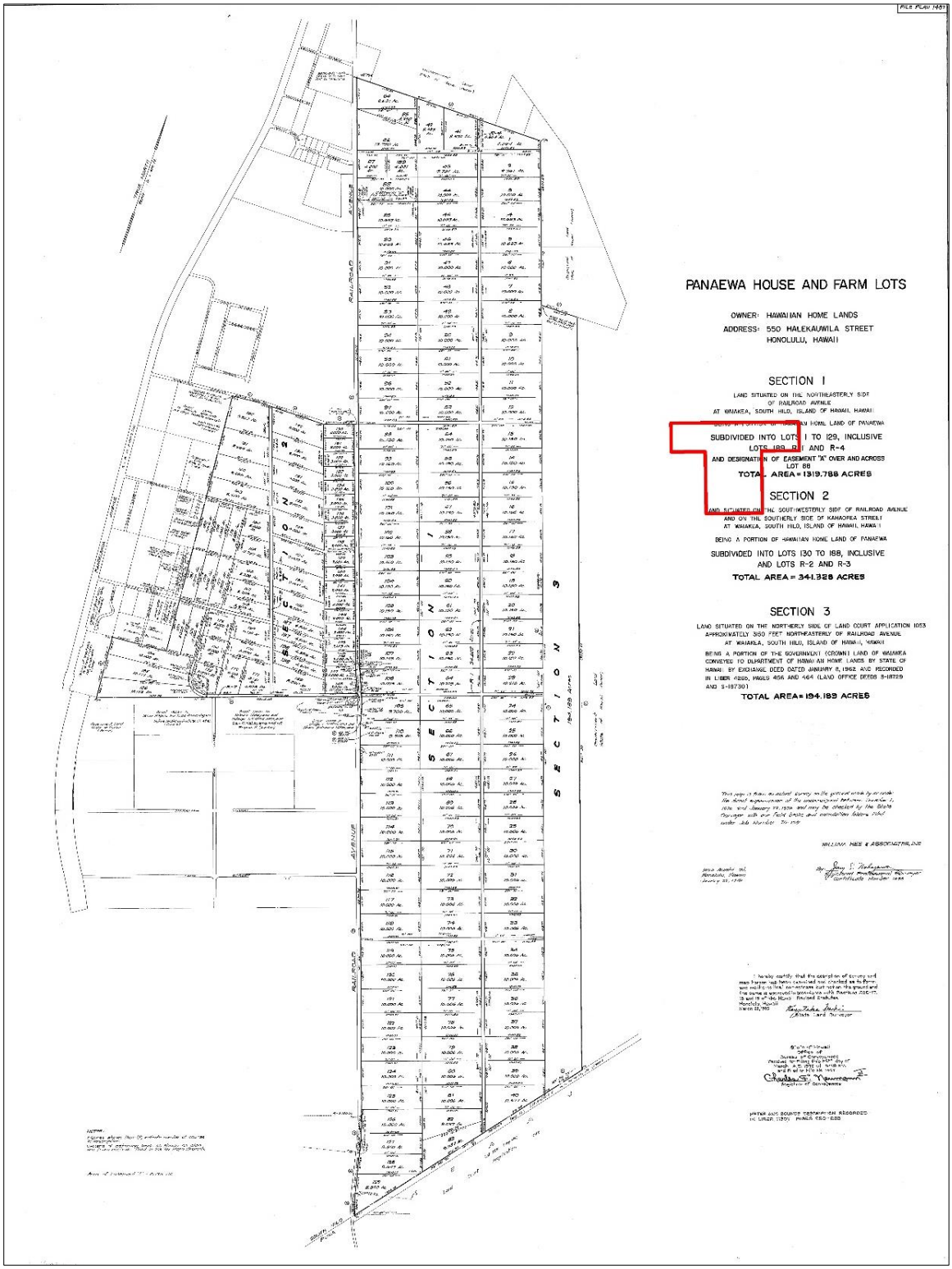


Figure 35. A 1976 map by Nakagawa of the Panaʻewa House and Farm Lots and the location of the study area outlined in red.

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

On April 1, 1946, a *tsunami* triggered by a 7.1 magnitude earthquake in the Aleutian Islands slammed into the north-facing shores of Hawai‘i Island. It claimed the lives of 159 people, destroyed more than 500 buildings, and caused millions of dollars in property damage (Muffler 2015) (Figure 36). The coastal community of Waiākea was decimated by the *tsunami* and associated flooding, which inundated an area spanning from central Hilo eastward to Keaukaha. The waves crushed numerous structures and lifted others off their foundations and swept them inland. The *tsunami* dealt a fatal blow to the already struggling HCR. Tracks around the waterfront were entirely washed out and the Hilo Station was wrecked. An entire span of the Wailuku Bridge was torn out and washed out. Despite the significant damage to Waiākea Town, many residents choose to remain, rebuilding their homes and businesses (ibid.).

Nine years later in 1955, Robert Yamada leased roughly 380 acres of Honohononui, the *‘ili kūpono mauka* of Kalaniana‘ole Avenue and south of the Hilo Airport, as pasture land. Just five years later, on May 23, 1960, a devastating series of *tsunami* waves triggered by a massive 8.3 earthquake in Chile, South America, swept through Hilo, killing sixty-one people and injuring many others. Hundreds of homes, businesses, and other infrastructure were leveled to the ground causing millions of dollars in damage. The economic loss and high number of casualties resulting from the 1946 and 1960 tsunami prompted Hawai‘i County officials to establish the Hawai‘i Redevelopment Agency as a means to economic recovery, thereby launching the Project Kaiko‘o initiative. In addition to promoting economic recovery, the Hawai‘i Redevelopment Agency sought to establish a tsunami buffer zone to prevent future economic and personal loss and between 1962 and 1963 the County of Hawai‘i exercised eminent domain to acquire numerous parcels of land in the *tsunami* affected areas of Hilo as part of Project Kaiko‘o. The goal of this project was to “designate lands…for such reuse as will minimize the danger of loss of life or damage to property in areas subject to possible inundation and flooding from future seismic waves” (Hawaii Redevelopment Agency 1965:3). Project activities included not only the acquisition of property, but relocation assistance for affected residents and business owners, property management, demolition and building removal, re-zoning of land use and preparation (clearance, grading, and filling) for new development, and disposition of acquired lands by sale or lease at a fair price for new development.

Figure 36. Aftermath from the 1946 tsunami with Waiakea Mill standing near back of Waiākea fishpond, study area vicinity in background. (Hawaii Tribune-Herld 2017)

One year later in 1961, most of Yamada's leased land was chain-dragged and the portion of TMK: (3) 2-1-013:002 that contains the current study area was designated as a 113.382-acre "Borrow Pit Site" as a result of the Hawai'i Redevelopment Agency's Project Kaiko'o. Yamada & Sons, Inc. and the County of Hawai'i also had 40-acre borrow pit sites located to the southwest of the current study area, adjacent to a roughly 192-acre strip of land that was deeded to the Department of Hawaiian Home Lands (DHHL) by the State of Hawai'i on January 8, 1962. Another 40-acre parcel of land adjacent to the northern edge of the borrow pit site eventually became the location of the South Hilo Sanitary Landfill.

By 1965, quarrying activities within the Hawai'i Redevelopment Agency borrow pit had commenced and had intruded slightly into the northern portion of the current study area (Figure 37). Additionally, extensive quarrying activities were being conducted within the original 40-acre Yamada & Sons, Inc. borrow pit site (west of the study area on TMKs: (3) 2-1-013:160, 161, and 163) at this time. Between 1965 and 1970, the leased lands were also used to stockpile sugarcane bagasse. Five years later in 1975, Yamada & Sons, Inc. reduced the number of leasehold lands to encompass only 180 acres, of which 150 acres was used for agricultural purposes with 30 acres being used as a quarry site. During that year, most of the leased lands were mechanically cleared and turned to pastureland. In a seven-year span between 1970 and 1977, much of the study area appears to have been cleared of vegetation, and a 1977 orthographic photo-quadrangle indicates that quarrying activities occurring on the original borrow pit had expanded into the southwestern corner of the study area and also across Parcel D (Figure 38). Additionally, the road that bisects the current study area is evident, as is a connector road that extends northwest to southeast across the northern portion of the area of the proposed quarry site. Although activities associated with quarrying of the current study area appear to have ceased by the early 1990s, as evidenced in a 1992 USGS aerial photograph (Figure 39), quarrying activities at the adjacent borrow pit site to the west have continued to this day. Additionally, that operation expanded its scope in 2007 to include the 14.99-acre "Parcel D" situated directly adjacent to the currently proposed quarry and borrow pit site also to the west.

Figure 37. January 16, 1965 USGS aerial photo showing quarry intruding into northern portion of study area (outlined in red).

Figure 38. Portion of a 1977 orthophotoquad showing quarry expansion and network of quarry roads within study area (outlined in red).

Figure 39. Portion of a September 23, 1992 USGS aerial photo showing active quarry site in relation to current study area (outlined in red).

PRIOR STUDIES

A number of archaeological and several cultural studies have been previously conducted within Waiākea and the general Hilo region over the years, most of which have occurred in areas located to the north and west of the current study area and concentrated primarily on the coastal environs. Collectively, site types previously documented within the coastal section of Waiākea include but are not limited to fishponds, burials, Historic-era military structures, the Puna Trail, temporary and permanent habitation sites, lava tubes, modified sinks, overhang shelters, and Historic sugarcane infrastructure. Within the Panaʻewa section of Waiākea, many more archaeological studies have been conducted, however, these studies have generally reported a lack of findings (Carson 1999; Escott 2013a, 2013b, 2015a; Hammatt and Tulchin 2007; Haun and Henry 2002; Rechtman 2003, 2006, 2009a, 2009b; Rosendahl 1988a, 2002; Wheeler et al. 2014a). There have been no prior archaeological studies conducted that have included the current study area. The most proximate studies conducted within Waiākea either within or in close proximity to Panaʻewa are presented in Table 1 and Figure 40 and those that have identified findings are discussed in detail below.

Table 2. Previous archaeological studies conducted in the vicinity of the current study area.

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

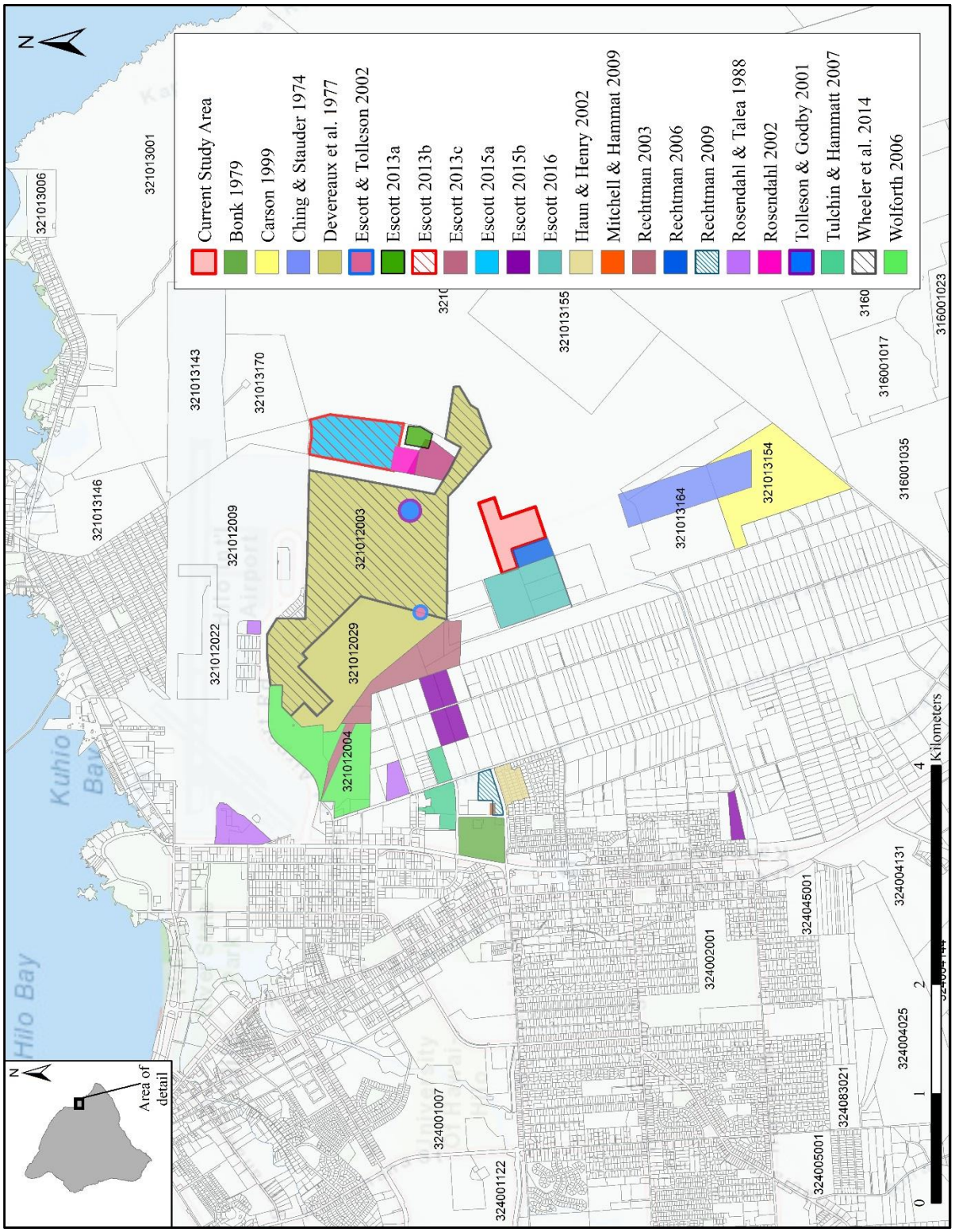


Figure 40. Previous archaeological studies conducted in the vicinity of the current study area..

Early Archaeological Investigations (1900s-1930s)

Thrum and his associates, W.T. Brigham and J.F. Stokes of the Bishop Museum, compiled information on over 130 *heiau* on Hawai‘i Island (Thrum 1908a). However, one must take into consideration that Thrum included data on *heiau* that had already been destroyed prior to his data collection efforts in the early 1900s. Regarding the *heiau* of the Hilo district, Thrum stated: “little evidence of their existence now remains, so complete has been their destruction, but though their stones are scattered, much of their history is yet preserved” (1908b:55).

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

> Of the several heiaus known to have existed in and around Hilo, that at Cocoanut Island was also a puuhonua.
>
> There is some reason to think that the island itself was the place of refuge and that the heiau was situated on the mainland opposite. Thrum (65-c, p. 40) locates it on the shore opposite the island. Elsewhere (65-d, p. 56) he says:
>
>> “Occasional reference is made to Cocoanut Island (Mokuola) as the place of refuge of the Hilo district, hence its name, Life Island.” Careful inquiry shows that the area of this puuhonua included also a portion of the mainland adjoining. The heiau connected with it, named Makaoku, was of the Luakini class. Its dimensions are unknown though it is said to have had a pyramid of stone 30 feet high as if for a place of observation. The remaining stones were taken by Captain Thos. Spencer for a boat landing about 1860. The northern part of Mokuola is known as Kaulaineiwi, being the place where the bones were placed to dry or for airing”.
>
> The present archaeological remains consist of a few single stones in the park opposite the island. Mr. Levi Lyman tells me that although they were found on the mainland they have all been moved in making the park. Quite probably they had also been moved several times previously so they are of no use in reconstructing the outlines of the site. Their only significance is in indicating that the structure was built, at least in part, of large lava blocks, rather than beach boulders. (Hudson 1932:256–257)

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

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

Subsequent Archaeological and Cultural Studies (1970-present)

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

In 1974, the Archaeological Research Center Hawai‘i (Ching and Stauder 1974) conducted a reconnaissance survey for a proposed 2.5 mile alignment of a road located to the southeast of the current study area (Figure 40). As a result of the study, Ching and Stauder (ibid) recorded four archaeological sites in the south portion of their study area including a “stacked *pāhoehoe* wall. . . platform/monument burial, animal enclosure and habitation site” (in Wheeler

et al. 2014a). It was recommended that an archaeological inventory survey (AIS) be undertaken for the proposed development area and that the projected alignment be shifted in an effort to protect archaeological resources.

Five years later in 1979, William Bonk (1979) of the University of Hawai‘i at Hilo conducted an archaeological survey of a 39-acre portion of Tract 1 of the Pana‘ewa Hawaiian Home Lands located to the northwest of the current study area (Figure 40). As a result of the survey, two modern features were documented: a segment of a stone wall and a fragment of a wire fence. Additionally, a 15 to a 20-foot-wide section of a roadway was identified, which was intermittently marked by short stone alignments. It was concluded by Bonk (1979) that no further work was the recommended treatment.

By the 1980s, stricter environmental regulations in the United States led to an increased number of archaeological and cultural studies. In 1981, at the request of the U. S. Army Corps of Engineers, the B. P. Bishop Museum Department of Anthropology prepared a chronological history of the Hilo Bay area in an effort to assist in future environmental planning (Kelly et al. 1981). Aside from a limited amount of survey work (Clark and Rechtman 2016; McEldowney 1979; Rechtman 2001) previously conducted in the upper forest area of Waiākea, most of the major previous (and more recent) archaeological studies in the *ahupua‘a* were conducted within the vicinity of Hilo town (Carson 1999; Hammatt et al. 1993; Hunt et al. 1993; Jennings 1991; Maly 1994; Maly et al. 1994; Rechtman and Henry 1998; Walker 1994). Collectively, these studies document the ravages that Historic Period land use associated with ranching and sugarcane cultivation (taking place between the 1860s-1940s) and increasing housing development associated with a growing population (from the 1950s through the present) had on the Precontact archaeological record. The acquisition of local building materials (rock and fill) and solid waste disposal are paramount among the infrastructural needs and by 1950, the vicinity of the current study area became the focal point for both of these activities.

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

There have been several archaeological studies conducted within the Keaukaha Military Reserve (KMR), situated north of the current study area beginning in 1996 when Cultural Surveys Hawai‘i (CSH) (Devereux et al. 1997) conducted a selective archaeological reconnaissance survey of a 500-acre parcel within KMR. Portions of their survey area bordered the current study area to the west, south, and east (Figure 40). As a result of their study, two archaeological sites were identified; however, one of these was subsequently reinterpreted to be a modern bulldozer push pile. The other, temporary site CSH-1, is a C-shaped enclosure located near a Jeep road that was interpreted to have served as a temporary habitation shelter. Devereux et al. (ibid.) suggested that the Jeep road may have been a remnant of the old Puna Trail (Site 18869) and that the C-shaped shelter may have been an ancillary feature of the trail. In addition to the C-shape, Devereux et al. (ibid.) also recorded ten historic buildings associated with KMR. No further work was the recommended treatment for the historic buildings. However, it was recommended that a more intensive AIS be conducted within the undisturbed forested areas along what they believed to be the old Puna Trail alignment, located to the northeast of the current study area.

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

A year later, Scientific Consultant Services (SCS) (Tolleson and Godby 2001) conducted a survey of a 100 square meter portion of the KMR, situated to the north of the current study area (Figure 40), which resulted in the identification of a newly identified site complex (Site 21771) consisting of four features (a platform, an enclosure, a possible *imu*, and a meadow) dating to the late 1800s. It was determined that Site 21771 was associated with the construction and maintenance of the Puna Trail, which Tolleson and Godby (ibid.) opined was widened from a foot

trail to a Government Road during the late 1800s to accommodate horses and wagons. Limited data recovery (excavation of two test units) was undertaken at Site 21771.

In 2002, SCS conducted an additional archaeological inventory survey (Escott and Tolleson 2002) of the KMR (Figure 40). As a result of that study, four sites previously identified by Bush and Hammatt (2000) were re-recorded (Sites 18869 and 21657, 21658, and 21659). Also in 2002, Paul H. Rosendahl Inc. (PHRI) conducted a 14.99-acre archaeological reconnaissance survey (Rosendahl 2002) located to the southeast of General Lyman Field (Hilo Airport). No historic properties or cultural resources were encountered as a result of that study.

In 2006, SCS conducted an archaeological inventory survey (Wolforth 2006) of a 147-acre industrial subdivision for the proposed development of the Mana Industrial Park project situated immediately west of the KMR and to the northwest of the current study area (Figure 40). Four WWII-era sites were identified within the study area including Site 25538, a Historic breakwater quarry and railroad line and Naval Air Station fuel station; Site 25539, a fuel station road; Site 25540, the southern end of the airport parking area; and Site 25541, a warehouse area. All of the identified sites were found to be characteristic with the known U.S. Navy and Army occupation of the area. No further work was the recommended treatment for all of the sites.

In 2009, CSH prepared a cultural impact assessment study (Mitchell and Hammatt 2009) for the Kamoleao Laulima Community Resource Center situated northwest of the current study area. Their study included a traditional and historical background of Waiākea Ahupuaʻa, as well as the history of land use. Four Native Hawaiian organizations were contacted, and two groups responded with brief comments. As a result of the study, Mitchell and Hammatt (ibid.) concluded that the proposed project will have little impact on Hawaiian traditional cultural practices within the project area, and that they recommended that the proposed project "incorporate the planting of native Hawaiian plant resources to serve future members of the Panaewa Community and its youth" (ibid.: 34).

In June of 2012, SCS conducted archaeological fieldwork (Escott 2013a) for a proposed 10.05-acre expansion of the quarry. As a result of the pedestrian survey, no archaeological sites or features were observed within their study area. In addition, very little natural landscape was present in the project area as a result of past and ongoing quarrying activity. Escott summarized his field observations thusly,

> Three quarters of the 50-acre parcel has been quarried in the past. Only the northeast corner of the project area is unaltered forest. The entire 50.0 acres were surveyed during the current study. At present, there are no cultural resources or modern structures on the study parcel. (ibid.:ii)

In July of 2013, SCS conducted archaeological fieldwork for the proposed expansion of the existing quarry (Escott 2013b). As a result of the roughly ninety-acre pedestrian survey, no archaeological sites or features were identified within the current project area. Escott summarized the terrain of the project area thusly:

> Roughly one quarter of the project area is previously quarried ground surface. The remainder of the project area has north-south bulldozer cuts through it, or has been completely bulldozed in the past. (ibid.:6)

Escott (2013b) also included the following conclusion based on his review of previous archaeological studies within the vicinity of the current project area, all of which report a low site density:

> The studies suggest that the lack of sites in this region is the result of the rugged and inhospitable landscape, having little fertile soil or arable land, being thickly forested, and subject to high rates of rainfall. (ibid.:21)

Escott (2013b) goes on to suggest that although no cultural resources were identified within the project area, undiscovered archaeological features may exist within the limited previously undisturbed areas of thick vegetation. As a result he recommended that a qualified archaeological monitor be present during initial ground clearing and grubbing operations for the proposed expansion.

In 2014, CSH conducted an AIS (Wheeler et al. 2014a) of a 405.3-acre portion of the KMR situated to the north of the current study area, roughly 600 meters north of the study area's northeastern boundary (Figure 40). While it was determined that the majority of KMR had been subject to intensive previous disturbance, the survey fieldwork primarily focused on areas which had been subject to minimal disturbance. As a result of the survey, a total of eleven archaeological sites (Sites 18869, 21657, 21658, 21771, 23273, 30008-30012, and 30038) were documented: four of which were previously identified during the inventory survey conducted by Bush and Hammatt (2000) and one (Site 21771) that was previously identified by Godby and Tolleson (2001). Specific site types identified during the Wheeler et al. (2014a) study included two segments of the Puna Trail (Site 18869 and Site 30038); a C-shaped enclosure (Site 21657); a complex comprised of five *ahu* (Site 21658); a complex of twelve features associated with potential

temporary habitation or agriculture (Site 21771); a remnant segment of a secondary Precontact/early Historic trail (Site 23273); a modified lava tube (Site 30008); a complex comprised of three temporary habitation features associated with a modified outcrop (Site 30009); a complex comprised of five features associated with temporary habitation or agriculture (Site 30010); a two-feature complex of indeterminate function (Site 30011); and a 15-meter-long segment of another secondary curbed trail (Site 30012). The trail segment designated Site 30038 was interpreted as an intact remnant of the Puna Trail alignment and was assigned a separate site number because it diverts from the modern Jeep road alignment that had been assigned the earlier Puna Trail designation (Site 18869). Collectively, all of the sites identified during the Wheeler et al. (2014a) study were interpreted either as ancillary features of the Puna Trail or associated with possible intermittent agricultural activities. It was concluded that the section of Waiākea in which KMR is situate was only marginally inhabited during the Precontact and Historic periods, with traditional settlements being concentrated mostly along the coast. As a result of extensive military-associated modification throughout the 20th century within KMR, many of the previously extant archaeological sites had been obliterated. While no further work was the recommended treatment for seven of the identified sites, including the segment of the Puna Trail, Wheeler et al. (2014a) did recommend preservation through avoidance (conservation) as the proposed treatment for three sites (Sites 21658, 21771, and 30038) and proposed future subsurface testing for Sites 21771 and 30010. Archaeological monitoring was recommended as a mitigation measure for all ground-disturbing activities, and a subsequent archaeological monitoring plan was prepared by CSH (Wheeler et al. 2014b).

In August of 2015, SCS prepared an archaeological monitoring report that consisted of descriptions of four of the aforementioned previously recorded sites (SIHP Sites 21658, 30008, 30009, and 30038) located in closest proximity to the current study area, within the adjacent KMR property. According to Escott (2015b:1), "The sites are located between 100 and 300 meters southeast of the existing Glover quarry boundary and between 300 and 600 meters southeast of the proposed quarry expansion project area boundary."

In October of 2015, SCS prepared a cultural impact assessment (Escott 2015c) for five ten-acre parcels of Department of Hawaiian Home Lands (DHHL) property located in the Panaʻewa region (TMK: (3) 2-1-025: 006, 007, 047, 048; and (3) 2-1-061: 002). Their study included a historical and cultural context of the project area as well as the history of land use from the Precontact period to modern times. A group interview was conducted with Native Hawaiian organizations including members of the Keaukaha-Panaʻewa Farmers Association, the Panaʻewa Community Association, DHHL, and state representatives. Escott states that although some interviewees knew of the history of the project area, no cultural practices were mentioned or identified during the consultation process. The study concluded that "no past or ongoing cultural practices associated with the project area lands were identified" (ibid.: 28).

In 2016, SCS conducted an archaeological assessment (Escott 2016a) and a CIA (Escott 2016b) for eighty-acres of modern quarry land (TMK: (3) 2-1-013: 142, 160, 161, and 163) located in the Panaʻewa region. As a result of the fieldwork survey no archaeological sites or historic resources were identified. Consultation was conducted as part of the archaeological assessment and three individuals responded to the public notices request for information. These individuals included Lei Leihua Kane, Carmen Maluanao, and Aunty Carmelita Dutchie Safferey. Two individuals, Carmen Maluanao and Aunty Dutchie Safferey, stated they were not aware of any historic properties or cultural practices associated with the project area. However, Lei Lehua Kane shared "that her family used to travel along the coastal trail east of the Panaʻewa forest and chant on their way to make offerings to Pele" but indicated that was "not aware of any historic properties or past/ongoing cultural practices associated with the project lands" (ibid.:6). Escott concluded that no historic properties will be affected by the proposed undertaking.

3. CONSULTATION

Gathering input from community members with genealogical ties and long-standing residency or relationships to the study area is vital to the process of assessing potential cultural impacts to resources, practices, and beliefs. It is precisely these individuals that ascribe meaning and value to traditional resources and practices. Community members often possess traditional knowledge and in-depth understanding that are unavailable elsewhere in the historical or cultural record of a place. As stated in the OEQC Guidelines for Assessing Cultural Impacts, the goal of the oral interview process is to identify potential cultural resources, practices, and beliefs associated with the affected project area. It is the present authors' further contention that the oral interviews should also be used to augment the process of assessing the significance of any identified traditional cultural properties. Thus, it is the researcher's responsibility to use the gathered information to identify and describe potential cultural impacts and propose appropriate mitigation as necessary.

INTERVIEW METHODOLOGY

In an effort to identify individuals knowledgeable about traditional cultural practices and/or uses associated with the current study area, a public notice was submitted to the Office of Hawaiian Affairs (OHA) for publication in their monthly newspaper, *Ka Wai Ola*. The notice was submitted via email on April 19th and was subsequently published in the May 2019 issue (Ka Wai Ola 2019:21)(Appendix A). As of the date of the current report, no responses have been received from the public notice.

Although no responses were received as a result of the *Ka Wai Ola* publication, nine individuals and three organization were contacted via email, mail, and/or phone regarding the preparation of the current CIA. Table 3 below is a listing of all individuals contacted. Of the nine individuals contacted, three individuals responded to our request with either brief comments, referrals, or accepted the interview request (see Table 3). Of the three individuals that responded to our interview request, Nākoʻolani Warrington provided written comments via email stating that she has lived on Auwae Road since 1983 and has heard of folks who would gather *maile lau liʻi* from the Panaʻewa forest, but with the expansion of houses and stores, this practice has ceased. With respect on ongoing cultural practices, Nākoʻolani stated that "taking care of our ʻāina and our people/family (neighbors taking care of neighbors) since we are indeed family here in Panaʻewa, just like those practices of old. Here also, we are constantly thinking and working towards making Railroad Avenue safe because the practice of being responsible for safety belongs to us." Nākoʻolani also recommended that ASM staff reach out to Maile Luʻukia, the President of the Keaukaha-Panaʻewa Farmers Association. Summaries of the two additional interviews are provided below.

Additionally, consultation letters were mailed to William Ailā from the Department of Hawaiian Home Lands; Maile Luʻuwai, President of Keaukaha-Panaʻewa Farmers Association; Patrick Kahawaiolaʻa, President of the Keaukaha Community Association; William Brown, President of the Panaʻewa Hawaiian Home Land Community Association; and a representative of the Office of Hawaiian Affairs (OHA), and to date, no response has been received.

The interviewees were asked a series of questions regarding their background, and their experience and knowledge of the proposed quarry site. Additional questions focused on any known cultural uses, traditions, or beliefs associated with the general Panaʻewa area. The interviewees were then asked about their general thoughts about the proposed quarry project and whether they were aware of any potential cultural impacts that could result from the development of the quarry site. The interviewees were then asked whether they had any recommendations to mitigate any identified cultural impacts as well as share any additional thoughts about the proposed action.

As part of the interview process and with the consent of the interviewees, some of the interviews were audio-recorded for note-taking purposes only (audio files not available). Where audio recordings were not permitted, ASM staff recorded notes throughout the interview process. Upon completion of the interview, ASM staff prepared an interview summary, which was emailed to the interviewees for review. The interviewees were given the opportunity to review the summary for accuracy and allowed to make any necessary edits. With the approval of the interviewees, the finalized version of the summaries are been presented below.

Table 3. Persons contacted for consultation.

Name	*Initial Contact Date*	*Response*	*Comments*
Kala Mossman	5/8/2019; 7/23/2019	Yes	Unable to secure interview
William Brown	5/8/2019	No	No response
Nakoʻolani Warrington	5/8/2019	Yes	Written comments. Referred ASM staff to Maile Luʻuwai.
Maile Luʻuwai	5/9/2019	No	No response
Gail Makuakane Lundin	5/9/2019	Yes	Unable to secure interview
Grant Kainalu Borges	5/10/2019	Yes	See summary below
Ray Bumatai	5/14/2019	Yes	Declined interview
Makaʻala Joshua Rawlins	7/12/2019	Yes	See summary below
Patrick Kahawaiolaʻa	7/12/2019	No	No response
Office of Hawaiian Affairs	7/12/2019	No	No response
Department of Hawaiian Home Lands	7/12/2019	No	No response
Keaukaha-Panaʻewa Farmers Association	7/24/2019	No	No response

GRANT KAINALU BORGES

On April 23rd and July 12th , 2019, ASM staff, ʻIolani Kaʻuhane conducted an interview with Grant Kainalu "Nalu" Borges, a Panaʻewa resident and a current board member of the Keaukaha-Panaʻewa Farmers Association. Nalu's family is recognized in the community as being one of the first families to move into the Panaʻewa Hawaiian Homestead community. Their home is situated along the *mauka* side of Railroad Avenue between Manuia Road and Mahiʻai Street. Nalu spent the majority of his life living in Panaʻewa where he learned to gather the natural resources from the area for subsistence and other traditional cultural practices, which are further described below.

When asked about his knowledge of the proposed study area, Mr. Borges reflected on his childhood when his family began homesteading on the plot of land that they currently reside in. He shared that when his family moved to their homestead lot in 1979, they started by clearing small sections of land where they slept in a tent and planted guava to help generate income. Nalu's memories of the area are strongly connected to when he was about seven or eight years old and recounted how he and his father, Ammon Nalei Borges, would explore the forest lands located east of their homestead lot, which during that time was undeveloped. Nalu shared that because they were homesteading and building their house, his family was highly dependent on the forest. They would catch wild boars and have "plenty of food" which they used to feed their family. Nalu also described gathering *maile (Alyxia olivaeformis*) which they sold to supplement the family income. Nalu emphasized that gathering *maile* and hunting wild pigs were their primary activities conducted by his family near the study area vicinity. When asked about specific practices associated with the gathering of *maile*, Nalu described that when his family or when other families in the community needed *maile* they would walk to the forest from their house lot and handpick the *maile.* Nalu explained that his family no longer gathers resources from the study area vicinity because of the increased development of residential lots and the expansion of the industrial area.

While the Panaʻewa forest provided the means for Nalu's family to survive, he also described how these resources (wild boars and *maile*) were used in *lūʻau* (traditional feast), which were organized for important milestone celebrations such as graduations, birthdays parties as well as church events. Nalu's father was an active member of the Mormon Church and would access the forest to hunt wild boars that were used to supply food for large church gatherings and mission-related feasts. *Maile* was also collected from the forest and were given as gifts during *lūʻau*.

Nalu also expressed that it is very important for Hawaiians living today to protect what Panaʻewa was traditionally known for, which is the massive *ʻōhiʻa* (*Metrosideros polymorpha*) trees. He described the Panaʻewa forest as having ancient *ʻōhiʻa* trees, and during the bulldozing of their homestead lot, they encountered giant trees but given the circumstances of that time, they were more focused on surviving and planting guava to generate income. With the threat of Rapid ʻŌhia Death (ROD), Nalu is very concerned for the loss of the Panaʻewa *ʻōhiʻa* and that current bulldozing practices in Panaʻewa maybe spreading ROD. Nalu comments that the *ʻōhiʻa* is a vital cultural resource to the Hawaiian people and is utilized in many ways from cooking to craft making. Nalu advocated for the protection of this resource and stated that we all utilized the tree in some form.

When asked about recommendations for the proposed quarry site, Nalu would like to see all large *ʻōhiʻa* trees, especially those that do not show signs of ROD preserved in place. Nalu stated that if the trees cannot be preserved in

place then the project managers should contact the Panaʻewa community so that the trees can be collected and repurposed.

MAKAʻALA JOSHUA RAWLINS

An in-person interview was conducted by ʻIolani Kaʻuhane on July 13, 2019, with Makaʻala Rawlins, a Panaʻewa resident and current board member of the Keaukaha-Panaʻewa Farmers Association (KPFA). Makaʻala is the grandson of Genesis Namakaokalani Lee Loy and Elizabeth Genevieve Luahiwa Hoʻopiʻi and currently lives on the Hawaiian Homestead lot that was granted to his grandparents in the early 1970s. This lot is situated west of the current study area along Auwae Road. Makaʻala explained that before Panaʻewa Homesteads was opened up for residential lots, his grandparents and family lived in Keaukaha. When the State of Hawaii was dividing up the lands for the Hilo International Airport between 1960 and 1967, Makaʻala's grandfather and his uncles as well as other people like Uncle Randy Ahuna and his wife Aunty Maka, sued the Department of Hawaiian Home Lands (Ahuna vs State) to open up lands in Panaʻewa for agricultural and homestead purposes. In 1972-73, Makaʻala's grandparents were awarded their homestead lot and began growing *Beaumont* guavas, through a partnership with the University of Hawaiʻi Hilo. Ten years later in 1983, Makaʻala and his family moved to the Panaʻewa homestead lot, when Railroad Avenue was a dirt road and the surrounding area was predominately forest and tall cane grass.

When asked about his knowledge of the proposed study area, Makaʻala responded that the Panaʻewa forest was famous for its natural resources such as *ʻōhiʻa, maile, lama* (*Diospyros sandwicensis),* and *ʻieʻie* (*Freycinetia arborea*). He expressed that the Panaʻewa forest was known for its large *ʻōhiʻa* and *maile lau loa*—a variety of *maile* known for its long and broader leaves which differs from the more commonly known, *maile lau liʻi* (small-leaved *maile*), which is common to the islands of Oʻahu and Kauaʻi. Makaʻala recounts seeing an old newspaper article referring to *kahuna*, or priest, who sought out the Panaʻewa *maile* for its *mana,* or spiritual strength, and that the forest was named after the *moʻo* deity, Panaʻewa. He remembers as a kid seeing an abundance of *ʻōhiʻa, maile,* and *lama* growing in the general vicinity of the study area and shared that his grandfather kept some of the large *ʻōhiʻa* and *lama* trees on their property. He also described an instance when his uncle was awarded a homestead lot located near his grandfather's place, in which they kept the majority of the native trees intact during the initial development of his uncle's lot. They discovered an abundance of *ʻōhiʻa, maile, and lama* and also a wild variety of *ʻawa* (*Piper methsticum)* growing which they still have on their farms today.

In the late 1980s to the early 1990s, his grandfather found a variety of *ʻawa,* called Panaʻewa *ʻawa,* near the study area by the Hilo Transfer Station, that initiated a Hawaiian association of *ʻawa* growers, which included the late Jerry Konanui, Ed Johnson, and his grandfather. The association was created to increase *ʻawa* growing and to promote its cultural uses in the early 1990s. Makaʻala explained that the presence of *ʻawa* in the forest indicated that Panaʻewa used to have *ʻawa* and that this variety has adapted to Panaʻewa's weather and climate, resulting in a new strain. When asked how his grandfather discovered the Panaʻewa *ʻawa*, Makaʻala responded that his grandfather's and uncle's house lots (Makaʻala's current residence) are situated on the northeast back portion of the Panaʻewa Hawaiian Homesteads located near an abandoned auxiliary road that extended from the Hilo Transfer Station area to their lots. His family would utilize the auxiliary road and look for native plants in the vicinity of the current study area.

Makaʻala expressed that the area of the current study area where his grandfather discovered the *ʻawa* is still an essential region of the Panaʻewa forest that he utilizes for collecting native plants and seeds. He mentioned that there are many native plants in the vicinity of the current study area including *ʻōhiʻa, maile,* and *lama,* and notes that *lama,* once common but now rare, can be found in high numbers. Makaʻala is concerned with the growing development that is occurring in the vicinity of the current study area and stated that these undisturbed areas of forest serve as seed banks for the Panaʻewa community. Instead of planting and growing native species from other districts of Hawaiʻi Island, we should be taking care of our forest areas in our communities and utilize those seeds and native plants to be incorporated back into the Panaʻewa communities.

4. IDENTIFICATION AND MITIGATION OF POTENTIAL CULTURAL IMPACTS

The OEQC guidelines identify several possible types of cultural practices and beliefs that are subject to assessment. These include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs. The guidelines also identify the types of potential cultural resources, associated with cultural practices and beliefs that are subject to assessment. Essentially these are natural features of the landscape and historic sites, including traditional cultural properties. In the Hawaiʻi Revised Statutes–Chapter 6E a definition of traditional cultural property is provided.

> "Traditional cultural property" means any historic property associated with the traditional practices and beliefs of an ethnic community or members of that community for more than fifty years. These traditions shall be founded in an ethnic community's history and contribute to maintaining the ethnic community's cultural identity. Traditional associations are those demonstrating a continuity of practice or belief until present or those documented in historical source materials, or both.

The origin of the concept of traditional cultural property is found in National Register Bulletin 38 published by the U.S. Department of Interior-National Park Service. "Traditional" as it is used, implies a time depth of at least 50 years, and a generalized mode of transmission of information from one generation to the next, either orally or by act. "Cultural" refers to the beliefs, practices, lifeways, and social institutions of a given community. The use of the term "Property" defines this category of resource as an identifiable place. Traditional cultural properties are not intangible, they must have some kind of boundary; and are subject to the same kind of evaluation as any other historic resource, with one very important exception. By definition, the significance of traditional cultural properties should be determined by the community that values them.

It is however with the definition of "Property" wherein there lies an inherent contradiction, and corresponding difficulty in the process of identification and evaluation of potential Hawaiian traditional cultural properties, because it is precisely the concept of boundaries that runs counter to the traditional Hawaiian belief system. The sacredness of a particular landscape feature is often cosmologically tied to the rest of the landscape as well as to other features on it. To limit a property to a specifically defined area may actually partition it from what makes it significant in the first place. However offensive the concept of boundaries may be, it is nonetheless the regulatory benchmark for defining and assessing traditional cultural properties. As the OEQC guidelines do not contain criteria for assessing the significance for traditional cultural properties, this study will adopt the state criteria for evaluating the significance of historic properties, of which traditional cultural properties are a subset. To be significant the potential historic property or traditional cultural property must possess integrity of location, design, setting, materials, workmanship, feeling, and association and meet one or more of the following criteria:

a Be associated with events that have made an important contribution to the broad patterns of our history;

b Be associated with the lives of persons important in our past;

c Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value;

d Have yielded, or is likely to yield, information important for research on prehistory or history;

e Have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group's history and cultural identity.

While it is the practice of the DLNR-SHPD to consider most historic properties significant under Criterion d at a minimum, it is clear that traditional cultural properties by definition would also be significant under Criterion e. A further analytical framework for addressing the preservation and protection of customary and traditional native practices specific to Hawaiian communities resulted from the *Ka Paʻakai O Ka ʻĀina* vs Land Use Commission court case. The court decision established a three-part process relative to evaluating such potential impacts: first, to identify whether any valued cultural, historical, or natural resources are present; and identify the extent to which any traditional and customary native Hawaiian rights are exercised; second, to identify the extent to which those resources and rights will be affected or impaired; and third, specify any mitigative actions to be taken to reasonably protect native Hawaiian rights if they are found to exist.

A review of the culture-historical background material, and as expressed by the consulted parties, the Panaʻewa forest is associated with multiple traditional *moʻolelo* that associate the creation of this forest to several Hawaiian *akua* (deities), *kupua* (culture heroes), and *moʻo* (guardians of fresh water sources). The Panaʻewa forest is arguably one of the most storied forests in east Hawaiʻi celebrated in traditional lore and chants for its grand stands of *ʻōhiʻa*, its *hala* forest, its unique variety of *maile*, and its *ʻawa* that were transported by birds and grew in the trees. All of the consulted parties described the traditional practice of gathering *maile* while some also spoke about the gathering of *ʻōhiʻa*. Collectively, these *moʻolelo* and the natural resources found therein are the major contributing elements that make the Panaʻewa region a culturally significant place. These *moʻolelo* enhance our understanding of traditional

perspectives and values associated with the Panaʻewa forest, which include the dangers of traversing the forest, the creation of forests by divine forces, and its role in storing the life giving element, *wai* (water).

Some of these *moʻolelo*, especially those associated with *moʻo* (i.e. the *Epic Tale of Hiʻiakaikapoliopele*) are foundational cultural beliefs associated with water resources as well as the unpredictable and unforgiving landscape of Panaʻewa. According to Makaʻala Rawlins, *moʻo* deities served as cultural indicators for freshwater and he made reference to the coastal region of the Panaʻewa forest where he has seen many surface water features. Many of the *moʻolelo* associated with the Panaʻewa forest also describe two main trail routes, one that passed through the forest while the other along the coast (old Puna Trail), which connected Waiākea to Keaʻau in the Puna District. As evidenced in the ancient accounts, caution was taken when traversing through this area. As learned from the story of Hiʻiakaikapoliopele, Hiʻiaka calls forth the fires of her siblings to slay Panaʻewa, thereby providing a safe passage for travelers. Although these fires ultimately destroy the forest, through her supernatural powers, she restores the growth. The message of ridding the forest of its dangers is also echoed in the *moʻolelo* of "*Kaʻao Hoʻoniua Puʻuwai no Ka-Miki"* ("The Heart Stirring Story of Ka-Miki"), when Ka-Miki and his companions encountered and defeated Kūkulu, guardian of the chiefess Panaʻewa-nui-moku-lehua. In all of the traditional *moʻolelo*, the name Panaʻewa is said in referenced to a high ranking *aliʻi* or *moʻo* that inhabited and guarded the forest.

While the gathering of natural resources from the Panaʻewa forest remains an important part of the cultural practices of this community, no explicit reference was made to such practices occurring in the study area. While it is not anticipated that the proposed quarry project will impact these cultural practices, based on the information obtained through the consultation efforts, continued development into the undeveloped forest, has impacted the area's natural resources by hindering access to or eliminating them completely from the landscape. As expressed by Nākoʻolani Warrington, continued development, has for many years impeded upon the traditional practices associated with the Panaʻewa forest natural resources. As shared by Nalu Borges, Panaʻewa was known for its forest with large *ʻōhiʻa* trees and *maile,* and that to maintain the natural character of the forest is integral to maintaining the cultural essence and beauty of the area. Nalu also added that Rapid ʻŌhiʻa Death has also resulted in the loss of important forest resources. While the consulted parties described the presence of *lama*, *ʻōhiʻa*, *maile*, and *ʻawa* within this general area of the Panaʻewa forest, none of these species, with the exception of *ʻōhiʻa*, was observed within the proposed quarry site.

It is the findings of the current study that the proposed development of the quarry will have no direct impact on any historic properties or traditional and customary native Hawaiian practices. While we recognize that intact sections of the Panaʻewa forest are valued cultural and natural resources, there is only one small section of such forest within the proposed quarry site. Based on our findings, it is recommended that Yamada and Sons Inc. make efforts to preserve or avoid disturbing the small and seemingly healthy portion of intact native *ʻōhiʻa* forest that is present within the southeast section of the proposed quarry site. This effort would serve to mitigate any potential impacts to the valued cultural and natural resources that may result from the development of the proposed Yamada and Sons' quarry site.

5. POST-STUDY UPDATE

Following the submission of the draft CIA, Ron Terry of Geometrician Associates, LLC shared the above described potential cultural impacts and recommendations with the staff and planners for the proposed Yamada quarry site project. Based on the recommendations in the draft CIA, Yamada & Sons Inc. (the applicant) agreed to reduce the size of the proposed quarry site to exclude a seemingly healthy section of *ʻōhiʻa* forest that is located in the southeast section of the original 51.192 acre proposed quarry site. The proposed project area in the revised Yamada quarry site plan has been reduced from 51.192 acres to 37.882 acres and now excludes the section of *ʻōhiʻa* forest as well as the Drag Strip road (Figure 41). The elimination of 13.31 acres from the original quarry site project area thereby mitigates the above described potential cultural impacts. Under the revised quarry site plan (see Figure 41), it is the findings of the current study that the revised quarry site project area will not directly impact any historic properties, traditional and customary native Hawaiian practices or any culturally valued forest resources.

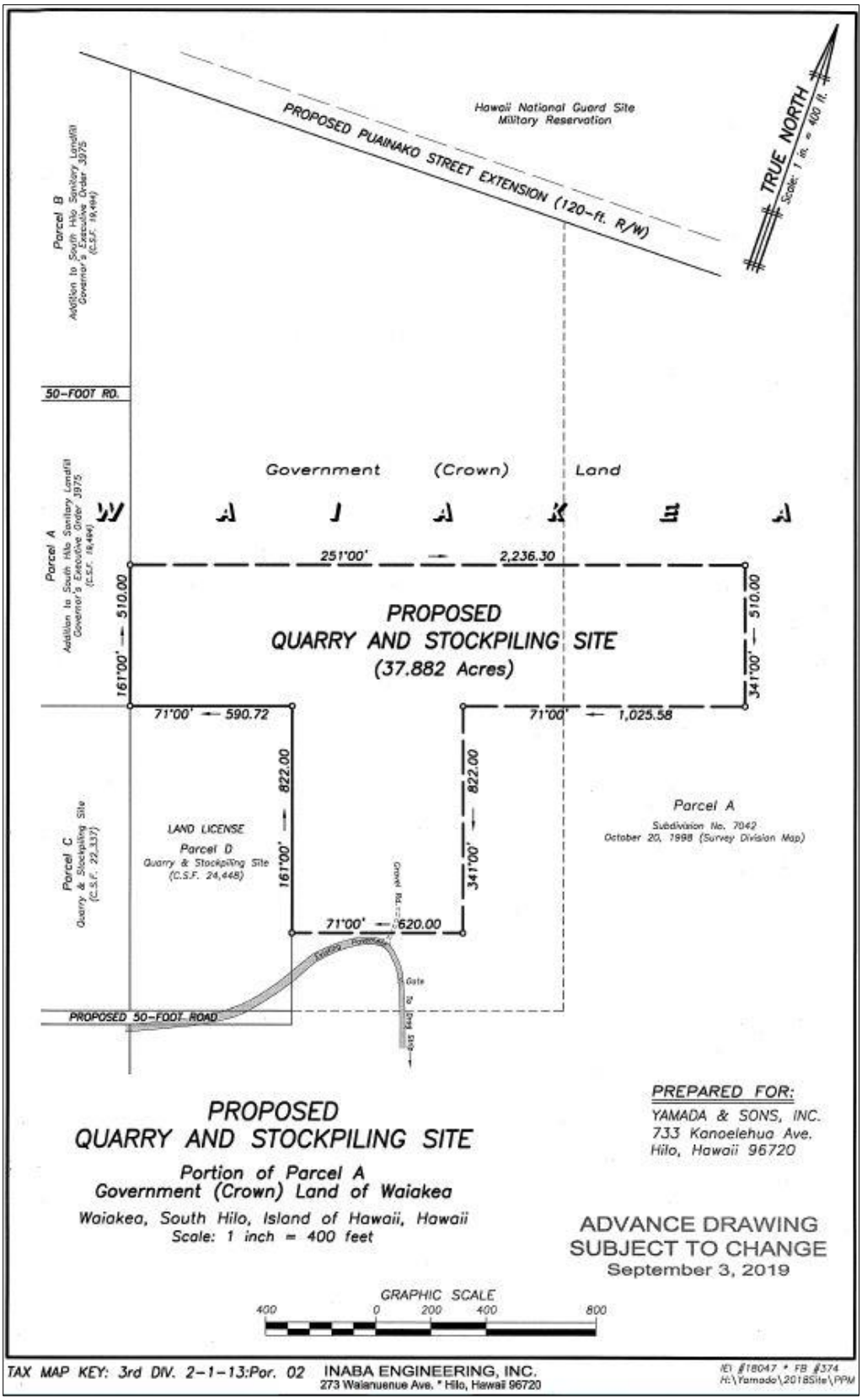


Figure 41. Revised Yamada & Son's Inc. quarry site plan which excludes *ʻōhiʻa* forest located in the southwest section of the study area.

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APPENDIX A.

KA WAI OLA, PUBLIC NOTICE

ASM Affiliates is preparing a Cultural Impact Assessment (CIA) in advance of a proposed 14.99-acre new quarry license adjacent to an existing quarry located on a portion of TMK (3) 2-1-3:002, situated in Waiākea Ahupua‘a, South Hilo District, Island of Hawai‘i. We are seeking consultation with any community members that might have knowledge of traditional cultural uses of the proposed project area; or who are involved in any ongoing cultural practices that may be occurring on or in the general vicinity of the subject property, that may be impacted by the proposed project. If you have and can share any such information please contact Lokelani Brandt lbrandt@asmaffiliates.com, or Aoloa Santos asantos@asmaffiliates.com, phone (808) 969-6066, mailing address ASM Affiliates 507A E. Lanikaula Street, Hilo, HI 96720.

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