William P. Kenoi
Mayor

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JUN 23 2015

Clayton S. Honma
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County of Hawai`i

DEPARTMENT OF PARKS AND RECREATION
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OFC. OF ENVIRONMENTAL QUALITY CONTROL

June 8, 2015

Jessica Wooley, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu HI 96813

Dear Ms. Wooley:

Subject: Draft Environmental Assessment for Kuawa Street New Sports Fields Development, TMK (3rd.) -2-032:003, 004, 008, 019, 087 and 088, Hilo, Island of Hawai'i

The County of Hawai'i, Department of Parks and Recreation, has prepared the draft environmental assessment for the subject project and anticipates a Finding of No Significant Impact (FONSI) determination. Please publish notice of availability for the EA for this project in the next available edition of the Environmental Notice. We have enclosed the following:

- One paper copy of the Draft EA;
- A CD containing the .pdf file for the EA and a WORD file with the OEQC Environmental Notice Publication Form; and
- A hardcopy of the OEQC publication form

Please contact James Komata at 961-8311 if you have any questions.

Sincerely,

Clayton Honma, Director
County of Hawai'i, Department of Parks and Recreation

Attach: As noted above

Cc: (w/o attach) Ron Terry, Ph.D, Project Environmental Consultant

AGENCY ACTIONS
SECTION 343-5(B), HRS
PUBLICATION FORM (FEBRUARY 2013 REVISION)

Project Name Kuawa Street New Sports Fields Development
Island: Hawai‘i
District: South Hilo
TMK: (3rd) 2-2-032:003, 004, 008, 019, 087 and 088
Permits:

National Pollutant Discharge Elimination System Permit (State DOH)
Grading, Grubbing and Driveway Permits (County DPW)
Building Permits and Plan Approval (County DPW and Planning)
Variance or exemption from HCC Chapter 27 – Flood Control to allow minor fill in Flood Zone
Chapter 6e, HRS, determination from State Historic Preservation Division on historic property effects
Disability and Communication Access Board (DCAB) plan review and approval
Approval from Department of Health of soil mitigation plans

Proposing/Determination Agency:

County of Hawai‘i
Department of Parks and Recreation
101 Pauahi Street, Suite 6
Hilo, Hawai‘i 96720
James Komata, 961-8311

Consultant:

Geometrician Associates
PO Box 396
Hilo HI 96721
Ron Terry Ph. (808) 969-7090 rterry@hawaii.rr.com

Status (check one only):

_**x**_DEA-AFNSI	Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of DEA, a completed OEQC publication form, along with an electronic word processing summary and a PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov); a 30-day comment period ensues upon publication in the periodic bulletin.
___FEA-FONSI	Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and a PDF copy (send both summary and PDF to oeqchawaii@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.
__FEA-EISPN	Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov); a 30-day consultation period ensues upon publication in the periodic bulletin.
__Act 172-12 EISPN	Submit the proposing agency notice of determination on agency letterhead, an OEQC publication form, and an electronic word processing summary (you may send the summary to oeqchawaii@doh.hawaii.gov). NO environmental assessment is required and a 30-day consultation period upon publication in the periodic bulletin.
__DEIS	The proposing agency simultaneously transmits to both the OEQC and the accepting authority, a hard copy of the DEIS, a completed OEQC publication form,

	a distribution list, along with an electronic word processing summary and PDF copy of the DEIS (you may send both the summary and PDF to oeqchawaii@doh.hawaii.gov); a 45-day comment period ensues upon publication in the periodic bulletin.
__FEIS	The proposing agency simultaneously transmits to both the OEQC and the accepting authority, a hard copy of the FEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the FEIS (you may send both the summary and PDF to oeqchawaii@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.
__ Section 11-200-23 Determination	The accepting authority simultaneously transmits its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS to both OEQC and the proposing agency. No comment period ensues upon publication in the periodic bulletin.
__Section 11-200-27 Determination	The accepting authority simultaneously transmits its notice to both the proposing agency and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is not required. No EA is required and no comment period ensues upon publication in the periodic bulletin.
__Withdrawal (explain)	

Summary The County of Hawai‘i P&R proposes to convert an open area near the Ho‘olulu Park Complex for use as recreational fields. There is a lack of fields for youth, adult and senior sports. The Proposed Action would prepare a safe, flat soil base and turf suitable for recreation, and then build a multi-use football/soccer/rugby field capable of hosting youth, adult makule level regulation games, with goals and goal posts, as well as bleachers on concrete slab, dugouts, fencing, drinking fountains and related amenities. The eastern part would have a field suitable for both youth soccer and baseball games. Driveways from Kuawa Street, fencing, parking, landscaping, and accessible routes and walkways would be provided. Future phases may include field lighting, covers for the bleachers, a concessions facility, a comfort station, a storage facility, an onsite network of walkways for bi-directional walking/jogging and full perimeter fencing. No impacts to any biological or water resources would occur, and traffic impacts were studied and found minor. Historical features spanning several eras will be honored through naming, signage, and preservation and reuse. Mitigation includes timing of clearing to avoid impacts to listed vertebrate species and best management practices during construction to avoid erosion and sedimentation. Soil testing found concentrations above background levels of arsenic and lead in some parts of the site. A mitigation plan is being developed in close coordination with the DOH to ensure safety during construction and public use.

Kuawa Street New Sports Fields Development

Draft Environmental Assessment

TMK (3rd) 2-2-032:003, 004, 008, 019, 087 and 088
South Hilo District, Hawai‘i Island, State of Hawai‘i

June 2015

Prepared for:
Hawai‘i County
Department of Parks and Recreation
101 Pauahi Street, Suite 6
Hilo, Hawai‘i 96720

DRAFT ENVIRONMENTAL ASSESSMENT

Kuawa Street New Sports Fields Development

TMK: (3rd) 2-2-032:003, 004, 008, 019, 087 and 088
South Hilo District, Island of Hawai‘i

PROPOSING/
APPROVING AGENCY:

County of Hawai‘i
Department of Parks and Recreation
101 Pauahi Street, Suite 6
Hilo, Hawai‘i 96720

CONSULTANT:

Geometrician Associates LLC
P.O. Box 396
Hilo Hawai‘i 96721

CLASS OF ACTION:

Use of State/County Land and County Funds

This document is prepared pursuant to:
The Hawai‘i Environmental Protection Act,
Chapter 343, Hawai‘i Revised Statutes (HRS), and
Title 11, Chapter 200, Hawai‘i Department of Health Administrative Rules (HAR).

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SUMMARY OF THE PROPOSED ACTION, ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

The County of Hawai‘i Department of Parks and Recreation (P&R) proposes to convert an open area *makai* of P&R’s Ho‘olulu Park Recreational Complex in Hilo for use as recreational fields. There are currently fewer sports fields than needed in the area, and teams often have a hard time finding a home field or venue. The Proposed Action would prepare a safe, flat soil base and turf suitable for recreation, and then build a multi-use football/soccer/rugby field capable of hosting youth, adult *makule* level regulation games. This field would include necessary facilities such as goals and goal posts, as well as bleachers on concrete slab, dugouts, fencing, drinking fountains and related amenities. The eastern part of the site would have a field suitable for both youth soccer and baseball games. Driveways from Kuawa Street, fencing, parking, landscaping, and accessible routes and walkways would be provided. Future phases may include field lighting, covers for the bleachers, a concessions facility, a comfort station, a storage facility, an onsite network of walkways for bi-directional walking/jogging and full perimeter fencing.

No impacts to any biological or water resources would occur. Historical features that span dates from the *kuleana* of the 19th century through the heyday of Waiākea Town will be honored through naming, signage, and preservation and reuse. Mitigation includes landscaping, timing of clearing to avoid impacts to listed vertebrate species, NPDES and grading permits with best management practices during construction to avoid erosion and sedimentation and precautionary conditions related to inadvertent finds of cultural materials. Preliminary evaluations have found concentrations above background levels of arsenic and lead in some parts of the site. In order to ensure safety during public use, this is being addressed by a mitigation plan that is currently in development in close coordination with the Department of Health. Traffic impacts are unlikely because peak use will not coincide with work and school peak traffic on adjacent major streets, and there will be no noticeable change to the traffic level of service.

PART 1: PROJECT DESCRIPTION, PURPOSE AND NEED AND ENVIRONMENTAL ASSESSMENT PROCESS

1.1 Project Description and Location

The County of Hawai‘i Department of Parks and Recreation (P&R) proposes a project to convert an open, grassed area consisting of five contiguous properties *makai* of P&R’s Ho‘olulu Park Recreational Complex in Hilo, on the Island of Hawai‘i, into recreational fields and support facilities. The site is between Kuawa Street and Kamehameha Avenue, adjacent to Manono Street (Figures 1-4). All the properties are owned by the State of Hawai‘i and are in the process of being transferred via an Executive Order to the County of Hawai‘i for recreational purposes.

The Proposed Action would remove existing vegetation, provide any necessary soil covering or removal necessary to mitigate above-background concentration of arsenic and lead levels on the site, install turf grass suitable for recreation, and construct two new multi-use sports fields. The western half of the site would have a multi-use football/soccer/rugby field capable of hosting youth, adult and *makule* level regulation games. This field would include necessary facilities such as goals and goal posts, as well as bleachers on concrete slab, fencing, drinking fountains and related amenities. The eastern part of the site would have a field suitable for youth soccer and baseball games, and would include a dugout. The site would be fenced on three sides to prevent kicked balls from entering adjoining roadways and property and to prevent unauthorized vehicle access. Historical features that span dates from the *kuleana* of the 19th century through the heyday of Waiākea Town would be honored through naming, historic interpretive signs, and preservation/ restoration/reuse of several sites or areas. Parking, landscaping, and accessible routes and walkways to connect and facilitate access would be provided. Vehicular access will be from three driveways on Kuawa Street. No vehicular access from Kamehameha Avenue or Manono Street will be allowed.

This Environmental Assessment (EA) also considers future amenities that may be provided in the initial phase, including weather-protective covering for the bleachers, field lighting, a concessions facility, a comfort station, a storage facility, an onsite network of walkways for bi-directional walking/jogging and full perimeter fencing.

1.2 Purpose and Need

Dozens of soccer, rugby, baseball and football youth and adult teams from East Hawai‘i utilize the Hilo Bayfront area for formal or informal recreational fields. The availability of free, public sports fields is vital for providing recreation for this population. There are currently fewer sports fields than needed in the area, and teams often have a hard time finding a home practice field or venue for league games or tournaments. For some sports such as rugby and football, there are very few existing fields that can be configured to accommodate their sport per regulated dimensions. Some informal fields are squeezed in spaces that are too small or too close to roadways for optimum use. The proposed fields would properly accommodate four different sports with correctly sized and shaped fields. This would benefit not only East Hawai‘i teams and their families but also visiting teams and their families from around the island and State.

Figure 1. Location Map

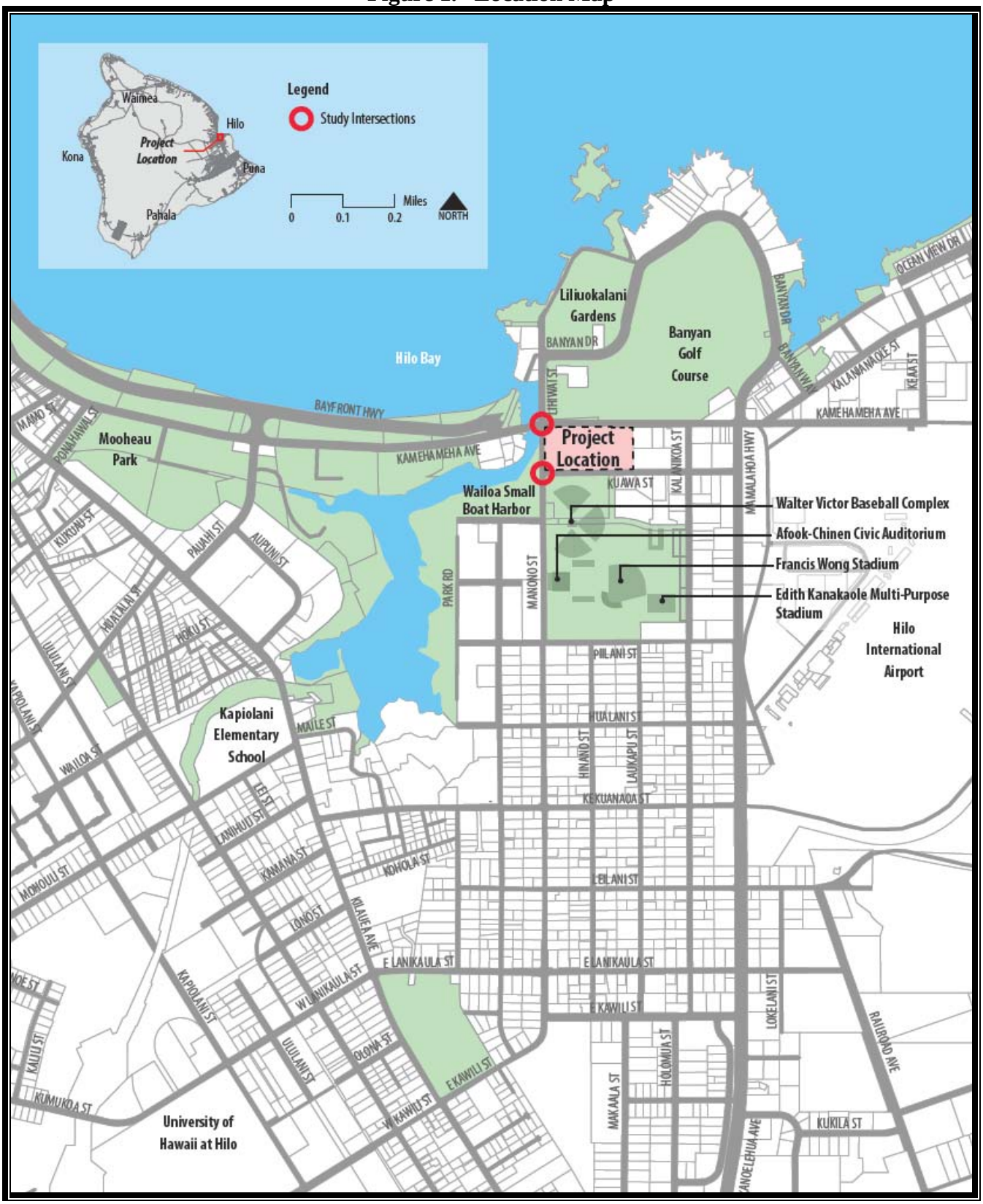
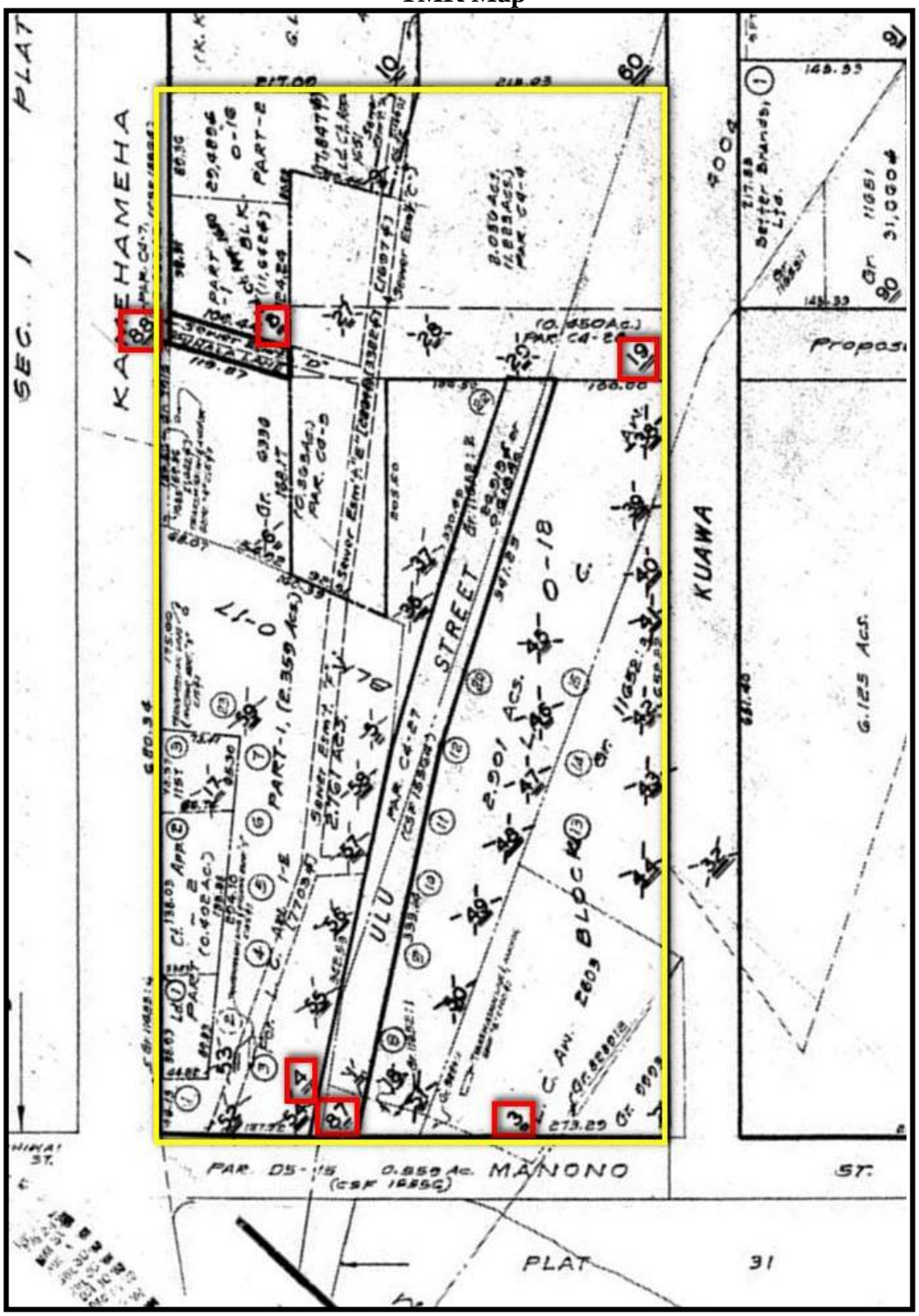


Figure 2. Aerial Image of Project Site

Figure 3
TMK Map



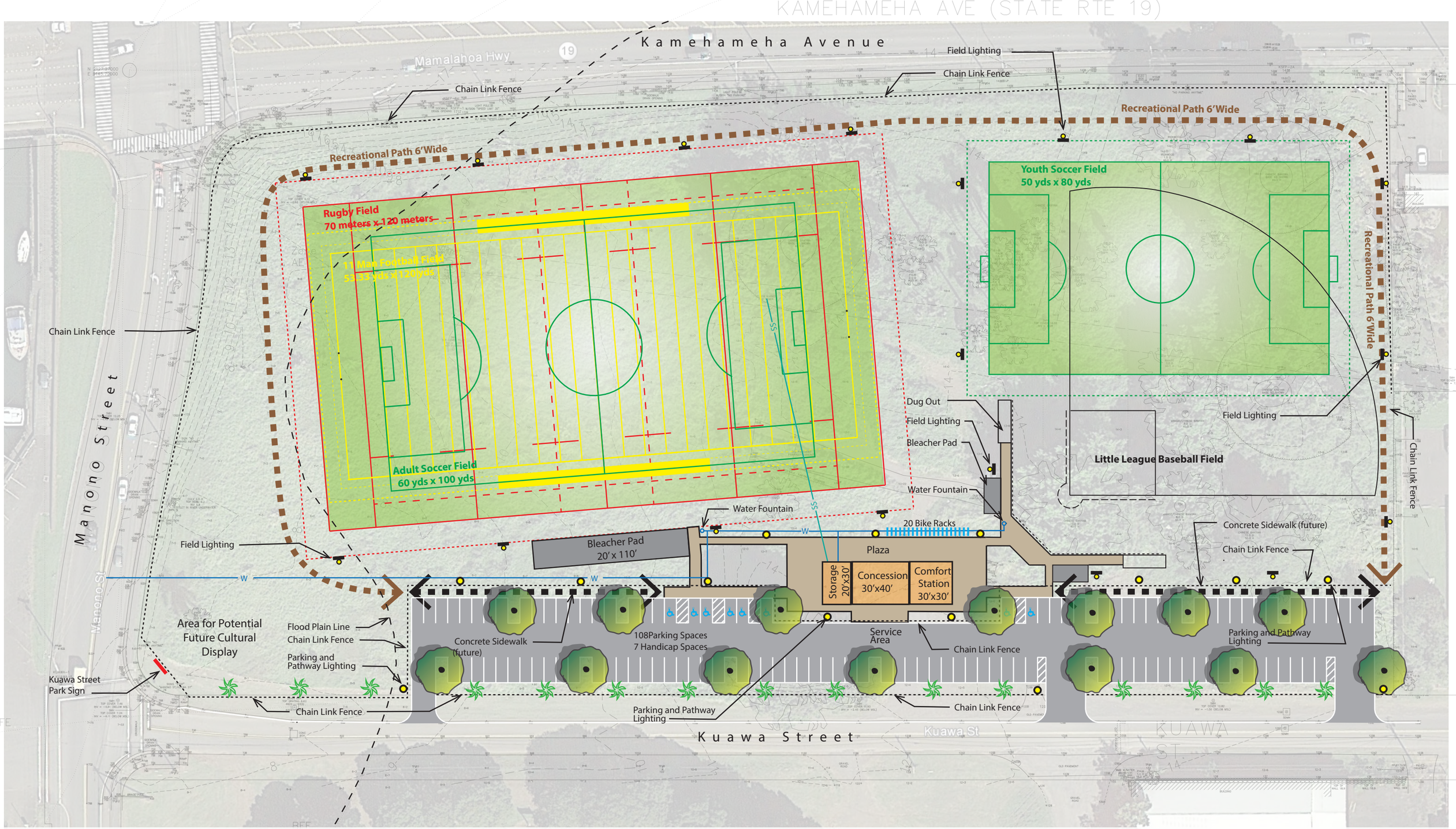
Source: Real Property Tax Maps. Notes: Yellow frame is project site; red frame denotes extant TMKs.

Figure 4. Project Site Photos

In central part of site, looking west▲ ▼ Typical banyan trees in eastern part

Figure 4. Project Site Photos

Corner of Kuawa and Manono▲ ▼ View from Kamehameha Avenue and Manono



Kuawa Street New Field Development

County of Hawaii, Department of Parks and Recreation

Hilo, Hawaii Island

SSFM International, Inc.

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Among urban planners, the extensive recreational open space of the Hilo Bayfront is noted worldwide as possibly the best example of sensible adaptation to tsunami hazard. The proposed use continues and extends this approach by firmly establishing recreational uses for an undeveloped property near the Bayfront.

1.3 Environmental Assessment Process

This Environmental Assessment (EA) is being conducted in accordance with Chapter 343 of the Hawai‘i Revised Statutes. This law, along with its implementing regulations, Title 11, Chapter 200, of the Hawai‘i Administrative Rules, 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 presents the preliminary findings for each made by the Hawai‘i County Department of Parks and Recreation, the proposing and approving agency. If, after considering comments to the Draft EA, the approving agency concludes that no significant impacts would be expected to occur, then the agency will issue a Finding of No Significant Impact (FONSI), and the action will be permitted to proceed to other appropriate approval and permit processes. If the agency concludes that significant impacts are expected to occur as a result of the Proposed Action, then an Environmental Impact Statement (EIS) will be prepared.

1.4 Public Involvement and Agency Coordination

The following agencies and organizations were consulted by letter during development of the Environmental Assessment.

State:

Department of Health, Environmental Health Administration
Department of Land and Natural Resources, Chairperson
Office of Hawaiian Affairs

County:

Civil Defense Agency
County Council
Department of Public Works
Fire Department
Planning Department
Police Department

Private:

Sierra Club
Neighboring Property Lessee

Responses received are contained in Appendix 1a.

1.5 Cost and Schedule

Shortly after the EA is complete and necessary permits are obtained, grading and site mitigation and tree removal will begin on the Proposed Action and the turf will be prepared. The cost of Phase 1 of the improvements, which includes the construction of the fields and associated infrastructure, parking, landscaping and some historic markers and preservation, is estimated at about $500,000. Costs for subsequent phases, which may build weather-protective covering for the bleachers, field lighting, a concessions facility, a comfort station, a storage facility, an onsite network of walkways for bi-directional walking/jogging, perimeter fencing, and a children's playground, have not yet been determined. These phases have not yet been scheduled.

It should be noted that the Department of Land and Natural Resources, Division of Boating and Ocean Recreation (DLNR-DOBOR) has used the site in the past for temporary storage and dewatering of dredge deposits from the Wailoa River. DLNR-DOBOR is considering using the site again as part of an upcoming project, prior to construction of the fields, and will coordinate with the P&R concerning utilizing this site or perhaps an alternate site, along with the potential for utilization of the tested and cleared deposits for project fill.

PART 2: ALTERNATIVES

2.1 No Action Alternative

Under the No Action Alternative, the County of Hawai‘i would not construct sports fields on this or any other site in the area. The benefits provided by sports fields in terms of open space and public health, recreation and enjoyment for both youth and adults would not occur, but there would be no disturbance of the existing ground surface or vegetation, and no impacts to traffic in the area. The No Action Alternative provides a basis for comparing the impacts of the proposed project.

2.2 Alternative Locations for New Sports Fields Park

As part of its mission to expand recreational opportunities, P&R periodically inventories available recreational areas and compare this against demand. As most of the central Hilo area is fully developed, there are very few vacant properties that lack encumbrances and are capable of accommodating a new sports field. Some vacant State and County lands are present near the South Hilo Sanitary Landfill. However, the amount of surveying, environmental studies, landclearing, grading, road improvements and utility improvements necessary to create an active park in this area would cost at least 10 times as much as utilizing the proposed project site. Furthermore, the proximity of the Kuawa Street project site to both the Walter Victor baseballs fields and the Hilo Bayfront soccer fields helps to centralize league activities and support expansion of tournaments. P&R is unaware of any other sites in the area that might be suitable for the sports field that are necessary for the current level of demand. Therefore, no alternative sites have been advanced in this Environmental Assessment.

2.3 Alternative Strategies Involving Existing Parks

The recreational purposes that would be met by providing new sports fields could conceivably be met by converting existing passive parks or portions of passive parks into active parks. The only passive parks in the Hilo Bayfront area with sufficient extents of somewhat suitable topography are Wailoa State Recreational Area and Queen Lili‘uokalani Gardens. Converting portions of these to active parks would require extensive grading and removal of ornamental trees and other features. More importantly, it would destroy the character of these historically important, scenic and cherished facilities in Hilo, which have been specifically developed for passive uses. P&R does not consider such an action to be worthy of consideration, and therefore it has not advanced it in this Environmental Assessment as an alternative.

PART 3: ENVIRONMENTAL SETTING, IMPACTS AND MITIGATION MEASURES

Basic Geographic Setting

The location for the Proposed Action is referred to throughout this EA as the *project site* (see Figures 1-4). The term *project area* is used to describe the general environs of this part of Hilo. The project site is surrounded by roads on three sides and by a restaurant/bar and Department of Health facility on the other side. Across adjacent streets are recreational uses: Banyan Golf Course, the Hoʻolulu Park Recreational Complex, and Wailoa Small Boat Harbor.

3.1 Physical Environment

3.1.1 Climate, Geology, Soils and Geologic Hazards

Environmental Setting

The climate in the area is mild and moist, with a high average annual rainfall of about 135 inches and a mean annual temperature of approximately 75 degrees Fahrenheit (Giambelluca et al 2013; UH Hilo-Geography 1998). The project site is located at about 10 feet in elevation above mean sea level. The underlying geology is a Mauna Loa lava flow dated between 750 and 1,500 years before the present (Wolfe and Morris 1996). Soil on the project site is classified by the U.S. Natural Resources Conservation Service (formerly Soil Conservation Service) as Keaukaha series extremely rocky muck. This organic and strongly acid soil is typically found up to 8 inches thick with roughly 30 percent rock outcroppings. Permeability is rapid, runoff is slow, and erosion hazard slight. Its capability subclass is VIIs, which means that this soil has very severe limitations that make it very unsuited for cultivation, and restricts its use to mainly pasture and woodland or wildlife. Erosion hazard is slight (U.S. Soil Conservation Service 1973). The area was also used to pile dredge deposits from the mouth of the Wailoa River in 2006 to 2007, where the sediments were dewatered and disposed of at the South Hilo Sanitary Landfill.

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

In terms of seismic risk, the entire Island of Hawaiʻi is rated Zone 4 Seismic Hazard (*Uniform Building Code, 1997 Edition*, Figure 16-2). Zone 4 areas are at risk from major earthquake damage, especially to structures that are poorly designed or built, as the 6.7-magnitude (Richter) quake of October 15, 2006, demonstrated. The project site is flat, with no surrounding steep slopes other than a minor highway embankment, and does not appear to be subject to subsidence, landslides or other forms of mass wasting.

Impacts and Mitigation Measures

Geologic conditions impose no constraints on the Proposed Action, and the utilization of the area for sports fields is not imprudent to undertake. Most of the surface of Hawai‘i Island is subject to eventual lava inundation, and any recreational facilities in in Hilo face risk. Given the need for recreation in the area, the County has determined that it is sensible to expand its facilities here. Project design will be taken the seismic setting into account, and no mitigation measures are expected to be required.

3.1.2 Drainage, Water Features and Water Quality

Existing Environment

The project site is across Manono Street and from the Wailoa Small Boat Harbor, on the Wailoa River, an estuary that connects to Hilo Bay. Hawai‘i Administrative Rules (HAR) 11 54 03(c)(2) state that class A waters such as those found in Hilo Bay are valuable for recreational purposes and aesthetic enjoyment. Any other use shall be permitted as long as it is compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation in and on these waters. The closest water bodies are approximately 100 feet to the northwest, but because of the raised rights-of-way of the adjacent streets, there is no direct surface connection to these waters.

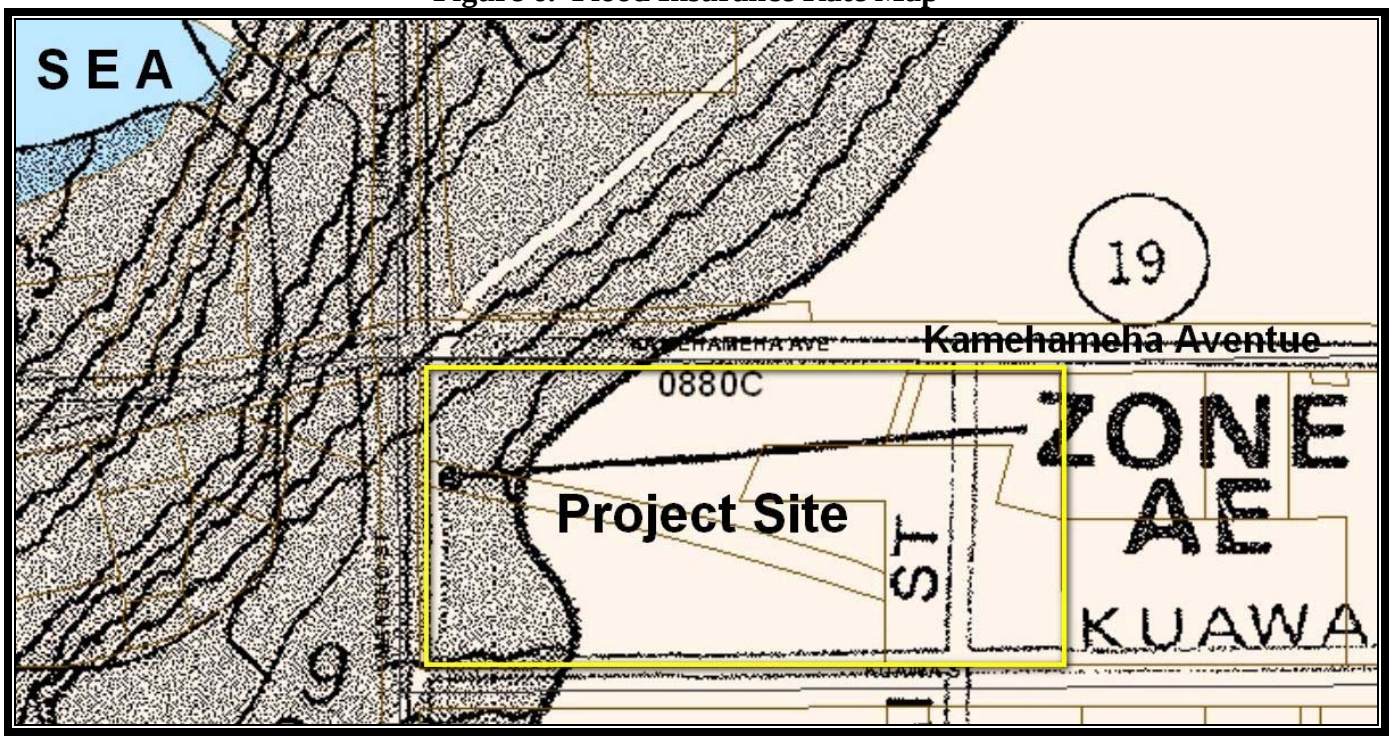
The Flood Insurance Rate Map (FIRM) 0880c (9/16/1988) shows that most of the project site is in Flood Zone X, outside of the 100-year or 500-year floodplain, although the western fifth of the property is within Zone AE (Figure 6). This zone consists of areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods, with Base Flood Elevations (BFEs) shown. The BFE on the project site is shown as 9 to 10 feet above sea level. Maps printed by the Hawai‘i County Civil Defense Agency locate the parcel in the area that should be evacuated during a tsunami warning. Hilo Bay, including the project site, has been struck by several highly destructive tsunami in historic times. The April 1, 1946 tsunami had a runup at Hilo Bay of 25 feet and killed 122 people on the Island of Hawai‘i. The May 23, 1960 tsunami had a runup of 35 feet at Hilo Bay, killing 61 people and destroying about 540 homes and businesses in Hilo alone (Hawai‘i County 2005).

Impacts and Mitigation Measures

Land clearing and construction activities, including parking, would occur in an area greater than one acre, and thus will require a National Pollutant Discharge Elimination System (NPDES) permit to ensure that erosion and sedimentation impacts to adjacent waters will be minimized. Plans submitted as part of the application for this permit and a County grading permit will specify practices to minimize the potential for sedimentation, erosion and pollution of coastal waters. The County will ensure that its contractor shall perform all earthwork and grading in conformance with:

(a) “Storm Drainage Standards,” County of Hawai‘i, October, 1970, and as revised.
(b) Applicable standards and regulations of Chapter 27, “Flood Control,” and Chapter 10, “Erosion and Sedimentation Control,” of the Hawai‘i County Code.
(c) Conditions of an NPDES permit.

Figure 6. Flood Insurance Rate Map



Source: http://gis.hawaiinfip.org/fhat/

Best Management Practices may include, but may not be limited to, the following practices:

- The total amount of land disturbance will be minimized. The construction contractor will be limited to the delineated construction work areas within the lot.
- The contractor will not allow any sediment to leave the site.
- Construction activities with the potential to produce polluted runoff will not be allowed during unusually heavy rains or storm conditions that might generate storm water runoff. Cleared areas will be replanted or otherwise stabilized as soon as possible.

The Proposed Action has been conceived and designed to minimize construction in the flood zone to the extent consistent with accomplishing key recreational goals. Small portions of the adult multi-sports field and the parking lot are within the AE flood zone. The field will require some fill to have the same level as the rest of the field. In order for this to be allowed, P&R will prepare an application for a "no-rise" certificate and submit it to the Hawai‘i County Department of Public Works to allow a variance or exemption. There will be no impact on the base flood elevation or the size of the floodplain.

The National Weather Service of the National Oceanic and Atmospheric Administration operates the Pacific Tsunami Warning Center and Alaska Tsunami Warning Center, which monitors sudden earth movements throughout the Pacific Basin. Tsunamis generated from earth movements on the Pacific Rim, including South America, Japan, California and Alaska, would allow for warning times between 4 and 15 hours, sufficient time for evacuation of the Hilo Bayfront. Sudden movement along faults close to

Hawai‘i are unpredictable, allowing only minutes or perhaps an hour of warning time, and evacuation would be more problematic. Coastal recreational areas in Hilo cannot avoid the tsunami hazard because the entire coast is vulnerable to tsunami. Warning sirens are present at the project site and are easily audible in all locations.

3.1.3 Flora, Fauna and Ecosystems

Existing Environment

The natural vegetation of this part of Hilo was most likely shoreline or coastal vegetation, dominated grasses such as *aki aki* (*Sporobolus virginicus*), sedges and coastal herbs, vines such as *pohuehue* (*Ipomoea pes-caprae*) and *nanea* (*Vigna marina*), as well as shrubs and trees such as *hala* (*Pandanus tectorius*), *milo* (*Thespesia populnea*), *hau* (*Hibiscus tiliaceus*) and *naupaka* (*Scaevola taccada*) (Gagne and Cuddihy 1990). As discussed previously, this original community has been modified by centuries of human use involving draining of wetlands, fill for railroad beds, highways and urban uses, dumping of dredge spoil, and landscaping for recreational use. The current vegetation of the project site is entirely managed vegetation, i.e., lawns and planted shrubs and trees. None of the above-named species still persist, and instead, various weedy or ornamental grasses, vines, herbs and trees predominate, including Hilo grass (*Paspalum conjugatum*), Chinese banyan (*Ficus microcarpa*), mango (*Mangifera indica*) and many others. A full list of plants found on the project site is provided in Table 1. Only two common native species were observed (one herb and one vine), and no plant species classified as threatened or endangered (USFWS 2014) are present or would be expected on the project site.

The urban project site is not habitat for native fauna. Typical expected birds include Common Myna (*Acridotheres tristis*), Northern Cardinal (*Cardinalis cardinalis*), Spotted Dove (*Streptopelia chinensis*), Zebra Dove (*Geopelia striata*), Japanese White-eye (*Zosterops japonicus*), Saffron Finch (*Sicalis flaveola*), and House Finch (*Carpodacus mexicanus*), most of which were observed during the botany survey on the site. The only native bird identified during site visits that included biologists was the Pacific Golden-Plover (*Pluvialis fulva*), a migratory bird that resides in Hawai‘i from September to April and commonly forages or rests in grassy areas. It is unlikely that many native forest birds would be expected to use the project site due to its low elevation, alien vegetation and lack of adequate forest resources. One native bird that is increasingly showing up in low elevations after having developed some resistance to the mosquitos that plague the lowlands with avian malaria is the Hawai‘i *‘Amakihi* (*Hemignathus virens virens*). This bird was not observed but could occasionally be present.

As with all of the island of Hawai‘i, several endangered native terrestrial vertebrates may overfly, roost, nest, or utilize resources in the general project area of urban Hilo. These include the endangered Hawaiian Hawk (*Buteo solitarius*), the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), the endangered Hawaiian Petrel (*Pterodroma sandwichensis*), and the threatened Newell’s Shearwater (*Puffinus auricularis newelli*).

Table 1 Plant Species Observed on Project Site

Scientific Name	Family	Common Name	Life Form	Status*
Ageratum conyzoides	Asteraceae	Ageratum	Herb	A
Amaranthus spinosus	Amaranthaceae	Amaranthus	Herb	A
Archontophoenix alexandrae	Arecaceae	King palm	Tree	A
Bidens alba	Asteraceae	Bidens	Herb	A
Bidens pilosa	Asteraceae	Bidens	Herb	A
Brachiaria mutica	Poaceae	California grass	Herb	A
Casuarina equisetifolia	Casuarinaceae	Ironwood	Tree	A
Chamaecrista nictitans	Fabaceae	Partridge pea	Herb	A
Chamaesyce hirta	Euphorbiaceae	Garden spurge	Herb	A
Chamaesyce hypericifolia	Euphorbiaceae	Graceful spurge	Herb	A
Chloris sp.	Poaceae	Swollen finger grass	Herb	A
Clusia rosea	Clusiaceae	Autograph tree	Tree	A
Cocos nucifera	Arecaceae	Coconut	Tree	A
Commelina diffusa	Commelinaceae	Honohono	Herb	A
Conyza bonariensis	Asteraceae	Hairy horseweed	Herb	A
Crassocephalum crepidioides	Asteraceae	Crassocephalum	Herb	A
Crotalaria pallida	Fabaceae	Crotalaria	Herb	A
Desmodium sandwicense	Fabaceae	Desmodium	Herb	A
Desmodium tortuosum	Fabaceae	Desmodium	Herb	A
Desmodium triflorum	Fabaceae	Desmodium	Herb	A
Drymaria cordata	Caryophyllaceae	Drymaria	Herb	A
Eleusine indica	Poaceae	Wiregrass	Herb	A
Emilia fosbergii	Asteraceae	Emilia	Herb	A
Emilia sonchifolia	Asteraceae	Flora's paintbrush	Herb	A
Epipremnum pinnatum	Araceae	Pothos	Vine	A
Eragrostis brownie	Poaceae	Eragrostis	Herb	A
Eragrostis tenella	Poaceae	Lovegrass	Herb	A
Ficus microcarpa	Moraceae	Banyan	Tree	A
Galinsoga parviflora	Asteraceae	Galinsoga	Herb	A
Hedyotis corymbosa	Rubiaceae	Hedyotis	Herb	A
Ipomoea indica	Convolvulaceae	Ipomoea	Vine	I
Ipomoea sp.	Convolvulaceae	Ipomoea	Vine	A
Ipomoea triloba	Convolvulaceae	Little bell	Vine	A
Koelreuteria elegans	Sapindaceae	Koelreuteria	Tree	A
Kyllinga brevifoliua	Cyperaceae	Kyllinga	Herb	A
Kyllinga nemoralis	Cyperaceae	Kyllinga	Herb	A
Lindernia crustacea	Scrophuariaceae	Lindernia	Herb	A
Macaranga mappa	Euphorbiaceae	Bingabing	Shrub	A
Macroptilium lathyroides	Fabaceae	Cow pea	Herb	A
Malvastrum coromandelianum	Malvaceae	Malvastrum	Herb	A
Malvaviscus penduliflorus	Malvaceae	Turk's cap	Shrub	A
Mangifera indica	Anacardiaceae	Mango	Tree	A
Melochia umbellata	Sterculiaceae	Melochia	Tree	A

Table 1, continued				
Scientific Name	**Family**	**Common Name**	**Life Form**	**Status***
Merremia aegyptia	Convolvulaceae	Hairy Merremia	Vine	A
Mimosa pudica	Fabaceae	Sleeping grass	Herb	A
Momordica charantia	Cucurbitaceae	Bitter melon	Vine	A
Paederia foetida	Rubiaceae	Maile pilau	Vine	A
Panicum maximum	Poaceae	Guinea grass	Herb	A
Paspalum conjugatum	Poaceae	Hilo grass	Herb	A
Paspalum scrobiculatum	Poaceae	Paspalum	Herb	A
Philodendron sp.	Araceae	Philodendron	Vine	A
Phlebodium aureum	Polypodiaceae	Phlebodium	Fern	A
Phyllanthus debilis	Euphorbiaceae	Niruri	Herb	A
Polygala paniculata	Polygalaceae	Milkwort	Herb	A
Ricinus communis	Euphorbiaceae	Castor bean	Shrub	A
Roystonea regia	Arecaceae	Roystonea	Tree	A
Sacciolepis indica	Poaceae	Glenwood grass	Herb	A
Sida rhombifolia	Malvaceae	Sida	Herb	A
Solanum americanum	Solanaceae	Popolo	Herb	I
Solanum sp.	Solanaceae	Solanum	Herb	A
Sonchus oleraceus	Asteraceae	Sow thistle	Herb	A
Spermacoce assurgens	Rubiaceae	Buttonweed	Herb	A
Sporobolus diander	Poaceae	Sporobolus	Herb	A
Synedrella nodiflora	Asteraceae	Nodeweed	Herb	A
Thunbergia fragrans	Acanthaceae	White Thunbergia	Vine	A

A=Alien E=Endemic I=Indigenous END=Federal and State Listed Endangered

Apart from the Hawaiian hoary bat, all mammals in the project area are introduced species, including feral cats (*Felis catus*), small Indian mongooses (*Herpestes a. auropunctatus*) and various species of rats (*Rattus* spp.). None are of conservation concern and all are deleterious to native flora and fauna.

Impacts and Mitigation Measures

Because of the lack of native ecosystems or threatened or endangered species on the project site, the Proposed Action would have no adverse impacts to native vegetation or habitat. Avoidance measures will be instituted in order to avoid impacts to Hawaiian Hawks, Hawaiian hoary bats, and listed seabirds:

- There will be no clearing of woody vegetation taller than 15 feet during the bat pupping season, which runs from June 1 through September 15 each year.
- If earthmoving or tree cutting is scheduled during the breeding season for Hawaiian Hawks (March through the end of September), the County will arrange for a hawk nest search to be conducted by a qualified biologist, and if hawk nests are present in or near the project site, all land clearing activity will cease until the expiration of the breeding season.
- No lighting will occur in Phase I; if lighting is installed in future phases, it will be required to be shielded in conformance with the Hawai‘i County Outdoor Lighting Ordinance to reduce the risk that seabirds may be attracted to and then disoriented by the lighting.

- No nighttime construction work will be allowed during the seabird-fledging season, which runs from September 15 through December 15 each year.

3.1.4 Air Quality, Noise, and Scenic Resources

Environmental Setting

Air pollution in East Hawai‘i is minimal, and is mainly derived from volcanic emissions of sulfur dioxide, which convert into particulate sulfate and produce a volcanic haze (vog) that occasionally blankets the district. Persistent trade winds keep the project area relatively free of vog for most of the year. Motor vehicles provide another source of air pollution.

Noise on the project site is moderate to high and derived mainly from motor vehicles on Kamehameha Avenue and Manono Street and aircraft associated with Hilo International Airport. The Kuawa Street fields are located directly under the flight path during normal trade wind patterns for arriving jets. This condition exists for all the sports facilities at the County’s Ho‘olulu Park Recreational Complex, including Francis F.C. Wong Stadium, the Walter Victor Baseball Complex, Aunty Sally Kaleohano’s Lu‘au Hale and the Afook-Chinen Civic Auditorium, as well as the Edith Kanaka‘ole Multi-Purpose Stadium.

The project site is near the ocean and Banyan Peninsula but is separated from them by a busy highway. In itself, the project site is not an area considered significant for its scenic character in the Hawai‘i County General Plan, and no other scenic resources exist, aside from several large mango and banyan trees (see photographs in Figure 4).

Impacts and Mitigation Measures

The Proposed Action would not measurably affect air quality, noise levels or scenic sites recognized in the Hawai‘i County General Plan. The increase in vehicular traffic associated with the conversion of the open field into an active park will slightly increase traffic noise and exhaust emissions, but such increases are expected to be modest and in a context of already moderate levels, and require no mitigation. Development of sports fields will require removal of all trees on the site, including banyan, mango and king palm. Although the loss of any trees involves some scenic impact, the park will include landscaping that will soften and enhance the views (see the Site Plan in Figure 5).

3.1.5 Hazardous Substances, Toxic Waste and Hazardous Conditions

As discussed in detail in Section 3.2.2, the project site has a long history of residential, commercial, industrial and transportation uses that terminated with the devastation of the 1960 tsunami. Ever since that event the property has been mostly vacant and unused, with the exception of periodic boat storage (Wailoa Small Boat Harbor is across Manono Street) and as a deposit site for dredged sediments from Wailoa River channel and Hilo Bayfront shoreline area. There is also a HELCO fuel line along Kamehameha Avenue. Given the context, the County of Hawai‘i authorized an enhanced Phase I Environmental Site Assessment for the property to determine whether Recognized Environmental Conditions (RECs) were present. The study was conducted by Myounghee Noh and Associates and is attached as Appendix 2 and summarized below. The enhanced Phase I ESA involved various forms of

research on the project site and surrounding properties, including searches of government records and databases, field observations, interviews with agency officials and others familiar with conditions and historical uses in the area, and several phases of soil sampling.

Environmental Setting: Surrounding Properties

No Underground Storage Tanks (USTs) or Leaking Underground Storage Tanks (LUSTs) were identified on immediately surrounding properties, nor were there any records of sites with hazardous or toxic issues that have been identified on various agency lists, including those developed pursuant to the Resource Conservation and Recovery Act (RCRA) or in the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS). One State CERCLIS site was identified within 1/2 mile of the subject property. The site, identified as the HELCO pipeline anomaly located at 126 Banyan Drive, was located approximately one third of a mile and downgradient from the subject property. Total Petroleum Hydrocarbons contamination below the Hawai‘i Department of Health (HDOH) Tier I Environmental Action Level was found. Contaminated soil was removed in 2012 and the site was backfilled and no further action was required. Due to the proximity of this site to the subject property, this is not considered an REC in the context of the project site.

Twenty-five state CERLIS sites were identified at greater than 1/2 mile from the project site, but due the distance of the sites from the subject property, they are not considered RECs. Two RCRA Generator sites (i.e., sites that generate a reportable quantity of hazardous materials) were identified on adjoining properties. No violations were listed for either location; therefore, these sites are not considered RECs. Eight LUST sites were identified within 1/2 mile of the subject property. The documented LUST sites have a current site status of Site Cleanup Complete, No Further Action. Due to the distance and proximity of these sites to the subject property, these LUST sites are considered Historical RECs, but are not expected to affect any proposed uses on the project site.

Environmental Setting: Project Site

No Underground Storage Tanks or Leaking Underground Storage Tanks were identified on the project site that is proposed for sports fields. No records of sites with hazardous or toxic issues that have been identified on various agency lists, including those developed pursuant to RCRA or in the CERCLIS were identified. However, based on former uses, it is possible that several types of hazardous materials or toxic substances are present.

> Arsenic. The Wailoa River is known to contain arsenic in its lower sediments (Hallacher 1985), and with the history of potential pesticide use and emplacing dredge deposits from the Wailoa River on the property, arsenic was a concern. Arsenic is a naturally occurring element in the earth’s crust. In Hawai‘i, low levels of arsenic are found naturally in native soils at levels between 1.0 milligrams per kilogram (mg/kg) to 20 mg/kg. However, significantly elevated levels of arsenic have been identified in soils at former sugar cane fields, former pesticide storage or mixing areas, former sugar plantation camps, a former canec production plant, and wood-treatment plants. The presence of elevated levels of soil arsenic at some historic sugar plantation areas is believed to be related to the widespread use of sodium arsenite or other arsenic-based herbicides/ pesticides in and around the cane fields and camps in the 1920s through 1940s (Hawai‘i Department of Health

2010). It should be noted that the project site used to pile dredge deposits from the mouth of the Wailoa River in 2006 to 2007, where the sediments were dewatered, tested for total metals, and disposed of at the South Hilo Sanitary Landfill. No levels of contaminants above environmental action levels were found, probably because the deposits appear to originate from the Wailuku River rather than the Wailoa River.

Pesticides. Pesticides have been used in Hawai‘i since the early 20th century for a variety of reasons including structural protection and agricultural uses (Hawai‘i Department of Health 2009). Since the subject property was used as former housing and shops before 1960s, pesticides such as chlordane and heptachlor may have been applied under building foundations.

Hydrocarbons. Various types of hydrocarbon products used in fuel and lubricants can still be present in old industrial and commercial settings, and they can also occur because of dumping of motor vehicles or parts.

PCBs. Polychlorinated biphenyls (PCB) have been widely used in electrical transformers and also as hydraulic fluids in the U.S. from the 1930s through the 1970s when production was banned. Old equipment containing PCB are still in use today, and therefore releases to the environment from these sources and runoff from contaminated upland sites with industrial uses continue to contribute PCB to aquatic systems.

Subsequent to soil testing and site observations, several RECs were noted on the property. During the site reconnaissance, conducted on 30 March 2015 an old motor was observed on the subject property. The motor was in poor condition, showing rust and weathering on all sides. The motor was void of fluids. While there was no staining to the soil or petroleum or oil odors, the motor represents a material threat of release to the surface soil of the subject property, and is therefore considered a REC.

Soil sampling and analytical results indicated that arsenic and lead (heavy metals) were present above the HDOH Tier 1 Soil Environmental Action Level (EAL) for unrestricted (residential) land use. Therefore, this is considered a REC. Arsenic was detected in several samples, with concentrations ranging from 25 mg/kg to 42 mg/kg, exceeding the EAL for unrestricted land use of 24 mg/kg (although it should be noted that natural background levels in Hawaiian soils may be high as 20 mg/kg). But the results were below the EAL for restricted land use (commercial/ industrial), which is 95 mg/kg. Lead was detected from all samples in the range of 18 mg/kg to 340 mg/kg. The lead results of the samples collected from surface and near-surface soil in one of the sample units was 340 mg/kg exceeding the EAL for unrestricted land use of 200 mg/kg. Levels of benzo(a)pyrene higher than the EAL were also detected. Elevated levels of lead and benzo(a)pyrene were detected only in the eastern one third of the project site.

Although various other substances were tested for and some detected, the concentrations did not rise to the level of representing an REC. Reportable levels of Total Petroleum Hydrocarbon (TPH)-Diesel and TPH-Oil; barium, cadmium, chromium, and mercury; and PAHs were detected. However, all concentrations were below the Tier 1 EALs for unrestricted land use. The volatile compounds TPH-Gasoline and BTEX were not detected, nor were organochlorine pesticides.

Impacts and Mitigation Measures

The Recognized Environmental Conditions listed above require remediation. The abandoned car motor will be removed and disposed of as scrap metal in conformance with State and County laws and regulations.

Soil impacted by arsenic, lead and benzo(a)pyrene is present on at least some parts of the site exceeding the Tier 1 EALs for unrestricted (residential) land use, but below the restricted (commercial/industrial) land use EALs. Since the site plan is for development and use as a soccer field, unrestricted land use EAL is applied. Based on the need for soil disturbance (grading) as part of the development of the fields, the Phase I ESA recommended further soil assessment for arsenic and lead in certain areas at different depths, specifically:

- Bioaccessible arsenic and lead test for surface (0-6 inch bgs) and near-surface (6-12 inch bgs) soil
- Total arsenic and lead test for subsurface soil below 12 inches bgs since arsenic and lead results for the near-surface soil exceeded or approached the EALs.

P&R has developed a program to address these issues and ensure the health and safety of the public for the proposed uses. Additional laboratory tests using the original soil samples are being performed to measure the bioaccessible arsenic content in the fine fragment of the soil. In Hawaiian soils, it is often the case that the fraction of arsenic that can be ingested and metabolized is far lower than the total arsenic. Environmental regulatory agencies now consider the degree of bioavailability of arsenic and other metal contaminants in risk assessments and remedial action evaluations (USEPA 2007). In this case, because the total arsenic levels were not highly elevated, the bioaccessible arsenic data are expected to be appropriate for unrestricted land use.

For other contaminants found on the eastern part of the project site, P&R is conducting additional sampling. Whereas the original sampling analysis "averaged" the concentrations throughout the eastern one third of the site, the next phase of sampling which will attempt to determine the location of lead- and benzo(a)pyrene-impacted areas. The area will be split into smaller "decision units" and analyzed per a sampling plan to determine whether the entire area or smaller sub-area is the source of the elevated lead.

Once these tests have been conducted and the results analyzed, P&R will share its results with the Department of Health and determine the most appropriate strategy, based on the extent of lead- and or benzo(a)pyrene-impacted soil. Two basic mitigation actions will be considered. The soil may be removed and placed in an approved disposal site, which because of the relatively low levels of metals, would likely be the South Hilo Sanitary Landfill. Borrow material would be tested prior to brought in as fill. This engineered control measure must be approved by the Department of Health. However, this option is expensive if a large volume of soil needs to be removed and replacement fill is brought in. A second option would be to "cap" the impacted layer with a permanent marking stratum, import several feet of clean fill, and then build the facilities above that. This method has been successfully used at many sites with low levels of metals in soil. This method may prove less expensive than the first option, especially if the contaminated area is relatively small and in the area with impermeable surface, such as paved parking, which would require only a thin capped layer, but any engineering controls require permanent maintenance. A site-specific Environmental Hazard Evaluation/Environmental Hazard Management Plan

(EHE/EHMP), to be approved by the Department of Health, will be required for long-term site management. If the impacted area is extensive and neither of these options is practical, the area may simply be fenced off to avoid public contact. It bears emphasis that the levels of arsenic, lead, and benzo(a)pyrene are relatively low and its characteristics are shared by many properties throughout urban Hilo, and would not be of concern for many types of commercial or industrial uses. It appears very likely that whatever the outcome of the testing and analysis, most if not all of the site will be acceptable as-is or mitigated to a condition that makes it acceptable for the proposed use. The Final EA will report on the progress of the testing and analysis.

In addition to the measures related to water quality detailed in Section 3.1.3, in order to ensure to minimize the possibility for spills of hazardous materials, the County will require contractors to adhere to the following conditions:

- Unused materials and excess fill will be removed and disposed of at an authorized waste disposal site.
- During construction, emergency spill treatment, storage, and disposal of all hazardous materials, will be explicitly required to meet all State and County requirements, and the contractor will be asked to adhere to "Good Housekeeping" for all appropriate substances, with the following instructions:
    - Onsite storage of the minimum practical quantity of hazardous materials necessary to complete the job;
    - Fuel storage and use will be conducted to prevent leaks, spills or fires;
    - Products will be kept in their original containers unless unresealable, and original labels and safety data will be retained;
    - Disposal of surplus will follow manufacturer's recommendation and adhere to all regulations;
    - Manufacturers' instructions for proper use and disposal will be strictly followed;
    - Regular inspection by contractor to ensure proper use and disposal;
    - Onsite vehicles and machinery will be monitored for leaks and receive regular maintenance to minimize leakage;
    - Construction materials, petroleum products, wastes, debris, and landscaping substances (herbicides, pesticides, and fertilizers) will be prevented from blowing, falling, flowing, washing, or leaching into the ocean
    - All spills will be cleaned up immediately after discovery, using proper materials that will be properly disposed of;
    - Regardless of size, spills of toxic or hazardous materials will be reported to the appropriate government agency; and
    - Should spills occur, the spill prevention plan will be adjusted to include measures to prevent spills from re-occurring and for modified clean-up procedures.

3.2 Socioeconomic and Cultural

3.2.1 Socioeconomic Characteristics

The Proposed Action would affect and benefit primarily residents of East Hawai‘i who belong to sports teams that practice and compete in the Hilo Bayfront area, by providing several sports fields that are currently in short supply or altogether lacking. It would also benefit visiting teams and their families. Table 2 provides information on the socioeconomic characteristics of Hilo from the U.S. 2010 Census of Population. The majority of the population is Asian or Pacific Islander. Those over 65 years old make up 18 percent of the population. Several segments of the population that typically exhibit disadvantaged measures of social welfare are disproportionately represented in the population of Hilo as compared to the State of Hawai‘i. Median family income is less than 65 percent that of the County as a whole. More than 15 percent of individuals have income below the poverty level, double the statewide rate. Similar patterns hold for households receiving welfare, food stamps, and disability payments. The availability of free, public sports fields for soccer, rugby, baseball and football are important for providing recreation for the population of East Hawai‘i and for promoting a health social environment.

Impacts

The Proposed Action would benefit recreational users by providing an additional area for active sports in Hilo Bayfront. This is particularly important given the high demand for youth activities from the large population of youths and an active senior population which depends upon public sports activities to maintain physical health and mental acuity. Despite a large inventory of facilities in the County parks closer to downtown, demand currently outstrips availability, and teams often have a difficult time finding a venue. No adverse socioeconomic effects are expected, as the project site is not near neighborhoods and would not affect residents through noise or traffic.

3.2.2 Cultural Setting

This section utilizes a variety of previous studies concerning Hilo or more specifically Waiākea Ahupua‘a, particularly McEldowney (1979), Kelly (1981) and Maly (1996). In addition, the archaeological inventory survey and limited cultural impact assessment included in Appendix 3 involved documentary research and interviews focused on this particular project site.

Traditional Cultural Background

The earliest historical knowledge of Hilo comes from legends written by Kamakau (1961) of a 16th century chief ‘Umi-a-Liloa (son of Liloa), who at that time ruled the entire island of Hawai‘i. Descendants of Umi and his sister-wife were referred to as “Kona” chiefs, controlling Ka‘ū, Kona, and Kohala, while descendants of Umi and his Maui wife were “Hilo” chiefs, controlling Hāmākua, Hilo, and Puna (Kelly 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 1981:3).

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

As part of an archaeological assessment study, Maly (1996) conducted historical research for the lands of Wainaku, Pōnahawai, Waiākea, and Pi‘ihonua. He discussed the significance of the use of the Hawaiian word *wai* in the place names: Pōnahawai, Waiākea, Wainaku, and Wailuku (River). According to Maly, the word *wai* (water) has strong metaphorical associations with the Hawaiian concept of wealth (*waiwai*), stressing its cultural importance (Maly 1996:A-2). In this context, the importance of Hilo can be better understood, with its copious streams that fed taro pondfields and its numerous fishponds.

Sometime near the end of the 16th century or early in the 17th century, the lands of Hilo were divided into *ahupua‘a,* which till today retain their original names (Kelly 1981:3). These include the *ahupua‘a* of Pu‘u‘eo, Pi‘ihonua, Punahoa, Pōnahawai Kūkūau and Waiākea (where the current project site is located). The design of these land divisions was such 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. However, only Pi‘ihonua 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 (Kelly 1981:5).

Waiākea, which translates as “broad waters” (Pukui et al. 1974:220) is home to the Wailoa River and portions of Hilo, Reed’s, Kuhio, and Puhi Bays. Historically, the ocean resources of Hilo Bay were vital to everyday subsistence, Kamakau describes various fishing techniques as follows:

> “… 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…” (Kamakau 1976:59-60 cited in Kelly et al. 1981:16-17),

Marine-based subsistence was also strongly linked to social organization. Strict *kapu* were enforced, which dictated when and where certain varieties of fish such as *‘ōpelu* and *aku* could be caught. A dedicated *aku* fishing ground or *ko‘a* known as Maka-o-Kū was located on the shore of the Waiākea peninsula, north of the current study area near present day Coconut Island (Maly 1996). Theoretically, access rights to fishing areas and ocean resources were defined by *ahupua‘a* boundaries, with residents of a specific *ahupua‘a* only taking fish within their own land division. However, in the case of Waiākea Ahupua‘a, the Waiākea fishery extended straight across Hilo Bay, allowing residents of the adjacent *ahupua‘a* only limited rights in the fishery (Kelly et al. 1981).

Extensive fishponds were developed in the vicinity of Hilo Bay including the royal fish ponds, five spring-fed inland ponds whose yield was reserved solely for the highest of *ali‘i*. The largest of these royal ponds, known as Waiākea, was located southwest of the project site in the Wailoa River. Religious ritual accompanied the creation and maintenance of the royal ponds, which according to a historic account from 1823, were surrounded by small huts for their caretakers (Kelly et al. 1981).

In addition to marine resources, agricultural resources were essential to the residents of Waiākea. 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 made a landscape of raised islands and ditches (Maly 1996). According to historical accounts in by Handy and Handy (1972) dry taro was planted wherever there was enough soil on the lava fields of Waiākea and on the slopes between the rivers.

Post-European Contact

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 n.d.; Tolleson 2001). 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) surmised 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. It was during this early Historic Period that Waiākea Ahupuaʻa became part of Kamehameha I's personal land holdings (Moniz n.d.).

In addition to providing valuable subsistence resources, the protected waters and sandier shores of Hilo Bay offered 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.

At the end of the 1830s, industrial development was on the rise in Hilo, despite the decline in whaling and the end of the sandalwood trade. In a letter written in 1840, Reverend Titus Coan remarked on the conditions in Hilo:

> "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).

A period of great social change began with the arrival of the first missionaries to Waiākea in 1824 and ended in 1848 with the formal land division known as the Great *Māhele*. The introduction of new spiritual concepts combined with an increased involvement in international trade and global politics lead to a shift in settlement patterns from traditionally dispersed Hawaiian villages to more concentrated urban population centers. Then, on November 7, 1837 at 7 p.m. a tsunami wave hit Hilo Bay, Reverend Coan described the scene as follows:

> "… we heard a heavy sound as of a falling mountain upon the beach. This noise was followed by loud wailing and cries of distress, extending for miles around the shores of the bay… House furniture, calabashes, fuel, timber, canoes, food, clothing, everything floated wild upon the flood. The waters rushed up valleys, carried away fish-ponds, and swept over many plantations of food" (Maly 1996:18).

After the tsunami, Hilo became the site of a large scale religious revival that lasted from 1837 until 1840 and included mass conversions and meetings of up to 10,000 worshippers. Other events that had a profound effect on the demography of Hilo was the measles epidemic of 1848, which claimed one third of the population of the island, followed by an outbreak of smallpox in 1853; later outbreaks of plague and leprosy caused the population to dwindle further (McEldowney 1979).

Pressure from foreign investors, combined with the above-described demographic and socioeconomic change, resulted in a shift from traditional land tenure to a system of private land ownership that culminated in the formal land division known as the *Māhele ʻĀina* or Great *Mahele* of 1848. During the *Māhele ʻĀina* all the lands of Hawaiʻi were classified into one of three categories: Crown Lands (for the occupant of the throne), Konohiki Lands (to be divided among 245 chiefs) and Government Lands. Conditions of the *Māhele ʻĀina* also afforded native tenants the right to claim, and acquire title to, parcels that they actively lived on or cultivated for a living (Maly 1996). These *kuleana* claims were essentially transfers of ownership from the *aliʻi nui* (high chief) or *konohiki* (lesser chief/overseer), who had been awarded ownership of the *ahupuaʻa* by Kamehameha III, to the commoners. The Board of Commissioners oversaw the program and administered the *kuleana* as Land Commission Awards (LCAw.).

Historically, the entire *ahupuaʻa* of Waiākea was treated as personal land by Kamehameha I, who and passed it on to his son Liholiho. Waiākea was later inherited by chiefess Kaunuohua, a grand-daughter of Keawemauhili and *kahu* of Alexander Liholiho (Kameʻeleihiwa 1992), who later relinquished the *ahupua'a* during the *Māhele ʻĀina.* As a result of the *Māhele*, Waiākea Ahupuaʻa was set aside as Crown Lands for Kamehameha III. In addition, twenty-six *kuleana* claims were registered within Waiākea for house lots and cultivation. Most were located along major inland roads or fishponds near Hilo Bay, (Devereux et. al. 1997; Moniz n.d.). Portions of three *kuleana* claims lie within the Kuawa sports field project site, as detailed within Appendix 3 in Table 1 and Figure 11.

The southern portion of LCAw. 1-E that was awarded to Mahoe falls within the northwest quarter of the project site. According to Board of Land Commission documentation from 1849, the cultivated field on the east bank of the Wailoa River was unfenced and had no house, the claimant had it from Konohiki Pea for years, undisturbed. LCAw. 4004 awarded to Hale extends from the east bank of the Wailoa River at the western edge of the project site (just south of LCAw. I-E) to the southeast corner (at present day Kuawa St). According to Records of Land Commission dated 1848, the four cultivated fields included one house that belonged to the claimant. Mahi ("who has no right in the soil") had another house that had descended to him from his forefathers time during Kamehameha's reign without objection. Most of the land associated with LCAw. 2603 awarded to Napeahi falls within the southwestern portion of the project site. According to Records of Land Commission from 1848, the unfenced house lot contained one house that belonged to the claimant and three other houses that belonged to Paakai, Kamokualiiole, and Kalua;

Napeahi had inherited the land from his forefathers and "no one had ever disputed his right". Furthermore, "Pikaka had given up his claim in favor of Napeahi" (1848).

Waiākea and the Heyday of Sugar Cane

Following the *Māhele,* the population of Hilo grew and the scattered upland habitations gave way to sugar cultivation (McEldowney 1979:37). In Waiākea, Kamehameha IV leased large portions of Waiākea to outside interests for pasture and sugarcane cultivation (Moniz 1992). In 1861 S. Kipi leased the Crown Lands of Waiākea for the rate of $600 dollars per year to be used as pasture land for five years (Kelly et al. 1981; Maly 1996). In 1874 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 Waiakea Mill Company, founded by Alexander Young and Theo H. Davis, and the Waiakea sugar plantation was established in 1879. The Waiakea Mill Company started with about 350 acres of cultivated lands they had acquired from Lyman. In 1888 the company acquired a 30-year lease that increased their land holdings in Waiākea Ahupuaʻa. When the lease ran out in 1918, the acreage under cultivation had increased to nearly 7,000; but without a lease the *ahupuaʻa* fell under the homesteading laws, which required the government to lease the land to individual growers. Waiakea Mill Company was expected to grind the crop for the independent growers under a contract that gave the company 40 percent of the proceeds from the sale of the refined sugar. Contractual and legal problems, combined with a declining sugar market and the devastating *tsunami* of 1946, led the Waiakea Mill Company to cease operation in 1947, and offer its property under General Lease 2741 to private cultivators for the purpose of growing cane (Maly 1996). During its 68 years of operation, the Waiakea 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 productive sugar cane areas were interconnected with a plantation railroad system connecting fields with the mill at Wailoa Stream, about a half mile southwest of the project site. The railroad in Hilo was in operation from 1899 until 1946. The railroad's primary business centered on the transport of raw sugar from the mills to the harbor and hauling plantation freight while the transport of passengers was merely a secondary interest. On April 18, 1899 the Republic of Hawaiʻi and the Hilo Railroad Company (HRC) reached an agreement for the HRC to "build and operate a railroad in, from between and through the districts of Hilo, Puna, Hāmākua, Kohala, Kona, and Kau" (Kelly et al. 1981:303). This rather liberal agreement granted the following to the HRC, subject to the approval of the Minister of the Interior: Government lands for the HRC to build their stations, depots and other structures; a free right of way across Government Lands and roads; and free use of water for the construction of the railroad (Kelly et al. 1981).

Six experienced Honolulu businessmen who hoped to recreate their success on Oʻahu in the cultivation and transport of sugarcane were behind the HRC venture on the island of Hawaiʻi. In the fall of 1899, the HRC began building its tracks from its terminus in Waiākea 8.3 miles south to the Olaa Sugar Company Mill near Keaʻau, Puna District (Kelly et al. 1981). The investors behind the HRC chose this route as their first rail service because they were backing the Olaa Sugar enterprise as well. Interestingly, the first product transported by rail from Olaa Sugar Company was not sugar, but rather timber that had been

recently cleared from forests in the area and supplied to the HRC as 35,000 railroad ties (Kelly et al 1981).

In 1900, a small wharf was constructed along the eastern bank of the Wailoa River near the current project site for the landing of material necessary to build the tracks, buildings and railroad cars. The first locomotive made landfall on May 15, 1900, and rail service from Hilo to Kea‘au began on June 18, 1900. The Wailoa River railroad wharf was expanded in 1901 and a large warehouse was built to store up to 15,000 bags of sugar (Kelly et al 1981). By the end of 1901, HRC had completed construction of more than 35 miles of railroad line, which included 25.1 miles from Waiākea to Kapoho and a 5-mile branch to Pāhoa. In 1902, a new sugar warehouse, with a 35,000 bag capacity, was built on the eastern shore of the Wailoa River near the project site. In 1903, a new railroad wharf was built north of the mouth of the Wailoa River in Hilo Bay and the railroad line from Waiākea to Hilo Town was completed, including two bridges over the Wailoa River just west of the project site.

The HRC ran mostly deficits during 1901-1905, but the advent of trans-Pacific steamship service in Hilo Bay promised to make the venture profitable. In 1906, the HRC directors paid to put together a proposal to construct a breakwater in order to accommodate the steamships and presented it to the U.S. Army Corps of Engineers. The HRC was able to secure the appropriation for the breakwater in 1907, by making assurances to the U.S. government that they would construct a railroad north of Hilo in addition to wharf facilities (Kelly et al. 1981). Breakwater construction began in 1908 and the HRC hauled most of the rock from Puna to Hilo for the breakwater project, which compensated for the decline in the sugar industry and resulted in increased revenue for the years 1908-1910. From 1909 to 1913, the HRC laid track from Hilo northward to the district of Hāmākua and southward through Puna. This expansion was funded by $4.5 million worth of stocks and bonds with annually rising interest rates that the HRC could not afford to pay. The HRC’s failure to meet their bond interest obligations resulted in foreclosure in 1916. Later that year, the Hilo Railroad Company was reorganized as the Hawaii Consolidated Railway (HCR) under the leadership of businessmen who represented the companies that ran the sugar plantations along the railroad.

A significant portion of the HCR’s Waiākea Rail Yard falls within the project site, as illustrated in Figures 13, 14, and 15 of Appendix 3, including the former site of the main railroad tracks, the commissary, main office, and railroad workers’ residences. A town sprung up around it.

Gloria Kobayashi and Richard Nakamura open their book *The Yashijima Story: The History of Waiakea Town*, with the following description of Waiākea Town:

> “… a community located on the banks of the Wailoa River with an economy based on fishing, stevedoring, sugar, railroading and service industries. At its peak, some 5,000 people lived in very close quarters covering some 10 square miles. It was a community of blue-collar workers and shop owners of predominantly Japanese, Hawaiian and Portuguese extraction and haole supervisors for the Hilo Railroad and Waiakea Mill” (2008:23).

In the 1920s and 1930s, Waiākea Town was also known as *Yashijima*, which means “coconut island” in Japanese (Kobayashi and Nakamura 2008). Most people alive today identify this area as Waiākea Town as opposed to *Yashijima*. The geographic boundaries of the Waiākea Town included the Wailoa River to

the west, the Waiākea fish ponds and Hoʻolulu Park to the south, most of Moku Ola to the north and Reed's Bay to the east. The boundaries of Waiākea Town are approximated by the following present day roadways Manono Street (west boundary), Piilani (south boundary), Kalanikoa (east boundary) and Banyan Drive (north boundary). The project site sits squarely within Waiākea Town. In addition to the Waiākea Rail Yard and the assorted storefronts up and down Kamehameha Avenue (see Figure 18 of Appendix 3), Waiākea Town was home to a movie theater, a Buddhist temple, various parks, a Japanese language school (Yashijima Nippon Go Gakko), Waiakeakai Elementary and Intermediate Schools and a fire station. Additionally, within the project site there were numerous restaurants and stores, residential structures and a Shinto Shrine (Hilo Daijingu).

In 1898, Kakuta Koshi completed building a Shinto shrine known as Yamato Shrine on Piʻopiʻo Street in Hilo. His successor, Jikko Koshi took over in 1902 and changed the name of the shrine to Hilo Daijingu in 1903. In 1926, the membership of the Shrine desired to rebuild the Shrine on fee simple land, and in 1928 the Hilo Daijingu shrine was built near the corner of Manono Street and present day Kuawa Street in the southwest portion of the project site, within the Napeahi LCAw. According to Kobayashi and Nakamura (2008), there was a sumo ring next to the Shinto shrine, where amateur wrestlers could be seen practicing throughout the week and goodwill tournaments were held between the locals and visiting Japanese sailors. In 1941, the U.S. government seized the shrine and its lands and interned the head priest, Rev. Isamu Kudo before repatriating him to Japan. In the absence of a head priest, no activities were conducted by the shrine from 1941 until 1955.

Tsunami Devastation and the Legacy of Open Space

The tsunami of April 1, 1946 damaged a great deal of industry and property in Hilo, including Waiākea Town. The HCR sustained overwhelming damage to the main tracks and structures in the rail yard at the western end of the project site, closer to the Wailoa River and Manono Street. The businesses located at the northern edge of the project site on the south side of Kamehameha Avenue remained standing largely because the brunt of the destructive force was absorbed by the buildings along the north side of Kamehameha Avenue. The storefronts and homes did not escape water damage however, and some of the businesses never recovered (Kobayashi and Nakamura 2008).

The Waiākea Town community endured the tsunami of 1946 and rebuilt only to have their homes and businesses destroyed by the May 1960 tsunami. Waiākea Town was largely abandoned and its residents scattered inland after this disastrous event. The tsunami destroyed the shrine buildings, but Rev. Miyazaki fled inland and was able to rescue the sacred objects (Goshintai), which were then enshrined in Onomea until 1966, when the Hilo Daijingu was rebuilt at their current location on Anela Street in Hilo. Many businesses were relocated and remain active in the Hilo community today, such as KTA Super Stores, Kuhio Grill and Café 100.

The State and County responded to the hazards of occupying Hilo's tsunami zone so painfully demonstrated in two events just 14 years apart with the Kaikoʻo project of the Hawaii Redevelopment Agency. During 1962 and 1963, the County of Hawaiʻi exercised eminent domain and acquired numerous parcels of land, including the entire project site. Vulnerable areas area from downtown Hilo to Waiākea were designated for "Open" land use in order to minimize the danger of loss of life or damage to property in areas subject to possible inundation and flooding from future tsunami.

Consultation

Appendix 3 contains summaries of interviews conducted with five individuals who had extensive knowledge of the historic and cultural values of the project site. The five informants included a former employee of the Hawaii Consolidated Railroad (Roy C. Wilson), two former residents of Waiākea Town (Gloria Kobayashi and Donald Leopoldino), a member of the Hilo Daijingu congregation (Richard Kunimoto), and two descendants of original LCAw. *kuleana* recipients (Terri Napeahi and Earl Viloria). The reader is referred to Appendix 3 for details; the following is a brief summary.

Born Shotaro Suzuki on August 8, 1920 to a Japanese father and half Hawaiian/ half Caucasian mother, Roy Wilson worked for Hawai‘i Consolidated Railway Ltd. from 1939 until 1946. He has clear memories of the land uses and individuals associated with the project site. The railway operations were staffed by a multi-ethnic crew, many of whom actually lived on the project site. Shusei Kondo, one of two yard men who was responsible for operating the swing bridge that was cranked into position by hand for boats to pass and for trains to cross Wailoa River; Herbert Watson, who was the master mechanic and lived in the northernmost residence on Puhala Lane, even after he retired; Robert Stevens, who eventually took over as master mechanic; Frank Tavares, who was the warehouse supply master, and as Roy explained “he got you everything you needed” including parts for the engines and cars, etc.; Stanley Can, who was a mechanic and machinist; and Dan Correa, who was foreman for the wharf operation and who swept away (never to be found) by the second wave of the 1946 tsunami when he returned to the rail yard from the bay front to turn off the switch that controlled the electricity to the yard. When asked how he felt about the County developing a park on this land he said he thought it was a good idea. In particular, Roy stressed that if the land is getting used then they would have to maintain it. He suggested that the flagpole is the only thing that can be identified as part of the railroad and that they should preserve the concrete and keep it from deteriorating maybe with paint or sealant. He also made the following recommendation for the flagpole: “dress it up with gravel or flowers around the edges with a plaque or something that should mention how the railroad got started in the 1880s and about it”.

Gloria Kobayashi is a retired librarian and active historian. She was born Gloria Miyashiro in 1946, to Hawaiian born parents of Okinawan descent. Her father, Richard Miyashiro, was studying in Honolulu at the time of the attack on Pearl Harbor. As a result, he enlisted with the 100th Battalion and served in Italy. After the war, he returned to Hawai‘i and moved to the Big Island because his brother was already set up in Hilo with a restaurant business. On January 21, 1946, Gloria’s father started his own restaurant in Waiākea Town, that he called Café 100 in reference to his Battalion. Café 100 was located at the corner of Manono Street and Kamehameha Avenue, at the northwest end of the project site. Gloria’s mother was six months pregnant with her when the tsunami struck on April 1, 1946. She and her mother were carried to safety from the Wailoa Bridge to higher ground by a stevedore. In the aftermath, her family repaired the damage to the cafe and her two sisters were born shortly thereafter. Gloria and her family lived above Café 100 until she was 13 years old. In 1959 they moved into a brand new three bedroom house at the corner of Ulu and Manono Streets, just north of the Hilo Daijingu shrine, near the southwest end of the project site. Her father built a brand new location for Café 100, which celebrated their Grand Opening three short weeks before the 1960 tsunami. On May 23, 1960, Gloria’s family decided not to evacuate in response to the tsunami warning because they had experienced a false alarm a few weeks before. As a result, Gloria and her family were home when disaster struck. A large wave broke the picture window in the living room of their home, and as the house filled with water the tsunami lifted it off its foundations

and "turned it into a boat". The family's harrowing story is chronicled in her memoir *Our House Became a Boat*, published as part of her edited volume *Aloha 'Āina Volume II: More Big Island Memories*. In the end, the tsunami destroyed the new Café 100 building and everything inside. Although a devastating loss, the restaurant building had acted as a buffer between the surge from the Wailoa River and Gloria's home and as a result, it saved their lives. By August of 1962, Gloria's father had rebuilt Café 100 for the third time at its current location at 969 Kilauea Avenue. Today the Café 100 legacy is being carried on by Gloria's son Rick. Gloria's family home survived its night as a boat and was relocated to Iwalani Street, where it remains to this. When asked about the proposed park, Gloria responded that she thinks it is a good idea and that the land is just sitting there doing nothing today. She mentioned that there is a need for more places for kids to play. As a historian she would like to see a historic element included in the park project.

Donald Leopoldino was born in 1935 in Waiākea Town to parents of Portuguese descent. His father worked as an engineer/engine operator for the railroad and his family lived in a three bedroom house, at the east edge of the Waiākea Rail Yard, immediately adjacent to the current study area.. He served two years in Korea and while overseas he was given the nickname "Leo". Today, he is retired after having passed his local business Leo's Rubbish Service to one of his sons. According to Donald, the population of Waiākea Town was mostly Japanese and Portuguese. Donald has fond memories of evenings spent around the Hawai'i Consolidated Railway, Ltd. flagpole during the war. He was 12 years old when the 1946 tsunami struck Waiākea Town. He saw the first wave at 7 a.m. and recalls that there were three waves. The waves were "very black" because they had churned up the sand on the beach in Hilo Bay. The waves derailed the train his father was on and he and the crew were forced to abandon it. They sought refuge in the Coca-Cola building, which was made of cement and tile and effectively "saved their lives". Leo had moved inland with his wife by the time the 1960 tsunami wiped out Waiākea Town. However his mother and father still resided in his childhood home. Leo and his brother waded thru waist deep water to help his parents out of their house. When asked about the proposed park project, Leo responded "that would be a beautiful thing." Leo refers to the flagpole feature as "the monument" and he has made efforts in the past to clean and preserve it. He recommends that the monument be protected and that the sports field park incorporate the name Waiākea Town or Waiakeakai.

Richard Kunimoto was born in 1941 and resided in Onomea. He became a member of the Hilo Daijingu congregation during the 1960s, when the Goshintai were relocated to Onomea and the shrine was rebuilt there as a result of the 1960 tsunami. He never saw the shrine at Manono Street but as an active member of the Daijingu, he was able to confirm some of its history. According to Richard, the residence and activity center were in one building and the Goshintai and shrine were in the other. He was able to corroborate that the building was used as a school for a time during WWII and that the U.S. military took it over. He also stated that there were likely no activities or ceremonies between the years of 1941 and 1955 because there was no head priest until Rev. Kanno took over as interim priest in 1955.

Terri Napeahi is a descendant of the original recipient of one of the three *kuleana* properties that fall within the current study area. Terri was born in 1961 to Hawaiian parents who trace their roots to the early days of Waiākea Ahupua'a. Terri's personal connection to the land and her ancestors remains strong. For the past twenty years Terri has been pursuing her family's history and in particular, seeking evidence of the Napeahi Family link to an ancient *heiau* known as Kuakaananuu, which was located on the shore

opposite Mokuola (Coconut Island), about a half mile north of the project site. According to family oral history, her ancestors were associated with the traditional activities that took place at Kuakaananuu Heiau. Terri Napeahi's quest also led her to identify a pile of large water rounded stone that are currently situated in the Wailoa Boat Ramp parking lot under a tree as additional *pōhaku* from the former Kuakaananuu Heiau. These stones were moved to this location from the vicinity of the Moku Ola parking lot when it was renovated, and she believes that these are some of the stones that her family oral traditions recount as be retrieved and curated. When asked about the proposed park project, Terri was in favor of creating more sports fields for the community youth. She did express that the early history of the area (the use of the area by her ancestors) should be an important element of public interpretation associated with park development. She also requested that an area in a portion of the park in the vicinity of her family's former *kuleana* land be used for the establishment of a cultural preserve where all of the known *pōhaku*–including Makaokuʻi Ka Lani–from Kuakaananuu Heiau could be assembled, where interpretive material can be displayed telling the story of the events and practices associated with the *heiau*, and where Terri and others could exercise modern cultural practice.

Earl Veloria was born in 1939 to parents who lived in Waiākea Town in the 1920s and 1930s in Earl's maternal grandfather's (Isaac Hale) house, which was sold by 1938. This house was located on a remnant portion of the former *kuleana* parcel that was awarded to one of the Hale families ancestors (likely Earl's 4th or 5th great grandfather). Earl, the oldest of the living Hale family members, has no direct recollection of their former property, but his family retains knowledge of its existence. Earl was interviewed by phone and expressed no opposition to the proposed park project.

A seventh individual was also contacted (Tom Goya) whose historical expertise was more associated with the nearby Shinmachi region of Hilo. Tom simply offered that the history of the project site should be incorporated into the proposed park development.

Existing Cultural Resources

The project site is currently a vacant, grassed lot. It does not contain nature features that might important in gathering or ritual, such as caves, springs, *puʻu*, native forest groves, etc. The vegetation is highly disturbed and does not contain the quality and quantity or resources that would be important for native gathering. The project site does not currently support any traditional resource uses. However, although the project site has experienced extensive disturbance through construction and demolition of roads, highways, buildings in various eras, as well as limited damage from a tsunami and later earthmoving, dredge deposits and later removals, the memories of cultural uses through the year, linger, along with a few archaeological remnants from the 20th century (see Section 3.2.3, below). Consultation with knowledgeable individuals indicates that there is still active interest in the former native Hawaiian *kuleana* use of the area, and the project site is also associated with history of Waiākea Town and its association with Japanese immigrant culture, and particularly the history of the Japanese Daijingu Shrine.

Cultural Resources: Impacts and Mitigation Measures

The Proposed Action will not have an adverse effect on the cultural/historical resources of the project site. However, to develop a complex of sports fields without honoring the rich multi-cultural history of the area would be to miss a critical opportunity to incorporate history and planning into land use, which

would be out of keeping with the Hawaiʻi County General Plan and Special Management Area goals and objectives for the storied Hilo Bayfront. The following actions are being implemented to interpret and celebrate this heritage:

- The flagpole structure, which is the only built historic property on the project site, will be preserved and rehabilitated and put back into use to support a flagpole (see Section 3.2.3).
- In partnership with interested organizations, P&R will support interpretive signage for various locations within the sports fields to interpret the native Hawaiian kuleana use of the area, development and use of the Waiākea Rail Yard, the land use history associated with the Japanese Daijingu Shrine, and the history of Waiākea Town.
- An area in the southwestern portion of the project site, in the vicinity of the former Napeahi kuleana parcel, will be set aside for a future interpretive cultural display and for cultural practice that is expected to be developed through a partnership with family descendants of the former kuleana. As determined by the family descendants, this display may feature the pōhaku from Kuakaananuu Heiau that were historically retrieved and curated by the Napeahi family.

The Office of Hawaiian Affairs, State Historic Preservation Division, and parties who shared information about cultural practices were supplied a copy of the Draft EA, which will also be reviewed by agencies and the general public, in order to help finalize the mitigation measures.

3.2.3 Archaeology and Historic Properties

An archaeological inventory survey and limited cultural impact assessment of the property and action was conducted by ASM Affiliates, Inc. The report is attached as Appendix 3 and summarized below.

Existing Environment

The methods used for the project including review of documentary sources, fieldwork and consultation. Documentary sources included maps, local histories and ethnographic accounts, and records of lands use. Fieldwork consisted of a pedestrian survey of the entire project site conducted by three archaeologists augmented with six mechanically excavated test trenches. The cultural consultation included five individuals, who participated in informal (unrecorded) “talk story” interviews conducted by the archaeologists. Historic maps and photographs were provided to the informants, when appropriate, in order to facilitate discussion of the project site and proposed sports fields. In some cases the informants provided additional historic resources to the interviewers in the form of books and images. The information obtained through the documentary and interview portions of the work have been presented in the previous section.

The archaeological fieldwork determined that three surface sites were present, all dating from the early to middle twentieth century were recorded (see Appendix 3 for detailed maps, photographs and descriptions of all sites). Two of these (SIHP Site T-1 and T-2) are remnant asphalt pavements (perhaps the former roadways Puhala Lane and Ulu Street), and the third (SIHP Site T-3) is a concrete foundation associated with Hawaii Consolidated Railway. Subsurface testing did not reveal any intact buried cultural deposits or features from either the Precontact or Historic Periods. While Historic Period cultural material was encountered during the subsurface testing, an assessment of the stratigraphy indicates that the study area

experienced a high level of prior ground disturbance and there were no intact deposits encountered. Site T-1, Puhala Lane, was constructed in the early 1900s and Site T-2, Ulu Street, was built in the middle 1900s. Both roads were abandoned after the 1960 tsunami, and both are evaluated to be significant according to the criteria under which historic properties are evaluated in the State of Hawai‘i under Criterion d for the information they have yielded about the twentieth century growth of the Waiākea Town region of Hilo.

Site T-3 is a concrete foundation structure that once supported a flagpole associated with Hawaii Consolidated Railway Ltd., which operated on the study property from 1899 to 1946 (from 1899-1916 as the Hilo Railroad Company). This foundation appears to have been built in 1926. Site T-3 is evaluated as significant under Criterion a as it is one of the few physical reminders of the railway industry that was instrumental in the development of Hilo and the greater east Hawai‘i region. This site is also significant under Criterion d for the information it adds to the understanding of the use and development of the Waiākea Town portion of Hilo

Impacts and Mitigation Measures

For Sites T-1 and T-2, the archaeologist recommended that that the archival and archaeological documentation presented in the AIS will serve to mitigate any potential impacts from future development, and thus no further historic preservation work was recommended for these two sites. The archaeologist is recommended that Site T-3 be preserved as part of the proposed sports field park, and that it be rehabilitated and put back into use as a flagpole feature with interpretive information provided to the public concerning its origin and significance. An archaeological preservation plan would be prepared in accordance with HAR 13§13-277 and submitted to DLNR-SHPD for review and approval. The subsurface testing conducted as a part of the AIS demonstrated that the likelihood of encountering intact subsurface archaeological deposits is remote; therefore, archaeological monitoring was not recommended with respect to development of the property. However, in the unlikely event that any unanticipated archaeological resources are unearthed during development activities, in compliance with HAR 13§13-280, work in the immediate vicinity of the finds will be halted and DLNR-SHPD contacted.

The AIS was officially transmitted to the State Historic Preservation Division (SHPD) for review, comment and concurrence in June 2015. The Final EA will report on this review.

3.3 Infrastructure

3.3.1 Utilities

Existing Facilities and Services and Impacts

Electrical power to the site is supplied by Hawai‘i Electric Light Company (HELCO), a privately owned utility company, via its island-wide distribution network, with poles and lines on Kuawa Street. No electricity would be required in Phase I, but future phases will require it for lighting and other power requirements of the comfort station and concession stand. Telephone and cable TV service are available, although not anticipated to be required, from Hawaiian Telcom and Oceanic Time Warner Cable.

An existing 12-inch water line runs along Kamehameha Avenue, and an 8-inch water line runs along Manono Street, which will be the line used for the sports fields. Water service in this first phase will only be to park drinking fountains and temporary irrigation. This connection will also service future planned facilities, including comfort stations and a concession stand.

An existing 8-inch wastewater line bisects the project site east to west and outlets to the wastewater main on Manono Street. Existing manhole tops located along this line that are at or above future grade will be lowered and buried six to twelve inches below grade so as not to impact the playability of the sports fields. No wastewater connection is required for the first phase. The proposed connection for the future comfort station and concession stand is anticipated to be through a manhole located on the project site. Capacity is not anticipated to be an issue, as previous connections to the line from this area are no longer in use and the future usage will not exceed the previous usage. However, the existing sewer line is old and the viability of connection will need to be verified at the appropriate time. An alternate connection could be to the existing 10-inch sewer line along Kuawa Street.

An existing drainage culvert at Manono Street collects runoff from the lot and discharges it into the Wailoa Boat Harbor and thence to Hilo Bay. Future development of the park will utilize this existing drainage outlet. A surface retention basin or shallow seepage pits will be utilized to help retain the net increase in runoff generated by new parking lots in the initial phase. Similar drainage measures will need to be implemented in future phases of the project to account for additional impervious areas added.

In summary, the Proposed Action of sports field development would not have any substantial impact on existing utilities.

3.3.2 Roadways and Traffic

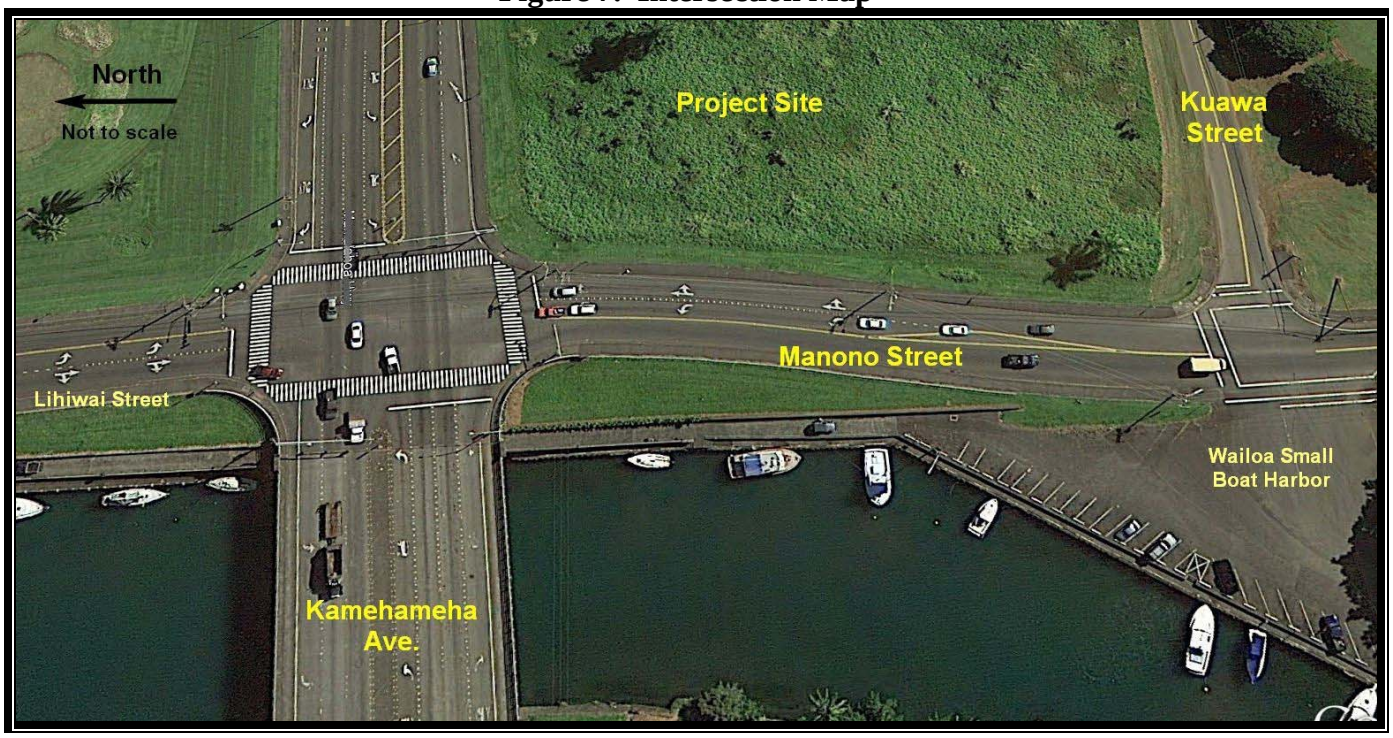
A Traffic Impact Assessment Report (TIAR) for the Proposed Action was conducted by SSFM International, Inc.. The report is attached as Appendix 4 and summarized below.

Existing Facilities

As shown in Figure 7, Kamehameha Avenue (State Route 19) is a four-lane, two-way, undivided roadway with bike lanes and paved sidewalks on both sides of the street. It is a State-owned highway with the functional classification of urban principal arterial and a posted speed limit of 35 mph. The road travels along the Hilo Bay coastline. The street name changes along its extent and is also called Kalaniana‘ole Street, Bayfront Highway, and Hawai‘i Belt Road in places. However, the street name adjacent to the project site is Kamehameha Avenue and is oriented in the east-west direction. There are no bus stops along Kamehameha Avenue adjacent to the project site. The closest bus stop is located along Banyan Drive less than a quarter of a mile north of the intersection of Kamehameha Avenue and Manono Street. The intersection of Kamehameha Avenue and Manono Street is signalized with marked crosswalks on all legs. Dedicated left and right turn lanes exist along the Kamehameha Avenue approaches.

Manono Street approaches have a dedicated left-turn lane and shared through/right-turn lane with right-turn acceleration lane along Kamehameha Avenue. Manono Street is a two-lane, two-way, undivided roadway with paved shoulders and sidewalks on both sides of the street from Kamehameha Avenue to

Figure 7. Intersection Map



Pi‘ilani Street. It is owned by the County of Hawai‘i and has the functional classification of urban major collector and posted speed limit of 35 mph. This road is oriented in the north-south direction. Manono Street becomes Lihiwai Street north of Kamehameha Avenue.

Kuawa Street is a two-lane, two-way, undivided roadway with no paved shoulders or sidewalks. There are no posted speed limit signs along the roadway and therefore the speed limit is 25 mph. It is a County of Hawai‘i owned road and oriented in the east-west direction, parallel to Kamehameha Avenue. A driveway connecting to the Wailoa Small Boat Harbor is located at the west leg of the intersection of Manono Street and Kuawa Street.

The intersection of Manono Street and Kuawa Street is controlled with a stop sign on the Kuawa Street/driveway approaches. It has marked crosswalks on the west, north, and east legs. There are no dedicated turn lanes along any approach. The Wailoa Small Boat Harbor driveway is about 80 feet wide. The wider driveway allows for vehicles with boat trailers to make wide turning movements in and out of the boat harbor area. However, the wider driveway also has the consequence of allowing vehicle movements to occur in different areas.

In 2013, average daily traffic (ADT) during the weekdays along Kamehameha Avenue in the project area was 23,000 vehicles, based on Hawai‘i Department of Transportation (HDOT) Historical Traffic Station Maps. The ADT along Manono Street in the project area in 2013 was 10,700 vehicles. Appendix 4 evaluated directional movements examines directional movements during the weekday and weekend

peaks. During the weekend peak hour, which is during the mid-day on Saturday and coincides with the greatest expected use of the sports fields, there were approximately 1,100 vehicles travelling along Kamehameha Avenue, with an equal eastbound and westbound split of about 550 vehicles per direction, or 275 vehicles per lane per hour, much less than the weekday peaks. During the weekend peak hour, there were approximately 750 vehicles traveling along Manono Street with an equal northbound and southbound split. This equates to approximately 375 vehicles per lane per hour, which is about the same as the weekday peak. Both of these are under the roadway capacity.

Although there are higher traffic volumes along Kamehameha Avenue during the weekday peak hours, it was assumed that the magnitude of the project generated trips during the weekday peak hours will not have as much of an effect on the roadway and intersection operations as it will over the weekend. It is because of this that weekend intersection volumes were analyzed. Intersection counts were taken during the weekend to account for the volume of traffic generated by the various sporting events for the existing facilities and projected uses of the Kuawa Street New Sports Fields Development. Multi-modal turning movement traffic counts were taken at the study intersections on Saturday, March 14, 2015 during the midday peak period from 11:30 AM to 1:30 PM. This time period was selected after a review of the numerous sporting events occurring at the adjacent facilities at the Ho'olulu Park Recreational Complex on that particular date and time.

The turning movement traffic counts included classification of passenger vehicles, heavy vehicles (buses, trucks, vehicles with trailers), bicycles, and pedestrians. Table 3 and Figure 4 of Appendix 4 provide details on the numbers of each type of traffic at the intersection. The percentage of heavy vehicles, bicycles and pedestrians volumes are each less than 1% of the total intersection volumes, but it is important to note over the two hour peak period, there were 23 pedestrians and 24 bicycles counted at the intersection of Kamehameha Avenue and Manono Street/Lihiwai Street. At the intersection of Manono Street and Kuawa Street/Bayfront driveway, there were 13 pedestrians and 14 bicycles counted over the two-hour peak period. The sidewalks and bike facilities in the area make it easier for pedestrians and bicyclists to travel along the roadways.

Level of service (LOS) is a rating system used in traffic engineering to measure the effectiveness of roadway operating conditions. There are six LOS ranging from A to F. LOS A is defined as being the least interrupted flow conditions with little or no delays, whereas LOS F is defined as conditions where extreme delays exist. A Policy on Geometric Design of Highways and Streets (AASHTO 2011) states that an "appropriate" LOS for an urban arterial, which is the classification of Kamehameha Avenue through the study area, is LOS C or D. An "appropriate" LOS for an urban collector, which is the classification of Manono Street is LOS D or better.

Another measure of intersection operation is the volume to capacity (v/c) ratio. This is the ratio of the volume of traffic utilizing the intersection compared to the maximum volume of vehicles that can be accommodated by the intersection during a specific period of time. A v/c ratio under 0.85 means the intersection is operating under capacity and excessive delays are not experienced. An intersection is operating near its capacity when v/c ratios range from 0.85 to 0.95. Unstable flows are expected when the v/c ratio is between 0.95 and 1.0. Any v/c ratio greater than or equal to 1.0 indicates that the intersection is operating at or above capacity which results in a LOS F per the HCM (TRB, 2010). A traffic movement

can have a poor LOS but low v/c which suggests that the traffic volumes along that movement are low but have to wait a long time to make the movement. This is common for low volume protected turn movements or side streets that have to wait through a long cycle length for their split to come up.

As detailed in Appendix 4, the existing (2015) LOS for the unsignalized and signalized intersection and traffic movements operated at an appropriate LOS D or better during the weekend peak hour (see Table 6). V/C for all movements were under capacity.

Impacts and Mitigation Measures

As discussed above, the metric for analysis of traffic impacts was whether the Proposed Action would cause the intersection LOS to fall below LOS D during the time period where traffic generated from the new sports fields would be expected to be by far at its highest – the weekend mid-day period . Intersection LOS and delay were determined for the weekend peak hour using traffic analysis software, as documented in Appendix 4.

To assess future conditions, the analysis used a cumulative perspective, assessing all past, current and future foreseeable projects and their potential contribution to traffic. The year 2020 was used as the baseline, which is 5 years after the Proposed Action would be undertaken. From research into the Statewide Transportation Improvements Program (STIP), it was determined that no roadway construction is expected to be completed along Kamehameha Avenue, Manono Street or Kuawa Street near the project site by the year 2020. Research into the State of Hawai‘i Office of Environmental Quality Control library, determined that no future developments are expected to be complete by the year 2020 that would affect the roadway geometrics or traffic volumes along Kamehameha Avenue, Manono Street and Kuawa Street in the project area.

Even without any new projects nearby, traffic is expected to grow. The *Hawai‘i Long Range Land Transportation Plan* (LRLTP) TransCAD model (CH2MHill 2013) projects a compounded annual increase of 1.3% along Kamehameha Avenue and 1.4% along Manono Street near the project area. The increase was applied to the existing traffic along Kamehameha Avenue and Manono Street to get the forecasted volumes for Future (2020) Without Project conditions.

With the Proposed Action, traffic will be greater. To estimate by how much, the TIAR examined the level of traffic that is typically generated by new sports fields of this particular size. By a methodology explained in Appendix 4, it was determined that in a worst-case scenario, about 44 trips in and 44 trips out would during the peak hour. The trips were then “distributed” to their expected origins and destinations based on *Hawai‘i Long Range Land Use Transportation Plan* data (Ibid.). This allowed calculations of how these new trips would affect the project area intersections.

As shown in Tables 3a and 3b, both the unsignalized and signalized intersection and movements would continue to operate at an appropriate LOS D or better during the weekend peak hour with all v/c under capacity in the year 2020. Additionally, in a letter in response to early consultation of March 25, 2015 (see Appendix 1a for letter), the Hawai‘i County Police Department stated that it did not anticipate any significant impacts to traffic or public safety concerns.

Table 3a. Traffic Conditions in 2020 Without Project

Signalized Intersection	App	Mvmt	Saturday Midday		
			Delay	v/c	LOS
Manono Street at Kuawa Street/Bayfront driveway	EB	LTR	17.8	0.08	C
	WB	LTR	16.7	0.25	C
	NB	L	8.1	0.01	A
	SB	L	8.3	0.04	C
Signalized Intersection	App	Mvmt	Saturday Midday		
			Delay		
Kamehameha Avenue at Manono Street	Intersection		23.1	-	-
		L	13.2	0.29	B
		T	17.3	0.30	B
		R	17.9	0.30	B
		L	14.5	0.12	B
		T	18.9	0.31	B
		R	16.4	0.05	B
		L	26.5	0.70	C
		TR	30.6	0.41	C
		L	29.7	0.15	C
		TR	41.5	0.88	D

Table 3b. Traffic Conditions in 2020 With Project

Signalized Intersection	App	Mvmt	Saturday Midday		
			Delay	v/c	LOS
Manono Street at Kuawa Street/Bayfront driveway	EB	LTR	21.1	0.09	C
	WB	LTR	21.6	0.43	C
	NB	L	8.1	0.01	A
	SB	L	8.4	0.08	A
	EB	LTR	21.1	0.09	C
Signalized Intersection	App	Mvmt	Saturday Midday		
			Delay	v/c	LOS
Kamehameha Avenue at Manono Street	Intersection		23.6	-	-
	EB	L	13.9	0.29	B
		T	18.2	0.31	B
		R	19.5	0.36	B
	WB	L	15.1	0.14	B
		T	19.7	0.32	B
		R	17.1	0.06	B
	NB	L	25.9	0.76	C
		TR	29.8	0.41	C
	SB	L	29.7	0.14	C
		TR	41.5	0.88	D

Notes: Delays are in seconds.

No impacts to pedestrian or bicycle safety are expected. As shown in the Site Plan in Figure 5, a future phase of the Proposed Action will construct a pedestrian/bicycle path that will improve conditions.

3.3.3 Airport Safety

Use of the park at night would require lighting, which would not be provided initially but would possibly be constructed in a later phase. Sports lighting for County parks are generally between 60 and 110 feet high. The project site is under a principal flight path for Hilo International Airport (west approach to Runway 8/26). It is within 1,400 feet of the airport boundary and 3,200 feet of Runway 8. Therefore, the Airports Division of the Hawai‘i Department of Transportation was contacted by letter on April 3, 2015, to determine if the agency had concerns regarding the height of the lighting facilities.

By letter of May 5, 2015 (see Appendix 1a for full text), the Airports Division determined that the project site is within the approach/departure path to Runway 8/26. Due to this proximity, the County will be required to file Federal Aviation Administration (FAA) Form 7460-1 “Notice of Proposed Construction or Alteration” for each proposed light pole, as well as for the temporary erection of the crane equipment that will be required during construction. The airlines have commented that any light pole above 85 feet in height above existing terrain would impact their takeoff performance. Therefore, the Airports Division recommended that the maximum height of the light poles for the recreational fields be limited to 85 feet. The direction of the lights should also be aimed such that it will not impact the pilots’ vision. The Airports Division also expressed concern about all uses near the airport being potential wildlife (bird) attractants, which could create hazards for operations at the airport.

In response to these concerns, the project has adopted the following mitigation:

- P&R will file Form 7460-1 if and when they proceed with installing lighting for the sports fields.
- No lighting structures taller than 85 feet will be installed without prior concurrence of the Airports Division.
- All lights will be aimed such that they do not impact the vision of pilots landing or taking off at Hilo International Airport.
- No landscaping that attracts birds into the approach or departure airspace, including ponds, will be utilized.

3.4 Secondary and Cumulative Impacts

The Proposed Action will not involve any substantial secondary or cumulative impacts, such as population changes or effects on public facilities. Traffic can be considered a secondary impact of park development, and it has been fully evaluated through a Traffic Impact Assessment Report (TIAR).

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 Proposed Action will have very limited and temporary construction period impacts, such as noise, traffic, dust and sedimentation. Several other projects, all recreationally related, are occurring in the area. As discussed above in Section 1.5, DLNR-DOBOR has used the site in the past for temporary storage and dewatering of dredge deposits from the Wailoa River and is again considering use of the site for an upcoming dredging project prior to construction of the sports fields. They are currently coordinating with P&R concerning utilizing this site or perhaps an alternate site, along with the potential for utilization of the tested and cleared deposits for project fill. Because of the coordination, no cumulative effects are expected, other than perhaps beneficial ones. DLNR Division of State Parks is currently planning some

repair and maintenance activities at Wailoa State Park, which would also include construction of minor new facilities. The construction would occur on the Wailoa River side of the park, at least a quarter mile southwest of the project site. Due to the minor nature and location of these activities, no adverse interaction would be expected. Finally, the Hilo Bayfront Trails project will be constructing a shared use path that would have one terminus the southwest corner of the project site. According to project officials at P&R and Hilo Bayfront Trails, Inc., the non-profit in charge of the project, this section of the trail would not be constructed during the construction period of the Kuawa Street sports fields project. In any case, the trail construction would be very minor and the construction period temporary, as it involves simply a 12-foot wide shared use path. Ultimately, there would be a beneficial interaction between the projects.

None of these projects would generate impacts that would be likely to accumulate with those from development and operation of a sports field. Operationally, future traffic impacts were explicitly assessed in the TIAR from a cumulative perspective that considered other traffic in the area, and found to be non-significant.

3.5 Required Permits and Approvals

The following permits and approvals would be required:

- National Pollutant Discharge Elimination System Permit (State DOH)
- Grading, Grubbing and Driveway Permits (County DPW)
- Building Permits and Plan Approval (County DPW and Planning)
- Variance or exemption from HCC Chapter 27 – Flood Control to allow minor fill in Flood Zone
- Chapter 6e, HRS, determination from State Historic Preservation Division on historic property effects
- Disability and Communication Access Board (DCAB) plan review and approval
- Approval from Department of Health of soil mitigation plans

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 Action would promote these goals by providing an appropriate site for additional recreational and educational opportunities for the project area, thereby enhancing quality-of-life and community and social well-being.

3.6.2 Hawai‘i State Land Use Law and Hawai‘i County Zoning

Hawai‘i State Land Use District. All land in the State of Hawai‘i is classified into one of four land use categories – Urban, Rural, Agricultural, or Conservation – by the State Land Use Commission, pursuant to Chapter 205, HRS. The property is in the State Land Use Urban District. The Proposed Action for use of the project site as a park is consistent with intended uses for this Land Use District.

3.6.3 Hawai‘i County Zoning and Property Designations

The project site is zoned Open, and the sports fields are a permitted use in this zoning category.

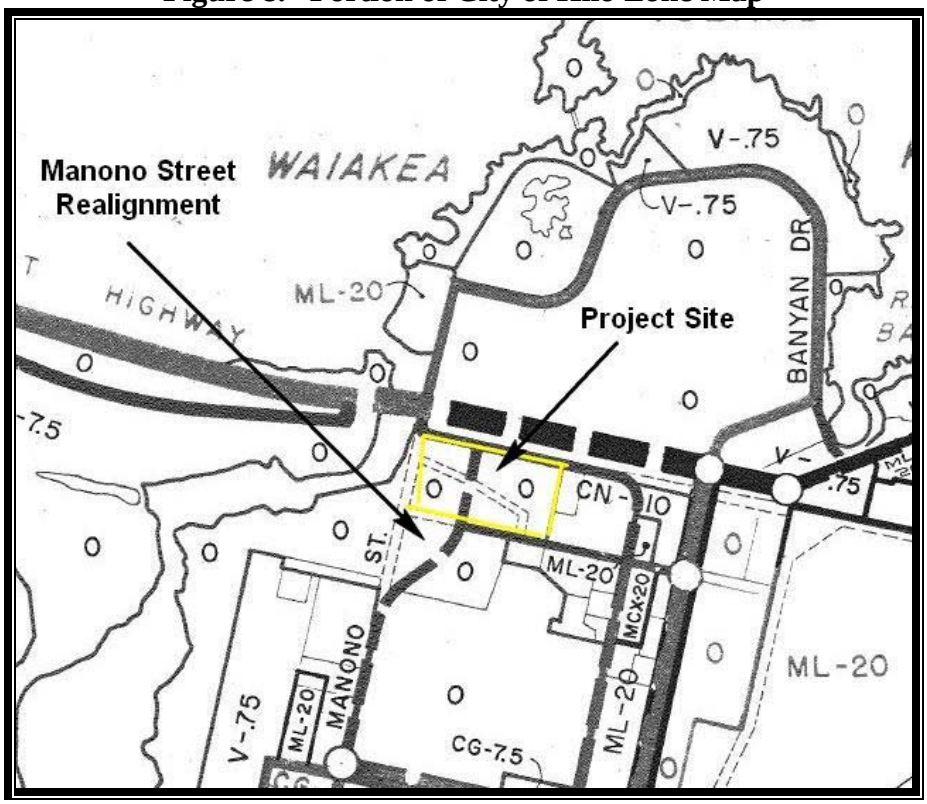
The Tax Map for the project site (Figure 3) reveals five current and a number of former legal properties that comprise the project site, reflecting the complex land use history of the site discussed in Section 3.2. All five extant properties are owned by the State of Hawai‘i and are in the process of being transferred via an Executive Order to the County of Hawai‘i for recreational purposes. As discussed in Section 3.3.1, a sewer easement crosses the project site, which will not be adversely affected by the proposed project. The TMK map also shows the former course of Ulu Street, which is no longer a valid right-of-way and thus will not be adversely affected by uses which span its former course. The Hawai‘i County Planning Department noted in its April 14, 2015 letter in response to early consultation (see Appendix 1a for full text) that the official zoning map in the Hawai‘i County Code, Chapter 25, Section 35-8-33 (City of Hilo Zone Map), adopted on December 26, 1968, indicates a 60-foot right-of-way for a realignment of Manono Street that crosses through the project area (see Figure 8). Although there have been no proposals, or indeed reasons, to undertake this realignment in at least the last four decades, and it is no longer practical because of both traffic circulation and topography, the Manono Street Realignment has never been removed from the map. The Planning Department suggested that if the right-of-way is no longer an applicable alignment, the City of Hilo map should be amended appropriately.

3.6.4 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. 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 elements, with policies, objectives, standards, and principles for each. There are also discussions of the specific applicability of each element to the nine judicial districts comprising the County of Hawai‘i. Most relevant to the proposed project are the following Goal and Policies, and Courses of Action of particular chapters of the General Plan:

RECREATION
12.2 GOALS
(a) Provide a wide variety of recreational opportunities for the residents and visitors of the County.
(b) Maintain the natural beauty of recreation areas.
(c) Provide a diversity of environments for active and passive pursuits.

Figure 8. Portion of City of Hilo Zone Map



12.3 POLICIES

(a) Strive to equitably allocate facility-based parks among the districts relative to population, with public input to determine the locations and types of facilities.

(c) Recreational facilities shall reflect the natural, historic, and cultural character of the area.

(d) The use of land adjoining recreation areas shall be compatible with community values, physical resources, and recreation potential.

(g) Facilities for compatible multiple uses shall be provided.

(h) Provide facilities and a broad recreational program for all age groups, with special considerations for the handicapped, the elderly, and young children.

(i) Coordinate recreational programs and facilities with governmental and private agencies and organizations. Innovative ideas for improving recreational facilities and opportunities shall be considered.

12.4 STANDARDS

(c) Community Parks:

- Community recreation area serving surrounding urban areas, and entire community in rural areas. Provides active and passive activities.
- Between 4 and 8 acres, within the center of the community or several neighborhoods.
- Facilities include: multi-purpose building; gymnasium (where not serviceable from a district park); courts for basketball, volleyball and tennis; ballfields for softball/ baseball, soccer,

football; play area and equipment for young children; walking and jogging paths; picnic and passive area; night lights and an adequate parking area.

12.5.2.2 COURSES OF ACTION FOR SOUTH HILO

(f) Expand the depth of coastal recreation areas. Park areas should be connected with trails to increase public access.

(m) Develop a center/complex for major cultural, educational and recreational activities.

Discussion: The Proposed Action is an appropriately scaled community park planned to serve the growing demand among a broad range of age groups for active sports facilities. It is adjacent to the Hoʻolulu Park Recreational Complex and near the Hilo Bayfront soccer fields, and it complements these facilities. It will also connect to planned area shared-use paths. It satisfies relevant goals, policies, standards and course of action for recreation.

HISTORIC SITES

6.2 GOALS

(a) Protect, restore, and enhance the sites, buildings, and objects of significant historical and cultural importance to Hawaiʻi.

(b) Appropriate access to significant historic sites, buildings, and objects of public interest should be made available.

Discussion: The Proposed Action has involved appropriate inventory survey to determine the presence and significance of historic sites, and to propose preservation of one site. Therefore the action satisfies relevant goals, policies, and courses of action for historic sites in Hawaiʻi County.

NATURAL BEAUTY

7.2 GOALS

(a) Protect, preserve and enhance the quality of areas endowed with natural beauty, including the quality of coastal scenic resources.

(b) Protect scenic vistas and view planes from becoming obstructed.

(c) Maximize opportunities for present and future generations to appreciate and enjoy natural and scenic beauty.

7.3 POLICIES

(a) Increase public pedestrian access opportunities to scenic places and vistas.

(d) Access easement to public or private lands that have natural or scenic value shall be provided or acquired for the public.

(i) Do not allow incompatible construction in areas of natural beauty.

Discussion: The Proposed Action does not involve scenic areas or vantages and would not be inconsistent with the natural beauty of the Hilo area. Therefore the action is consistent with relevant goals, policies, and courses of action of the Natural Beauty section of the Hawaiʻi County General Plan.

NATURAL RESOURCES

8.2 GOALS

(a) Protect and conserve the natural resources from undue exploitation, encroachment and damage.

(b) Provide opportunities for recreational, economic, and educational needs without despoiling or endangering natural resources.
(c) Protect and promote the prudent use of Hawaii's unique, fragile, and significant environmental and natural resources.
(e) Protect and effectively manage Hawaii's open space, watersheds, shoreline, and natural areas.

8.3 POLICIES

(b) Encourage a program of collection and dissemination of basic data concerning natural resources.
(h) Encourage public and private agencies to manage the natural resources in a manner that avoids or minimizes adverse effects on the environment and depletion of energy and natural resources to the fullest extent.
(i) Encourage an overall conservation ethic in the use of Hawaii's resources by protecting, preserving, and conserving the critical and significant natural resources of the County of Hawaii.
(u) Ensure that activities authorized or funded by the County do not damage important natural resources.

Discussion: The Proposed Action does not involve destruction of natural resources and is consistent with the goals, standards and policies of the Natural Resources chapter of the Hawai'i County General Plan.

The *Hawai'i County General Plan Land Use Pattern Allocation Guide (LUPAG)*. 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 within the planned public and cultural facilities, public utilities and safety features, and transportation corridors. The project site is classified as Open in the LUPAG. Use of the project site for a park is consistent with this designation.

3.6.5 Special Management Area

The property is located within the County's Special Management Area (SMA). Public parks, public uses, and structures are allowed in the Special Management Area. After the EA is complete, P&R will prepare an SMA Assessment describing the characteristics of the project that are relevant to the SMA, the potential impacts on SMA resources, and mitigation measures to avoid or reduce impacts. The following presents and analysis of the project's effect on key SMA resources:

Recreational Resources. The proposed sports fields would not in any manner adversely affect any recreational resources, and the Proposed Action expands recreational uses in the highly popular Hilo Bayfront area. The Proposed Action would not restrict any shoreline uses such as hiking, fishing, or water sports, The Proposed Action would help P&R in its mission to provide adequate, accessible and diverse recreational opportunities.

Historic Resources. The historic resources of the project site have been inventoried and evaluated in coordination with the State Historic Preservation Division. The Proposed Action would preserve one of the sites and provide opportunities for interpretation of an interesting aspect of Hilo's history.

Scenic and Open Space Resources. The guidelines contained in Rule 9 of the Hawai‘i County Planning Commission Rules (which governs the SMA) express the intent to minimize development that would "substantially interfere with or detract from the line of site toward the sea from the State Highway nearest the coast or from other scenic areas identified in the General Plan." The proposed improvements would not adversely affect any sight lines or scenic resources in any way. Furthermore, the project maintains the quality of scenic and open space resources.

Coastal Ecosystems. The nature, location and design of the proposed sports fields, along with precautions that will be undertaken during construction, would minimize impacts to coastal biological resources. No coastal ecosystems are present on or directly adjacent to the property, and no threatened or endangered animal or plant species would be affected.

Economic Uses. The Proposed Action use would not impact adversely affect any economic aspects of the coastal zone, and it would positively contribute to the economy by providing safe and accessible facilities for residents and some visitors.

Coastal Hazards. The proposed improvements would be undertaken mainly outside designated coastal floodplains, with all structures entirely outside. The proposed land use, sports fields, are consistent with approved open-space uses and will not adversely affect any floodplain. Maps printed by the Pacific Tsunami Warning Center/Hawai‘i County Civil Defense Agency locate the project site within an area that should be evacuated during a tsunami warning (http://www5.hawaii.gov/tsunami/maps.asp). Recreation is a generally allowed and appropriate use within the coastal flood zones. Warning sirens are present nearby and the area can readily be evacuated in the event of a tsunami or other coastal hazard emergency. No aspect of the Proposed Action would adversely affect the public exposure to coastal hazards.

In summary, the Proposed Action would benefit and/or not adversely impact Special Management Area resources, including beaches, recreation, native species or ecosystems, historic sites, water quality, and susceptibility to hazards. Minor impacts and mitigation measures are discussed individually in the resource sections of Chapter 3, above. The Proposed Action does not involve any irreversible or irretrievable commitment of resources or any substantial adverse environmental impact that cannot be avoided. The Planning Department will review the SMA Assessment and determine the level of permitting required in order to implement the Proposed Action.

PART 4: DETERMINATION

Based on the information to this point, the Hawai‘i County Department of Parks and Recreation expects to determine that the proposed project will not significantly alter the environment. It is therefore anticipated that an Environmental Impact Statement is not warranted and that the Department will issue a Finding of No Significant Impact (FONSI). A final determination will be made by the Hawai‘i County Department of Parks and Recreation after consideration of comments on the Draft EA.

PART 5: FINDINGS AND REASONS

Chapter 11-200-12, Hawai‘i Administrative Rules, outlines those factors agencies must consider when determining whether an Action has significant effects:

1. *The proposed project will not involve an irrevocable commitment or loss or destruction of any natural or cultural resources.* No valuable natural or cultural resources would be committed or lost by the Proposed Action, which would not involve significant historic sites or native species or habitat.
2. *The proposed project will not curtail the range of beneficial uses of the environment.* The Proposed Action expands and in no way curtails beneficial uses of the environment, and through proposed remediation of minor levels of soil contamination, expands potential beneficial uses.
3. *The proposed project will not conflict with the State's long-term environmental policies*. 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 Proposed Action is minor, environmentally beneficial, and fulfills aspects of these policies calling for an improved social environment by improving and expanding recreational opportunities. It is thus consistent with all elements of the State’s long-term environmental policies.
4. *The proposed project will not substantially affect the economic or social welfare of the community or State.* The Proposed Action will benefit the social welfare of the community and State by allowing for recreational use of public property for public benefit.
5. *The proposed project does not substantially affect public health in any detrimental way.* The Proposed Action will promote public health through provision of recreational opportunities. Remediation of minor levels of soil contamination will be undertaken, which will protect public health during construction and use of the site and improve the environment.
6. *The proposed project will not involve substantial secondary impacts, such as population changes or effects on public facilities*. No secondary effects are expected to result from the Proposed Action, which would not induce in-migration or unduly affect roads or other public facilities.
7. *The proposed project will not involve a substantial degradation of environmental quality*. The Proposed Action is minor and environmentally benign, and would thus not contribute to environmental degradation with adherence to Best Management Practices.
8. *The proposed project will not substantially affect any rare, threatened or endangered species of flora or fauna or habitat.* The project site supports overwhelmingly alien vegetation. Impacts to rare, threatened or endangered species of flora or fauna will not occur, with planned restrictions of the timing of vegetation removal.
9. *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.* Effects to

resources and conditions, including traffic flow, have been considered from a cumulative perspective. The Proposed Action 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.

10. *The proposed project will not detrimentally affect air or water quality or ambient noise levels.* Slight increases in noise and effects to air quality will occur, but below levels that would require mitigation.
11. *The project does not affect nor would it likely to be damaged as a result of being located in an environmentally sensitive area such as a flood plain, tsunami zone, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal area.* Although the project site is in an area with volcanic and seismic risk, the entire Island of Hawai‘i shares this risk, and the Proposed Action is not imprudent to undertake.
12. *The project will not substantially affect scenic vistas and viewplanes identified in county or state plans or studies.* The Proposed Action would not adversely impact any scenic sites or viewplanes. Loss of several large trees will be compensated for by landscaping.
13. *The project will not require substantial energy consumption*. The Proposed Action involves only minor use of energy for construction and operation.

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 11-200-12 of the State Administrative Rules.

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Kuawa Street New Sports Fields Development

Environmental Assessment

APPENDIX 1a
Comments in Response to Early Consultation

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William P. Kenoi
Mayor

Harry S. Kubojiri
Police Chief

Paul K. Ferreira
Deputy Police Chief

County of Hawai`i

POLICE DEPARTMENT
349 Kapi'olani Street • Hilo, Hawai'i 96720-3998
(808) 935-3311 • Fax (808) 961-2389

March 25, 2015

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

Dear Mr. Terry:

SUBJECT: EARLY CONSULTATION FOR ENVIRONMENTAL ASSESSMENT FOR KUAWA STREET RECREATIONAL FIELDS, HILO, ISLAND OF HAWAII, TMKs (3) 2-2-032:003, 004, 008, 019, 087 AND 088

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.

If you have any questions, please contact Captain Richard Sherlock, S. Hilo Patrol Commander, at 961-2214.

Sincerely,

HENRY J. TAVARES, JR.
ASSISTANT POLICE CHIEF
AREA I OPERATIONS BUREAU

RS:lli
150192

William P. Kenoi
Mayor

Duane Kanuha
Director

Bobby Command
Deputy Director

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County of Hawai'i

PLANNING DEPARTMENT

East Hawai'i Office
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Phone (808) 961-8288
Fax (808) 961-8742

April 14, 2015

Ron Terry, Ph.D.
Geometrician Associates, LLC
P.O. Box 396
Hilo, HI 96721

Dear Mr. Terry:

Subject: Pre-Consultation for Draft Environmental Assessment
Project: Kuawa Street Recreational Fields
TMK: 2-2-032:003, 004, 008, 019, 087 and 088, South Hilo, Hawai'i

Thank you for your letter dated March 13, 2015, requesting comments from this office regarding the preparation of a Draft Environmental Assessment (DEA) for the subject project.

The County of Hawai'i Department of Parks and Recreation (P & R) proposes to convert an open area makai of P & R's Ho'olulu Complex into recreational fields and support facilities. The project would remove existing vegetation, provide turf grass suitable for recreation, and construct a new multi-use football/soccer/rugby field capable of hosting adult level regulation games. This field would include necessary facilities such as goals and goal posts, as well as bleachers on concrete slab (with provisions for future weather-protective covering), fencing, drinking fountains and related amenities.

The subject parcels contain 9.053 contiguous acres. The subject parcels are zoned Open by the County. They are situated within the State Land Use Urban District. In addition, the Hawai'i County General Plan Land Use Pattern Allocation Guide (LUPAG) Map designates the parcels as Open. They are within the Special Management Area (SMA); however, they do not have frontage along the coastline.

Please note that public uses, structures, and buildings and community buildings are permitted uses in any district, provided that the director has issued plan approval for such use. Therefore, the proposed project will require a Plan Approval issued by this office.

Finally, according to Hawai'i County Code, Chapter 25, Section 25-8-33 (City of Hilo zone map), there is a proposed sixty (60) foot right-of-way extension alignment for Manono Street

that crosses through the project area. If this right-of-way is no longer an applicable alignment, the City of Hilo zone map should be amended appropriately.

We have no further comments to offer, at this time. However, please provide our department with a copy of the Draft Environmental Assessment for our review and comment.

If you have any questions, or if you need further assistance, please feel free to contact Bethany Morrison of this office at (808) 961-8138.

Sincerely,

DUANE KANUHA
Planning Director

BJM:cs
P:\wpwin60\Bethany\EA-EIS Review\preconsultdraftea Kuawa Street Recreational Fields.doc

cc: Mr. Clayton Honma, Director
Department of Parks and Recreation

DAVID Y. IGE
GOVERNOR

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Deputy Directors
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
AIRPORTS DIVISION
400 RODGERS BOULEVARD, SUITE 700
HONOLULU, HAWAII 96819-1880

IN REPLY REFER TO:
AIR-EP
15.0035

May 5, 2015

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

Dear Mr. Terry:

Subject: Kuawa Street Recreational Fields, Hilo, Hawaii
Early Consultation for Environmental Assessment

In response to your letter dated April 3, 2015, Airports Division has the following comments:

- The proposed park falls within Hilo International Airport's approach/departure path to Runway 8/26.
- Due to its close proximity to the Hilo International Airport, the developer is required to file the Federal Aviation Administration (FAA) Form 7460-1 "Notice of Proposed Construction or Alteration" for each proposed light pole, as well as for the temporary erection of the crane equipment that will be required during construction. The form can be filed online at https://oeaaa.faa.gov/oeaaaexternal/portal.jsp.
- The airlines have commented that any light pole above eighty-five (85) feet would impact their takeoff performance. Therefore, it is recommended that the maximum height of the light poles for the recreational fields be limited to 85 feet. The direction of the lights should also be aimed such that it will not impact the pilots' vision.
- The Airports Division is also very concerned about the proposed land uses of surrounding developments due to the potential wildlife attractants which could create hazards for operations at the Airfield. In accordance with the Federal Aviation Administration (FAA) Advisory Circular 150/5200-33B, *Hazardous Wildlife Attractants On or Near Airports*, the developer should ensure that land use practices such as landscaping, will not cause hazardous wildlife movement into or across the approach or departure airspace.

Thank you for providing us an opportunity to comment on this proposed project. Please keep the Airports Division apprised on this project, and provide us with a copy of the Draft Environmental Assessment when it is completed.

Should you have any questions regarding the above, please contact Ms. Lynn Becones, Planner, at (808) 838-8817.

Sincerely,

ROSS M. HIGASHI
Deputy Director - Airports

c: Mr. Gordon Wong, Federal Aviation Administration

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Kuawa Street New Sports Fields Development

Environmental Assessment

APPENDIX 2
Phase I Environmental Site Assessment

Note: Environmental Data Report (EDR) portion (Appendix A) not included, but available for inspection upon request of P&R

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DRAFT Enhanced Phase I Environmental Site Assessment For Kuawa Street New Fields Development Project TMK (3) 2-2-032:003, :004, :008, :019, :087, and :088 Hilo, Island of Hawaii 96720

MNA Project 01927_3

May 5, 2015

Myounghee Noh & Associates

Environmental Studies and Consulting Services

200 Kohola Street, Hilo, Hawaii, USA 96720 • 808.935.8727
99-1046 Iwaena Street, Suite 210A, Aiea, Hawaii, USA 96701 • 808.484.9214

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DRAFT Enhanced Phase I Environmental Site Assessment for Kuawa Street New Fields Development Project TMK (3)2-2-032:003, :004, :008, :019, :087, and :088 Hilo, Island of Hawaii 96720

9.053 acres

MNA Job No. 01927_3

June 5, 2015

I declare that, to the best of my professional knowledge and belief, I meet the definition of *Environmental professional* as defined in §312.10 of 40 CFR 312.

I have the specific qualifications based on education, training, and experience to assess a *property* of the nature, history, and setting of the subject *property*. I have developed and performed the all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312.

Jessica Walsh, Author
Environmental Planner

Myounghee Noh
Principal

Myounghee Noh & Associates, L.L.C.
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APPENDICES

Appendix A Environmental Data Resources Report and Maps
Appendix B Site Reconnaissance and Soil Sampling Photographs
Appendix C Laboratory Analytical Reports

CONTRIBUTORS

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Drafter/Illustrator	Kristin Cabanila
Environmental Professional	Jessica Walsh
Quality Assurance	Myounghee Noh

LIST OF ABBREVIATIONS/ACRONYMS

AST	Aboveground Storage Tank
AVG	Average
bgs	Below Ground Surface
B/W	Black and White
BTEX	Benzene, Ethylbenzene, Toluene, and Xylenes
C	Celsius
CCA	Chromated Copper Arsenate
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CESQG	Conditionally Exempt Small Quantity Generators
CFR	Code of Federal Regulations
COPC	Chemicals of Potential Concern
CORRACTS	RCRA Facilities that are undergoing "corrective action"
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DU	Decision Unit
EAL	Environmental Action Level
EC	Engineering Control
EDR	Environmental Data Resources, Inc.
EHE/EHMP	Environmental Hazard Evaluation/Environmental Hazard Management Plan
EPA	Environmental Protection Agency
ERNS	Emergency Response Notification System
ESA	Environmental Site Assessment
HDOH	Hawaii Department of Health
HELCO	Hawaii Electric Light Company
HEER Office	Office of Hazard Evaluation and Emergency Response
HFD	County of Hawaii Fire Department
HMIRS	Hazardous Materials Incident Reporting System
HREC	Historical Recognized Environmental Condition
IC	Institutional Control
IDW	Investigation Derived Waste
LCS/LCSD	Laboratory Control Sample/Laboratory Control Sample Duplicate
LQG	Large Quantity Generators
LUST	Leaking Underground Storage Tank
mg/kg	milligrams per kilogram
MIS	Multi-Increment Sample
MNA	Myounghee Noh & Associates, L.L.C.
MS/MSD	Matrix Spike/Matrix Spike Duplicate

NA	Not Available
ND	Not Detected
NFRAP	CERCLIS No Further Remedial Action Planned
NLR	No Longer Regulated
NPL	National Priorities List
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PPE	Personal Protective Equipment
RCRA	Resource Conservation and Recovery Act
REC	Recognized Environmental Condition
RSD	Relative Standard Deviation
SHWB	Solid and Hazardous Waste Branch
SIR	Statistical Inventory Reconciliation
SQG	Small Quantity Generators
STDEV	Standard Deviation
TMK	Tax Map Key
TPH	Total Petroleum Hydrocarbons
TSD	Treatment/Storage/Disposal
UIC	Underground Injection Control
UST	Underground Storage Tank
USGS	United States Geological Survey

EXECUTIVE SUMMARY

Myounghee Noh & Associates, L.L.C. (MNA) was retained in March 2015 to conduct an Enhanced Phase I Environmental Site Assessment (ESA) for the approximately 9-acre subject property located in Hilo, Island of Hawaii, and identified by the Tax Map Key (TMK) of Island 3, Zone 2, Section 2, Plat 032, and Parcels :003, :004, :008, :019, :087, and :088 (TMK (3) 2-2-032:003, :004, :008, :019, :087, and :088). At the time of this Phase I ESA, the subject property was owned by the State of Hawaii. This Phase I ESA was completed for the County of Hawaii and Geometrician Associates, LLC.

The purpose of this Enhanced Phase I ESA is to identify *recognized environmental conditions* (RECs) at the subject property, with respect to the range of contaminants within the scope of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and petroleum products. A Phase I ESA consists of four components. Three of those components are intended to collect information that will aid in the identification of RECs at the subject property. The information collected and reviewed consists of state, federal, and local environmental records; a site reconnaissance visit; and interviews with key site personnel and other individuals with knowledge regarding the subject property. The fourth part of a Phase I ESA is a report that documents the collection of information about the subject property and evaluation of that information towards making a determination of the presence of REC at the subject property.

Additionally, the "enhanced" portion pertains to a limited soil sampling on the subject property to identify the presence of potentially hazardous soil contaminants that might be RECs. Based on the information collected from record review and interviews, the Chemicals of Potential Concern (COPC) were identified as follows.

- Total Petroleum Hydrocarbon (TPH)-Gasoline, Diesel, and Oil
- Benzene, toluene, ethylbenzene, and xylenes
- Priority Pollutant Polycyclic Aromatic Hydrocarbons
- Polychlorinated biphenyls
- Resource Conservation and Recovery Act 8 metals
- Organochlorine pesticides

The analytical results for the COPC were compared to the State of Hawaii Department of Health (HDOH) Tier 1 Soil Environmental Action Levels (EALs) with unrestricted (residential) and restricted (commercial/industrial) land uses above a nondrinking water resource and located less than 150 meters from surface water (Fall 2011; revised Jan. 2012).

The 9 acre subject property is at the intersection of Kamehameha Avenue (Highway 19) and Manono Street, across from the Wailoa River Harbor and Park, approximately 675 feet southeast of the mouth of the Wailoa River, where it empties into Hilo Bay. The subject property was unused and vacant at the time of this Phase I ESA.

FINDINGS

Subject Property. No Underground Storage Tank (UST) or Leaking UST (LUST) were identified at the vacant subject property which is located within50 yards from a small boat harbor to the west. No records of National Priority List (NPL) sites, RCRA CORRACTS TDS or non-CORRACTS facilities, State Sites of Interest, delisted NPL sites, CERCLIS or CERCLIS NFRAP sites, State Brownfield sites, landfill or solid waste disposal sites, RCRA generator sites, State Voluntary

Cleanup sites, Institutional Control/Engineering Control (IC/EC) registries, or Federal ERNS sites at the subject property.

REC. Soil sampling and analytical results indicated that arsenic and lead were present, exceeding the HDOH Tier 1 Soil EALs for unrestricted (residential) land use. Therefore, this is considered a REC.

During the site reconnaissance conducted on 30 March 2015, MNA observed an old motor in the subject property. While there was no staining to the soil or petroleum or oil odors, the discarded motor represents a material threat of release to the surface soil of the subject property, and is therefore considered a REC.

Surrounding Properties. No records of NPL sites, RCRA CORRACTS facilities, delisted NPL sites, CERCLIS sites, Brownfield sites, landfill or solid waste disposal sites, State Voluntary Cleanup sites, IC/EC registries, or Federal ERNS sites were reported at the surrounding properties.

Non-REC. One State CERCLIS site was identified within 1/2 mile of the subject property. The site, identified as "HELCO pipeline anomaly" located at 126 Banyan Drive, was located approximately one third of a mile and downgradient from the subject property. TPH-G contamination below the HDOH Tier I EAL was identified onsite. Contaminated soil was removed and the site was backfilled. A No Further Action - Unrestricted Land Use letter was issued on 16 July 2012. Due to the proximity of this site to the subject property, this is not considered a REC.

One CERCLIS NFRAP site was identified in the vicinity, identified as Hilo Bayfront Soccer Field, located south of Kamehameha Avenue between Pauahi and Ponahawai Streets. This site is located approximately 1/2 mile west of and at equal gradient to the subject property. Due to the distance and proximity of this site from the subject property, this is not considered a REC. Refer to Section 8.0 KEY FINDINGS AND OPINION for additional non-REC evaluations.

Historical RECs (HREC). Eight LUST sites were identified within 1/2 mile of the subject property (Table 6). A few of the LUST sites were located upgradient. The documented LUST sites have a current site status of Site Cleanup Complete, No Further Action. Due to the distance and proximity of these sites to the subject property, these LUST sites are considered HRECs:

Facility Name	Location	Distance (feet)	Direction	Potential Impact? Y/N
S.K. Oda, Ltd.	180 Kalanikoa St.	707	SE	Undetermined*
Jack's Tours	226 Kanoelehua Ave.	1,103	ESE	N*
Mid Pac Petroleum 2705956	1801 Kamehameha Ave.	1,309	E	N*
Kumu Street	Kumu St. and Kamehameha Ave.	1,378	E	N*
H. Harada Contractor, Inc.	24 Railroad Ave.	1,431	SE	N
Tesoro Gas Express 82	1672 Kamehameha Ave.	1,695	E	N
Harper Car & Truck Rentals of Hawaii	456 Kalanianaole Ave.	1,721	E	N
Phillips U Drive Inc.	920 Piilani St.	1,906	SSE	N

*Assumed due to no HDOH records were available to determine potential impacts to the subject property.

LIMITATIONS

The sampling and analytical results represent the soil condition in 0-12 inches below ground surface (bgs) at the time of the sampling, and the soil conditions below 12 inches bgs are unknown.

There was a data gap in this Phase I ESA. Detailed information about the dredged spoils from Wailoa River were spread over the subject property was not available at the time of this writing. Moreover, except for Tesoro Gas Express, no HDOH records were made available to determine potential historical impacts of the LUST sites to the subject property.

Limitations, page x: Add information on dredged spoils sampling – Letter indicates sampling showed residues were below EALS.

There was a deviation from the *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process* conducted (ASTM International, 2013). The User Questionnaire was not completed as the user did not have actual or potential CERCLA liability and was not seeking to qualify for the Landowner Liability Protections.

RECOGNIZED ENVIRONMENTAL CONDITIONS

This assessment has revealed evidence of *recognized environmental conditions* in connection with the subject property, as follows:

RECs

Subject Property

Arsenic and Lead in Soil. Soil sampling and analysis of COPC indicated that heavy metal arsenic and lead were present, exceeding the HDOH Tier 1 Soil EAL for unrestricted (residential) land use. Therefore, this is considered a *REC* (Section 5.0). Additional soil sampling is being planned at this writing, and the findings will be included in the final Phase I ESA.

Discarded Motor in DU-02. While there was no staining to the soil or petroleum or oil odors, the discarded motor represents a material threat of past release to the surface soil of the subject property, and is therefore considered a *REC* (Figure 4).

Historical REC

Surrounding Area

LUST Sites. A few of the 8 LUST sites within 1/2 mile of the subject property are upgradient and have a current status of Site Cleanup Completed and No Further Action. Limited historical information was available at the HDOH, and this is a data gap.

1.0 INTRODUCTION

This report presents the results of an Enhanced Phase I Environmental Site Assessment (ESA) of the 9-acre subject property identified by Tax Map Key (TMK) of Island 3, Zone 2, Section 2, Plat 032, and Parcels :003, :004, :008, :019, :087, and :088 [TMK (3) 2-2-032:003, :004, :008, :019, :087, and :088]. According to the County of Hawaii Real Property Tax Office, the subject property has no physical address. Figure 1 presents the location of the subject property.

This Phase I ESA was conducted by Myounghee Noh & Associates, L.L.C., herein referred to as MNA, for the County of Hawaii and Geometrician Associates, LLC. At the time of this Phase I ESA, the subject property was owned by the State of Hawaii.

1.1 PURPOSE

The purpose of this Enhanced Phase I ESA is to identify any *recognized environmental conditions* (*REC*s) at a subject property, with respect to the range of contaminants within the scope of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and petroleum products.

The "enhanced" portion of this Phase I ESA pertains to soil sampling that was conducted on the subject property to determine if soil contaminants were present in the surface and subsurface soil in concentrations that might be of concern to public health.

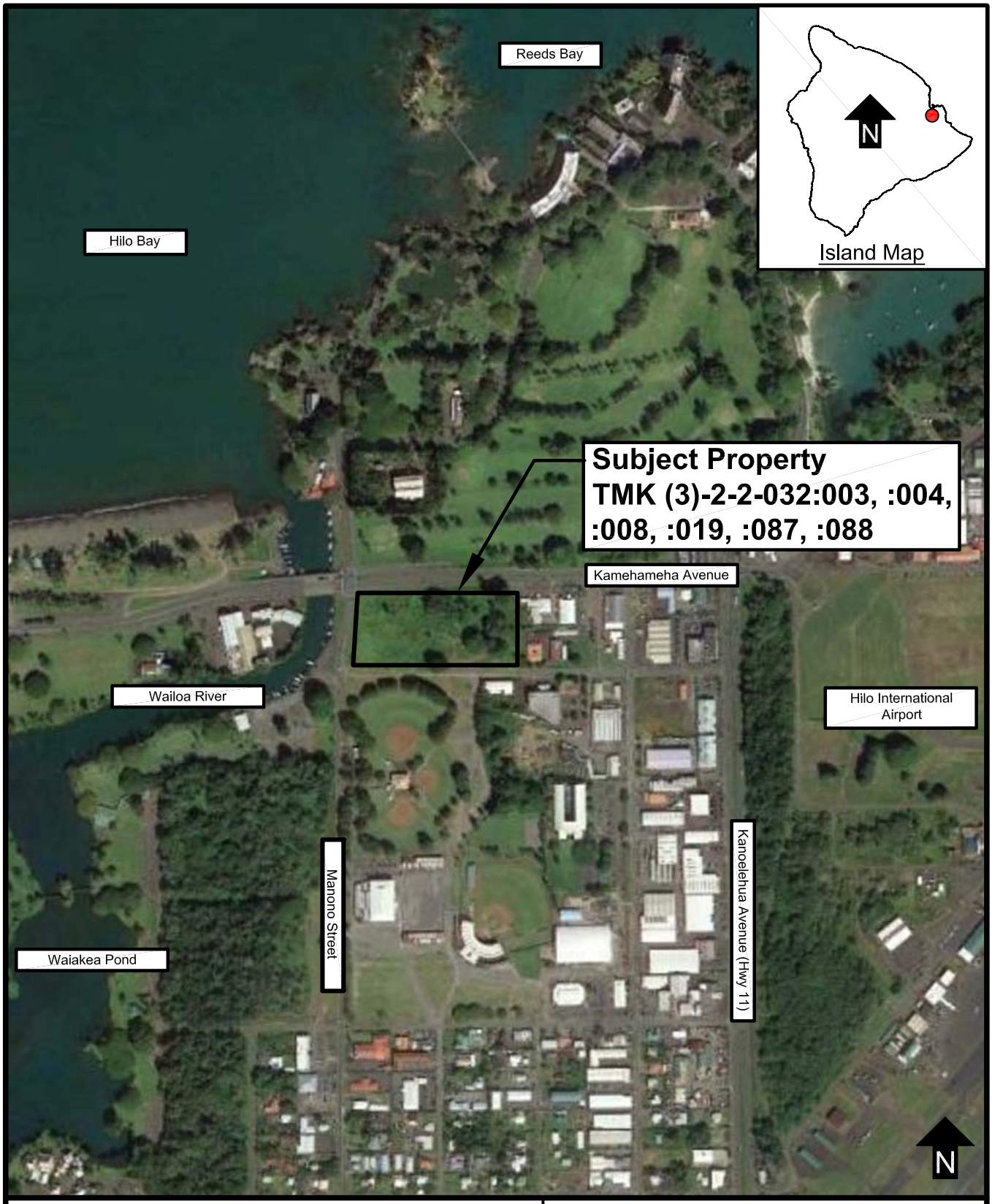
The term *recognized environmental condition* denotes the presence, or likely presence, of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release into structures on the property, or into the ground, groundwater, or surface water of the property. The term is not intended to include *de minimis* conditions that generally do not present a threat to human health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies.

1.2 DETAILED SCOPE OF SERVICES

A Phase I ESA has four components: records review, site reconnaissance, interview, and report. MNA conducted this ESA using information sources with the potential to identify past or current releases of hazardous substances or petroleum products that may have impacted the subject property. Adjoining and surrounding properties were also evaluated for their potential to affect the subject property. Per the Phase I ESA Standard ASTM E 1527-13, adjoining properties include parcels touching the subject property, as well as those properties positioned across a roadway (ASTM International, 2013).

1.2.1 Site History

Where available, and as needed, MNA researched historical and current topographic maps, tax records, publications, fire insurance maps, and aerial photographs to identify previous and current uses of the property, adjoining properties, and the general surrounding area.



Scale

500'

Figure 1. Site Location Map
Kuawa Street Enhanced Phase I ESA
TMK (3) 2-2-032:003, :004, :008, :019, :087, :088
Hilo, Island of Hawaii
May 2015

1.2.2 Regulatory Records

MNA examined government records with respect to environmental conditions, citations, complaints, and permits at the subject property, at adjoining properties, and within the surrounding area. MNA utilized a records search provided by Environmental Data Resources Inc. (EDR), to review records from the following federal and state programs.

- National Priorities List (NPL)
- Delisted NPL
- Resource Conservation and Recovery Act (RCRA) facilities that are undergoing "corrective action" (CORRACTS)
- RCRA-Treatment, Storage, & Disposal (TSD)
- Comprehensive Environmental Response, Compensation & Liability Information System (CERCLIS) List
- CERCLIS No Further Remedial Action Planned (NFRAP) List
- Federal and Hawaii State Brownfields
- Solid Waste and Landfill
- Leaking Underground Storage Tank (LUST)
- Underground Storage Tank (UST)
- Emergency Response Notification System (ERNS)
- RCRA – Generators, including those No Longer Regulated (NLR)
- Hawaii Sites of Interest
- Hawaii Releases
- Federal and Hawaii State Land Use Controls
- Hawaii Voluntary Cleanup Sites
- Tribal Lands

Additionally, MNA reviewed state environmental databases and case files from the Hawaii Department of Health (HDOH), and requested information from the Hawaii Electric Light Company (HELCO), and the County of Hawaii Fire Department (HFD).

1.2.3 Site Reconnaissance

MNA performed a site reconnaissance to obtain information indicating the likelihood of contamination, to interview available site personnel, and to conduct a brief assessment of the adjoining properties. During the site reconnaissance, MNA looked for a variety of indicators of environmental hazards including, but not limited to, stained surface soil, dead or stressed vegetation, hazardous substances, aboveground and underground storage tanks, disposal areas, groundwater wells, drywells, and sumps. Sampling and testing of groundwater or area air quality investigation was not part of this assessment.

1.2.4 Site Geology and Hydrogeology

MNA reviewed published information for the property and surrounding area regarding surface and subsurface conditions such as topography, drainage, surface water bodies, subsurface geology, and groundwater. MNA used this information to assess the potential for migration, and impacts, of hazardous substances or petroleum products released to the subject property from off-site properties.

1.2.5 Data Evaluation and Reporting

MNA evaluated the information collected, and prepared this report as part of the assessment. Section 2 presents the site background information; Section 3 information collected from records review; Section 4 site reconnaissance; Section 5 limited soil sampling results, Section 6 interviews; Section 7 data gaps; Section 8 key findings and opinion; and Section 9 conclusion. Per client's request, MNA's recommendations are included in Section 9.

1.3 SIGNIFICANT ASSUMPTIONS

The conclusion presented in this report is based upon the assumption that reasonably ascertainable and relevant information pertaining to the environmental condition of the subject property was made available to MNA during the assessment. Information obtained from government agencies and other resources is presumed to be accurate and updated. Additionally, information provided in interviews is collected in "good faith" and believed to be true and accurate to the best knowledge of the interviewee.

1.4 LIMITATIONS AND EXCEPTIONS

The Phase I ESA provides a "snapshot" of the conditions of the property at the time of the assessment. Findings, opinions, and conclusions apply to the existing conditions of the property at the time of the investigation and those reasonably foreseeable. They do not apply to conditions at, or changes to, the property, of which MNA is not aware, could not reasonably be aware, and has not had the opportunity to evaluate.

This report is based upon visual observations of property and vicinity, interpretation of the available historical and regulatory information and documents reviewed, and interviews of individuals with knowledge of the subject or surrounding properties. MNA cannot ensure the accuracy of the historical or regulatory information. This report is intended exclusively for the purpose outlined in Section 1.1 and applies only to the subject property.

This Enhanced Phase I ESA excludes investigation of asbestos, lead paints, geophysical, or geotechnical concerns.

MNA performed an Enhanced Phase I ESA in general conformance with the scope and limitations of ASTM E 1527-13 of the property located at TMK (3) 2-2-032:003, :004, :008, :019, :087, and :088, Hilo, Island of Hawaii. Any exceptions to, or deletions from, this practice are described in Section 7.0 of this report.

1.5 SPECIAL TERMS AND CONDITIONS

This Enhanced Phase I ESA was conducted and prepared by MNA for the exclusive use of the County of Hawaii and Geometrician Associates, LLC. This report shall not be relied upon or transferred to any other party without written authorization from the County of Hawaii and Geometrician Associates, LLC.

1.6 USER RELIANCE

This report is an instrument of service of MNA, which summarizes its findings and opinions with respect to *RECs* at the subject property. Findings and opinions are predicated on information that MNA obtained on the dates and from individuals stated herein, from public records reviewed, a site reconnaissance, and ancillary Phase I ESA activities. This assessment relies

upon the accuracy and completeness of the information provided. The information obtained for this assessment is used without extraordinary verification. It is possible that other information exists and may be discovered, or environmental conditions change subsequent to the submittal of this Enhanced Phase I ESA report, to which MNA shall not be held responsible for exclusion.

2.0 SITE DESCRIPTION

This section contains: location and legal description; site and vicinity general characteristics; current uses of the subject property; structures, roads, and other improvements; past uses of the subject property; and current and past uses of adjoining properties.

2.1 LOCATION AND LEGAL DESCRIPTION

The subject property is located in Hilo, an urban region in the eastern area of the Island of Hawaii (Figure 1). The County of Hawaii Real Properties Tax Office identified TMK (3) 2-2-032:003, :004, :008, :019, :087, and :088 as not having physical addresses. Figure 2 presents a TMK map of the subject property and adjoining properties.

According to the County of Hawaii Real Properties Assessment Division, the subject property is approximately 9 acres with its zoning as agricultural (County of Hawaii, 2014). A breakdown of the acreage per parcel is shown below (Table 1). The western quarter of the subject property was located inside of the 100-year floodplain (Hawaii-National Flood Insurance Program, 2014).

Table 1. Subject Property Acreage per TMK

Parcel	Acreage
2-2-032:003	2.901
2-2-032:004	2.761
2-2-032:008	0.677
2-2-032:019	2.036
2-2-032:087	0.618
2-2-032:088	0.06

2.2 SITE AND VICINITY GENERAL CHARACTERISTICS

The subject property is on the south side of Kamehameha Avenue (Highway 19), on the east side of Manono Street, across from the Wailoa River Harbor and Park approximately 675 feet southeast of the mouth of the Wailoa River. The Walter Victor CK Baseball Complex and Wailoa River Harbor and Park are adjoining properties to the south and east, respectively. The Naniloa Golf Course is the adjoining property to the north; County offices, Coqui's Hideaway Bar and Grill, and AKW Environmental operate on adjoining properties to the east and south.

Topographic maps generally depict the surface at the subject property sloping toward the north (Appendix A). The subject property is located approximately one quarter mile south of Hilo Bay.

2.2.1 Geology

The Island of Hawaii is the youngest and most southeasterly of the emerged volcanic edifices of the Hawaiian chain largest of the Hawaiian-Emperor Seamount Chain. The area spans 90 miles from North to south and 80 miles east to west (10,478 km^2). Five large volcanoes (Kohala, Mauna Kea, Hualalai, Mauna Loa, and Kilauea) coalesce to make the visible part of the island.

A sixth, Loihi Seamount, 20 miles from the coast lies 3,100 feet beneath the waves. The geology of the Island of Hawaii has been extensively studied because of the island's recent geological history, the stages of volcano development has barely advanced beyond the erosional stage as seen in Kohala [the oldest at about 0.7 mega-annum (Ma), or 0.7 million years before the present time]. Mauna Kea and Hualalai (last active in 1800-01, its oldest rocks may be greater than 0.12 Ma) have reached the post-caldera stage, while Mauna Loa and Kilauea [divided into two ages, Hilina Basalt (>25,000 years) and the younger Puna Basalt (<25,000 years)] have only advanced to the caldera development and filling stages (George A.L. Yuen and Associates, Inc., 1990).

In 1990, Mink and Lau described the geology in the vicinity of the subject property as follows:

> Virtually the entire region is covered with pre-historic lavas of the Kau Basalt, onto which long tongues of historic lavas from the northeast rift have flowed. Other than scanty recent alluvium, no sediments occur (Mink & Lau, 1990).

The United States Department of Agriculture Natural Resources Conservation Service classifies the soil at the subject property as 100% Opihikao highly decomposed plant material. This Opihikao material is typically composed of decomposed plant material from 0 - 3 inches and bedrock from 3 - 13 inches. It has a slope of 2 - 20%, is well drained, and has a very low chance of storing water (United States Department of Agriculture, 2015).

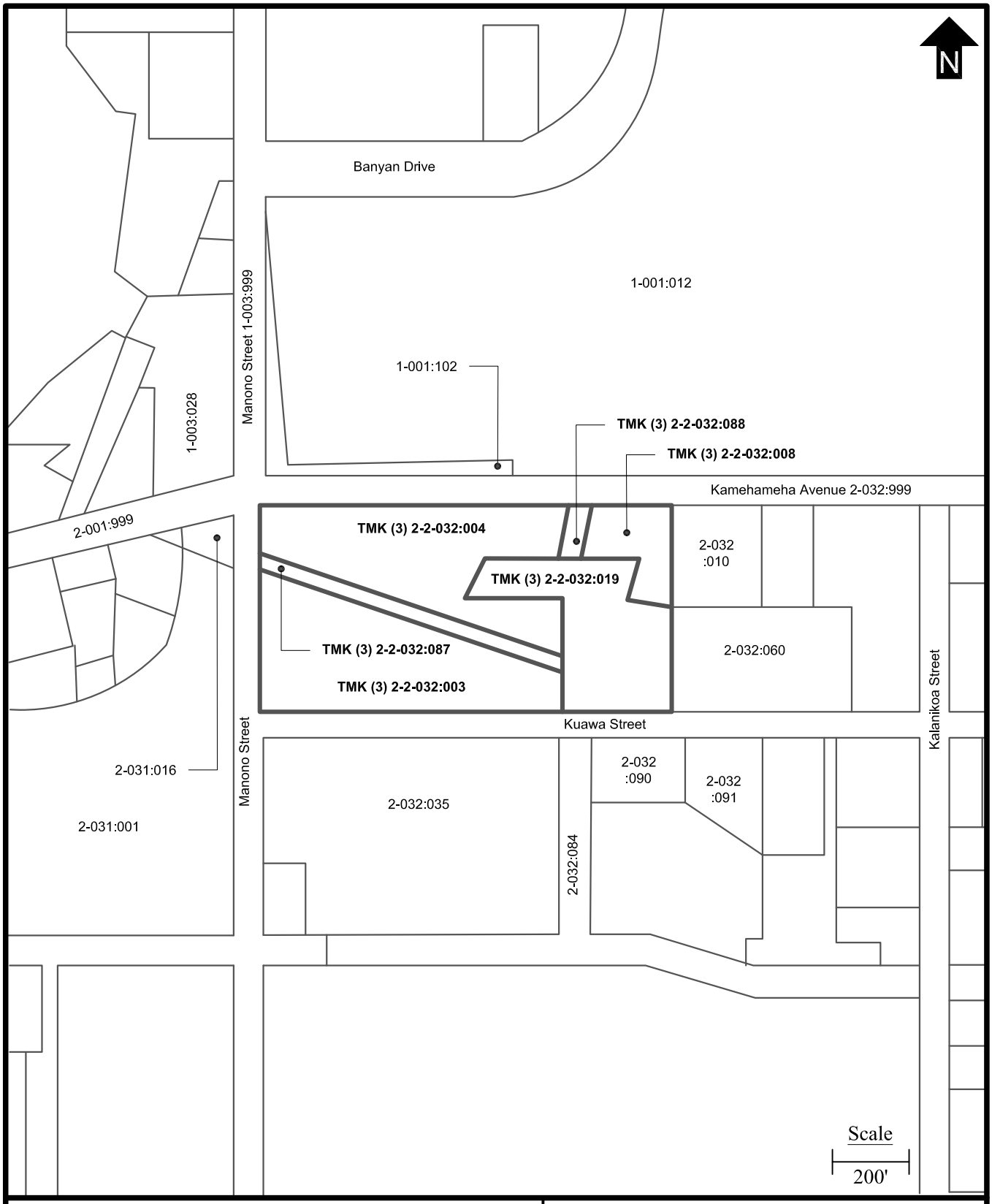
2.2.2 Hydrogeology

The HDOH Safe Drinking Water Branch has established an Underground Injection Control (UIC) line to serve as a boundary between drinking water and non-drinking water portions of aquifers. Areas above (mountain side) the UIC line are within drinking water portions of the aquifer, while areas below (ocean side) the UIC are in non-drinking water portions of the underlying aquifer. The subject property, identified by TMK (3) 2-2-032:003, :004, :008, :019, :087, and :088, is located below the UIC line in drinking water portion of the aquifer (HDOH Safe Drinking Water Branch, 1999).

The hydraulic gradient of the basal groundwater within the basaltic formation is, in general, from mountain areas to the shoreline. At the location of the subject property with the shoreline to the east/southeast, the general direction of the basal groundwater would naturally flow to the east/southeast without tidal influences. According to the Mink and Lau Technical Report #191, the subject property is located below the Kilauea Aquifer.

Mink and Lau described the hydrogeology and aquifer as follows:

The northern boundary of the Northeast Mauna Loa Aquifer Sector is the contact between the Mauna Loa and Mauna Kea rocks, which is nearly coincident with the Wailuku River. The inland boundary is a north-south trace along the saddle between the northeast rift zone of Mauna Load and the Meeting of Mauna Load and Mauna Kea. The southern boundary starts at the summit of Mauna Load, follows the rift zone, then bends toward Mountain View along the Kilauea/Mauna Loa contact, reaching the sea at Keaau. Total area is about 400 square miles divided between the Hilo Aquifer System and the Keaau Aquifer System. All rocks originated from Mauna Loa. The oldest series is the Kahuku Basalt, on top of which the Pahala Ash occurs in many places. The youngest formation, the Kau Basalt, lies on the Pahala Ash. The Kau Basalt includes recent and historic lava flows (Mink & Lau, 1990).



Legend and Notes:

Subject TMK Boundary

TMK Boundaries

Figure 2. TMK Map
Kuawa Street Enhanced Phase I ESA
TMK (3) 2-2-032:003, :004, :008, :019, :087, :088
Hilo, Island of Hawaii
May 2015

Myounghee Noh & Associates, L.L.C.

1927_3

Aquifer classification information for the Hilo Aquifer is provided in Table 2 (Environmental Data Resources, Inc., 2013). Mink and Lau classification is drinking water utility; however, based on the SDWB map, the subject property is below the UIC line, rendering the groundwater at the site non-drinking water utility.

Table 2. Hilo Aquifer Classification System

Aquifer Code	80401111
Island Code	8 – Hawaii
Aquifer Sector	04 – Northeast Mauna Loa
Aquifer System	01 – Hilo
Aquifer Type, hydrogeology	1 – Basal
Aquifer Condition	1 – Unconfined
Aquifer Type, geology	1 – Flank; Horizontally extensive lavas
Status Code	11111
Development Stage	1 – Currently Used
Utility	1 – Drinking
Salinity (in mg/L Cl^-)	1 – Fresh (<250)
Uniqueness	1 – Irreplaceable
Vulnerability to Contamination	1 – High

mg/L Cl^--milligrams per liter chloride

2.3 CURRENT USE OF THE SUBJECT PROPERTY

The subject property is currently vacant and unused. Scattered banyan, mango, and palm trees can be found on the relatively flat property.

2.4 STRUCTURES, ROADS, AND OTHER IMPROVEMENTS

The subject property is at the intersection of Manono Street and Kamehameha Avenue (Highway 19). The property is accessed from Kuawa Street, a 2-lane road. There are subsurface sewer and water lines located on the subject property, as evidenced by the multiple manholes identified onsite (Figure 3).

2.5 PAST USES OF THE SUBJECT PROPERTY

Information regarding past uses of the subject property was obtained from a review of tax records, scientific publications, historic topographic maps, historic aerial photographs, user provided information, and interviews.

Table 3 summarizes the information available regarding the historical uses of the subject property.

Table 3. Users and Primary Uses of Subject Property

Period (approx.)	Owner/Lessee/Sub-Lessee	Area (acres)	Primary Use
TMK (2) 2-2-032:003			
1965 – present	State of Hawaii	2.901	Vacant
1962 – 1965	Hawaii Development Agency	0.88	Vacant
1955 – 1962	Hilo Daijingu	0.86	Vacant
1949 – 1955	Office of Alien Property Department of Justice	0.86	Vacant

Period (approx.)	Owner/Lessee/Sub-Lessee	Area (acres)	Primary Use
TMK (2) 2-2-032:004			
1965 – present	State of Hawaii	2.741	Vacant
1961 – 1965	Hawaii Development Agency	0.37	Vacant
1957 – 1961	Chikao Mukai	0.37	Vacant
1945 – 1957	Izo Mukai Shimane Mukai	0.52	Vacant
TMK (2) 2-2-032:008; Hilo			
1965 – present	State of Hawaii	0.68	Vacant
1961 – 1965	Hawaii Development Agency	0.27	Vacant
1957 – 1961	Yuichi & Sumiko Abuyamen Trust George L. Machado Trustee Sunrise Products, Ltd.	0.27	Vacant
1952 – 1957	Yuichi & Sumiko Abuyamen Trust	0.27	Vacant
1951 – 1952	George L. Machado Yuichi & Sumiko Abuyamen Trust	0.27	Vacant
TMK (2) 2-2-032:019; Hilo			
1964 – present	State of Hawaii	2.04	Vacant
1948 – 1964	Territory of Hawaii	42.25	Vacant
TMK (2) 2-2-032:087; Hilo			
1970 – present	State of Hawaii	0.62	Vacant
1969 – 1970	Hawaii Redevelopment Agency	0.62	Vacant
1968 – 1969	State of Hawaii	0.62	Vacant
TMK (2) 2-2-032:088; Hilo			
1970 – present	State of Hawaii	0.06	Vacant
1969 – 1970	Hawaii Redevelopment Agency	0.06	Vacant
1968 – 1969	State of Hawaii	0.06	Vacant

2.6 CURRENT AND PAST USES OF ADJOINING PROPERTIES

Information regarding current and past uses of the adjoining properties was obtained from review of tax records, historic topographic maps, aerial photographs, and interviews. Property use information is summarized in Table 4.

Table 4. Users and Primary Uses of Adjoining Properties

Period (9pprox..)	Owner/Lessee/Sub-Lessee	Area (acres)	Primary Use
TMK (2) 2-1-003:028; Hilo Adjoining property to the Northwest			
1971 – present	State of Hawaii	1.79	Vacant
1946 – 1971	Territory of Hawaii	1.79	Vacant
TMK (2) 2-1-001:012; 1713 Kamehameha Ave., Hilo Adjoining property to the North			
2013 – present	State of Hawaii WHR, LLC	62.58	Golf Course
2007 – 2013	State of Hawaii Hawaii Outdoor Tours, Inc.	62.58	Golf Course
2006 – 2007	State of Hawaii	62.58	Golf Course

Period (9pprox..)	Owner/Lessee/Sub-Lessee	Area (acres)	Primary Use
2002 – 2006	State of Hawaii Country Club Hawaii, Inc. Hawaii Naniloa Resort, LLC	63.25	Golf Course
1987 – 2002	State of Hawaii Country Club Hawaii, Inc. Nakano Co., Ltd.	63.25	Golf Course
1981 – 1987	State of Hawaii Bayshore Realty Investment, Inc.	63.25	Golf Course
1975 – 1981	State of Hawaii Mike Dietz Golf Shops, Inc.	63.25	Golf Course
1970 – 1975	State of Hawaii Alflo Ronco Development, Inc.	63.25	Golf Course
1966 – 1970	State of Hawaii	0.10	Vacant
1961 – 1966	Hawaii Development Agency	0.10	Vacant
1956 – 1961	Michie Sakomoto	0.10	Vacant
TMK (2) 2-2-032:010; 1550 Kamehameha Ave., Hilo Adjoining property to the East			
2000 – present	State of Hawaii Pubtime, Inc.	0.99	Bar
1996 – 2000	State of Hawaii Rus Sho Den, Inc	0.99	Restaurant
1969 – 1996	State of Hawaii K. Kobata & Sons, Inc.	0.99	Restaurant
1967 – 1969	State of Hawaii Kiyami & Fumio Kobata	0.99	Restaurant
1960 – 1967	State of Hawaii	1.53	Vacant
TMK (2) 2-2-032:060; 191 Kuawa St., Hilo Adjoining property to the East			
1960 – present	State of Hawaii Board of Health	1.94	Vacant
1955 – 1960	Territory of Hawaii Board of Health	2.05	Vacant
TMK (2) 2-2-032:091; 200 Kuawa St., Hilo Adjoining property to the East			
2013 – present	Kuawa Storage 17 (HI), LLC	0.77	Storage
2007 – 2013 2006 – 2007	MRP Kuawa Storage, LLC Kuawa Storage, LLC	0.77 0.77	Storage Storage
1973 – 2006	Constructors Hawaii, Inc.	0.77	Vacant
TMK (2) 2-2-032:090; 190 Kuawa St. Hilo Adjoining property to the Southeast			
1970 – present	Better Brands, Ltd.	0.73	Liquor Warehouse
TMK (2) 2-2-032:084; Hilo Adjoining property to the East & South			
1964 - present	State of Hawaii	2.377	Roadway
TMK (2) 2-2-032:0035; Hilo Adjoining property to the South			
1961 – present	State of Hawaii	6.12	Baseyard
1952 – 1961	Territory of Hawaii	4.22	Baseyard

Period (9pprox..)	Owner/Lessee/Sub-Lessee	Area (acres)	Primary Use
TMK (2) 2-2-031:016; Hilo Adjoining property to the West			
1968 – present	State of Hawaii	0.36	Waterway

3.0 RECORDS REVIEW

Under ASTM E 1527-13, records are to be reviewed by the environmental professional that may help identify *REC*s in connection with the subject property.

3.1 STANDARD ENVIRONMENTAL RECORD SOURCES

MNA used Environmental Data Resources, Inc. (EDR), to search standard federal and state government databases for hazardous substance or petroleum product releases that could impact the subject property. A copy of the EDR report is provided in Appendix A.

ASTM E 1527-13 specifies a minimum search distance for specific environmental record sources. The following sources are specified for incidents or sites within one mile of the subject property:

- Federal NPL site list
- Federal RCRA CORRACTS TSD facilities list

The following sources are specified for incidents or sites within one-half mile of the subject property:

- Federal Delisted NPL site list
- Federal CERCLIS list
- Federal CERCLIS NFRAP site list
- Federal RCRA non-CORRACTS TSD facilities list
- Federal and State Brownfield Sites
- State CERCLIS list
- State landfill and/or solid waste disposal site list
- State leaking UST list
- State voluntary cleanup program sites
- State Sites of Interest

The following sources are for incidents on the subject and adjoining properties:

- Federal RCRA generators list
- State registered UST list

Finally, the following are for incidents on the subject property:

- Federal ERNS list
- State and Federal Institutional Control (IC) and Engineering Control (EC) Registries
- State releases list

3.1.1 Federal National Priorities List

The NPL, maintained by the United States Environmental Protection Agency (EPA), is a list of highly contaminated sites that have been identified by Superfund. EDR identified no NPL sites within one mile of the subject property (Environmental Data Resources, Inc., 2015).

3.1.2 Federal RCRA CORRACTS TSD Facilities List

The RCRA CORRACTS TSD facilities list, maintained by the EPA, contains treaters, storers, and disposers of hazardous waste that have reported violations and are subject to corrective actions. EDR identified one RCRA CORRACTS TSD site within 1/4 mile of the subject property (Environmental Data Resources, Inc., 2015). The site was identified as Shipman Generating Station located at 20 Banyan Drive in Hilo, approximately 0.15 miles north and downgradient from the subject property. Refer to Section 3.2.2 for additional discussion regarding this site.

3.1.3 Delisted NPL Site List

This list, maintained by the EPA, contains delisted NPL sites. EDR identified no delisted NPL sites within 1/2 mile of the subject property (Environmental Data Resources, Inc., 2015).

3.1.4 Federal CERCLIS List

The CERCLIS list, maintained by the EPA, contains sites that are either proposed to be or are on the NPL list, as well as sites that are in the screening and assessment phase for possible inclusion on the NPL. EDR identified no CERCLIS sites within 1/2 mile of the subject property (Environmental Data Resources, Inc., 2015).

3.1.5 Federal CERCLIS NFRAP Site List

The CERCLIS NFRAP list, maintained by the EPA, contains designated CERCLA sites that, to the best of EPA's knowledge, assessment has been completed, and it has been determined that no further steps will be taken to list the sites on the NPL. EDR identified no CERCLIS NFRAP sites within 1/2 mile of the subject property (Environmental Data Resources, Inc., 2015). EDR identified on CERCLIS NFRAP site within the same zip code as the subject property. The site was identified as Hilo Bayfront Soccer Field, located south of Kamehameha Avenue between Pauahi and Ponahawai Streets. This site is located approximately 1/2 mile west of and at equal gradient to the subject property. Refer to Section 8.2 for findings regarding this site.

3.1.6 Federal RCRA non-CORRACTS TSD Facilities List

The RCRA non-CORRACTS TSD facilities list, maintained by the EPA, contains RCRA permitted facilities that treat, store, or dispose of hazardous waste. EDR identified no RCRA TSD facilities within 1/2 mile of the subject property (Environmental Data Resources, Inc., 2015).

3.1.7 State Brownfield Sites

This database, maintained by the HDOH HEER Office, provides an inventory of state designated brownfield sites. Under the Small Business Liability Relief and Brownfields Revitalization Act, a brownfield is defined as "real properties, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or

contaminant." EPA provides grants and loans to state and local governments for the assessment, cleanup, and redevelopment of these properties. Properties located on the State Brownfield list may have received federal funding under this program or be designated a Brownfield for state administration or funding purposes. EDR identified no State Brownfield Sites within 1/2 mile of the subject property (Environmental Data Resources, Inc., 2015).

3.1.8 State CERCLIS Site List

The HDOH Hazard Evaluation and Emergency Response (HEER) Office maintains a list of sites where it has an interest, has investigated, or may investigate. EDR identified 26 sites in the area surrounding the subject property (Environmental Data Resources, Inc., 2015) (Table 5). One site was within 1/2 mile of the subject property. Twenty sites were greater than 1/2 mile distance from the subject property, and five sites were at a non-geocoded location with the zip code.

Table 5. State CERCLIS Sites

Facility Name	Location	Distance (mile)	Direction	Relative Elevation	Notes
HELCO Pipeline Anomaly at Northeast Side of Seaside Hotel	126 Banyan Wy.	0.34	ENE	Lower	Refer to Section 8.2
HELCO Pipeline Release Hualani Hilo	Kanoelehua Ave. and Hualani St.	0.54	SSE	Higher	Refer to Section 8.2
Bayside Chevron Service	774 Kamehameha Ave.	0.57	W	Lower	Refer to Section 8.2
Wood Protection Company (HPM Building Supply)	150 Keaa St.	0.57	E	Higher	Refer to Section 3.2.2
Larry's Kaikoo Chevron	835 Kilauea Ave.	0.65	SW	Higher	Refer to Section 8.2
Pacific Machinery	456 Kalanianaole Ave.	0.67	ENE	Lower	Refer to Section 8.2
Exempt UST Closure at Excelsior Dairy	458 Kekuanaoa St.	0.68	SSW	Higher	Refer to Section 8.2
500 Kalanianaole Avenue, Truck/Car Accident	500 Kalanianaole Ave.	0.72	ENE	Lower	Refer to Section 8.2
Alamo Rent-a-Car, Hilo International Airport	131 Kekuanaoa Pl.	0.76	SSW	Higher	Refer to Section 3.2.2
Tesoro Hawaii Terminal Department - 607 Kalanianiole	607 Kalanianaole Ave.	0.84	ENE	Lower	Refer to Section 8.2
Stationers Corporation of Hawaii	708 Kanoelehua Ave.	0.84	SSE	Higher	Refer to Section 8.2
Hilo Shopping Center	1255 Kilauea Ave.	0.86	SSW	Higher	Refer to Section 8.2
187 Silva Street	187 Silva St.	0.86	E	Higher	Refer to Section 8.2
Equilon Enterprises, LLC - Hilo Terminal (Shell Oil Co.)	661 Kalanianaole Ave.	0.87	ENE	Lower	Refer to Section 8.2

Facility Name	Location	Distance (mile)	Direction	Relative Elevation	Notes
Hilo Quality Washerette	210 Hoku St.	0.88	WSW	Higher	Refer to Section 3.2.2
Hilo Terminal 666 Kalanianaole Avenue	666 Kalanianaole Ave.	0.89	ENE	Lower	Refer to Section 3.2.2
Tesoro Hawaii Corporation Terminal Department - 701 Kalanianiole	701 Kalanianaole Ave.	0.91	ENE	Lower	Refer to Section 3.2.2
Hatada Bakery (Former)	55 Kukuau St.	0.93	W	Higher	Refer to Section 8.2
Hilo Quality Cleaners	865 Kinoole St.	0.93	WSW	Higher	Refer to Section 8.2
Sun Sun Lau Chop Suey House	1055 Kinoole St.	0.94	SW	Higher	Refer to Section 8.2
Hilo Macaroni Factory	639 Kinoole St.	0.98	WSW	Higher	Refer to Section 8.2

3.1.9 State Landfill/Solid Waste Disposal Sites

The HDOH records contain an inventory of permitted landfills in the State of Hawaii. EDR identified no permitted solid waste landfills, incinerators, or transfer stations within 1/2 mile of the subject property (Environmental Data Resources, Inc., 2015).

3.1.10 State LUST List

The state LUST list, maintained by the HDOH Solid and Hazardous Waste Branch (SHWB), contains an inventory of sites with leaking underground storage tanks. EDR identified eight LUST tanks within 1/2 mile of the subject property (Environmental Data Resources, Inc., 2015) (Table 6).

Table 6. State LUST Sites

Facility Name	Location	Distance (mile)	Direction	Relative Elevation	Notes
S.K. Oda, Ltd.	180 Kalanikoa St.	0.134	SE	Higher	SCC/NFA Refer to Section 8.2
Jack's Tours	226 Kanoelehua Ave.	0.209	ESE	Higher	SCC/NFA Refer to Section 8.2
Mid Pac Petroleum 2705956	1801 Kamehameha Ave.	0.248	E	Higher	SCC/NFA Refer to Section 8.2
Kumu Street	Kumu Street and Kamehameha Ave.	0.261	E	Higher	SCC/NFA Refer to Section 8.2
H. Harada Contractor, Inc.	24 Railroad Ave.	0.271	E	Higher	SCC/NFA Refer to Section 8.2
Tesoro Gas Express 82	1672 Kamehameha Ave.	0.321	E	Higher	SCC/NFA Refer to Section 8.2
Harper Car & Truck Rentals of Hawaii	1690 Kamehameha Ave.	0.326	E	Higher	SCC/NFA Refer to Section 8.2
Phillips U Drive Inc.	920 Piilani St.	0.367	SSE	Higher	SCC/NFA Refer to Section 8.2

NFA – No Further Action SCC – Site Cleanup Complete

3.1.11 State Voluntary Cleanup Sites

The state voluntary cleanup sites list, maintained by the HDOH HEER Office, contains sites participating in the State's Voluntary Response Program. EDR identified no sites participating in the State's Voluntary Response Program within 1/2 mile of the subject property (Environmental Data Resources, Inc., 2015).

3.1.12 Federal RCRA Generators List

The RCRA Generators list, maintained by the EPA, contains small and large quantity generators of RCRA hazardous waste. The determination of generator size is used to establish the risk that the facility poses to public health and the environment, and consequently, the amount of regulation and reporting required. Large Quantity Generators (LQG) are facilities that generate more than a 1,000 kg/month of hazardous waste and/or more than 1 kg/month of acute hazardous waste. Small Quantity Generators (SQG) are facilities that generate less than 1,000 kg/month, but more than 100 kg/month of hazardous waste and/or less than 1 kg/month of acute hazardous waste. Conditionally Exempt Small Quantity Generators (CESQG) are facilities that generate less than 100 kg/month of hazardous waste and/or less than 1 kg/month of acute hazardous waste. The EPA also maintains the RCRA NLR list. This list contains facilities that were once on the RCRA generators list, but are no longer in business, no longer in business at the listed address, or are no longer generating hazardous waste in quantities that require reporting. This list also identifies the facilities of hazardous waste transporters.

EDR identified no LQG, SQG, CESQG, or NLR facilities on the subject property or adjoining properties (Environmental Data Resources, Inc., 2015). Eight RCRA generator facilities were identified within 1/4 mile of the subject property; four CESQG, three SQG, and one NLR (Table 7).

Table 7. Federal RCRA Generator Sites

Facility Name	Facility Type	Location	Distance (mile)	Direction	Relative Elevation	Notes
AKW Environmental, LLC	CESQG	190 Kuawa St.	0.01	SSE	Higher	Refer to Section 8.2
Tractor Supply Company #4604	CESQG	199 Kalanikoa St.	0.15	SE	Higher	Refer to Section 8.2
Rex Tire and Supply	CESQG	266 Kanoelehua Ave.	0.23	ESE	Higher	Refer to Section 8.2
Meadow Gold Dairies, Inc. - Puhi Plant	CESQG	1801 Kamehameha Ave.	0.25	E	Higher	Refer to Section 8.2
Unitek Solvent Services, Inc.	NLR	110 Kalanikoa Ave.	0.09	ESE	Higher	Refer to section 3.2.2
Beachside Roofing, LLC	SQG	1266 Kamehameha Hwy.	0.10	WNW	Lower	Refer to Section 8.2
HDOH V C Branch	SQG	191 Kuawa St.	0.010	SSE	Higher	Refer to Section 8.2
Shipman Generating Station	SQG	20 Banyan Dr.	0.138	NNW	Lower	Refer to section 3.2.2

CESQG – Conditionally Exempt Small Quantity Generator
NLR – No Longer Regulated
SQG – Small Quantity Generator

3.1.13 State Registered UST List

The HDOH SHWB maintains a database of known underground storage tanks. EDR identified five UST facilities within 1/4 mile of the subject property (Environmental Data Resources, Inc., 2015) (Table 8).

Table 8. State Registered UST

Facility Name	Location	Distance (mile)	Direction	Relative Elevation	Facility ID	Facility Status
S.K. Oda, Ltd.	180 Kalanikoa St.	0.134	SE	High	9-600449	1-6,000 Gal Gasoline - Permanently Out of Use
Firestone Tire/Rubber	200 Kanoelehua & Kuawa St.	0.197	ESE	High	9-601362	1 - 280 Gal Used Oil - Permanently Out of Use
Jack's Tours	226 Kanoelehua Ave.	0.209	ESE	High	9-603750	1-10,000 Gal Gasoline - Permanently Out of Use 1-10,000 Gal Diesel - Permanently Out of Use 1-1,000 Gal Used Oil - Permanently Out of Use
DLNR - Land Division	71-1555 Hawaii Belt Rd.	0.222	ESE	High	9-603753	1-1,000 Gal Gasoline - Permanently Out of Use
Mid Pac Petroleum 2705956	1801 Kamehameha Ave.	0.248	E	High	9-600013	1 - 8,000 Gal Gasoline - Currently in Use 1-4,000 Gal Diesel - Currently in Use 1-12,000 Gal Gasoline - Currently in Use 2-8,000 Gal Gasoline - Permanently Out of Use 1 - 550 Gal Used Oil - Permanently Out of Use

3.1.14 Federal ERNS List

The ERNS list, maintained by the EPA, contains CERCLA hazardous substance releases or spills, as maintained by the National Response Center. EDR identified no release incidents on the subject property or within the zip code (Environmental Data Resources, Inc., 2015).

3.1.15 State IC and EC Registries

The State of Hawaii maintains a list of properties that have been remediated to a particular standard. Because the sites may continue to be impacted by past use, future use of the properties may be restricted in order to protect human health and the environment. Land Use Controls can be either IC or EC. ICs are limitations on how the properties may be used, such as limiting its use to industrial activities. ECs are physical structures or devices located on the properties that contain or limit exposure to contamination. ECs need to be maintained or protected to be effective. No IC or EC sites were identified within 1/4 mile of the subject property or within the zip code (Environmental Data Resources, Inc., 2015).

3.1.16 Hazardous Materials Incident Report System List

The U.S. Department of Transportation maintains a list of hazardous material spill incidents reported on the Hazardous Materials Incident Report System (HMIRS), SPILLS90. EDR identified no SPILLS sites in the area surrounding the subject property (Environmental Data Resources, Inc., 2015).

3.2 ADDITIONAL ENVIRONMENTAL RECORD SOURCES

MNA reviewed additional environmental records as needed and available. Record sources filed by HELCO, the County Fire Department, State HEER, SHWB, and Department of Land and Natural Resources (DLNR) were requested. Refer to Section 8.0 for opinions associated with the findings of the records review.

3.2.1 Subject Property

MNA submitted a request to the HFD on 22 April 2015. HFD had not responded at the time of this writing. MNA submitted records request to the HEER Office and SHWB for the subject property on 07 April 2015. SHWB had no records on file for the subject property.

No records of registered UST or LUST facilities were identified at the subject property from the HDOH UST database (Hawaii Department of Health, 2015).

MNA submitted records request to HELCO on 24 April 2015. HELCO confirmed that there were no transformers on the subject property.

A letter, dated August 14, 2007, issued by the HDOH to DLNR Engineering indicated that Wailoa Small Boat Harbor was dredged as part of the harbor maintenance. The dredge material was tested, and the results were reported as "below the DOH Environmental Action Levels and the dredge material is approved for reuse."

3.2.2 Surrounding Properties

MNA identified three pole-mounted transformers on adjoining properties to the south and west of the subject property. The observed transformers were in fair condition, and no stains were observed on the transformers or the ground surface below them. MNA submitted records request to HELCO on 24 April 2015. HELCO confirmed that there were five transformers on adjoining properties. The transformers were known to be free of polychlorinated biphenyls (PCB). Table 9 summarizes the transformer information provided by HELCO.

Table 9. Transformer Near the Subject Property

Transformer Information		Location			Date Purchased	PCB Status
KVA	CO#	Structure ID	Pole #	Street Name		
10	25134	114132	2	Manono St.	8/17/1992	Non-PCB
10	24674	114141	9		5/11/1992	Non-PCB
50	45466	113936	7	Kuawa St.	7/10/2013	Non-PCB
75	38119				1/13/2006	Non-PCB
50	45465				7/10/2013	Non-PCB

ID- Identification PCB- Polychlorinated biphenyls

No UST or LUST facilities were identified for the adjoining properties in the HDOH UST database (Hawaii Department of Health, 2014).

MNA requested a review of the HEER Office and SHWB case files for the adjoining properties and properties with any potential to affect the subject property.

The HEER Office provided records, which are summarized as follows:

666 Kalanianaole Ave., TMK (3) 2-1-008:006

The site, identified as Chevron Hilo Terminal, was located less than one mile east and downgradient from the subject property. On 02 December 1994, there was a release of 10-gallon of an oil/water/gasoline mixture from a vacuum truck. Some of the spill entered the water causing a sheen. Response was taken immediately and the spill was remediated. No further action was necessary.

On 24 August 1995, there was a release of 20-gallon of unleaded gasoline due to a valve failure. The release occurred within a bermed area. No further action was necessary. Refer to Section 8.2 for findings related to this record.

150 Keaa Street, TMK (3) 2-1-006:087

The site, identified as Wood Protection Company (HPM Building Supply), was located approximately 1/2 mile east and downgradient from the subject property. On 22 July 1990, 2,500 - 4,000 gallons of 2% solution Chromated Copper Arsenate (CCA) wood treating solution was spilled from a pressure vessel and spread to the ocean, due to operator error. Response was thwarted by heavy rains and the spill went uncontrolled. Remediation began immediately, and the impacted soil was removed and transferred to a landfill. Refer to Section 8.2 for findings related to this record.

191 Kuawa Street, TMK (3) 2-2-032:060

The site, identified as Hawaii District Lab, was located approximately 50 feet south and upgradient from the subject property. On 26 December 1991, there was a spill of 10-gallon of picric acid. Due to the potential danger of the acid, PENCO was contracted to remove it from the site and had the substance detonated. No further action was required. Refer to Section 8.2 for findings related to this record.

131 Kekuanaoa Place, TMK (3) 2-1-012:101

The site, identified as Alamo Rent-a-Car, was located approximately 3/4 mile south-southwest and upgradient from the subject property. On 21 December 1994, there was a spill of 40-gallon of gasoline. An attendant drove a car while it was being filled at the pump. The hose was released from the fuel tank, and fuel was released onto the ground (Section 8.2).

210 Hoku Street, TMK (3) 2-2-018:038

The site, identified as Hilo Quality Washerette, was located just less than one mile south-southwest and upgradient from the subject property. On 12 December 1995, 200 gallon of diesel fuel was released to the soil. A routine fuel-level check of a UST indicated a large loss of fuel. Walker Consultants, Ltd., was contracted, and the UST was removed on 19 December 1995. Upon removal of the UST it was evident that the soil around the lower walls and bottom of the UST were impacted by the diesel release. Soil was removed from the UST excavation to approximately 25 ft. bgs (the extent the backhoe would allow), however; diesel-impacted soil remained at the bottom of the excavation. In a letter dated 03 April 1997, the HDOH concluded that due to the unknown extent of diesel contamination in the soil, Hilo Quality Washerette was identified as a medium priority site. The site required further investigation and/or monitoring

according to the Technical Guidance Manual for the Implementation of the Hawaii State Contingency Plan. Refer to Section 8.2 for findings related to this record.

701 Kalanianaole Avenue, TMK (3) 2-1-007:016

The site, identified as Tesoro Hawaii Corporation Terminal, was located just less than one mile east-northeast and downgradient from the subject property. On 14 May 1997, an excavator released 20 gallon of oil from its hydraulic line. The spill was stopped and cleaned with absorbents. An excavation was planned to remove the residual oil. Refer to Section 8.2 for findings related to this record.

865 Kinoole Street, TMK (3) 2-2-017:040

The site, identified as Hilo Quality Cleaners, was located less than a mile west-southwest and upgradient from the subject property. On 08 October 1997, equipment failed and 20 gallon of diesel fuel was released into the ocean. The equipment was repaired and cleanup operations were completed by the responsible party. No further action was required.

On 11 January 1995, a 7,000 gallon diesel fuel UST was removed from the site by Walker Consultants, Ltd. Upon excavation it was observed that a relatively small area of soil/basalt lining one end of the UST-removal excavation was impacted by diesel fuel. The impacted soil was excavated from the site. Soil samples taken from the excavation indicated that the site was not significantly impacted by the release. In a letter dated 18 July 1995, the HDOH stated that no further action was necessary in response to the release. Refer to Section 8.2 for findings related to this record.

20 Banyan Drive, TMK (3) 2-1-001:024

The site, identified as HELCO Generating Station: Shipman, was located less than 1/4 mile north and downgradient from the subject property. On 10 November 1996, a release of approximately 100 gallon of fuel oil entered an inspection well. Most of the spill material was recovered in a cleanup conducted by Unitek. No further action was required.

On 11 November 2002, there was a release of 90 gallon of fuel oil from the terminal due to a leak in a guage line. The release was inside a concrete secondary containment. No further action was required. On 03 February 2003, 100 gallon of lube oil was released from a line within a concrete containment trench. No further action was required. Refer to Section 8.2 for findings related to this record.

The SHWB provided records, which are summarized as follows:

200 Kanoelehua and Kuawa Street, No TMK Listed

The site (facility ID 9-601362), identified as Firestone Tire/Rubber, was located little more than 1/4 miles southwest and upgradient from the subject property. One 280 gallon used oil UST was installed in approximately 1977 at the property. It is permanently out of use, and no violations were listed. Refer to Section 8.2 for findings related to this record.

131 Kekuanaoa Place, TMK 2-2-012:101

The site (facility ID 9-601537), identified as Alamo Rent-a-Car Inc., was located approximately 3/4 miles southwest and upgradient from the subject property. One 1,000 gallon gasoline UST was installed at the property in 1992. It has since been taken out of use. Alamo Rent-a-Car was

inspected on 07 February 2005 by the HDOH. During the inspection the following violations were cited:

- Failure to perform test of operability.
- Failure to maintain 3rd party certificate as automatic line leak detector.
- Failure to maintain the certificate of financial responsibility.
- Failure to have an overfill prevention device installed on UST system.
- Failure to monitor tanks at least every 30 days.
- Failure to maintain statistical inventory reconciliation (SIR) 3rd party certificate for tanks.
- Failure to monitor pipes using a monthly method.
- Failure to maintain SIR 3rd party certificate for SIR method for pipe.

A follow up inspection was done on 05 June 2007. The facility did not receive any citations. Refer to Section 8.2 for findings related to this record.

210 Hoku Street, TMK (3) 2-2-018:038

The site, identified as Hilo Quality Washerette, was located approximately a mile southeast and upgradient from the subject property. The site (Facility ID 9-600467) had one unregulated UST to store heating oil. It was removed in 1996. Refer to Section 8.2 for findings related to this record.

865 Kinoole Street, TMK (3)2-2-017:040

The site (Facility ID 9-601694), identified as Hilo Quality Cleaners, was located approximately a mile west-southwest and upgradient from the subject property. The site had 1,000 gallon fuel oil UST, 1,000 gallon dry-cleaning solvent UST, and a 6,000 gallon diesel UST all of unknown age or installation date. Due to the location of the tanks within the main facility, they were abandoned in place; in October 1990, the tanks were abandoned in place by the Fuel Oil Polishing Company of Hawaii. In a letter dated 12 March 2002, the HDOH issued a No Further Action for the site. Refer to Section 8.2 for findings related to this record.

190 Kuawa Street, TMK (3) 2-2-032:090

The site (Facility ID HW-6522), identified as AKW Environmental, LLC, was located approximately 500 feet south-southeast and slightly upgradient from the subject property. The site was inspected by the HDOH on 21 March 2014. No violations were noted during the inspection. Refer to Section 8.2 for findings related to this record.

150 Keaa Street, TMK (3)2-1-006:087

The site (Facility ID HW-6402), identified as Wood Protection Company (HPM Building Supply), was located approximately 1/2 a mile east and downgradient from the subject property. The site was inspected by the HDOH on 23 August 2002. After the inspection, a warning letter was issued to Wood Protection Company/HPM requesting further documentation. That documentation was provided. It was again inspected by the HDOH on 06 February 2009. No violations were noted during the inspection. Refer to Section 8.2 for findings related to this record.

110 Kalanikoa Street, TMK (3) 2-2-32:085

The site (Facility ID HW-2114), identified as Unitek Solvent Services, Inc., was located approximately less than 1/4 mile southeast and upgradient from the subject property. In a letter

dated 06 October 2014 issued by the HDOH, the site was notified of having operating as an unpermitted used oil transporter and transfer facility. This action had continued for six months after having received a letter and a site visit regarding the lapsed permits. Refer to Section 8.2 for findings related to this record.

3.3 HISTORICAL USE INFORMATION ON THE SUBJECT PROPERTY

MNA reviewed historical use information for the subject property including aerial photographs, United States Geological Survey (USGS) topographic maps, and Sanborn Fire Insurance maps.

3.3.1 Historical Aerial Photographs

Aerial photographs of the subject, adjoining, and surrounding properties were provided by EDR (Environmental Data Resources, Inc., 2015). Photographs from the years 1954, 1975, 1977, 1985, 1988, 1992, and 2000 were reviewed (Table 10).

Table 10. Historical Photograph Details

Year	Image Type	Approximate Scale
1954	B/W	1”:750’
1975	C	1”:1000’
1977	B/W	1”:500’
1985	C	1”:500’
1988	C	1”:500’
1992	C	1”:500’
2000	C	1”:500’

B/W - Black and White C – Color Photograph

For the reviewed aerial photographs, the following observations were made:

1954: The subject property was visibly covered with vegetation. A road was visible going east to west through the property. Adjoining to the north was Kamehameha Avenue, and adjoining to the west was Manono Street.

1975: The subject property was vacant. The area north of the subject property appeared to be in use as a golf course. The area to the southeast of the subject property was a mix of residential and commercial.

1977: The subject property was vacant. Kuawa Street was visible south of the subject property. Further south of Kuawa Street was a baseball field. Large warehouse structures were visible to the east, and boats were visible, docked in the water to the west.

1985: Small structures were visible on the west side of the subject property. The east side of the property remained vacant. Modernization of the roadways in the area is apparent.

1988: More small structures were visible on the south side of the subject property. More than half of the subject property was still covered with vegetation. The adjoining area to the east of the subject property included denser commercial development.

1992: No visible changes were depicted in the 1992 photograph.

2000: Small structures were visible in the southwest corner of the subject property. More than 75% of the site remained covered in vegetation.

3.3.2 Historical Topographic Maps

USGS topographic maps that cover the subject property and vicinity were reviewed. Maps were available for the years 1914, 1932, 1963, 1980, 1981, and 1995 (Environmental Data Resources, Inc., 2015) (Appendix A). The maps depicted the following:

1914: The area of the subject property was developed and labeled Waiakea. To the south Waiakea Fish Pond was visible. The area appeared to be primarily residential.

1932: Kamehameha Avenue was visible north of the subject property. To the east, Hilo Airport was depicted.

1963: Structures were visible on the northeast side of the subject property. Hoolulu Park was to the south. East of the subject property were a mix of residential and commercial structures.

1980: Liliuokalani Gardens and the Golf Course were visible north of the subject property. South of the subject property was vacant. The structures were still present on the northeast side of the subject property.

1981: No visible changes were depicted in the 1981 map.

1995: The structures previously depicted on the subject property were no longer present. To the south Hoolulu Park was visible.

3.3.3 Fire Insurance Maps

Fire insurance maps for the subject property and vicinity were reviewed. Maps were available for the years 1991, 1987, 1978, 1974, 1957, 1921, and 1914 (Environmental Data Resources, Inc., 2015) (Appendix A). The maps depicted to following:

1991: The subject property and surrounding area were vacant. Kamehameha Avenue was to the north, and Manono Street was to the west.

1987: No changes from the 1991 map are observed to the subject property.

1978: No changes from the 1987 map are observed to the subject property.

1974: No changes from the 1978 map are observed to the subject property.

1957: The subject property and surrounding area were in use as a residential area. North of Kamehameha Avenue there were more residences, as well as the Waiakea Theatre and several small store fronts.

1921: The northwest portion of the subject property was in use as a commercial area. A tailor and drug store were depicted. The remaining portion of the subject property appeared vacant.

1914: The subject property and surrounding area were in use as a commercial area with small vendors occupying the area. To the south of the subject property was a freight warehouse and a railroad depot.

4.0 SITE RECONNAISSANCE

MNA personnel conducted site reconnaissance on 30 March 2015. The weather was sunny with partly cloudy skies and light trade winds. The site reconnaissance focused on the identification of *RECs* that may have the ability to impact the subject property.

Refer to Section 8.0 for opinions related to the findings during the site reconnaissance.

4.1 METHODOLOGY AND LIMITING CONDITIONS

The site reconnaissance was conducted by Kristin Cabanila and Phillip Cabanila of MNA. MNA visually inspected the subject property, adjoining properties, and associated streets and roadways. MNA looked for a variety of environmental hazard indicators at and around the subject property including, but not limited to, stained surface soil, dead or stressed vegetation, hazardous substances, aboveground or underground storage tanks, disposal areas, pole-mounted or pad-mounted transformers, groundwater wells, drywells, and sumps. Structures and or building materials were not observed onsite during the assessment. Photographs of the site reconnaissance are presented in Appendix B.

4.2 GENERAL SITE SETTING

The subject property is bordered by Kamehameha Avenue (Highway 19) to the north, Manono Street to the west, and Kuawa Street to the south (Figure 1). The subject property is set 2-4 feet below the grade of Kamehameha Avenue and Manono Street, with a cross grade to Kuawa Street. Scattered banyan, mango, and palm trees are found on the relatively flat property. Evidence of heavy equipment operating onsite was observed. There was bare soil with evenly spaced scrape marks within the subject property.

4.3 EXTERIOR OBSERVATIONS

During the 30 March 2015 site reconnaissance, MNA personnel observed the conditions of the subject property and the adjoining properties.

The entrance to the property was accessible along Kuawa Street (Photograph 1). The adjoining property to the north, and across Kamehameha Avenue was the Naniloa Golf Course (Photograph 2). The adjoining properties to the south and across Kuawa Street included the Walter Victor CK Baseball Complex and AKW Environmental, LLC. (Photographs 3 and 4). Adjoining properties to the east included County of Hawaii Offices and Coqui's Hideaway Bar and Grill (Photographs 5 and 6). The adjoining property to the west and across Manono Street was the Wailoa River Harbor and Park (Photograph 7).

No building structures were present on the subject property. A monument base was observed onsite, approximately 100 feet north of Kuawa Street near the center of the property (Photograph 8). A soil stockpile was also observed onsite, approximately 250 feet north of Kuawa Street, near the center-east portion of the subject property (Photograph 9).

Six sewer manholes and one storm drain were observed in various areas on the subject property (Photograph 10; Figure 3). Eleven concrete fence anchors were observed on the western end of the property (Photograph 11).

Sewer markers were observed on the subject property (Photographs 12 and 13). On the central northern area of the property, a discarded motor was observed near the banyan tree (Photograph

14). The motor was in poor condition, showing rust and weathering on all sides. Vegetation in the area surrounding the motor appeared to be stressed.

Three pole-mounted transformers were observed on an adjoining property to the south and west. All observed transformers were in good condition, showing no signs of leaking or staining (Photographs 15 through 19).

4.4 INTERIOR OBSERVATIONS

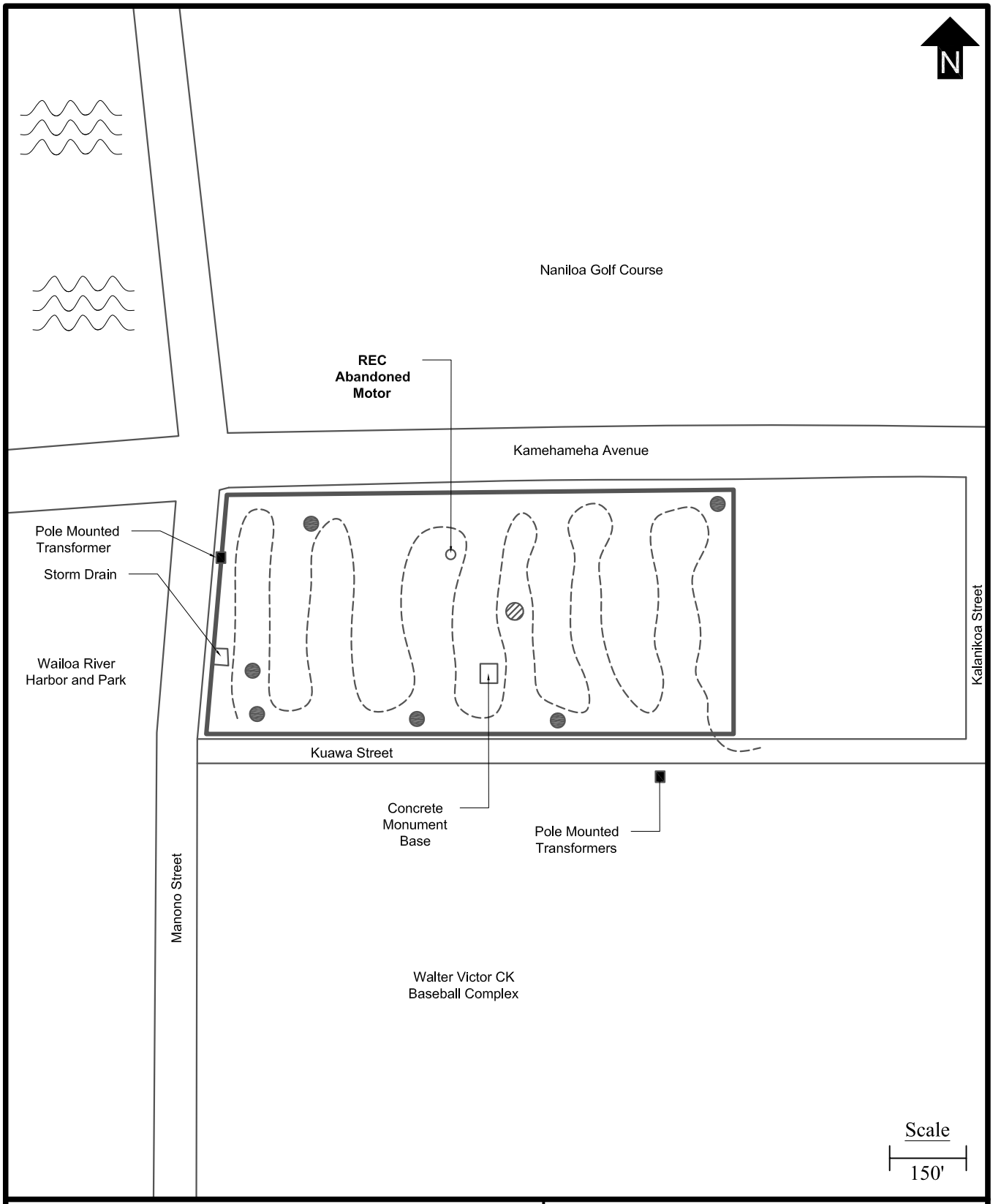
No structures were observed onsite. Therefore, no interior observations were made.

4.5 HAZARDOUS SUBSTANCES AND PETROLEUM PRODUCTS

The discarded motor observed onsite appeared to be in poor condition and void of fluids. There was no apparent staining to the soil surrounding the motor, and no petroleum or oil odors were detected.

4.6 UNDERGROUND STORAGE TANKS

Review of HDOH online records verified that no USTs were associated with the subject property. No evidence of USTs, such as dispensers, vent pipes, or fill ports were observed on the subject property.



Legend and Notes:

Subject Property

Path Walked

Manhole

Stockpile

REC - Recognized Environmental Condition

Myounghee Noh & Associates, L.L.C.

1927_3

Figure 3. Site Map
Kuawa Street Enhanced Phase I ESA
TMK (3) 2-2-032:003, :004, :008, :019, :087, :088
Hilo, Island of Hawaii

May 2015

5.0 SOIL SAMPLING AND ANALYSIS

5.1 Contaminants of Potential Concern (COPC)

Petroleum Contaminants

There is a HELCO fuel line along Kamehameha Avenue, and a former rail station ran through one of the adjoining properties. The subject property was formerly used as housing and shops during the 1950s and 1960s before they were demolished. Based on information obtained by interviews (Section 6.0), a portion of the subject property was fenced off and used for boat storage, and there was a former rail maintenance facility at an adjoining property.

Even though there are no historical records of oil storage tanks [i.e. aboveground storage tanks (AST), UST] and releases at the subject property and adjoining properties, there were potential uses of AST/UST and fuel releases for heating and fueling and maintenance of vehicles, rails, and boats prior to 1960s. Therefore, petroleum contaminants including petroleum hydrocarbons; benzene, toluene, ethylbenzene, and xylenes (BTEX); heavy metals (lead, cadmium, arsenic, barium, chromium, selenium, silver, and mercury); and PAH were identified as the COPC.

Arsenic and Pesticides

Arsenic is a naturally occurring element in the earth's crust. In Hawaii, low levels of arsenic are found naturally in native soils between 1.0 milligrams per kilogram (mg/kg) - 20 mg/kg. However, significantly elevated levels of arsenic have been identified in soils at former sugar cane fields, former pesticide storage or mixing areas, former sugar plantation camps, a former canec production plant, and wood-treatment plants. The presence of elevated levels of soil arsenic at some historic sugar plantation areas is believed to be related to the widespread use of sodium arsenite or other arsenic-based herbicides/pesticides in and around the cane fields and camps in the 1920s through 1940s (Hawaii Department of Health, 2010). Based on the information obtained from an interview, proximity to the Wailoa River and the associated known arsenic contamination was of concern.

Pesticides have been used in Hawaii since the early 1900s for a variety of reasons including structural protection and agricultural uses (State of Hawaii, Department of Health, 2009). Since the subject property was used as former housing and shops before 1960s, pesticides such as chlordane and heptachlor may have been applied under building foundations. The following pesticides may have been routinely applied to control termites and other pests in Hawaii (Naval Facility Engineering Command, 2013).

- Chlordane, heptachlor, and heptachlor epoxide (an oxidation product of chlordane and heptachlor)
- Dichlorodiphenyltrichloroethane (DDT), dichlorodiphenyldichloroethane (DDD), and dichlorodiphenyldichloroethylene (DDE)
- Aldrin, dieldrin, and endrin
- Endosulfan

Due to potential use of herbicides and pesticides at the subject property, those chemicals were included in the COPC.

Polychlorinated Biphenyls (PCB)

PCB was widely used in electrical transformers and also as hydraulic fluids in the U.S. from the 1930s through the 1970s when production was banned. They were manufactured for their chemical and thermal stability and used as liquid insulators in electrical equipment. Old

equipment containing PCB are still in use today, and therefore releases to the environment are still occurring. In addition, contaminated upland sites and runoff from many industrial environments continue to contribute PCB to aquatic systems (Battelle Memorial Institute, GeoChem Metrix Inc., U.S. Navy SPAWR Systems Center, and U.S.EPA ORD, 2012). While PCB may have not have been used or released in the subject property, it is possible that it can be present on the subject property by flood history, tsunami impacts, dredging, and illegal dumping.

Based on the literature review and potential chemical use as described in this section, the COPC were identified as follows:

- Total Petroleum Hydrocarbon (TPH)-Gasoline, Diesel, and Oil
- BTEX
- Priority pollutant PAH
- Organochlorine Pesticides
- RCRA 8 metals (lead, cadmium, arsenic, barium, chromium, selenium, silver, and mercury)
- PCB

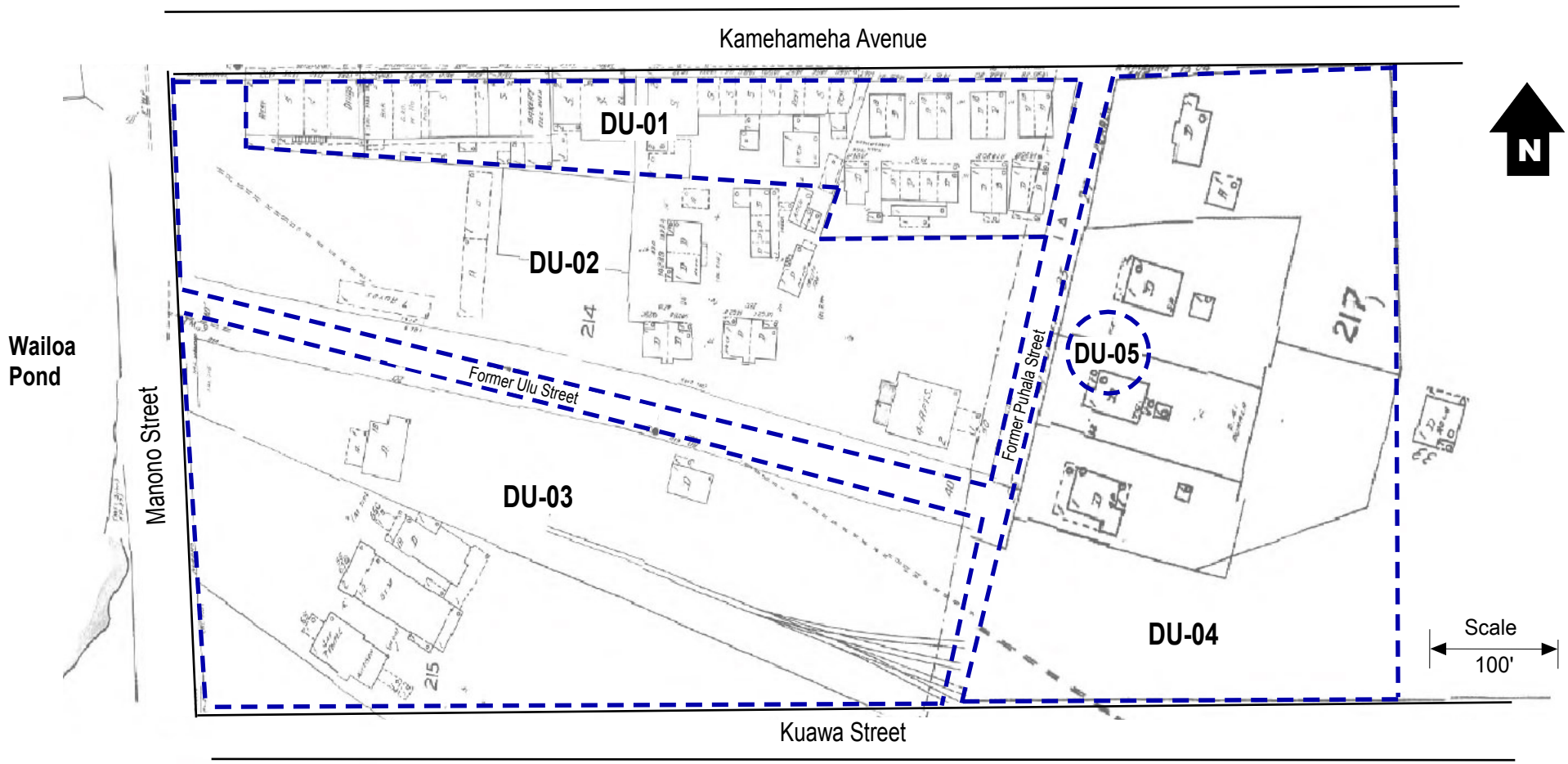
5.2 Field Methodology

During 31 March and 01 April 2015, MNA conducted surface and near surface soil sampling on the subject property. The subject property was divided into 4 decision units (DU) based on the historical geophysical boundary in the 1950s before the housing and shops were demolished. During the site reconnaissance, a stockpile was discovered on the subject property (Figure 4). The stockpile was approximately 30 cubic yards (12 feet wide by 6.5 feet tall). The stockpile was identified as an additional DU. The five DUs are described as follows:

- DU-01: Former Dense Shop and Housing Area, on the northwest side of the subject property
- DU-02: Former housing and landscape area, located on the west side of the subject property
- DU-03: Former housing and landscape area, located on the southwest side of the subject property
- DU-04: Former housing and landscape area, located on the east side of the subject property
- DU-05: Stockpile that was located in the DU-04 area

MNA used a multi-incremental sampling (MIS) method. Each sample combined fifty 30-gram increments. Each DU was divided into 50 equally spaced areas, and the 50 boreholes were advanced using a hand auger and a metal digging bar. When the 12-inch depth was achieved, loose soil was removed from the borehole using a garden shovel, and the incremental samples were collected.

From each borehole, the lower near-surface sample (6-12 inches bgs) was collected first by loosening the soil along the sidewalls with a metal trowel and collecting the soil using a 10-gram TerraCore® sampler. Surface soil (below the grass cover 0-6 inches bgs) samples were then collected using a second 10-gram TerraCore® sampler, scraping the sidewall in the borehole. The soil increments were transferred into two separate laboratory-supplied containers. VOC samples were collected from the lower 6-12 inches bgs in the same boreholes, using a 10-gram TerraCore® scraping the side walls, then placed directly into an amber glass jar with methanol preservative.



Analytical Results for the Contaminants Exceeding EAL

Decision Unit	Sampling Depth (inches bgs)	Arsenic (mg/kg) EAL: 24 mg/kg		Lead (mg/kg) EAL: 200 mg/kg	
		Analytical Result	Upper Range Value	Analytical Result	Upper Range Value
DU-01	0-6	29	31	86	92.4
	6-12	25	26.7	110	118.1
DU-02	0-6	22	23.5	18	19.3
	6-12	22	23.5	36	38.7
DU-03	0-6	21	22.5	15	16.1
	6-12	19	20.3	47	50.5
DU-04	0-6	35	37.4	340	365.2
	6-12	41	43.9	340	365.2
DU-05	Stockpile	42	44.9	140	150.4

Criteria: HDOH, Tier 1 Soil EAL with unrestricted land use

Acronyms and Abbreviations

bgs: below ground surface
EAL: Environmental Action Level
HDOH: Hawaii Department of Health
mg/kg: milligrams per kilogram

Note:

1) DU-01 through DU-04: The DU boundaries were delineated based on the historical geophysical boundary in the 1950s before the housing and shops were demolished.
2) DU-05: Stockpile discovered during the site reconnaissance in March 2015
3) Upper Range Value: Mean plus the standard deviation evaluated by the triplicate samples

Figure 4. Soil Sampling Locations and Results
Kuawa Street Enhanced Phase I ESA
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The soil samples were transported under a chain-of-custody for analysis to Curtis & Tompkins Laboratories in Berkeley, California. The samples were analyzed by the following methods:

- TPH-Gasoline Diesel, and Oil by EPA Method 8015B
- BTEX by EPA Method 8021B
- Priority PAH by EPA Method 8270C-SIM
- PCB by EPA Method 8082
- Organochlorine pesticides by EPA Method 8081A
- RCRA 8 metals by EPA 6010B and 7471A

TPH-Gasoline and BTEX were analyzed for the near-surface samples only. Since these analytes are volatile, they were unlikely present in the surface soil.

During sample transit to the laboratory, three sample containers were damaged. The affected samples were Sample IDs DU-03-A, DU-04-B, and DU-05-A. MNA conducted resampling for the affected samples on 06 April 2015. A summary of the soil sampling and analyses is presented in Table 11.

Table 11. Summary of Soil Sampling and Analytes

Decision Unit	Sample ID	Sample Depth (inches below ground surface)	Sample Type	Date of Sample Collection (mm/dd/yy)	Analytes (Analytical Method No.)					
					TPH-Diesel/Oil (8015B)	TPH-Gasoline (8015B) & BTEX (8021B)	PAHs (8270C-SIM)	PCB (8082)	Organichlorine pesticides (8081A)	Total RCRA8 Metals (6010B/7471A)
DU-01	DU-01-A	0-6	MIS-50 Increments	03/31/15	X		X	X	X	X
	DU-01-B	6-12	MIS-50 Increments	03/31/15	X	X	X	X	X	X
DU-02	DU-02-A	0-6	MIS-50 Increments [Primary]	03/31/15	X		X	X	X	X
	DU-02-B	6-12	MIS-50 Increments	03/31/15	X	X	X	X	X	X
DU-03	DU-03-A	0-6	MIS-50 Increments	**04/06/15 Resampling**	X		X	X	X	X
	DU-03-B	6-12	MIS-50 Increments	03/31/15	X	X	X	X	X	X
DU-04	DU-04-A-1	0-6	MIS-50 Increments [Primary]	04/01/15	X		X	X	X	X
	DU-04-A-2	0-6	MIS-50 Increments [Duplicate]	04/01/15	X		X	X	X	X
	DU-04-A-3	0-6	MIS-50 Increments [Triplicate]	04/01/15	X		X	X	X	X
	DU-04-B	6-12	MIS-50 Increments	04/01/15 **04/06/2015 Resampling** for TPH-G and BTEX analyses	X	X	X	X	X	X
DU-05	DU-05-A	Entire Stockpile	MIS-50 Increments	**04/06/15 Resampling**	X		X	X	X	X

BTEX Benzene, Toluene, Ethylbenzene, and Xylenes
DU Decision Unit
EPA U.S. Environmental Protection Agency
ID Identification
PAH Polycyclic Aromatic Hydrocarbon
PCB Polychlorinated Biphynels
RCRA Resource Conservation and Recovery Act
TPH Total Petroleum Hydrocarbons

5.3 Preservation and Transportation

All samples were labeled and recorded in a chain-of-custody document. The samples were placed in a cooler and chilled to 4˚ Celsius (C) with frozen gel ice for transport to Curtis & Tompkins Laboratories in Berkeley, California, via FedEx.

5.4 Decontamination and Investigation Derived Waste

Investigation Derived Waste (IDW) was minimized through the selection of sampling techniques and the use of disposable sampling equipment. IDW included disposable personal protective equipment (PPE) and disposable sampling tools. Less than one trash bag of PPE and disposable sampling tools were generated and disposed of in a municipal waste dumpster.

5.5 Analytical Results

The analytical results for contaminants were compared to the HDOH Tier 1 Environmental Action Levels (EAL) with unrestricted (residential) and restricted (commercial/industrial) land uses above a nondrinking water resource and located less than 150 meters from surface water (State of Hawaii, Department of Health, Fall 2011; revised Jan 2012).

MNA collected a set of triplicate surface soil samples from DU-04 (DU-04-A-1, DU-04-A-2, and DU-04-A-3) to support the reproducibility of the sampling technique and analytical practice and representativeness of the subject property. Field performance was reviewed by comparing the results of primary, duplicate, and triplicate samples. Standard Deviation (STDEV), Average (AVG), and/or the percent Relative Standard Deviation (RSD) between triplicates were evaluated when analytes are detected above the reporting limits (Table 12). If the percent RSD between field triplicate MIS is 35% or less, then the total error is considered within a reasonable range for precision and reproducibility. The percent RSD was calculated by using the following equations.

$$RSD\ (\%) = \frac{100s}{\bar{x}}$$

Where: $\bar{x}$ = Average
s = Standard deviation

The percent RSDs of TPH-Diesel, TPH-Oil, and heavy metals in the replicate set were below 35. The percent RSDs for fluoranthene and pyrene in the soil replicate set were 75.4 and 87.2 respectively. The fluoranthene results in the triplicate data set were in the range of 0.17 to 0.73 mg/kg and the average level was 0.30 mg/kg. The pyrene results were in the range of 0.19 to 0.98 mg/kg and the average level was 0.49 mg/kg. Although percent RSDs exceeded the acceptance level, 35% RSD, the detected concentrations and the average levels were below the soil EAL for the unrestricted land use, 87 mg/kg for fluoranthene and 44 mg/kg for pyrene. Thus, it was considered that the variations of the results are acceptable, and the incremental sample results are determined to be representative.

The RSD was used to calculate the upper and lower range of analytes with concentration near, or exceeding the EALs for unrestricted land use which are arsenic (%RSD: 7.0) and lead (%RSD: 7.4).

Table 12. Field Performance Review Data

Analytes	Tier 1 EAL (mg/kg) Unrestricted (Residential)	Sample Results (mg/kg)			Field Performance Data		
		DU-04-A-1 (Primary)	DU-04-A-2 (Duplicate)	DU-04-A-3 (Triplicate)	Average (mg/kg)	Standard Deviation	Relative Standard Deviation (%)
Total Petroleum Hydrocarbons (8015B)							
TPH-Diesel	500	29	15	23	22	7.0	31.4
TPH-Oil	500	160	160	180	167	11.5	6.9
Polycyclic Aromatic Hydrocarbons (8270C)							
Acenaphthene	120	ND (0.07)	ND (0.07)	ND (0.17)	---	---	---
Acenaphthylene	13	ND (0.07)	ND (0.07)	ND (0.17)	---	---	---
Anthracene	4.3	ND (0.07)	ND (0.07)	ND (0.17)	---	---	---
Benzo[a]anthracene	1.5	0.098	0.35	ND (0.17)	---	---	---
Benzo[a]pyrene	0.15	0.16	0.43	ND (0.17)	---	---	---
Benzo[b]fluoranthene	1.5	0.24	0.57	ND (0.17)	---	---	---
Benzo[g,h,i]perylene	27	0.11	0.17	ND (0.17)	---	---	---
Benzo[k]fluoranthene	15	0.08	0.21	ND (0.17)	---	---	---
Chrysene	10	0.21	0.64	ND (0.17)	---	---	---
Dibenz(a,h)anthracene	0.15	ND (0.07)	ND (0.07)	ND (0.17)	---	---	---
Fluoranthene	87	0.28	0.73	0.17	0.4	0.3	75.5
Fluorene	100	ND (0.07)	ND (0.07)	ND (0.17)	---	---	---
Indeno[1,2,3-cd]pyrene	1.5	0.093	0.17	ND (0.17)	---	---	---
Naphthalene	4.5	ND (0.07)	ND (0.07)	ND (0.17)	---	---	---
1-methylnaphthalene	0.79	ND (0.07)	ND (0.07)	ND (0.17)	---	---	---
2-methylnaphthalene	0.87	ND (0.07)	ND (0.07)	ND (0.17)	---	---	---
Phenanthrene	69	0.16	0.6	ND (0.17)	---	---	---
Pyrene	44	0.3	0.98	0.19	0.49	0.43	87.3
Chlorinated Pesticides (8081)							
Aldrine	0.92	ND (0.034)	ND (0.034)	ND (0.033)	---	---	---
Hexachlorocyclohexane including alpha-BHC,beta-BHC,delta-BHC, & gamma-BHC]	0.037	ND (0.034)	ND (0.034)	ND (0.033)	---	---	---
Heptachlor epoxide	0.053	ND (0.034)	ND (0.034)	ND (0.033)	---	---	---
Endosulfan (including endosulfan I, endosulfan II, and endosulfan sulfate)	18	ND (0.034)	ND (0.034)	ND (0.033)	---	---	---
Dieldrin	1.5	ND (0.066)	ND (0.065)	ND (0.065)	---	---	---
Endrin (including endrin aldehyde)	3.7	ND (0.066)	ND (0.065)	ND (0.065)	---	---	---
4,4'-Dichlorodiphenyldichloro ethylene (DDE)	1.4	ND (0.066)	ND (0.065)	ND (0.065)	---	---	---
4,4'-Dichlorodiphenyldichloro ethane (DDD)	2	ND (0.066)	ND (0.065)	ND (0.065)	---	---	---
4,4'-dichlorodiphenyltrichloroe thane (DDT)	1.7	ND (0.066)	ND (0.065)	ND (0.065)	---	---	---
Chloradane (Technical)	16	ND (0.6)	ND (0.6)	ND (0.59)	---	---	---
Methoxychlor	16	ND (0.34)	ND (0.34)	ND (0.33)	---	---	---
Toxaphene	0.44	ND (1.2)	ND (1.2)	ND (1.2)	---	---	---
Polychlorinated Biphenyls (8082)							

Analytes	Tier 1 EAL (mg/kg) Unrestricted (Residential)	Sample Results (mg/kg)			Field Performance Data		
		DU-04-A-1 (Primary)	DU-04-A-2 (Duplicate)	DU-04-A-3 (Triplicate)	Average (mg/kg)	Standard Deviation	Relative Standard Deviation (%)
Aroclor-1016	1.1	ND (0.0096)	ND (0.0095)	ND (0.0095)	---	---	---
Aroclor-1221		ND (0.019)	ND (0.019)	ND (0.019)	---	---	---
Aroclor-1232		ND (0.0096)	ND (0.0095)	ND (0.0095)	---	---	---
Aroclor-1242		ND (0.0096)	ND (0.0095)	ND (0.0095)	---	---	---
Aroclor-1248		ND (0.0096)	ND (0.0095)	ND (0.0095)	---	---	---
Aroclor-1254		ND (0.0096)	ND (0.0095)	ND (0.0095)	---	---	---
Aroclor-1260		ND (0.0096)	ND (0.0095)	ND (0.0095)	---	---	---
RCRA 8 Metals (6010 and 7471)							
Cadmium	14	1.8	1.8	1.6	1.7	0.12	6.7
Barium	1,000	60	55	55	56.7	2.9	5.1
Silver	78	ND (0.27)	ND (0.23)	ND (0.25)	---	---	---
Arsenic	**24**	**35**	**31**	**35**	**33.7**	**2.3**	**7.0**
Lead	**200**	**340**	**300**	**300**	**313**	**23.1**	**7.4**
Selenium	78	ND (0.53)	ND (0.47)	ND (0.50)	---	---	---
Chromium	1,100	56	50	47	51	4.6	9.0
Mercury	4.7	0.4	0.42	0.4	0.41	0.01	2.9

Acronyms and Abbreviations:
DU: Decision Unit
mg/kg: milligrams per kilogram
ND (00) : Not Detected (Reporting Limit)
---: Not Available

5.5.1 Analytical Results for TPH, BTEX, PAH, Pesticides and PCB

A summary of the analytical results and Tier 1 soil EAL is presented in Table 13 and Table 14. A complete laboratory analytical report is provided in Appendix C.

Reportable levels of TPH-Diesel, TPH-Oil and PAHs were detected; however, the concentrations were below the Tier 1 EALs for unrestricted land use. None of TPH-Gasoline, BTEX, and chlorinated pesticides were detected.

5.5.2 The none-detect benzo(a)pyrene laboratory reporting levels were over the EAL, and the relative standard deviation, a measure of precision in data, for PAHs in the triplicate samples was small. Therefore, it is interpreted that the benzo(a)pyrene is over the EAL in DU-4, though not far over, with considerable uncertainty.Analytical Results for Metals

Reportable levels of barium, cadmium, chromium, and mercury were detected; however, the concentrations were below the Tier 1 EALs for unrestricted land use. Silver and selenium were not detected. Arsenic and lead were found above the Tier 1 EALs for unrestrained land use (Table 13 and Table 14).

5.5.2.1 Arsenic and Lead Analytical Results

Measurable levels of arsenic was detected in the samples collected from DU-01, DU-04 and DU-05, ranging from 25 mg/kg to 42 mg/kg; exceeding the EAL for unrestricted land use, 24 mg/kg. However, the results were below the EAL for restricted land use, 95 mg/kg. The arsenic results of the samples collected from DU-02 and DU-03 were in the rage of 19 mg/kg - 22 mg/kg approaching the EAL for unrestricted land use.

Lead was detected in all samples ranging from 18 mg/kg to 340 mg/kg. The lead results of the samples collected from surface and near-surface soil in DU 4, on the east end of the subject property, were 340 mg/kg exceeding the EAL for unrestricted land use, 200 mg/kg.

5.5.2.2 Arsenic/Lead Upper and Lower Range Values

Since arsenic and lead were the only contaminates detected near or above the Tier 1 EAL for unrestrained land use, the upper and lower range values were calculate by adding or subtracting the respective %RSD to the analytical results. The upper (high) range values mean conservative estimates of the contaminant levels; thus, the values were compared to the Tier 1 EAL for unrestricted land use. Based on the upper range values, the arsenic or lead results for the samples collected from DU-01, DU-04, and DU-05 exceeded the Tier 1 EAL. DU-01 is the narrow DU along Kamehameha Avenue, and DU-04 and DU-05 are about one-third of the subject property at the east end.

5.6 Data Quality Review

MNA conducted the analytical data quality review to determine the usability of the data generated by performing a data check for sample preservation methods, technical sample holding times, method blanks, laboratory control sample/laboratory control sample duplicate (LCS/LCSD), matrix spike/matrix spike duplicate (MS/MSD), and surrogate recoveries.

5.6.1 Sample Holding Times

Technical holding times for all analytes were met.

5.6.2 Laboratory Blank Results

None of the analytes were found in the laboratory blank sample which indicated that the analytical processes were free of the contaminants.

5.6.3 Laboratory Performance Review

The LCS/LCSD, MS/MSD, and surrogate recoveries were within the laboratory acceptable ranges. Based on this analytical data review, MNA concluded that the analytical results are considered valid and useable.

Table 13. Soil Analytical Results for DU-01, DU-02, and DU-03

Sample ID (Sampling Depth) / Analytes	Sample Analytical Result (mg/kg)						Tier 1 EAL(mg/kg)	
	DU-01-A (0-6 inches)	DU-01-B (6-12 inches)	DU-02-A (0-6 inches)	DU-02-B (6-12 inches)	DU-03-A (0-6 Inches)	DU-03-B (6-12 inches)	Unrestricted (Residential)	Restricted (Commercial/ Industrial)
Total Petroleum Hydrocarbons (8015B)								
TPH-Gasoline	NA	ND (3.8)	NA	ND (2.9)	NA	ND (2.7)	100	400
TPH-Diesel	16	18	12	12	6.5	20	500	500
TPH-Oil	87	88	53	59	50	130	500	1,000
BTEX (8021B)								
Benzene	NA	ND (0.019)	NA	ND (0.015)	NA	ND (0.014)	0.67	1.9
Toluene	NA	ND (0.019)	NA	ND (0.015)	NA	ND (0.014)	10	10
Ethylbenzene	NA	ND (0.019)	NA	ND (0.015)	NA	ND (0.014)	21	36
Xylenes	NA	ND (0.019)	NA	ND (0.015)	NA	ND (0.014)	11	11
Polycyclic Aromatic Hydrocarbons (8270C-SIM)								
Acenaphthene	ND (0.041)	ND (0.0068)	ND (0.0061)	ND (0.029)	ND (0.019)	ND (0.058)	120	120
Acenaphthylene	ND (0.041)	0.011	0.0091	ND (0.029)	ND (0.019)	ND (0.058)	13	13
Anthracene	ND (0.041)	0.0091	ND (0.0061)	ND (0.029)	ND (0.019)	ND (0.058)	4.3	4.3
Benzo[a]anthracene	ND (0.041)	0.05	0.02	0.047	ND (0.019)	ND (0.058)	1.5	10
Benzo[a]pyrene	0.045	0.067	0.047	0.084	ND (0.019)	ND (0.058)	0.15	2.1
Benzo[b]fluoranthene	0.079	0.1	0.061	0.12	ND (0.019)	ND (0.058)	1.5	21
Benzo[g,h,i]perylene	ND (0.041)	0.026	0.027	0.052	ND (0.019)	ND (0.058)	27	27
Benzo[k]fluoranthene	ND (0.041)	0.03	0.019	0.037	ND (0.019)	ND (0.058)	15	39
Chrysene	0.052	0.081	0.034	0.11	ND (0.019)	ND (0.058)	10	10
Dibenz(a,h)anthracene	ND (0.041)	0.007	ND (0.0061)	ND (0.029)	ND (0.019)	ND (0.058)	0.15	2.1
Fluoranthene	0.081	0.14	0.047	0.18	ND (0.019)	0.067	87	87
Fluorene	ND (0.041)	ND (0.0068)	ND (0.0061)	ND (0.029)	ND (0.019)	ND (0.058)	100	100
Indeno[1,2,3-cd]pyrene	ND (0.041)	0.025	0.022	0.043	ND (0.019)	ND (0.058)	1.5	21
Naphthalene	ND (0.041)	ND (0.0068)	ND (0.0061)	ND (0.029)	ND (0.019)	ND (0.058)	4.5	6.2
1-methylnaphthalene	ND (0.041)	ND (0.0068)	ND (0.0061)	ND (0.029)	ND (0.019)	ND (0.058)	0.79	0.79
2-methylnaphthalene	ND (0.041)	ND (0.0068)	ND (0.0061)	ND (0.029)	ND (0.019)	ND (0.058)	0.87	0.87
Phenanthrene	ND (0.041)	0.066	0.018	0.18	ND (0.019)	ND (0.058)	69	69
Pyrene	0.082	0.13	0.057	0.2	ND (0.019)	0.075	44	44
Chlorinated Pesticides (8081A)								
Aldrin	ND (0.017)	ND (0.017)	ND (0.0085)	ND (0.017)	ND (0.017)	ND (0.086)	0.92	8.4
Hexachlorocyclohexane [including alpha-BHC, beta-BHC, delta-BHC, and gamma-BHC]	ND (0.017)	ND (0.017)	ND (0.0085)	ND (0.017)	ND (0.017)	ND (0.086)	0.037	0.037
Heptachlor epoxide	ND (0.017)	ND (0.017)	ND (0.0085)	ND (0.017)	ND (0.017)	ND (0.086)	0.053	0.19
Endosulfan (including endosulfan I, endosulfan II, and endosulfan sulfate)	ND (0.017)	ND (0.017)	ND (0.0085)	ND (0.017)	ND (0.017)	ND (0.086)	18	18

Sample ID (Sampling Depth) / Analytes	Sample Analytical Result (mg/kg)						Tier 1 EAL(mg/kg)	
	DU-01-A (0-6 inches)	**DU-01-B (6-12 inches)**	**DU-02-A (0-6 inches)**	**DU-02-B (6-12 inches)**	**DU-03-A (0-6 Inches)**	**DU-03-B (6-12 inches)**	**Unrestricted (Residential)**	**Restricted (Commercial/ Industrial)**
Dieldrin	ND (0.033)	ND (0.033)	ND (0.017)	ND (0.033)	ND (0.033)	ND (0.17)	1.5	11
Endrin (including endrin aldehyde)	ND (0.033)	ND (0.033)	ND (0.017)	ND (0.033)	ND (0.033)	ND (0.17)	3.7	30
4,4'-Dichlorodiphenyldichloroethylene (DDE)	ND (0.033)	ND (0.033)	ND (0.017)	ND (0.033)	ND (0.033)	ND (0.17)	1.4	5.1
4,4'-Dichlorodiphenyldichloroethane (DDD)	ND (0.033)	ND (0.033)	ND (0.017)	ND (0.033)	ND (0.033)	ND (0.17)	2	7.2
4,4'-dichlorodiphenyltrichloroethane (DDT)	ND (0.033)	ND (0.033)	ND (0.017)	ND (0.033)	ND (0.033)	ND (0.17)	1.7	5.6
Chloradane (Technical)	ND (0.3)	ND (0.3)	ND (0.15)	ND (0.3)	ND (0.3)	ND (1.5)	16	29
Methoxychlor	ND (0.17)	ND (0.17)	ND (0.085)	ND (0.17)	ND (0.17)	ND (0.86)	16	16
Toxaphene	ND (**0.6**)	ND (**0.59**)	ND (0.3)	ND (**0.6**)	ND (**0.6**)	ND (3)	**0.44**	1.6
Polychlorinated Biphenyls (8082)								
Aroclor-1016	ND (0.0096)	ND (0.0095)	ND (0.0096)	ND (0.0096)	ND (0.0095)	ND (0.0097)	1.1	6.3
Aroclor-1221	ND (0.019)	ND (0.019)	ND (0.019)	ND (0.019)	ND (0.019)	ND (0.019)		
Aroclor-1232	ND (0.0096)	ND (0.0095)	ND (0.0096)	ND (0.0096)	ND (0.0095)	ND (0.0097)		
Aroclor-1242	ND (0.0096)	ND (0.0095)	ND (0.0096)	ND (0.0096)	ND (0.0095)	ND (0.0097)		
Aroclor-1248	ND (0.0096)	ND (0.0095)	ND (0.0096)	ND (0.0096)	ND (0.0095)	ND (0.0097)		
Aroclor-1254	ND (0.0096)	ND (0.0095)	ND (0.0096)	ND (0.0096)	ND (0.0095)	ND (0.0097)		
Aroclor-1260	ND (0.0096)	ND (0.0095)	ND (0.0096)	ND (0.0096)	ND (0.0095)	ND (0.0097)		
RCRA 8 Metals (6010B and 7471A)								
Cadmium	1.9	1.9	1.6	1.5	0.75	1.1	14	120
Barium	24	30	13	14	13	23	1,000	2,500
Silver	ND (0.26)	ND (0.26)	ND (0.25)	ND (0.23)	ND (0.24)	ND (0.27)	78	1,000
Arsenic	**29**	**25**	22	22	21	19	**24**	95
Lead	86	110	18	36	15	47	200	800
Selenium	ND (0.53)	ND (0.51)	ND (0.49)	ND (0.47)	ND (0.48)	ND (0.53)	78	1,000
Chromium	130	120	100	92	86	50	1,100	1,100
Mercury	0.2	0.23	0.077	0.095	0.047	0.1	4.7	61
Calculated upper and lower range values for Arsenic and Lead which the concentrations are near or above the EAL for Unrestricted Land Use.								
Arsenic-High	**31.0**	**26.7**	23.5	23.5	22.5	20.3	**24**	95
Arsenic-Low	**27.0**	23.3	20.5	20.5	19.5	17.7	**24**	95
Lead-High	92.4	118.1	19.3	38.7	16.1	50.5	200	800
Lead-Low	79.6	101.9	16.7	33.3	13.9	43.5	200	822

Criteria: Hawaii Department of Health, Tier 1 Soil EAL with unrestricted (residential) and restricted (industrial and commercial) land use above a non-drinking water resource and located less than 150 meters from surface water (State of Hawaii, Department of Health, Fall 2011; revised Jan 2012)

Acronyms and Abbreviations:

BTEX: Benzene, Toluene, Ethylbenzene, and Xylenes
DU: Decision Unit
EAL: Environmental Action Levels
mg/kg: milligrams per kilogram
NA: Not Analyzed
ND (00) : Not Detected (Reporting Limit)

Table 14. Soil Analytical Results for DU-04 and DU-05

Analytes / Sample ID (Sampling Depth)	Sample Analytical Result (mg/kg)			Tier 1 EALs (mg/kg)	
	DU-04-A-1 (0-6 inches)	DU-04-B (6-12 inches)	DU-05-A (Entire stockpile)	Unrestricted (Residential)	Restricted (Commercial/ Industrial)
Total Petroleum Hydrocarbons (8015B)					
TPH-Gasoline	NA	ND (3.0)	NA	100	400
TPH-Diesel	29	17	17	500	500
TPH-Oil	160	170	120	500	1,000
BTEX (8021B)					
Benzene	NA	ND (0.015)	NA	0.67	1.9
Toluene	NA	ND (0.015)	NA	10	10
Ethylbenzene	NA	ND (0.015)	NA	21	36
Xylenes	NA	ND (0.015)	NA	11	11
Polycyclic Aromatic Hydrocarbons (8270C-SIM)					
Acenaphthene	ND (0.07)	ND (0.13)	ND (0.049)	120	120
Acenaphthylene	ND (0.07)	ND (0.13)	ND (0.049)	13	13
Anthracene	ND (0.07)	ND (0.13)	ND (0.049)	4.3	4.3
Benzo[a]anthracene	0.098	ND (0.13)	0.11	1.5	10
Benzo[a]pyrene	0.16	ND (0.13)	0.14	0.15	2.1
Benzo[b]fluoranthene	0.24	0.18	0.2	1.5	21
Benzo[g,h,i]perylene	0.11	ND (0.13)	0.11	27	27
Benzo[k]fluoranthene	0.08	ND (0.13)	0.056	15	39
Chrysene	0.21	0.14	0.16	10	10
Dibenz(a,h)anthracene	ND (0.07)	ND (0.13)	ND (0.049)	0.15	2.1
Fluoranthene	0.28	0.19	0.3	87	87
Fluorene	ND (0.07)	ND (0.13)	ND (0.049)	100	100
Indeno[1,2,3-cd]pyrene	0.093	ND (0.13)	0.085	1.5	21
Naphthalene	ND (0.07)	ND (0.13)	ND (0.049)	4.5	6.2
1-methylnaphthalene	ND (0.07)	ND (0.13)	ND (0.049)	0.79	0.79
2-methylnaphthalene	ND (0.07)	ND (0.13)	ND (0.049)	0.87	0.87
Phenanthrene	0.16	ND (0.13)	0.15	69	69
Pyrene	0.3	0.21	0.25	44	44
Chlorinated Pesticides (8081A)					
Aldrine	ND (0.034)	ND (0.085)	ND (0.034)	0.92	8.4
Hexachlorocyclohexane [including alpha-BHC, beta-BHC, delta-BHC, and gamma-BHC]	ND (0.034)	ND (0.085)	ND (0.034)	0.037	0.037
Heptachlor epoxide	ND (0.034)	ND (0.085)	ND (0.034)	0.053	0.19
Endosulfan (including endosulfan I, endosulfan II, and endosulfan sulfate)	ND (0.034)	ND (0.085)	ND (0.034)	18	18

Sample ID (Sampling Depth) / Analytes	Sample Analytical Result (mg/kg)			Tier 1 EALs (mg/kg)	
	DU-04-A-1 (0-6 inches)	**DU-04-B (6-12 inches)**	**DU-05-A (Entire stockpile)**	**Unrestricted (Residential)**	**Restricted (Commercial/ Industrial)**
Dieldrin	ND (0.066)	ND(0.17)	ND (0.067)	1.5	11
Endrin (including endrin aldehyde)	ND (0.066)	ND(0.17)	ND (0.067)	3.7	30
4,4'-Dichlorodiphenyldichloroethylene (DDE)	ND (0.066)	ND(0.17)	ND (0.067)	1.4	5.1
4,4'-Dichlorodiphenyldichloroethane (DDD)	ND (0.066)	ND(0.17)	ND (0.067)	2	7.2
4,4'-dichlorodiphenyltrichloroethane (DDT)	ND (0.066)	ND(0.17)	ND (0.067)	1.7	5.6
Chloradane (Technical)	ND (0.6)	ND(1.5)	ND (0.61)	16	29
Methoxychlor	ND (0.34)	ND (0.85)	ND (0.34)	16	16
Toxaphene	ND (1.2)	ND(3)	ND (1.2)	0.44	1.6
Polychlorinated Biphenyls (8082)					
Aroclor-1016	ND (0.0096)	ND (0.0096)	ND (0.0097)	1.1	6.3
Aroclor-1221	ND (0.019)	ND (0.019)	ND (0.019)		
Aroclor-1232	ND (0.0096)	ND (0.0096)	ND (0.0097)		
Aroclor-1242	ND (0.0096)	ND (0.0096)	ND (0.0097)		
Aroclor-1248	ND (0.0096)	ND (0.0096)	ND (0.0097)		
Aroclor-1254	ND (0.0096)	ND (0.0096)	ND (0.0097)		
Aroclor-1260	ND (0.0096)	ND (0.0096)	ND (0.0097)		
RCRA 8 Metals (6010B and 7471A)					
Cadmium	1.8	1.8	0.89	14	120
Barium	60	62	37	1,000	2,500
Silver	ND (0.27)	ND (0.27)	ND (0.25)	78	1,000
Arsenic	**35**	**41**	**42**	**24**	95
Lead	**340**	**340**	140	**200**	800
Selenium	ND (0.53)	ND (0.54)	ND (0.49)	78	1,000
Chromium	56	57	92	1,100	1,100
Mercury	0.4	0.46	0.21	4.7	61
Calculated upper and lower range values for Arsenic and Lead which the concentrations are near or above the EAL for Unrestricted Land Use.					
Arsenic-High	**37.4**	**43.9**	**44.9**	**24**	95
Arsenic-Low	**32.6**	**38.1**	**39.1**	**24**	95
Lead-High	**365.2**	**365.2**	150.4	**200**	800
Lead-Low	**314.8**	**314.8**	129.6	**200**	822

Criteria: Hawaii Department of Health, Tier 1 Soil EAL with unrestricted (residential) and restricted (industrial and commercial) land use above a non-drinking water resource and less than 150 meters from surface water (State of Hawaii, Department of Health, Fall 2011; revised Jan 2012)

Acronyms and Abbreviations:

BTEX: Benzene, Toluene, Ethylbenzene, and Xylenes
DU: Decision Unit
EAL: Environmental Action Levels
mg/kg: milligrams per kilogram
NA: Not Analyzed
ND (00) : Not Detected (Reporting Limit)

6.0 INTERVIEWS

MNA interviewed John Peard, HDOH HEER Office Remediation Project Manager, who is familiar with the subject property and surrounding area. The interview with Mr. Peard was conducted via email. MNA interviewed Gordon Heit, land agent for the DLNR. The interview with Mr. Peard was conducted via email. MNA contacted Dickey Lee from the DLNR Engineering Division.

6.1 John Peard

Mr. Peard stated that there was institutional knowledge indicating that at one point a portion of the subject property was fenced off and used for boat storage. Mr. Peard referenced the former use of an adjoining property as a rail maintenance facility.

Proximity to the Wailoa River and the associated known arsenic contamination was of concern. Mr. Peard suggested the potential for pesticide use at the subject property, if there were previously buildings located onsite.

6.2 Gordon Heit

Mr. Heit, stated that the past use of the property was mostly private land prior to the 1960 tsunami. He stated that portions of the property have been identified as the location of a train depot.

Mr. Heit mentioned that portions of the property were used as a deposit site for material dredged from the adjacent Wailoa river entrance during the past 10 years. The rest of the dredging material was either hauled away by the county DPW or removed by private individuals who loaded their pick-up trucks with the material. He also stated that there is an active County of Hawaii sewer line that runs through the property. The approximate location can be identified on TMK (3) 2-2-032.

6.3 Dickey Lee

MNA contacted Mr. Lee via telephone on 29 April 2015. Mr. Lee was unavailable at the time of the call and a message was taken with the receptionist. Mr. Lee had no responded at the time of this writing.

7.0 DATA GAPS AND DEVIATIONS

There was a data gap in this Phase I ESA. Detailed information about the dredged spoils from Wailoa River, spread over the subject property, was not available at the time of this writing. Moreover, except for Tesoro Gas Express, no HDOH records were made available to determine potential historical impacts of the LUST sites to the subject property.

The sampling and analytical results represent the soil condition in 0-12 inches bgs at the time of the sampling, and the soil condition below 12 inches bgs is unknown.

There was a deviation from the *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process* conducted (ASTM International, 2013). The User Questionnaire was not completed.

8.0 KEY FINDINGS AND OPINION

This section evaluates the key findings of this assessment and makes a determination as to the presence of a *REC*.

8.1 Subject Property

No UST or LUST were identified at the vacant subject property which is located within 50 yards from a small boat harbor to the west. . No records of NPL sites, RCRA CORRACTS TDS or non-CORRACTS facilities, State Sites of Interest, delisted NPL sites, CERCLIS or CERCLIS NFRAP sites, State Brownfield sites, landfill or solid waste disposal sites, RCRA generator sites, State Voluntary Cleanup sites, IC/EC registries, or Federal ERNS sites at the subject property.

8.1.1 REC

The 2007 HDOH letter to the DLNR Engineering indicated that the dredge material from the Wailoa Small Boat Harbor was tested, and the results were below the EALs. However, the MIS soil sampling and analysis conducted for this Phase I ESA indicated that arsenic and lead were present, exceeding the HDOH Tier 1 Soil EALs for unrestricted (residential) land use. Therefore, this is considered a *REC*. Additional soil sampling is being planned at this writing, and the findings will be included in the final Phase I ESA.

During the site reconnaissance, conducted on 30 March 2015, MNA observed an old motor on the subject property. The motor was in poor condition, showing rust and weathering on all sides. The motor was void of fluids. While there was no staining to the soil or petroleum or oil odors, the motor represents a material threat of release to the surface soil of the subject property, and is therefore considered a *REC*.

8.2 Surrounding Properties

No records of NPL sites, RCRA CORRACTS facilities, delisted NPL sites, CERCLIS sites, Brownfield sites, landfill or solid waste disposal sites, State Voluntary Cleanup sites, IC/EC registries, or Federal ERNS sites were reported at the surrounding properties.

8.2.1 Non-REC

One State CERCLIS site was identified within 1/2 mile of the subject property. The site, identified as “HELCO pipeline anomaly” at 126 Banyan Drive, was approximately one third of a mile and downgradient from the subject property. TPH-G contamination below the HDOH Tier I EAL was identified at the site. Contaminated soil was removed and the site was backfilled. A No Further Action - Unrestricted Land Use letter was issued on 16 July 2012. Due to the proximity of this site to the subject property, this is not considered a *REC*.

One CERCLIS NFRAP site was identified within the same zip code as the subject property. The site was identified as Hilo Bayfront Soccer Field, located south of Kamehameha Avenue

between Pauahi and Ponahawai Streets. This site is located approximately 1/2 mile west of and at equal gradient to the subject property. Due to the distance and proximity of this site from the subject property, this is not considered a *REC*.

666 Kalanianaole Avenue, TMK (3) 2-1-008:006: Chevron Hilo Terminal was located less than one mile east and downgradient from the subject property. Due to the distance and proximity of this site from the subject property, this is not considered a *REC*.

191 Kuawa Street, TMK (3) 2-2-032:060: Hawaii District Lab was located 50 feet south and upgradient from the subject property. Due to the small amount of spill and prompt removal from site, this is not considered a *REC*.

131 Kekuanaoa Place, TMK (3) 2-1-012:101: Alamo Rent-a-Car was located 3/4 mile south-southwest and upgradient from the subject property. Due to the distance of this site from the subject property, this is not considered a *REC*.

210 Hoku Street, TMK (3) 2-2-018:038: Hilo Quality Washerette was located just less than one mile south-southwest and upgradient from the subject property. Due to the distance of this site from the subject property, this is not considered a *REC*.

701 Kalanianaole Avenue, TMK (3) 2-1-007:016: Tesoro Hawaii Corporation Terminal was located less than one mile east-northeast and downgradient from the subject property. Due to the distance of this site from the subject property, this is not considered a *REC*.

865 Kinoole Street, TMK (3) 2-2-017:040: Hilo Quality Cleaners was located just less than one mile west-southwest and upgradient from the subject property. Due to the distance of this site from the subject property, this is not considered a *REC*.

20 Banyan Drive, TMK (3) 2-1-001:024: HELCO Generating Station Shipman was located less than a quarter mile north and downgradient from the subject property. Both documented releases were into secondary containment, and therefore this is not considered a *REC*.

200 Kanoelehua and Kuawa Street, No TMK Listed: One 280 gallon used oil UST was installed in approximately 1977. It is permanently out of use, and no violations were listed. Due to the UST being out of use and no violation listed, this is not considered a *REC*.

210 Hoku Street, TMK (3) 2-2-018:038: the site had one unregulated UST for heating oil. It was removed in 1996. Due to the UST being removed, this is not considered a *REC*

190 Kuawa Street, TMK (3) 2-2-032:090: The site was inspected by the HDOH on 21 March 2014. No violations were noted during the inspection. Based on no violation listed, this is not considered a *REC*.

150 Keaa Street, TMK (3)2-1-006:087: The site was located approximately a 1/2 mile northeast and downgradient from the subject property. On 22 July 1990, 2,500 - 4,000 gallons of 2% Chromated Copper Arseniate (CCA) wood treating solution was spilled from a pressure vessel and spread to the ocean. Remediation began immediately, and the impacted soil was removed and transferred to a landfill. Due to the downgradient and distance of the site from the subject property, this is not considered a *REC*.

110 Kalanikoa Street, TMK (3) 2-2-32:085: In a letter dated 06 October 2014, issued by the HDOH, the site was notified of operating as an unpermitted used oil transporter and transfer facility. This action had continued for six months after having received a letter and a site visit regarding the lapsed permits. Due to this being a administrative concern, this is not considered a *REC*

Twenty-five state CERLIS sites were identified at greater than 1/2 mile from the subject property. Due the distance of the sites from the subject property, they are not considered a *REC* (Table 5).

Two RCRA Generator sites were identified on adjoining properties. No violations were listed for either location; therefore, these sites are not considered *REC*.

- AKW Environmental, LLC, a CESQG, located at 190 Kuawa Street, and identified as TMK (3) 2-2-032:090 approximately 60 feet south-southeast.
- HDOH VC Branch, a SQG, located at 191 Kuawa Street, and identified as (3) 2-2-032:060 approximately 50 feet south-southeast.

8.2.2 Historical REC

Eight LUST sites were identified within 1/2 mile of the subject property (Table 6). A few of the LUST sites were located upgradient. The documented LUST sites have a current site status of Site Cleanup Complete, No Further Action. Due to the distance and proximity of these sites to the subject property, these LUST sites are considered HREC.

9.0 CONCLUSION AND RECOMMENDATIONS

Myounghee Noh & Associates, L.L.C., performed a *Phase I ESA Environmental Site Assessment* in conformance with the scope and limitations of ASTM E 1527-13 at the subject property located at TMK (3) 2-2-032:003, :004, :008, :019, :087, and :088, Hilo, Island of Hawaii. Any exceptions to, or deletions from, this practice are described in Section 7.0 of this report. This assessment has revealed evidence of *recognized environmental conditions* in connection with the subject property, as follows:

9.1 RECs

<u>Subject Property</u>

Arsenic and Lead in Soil. Soil sampling and analysis of COPC indicated that heavy metal arsenic and lead were present, exceeding the HDOH Tier 1 Soil EAL for unrestricted (residential) land use. Therefore, this is considered a REC. Additional soil sampling is being planned at this writing, and the findings will be included in the final Phase I ESA.

Discarded Motor. While there was no staining to the soil or petroleum or oil odors, the discarded motor represents a material threat of past release to the surface soil of the subject property, and is therefore considered a *REC*.

9.2 Historical RECs

<u>Surrounding Area</u>

LUST Sites. A few of the 8 LUST sites within 1/2 mile of the subject property are upgradient and have a current status of Site Cleanup Completed and No Further Action. Limited historical information was available at the HDOH, and this is a data gap.

9.3 Recommendations

Arsenic- and lead-impacted soil is present on the site (DU-01, DU-04, and DU-05), exceeding the Tier 1 EALs for unrestricted (residential) land use, but below the restricted (commercial/industrial) land use EALs.

Since the site plan is a development and use as a soccer field, unrestricted land use EAL is applied. If the development plan involves soil disturbance, MNA recommends a further soil assessment for arsenic and lead in DU-01, DU-04, and DU-05 as follows:

- Bioaccessible arsenic and lead test for surface (0-6 inch bgs) and near-surface (6-12 inch bgs) soil
- Total arsenic and lead test for subsurface soil below 12 inches bgs since arsenic and lead results for the near-surface soil exceeded or approached the EALs.

Based on the total and bioaccessible arsenic and lead results, mitigation measures must be designed and implemented. In addition, MNA recommends reporting the finding to HDOH-HEER office. The HEER office may review the future plans and provide guidance on managing impacted soil.

Based on the bioaccessible arsenic and lead results and potential health risks for short-term and long-term exposures, engineering control or site clean-up may be required. If the final plan is to keep the impacted soil onsite, a site-specific Environmental Hazard Analysis/Environmental Hazard Management Plan (EHE/EHMP) will be required for long-term site management.

If the bioaccessible arsenic and lead results exceed the acceptable health risk range, engineering control (i.e. encapsulation) or disposal of impacted soil may be required. This engineered control measures must be approved by the HDOH.

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APPENDIX A

Environmental Data Resources Report and Maps

APPENDIX B

Site Reconnaissance and Soil Sampling Photographs

Photograph 1. A view of the entrance to the subject property on Kuawa Street to the west (30 March 2015).

Photograph 2. A view of the adjoining property to the north, Naniloa Golf Course. Kamehameha Avenue is in the foreground (30 March 2015).

Photograph 3. A view of the adjoining property to the south, Walter Victor CK Baseball Complex (30 March 2015).

Photograph 4. A view of the adjoining property to the south, AKW Environmental, LLC. The green area in the foreground is the southeast corner of the subject property (30 March 2015).

Photograph 5. A view of the adjoining property to the east, Coqui's Hideaway. Kamehameha Avenue is shown in the foreground (30 March 2015).

Photograph 6. A view of the adjoining property to the east, County of Hawaii Offices (30 March 2015).

Photograph 7. A view of the adjoining property to the west, across Manono Street (30 March 2015).

Photograph 8. A view of the monument base located near the center portion of the subject property (30 March 2015).

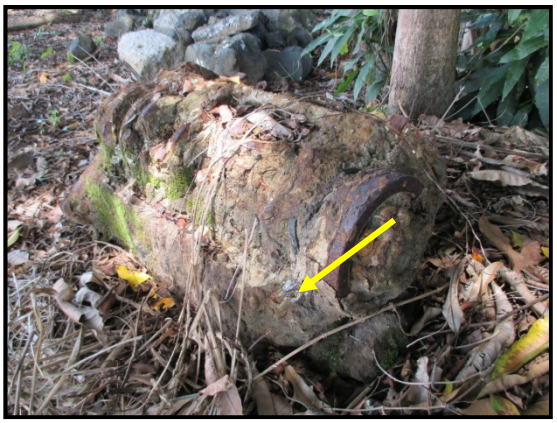
Photograph 9. A view of the stockpile observed near the center-east portion of the subject property. Refer to Table 14 for multi-incremental sample analytical results (30 March 2015).

Photograph 10. A view of a sewer manhole, one of six observed on the subject property (30 March 2015).

Photograph 11. A view of concrete fence anchors located on the west end of the subject property (30 March 2015).

Photograph 12. A view of sewer markers on the subject property (30 March 2015).

Photograph 13. A view of larger metal debris located on the subject property (30 March 2015).



Photograph 14. A view of a discarded motor located near the central portion of the subject property, at the base of a banyan tree (30 March 2015).

Photograph 15. A view of pole mounted transformers located on the adjoining property to the south (30 March 2015).

Photograph 16. A view of pole mounted transformers located on the adjoining property to the south (30 March 2015).

Photograph 17. A view of pole number 7 with three transformers, on the adjoining property to the south (30 March 2015).

Photograph 18. A view of a pole mounted transformer on the adjoining property to the west (30 March 2015).

Photograph 19. A view of pole number 2 with a transformer, on the adjoining property to the west (30 March 2015).

Photograph 20. A view of DU-01 facing east along Kamehameha Avenue (31 March 2015).

Photograph 21. A general area of DU-02 facing west (31 March 2015).

Photograph 22. A view of DU-03 facing west. Kuawa Street is on the left (31 March 2015).

Photograph 23. A view of DU-04 facing northeast (31 March 2015).

Photograph 24. A view of DU-05 stockpile facing west (31 March 2015).

Photograph 25. A view of MNA personnel advancing a hole, using a digging bar (1 April 2015).

Photograph 26. A view of MNA personnel collecting soil samples (1 April 2015).

Photograph 27. A view of a sampling point, restored after sampling (1 April 2015).

APPENDIX C

Laboratory Analytical Reports

Curtis & Tompkins, Ltd.
Analytical Laboratories, Since 1878

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

Laboratory Job Number 265795
ANALYTICAL REPORT

Myounghee Noh & Associates	Project	: 1927_3
99-1046 Iwaena Street	Location	: Kuawa St New Field Development EPH1
Aiea, HI 96701	Level	: II

Sample ID	Lab ID
DU-01-A	265795-001
DU-01-A	265795-002
DU-01-B	265795-003
DU-01-B	265795-004
DU-02-A	265795-005
DU-02-A	265795-006
DU-02-B	265795-007
DU-02-B	265795-008
DU-03-B	265795-009
DU-03-B	265795-010
DU-04-A-1	265795-011
DU-04-A-1	265795-012
DU-04-A-2	265795-013
DU-04-A-2	265795-014
DU-04-A-3	265795-015
DU-04-A-3	265795-016
DU-04-B	265795-017
DU-04-B	265795-018

This data package has been reviewed for technical correctness and completeness. Release of this data has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature. The results contained in this report meet all requirements of NELAC and pertain only to those samples which were submitted for analysis. This report may be reproduced only in its entirety.

Signature: Isabelle Choy Date: 04/10/2015

Isabelle Choy
Project Manager
isabelle.choy@ctberk.com

CA ELAP# 2896, NELAP# 4044-001

Curtis & Tompkins, Ltd.

CASE NARRATIVE

Laboratory number:	**265795**
Client:	**Myounghee Noh & Associates**
Project:	**1927_3**
Location:	**Kuawa St New Field Development EPH1**
Request Date:	**04/03/15**
Samples Received:	**04/03/15**

This data package contains sample and QC results for nine soil samples, requested for the above referenced project on 04/03/15. The samples were received on ice and intact. Multi-Increment Sampling (ISM) was performed on all samples in accordance per HDOH.

TPH-Purgeables and/or BTXE by GC (EPA 8015B and EPA 8021B):
No analytical problems were encountered.

TPH-Extractables by GC (EPA 8015B):
Many samples were diluted due to the dark and viscous nature of the sample extracts. No other analytical problems were encountered.

Semivolatile Organics by GC/MS SIM (EPA 8270C-SIM):
Many samples were diluted due to the dark and viscous nature of the sample extracts. No other analytical problems were encountered.

Pesticides (EPA 8081A):
All samples underwent sulfur cleanup using the copper option in EPA Method 3660B. All samples underwent florisil cleanup using EPA Method 3620C. Matrix spikes QC783341,QC783342 (batch 222015) were not analyzed because the parent sample required a dilution that would have diluted out the spikes. Many samples were diluted due to the color of the sample extracts. No other analytical problems were encountered.

PCBs (EPA 8082):
All samples underwent sulfuric acid cleanup using EPA Method 3665A. All samples underwent sulfur cleanup using the copper option in EPA Method 3660B. Matrix spikes QC783341,QC783342 (batch 222015) were not analyzed because the parent sample required a dilution that would have diluted out the spikes. No other analytical problems were encountered.

Metals (EPA 6010B and EPA 7471A):
No analytical problems were encountered.

Moisture (ASTM D2216/CLP):
No analytical problems were encountered.

Curtis & Tompkins, Ltd.
Analytical Laboratory Since 1878
2323 Fifth Street
Berkeley, CA 94710
(510)486-0900 Phone
(510)486-0532 Fax

CHAIN OF CUSTODY

Chain of Custody # : _____

C&T LOGIN # 2605795

Project No: 1927_3
Project Name: Kuawa St New Field Development EPH1
EDD Format: _____ **Rpt Level:** ☐ II ☐ III ☒ IV
Turnaround Time: ☐ RUSH _____ ☐ Standard

Sampler: BC, PC, KC
Report To: Bryan Chinaka
Company : Myounghee Noh & Associates, L.L.C.
Telephone: 808-484-9214
Email: bryan@noh-associates.com

Lab No.	Sample ID.	Sampling Date	Sampling Time	Matrix: Water	Matrix: Soil	Matrix:	Matrix:	# of Containers	Chemical Preservative: MeOH	H_2SO_4	HNO_3	NaOH	None	TPH-D, TPH-O (8015)	TPH-G & BTEX (8260)	PAH (8270)	PCB (8270)	Organochlorine Pesticides (8081)	Total RCRA 8 Metals (6010/7000)	MIS Preparation /Process
1,2	DU-01-A	3/31	1445		X			1					1	X		X	X	X	X	X
3,4	DU-01-B	3/31	1445		X			2	1				1	X	X	X	X	X	X	X
5,6	DU-02-A	3/31	1215		X			1					1	X		X	X	X	X	X
7,8	DU-02-B	3/31	1215		X			2	1				1	X	X	X	X	X	X	X
~~9,10~~	DU-03-A	3/31	940		X			1					1	X		X	X	X	X	X
11,12	DU-03-B	3/31	940		X			2	1				1	X	X	X	X	X	X	X
13,14	DU-04-A-1	4/1	1100		X			1					1	X		X	X	X	X	X
15,16	DU-04-A-2	4/1	1100		X			1					1	X		X	X	X	X	X
17,18	DU-04-A-3	4/1	1100		X			1					1	X		X	X	X	X	X
19,20	DU-04-B	4/1	1100		X			2	1				1	X	X	X	X	X	X	X
~~21,22~~	DU-05-A	4/1	1120		X			1	0	0	0	0	1	X		X	X	X	X	X

Notes:
All samples are MIS.

SAMPLE RECEIPT
☐ Intact ☐ Cold
☐ On Ice ☐ Ambient

RELINQUISHED BY:
[signature] 4/3/2015 DATE/TIME
DATE/TIME
DATE/TIME

RECEIVED BY:
[signature] 4/3/15 1030 DATE/TIME
DATE/TIME
DATE/TIME

COOLER RECEIPT CHECKLIST

Curtis & Tompkins, Ltd.

Login # 205795 Date Received 4/3/15 Number of coolers 1
Client MNA Project 1927-3

Date Opened 4/3 By (print) " FJ " (sign) " "
Date Logged in " " By (print) " " (sign) " "

1. Did cooler come with a shipping slip (airbill, etc) ~~FEDEX~~ YES NO
   Shipping info #8077 8756 1838

2A. Were custody seals present? .... ☐ YES (circle) on cooler on samples ☒ NO
   How many _____ Name _____ Date _____
2B. Were custody seals intact upon arrival? _____ YES NO N/A
3. Were custody papers dry and intact when received? _____ YES NO
4. Were custody papers filled out properly (ink, signed, etc)? _____ YES NO
5. Is the project identifiable from custody papers? (If so fill out top of form) ___ YES NO
6. Indicate the packing in cooler: (if other, describe) _____

☒ Bubble Wrap ☐ Foam blocks ☐ Bags ☐ None
☐ Cloth material ☐ Cardboard ☐ Styrofoam ☐ Paper towels

7. Temperature documentation: * Notify PM if temperature exceeds 6°C

Type of ice used: ☐ Wet ☒ Blue/Gel ☐ None Temp(°C) 3.8°

☒ Samples Received on ice & cold without a temperature blank; temp. taken with IR gun

☐ Samples received on ice directly from the field. Cooling process had begun

8. Were Method 5035 sampling containers present? _____ YES NO
   If YES, what time were they transferred to freezer? 1200
9. Did all bottles arrive unbroken/unopened? _____ YES NO
10. Are there any missing / extra samples? _____ YES NO
11. Are samples in the appropriate containers for indicated tests? _____ YES NO
12. Are sample labels present, in good condition and complete? _____ YES NO
13. Do the sample labels agree with custody papers? _____ YES NO
14. Was sufficient amount of sample sent for tests requested? _____ YES NO
15. Are the samples appropriately preserved? _____ YES NO N/A
16. Did you check preservatives for all bottles for each sample? _____ YES NO N/A
17. Did you document your preservative check? _____ YES NO N/A
18. Did you change the hold time in LIMS for unpreserved VOAs? _____ YES NO N/A
19. Did you change the hold time in LIMS for preserved terracores? _____ YES NO N/A
20. Are bubbles > 6mm absent in VOA samples? _____ YES NO N/A
21. Was the client contacted concerning this sample delivery? _____ YES NO
   If YES, Who was called? _____ By _____ Date: _____

COMMENTS
9) Received 3 broken containers. MeOH 500 mL bottle (number) from ~~[illegible]~~-017 "DU-04-B"
3202 jar from "DU-05-A" & "DU-03-A".

Rev 10, 9/12

Curtis & Tompkins, Ltd.

Detections Summary for 265795

Results for any subcontracted analyses are not included in this summary.

Client : Myounghee Noh & Associates
Project : 1927_3
Location : Kuawa St New Field Development EPH1

Client Sample ID : DU-01-A Laboratory Sample ID : 265795-001

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Diesel C10-C24	16	Y	4.0	mg/Kg	Dry	3.000	EPA 8015B	EPA 3550B
Motor Oil C24-C36	87		20	mg/Kg	Dry	3.000	EPA 8015B	EPA 3550B
Fluoranthene	81		41	ug/Kg	Dry	6.250	EPA 8270C-SIM	EPA 3550B
Pyrene	82		41	ug/Kg	Dry	6.250	EPA 8270C-SIM	EPA 3550B
Chrysene	52		41	ug/Kg	Dry	6.250	EPA 8270C-SIM	EPA 3550B
Benzo(b)fluoranthene	79		41	ug/Kg	Dry	6.250	EPA 8270C-SIM	EPA 3550B
Benzo(a)pyrene	45		41	ug/Kg	Dry	6.250	EPA 8270C-SIM	EPA 3550B
Mercury	0.20		0.023	mg/Kg	Dry	1.000	EPA 7471A	METHOD

Client Sample ID : DU-01-A Laboratory Sample ID : 265795-002

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Arsenic	29		0.26	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Barium	24		0.26	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Cadmium	1.9		0.26	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Chromium	130		0.26	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Lead	86		0.26	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B

Client Sample ID : DU-01-B Laboratory Sample ID : 265795-003

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Diesel C10-C24	18	Y	4.1	mg/Kg	Dry	3.000	EPA 8015B	EPA 3550B
Motor Oil C24-C36	88		21	mg/Kg	Dry	3.000	EPA 8015B	EPA 3550B
Acenaphthylene	11		6.8	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Phenanthrene	66		6.8	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Anthracene	9.1		6.8	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Fluoranthene	140		6.8	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Pyrene	130		6.8	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Benzo(a)anthracene	50		6.8	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Chrysene	81		6.8	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Benzo(b)fluoranthene	100		6.8	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Benzo(k)fluoranthene	30		6.8	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Benzo(a)pyrene	67		6.8	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Indeno(1,2,3-cd)pyrene	25		6.8	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Dibenz(a,h)anthracene	7.0		6.8	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Benzo(g,h,i)perylene	26		6.8	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Mercury	0.23		0.025	mg/Kg	Dry	1.000	EPA 7471A	METHOD

Curtis & Tompkins, Ltd.

Client Sample ID : DU-01-B Laboratory Sample ID : 265795-004

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Arsenic	25		0.26	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Barium	30		0.26	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Cadmium	1.9		0.26	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Chromium	120		0.26	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Lead	110		0.26	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B

Client Sample ID : DU-02-A Laboratory Sample ID : 265795-005

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Diesel C10-C24	12	Y	3.6	mg/Kg	Dry	3.000	EPA 8015B	EPA 3550B
Motor Oil C24-C36	53		18	mg/Kg	Dry	3.000	EPA 8015B	EPA 3550B
Acenaphthylene	9.1		6.1	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Phenanthrene	18		6.1	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Fluoranthene	47		6.1	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Pyrene	57		6.1	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Benzo(a)anthracene	20		6.1	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Chrysene	34		6.1	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Benzo(b)fluoranthene	61		6.1	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Benzo(k)fluoranthene	19		6.1	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Benzo(a)pyrene	47		6.1	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Indeno(1,2,3-cd)pyrene	22		6.1	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Benzo(g,h,i)perylene	27		6.1	ug/Kg	Dry	1.000	EPA 8270C-SIM	EPA 3550B
Mercury	0.077		0.020	mg/Kg	Dry	1.000	EPA 7471A	METHOD

Client Sample ID : DU-02-A Laboratory Sample ID : 265795-006

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Arsenic	22		0.25	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Barium	13		0.25	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Cadmium	1.6		0.25	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Chromium	100		0.25	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Lead	18		0.25	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B

Curtis & Tompkins, Ltd.

Client Sample ID : DU-02-B Laboratory Sample ID : 265795-007

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Diesel C10-C24	12	Y	3.5	mg/Kg	Dry	3.000	EPA 8015B	EPA 3550B
Motor Oil C24-C36	59		18	mg/Kg	Dry	3.000	EPA 8015B	EPA 3550B
Phenanthrene	180		29	ug/Kg	Dry	5.000	EPA 8270C-SIM	EPA 3550B
Fluoranthene	180		29	ug/Kg	Dry	5.000	EPA 8270C-SIM	EPA 3550B
Pyrene	200		29	ug/Kg	Dry	5.000	EPA 8270C-SIM	EPA 3550B
Benzo(a)anthracene	47		29	ug/Kg	Dry	5.000	EPA 8270C-SIM	EPA 3550B
Chrysene	110		29	ug/Kg	Dry	5.000	EPA 8270C-SIM	EPA 3550B
Benzo(b)fluoranthene	120		29	ug/Kg	Dry	5.000	EPA 8270C-SIM	EPA 3550B
Benzo(k)fluoranthene	37		29	ug/Kg	Dry	5.000	EPA 8270C-SIM	EPA 3550B
Benzo(a)pyrene	84		29	ug/Kg	Dry	5.000	EPA 8270C-SIM	EPA 3550B
Indeno(1,2,3-cd)pyrene	43		29	ug/Kg	Dry	5.000	EPA 8270C-SIM	EPA 3550B
Benzo(g,h,i)perylene	52		29	ug/Kg	Dry	5.000	EPA 8270C-SIM	EPA 3550B
Mercury	0.095		0.021	mg/Kg	Dry	1.000	EPA 7471A	METHOD

Client Sample ID : DU-02-B Laboratory Sample ID : 265795-008

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Arsenic	22		0.23	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Barium	14		0.23	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Cadmium	1.5		0.23	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Chromium	92		0.23	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Lead	36		0.23	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B

Client Sample ID : DU-03-B Laboratory Sample ID : 265795-009

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Diesel C10-C24	20	Y	5.9	mg/Kg	Dry	5.000	EPA 8015B	EPA 3550B
Motor Oil C24-C36	130		30	mg/Kg	Dry	5.000	EPA 8015B	EPA 3550B
Fluoranthene	67		58	ug/Kg	Dry	10.00	EPA 8270C-SIM	EPA 3550B
Pyrene	75		58	ug/Kg	Dry	10.00	EPA 8270C-SIM	EPA 3550B
Mercury	0.10		0.019	mg/Kg	Dry	1.000	EPA 7471A	METHOD

Client Sample ID : DU-03-B Laboratory Sample ID : 265795-010

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Arsenic	19		0.27	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Barium	23		0.27	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Cadmium	1.1		0.27	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Chromium	50		0.27	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Lead	47		0.27	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B

Curtis & Tompkins, Ltd.

Client Sample ID : DU-04-A-1 Laboratory Sample ID : 265795-011

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Diesel C10-C24	29	Y	7.0	mg/Kg	Dry	5.000	EPA 8015B	EPA 3550B
Motor Oil C24-C36	160		35	mg/Kg	Dry	5.000	EPA 8015B	EPA 3550B
Phenanthrene	160		70	ug/Kg	Dry	10.00	EPA 8270C-SIM	EPA 3550B
Fluoranthene	280		70	ug/Kg	Dry	10.00	EPA 8270C-SIM	EPA 3550B
Pyrene	300		70	ug/Kg	Dry	10.00	EPA 8270C-SIM	EPA 3550B
Benzo(a)anthracene	98		70	ug/Kg	Dry	10.00	EPA 8270C-SIM	EPA 3550B
Chrysene	210		70	ug/Kg	Dry	10.00	EPA 8270C-SIM	EPA 3550B
Benzo(b)fluoranthene	240		70	ug/Kg	Dry	10.00	EPA 8270C-SIM	EPA 3550B
Benzo(k)fluoranthene	80		70	ug/Kg	Dry	10.00	EPA 8270C-SIM	EPA 3550B
Benzo(a)pyrene	160		70	ug/Kg	Dry	10.00	EPA 8270C-SIM	EPA 3550B
Indeno(1,2,3-cd)pyrene	93		70	ug/Kg	Dry	10.00	EPA 8270C-SIM	EPA 3550B
Benzo(g,h,i)perylene	110		70	ug/Kg	Dry	10.00	EPA 8270C-SIM	EPA 3550B
Mercury	0.40		0.025	mg/Kg	Dry	1.000	EPA 7471A	METHOD

Client Sample ID : DU-04-A-1 Laboratory Sample ID : 265795-012

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Arsenic	35		0.27	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Barium	60		0.27	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Cadmium	1.8		0.27	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Chromium	56		0.27	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Lead	340		0.27	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B

Client Sample ID : DU-04-A-2 Laboratory Sample ID : 265795-013

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Diesel C10-C24	15	Y	6.9	mg/Kg	Dry	5.000	EPA 8015B	EPA 3550B
Motor Oil C24-C36	160		34	mg/Kg	Dry	5.000	EPA 8015B	EPA 3550B
Phenanthrene	600		70	ug/Kg	Dry	10.00	EPA 8270C-SIM	EPA 3550B
Fluoranthene	730		70	ug/Kg	Dry	10.00	EPA 8270C-SIM	EPA 3550B
Pyrene	980		70	ug/Kg	Dry	10.00	EPA 8270C-SIM	EPA 3550B
Benzo(a)anthracene	350		70	ug/Kg	Dry	10.00	EPA 8270C-SIM	EPA 3550B
Chrysene	640		70	ug/Kg	Dry	10.00	EPA 8270C-SIM	EPA 3550B
Benzo(b)fluoranthene	570		70	ug/Kg	Dry	10.00	EPA 8270C-SIM	EPA 3550B
Benzo(k)fluoranthene	210		70	ug/Kg	Dry	10.00	EPA 8270C-SIM	EPA 3550B
Benzo(a)pyrene	430		70	ug/Kg	Dry	10.00	EPA 8270C-SIM	EPA 3550B
Indeno(1,2,3-cd)pyrene	170		70	ug/Kg	Dry	10.00	EPA 8270C-SIM	EPA 3550B
Benzo(g,h,i)perylene	170		70	ug/Kg	Dry	10.00	EPA 8270C-SIM	EPA 3550B
Mercury	0.42		0.024	mg/Kg	Dry	1.000	EPA 7471A	METHOD

Curtis & Tompkins, Ltd.

Client Sample ID : DU-04-A-2 Laboratory Sample ID : 265795-014

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Arsenic	31		0.23	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Barium	55		0.23	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Cadmium	1.8		0.23	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Chromium	50		0.23	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Lead	300		0.23	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B

Client Sample ID : DU-04-A-3 Laboratory Sample ID : 265795-015

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Diesel C10-C24	23	Y	6.7	mg/Kg	Dry	5.000	EPA 8015B	EPA 3550B
Motor Oil C24-C36	180		33	mg/Kg	Dry	5.000	EPA 8015B	EPA 3550B
Fluoranthene	170		170	ug/Kg	Dry	25.00	EPA 8270C-SIM	EPA 3550B
Pyrene	190		170	ug/Kg	Dry	25.00	EPA 8270C-SIM	EPA 3550B
Mercury	0.40		0.022	mg/Kg	Dry	1.000	EPA 7471A	METHOD

Client Sample ID : DU-04-A-3 Laboratory Sample ID : 265795-016

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Arsenic	35		0.25	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Barium	55		0.25	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Cadmium	1.6		0.25	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Chromium	47		0.25	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Lead	300		0.25	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B

Client Sample ID : DU-04-B Laboratory Sample ID : 265795-017

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Diesel C10-C24	17	Y	6.6	mg/Kg	Dry	5.000	EPA 8015B	EPA 3550B
Motor Oil C24-C36	170		33	mg/Kg	Dry	5.000	EPA 8015B	EPA 3550B
Fluoranthene	190		130	ug/Kg	Dry	20.00	EPA 8270C-SIM	EPA 3550B
Pyrene	210		130	ug/Kg	Dry	20.00	EPA 8270C-SIM	EPA 3550B
Chrysene	140		130	ug/Kg	Dry	20.00	EPA 8270C-SIM	EPA 3550B
Benzo(b)fluoranthene	180		130	ug/Kg	Dry	20.00	EPA 8270C-SIM	EPA 3550B
Mercury	0.46		0.022	mg/Kg	Dry	1.000	EPA 7471A	METHOD

Client Sample ID : DU-04-B Laboratory Sample ID : 265795-018

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Arsenic	41		0.27	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Barium	62		0.27	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Cadmium	1.8		0.27	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Chromium	57		0.27	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Lead	340		0.27	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B

Y = Sample exhibits chromatographic pattern which does not resemble standard

Curtis & Tompkins, Ltd.

Curtis & Tompkins Laboratories Analytical Report

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	1927_3		
Matrix:	Soil	Sampled:	03/31/15
Basis:	dry	Received:	04/03/15
Batch#:	222007		

Field ID:	DU-01-B	Moisture:	27%
Type:	SAMPLE	Diln Fac:	25.00
Lab ID:	265795-003	Analyzed:	04/07/15

Analyte	Result	RL	Units	Analysis
Gasoline C7-C12	ND	3.8	mg/Kg	EPA 8015B
Benzene	ND	19	ug/Kg	EPA 8021B
Toluene	ND	19	ug/Kg	EPA 8021B
Ethylbenzene	ND	19	ug/Kg	EPA 8021B
m,p-Xylenes	ND	19	ug/Kg	EPA 8021B
o-Xylene	ND	19	ug/Kg	EPA 8021B

Surrogate	%REC	Limits	Analysis
Bromofluorobenzene (FID)	107	78-138	EPA 8015B
Bromofluorobenzene (PID)	100	70-137	EPA 8021B

Field ID:	DU-02-B	Moisture:	15%
Type:	SAMPLE	Diln Fac:	25.00
Lab ID:	265795-007	Analyzed:	04/08/15

Analyte	Result	RL	Units	Analysis
Gasoline C7-C12	ND	2.9	mg/Kg	EPA 8015B
Benzene	ND	15	ug/Kg	EPA 8021B
Toluene	ND	15	ug/Kg	EPA 8021B
Ethylbenzene	ND	15	ug/Kg	EPA 8021B
m,p-Xylenes	ND	15	ug/Kg	EPA 8021B
o-Xylene	ND	15	ug/Kg	EPA 8021B

Surrogate	%REC	Limits	Analysis
Bromofluorobenzene (FID)	113	78-138	EPA 8015B
Bromofluorobenzene (PID)	99	70-137	EPA 8021B

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Curtis & Tompkins Laboratories Analytical Report

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	1927_3		
Matrix:	Soil	Sampled:	03/31/15
Basis:	dry	Received:	04/03/15
Batch#:	222007		

Field ID:	DU-03-B	Moisture:	15%
Type:	SAMPLE	Diln Fac:	25.00
Lab ID:	265795-009	Analyzed:	04/08/15

Analyte	Result	RL	Units	Analysis
Gasoline C7-C12	ND	2.7	mg/Kg	EPA 8015B
Benzene	ND	14	ug/Kg	EPA 8021B
Toluene	ND	14	ug/Kg	EPA 8021B
Ethylbenzene	ND	14	ug/Kg	EPA 8021B
m,p-Xylenes	ND	14	ug/Kg	EPA 8021B
o-Xylene	ND	14	ug/Kg	EPA 8021B

Surrogate	%REC	Limits	Analysis
Bromofluorobenzene (FID)	107	78-138	EPA 8015B
Bromofluorobenzene (PID)	97	70-137	EPA 8021B

Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC783303	Analyzed:	04/07/15

Analyte	Result	RL	Units	Analysis
Gasoline C7-C12	ND	0.20	mg/Kg	EPA 8015B
Benzene	ND	1.0	ug/Kg	EPA 8021B
Toluene	ND	1.0	ug/Kg	EPA 8021B
Ethylbenzene	ND	1.0	ug/Kg	EPA 8021B
m,p-Xylenes	ND	1.0	ug/Kg	EPA 8021B
o-Xylene	ND	1.0	ug/Kg	EPA 8021B

Surrogate	%REC	Limits	Analysis
Bromofluorobenzene (FID)	112	78-138	EPA 8015B
Bromofluorobenzene (PID)	101	70-137	EPA 8021B

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Curtis & Tompkins Laboratories Analytical Report

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	1927_3	Analysis:	EPA 8015B
Matrix:	Soil	Batch#:	222007
Units:	mg/Kg	Analyzed:	04/07/15
Diln Fac:	1.000		

Type: BS Lab ID: QC783348

Analyte	Spiked	Result	%REC	Limits
Gasoline C7-C12	1.000	0.9833	98	80-121

Surrogate	%REC	Limits
Bromofluorobenzene (FID)	110	78-138

Type: BSD Lab ID: QC783349

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Gasoline C7-C12	2.000	1.962	98	80-121	0	20

Surrogate	%REC	Limits
Bromofluorobenzene (FID)	118	78-138

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Batch QC Report

Curtis & Tompkins Laboratories Analytical Report

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 5030B
Project#:	1927_3	Analysis:	EPA 8015B
Field ID:	ZZZZZZZZZZ	Diln Fac:	1.000
MSS Lab ID:	265886-001	Batch#:	222007
Matrix:	Soil	Sampled:	04/07/15
Units:	mg/Kg	Received:	04/07/15
Basis:	as received	Analyzed:	04/07/15

Type: MS Lab ID: QC783362

Analyte	MSS Result	Spiked	Result	%REC	Limits
Gasoline C7-C12	0.6264	10.64	8.816	77	50-120

Surrogate	%REC	Limits
Bromofluorobenzene (FID)	112	78-138

Type: MSD Lab ID: QC783363

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Gasoline C7-C12	10.53	7.439	65	50-120	16	31

Surrogate	%REC	Limits
Bromofluorobenzene (FID)	115	78-138

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Batch QC Report

Curtis & Tompkins Laboratories Analytical Report

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	1927_3	Analysis:	EPA 8021B
Matrix:	Soil	Batch#:	222007
Units:	ug/Kg	Analyzed:	04/07/15
Diln Fac:	1.000		

Type: BS Lab ID: QC783425

Analyte	Spiked	Result	%REC	Limits
Benzene	20.00	20.01	100	80-120
Toluene	20.00	19.96	100	80-120
Ethylbenzene	20.00	20.89	104	80-120
m,p-Xylenes	20.00	22.19	111	80-120
o-Xylene	20.00	22.04	110	80-120

Surrogate	%REC	Limits
Bromofluorobenzene (PID)	101	70-137

Type: BSD Lab ID: QC783426

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Benzene	20.00	20.87	104	80-120	4	20
Toluene	20.00	20.77	104	80-120	4	20
Ethylbenzene	20.00	21.44	107	80-120	3	20
m,p-Xylenes	20.00	22.93	115	80-120	3	20
o-Xylene	20.00	22.66	113	80-120	3	20

Surrogate	%REC	Limits
Bromofluorobenzene (PID)	102	70-137

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Total Extractable Hydrocarbons

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8015B
Matrix:	Soil	Received:	04/03/15
Units:	mg/Kg	Prepared:	04/06/15
Basis:	dry	Analyzed:	04/06/15
Batch#:	221960		

Field ID:	DU-01-A	Moisture:	25%
Type:	SAMPLE	Diln Fac:	3.000
Lab ID:	265795-001	Sampled:	03/31/15

Analyte	Result	RL
Diesel C10-C24	16 Y	4.0
Motor Oil C24-C36	87	20

Surrogate	%REC	Limits
o-Terphenyl	78	59-140

Field ID:	DU-01-B	Moisture:	27%
Type:	SAMPLE	Diln Fac:	3.000
Lab ID:	265795-003	Sampled:	03/31/15

Analyte	Result	RL
Diesel C10-C24	18 Y	4.1
Motor Oil C24-C36	88	21

Surrogate	%REC	Limits
o-Terphenyl	73	59-140

Field ID:	DU-02-A	Moisture:	17%
Type:	SAMPLE	Diln Fac:	3.000
Lab ID:	265795-005	Sampled:	03/31/15

Analyte	Result	RL
Diesel C10-C24	12 Y	3.6
Motor Oil C24-C36	53	18

Surrogate	%REC	Limits
o-Terphenyl	77	59-140

Field ID:	DU-02-B	Moisture:	15%
Type:	SAMPLE	Diln Fac:	3.000
Lab ID:	265795-007	Sampled:	03/31/15

Analyte	Result	RL
Diesel C10-C24	12 Y	3.5
Motor Oil C24-C36	59	18

Surrogate	%REC	Limits
o-Terphenyl	78	59-140

Y= Sample exhibits chromatographic pattern which does not resemble standard
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Total Extractable Hydrocarbons

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8015B
Matrix:	Soil	Received:	04/03/15
Units:	mg/Kg	Prepared:	04/06/15
Basis:	dry	Analyzed:	04/06/15
Batch#:	221960		

Field ID:	DU-03-B	Moisture:	15%
Type:	SAMPLE	Diln Fac:	5.000
Lab ID:	265795-009	Sampled:	03/31/15

Analyte	Result	RL
Diesel C10-C24	20 Y	5.9
Motor Oil C24-C36	130	30

Surrogate	%REC	Limits
o-Terphenyl	73	59-140

Field ID:	DU-04-A-1	Moisture:	28%
Type:	SAMPLE	Diln Fac:	5.000
Lab ID:	265795-011	Sampled:	04/01/15

Analyte	Result	RL
Diesel C10-C24	29 Y	7.0
Motor Oil C24-C36	160	35

Surrogate	%REC	Limits
o-Terphenyl	80	59-140

Field ID:	DU-04-A-2	Moisture:	27%
Type:	SAMPLE	Diln Fac:	5.000
Lab ID:	265795-013	Sampled:	04/01/15

Analyte	Result	RL
Diesel C10-C24	15 Y	6.9
Motor Oil C24-C36	160	34

Surrogate	%REC	Limits
o-Terphenyl	81	59-140

Field ID:	DU-04-A-3	Moisture:	25%
Type:	SAMPLE	Diln Fac:	5.000
Lab ID:	265795-015	Sampled:	04/01/15

Analyte	Result	RL
Diesel C10-C24	23 Y	6.7
Motor Oil C24-C36	180	33

Surrogate	%REC	Limits
o-Terphenyl	78	59-140

Y= Sample exhibits chromatographic pattern which does not resemble standard
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Total Extractable Hydrocarbons

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8015B
Matrix:	Soil	Received:	04/03/15
Units:	mg/Kg	Prepared:	04/06/15
Basis:	dry	Analyzed:	04/06/15
Batch#:	221960		

Field ID:	DU-04-B	Moisture:	24%
Type:	SAMPLE	Diln Fac:	5.000
Lab ID:	265795-017	Sampled:	04/01/15

Analyte	Result	RL
Diesel C10-C24	17 Y	6.6
Motor Oil C24-C36	170	33

Surrogate	%REC	Limits
o-Terphenyl	73	59-140

Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC783119		

Analyte	Result	RL
Diesel C10-C24	ND	1.0
Motor Oil C24-C36	ND	5.0

Surrogate	%REC	Limits
o-Terphenyl	91	59-140

Y= Sample exhibits chromatographic pattern which does not resemble standard
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Total Extractable Hydrocarbons

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8015B
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC783120	Batch#:	221960
Matrix:	Soil	Prepared:	04/06/15
Units:	mg/Kg	Analyzed:	04/07/15

Cleanup Method: EPA 3630C

Analyte	Spiked	Result	%REC	Limits
Diesel C10-C24	49.94	42.30	85	58-137

Surrogate	%REC	Limits
o-Terphenyl	92	59-140

Curtis & Tompkins, Ltd.

Batch QC Report

Total Extractable Hydrocarbons

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8015B
Field ID:	ZZZZZZZZZZ	Batch#:	221960
MSS Lab ID:	265804-003	Sampled:	04/02/15
Matrix:	Soil	Received:	04/03/15
Units:	mg/Kg	Prepared:	04/06/15
Basis:	dry	Analyzed:	04/06/15
Diln Fac:	1.000		

Type: MS Moisture: 16%
Lab ID: QC783121

Analyte	MSS Result	Spiked	Result	%REC	Limits
Diesel C10-C24	<0.3650	59.88	46.07	77	46-154

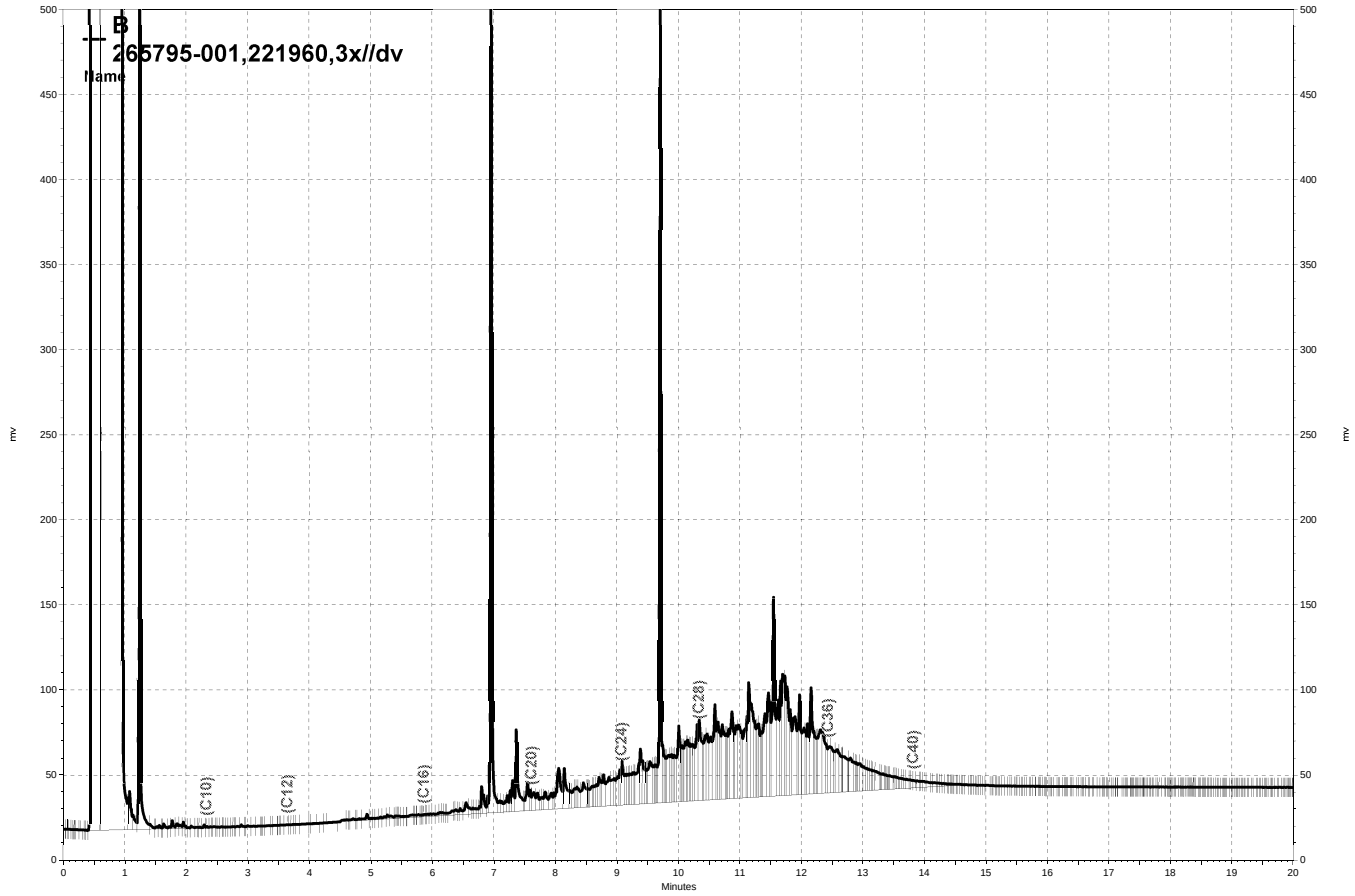
Surrogate	%REC	Limits
o-Terphenyl	82	59-140

Type: MSD Moisture: 16%
Lab ID: QC783122

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Diesel C10-C24	59.37	48.37	81	46-154	6	50

Surrogate	%REC	Limits
o-Terphenyl	84	59-140

RPD= Relative Percent Difference



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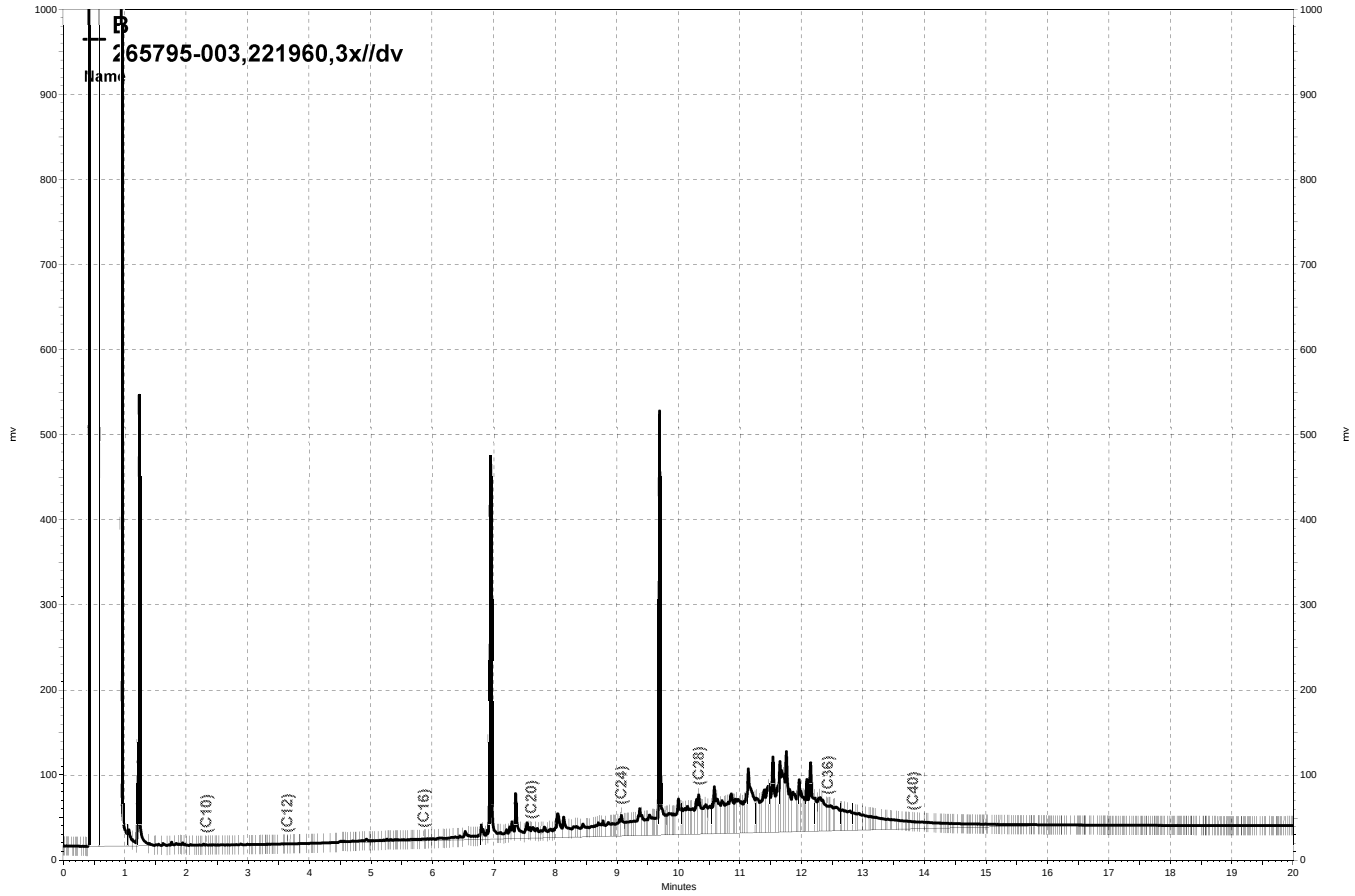

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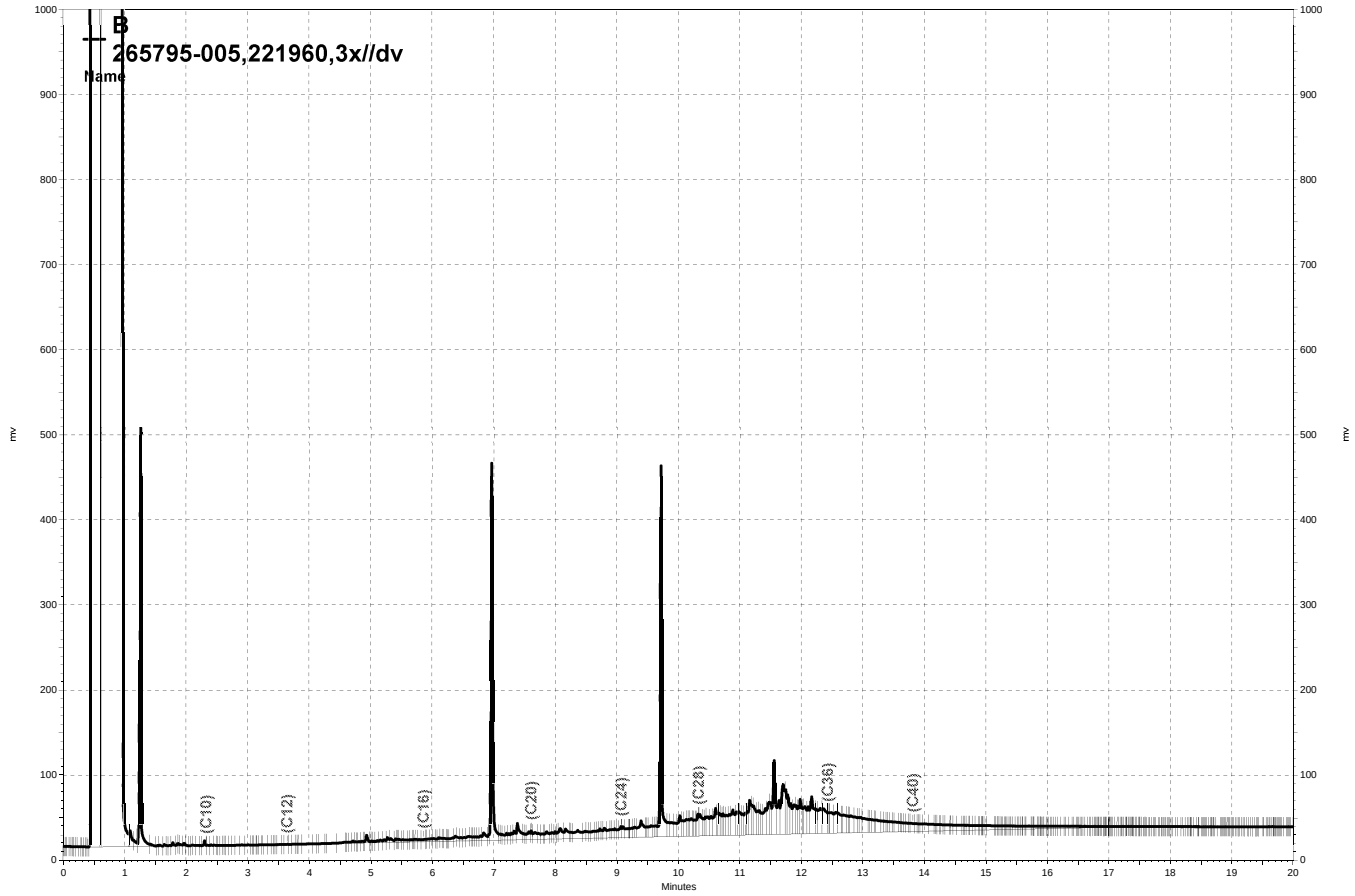

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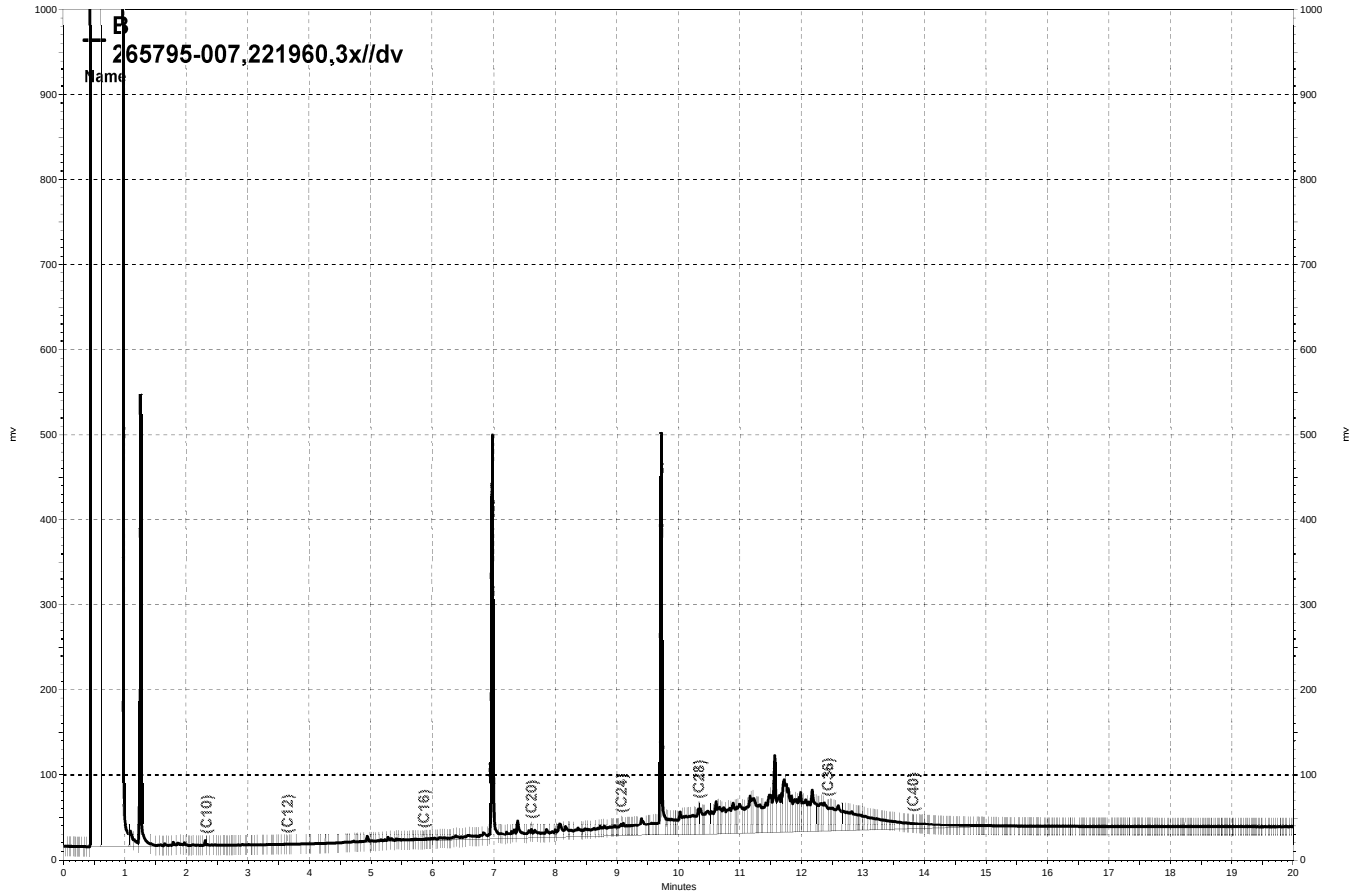

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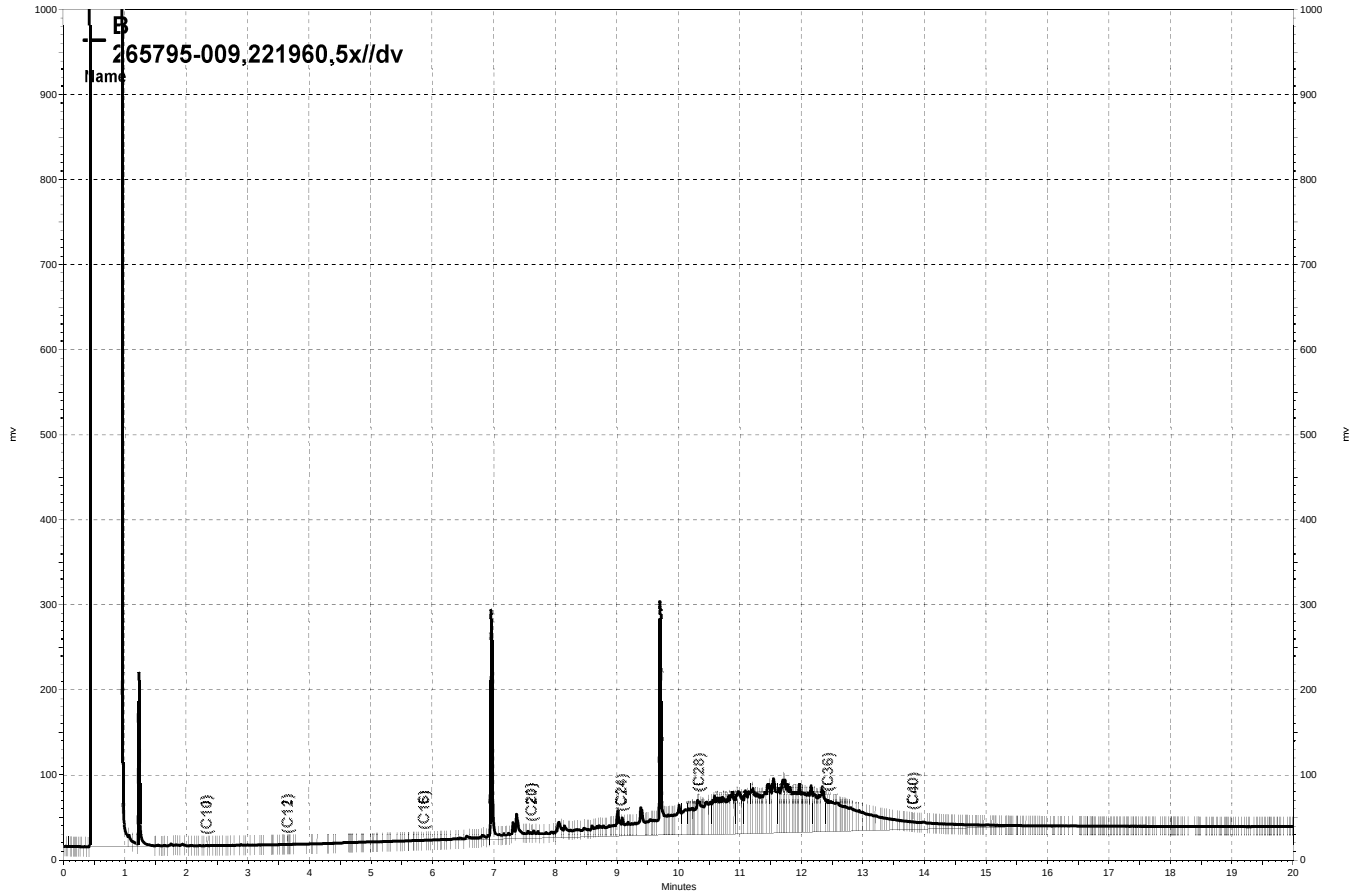

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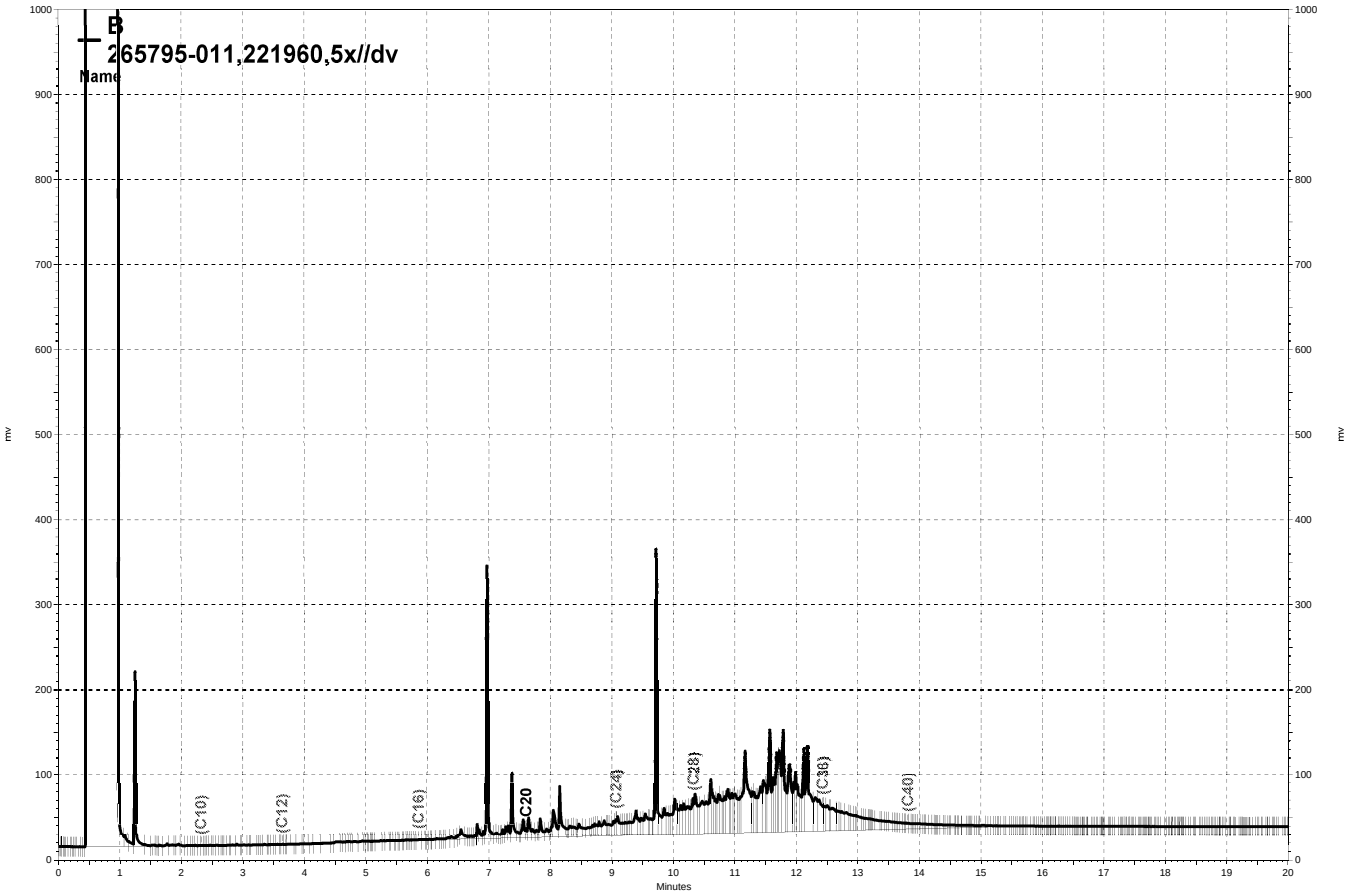

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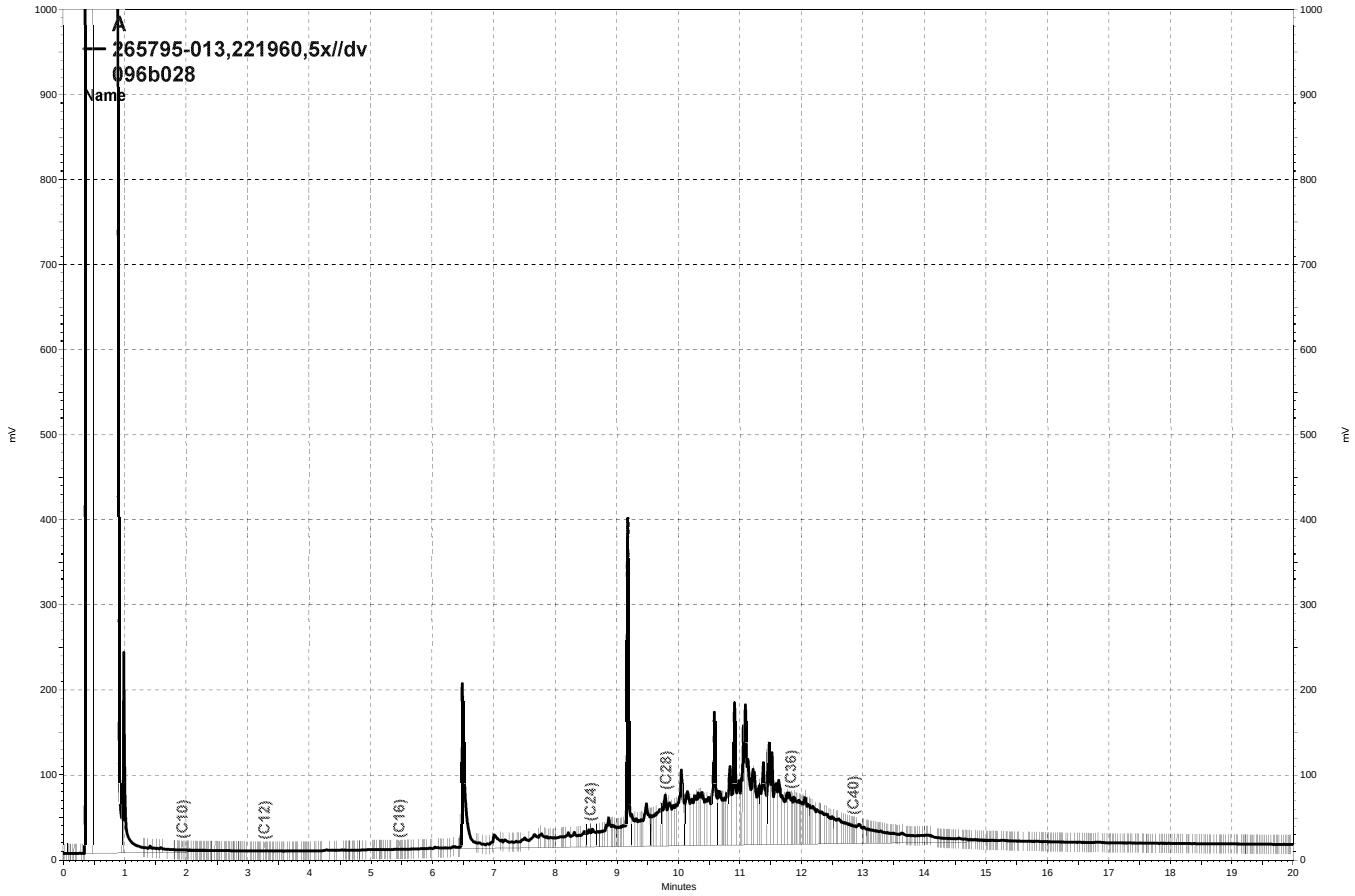

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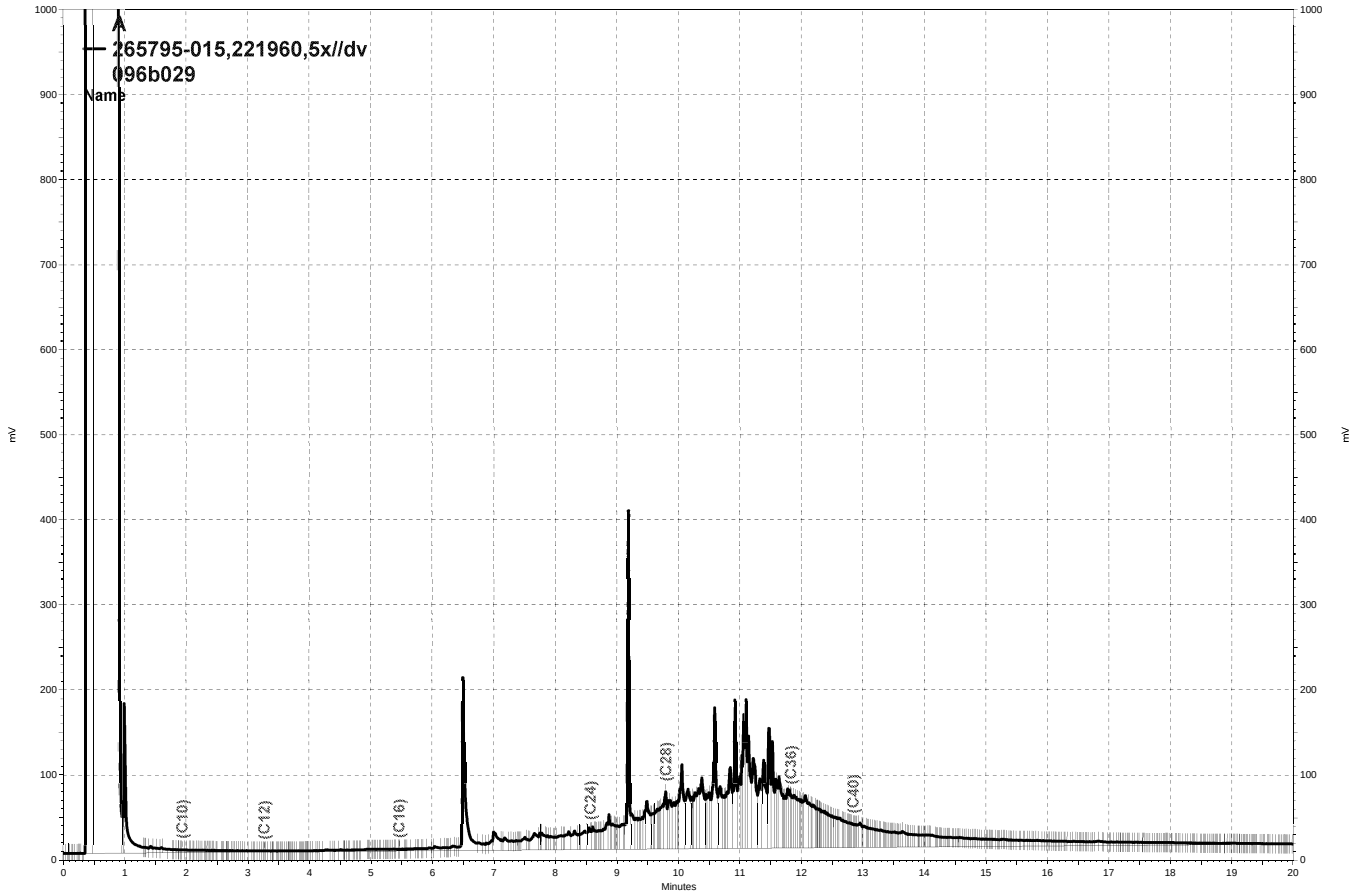

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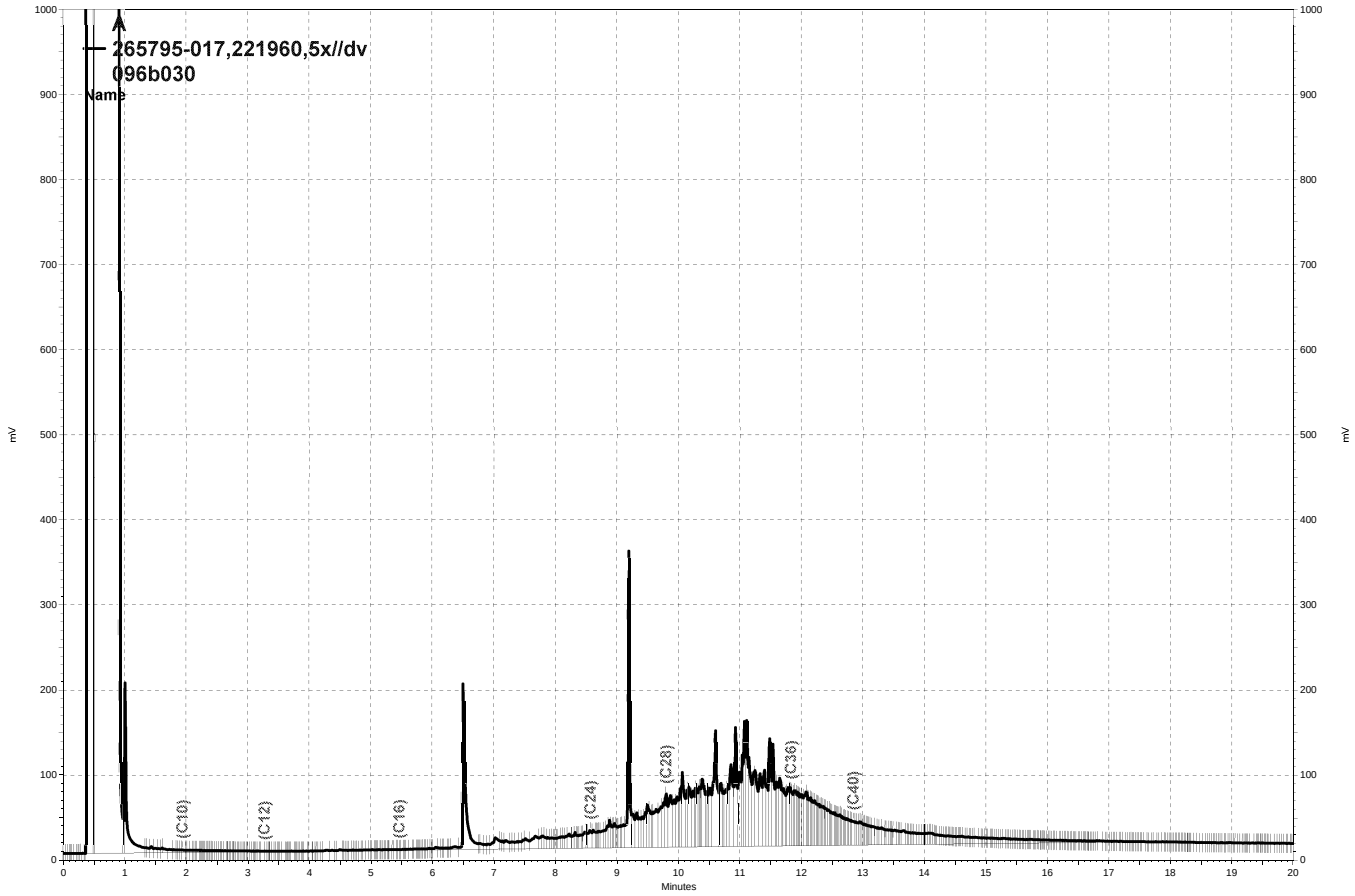

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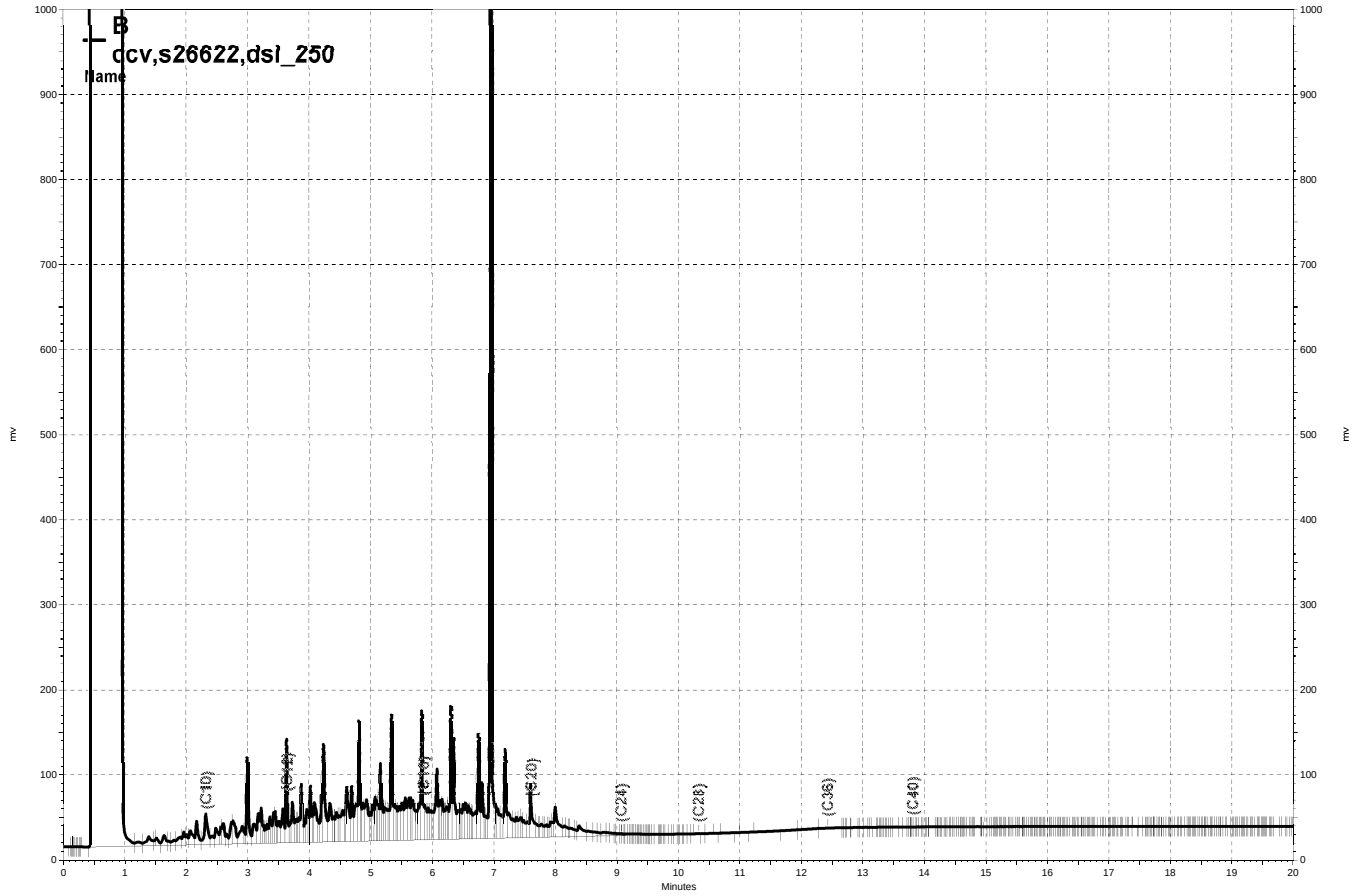

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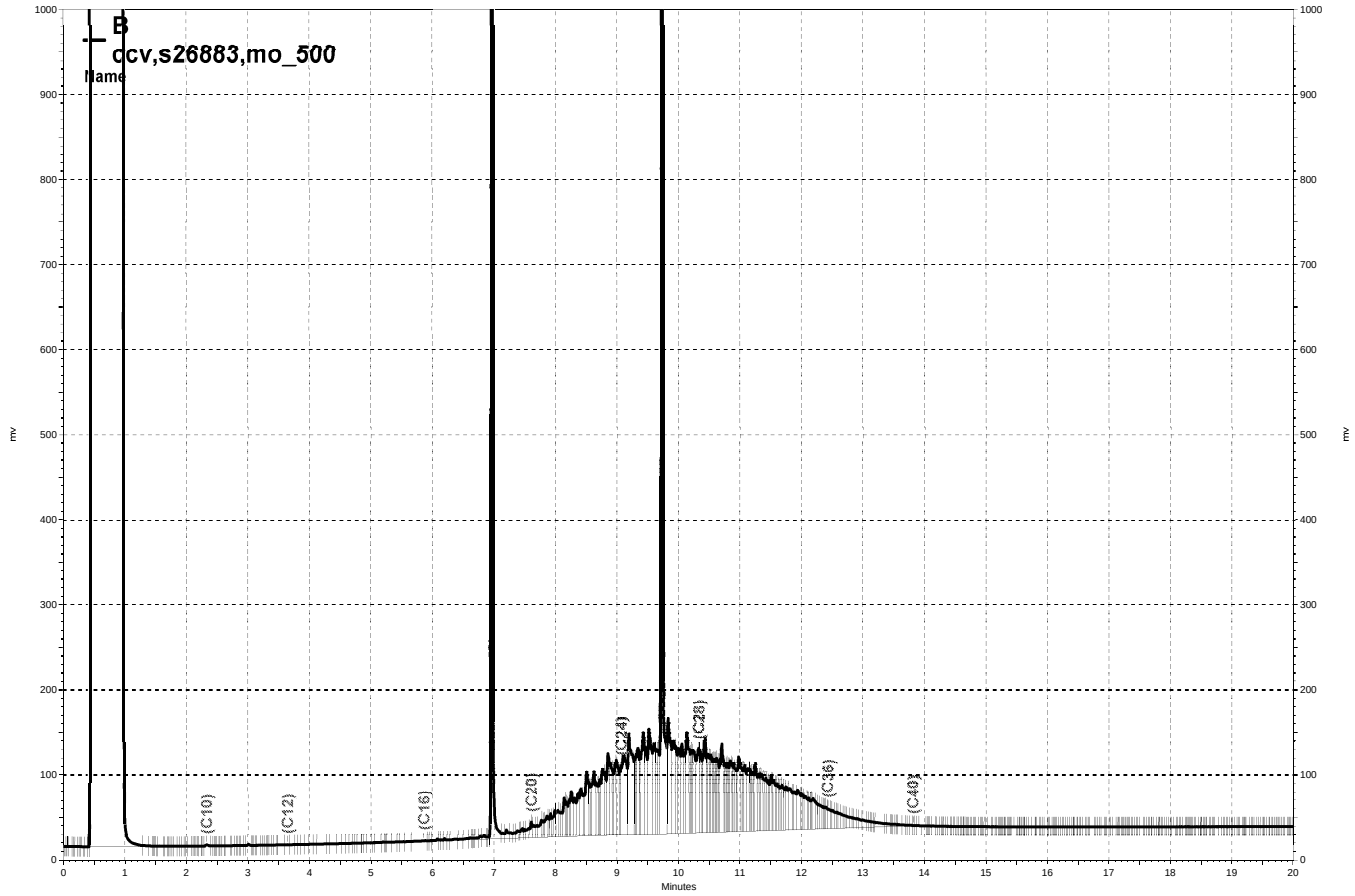

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Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS SIM

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8270C-SIM
Field ID:	DU-01-A	Batch#:	221975
Lab ID:	265795-001	Sampled:	03/31/15
Matrix:	Soil	Received:	04/03/15
Units:	ug/Kg	Prepared:	04/06/15
Basis:	dry	Analyzed:	04/07/15
Diln Fac:	6.250		

Moisture: 25%

Analyte	Result	RL
Naphthalene	ND	41
1-Methylnaphthalene	ND	41
2-Methylnaphthalene	ND	41
Acenaphthylene	ND	41
Acenaphthene	ND	41
Fluorene	ND	41
Phenanthrene	ND	41
Anthracene	ND	41
Fluoranthene	81	41
Pyrene	82	41
Benzo(a)anthracene	ND	41
Chrysene	52	41
Benzo(b)fluoranthene	79	41
Benzo(k)fluoranthene	ND	41
Benzo(a)pyrene	45	41
Indeno(1,2,3-cd)pyrene	ND	41
Dibenz(a,h)anthracene	ND	41
Benzo(g,h,i)perylene	ND	41

Surrogate	%REC	Limits
Nitrobenzene-d5	100	40-120
2-Fluorobiphenyl	107	46-120
Terphenyl-d14	104	43-120

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS SIM

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8270C-SIM
Field ID:	DU-01-B	Batch#:	221975
Lab ID:	265795-003	Sampled:	03/31/15
Matrix:	Soil	Received:	04/03/15
Units:	ug/Kg	Prepared:	04/06/15
Basis:	dry	Analyzed:	04/08/15
Diln Fac:	1.000		

Moisture: 27%

Analyte	Result	RL
Naphthalene	ND	6.8
1-Methylnaphthalene	ND	6.8
2-Methylnaphthalene	ND	6.8
Acenaphthylene	11	6.8
Acenaphthene	ND	6.8
Fluorene	ND	6.8
Phenanthrene	66	6.8
Anthracene	9.1	6.8
Fluoranthene	140	6.8
Pyrene	130	6.8
Benzo(a)anthracene	50	6.8
Chrysene	81	6.8
Benzo(b)fluoranthene	100	6.8
Benzo(k)fluoranthene	30	6.8
Benzo(a)pyrene	67	6.8
Indeno(1,2,3-cd)pyrene	25	6.8
Dibenz(a,h)anthracene	7.0	6.8
Benzo(g,h,i)perylene	26	6.8

Surrogate	%REC	Limits
Nitrobenzene-d5	75	40-120
2-Fluorobiphenyl	84	46-120
Terphenyl-d14	76	43-120

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS SIM

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8270C-SIM
Field ID:	DU-02-A	Batch#:	221975
Lab ID:	265795-005	Sampled:	03/31/15
Matrix:	Soil	Received:	04/03/15
Units:	ug/Kg	Prepared:	04/06/15
Basis:	dry	Analyzed:	04/08/15
Diln Fac:	1.000		

Moisture: 17%

Analyte	Result	RL
Naphthalene	ND	6.1
1-Methylnaphthalene	ND	6.1
2-Methylnaphthalene	ND	6.1
Acenaphthylene	9.1	6.1
Acenaphthene	ND	6.1
Fluorene	ND	6.1
Phenanthrene	18	6.1
Anthracene	ND	6.1
Fluoranthene	47	6.1
Pyrene	57	6.1
Benzo(a)anthracene	20	6.1
Chrysene	34	6.1
Benzo(b)fluoranthene	61	6.1
Benzo(k)fluoranthene	19	6.1
Benzo(a)pyrene	47	6.1
Indeno(1,2,3-cd)pyrene	22	6.1
Dibenz(a,h)anthracene	ND	6.1
Benzo(g,h,i)perylene	27	6.1

Surrogate	%REC	Limits
Nitrobenzene-d5	96	40-120
2-Fluorobiphenyl	102	46-120
Terphenyl-d14	100	43-120

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS SIM

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8270C-SIM
Field ID:	DU-02-B	Batch#:	221975
Lab ID:	265795-007	Sampled:	03/31/15
Matrix:	Soil	Received:	04/03/15
Units:	ug/Kg	Prepared:	04/06/15
Basis:	dry	Analyzed:	04/08/15
Diln Fac:	5.000		

Moisture: 15%

Analyte	Result	RL
Naphthalene	ND	29
1-Methylnaphthalene	ND	29
2-Methylnaphthalene	ND	29
Acenaphthylene	ND	29
Acenaphthene	ND	29
Fluorene	ND	29
Phenanthrene	180	29
Anthracene	ND	29
Fluoranthene	180	29
Pyrene	200	29
Benzo(a)anthracene	47	29
Chrysene	110	29
Benzo(b)fluoranthene	120	29
Benzo(k)fluoranthene	37	29
Benzo(a)pyrene	84	29
Indeno(1,2,3-cd)pyrene	43	29
Dibenz(a,h)anthracene	ND	29
Benzo(g,h,i)perylene	52	29

Surrogate	%REC	Limits
Nitrobenzene-d5	82	40-120
2-Fluorobiphenyl	99	46-120
Terphenyl-d14	96	43-120

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS SIM

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8270C-SIM
Field ID:	DU-03-B	Batch#:	221975
Lab ID:	265795-009	Sampled:	03/31/15
Matrix:	Soil	Received:	04/03/15
Units:	ug/Kg	Prepared:	04/06/15
Basis:	dry	Analyzed:	04/07/15
Diln Fac:	10.00		

Moisture: 15%

Analyte	Result	RL
Naphthalene	ND	58
1-Methylnaphthalene	ND	58
2-Methylnaphthalene	ND	58
Acenaphthylene	ND	58
Acenaphthene	ND	58
Fluorene	ND	58
Phenanthrene	ND	58
Anthracene	ND	58
Fluoranthene	67	58
Pyrene	75	58
Benzo(a)anthracene	ND	58
Chrysene	ND	58
Benzo(b)fluoranthene	ND	58
Benzo(k)fluoranthene	ND	58
Benzo(a)pyrene	ND	58
Indeno(1,2,3-cd)pyrene	ND	58
Dibenz(a,h)anthracene	ND	58
Benzo(g,h,i)perylene	ND	58

Surrogate	%REC	Limits
Nitrobenzene-d5	DO	40-120
2-Fluorobiphenyl	DO	46-120
Terphenyl-d14	DO	43-120

DO= Diluted Out
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS SIM

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8270C-SIM
Field ID:	DU-04-A-1	Batch#:	221975
Lab ID:	265795-011	Sampled:	04/01/15
Matrix:	Soil	Received:	04/03/15
Units:	ug/Kg	Prepared:	04/06/15
Basis:	dry	Analyzed:	04/07/15
Diln Fac:	10.00		

Moisture: 28%

Analyte	Result	RL
Naphthalene	ND	70
1-Methylnaphthalene	ND	70
2-Methylnaphthalene	ND	70
Acenaphthylene	ND	70
Acenaphthene	ND	70
Fluorene	ND	70
Phenanthrene	160	70
Anthracene	ND	70
Fluoranthene	280	70
Pyrene	300	70
Benzo(a)anthracene	98	70
Chrysene	210	70
Benzo(b)fluoranthene	240	70
Benzo(k)fluoranthene	80	70
Benzo(a)pyrene	160	70
Indeno(1,2,3-cd)pyrene	93	70
Dibenz(a,h)anthracene	ND	70
Benzo(g,h,i)perylene	110	70

Surrogate	%REC	Limits
Nitrobenzene-d5	DO	40-120
2-Fluorobiphenyl	DO	46-120
Terphenyl-d14	DO	43-120

DO= Diluted Out
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS SIM

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8270C-SIM
Field ID:	DU-04-A-2	Batch#:	221975
Lab ID:	265795-013	Sampled:	04/01/15
Matrix:	Soil	Received:	04/03/15
Units:	ug/Kg	Prepared:	04/06/15
Basis:	dry	Analyzed:	04/07/15
Diln Fac:	10.00		

Moisture: 27%

Analyte	Result	RL
Naphthalene	ND	70
1-Methylnaphthalene	ND	70
2-Methylnaphthalene	ND	70
Acenaphthylene	ND	70
Acenaphthene	ND	70
Fluorene	ND	70
Phenanthrene	600	70
Anthracene	ND	70
Fluoranthene	730	70
Pyrene	980	70
Benzo(a)anthracene	350	70
Chrysene	640	70
Benzo(b)fluoranthene	570	70
Benzo(k)fluoranthene	210	70
Benzo(a)pyrene	430	70
Indeno(1,2,3-cd)pyrene	170	70
Dibenz(a,h)anthracene	ND	70
Benzo(g,h,i)perylene	170	70

Surrogate	%REC	Limits
Nitrobenzene-d5	DO	40-120
2-Fluorobiphenyl	DO	46-120
Terphenyl-d14	DO	43-120

DO= Diluted Out
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS SIM

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8270C-SIM
Field ID:	DU-04-A-3	Batch#:	221975
Lab ID:	265795-015	Sampled:	04/01/15
Matrix:	Soil	Received:	04/03/15
Units:	ug/Kg	Prepared:	04/06/15
Basis:	dry	Analyzed:	04/07/15
Diln Fac:	25.00		

Moisture: 25%

Analyte	Result	RL
Naphthalene	ND	170
1-Methylnaphthalene	ND	170
2-Methylnaphthalene	ND	170
Acenaphthylene	ND	170
Acenaphthene	ND	170
Fluorene	ND	170
Phenanthrene	ND	170
Anthracene	ND	170
Fluoranthene	170	170
Pyrene	190	170
Benzo(a)anthracene	ND	170
Chrysene	ND	170
Benzo(b)fluoranthene	ND	170
Benzo(k)fluoranthene	ND	170
Benzo(a)pyrene	ND	170
Indeno(1,2,3-cd)pyrene	ND	170
Dibenz(a,h)anthracene	ND	170
Benzo(g,h,i)perylene	ND	170

Surrogate	%REC	Limits
Nitrobenzene-d5	DO	40-120
2-Fluorobiphenyl	DO	46-120
Terphenyl-d14	DO	43-120

DO= Diluted Out
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS SIM

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8270C-SIM
Field ID:	DU-04-B	Batch#:	221975
Lab ID:	265795-017	Sampled:	04/01/15
Matrix:	Soil	Received:	04/03/15
Units:	ug/Kg	Prepared:	04/06/15
Basis:	dry	Analyzed:	04/07/15
Diln Fac:	20.00		

Moisture: 24%

Analyte	Result	RL
Naphthalene	ND	130
1-Methylnaphthalene	ND	130
2-Methylnaphthalene	ND	130
Acenaphthylene	ND	130
Acenaphthene	ND	130
Fluorene	ND	130
Phenanthrene	ND	130
Anthracene	ND	130
Fluoranthene	190	130
Pyrene	210	130
Benzo(a)anthracene	ND	130
Chrysene	140	130
Benzo(b)fluoranthene	180	130
Benzo(k)fluoranthene	ND	130
Benzo(a)pyrene	ND	130
Indeno(1,2,3-cd)pyrene	ND	130
Dibenz(a,h)anthracene	ND	130
Benzo(g,h,i)perylene	ND	130

Surrogate	%REC	Limits
Nitrobenzene-d5	DO	40-120
2-Fluorobiphenyl	DO	46-120
Terphenyl-d14	DO	43-120

DO= Diluted Out
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Semivolatile Organics by GC/MS SIM

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8270C-SIM
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC783183	Batch#:	221975
Matrix:	Soil	Prepared:	04/06/15
Units:	ug/Kg	Analyzed:	04/07/15

Analyte	Result	RL
Naphthalene	ND	5.0
1-Methylnaphthalene	ND	5.0
2-Methylnaphthalene	ND	5.0
Acenaphthylene	ND	5.0
Acenaphthene	ND	5.0
Fluorene	ND	5.0
Phenanthrene	ND	5.0
Anthracene	ND	5.0
Fluoranthene	ND	5.0
Pyrene	ND	5.0
Benzo(a)anthracene	ND	5.0
Chrysene	ND	5.0
Benzo(b)fluoranthene	ND	5.0
Benzo(k)fluoranthene	ND	5.0
Benzo(a)pyrene	ND	5.0
Indeno(1,2,3-cd)pyrene	ND	5.0
Dibenz(a,h)anthracene	ND	5.0
Benzo(g,h,i)perylene	ND	5.0

Surrogate	%REC	Limits
Nitrobenzene-d5	92	40-120
2-Fluorobiphenyl	101	46-120
Terphenyl-d14	102	43-120

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Semivolatile Organics by GC/MS SIM

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8270C-SIM
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC783184	Batch#:	221975
Matrix:	Soil	Prepared:	04/06/15
Units:	ug/Kg	Analyzed:	04/07/15

Analyte	Spiked	Result	%REC	Limits
Acenaphthene	33.19	28.62	86	49-120
Pyrene	33.19	28.20	85	48-120

Surrogate	%REC	Limits
Nitrobenzene-d5	91	40-120
2-Fluorobiphenyl	96	46-120
Terphenyl-d14	98	43-120

Curtis & Tompkins, Ltd.

Batch QC Report

Semivolatile Organics by GC/MS SIM

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8270C-SIM
Field ID:	ZZZZZZZZZZ	Batch#:	221975
MSS Lab ID:	265802-001	Sampled:	04/01/15
Matrix:	Soil	Received:	04/03/15
Units:	ug/Kg	Prepared:	04/06/15
Basis:	dry	Analyzed:	04/07/15
Diln Fac:	2.000		

Type: MS Moisture: 16%
Lab ID: QC783185

Analyte	MSS Result	Spiked	Result	%REC	Limits
Acenaphthene	20.56	39.83	54.84	86	43-120
Pyrene	43.93	39.83	78.88	88	18-144

Surrogate	%REC	Limits
Nitrobenzene-d5	93	40-120
2-Fluorobiphenyl	101	46-120
Terphenyl-d14	106	43-120

Type: MSD Moisture: 16%
Lab ID: QC783186

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Acenaphthene	39.39	60.98	103	43-120	11	45
Pyrene	39.39	82.03	97	18-144	4	72

Surrogate	%REC	Limits
Nitrobenzene-d5	101	40-120
2-Fluorobiphenyl	109	46-120
Terphenyl-d14	110	43-120

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Organochlorine Pesticides

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8081A
Field ID:	DU-01-A	Batch#:	222015
Lab ID:	265795-002	Sampled:	03/31/15
Matrix:	Soil	Received:	04/03/15
Units:	ug/Kg	Prepared:	04/07/15
Basis:	as received	Analyzed:	04/08/15
Diln Fac:	10.00		

Cleanup Method: EPA 3620B

Analyte	Result	RL
alpha-BHC	ND	17
beta-BHC	ND	17
gamma-BHC	ND	17
delta-BHC	ND	17
Heptachlor	ND	17
Aldrin	ND	17
Heptachlor epoxide	ND	17
Endosulfan I	ND	17
Dieldrin	ND	33
4,4'-DDE	ND	33
Endrin	ND	33
Endosulfan II	ND	33
Endosulfan sulfate	ND	33
4,4'-DDD	ND	33
Endrin aldehyde	ND	33
4,4'-DDT	ND	33
Chlordane (Technical)	ND	300
alpha-Chlordane	ND	17
gamma-Chlordane	ND	17
Methoxychlor	ND	170
Toxaphene	ND	600

Surrogate	%REC	Limits
TCMX	DO	44-125
Decachlorobiphenyl	DO	39-121

DO= Diluted Out
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Organochlorine Pesticides

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8081A
Field ID:	DU-01-B	Batch#:	222015
Lab ID:	265795-004	Sampled:	03/31/15
Matrix:	Soil	Received:	04/03/15
Units:	ug/Kg	Prepared:	04/07/15
Basis:	as received	Analyzed:	04/08/15
Diln Fac:	10.00		

Cleanup Method: EPA 3620B

Analyte	Result	RL
alpha-BHC	ND	17
beta-BHC	ND	17
gamma-BHC	ND	17
delta-BHC	ND	17
Heptachlor	ND	17
Aldrin	ND	17
Heptachlor epoxide	ND	17
Endosulfan I	ND	17
Dieldrin	ND	33
4,4'-DDE	ND	33
Endrin	ND	33
Endosulfan II	ND	33
Endosulfan sulfate	ND	33
4,4'-DDD	ND	33
Endrin aldehyde	ND	33
4,4'-DDT	ND	33
Chlordane (Technical)	ND	300
alpha-Chlordane	ND	17
gamma-Chlordane	ND	17
Methoxychlor	ND	170
Toxaphene	ND	590

Surrogate	%REC	Limits
TCMX	DO	44-125
Decachlorobiphenyl	DO	39-121

DO= Diluted Out
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Organochlorine Pesticides

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8081A
Field ID:	DU-02-A	Batch#:	222015
Lab ID:	265795-006	Sampled:	03/31/15
Matrix:	Soil	Received:	04/03/15
Units:	ug/Kg	Prepared:	04/07/15
Basis:	as received	Analyzed:	04/08/15
Diln Fac:	5.000		

Cleanup Method: EPA 3620B

Analyte	Result	RL
alpha-BHC	ND	8.5
beta-BHC	ND	8.5
gamma-BHC	ND	8.5
delta-BHC	ND #	8.5
Heptachlor	ND	8.5
Aldrin	ND	8.5
Heptachlor epoxide	ND	8.5
Endosulfan I	ND	8.5
Dieldrin	ND	17
4,4'-DDE	ND	17
Endrin	ND	17
Endosulfan II	ND	17
Endosulfan sulfate	ND	17
4,4'-DDD	ND	17
Endrin aldehyde	ND	17
4,4'-DDT	ND	17
Chlordane (Technical)	ND	150
alpha-Chlordane	ND #	8.5
gamma-Chlordane	ND #	8.5
Methoxychlor	ND	85
Toxaphene	ND	300

Surrogate	%REC	Limits
TCMX	115	44-125
Decachlorobiphenyl	115	39-121

#= CCV drift outside limits; average CCV drift within limits per method requirements
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Organochlorine Pesticides

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8081A
Field ID:	DU-02-B	Batch#:	222015
Lab ID:	265795-008	Sampled:	03/31/15
Matrix:	Soil	Received:	04/03/15
Units:	ug/Kg	Prepared:	04/07/15
Basis:	as received	Analyzed:	04/08/15
Diln Fac:	10.00		

Cleanup Method: EPA 3620B

Analyte	Result	RL
alpha-BHC	ND	17
beta-BHC	ND	17
gamma-BHC	ND	17
delta-BHC	ND	17
Heptachlor	ND	17
Aldrin	ND	17
Heptachlor epoxide	ND	17
Endosulfan I	ND	17
Dieldrin	ND	33
4,4'-DDE	ND	33
Endrin	ND	33
Endosulfan II	ND	33
Endosulfan sulfate	ND	33
4,4'-DDD	ND	33
Endrin aldehyde	ND	33
4,4'-DDT	ND	33
Chlordane (Technical)	ND	300
alpha-Chlordane	ND	17
gamma-Chlordane	ND	17
Methoxychlor	ND	170
Toxaphene	ND	600

Surrogate	%REC	Limits
TCMX	DO	44-125
Decachlorobiphenyl	DO	39-121

DO= Diluted Out
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Organochlorine Pesticides

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8081A
Field ID:	DU-03-B	Batch#:	222015
Lab ID:	265795-010	Sampled:	03/31/15
Matrix:	Soil	Received:	04/03/15
Units:	ug/Kg	Prepared:	04/07/15
Basis:	as received	Analyzed:	04/08/15
Diln Fac:	50.00		

Cleanup Method: EPA 3620B

Analyte	Result	RL
alpha-BHC	ND	86
beta-BHC	ND	86
gamma-BHC	ND	86
delta-BHC	ND	86
Heptachlor	ND	86
Aldrin	ND	86
Heptachlor epoxide	ND	86
Endosulfan I	ND	86
Dieldrin	ND	170
4,4'-DDE	ND	170
Endrin	ND	170
Endosulfan II	ND	170
Endosulfan sulfate	ND	170
4,4'-DDD	ND	170
Endrin aldehyde	ND	170
4,4'-DDT	ND	170
Chlordane (Technical)	ND	1,500
alpha-Chlordane	ND	86
gamma-Chlordane	ND	86
Methoxychlor	ND	860
Toxaphene	ND	3,000

Surrogate	%REC	Limits
TCMX	DO	44-125
Decachlorobiphenyl	DO	39-121

DO= Diluted Out
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Organochlorine Pesticides

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8081A
Field ID:	DU-04-A-1	Batch#:	222015
Lab ID:	265795-012	Sampled:	04/01/15
Matrix:	Soil	Received:	04/03/15
Units:	ug/Kg	Prepared:	04/07/15
Basis:	as received	Analyzed:	04/08/15
Diln Fac:	20.00		

Cleanup Method: EPA 3620B

Analyte	Result	RL
alpha-BHC	ND	34
beta-BHC	ND	34
gamma-BHC	ND	34
delta-BHC	ND	34
Heptachlor	ND	34
Aldrin	ND	34
Heptachlor epoxide	ND	34
Endosulfan I	ND	34
Dieldrin	ND	66
4,4'-DDE	ND	66
Endrin	ND	66
Endosulfan II	ND	66
Endosulfan sulfate	ND	66
4,4'-DDD	ND	66
Endrin aldehyde	ND	66
4,4'-DDT	ND	66
Chlordane (Technical)	ND	600
alpha-Chlordane	ND	34
gamma-Chlordane	ND	34
Methoxychlor	ND	340
Toxaphene	ND	1,200

Surrogate	%REC	Limits
TCMX	DO	44-125
Decachlorobiphenyl	DO	39-121

DO= Diluted Out
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Organochlorine Pesticides

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8081A
Field ID:	DU-04-A-2	Batch#:	222015
Lab ID:	265795-014	Sampled:	04/01/15
Matrix:	Soil	Received:	04/03/15
Units:	ug/Kg	Prepared:	04/07/15
Basis:	as received	Analyzed:	04/08/15
Diln Fac:	20.00		

Cleanup Method: EPA 3620B

Analyte	Result	RL
alpha-BHC	ND	34
beta-BHC	ND	34
gamma-BHC	ND	34
delta-BHC	ND	34
Heptachlor	ND	34
Aldrin	ND	34
Heptachlor epoxide	ND	34
Endosulfan I	ND	34
Dieldrin	ND	65
4,4'-DDE	ND	65
Endrin	ND	65
Endosulfan II	ND	65
Endosulfan sulfate	ND	65
4,4'-DDD	ND	65
Endrin aldehyde	ND	65
4,4'-DDT	ND	65
Chlordane (Technical)	ND	600
alpha-Chlordane	ND	34
gamma-Chlordane	ND	34
Methoxychlor	ND	340
Toxaphene	ND	1,200

Surrogate	%REC	Limits
TCMX	DO	44-125
Decachlorobiphenyl	DO	39-121

DO= Diluted Out
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Organochlorine Pesticides

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8081A
Field ID:	DU-04-A-3	Batch#:	222015
Lab ID:	265795-016	Sampled:	04/01/15
Matrix:	Soil	Received:	04/03/15
Units:	ug/Kg	Prepared:	04/07/15
Basis:	as received	Analyzed:	04/08/15
Diln Fac:	20.00		

Cleanup Method: EPA 3620B

Analyte	Result	RL
alpha-BHC	ND	33
beta-BHC	ND	33
gamma-BHC	ND	33
delta-BHC	ND	33
Heptachlor	ND	33
Aldrin	ND	33
Heptachlor epoxide	ND	33
Endosulfan I	ND	33
Dieldrin	ND	65
4,4'-DDE	ND	65
Endrin	ND	65
Endosulfan II	ND	65
Endosulfan sulfate	ND	65
4,4'-DDD	ND	65
Endrin aldehyde	ND	65
4,4'-DDT	ND	65
Chlordane (Technical)	ND	590
alpha-Chlordane	ND	33
gamma-Chlordane	ND	33
Methoxychlor	ND	330
Toxaphene	ND	1,200

Surrogate	%REC	Limits
TCMX	DO	44-125
Decachlorobiphenyl	DO	39-121

DO= Diluted Out
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Organochlorine Pesticides

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8081A
Field ID:	DU-04-B	Batch#:	222015
Lab ID:	265795-018	Sampled:	04/01/15
Matrix:	Soil	Received:	04/03/15
Units:	ug/Kg	Prepared:	04/07/15
Basis:	as received	Analyzed:	04/08/15
Diln Fac:	50.00		

Cleanup Method: EPA 3620B

Analyte	Result	RL
alpha-BHC	ND	85
beta-BHC	ND	85
gamma-BHC	ND	85
delta-BHC	ND	85
Heptachlor	ND	85
Aldrin	ND	85
Heptachlor epoxide	ND	85
Endosulfan I	ND	85
Dieldrin	ND	170
4,4'-DDE	ND	170
Endrin	ND	170
Endosulfan II	ND	170
Endosulfan sulfate	ND	170
4,4'-DDD	ND	170
Endrin aldehyde	ND	170
4,4'-DDT	ND	170
Chlordane (Technical)	ND	1,500
alpha-Chlordane	ND	85
gamma-Chlordane	ND	85
Methoxychlor	ND	850
Toxaphene	ND	3,000

Surrogate	%REC	Limits
TCMX	DO	44-125
Decachlorobiphenyl	DO	39-121

DO= Diluted Out
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Organochlorine Pesticides

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8081A
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC783336	Batch#:	222015
Matrix:	Soil	Prepared:	04/07/15
Units:	ug/Kg	Analyzed:	04/08/15

Cleanup Method: EPA 3620B

Analyte	Result	RL
alpha-BHC	ND	1.7
beta-BHC	ND	1.7
gamma-BHC	ND	1.7
delta-BHC	ND	1.7
Heptachlor	ND	1.7
Aldrin	ND	1.7
Heptachlor epoxide	ND	1.7
Endosulfan I	ND	1.7
Dieldrin	ND	3.3
4,4'-DDE	ND	3.3
Endrin	ND	3.3
Endosulfan II	ND	3.3
Endosulfan sulfate	ND	3.3
4,4'-DDD	ND	3.3
Endrin aldehyde	ND	3.3
4,4'-DDT	ND	3.3
Chlordane (Technical)	ND	30
alpha-Chlordane	ND	1.7
gamma-Chlordane	ND	1.7
Methoxychlor	ND	17
Toxaphene	ND	60

Surrogate	%REC	Limits
TCMX	81	44-125
Decachlorobiphenyl	85	39-121

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Organochlorine Pesticides

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8081A
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC783340	Batch#:	222015
Matrix:	Soil	Prepared:	04/07/15
Units:	ug/Kg	Analyzed:	04/08/15

Cleanup Method: EPA 3620B

Analyte	Spiked	Result	%REC	Limits
gamma-BHC	13.50	9.679 #	72	44-121
Heptachlor	13.50	11.05 #	82	45-129
Aldrin	13.50	9.089	67	45-120
Dieldrin	13.50	12.07	89	49-131
Endrin	13.50	12.52	93	43-135
4,4'-DDT	13.50	12.56 #	93	37-141

Surrogate	%REC	Limits
TCMX	78	44-125
Decachlorobiphenyl	93	39-121

#= CCV drift outside limits; average CCV drift within limits per method requirements

Curtis & Tompkins, Ltd.

Polychlorinated Biphenyls (PCBs)

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8082
Matrix:	Soil	Batch#:	222015
Units:	ug/Kg	Received:	04/03/15
Basis:	as received	Prepared:	04/07/15
Diln Fac:	1.000		

Field ID:	DU-01-A	Sampled:	03/31/15
Type:	SAMPLE	Analyzed:	04/09/15
Lab ID:	265795-002	Cleanup Method:	EPA 3620B

Analyte	Result	RL
Aroclor-1016	ND	9.6
Aroclor-1221	ND	19
Aroclor-1232	ND	9.6
Aroclor-1242	ND	9.6
Aroclor-1248	ND	9.6
Aroclor-1254	ND	9.6
Aroclor-1260	ND	9.6

Surrogate	%REC	Limits
TCMX	96	46-141
Decachlorobiphenyl	96	25-135

Field ID:	DU-01-B	Sampled:	03/31/15
Type:	SAMPLE	Analyzed:	04/08/15
Lab ID:	265795-004	Cleanup Method:	EPA 3620B

Analyte	Result	RL
Aroclor-1016	ND	9.5
Aroclor-1221	ND	19
Aroclor-1232	ND	9.5
Aroclor-1242	ND	9.5
Aroclor-1248	ND	9.5
Aroclor-1254	ND	9.5
Aroclor-1260	ND	9.5

Surrogate	%REC	Limits
TCMX	94	46-141
Decachlorobiphenyl	86	25-135

Field ID:	DU-02-A	Sampled:	03/31/15
Type:	SAMPLE	Analyzed:	04/08/15
Lab ID:	265795-006	Cleanup Method:	EPA 3620B

Analyte	Result	RL
Aroclor-1016	ND	9.6
Aroclor-1221	ND	19
Aroclor-1232	ND	9.6
Aroclor-1242	ND	9.6
Aroclor-1248	ND	9.6
Aroclor-1254	ND	9.6
Aroclor-1260	ND	9.6

Surrogate	%REC	Limits
TCMX	90	46-141
Decachlorobiphenyl	97	25-135

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Polychlorinated Biphenyls (PCBs)

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8082
Matrix:	Soil	Batch#:	222015
Units:	ug/Kg	Received:	04/03/15
Basis:	as received	Prepared:	04/07/15
Diln Fac:	1.000		

Field ID:	DU-02-B	Sampled:	03/31/15
Type:	SAMPLE	Analyzed:	04/08/15
Lab ID:	265795-008	Cleanup Method:	EPA 3620B

Analyte	Result	RL
Aroclor-1016	ND	9.6
Aroclor-1221	ND	19
Aroclor-1232	ND	9.6
Aroclor-1242	ND	9.6
Aroclor-1248	ND	9.6
Aroclor-1254	ND	9.6
Aroclor-1260	ND	9.6

Surrogate	%REC	Limits
TCMX	105	46-141
Decachlorobiphenyl	107	25-135

Field ID:	DU-03-B	Sampled:	03/31/15
Type:	SAMPLE	Analyzed:	04/08/15
Lab ID:	265795-010	Cleanup Method:	EPA 3620B

Analyte	Result	RL
Aroclor-1016	ND	9.7
Aroclor-1221	ND	19
Aroclor-1232	ND	9.7
Aroclor-1242	ND	9.7
Aroclor-1248	ND	9.7
Aroclor-1254	ND	9.7
Aroclor-1260	ND	9.7

Surrogate	%REC	Limits
TCMX	69	46-141
Decachlorobiphenyl	63	25-135

Field ID:	DU-04-A-1	Sampled:	04/01/15
Type:	SAMPLE	Analyzed:	04/08/15
Lab ID:	265795-012	Cleanup Method:	EPA 3620B

Analyte	Result	RL
Aroclor-1016	ND	9.6
Aroclor-1221	ND	19
Aroclor-1232	ND	9.6
Aroclor-1242	ND	9.6
Aroclor-1248	ND	9.6
Aroclor-1254	ND	9.6
Aroclor-1260	ND	9.6

Surrogate	%REC	Limits
TCMX	77	46-141
Decachlorobiphenyl	85	25-135

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Polychlorinated Biphenyls (PCBs)

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8082
Matrix:	Soil	Batch#:	222015
Units:	ug/Kg	Received:	04/03/15
Basis:	as received	Prepared:	04/07/15
Diln Fac:	1.000		

Field ID:	DU-04-A-2	Sampled:	04/01/15
Type:	SAMPLE	Analyzed:	04/08/15
Lab ID:	265795-014	Cleanup Method:	EPA 3620B

Analyte	Result	RL
Aroclor-1016	ND	9.5
Aroclor-1221	ND	19
Aroclor-1232	ND	9.5
Aroclor-1242	ND	9.5
Aroclor-1248	ND	9.5
Aroclor-1254	ND	9.5
Aroclor-1260	ND	9.5

Surrogate	%REC	Limits
TCMX	76	46-141
Decachlorobiphenyl	69	25-135

Field ID:	DU-04-A-3	Sampled:	04/01/15
Type:	SAMPLE	Analyzed:	04/08/15
Lab ID:	265795-016	Cleanup Method:	EPA 3620B

Analyte	Result	RL
Aroclor-1016	ND	9.5
Aroclor-1221	ND	19
Aroclor-1232	ND	9.5
Aroclor-1242	ND	9.5
Aroclor-1248	ND	9.5
Aroclor-1254	ND	9.5
Aroclor-1260	ND	9.5

Surrogate	%REC	Limits
TCMX	105	46-141
Decachlorobiphenyl	115	25-135

Field ID:	DU-04-B	Sampled:	04/01/15
Type:	SAMPLE	Analyzed:	04/08/15
Lab ID:	265795-018	Cleanup Method:	EPA 3620B

Analyte	Result	RL
Aroclor-1016	ND	9.6
Aroclor-1221	ND	19
Aroclor-1232	ND	9.6
Aroclor-1242	ND	9.6
Aroclor-1248	ND	9.6
Aroclor-1254	ND	9.6
Aroclor-1260	ND	9.6

Surrogate	%REC	Limits
TCMX	107	46-141
Decachlorobiphenyl	101	25-135

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Polychlorinated Biphenyls (PCBs)

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8082
Matrix:	Soil	Batch#:	222015
Units:	ug/Kg	Received:	04/03/15
Basis:	as received	Prepared:	04/07/15
Diln Fac:	1.000		

Type:	BLANK	Analyzed:	04/08/15
Lab ID:	QC783336	Cleanup Method:	EPA 3620B

Analyte	Result	RL
Aroclor-1016	ND	9.6
Aroclor-1221	ND	19
Aroclor-1232	ND	9.6
Aroclor-1242	ND	9.6
Aroclor-1248	ND	9.6
Aroclor-1254	ND	9.6
Aroclor-1260	ND	9.6

Surrogate	%REC	Limits
TCMX	87	46-141
Decachlorobiphenyl	87	25-135

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Polychlorinated Biphenyls (PCBs)

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8082
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC783337	Batch#:	222015
Matrix:	Soil	Prepared:	04/07/15
Units:	ug/Kg	Analyzed:	04/08/15

Analyte	Spiked	Result	%REC	Limits
Aroclor-1016	168.6	208.0	123	64-140
Aroclor-1260	168.6	234.6	139	65-146

Surrogate	%REC	Limits
TCMX	115	46-141
Decachlorobiphenyl	131	25-135

Curtis & Tompkins, Ltd.

Mercury by Cold Vapor AA

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	METHOD
Project#:	1927_3	Analysis:	EPA 7471A
Analyte:	Mercury	Batch#:	222065
Matrix:	Soil	Received:	04/03/15
Units:	mg/Kg	Prepared:	04/08/15
Basis:	dry	Analyzed:	04/09/15
Diln Fac:	1.000		

Field ID	Type	Lab ID	Result	RL	Moisture	Sampled
DU-01-A	SAMPLE	265795-001	0.20	0.023	25%	03/31/15
DU-01-B	SAMPLE	265795-003	0.23	0.025	27%	03/31/15
DU-02-A	SAMPLE	265795-005	0.077	0.020	17%	03/31/15
DU-02-B	SAMPLE	265795-007	0.095	0.021	15%	03/31/15
DU-03-B	SAMPLE	265795-009	0.10	0.019	15%	03/31/15
DU-04-A-1	SAMPLE	265795-011	0.40	0.025	28%	04/01/15
DU-04-A-2	SAMPLE	265795-013	0.42	0.024	27%	04/01/15
DU-04-A-3	SAMPLE	265795-015	0.40	0.022	25%	04/01/15
DU-04-B	SAMPLE	265795-017	0.46	0.022	24%	04/01/15
	BLANK	QC783515	ND	0.017		

ND= Not Detected
RL= Reporting Limit

36.0

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RCRA Metals

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3050B
Project#:	1927_3	Analysis:	EPA 6010B
Matrix:	Soil	Batch#:	222102
Units:	mg/Kg	Received:	04/03/15
Basis:	as received	Prepared:	04/09/15
Diln Fac:	1.000	Analyzed:	04/09/15

Field ID: DU-01-A Lab ID: 265795-002
Type: SAMPLE Sampled: 03/31/15

Analyte	Result	RL
Arsenic	29	0.26
Barium	24	0.26
Cadmium	1.9	0.26
Chromium	130	0.26
Lead	86	0.26
Selenium	ND	0.53
Silver	ND	0.26

Field ID: DU-01-B Lab ID: 265795-004
Type: SAMPLE Sampled: 03/31/15

Analyte	Result	RL
Arsenic	25	0.26
Barium	30	0.26
Cadmium	1.9	0.26
Chromium	120	0.26
Lead	110	0.26
Selenium	ND	0.51
Silver	ND	0.26

Field ID: DU-02-A Lab ID: 265795-006
Type: SAMPLE Sampled: 03/31/15

Analyte	Result	RL
Arsenic	22	0.25
Barium	13	0.25
Cadmium	1.6	0.25
Chromium	100	0.25
Lead	18	0.25
Selenium	ND	0.49
Silver	ND	0.25

Field ID: DU-02-B Lab ID: 265795-008
Type: SAMPLE Sampled: 03/31/15

Analyte	Result	RL
Arsenic	22	0.23
Barium	14	0.23
Cadmium	1.5	0.23
Chromium	92	0.23
Lead	36	0.23
Selenium	ND	0.47
Silver	ND	0.23

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

RCRA Metals

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3050B
Project#:	1927_3	Analysis:	EPA 6010B
Matrix:	Soil	Batch#:	222102
Units:	mg/Kg	Received:	04/03/15
Basis:	as received	Prepared:	04/09/15
Diln Fac:	1.000	Analyzed:	04/09/15

Field ID: DU-03-B Lab ID: 265795-010
Type: SAMPLE Sampled: 03/31/15

Analyte	Result	RL
Arsenic	19	0.27
Barium	23	0.27
Cadmium	1.1	0.27
Chromium	50	0.27
Lead	47	0.27
Selenium	ND	0.53
Silver	ND	0.27

Field ID: DU-04-A-1 Lab ID: 265795-012
Type: SAMPLE Sampled: 04/01/15

Analyte	Result	RL
Arsenic	35	0.27
Barium	60	0.27
Cadmium	1.8	0.27
Chromium	56	0.27
Lead	340	0.27
Selenium	ND	0.53
Silver	ND	0.27

Field ID: DU-04-A-2 Lab ID: 265795-014
Type: SAMPLE Sampled: 04/01/15

Analyte	Result	RL
Arsenic	31	0.23
Barium	55	0.23
Cadmium	1.8	0.23
Chromium	50	0.23
Lead	300	0.23
Selenium	ND	0.47
Silver	ND	0.23

Field ID: DU-04-A-3 Lab ID: 265795-016
Type: SAMPLE Sampled: 04/01/15

Analyte	Result	RL
Arsenic	35	0.25
Barium	55	0.25
Cadmium	1.6	0.25
Chromium	47	0.25
Lead	300	0.25
Selenium	ND	0.50
Silver	ND	0.25

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

RCRA Metals

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3050B
Project#:	1927_3	Analysis:	EPA 6010B
Matrix:	Soil	Batch#:	222102
Units:	mg/Kg	Received:	04/03/15
Basis:	as received	Prepared:	04/09/15
Diln Fac:	1.000	Analyzed:	04/09/15

Field ID:	DU-04-B	Lab ID:	265795-018
Type:	SAMPLE	Sampled:	04/01/15

Analyte	Result	RL
Arsenic	41	0.27
Barium	62	0.27
Cadmium	1.8	0.27
Chromium	57	0.27
Lead	340	0.27
Selenium	ND	0.54
Silver	ND	0.27

Type:	BLANK	Lab ID:	QC783652

Analyte	Result	RL
Arsenic	ND	0.25
Barium	ND	0.25
Cadmium	ND	0.25
Chromium	ND	0.25
Lead	ND	0.25
Selenium	ND	0.50
Silver	ND	0.25

ND= Not Detected
RL= Reporting Limit

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Batch QC Report

Mercury by Cold Vapor AA

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	METHOD
Project#:	1927_3	Analysis:	EPA 7471A
Analyte:	Mercury	Diln Fac:	1.000
Field ID:	DU-01-A	Batch#:	222065
MSS Lab ID:	265795-001	Sampled:	03/31/15
Matrix:	Soil	Received:	04/03/15
Units:	mg/Kg	Prepared:	04/08/15
Basis:	dry	Analyzed:	04/09/15

Type	Lab ID	MSS Result	Spiked	Result	%REC	Limits	Moisture	RPD	Lim
BS	QC783516		0.2083	0.2392	115	80-120			
BSD	QC783517		0.2083	0.2281	109	80-120		5	20
MS	QC783518	0.1992	0.2874	0.4881	101	69-142	25%		
MSD	QC783519		0.2688	0.4614	98	69-142	25%	2	36

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Batch QC Report

RCRA Metals

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3050B
Project#:	1927_3	Analysis:	EPA 6010B
Matrix:	Soil	Batch#:	222102
Units:	mg/Kg	Prepared:	04/09/15
Diln Fac:	5.000	Analyzed:	04/09/15

Type: BS Lab ID: QC783653

Analyte	Spiked	Result	%REC	Limits
Arsenic	50.00	45.28	91	80-120
Barium	50.00	45.54	91	80-120
Cadmium	50.00	47.82	96	80-120
Chromium	50.00	45.24	90	80-120
Lead	50.00	44.71	89	80-120
Selenium	50.00	45.60	91	80-120
Silver	50.00	43.73	87	80-120

Type: BSD Lab ID: QC783654

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Arsenic	50.00	47.02	94	80-120	4	20
Barium	50.00	46.87	94	80-120	3	20
Cadmium	50.00	49.35	99	80-120	3	20
Chromium	50.00	46.45	93	80-120	3	20
Lead	50.00	45.95	92	80-120	3	20
Selenium	50.00	47.87	96	80-120	5	20
Silver	50.00	45.19	90	80-120	3	20

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Batch QC Report

RCRA Metals

Lab #:	265795	Location:	Kuawa St New Field Development EPH1
Client:	Myounghee Noh & Associates	Prep:	EPA 3050B
Project#:	1927_3	Analysis:	EPA 6010B
Field ID:	DU-01-A	Batch#:	222102
MSS Lab ID:	265795-002	Sampled:	03/31/15
Matrix:	Soil	Received:	04/03/15
Units:	mg/Kg	Prepared:	04/09/15
Basis:	dry	Analyzed:	04/09/15
Diln Fac:	5.000		

Type: MS Moisture: 25%
Lab ID: QC783655

Analyte	MSS Result	Spiked	Result	%REC	Limits
Arsenic	39.32	62.66	89.56	80	69-120
Barium	32.27	62.66	89.08	91	35-154
Cadmium	2.558	62.66	57.92	88	71-120
Chromium	171.7	62.66	250.5	126	57-133
Lead	114.6	62.66	177.8	101	53-125
Selenium	<0.2256	62.66	44.34	71	61-120
Silver	<0.05631	62.66	55.20	88	69-120

Type: MSD Moisture: 25%
Lab ID: QC783656

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Arsenic	69.74	99.07	86	69-120	3	35
Barium	69.74	96.80	93	35-154	1	36
Cadmium	69.74	65.20	90	71-120	2	25
Chromium	69.74	256.0	121	57-133	1	33
Lead	69.74	189.7	108	53-125	3	42
Selenium	69.74	52.70	76	61-120	7	33
Silver	69.74	62.52	90	69-120	2	22

RPD= Relative Percent Difference

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2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

Laboratory Job Number 265987
ANALYTICAL REPORT

Myounghee Noh & Associates	Project : 1927_3
99-1046 Iwaena Street	Location : Kuawa Soccer Field
Aiea, HI 96701	Level : II

Sample ID	Lab ID
DU-04-B	265987-001
DU-03-A	265987-002
DU-03-A	265987-003
DU-05-A	265987-004
DU-05-A	265987-005

This data package has been reviewed for technical correctness and completeness. Release of this data has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature. The results contained in this report meet all requirements of NELAC and pertain only to those samples which were submitted for analysis. This report may be reproduced only in its entirety.

Signature: Isabelle Choy Date: 04/20/2015

Isabelle Choy
Project Manager
isabelle.choy@ctberk.com

CA ELAP# 2896, NELAP# 4044-001

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CASE NARRATIVE

Laboratory number:	**265987**
Client:	**Myounghee Noh & Associates**
Project:	**1927_3**
Location:	**Kuawa Soccer Field**
Request Date:	**04/09/15**
Samples Received:	**04/09/15**

This data package contains sample and QC results for three soil samples, requested for the above referenced project on 04/09/15. The samples were received cold and intact. Multi-Increment Sampling (ISM) was performed on all samples in accordance per HDOH.

TPH-Purgeables and/or BTXE by GC (EPA 8015B and EPA 8021B):
No analytical problems were encountered.

TPH-Extractables by GC (EPA 8015B):
DU-03-A (lab # 265987-002) and DU-05-A (lab # 265987-004) were diluted due to the dark and viscous nature of the sample extracts. No other analytical problems were encountered.

Semivolatile Organics by GC/MS SIM (EPA 8270C-SIM):
DU-03-A (lab # 265987-002) and DU-05-A (lab # 265987-004) were diluted due to the dark and viscous nature of the sample extracts. No other analytical problems were encountered.

Pesticides (EPA 8081A):
All samples underwent sulfur cleanup using the copper option in EPA Method 3660B. All samples underwent florisil cleanup using EPA Method 3620C. Matrix spikes QC784108,QC784109 (batch 222211) were not analyzed because the parent sample required a dilution that would have diluted out the spikes. High recovery was observed for endrin in the LCS for batch 222211; this analyte was not detected at or above the RL in the associated samples. DU-03-A (lab # 265987-003) and DU-05-A (lab # 265987-005) were diluted due to the color of the sample extracts. No other analytical problems were encountered.

PCBs (EPA 8082):
All samples underwent sulfuric acid cleanup using EPA Method 3665A. All samples underwent sulfur cleanup using the copper option in EPA Method 3660B. High response was observed for Aroclor-1016 in the CCV analyzed 04/14/15 20:20; affected data was qualified with "b". Matrix spikes QC784108,QC784109 (batch 222211) were not analyzed because the parent sample required a dilution that would have diluted out the spikes. No other analytical problems were encountered.

Metals (EPA 6010B and EPA 7471A):
Low recoveries were observed for mercury in the MS/MSD for batch 222238; the parent sample was not a project sample, the BS/BSD were within limits, and the associated RPD was within limits. High recoveries were observed for

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CASE NARRATIVE

Laboratory number:	**265987**
Client:	**Myounghee Noh & Associates**
Project:	**1927_3**
Location:	**Kuawa Soccer Field**
Request Date:	**04/09/15**
Samples Received:	**04/09/15**

Metals (EPA 6010B and EPA 7471A):
chromium in the MS/MSD of DU-03-A (lab # 265987-003); the BS/BSD were within limits, and the associated RPD was within limits. No other analytical problems were encountered.

Moisture (ASTM D2216/CLP):
No analytical problems were encountered.

CHAIN OF CUSTODY

Curtis & Tompkins Laboratories
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2323 Fifth Street
Berkeley, CA 94710

Phone (510) 486-0900
Fax (510) 486-0532

C&T LOGIN # 265987

Chain of Custody #

Project No: 31927
Project Name: Kuawa Soccer Field
Project P. O. No:
EDD Format: Report Level ☐ II ☐ III ☒ IV
Turnaround Time: ☐ RUSH ☒ Standard

Sampler: Philip Cabanila
Report To: Philip Cabanila
Company: Myounghee Noh + Assoc.
Telephone: 808 937 1807
Email: philip@noh-associates.com

Lab No.	Sample ID.	Sampling: Date Collected	Sampling: Time Collected	Matrix: Water	Matrix: Solid	# of Containers	Chemical Preservative: MeOH	H2SO4	HNO3	NaOH	None	TPH-G + BTEX (8260)	TPH-D, TPH-O (8015)	PAH (8270)	PCB (8270)	Organochlorine Pest (8081)	Total RCRA Metals (6010)	MIS PREP
1	DU-04-B	4/6/15	1120		X	1	X					X						X
2,3	DU-03-A	4/6/15	1205		X	1					X	X	X	X	X	X	X	X
4,5	DU-05-A	4/6/15	1148		X	1					X	X	X	X	X	X	X	X

Notes:
All samples are MIS.

SAMPLE RECEIPT
☐ Intact
☐ Cold
☐ On Ice
☐ Ambient

RELINQUISHED BY:
DATE: 4/7/15 TIME: 0915
DATE: TIME:
DATE: TIME:

RECEIVED BY:
DATE: 4/7/15 TIME: 0815
DATE: TIME:
DATE: TIME:

COOLER RECEIPT CHECKLIST

Curtis & Tompkins, Ltd.

Login # 265987 Date Received 4/9/15 Number of coolers 1
Client Myounghee Noh + Assoc. Project Kuawa Soccer Field

Date Opened 4/9 By (print) BL (sign) [illegible]
Date Logged in [illegible] By (print) [illegible] (sign) [illegible]

1. Did cooler come with a shipping slip (airbill, etc) YES NO
   Shipping info TRK# 7733 2612 9461
2A. Were custody seals present? .... ☒ YES (circle) on cooler on samples ☐ NO
   How many 2 Name — Date —
2B. Were custody seals intact upon arrival? YES NO N/A
3. Were custody papers dry and intact when received? YES NO
4. Were custody papers filled out properly (ink, signed, etc)? YES NO
5. Is the project identifiable from custody papers? (If so fill out top of form) YES NO
6. Indicate the packing in cooler: (if other, describe)

   ☒ Bubble Wrap ☐ Foam blocks ☐ Bags ☐ None
   ☐ Cloth material ☐ Cardboard ☐ Styrofoam ☐ Paper towels
7. Temperature documentation: * Notify PM if temperature exceeds 6°C

   Type of ice used: ☐ Wet ☒ Blue/Gel ☐ None Temp(°C) 4.3

   ☒ Samples Received on ice & cold without a temperature blank; temp. taken with IR gun

   ☐ Samples received on ice directly from the field. Cooling process had begun

8. Were Method 5035 sampling containers present? YES NO
   If YES, what time were they transferred to freezer?
9. Did all bottles arrive unbroken/unopened? YES NO
10. Are there any missing / extra samples? YES NO
11. Are samples in the appropriate containers for indicated tests? YES NO
12. Are sample labels present, in good condition and complete? YES NO
13. Do the sample labels agree with custody papers? YES NO
14. Was sufficient amount of sample sent for tests requested? YES NO
15. Are the samples appropriately preserved? YES NO N/A
16. Did you check preservatives for all bottles for each sample? YES NO N/A
17. Did you document your preservative check? YES NO N/A
18. Did you change the hold time in LIMS for unpreserved VOAs? YES NO N/A
19. Did you change the hold time in LIMS for preserved terracores? YES NO ~~N/A~~ BL
20. Are bubbles > 6mm absent in VOA samples? YES NO N/A
21. Was the client contacted concerning this sample delivery? YES NO
    If YES, Who was called? By Date:

COMMENTS

Rev 10, 9/12

Curtis & Tompkins, Ltd.

Detections Summary for 265987

Results for any subcontracted analyses are not included in this summary.

Client : Myounghee Noh & Associates
Project : 1927_3
Location : Kuawa Soccer Field

Client Sample ID : DU-04-B Laboratory Sample ID : 265987-001

No Detections

Client Sample ID : DU-03-A Laboratory Sample ID : 265987-002

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Diesel C10-C24	6.5	Y	6.2	mg/Kg	Dry	5.000	EPA 8015B	EPA 3550B
Motor Oil C24-C36	50		31	mg/Kg	Dry	5.000	EPA 8015B	EPA 3550B
Mercury	0.047		0.020	mg/Kg	Dry	1.000	EPA 7471A	METHOD

Client Sample ID : DU-03-A Laboratory Sample ID : 265987-003

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Arsenic	21		0.24	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Barium	13		0.24	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Cadmium	0.75		0.24	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Chromium	86		0.24	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Lead	15		0.24	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B

Client Sample ID : DU-05-A Laboratory Sample ID : 265987-004

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Diesel C10-C24	17	Y	6.9	mg/Kg	Dry	5.000	EPA 8015B	EPA 3550B
Motor Oil C24-C36	120		35	mg/Kg	Dry	5.000	EPA 8015B	EPA 3550B
Phenanthrene	150		49	ug/Kg	Dry	7.000	EPA 8270C-SIM	EPA 3550B
Fluoranthene	300		49	ug/Kg	Dry	7.000	EPA 8270C-SIM	EPA 3550B
Pyrene	250		49	ug/Kg	Dry	7.000	EPA 8270C-SIM	EPA 3550B
Benzo(a)anthracene	110		49	ug/Kg	Dry	7.000	EPA 8270C-SIM	EPA 3550B
Chrysene	160		49	ug/Kg	Dry	7.000	EPA 8270C-SIM	EPA 3550B
Benzo(b)fluoranthene	200		49	ug/Kg	Dry	7.000	EPA 8270C-SIM	EPA 3550B
Benzo(k)fluoranthene	56		49	ug/Kg	Dry	7.000	EPA 8270C-SIM	EPA 3550B
Benzo(a)pyrene	140		49	ug/Kg	Dry	7.000	EPA 8270C-SIM	EPA 3550B
Indeno(1,2,3-cd)pyrene	85		49	ug/Kg	Dry	7.000	EPA 8270C-SIM	EPA 3550B
Benzo(g,h,i)perylene	110		49	ug/Kg	Dry	7.000	EPA 8270C-SIM	EPA 3550B
Mercury	0.21		0.024	mg/Kg	Dry	1.000	EPA 7471A	METHOD

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Client Sample ID : DU-05-A Laboratory Sample ID : 265987-005

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Arsenic	42		0.25	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Barium	37		0.25	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Cadmium	0.89		0.25	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Chromium	92		0.25	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Lead	140		0.25	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B

Y = Sample exhibits chromatographic pattern which does not resemble standard

Curtis & Tompkins, Ltd.

Curtis & Tompkins Laboratories Analytical Report

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	1927_3		
Field ID:	DU-04-B	Sampled:	04/06/15
Matrix:	Soil	Received:	04/09/15
Basis:	as received	Analyzed:	04/10/15
Batch#:	222151		

Type: SAMPLE Diln Fac: 25.00
Lab ID: 265987-001

Analyte	Result	RL	Units	Analysis
Gasoline C7-C12	ND	3.0	mg/Kg	EPA 8015B
Benzene	ND	15	ug/Kg	EPA 8021B
Toluene	ND	15	ug/Kg	EPA 8021B
Ethylbenzene	ND	15	ug/Kg	EPA 8021B
m,p-Xylenes	ND	15	ug/Kg	EPA 8021B
o-Xylene	ND	15	ug/Kg	EPA 8021B

Surrogate	%REC	Limits	Analysis
Bromofluorobenzene (FID)	110	78-138	EPA 8015B
Bromofluorobenzene (PID)	98	70-137	EPA 8021B

Type: BLANK Diln Fac: 1.000
Lab ID: QC783850

Analyte	Result	RL	Units	Analysis
Gasoline C7-C12	ND	0.20	mg/Kg	EPA 8015B
Benzene	ND	1.0	ug/Kg	EPA 8021B
Toluene	ND	1.0	ug/Kg	EPA 8021B
Ethylbenzene	ND	1.0	ug/Kg	EPA 8021B
m,p-Xylenes	ND	1.0	ug/Kg	EPA 8021B
o-Xylene	ND	1.0	ug/Kg	EPA 8021B

Surrogate	%REC	Limits	Analysis
Bromofluorobenzene (FID)	107	78-138	EPA 8015B
Bromofluorobenzene (PID)	96	70-137	EPA 8021B

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Curtis & Tompkins Laboratories Analytical Report

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	1927_3	Analysis:	EPA 8015B
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC783851	Batch#:	222151
Matrix:	Soil	Analyzed:	04/10/15
Units:	mg/Kg		

Analyte	Spiked	Result	%REC	Limits
Gasoline C7-C12	1.000	0.9898	99	80-121

Surrogate	%REC	Limits
Bromofluorobenzene (FID)	108	78-138

Curtis & Tompkins, Ltd.

Batch QC Report

Curtis & Tompkins Laboratories Analytical Report

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	1927_3	Analysis:	EPA 8021B
Matrix:	Soil	Batch#:	222151
Units:	ug/Kg	Analyzed:	04/10/15
Diln Fac:	1.000		

Type: BS Lab ID: QC783852

Analyte	Spiked	Result	%REC	Limits
Benzene	10.00	9.814	98	80-120
Toluene	10.00	9.893	99	80-120
Ethylbenzene	10.00	10.29	103	80-120
m,p-Xylenes	10.00	10.98	110	80-120
o-Xylene	10.00	10.79	108	80-120

Surrogate	%REC	Limits
Bromofluorobenzene (PID)	95	70-137

Type: BSD Lab ID: QC783853

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Benzene	10.00	9.509	95	80-120	3	20
Toluene	10.00	9.647	96	80-120	3	20
Ethylbenzene	10.00	10.28	103	80-120	0	20
m,p-Xylenes	10.00	11.04	110	80-120	1	20
o-Xylene	10.00	10.97	110	80-120	2	20

Surrogate	%REC	Limits
Bromofluorobenzene (PID)	97	70-137

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Batch QC Report

Curtis & Tompkins Laboratories Analytical Report

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	EPA 5030B
Project#:	1927_3	Analysis:	EPA 8015B
Field ID:	ZZZZZZZZZZ	Diln Fac:	1.000
MSS Lab ID:	265953-004	Batch#:	222151
Matrix:	Soil	Sampled:	04/07/15
Units:	mg/Kg	Received:	04/09/15
Basis:	dry	Analyzed:	04/10/15

Type: MS Moisture: 13%
Lab ID: QC783854

Analyte	MSS Result	Spiked	Result	%REC	Limits
Gasoline C7-C12	0.7044	12.63	11.72	87	50-120

Surrogate	%REC	Limits
Bromofluorobenzene (FID)	112	78-138

Type: MSD Moisture: 13%
Lab ID: QC783855

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Gasoline C7-C12	11.27	10.99	91	50-120	4	31

Surrogate	%REC	Limits
Bromofluorobenzene (FID)	109	78-138

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Total Extractable Hydrocarbons

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8015B
Matrix:	Soil	Sampled:	04/06/15
Units:	mg/Kg	Received:	04/09/15
Basis:	dry	Prepared:	04/10/15
Batch#:	222169	Analyzed:	04/12/15

Field ID:	DU-03-A	Moisture:	20%
Type:	SAMPLE	Diln Fac:	5.000
Lab ID:	265987-002		

Analyte	Result	RL
Diesel C10-C24	6.5 Y	6.2
Motor Oil C24-C36	50	31

Surrogate	%REC	Limits
o-Terphenyl	86	59-140

Field ID:	DU-05-A	Moisture:	28%
Type:	SAMPLE	Diln Fac:	5.000
Lab ID:	265987-004		

Analyte	Result	RL
Diesel C10-C24	17 Y	6.9
Motor Oil C24-C36	120	35

Surrogate	%REC	Limits
o-Terphenyl	73	59-140

Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC783920		

Analyte	Result	RL
Diesel C10-C24	ND	1.0
Motor Oil C24-C36	ND	5.0

Surrogate	%REC	Limits
o-Terphenyl	114	59-140

Y= Sample exhibits chromatographic pattern which does not resemble standard
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Total Extractable Hydrocarbons

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8015B
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC783921	Batch#:	222169
Matrix:	Soil	Prepared:	04/10/15
Units:	mg/Kg	Analyzed:	04/14/15

Cleanup Method: EPA 3630C

Analyte	Spiked	Result	%REC	Limits
Diesel C10-C24	50.15	44.94	90	58-137

Surrogate	%REC	Limits
o-Terphenyl	95	59-140

Curtis & Tompkins, Ltd.

Batch QC Report

Total Extractable Hydrocarbons

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8015B
Field ID:	ZZZZZZZZZZ	Batch#:	222169
MSS Lab ID:	265953-004	Sampled:	04/07/15
Matrix:	Soil	Received:	04/09/15
Units:	mg/Kg	Prepared:	04/10/15
Basis:	dry	Analyzed:	04/12/15
Diln Fac:	1.000		

Type: MS Moisture: 13%
Lab ID: QC783922

Analyte	MSS Result	Spiked	Result	%REC	Limits
Diesel C10-C24	0.5327	57.27	56.31	97	46-154

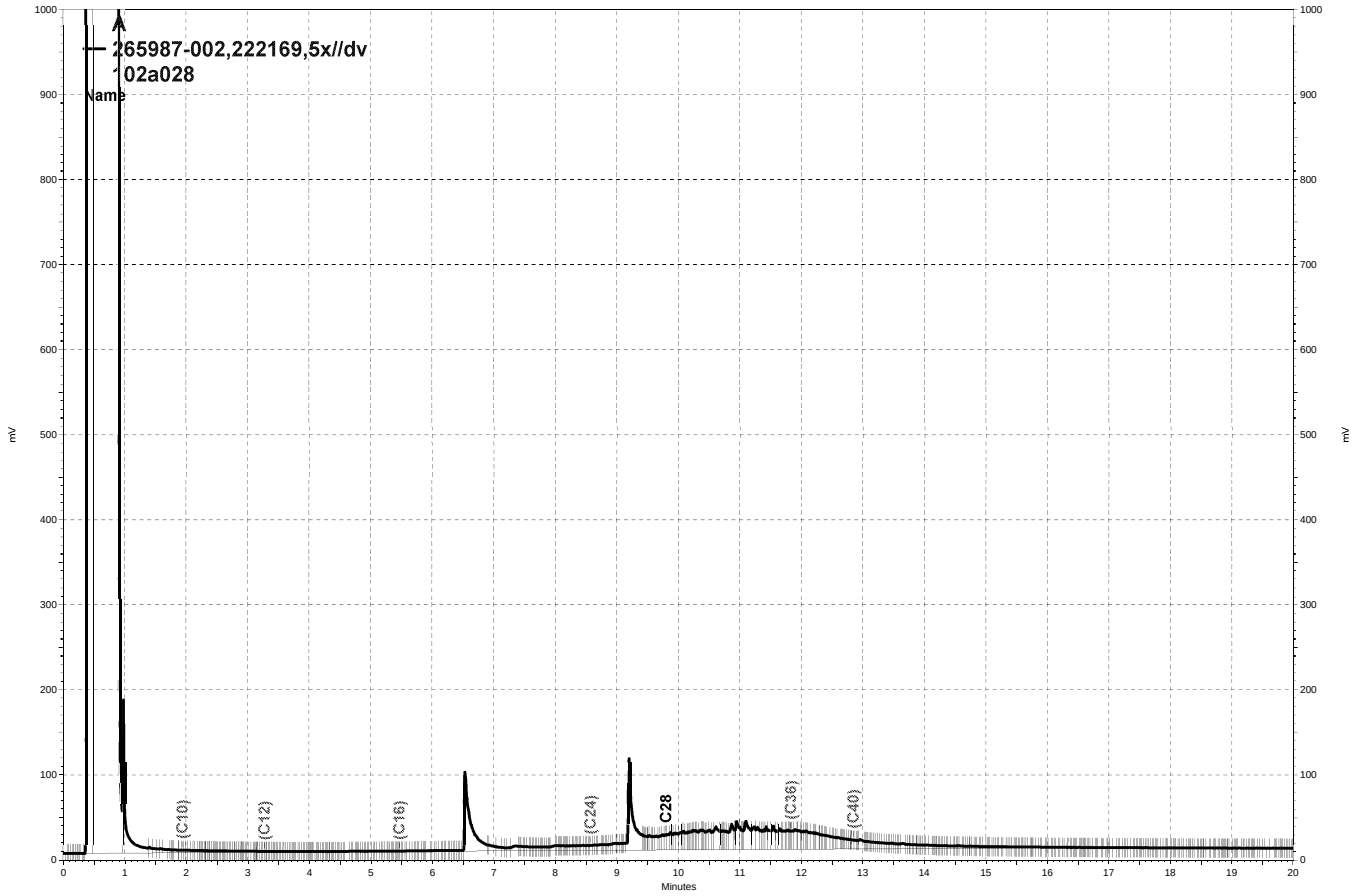
Surrogate	%REC	Limits
o-Terphenyl	109	59-140

Type: MSD Moisture: 13%
Lab ID: QC783923

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Diesel C10-C24	57.49	55.93	96	46-154	1	50

Surrogate	%REC	Limits
o-Terphenyl	112	59-140

RPD= Relative Percent Difference



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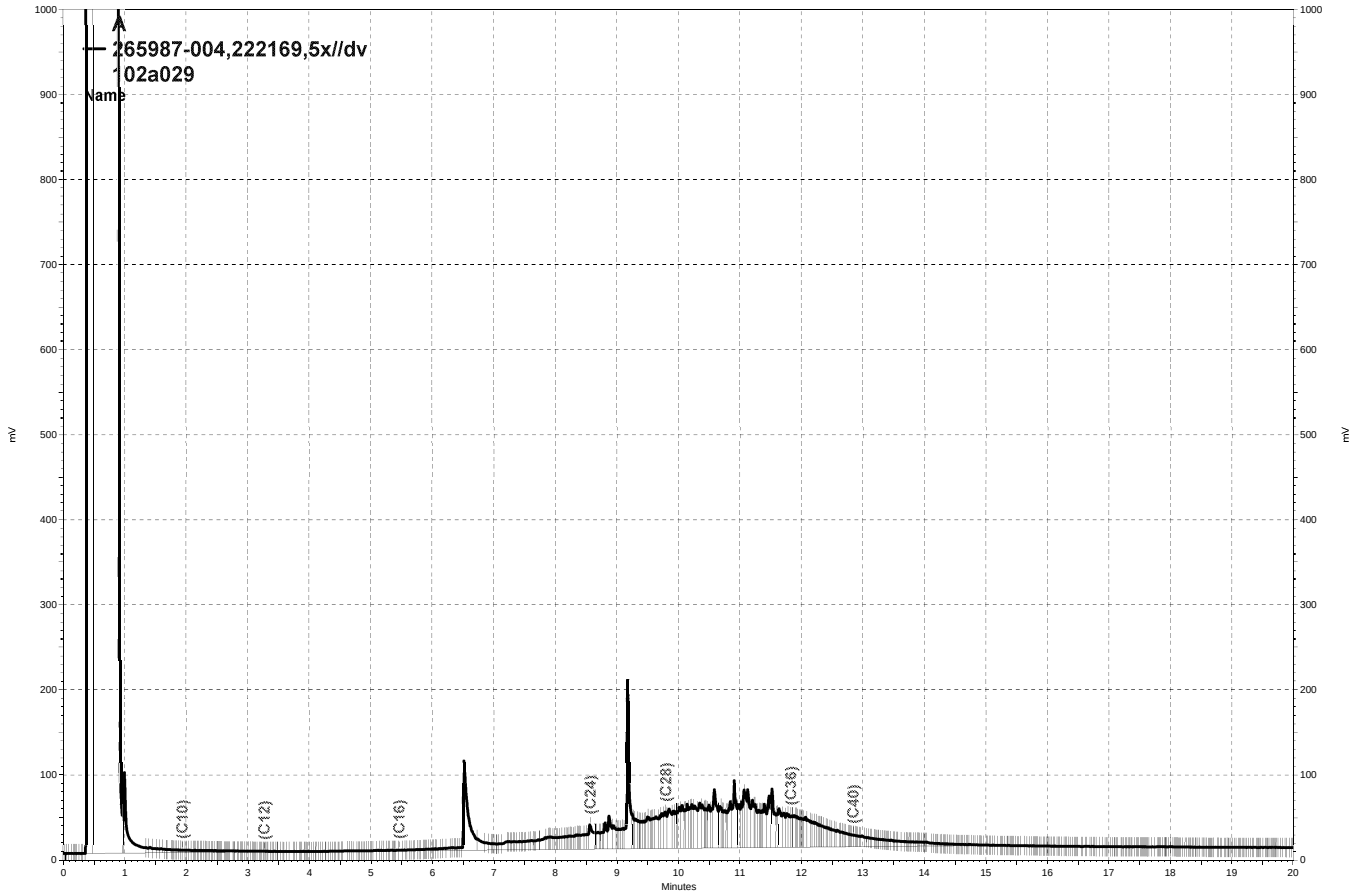

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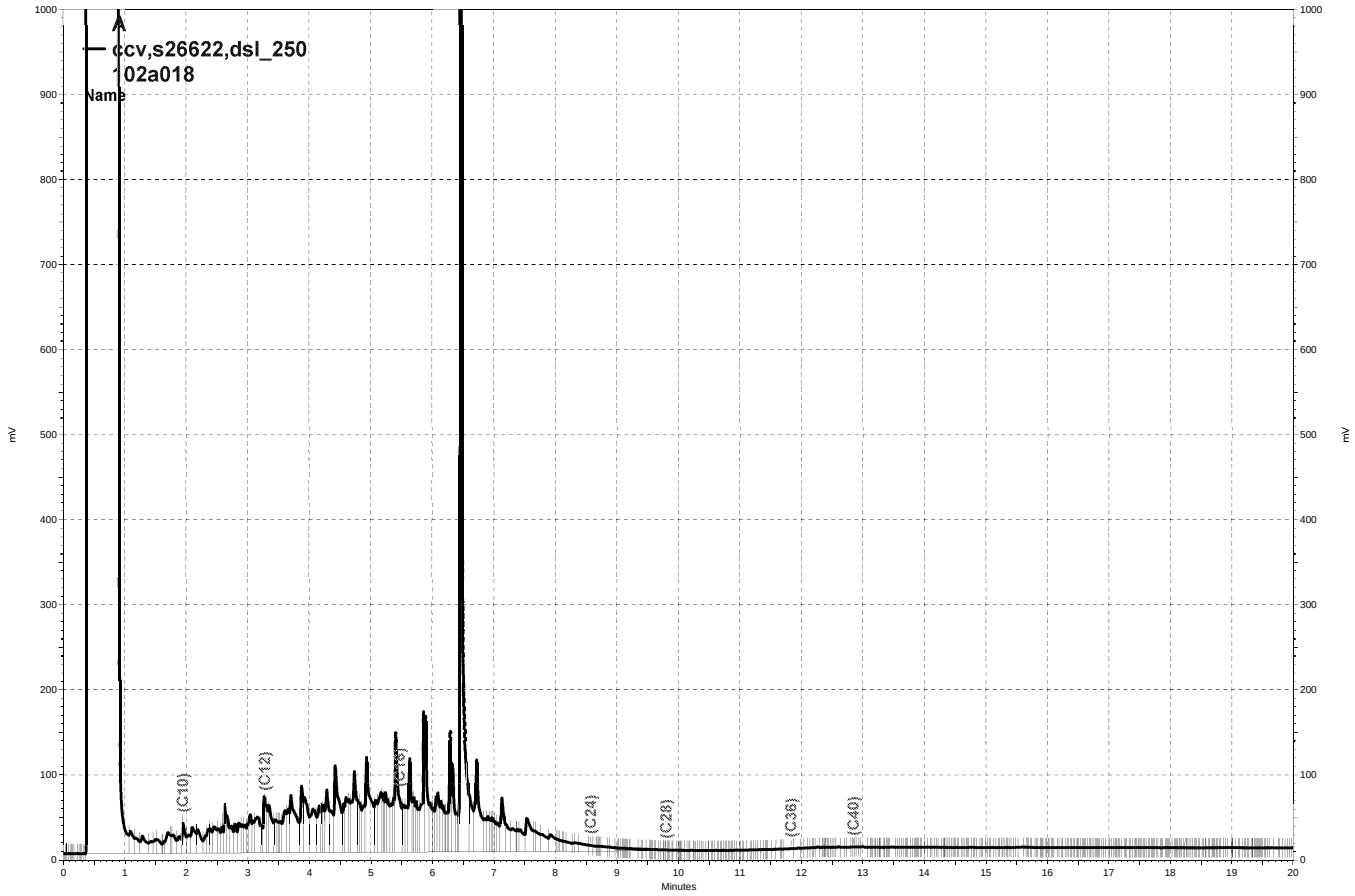

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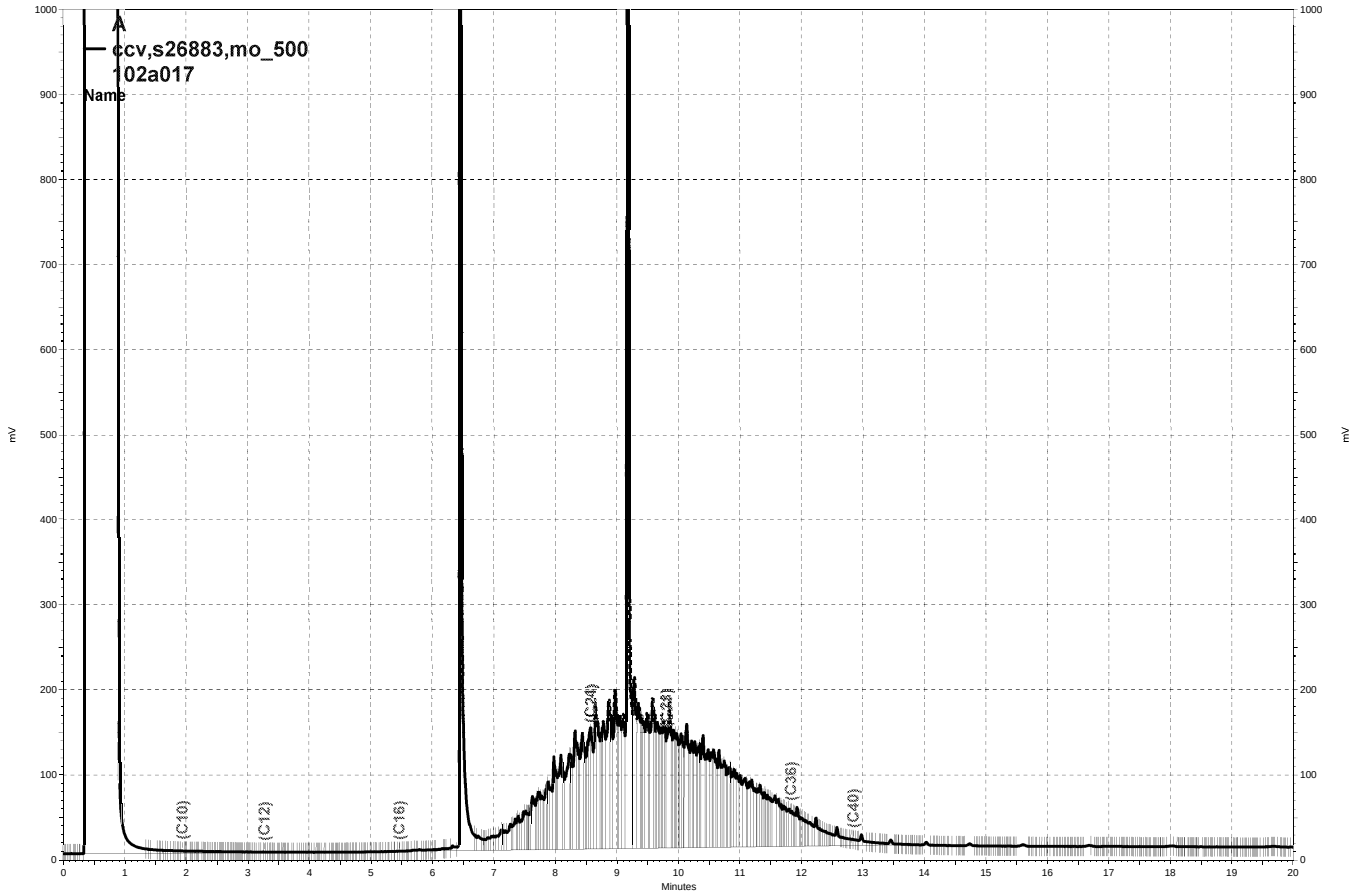

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Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS SIM

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8270C-SIM
Field ID:	DU-03-A	Batch#:	222216
Lab ID:	265987-002	Sampled:	04/06/15
Matrix:	Soil	Received:	04/09/15
Units:	ug/Kg	Prepared:	04/13/15
Basis:	dry	Analyzed:	04/14/15
Diln Fac:	3.000		

Moisture: 20%

Analyte	Result	RL
Naphthalene	ND	19
1-Methylnaphthalene	ND	19
2-Methylnaphthalene	ND	19
Acenaphthylene	ND	19
Acenaphthene	ND	19
Fluorene	ND	19
Phenanthrene	ND	19
Anthracene	ND	19
Fluoranthene	ND	19
Pyrene	ND	19
Benzo(a)anthracene	ND	19
Chrysene	ND	19
Benzo(b)fluoranthene	ND	19
Benzo(k)fluoranthene	ND	19
Benzo(a)pyrene	ND	19
Indeno(1,2,3-cd)pyrene	ND	19
Dibenz(a,h)anthracene	ND	19
Benzo(g,h,i)perylene	ND	19

Surrogate	%REC	Limits
Nitrobenzene-d5	100	40-120
2-Fluorobiphenyl	105	46-120
Terphenyl-d14	93	43-120

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS SIM

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8270C-SIM
Field ID:	DU-05-A	Batch#:	222216
Lab ID:	265987-004	Sampled:	04/06/15
Matrix:	Soil	Received:	04/09/15
Units:	ug/Kg	Prepared:	04/13/15
Basis:	dry	Analyzed:	04/14/15
Diln Fac:	7.000		

Moisture: 28%

Analyte	Result	RL
Naphthalene	ND	49
1-Methylnaphthalene	ND	49
2-Methylnaphthalene	ND	49
Acenaphthylene	ND	49
Acenaphthene	ND	49
Fluorene	ND	49
Phenanthrene	150	49
Anthracene	ND	49
Fluoranthene	300	49
Pyrene	250	49
Benzo(a)anthracene	110	49
Chrysene	160	49
Benzo(b)fluoranthene	200	49
Benzo(k)fluoranthene	56	49
Benzo(a)pyrene	140	49
Indeno(1,2,3-cd)pyrene	85	49
Dibenz(a,h)anthracene	ND	49
Benzo(g,h,i)perylene	110	49

Surrogate	%REC	Limits
Nitrobenzene-d5	97	40-120
2-Fluorobiphenyl	103	46-120
Terphenyl-d14	90	43-120

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Semivolatile Organics by GC/MS SIM

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8270C-SIM
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC784127	Batch#:	222216
Matrix:	Soil	Prepared:	04/13/15
Units:	ug/Kg	Analyzed:	04/14/15

Analyte	Result	RL
Naphthalene	ND	5.0
1-Methylnaphthalene	ND	5.0
2-Methylnaphthalene	ND	5.0
Acenaphthylene	ND	5.0
Acenaphthene	ND	5.0
Fluorene	ND	5.0
Phenanthrene	ND	5.0
Anthracene	ND	5.0
Fluoranthene	ND	5.0
Pyrene	ND	5.0
Benzo(a)anthracene	ND	5.0
Chrysene	ND	5.0
Benzo(b)fluoranthene	ND	5.0
Benzo(k)fluoranthene	ND	5.0
Benzo(a)pyrene	ND	5.0
Indeno(1,2,3-cd)pyrene	ND	5.0
Dibenz(a,h)anthracene	ND	5.0
Benzo(g,h,i)perylene	ND	5.0

Surrogate	%REC	Limits
Nitrobenzene-d5	85	40-120
2-Fluorobiphenyl	94	46-120
Terphenyl-d14	96	43-120

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Semivolatile Organics by GC/MS SIM

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8270C-SIM
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC784128	Batch#:	222216
Matrix:	Soil	Prepared:	04/13/15
Units:	ug/Kg	Analyzed:	04/14/15

Analyte	Spiked	Result	%REC	Limits
Acenaphthene	33.47	30.53	91	49-120
Pyrene	33.47	26.91	80	48-120

Surrogate	%REC	Limits
Nitrobenzene-d5	95	40-120
2-Fluorobiphenyl	99	46-120
Terphenyl-d14	92	43-120

Curtis & Tompkins, Ltd.

Batch QC Report

Semivolatile Organics by GC/MS SIM

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8270C-SIM
Field ID:	ZZZZZZZZZZ	Batch#:	222216
MSS Lab ID:	266057-001	Sampled:	04/11/15
Matrix:	Soil	Received:	04/13/15
Units:	ug/Kg	Prepared:	04/13/15
Basis:	as received	Analyzed:	04/14/15
Diln Fac:	3.000		

Type: MS Lab ID: QC784129

Analyte	MSS Result	Spiked	Result	%REC	Limits
Acenaphthene	8.483	33.52	36.17	83	43-120
Pyrene	586.1	33.52	367.5	-652 NM	18-144

Surrogate	%REC	Limits
Nitrobenzene-d5	93	40-120
2-Fluorobiphenyl	99	46-120
Terphenyl-d14	90	43-120

Type: MSD Lab ID: QC784130

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Acenaphthene	33.67	31.04	67	43-120	16	45
Pyrene	33.67	202.0	-1141 NM	18-144	58	72

Surrogate	%REC	Limits
Nitrobenzene-d5	91	40-120
2-Fluorobiphenyl	95	46-120
Terphenyl-d14	83	43-120

NM= Not Meaningful: Sample concentration > 4X spike concentration
RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Organochlorine Pesticides

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8081A
Field ID:	DU-03-A	Batch#:	222211
Lab ID:	265987-003	Sampled:	04/06/15
Matrix:	Soil	Received:	04/09/15
Units:	ug/Kg	Prepared:	04/13/15
Basis:	as received	Analyzed:	04/14/15
Diln Fac:	10.00		

Analyte	Result	RL
alpha-BHC	ND	17
beta-BHC	ND	17
gamma-BHC	ND	17
delta-BHC	ND	17
Heptachlor	ND	17
Aldrin	ND	17
Heptachlor epoxide	ND	17
Endosulfan I	ND	17
Dieldrin	ND	33
4,4'-DDE	ND	33
Endrin	ND	33
Endosulfan II	ND	33
Endosulfan sulfate	ND	33
4,4'-DDD	ND	33
Endrin aldehyde	ND	33
4,4'-DDT	ND	33
Chlordane (Technical)	ND	300
alpha-Chlordane	ND	17
gamma-Chlordane	ND	17
Methoxychlor	ND	170
Toxaphene	ND	600

Surrogate	%REC	Limits
TCMX	DO	44-125
Decachlorobiphenyl	DO	39-121

DO= Diluted Out
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Organochlorine Pesticides

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8081A
Field ID:	DU-05-A	Batch#:	222211
Lab ID:	265987-005	Sampled:	04/06/15
Matrix:	Soil	Received:	04/09/15
Units:	ug/Kg	Prepared:	04/13/15
Basis:	as received	Analyzed:	04/14/15
Diln Fac:	20.00		

Analyte	Result	RL
alpha-BHC	ND	34
beta-BHC	ND	34
gamma-BHC	ND	34
delta-BHC	ND	34
Heptachlor	ND	34
Aldrin	ND	34
Heptachlor epoxide	ND	34
Endosulfan I	ND	34
Dieldrin	ND	67
4,4'-DDE	ND	67
Endrin	ND	67
Endosulfan II	ND	67
Endosulfan sulfate	ND	67
4,4'-DDD	ND	67
Endrin aldehyde	ND	67
4,4'-DDT	ND	67
Chlordane (Technical)	ND	610
alpha-Chlordane	ND	34
gamma-Chlordane	ND	34
Methoxychlor	ND	340
Toxaphene	ND	1,200

Surrogate	%REC	Limits
TCMX	DO	44-125
Decachlorobiphenyl	DO	39-121

DO= Diluted Out
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Organochlorine Pesticides

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8081A
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC784103	Batch#:	222211
Matrix:	Soil	Prepared:	04/13/15
Units:	ug/Kg	Analyzed:	04/14/15

Analyte	Result	RL
alpha-BHC	ND	1.7
beta-BHC	ND	1.7
gamma-BHC	ND	1.7
delta-BHC	ND	1.7
Heptachlor	ND	1.7
Aldrin	ND	1.7
Heptachlor epoxide	ND	1.7
Endosulfan I	ND	1.7
Dieldrin	ND	3.3
4,4'-DDE	ND	3.3
Endrin	ND	3.3
Endosulfan II	ND	3.3
Endosulfan sulfate	ND	3.3
4,4'-DDD	ND	3.3
Endrin aldehyde	ND	3.3
4,4'-DDT	ND	3.3
Chlordane (Technical)	ND	30
alpha-Chlordane	ND	1.7
gamma-Chlordane	ND	1.7
Methoxychlor	ND	17
Toxaphene	ND	60

Surrogate	%REC	Limits
TCMX	64	44-125
Decachlorobiphenyl	79	39-121

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Organochlorine Pesticides

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8081A
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC784107	Batch#:	222211
Matrix:	Soil	Prepared:	04/13/15
Units:	ug/Kg	Analyzed:	04/14/15

Analyte	Spiked	Result	%REC	Limits
gamma-BHC	13.40	10.21	76	44-121
Heptachlor	13.40	10.03	75	45-129
Aldrin	13.40	9.708	72	45-120
Dieldrin	13.40	10.63 #	79	49-131
Endrin	13.40	19.35 #	144 *	43-135
4,4'-DDT	13.40	9.616	72	37-141

Surrogate	%REC	Limits
TCMX	82	44-125
Decachlorobiphenyl	71	39-121

#= CCV drift outside limits; average CCV drift within limits per method requirements
*= Value outside of QC limits; see narrative

Curtis & Tompkins, Ltd.

Polychlorinated Biphenyls (PCBs)

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8082
Matrix:	Soil	Sampled:	04/06/15
Units:	ug/Kg	Received:	04/09/15
Basis:	as received	Prepared:	04/13/15
Diln Fac:	1.000	Analyzed:	04/14/15
Batch#:	222211		

Field ID: DU-03-A Lab ID: 265987-003
Type: SAMPLE

Analyte	Result	RL
Aroclor-1016	ND	9.5
Aroclor-1221	ND	19
Aroclor-1232	ND	9.5
Aroclor-1242	ND	9.5
Aroclor-1248	ND	9.5
Aroclor-1254	ND	9.5
Aroclor-1260	ND	9.5

Surrogate	%REC	Limits
TCMX	123	46-141
Decachlorobiphenyl	113	25-135

Field ID: DU-05-A Lab ID: 265987-005
Type: SAMPLE

Analyte	Result	RL
Aroclor-1016	ND	9.7
Aroclor-1221	ND	19
Aroclor-1232	ND	9.7
Aroclor-1242	ND	9.7
Aroclor-1248	ND	9.7
Aroclor-1254	ND	9.7
Aroclor-1260	ND	9.7

Surrogate	%REC	Limits
TCMX	101	46-141
Decachlorobiphenyl	81	25-135

Type: BLANK Lab ID: QC784103

Analyte	Result	RL
Aroclor-1016	ND	9.5
Aroclor-1221	ND	19
Aroclor-1232	ND	9.5
Aroclor-1242	ND	9.5
Aroclor-1248	ND	9.5
Aroclor-1254	ND	9.5
Aroclor-1260	ND	9.5

Surrogate	%REC	Limits
TCMX	84	46-141
Decachlorobiphenyl	100	25-135

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Polychlorinated Biphenyls (PCBs)

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8082
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC784104	Batch#:	222211
Matrix:	Soil	Prepared:	04/13/15
Units:	ug/Kg	Analyzed:	04/14/15

Analyte	Spiked	Result	%REC	Limits
Aroclor-1016	167.0	185.5 b	111	64-140
Aroclor-1260	167.0	189.7	114	65-146

Surrogate	%REC	Limits
TCMX	93	46-141
Decachlorobiphenyl	101	25-135

b= See narrative

Curtis & Tompkins, Ltd.

Batch QC Report

Polychlorinated Biphenyls (PCBs)

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	1927_3	Analysis:	EPA 8082
Field ID:	ZZZZZZZZZZ	Batch#:	222211
MSS Lab ID:	266047-003	Sampled:	04/11/15
Matrix:	Soil	Received:	04/13/15
Units:	ug/Kg	Prepared:	04/13/15
Basis:	as received	Analyzed:	04/16/15
Diln Fac:	1.000		

Type: MS Lab ID: QC784105

Analyte	MSS Result	Spiked	Result	%REC	Limits
Aroclor-1016	<2.394	168.3	171.2	102	60-161
Aroclor-1260	63.13	168.3	181.4	70	42-166

Surrogate	%REC	Limits
TCMX	79	46-141
Decachlorobiphenyl	71	25-135

Type: MSD Lab ID: QC784106

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Aroclor-1016	168.6	173.6	103	60-161	1	43
Aroclor-1260	168.6	193.4	77	42-166	6	51

Surrogate	%REC	Limits
TCMX	75	46-141
Decachlorobiphenyl	68	25-135

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Mercury by Cold Vapor AA

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	METHOD
Project#:	1927_3	Analysis:	EPA 7471A
Analyte:	Mercury	Batch#:	222238
Matrix:	Soil	Sampled:	04/06/15
Units:	mg/Kg	Received:	04/09/15
Basis:	dry	Prepared:	04/14/15
Diln Fac:	1.000	Analyzed:	04/14/15

Field ID	Type	Lab ID	Result	RL	Moisture
DU-03-A	SAMPLE	265987-002	0.047	0.020	20%
DU-05-A	SAMPLE	265987-004	0.21	0.024	28%
	BLANK	QC784212	ND	0.017	

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

RCRA Metals

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	EPA 3050B
Project#:	1927_3	Analysis:	EPA 6010B
Matrix:	Soil	Sampled:	04/06/15
Units:	mg/Kg	Received:	04/09/15
Basis:	as received	Prepared:	04/16/15
Diln Fac:	1.000	Analyzed:	04/16/15
Batch#:	222312		

Field ID: DU-03-A Lab ID: 265987-003
Type: SAMPLE

Analyte	Result	RL
Arsenic	21	0.24
Barium	13	0.24
Cadmium	0.75	0.24
Chromium	86	0.24
Lead	15	0.24
Selenium	ND	0.48
Silver	ND	0.24

Field ID: DU-05-A Lab ID: 265987-005
Type: SAMPLE

Analyte	Result	RL
Arsenic	42	0.25
Barium	37	0.25
Cadmium	0.89	0.25
Chromium	92	0.25
Lead	140	0.25
Selenium	ND	0.49
Silver	ND	0.25

Type: BLANK Lab ID: QC784517

Analyte	Result	RL
Arsenic	ND	0.25
Barium	ND	0.25
Cadmium	ND	0.25
Chromium	ND	0.25
Lead	ND	0.25
Selenium	ND	0.50
Silver	ND	0.25

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Mercury by Cold Vapor AA

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	METHOD
Project#:	1927_3	Analysis:	EPA 7471A
Analyte:	Mercury	Diln Fac:	1.000
Field ID:	ZZZZZZZZZZ	Batch#:	222238
MSS Lab ID:	266071-001	Sampled:	04/14/15
Matrix:	Soil	Received:	04/14/15
Units:	mg/Kg	Prepared:	04/14/15
Basis:	as received	Analyzed:	04/14/15

Type	Lab ID	MSS Result	Spiked	Result	%REC	Limits	RPD	Lim
BS	QC784213		0.2083	0.1780	85	80-120		
BSD	QC784214		0.2083	0.1755	84	80-120	1	20
MS	QC784215	0.1229	0.2155	0.1042	-9 *	69-142		
MSD	QC784216		0.2155	0.1059	-8 *	69-142	2	36

*= Value outside of QC limits; see narrative
RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Batch QC Report

RCRA Metals

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	EPA 3050B
Project#:	1927_3	Analysis:	EPA 6010B
Matrix:	Soil	Batch#:	222312
Units:	mg/Kg	Prepared:	04/16/15
Diln Fac:	5.000	Analyzed:	04/16/15

Type: BS Lab ID: QC784518

Analyte	Spiked	Result	%REC	Limits
Arsenic	50.00	42.16	84	80-120
Barium	50.00	43.40	87	80-120
Cadmium	50.00	44.11	88	80-120
Chromium	50.00	43.15	86	80-120
Lead	50.00	40.95	82	80-120
Selenium	50.00	44.86	90	80-120
Silver	50.00	41.48	83	80-120

Type: BSD Lab ID: QC784519

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Arsenic	50.00	43.80	88	80-120	4	20
Barium	50.00	45.83	92	80-120	5	20
Cadmium	50.00	46.19	92	80-120	5	20
Chromium	50.00	45.46	91	80-120	5	20
Lead	50.00	42.52	85	80-120	4	20
Selenium	50.00	46.98	94	80-120	5	20
Silver	50.00	43.68	87	80-120	5	20

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Batch QC Report

RCRA Metals

Lab #:	265987	Location:	Kuawa Soccer Field
Client:	Myounghee Noh & Associates	Prep:	EPA 3050B
Project#:	1927_3	Analysis:	EPA 6010B
Field ID:	DU-03-A	Batch#:	222312
MSS Lab ID:	265987-003	Sampled:	04/06/15
Matrix:	Soil	Received:	04/09/15
Units:	mg/Kg	Prepared:	04/16/15
Basis:	dry	Analyzed:	04/16/15
Diln Fac:	5.000		

Type: MS Moisture: 20%
Lab ID: QC784520

Analyte	MSS Result	Spiked	Result	%REC	Limits
Arsenic	25.73	62.38	89.33	102	69-120
Barium	16.42	62.38	88.29	115	35-154
Cadmium	0.9352	62.38	66.28	105	71-120
Chromium	108.0	62.38	195.3	140 *	57-133
Lead	19.23	62.38	83.85	104	53-125
Selenium	<0.1748	62.38	62.20	100	61-120
Silver	<0.08933	62.38	62.92	101	69-120

Type: MSD Moisture: 20%
Lab ID: QC784521

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Arsenic	61.82	87.56	100	69-120	1	35
Barium	61.82	86.99	114	35-154	1	36
Cadmium	61.82	65.16	104	71-120	1	25
Chromium	61.82	197.4	145 *	57-133	1	33
Lead	61.82	82.60	103	53-125	1	42
Selenium	61.82	59.50	96	61-120	4	33
Silver	61.82	60.99	99	69-120	2	22

*= Value outside of QC limits; see narrative
RPD= Relative Percent Difference

Kuawa Street New Sports Fields Development

Environmental Assessment

APPENDIX 3
Archaeological Report and Cultural Impact Assessment

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Archaeological Inventory Survey and Limited Cultural Assessment of the Proposed County of Hawai'i Sports Complex along Kuawa Street

TMKs: (3) 2-2-032:003, 004, 008, 019, 087 and 088

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

DRAFT VERSION

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ASM Project Number 24120.00

Archaeological Inventory Survey and Limited Cultural Assessment of the Proposed County of Hawai‘i Sports Complex along Kuawa Street

TMK: (3) 2-2-032:003, 004, 008, 019, 087 and 088

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

ASM affiliates

EXECUTIVE SUMMARY

At the request of SSFM International on behalf of the County of Hawai‘i, ASM Affiliates conducted an Archaeological Inventory Survey (AIS) and limited cultural assessment of a roughly nine acre property consisting of six parcels (TMK: (3) 2-2-032:003, 004, 008, 019, 087, and 088) located in Waiākea Ahupua‘a, South Hilo District, Island of Hawai‘i. The County of Hawai‘i intends to develop the property into a sports complex to include a multiuse sports field (rugby, football, soccer), a youth soccer field and baseball diamond, two children's playgrounds, concession and restroom facilities, as well as paved parking. This project triggers compliance with HRS Chapter 343 and thus the production of an Environmental Assessment (EA). The present study is being prepared to support the EA in accordance with Hawai‘i Administrative Rules13§13–275, and was performed in compliance with the Rules Governing Minimal Standards for Archaeological Inventory Surveys and Reports as contained in Hawai‘i Administrative Rules 13§13–276. Compliance with the above standards is sufficient for meeting the initial historic preservation review process requirements of both the Department of Land and Natural Resources and the County of Hawai‘i Planning Department. While not a full blown Cultural Impact Assessment (CIA), the current study contains many of the elements (most importantly consultation) specified for such documents in the Office of Environmental Quality Control (OEQC) guidelines.

Archaeological fieldwork for the current study was conducted by Matthew R. Clark, B.A, Teresa Gotay, M.A, and Ivana Hall (UHH intern), under the supervision of Principal Investigator Robert B. Rechtman, Ph.D. Fieldwork consisted of a pedestrian survey of the entire study area augmented with six mechanically excavated test trenches. The cultural consultation included six individuals, who participated in informal (unrecorded) "talk story" interviews conducted by one or both authors. Historic maps and photographs were provided to the informants, when appropriate, in order to facilitate discussion of the study area and proposed development. Detailed hand-written notes were taken during each interview and in some cases the informants provided additional historic resources to the interviewers in the form of books and images. Following each interview, the authors typed their handwritten notes and reviewed them for any gaps in information that might necessitate a follow up inquiry; follow up contact was made when necessary. Upon completion, the interviews were summarized for inclusion in the current report.

As a result of the archaeological fieldwork three surface sites, all dating from the early to middle twentieth century were recorded. Two of these (SIHP Site 30288 and 30289) are remnant asphalt pavements (perhaps the former roadways Puhala Lane and Ulu Street) and the third (SIHP Site 30290) is a concrete foundation associated with Hawaii Consolidated Railway. Subsurface testing did not reveal any intact buried cultural deposits or features from either the Precontact or Historic Periods. While Historic Period cultural material was encountered during the subsurface testing, an assessment of the stratigraphy indicates that the study area experienced a high level of prior ground disturbance and there were no intact deposits encountered. Site 30288, Puhala Lane, was constructed in the early 1900s and Site 30289, Ulu Street, was built in the middle 1900s. Both roads were abandoned after the 1960 *tsunami*, and both are evaluated to be significant under Criterion d for the information they have yielded about the twentieth century growth of the Waiākea Town region of Hilo. It is suggested that the archival and archaeological documentation presented in the current study about these sites serves to mitigate any potential impacts from future development, and thus no further historic preservation work is recommend relative to Sites 30288 and 30289. SIHP Site 30290 is a concrete foundation structure that once supported a flagpole associated with Hawaii Consolidated Railway Ltd., which operated on the study property from 1899 to 1946 (from 1899-1916 as the Hilo Railroad Company). This foundation appears to have been built in 1926. Site 30290 is evaluated as significant under Criterion a as it is one of the few physical reminders of the railway industry that was instrumental in the development of Hilo and the greater east Hawai‘i region. This site is also significant under Criterion d for the information it adds to the understanding of the use and development of the Waiākea Town portion of Hilo. It is recommended that Site 30290 be preserved as part of the current proposed park development, and that it be rehabilitated and put back into use as a flagpole feature with interpretive information provided to the public concerning its origin and significance. An archaeological preservation plan should be prepared in accordance with HAR 13§13-277 and submitted to DLNR-SHPD for review and approval. As indicated by the subsurface testing that was conducted as a part of the current study, the likelihood of encountering intact subsurface archaeological deposits is remote; therefore, archaeological monitoring is not recommended with respect to development of the property. However, in the unlikely event that any unanticipated archaeological resources are unearthed during development activities, in compliance with HAR 13§13-280, work in the immediate vicinity of the finds should be halted and DLNR-SHPD contacted.

The proposed park development was supported by everyone contacted during the consultation effort that was conducted as a part of the current study. It is our conclusion that the conversion of the current study area by the County of Hawai‘i into a sports complex will not negatively impact any traditionally valued cultural or natural resources or constitutionally protected customary practices. Based on information shared during consultation, there are several recommendations and cultural consideration that are offered. The first of these is that the name of the proposed park should contain the appropriate geohistorical reference, that being Waiākea Town. Thus, we offer the name “Waiākea Town Sports Complex” for the proposed park; the name Kuawa is relatively new and historically unfamiliar. A second recommendation is that all proposed buildings and fixtures (e.g., concessions, restrooms, light posts, etc.) within the park be designed in such a way that their façades are visually reminiscent of late teens- to middle 1920s-era architecture that is seen in railway-related buildings. This can serve as a visual aid in the historical interpretation of former activities that took place within the study area and provide for the thematic integration of the rehabilitated flagpole feature (Site 30290). It is also recommended that interpretive signage be developed In partnership with interested organizations, and displayed at various locations within the proposed park that describe the following historical contexts:

- native Hawaiian *kuleana* use of the area,
- development and use of the Waiākea Rail Yard,
- land use history associated with the Japanese Daijingu Shrine, and
- history of Waiākea Town.

As a result of the consultation with Terri Napeahi, it is the recommendation of the current study that an area in the southwestern portion of the proposed park, in the vicinity of the former Napeahi *kuleana* parcel, be set aside for an interpretive cultural display and for cultural practice, the specifics of which are expected to be developed through a partnership with family descendants of the former *kuleana*. Lastly, we suggest that some consideration be given to linking the proposed park with the Hilo Bayfront Trails project so that the preserved historical and cultural features and their associated interpretive displays are not only accessible to the park users, but also to the larger community and visitor populations.

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1. INTRODUCTION

At the request of SSFM International on behalf of the County of Hawai‘i, ASM Affiliates conducted an Archaeological Inventory Survey (AIS) and limited cultural assessment of a roughly nine acre property consisting of six parcels (TMK: (3) 2-2-032:003, 004, 008, 019, 087, and 088) located in Waiākea Ahupua‘a, South Hilo District, Island of Hawai‘i (Figures 1 and 2). The County of Hawai‘i intends to develop the property into a sports complex to include a multiuse sports field (rugby, football, soccer), a youth soccer field and baseball diamond, two children's playgrounds, concession and restroom facilities, as well as paved parking (Figure 3). This project triggers compliance with HRS Chapter 343 and thus the production of an Environmental Assessment (EA). The present study is being prepared to support the EA in accordance with Hawai‘i Administrative Rules13§13–275, and was performed in compliance with the Rules Governing Minimal Standards for Archaeological Inventory Surveys and Reports as contained in Hawai‘i Administrative Rules 13§13–276. Compliance with the above standards is sufficient for meeting the initial historic preservation review process requirements of both the Department of Land and Natural Resources and the County of Hawai‘i Planning Department. While not a full blown Cultural Impact Assessment (CIA), the current study contains many of the elements (most importantly consultation) specified for such documents in the Office of Environmental Quality Control (OEQC) guidelines.

This report contains background information outlining the study area's physical and cultural contexts, a presentation of previous archaeological and cultural work in the vicinity of the study area, current survey expectations based on that previous work, and a section devoted to the consultation effort. Also presented is an explanation of the study's methods, detailed descriptions of the archaeological features encountered, interpretation and evaluation of those resources, and treatment recommendations for the documented sites and well as a set of recommendations derived from consultation.

STUDY AREA DESCRIPTION

The study area, which is roughly nine acres and consists of six currently vacant Tax Map parcels (3) 2-2-032:003, 004, 008, 019, 087 and 088 (see Figure 2), is situated just south of the Waiākea Peninsula landform, which extends into Hilo Bay and Reed's Bay (see Figure 1). The current study area is bounded by Manono Street to the west, Kamehameha Avenue to the north, Kuawa Street to the south, and developed commercial properties to the east (Figure 3). Elevation within the study area ranges from 3-14 feet (0.9-4.2 meters) above sea level and the current course of the Wailoa River enters Hilo Bay roughly 250 meters to the northwest.

The soil within the study area is classified as Opihikao-Urban land complex (USDA Web Soil Survey), which is described as shallow, well drained soils that formed in a thin mantle of organic material and volcanic ash overlying *pāhoehoe* bedrock. The study area is in the *tsunami* zone and was inundated in 1946 and again in 1960. Soil deposition within the study area is somewhat limited toward the eastern margin, and within the central and western portions is markedly disturbed as a result of the *tsunami* (and post-*tsunami*) activities. The entire study area is currently a mowed grass field (Figure 4) with a few clusters of trees (banyan and mango) scattered across the eastern portion (Figure 5) and a few scattered palms.

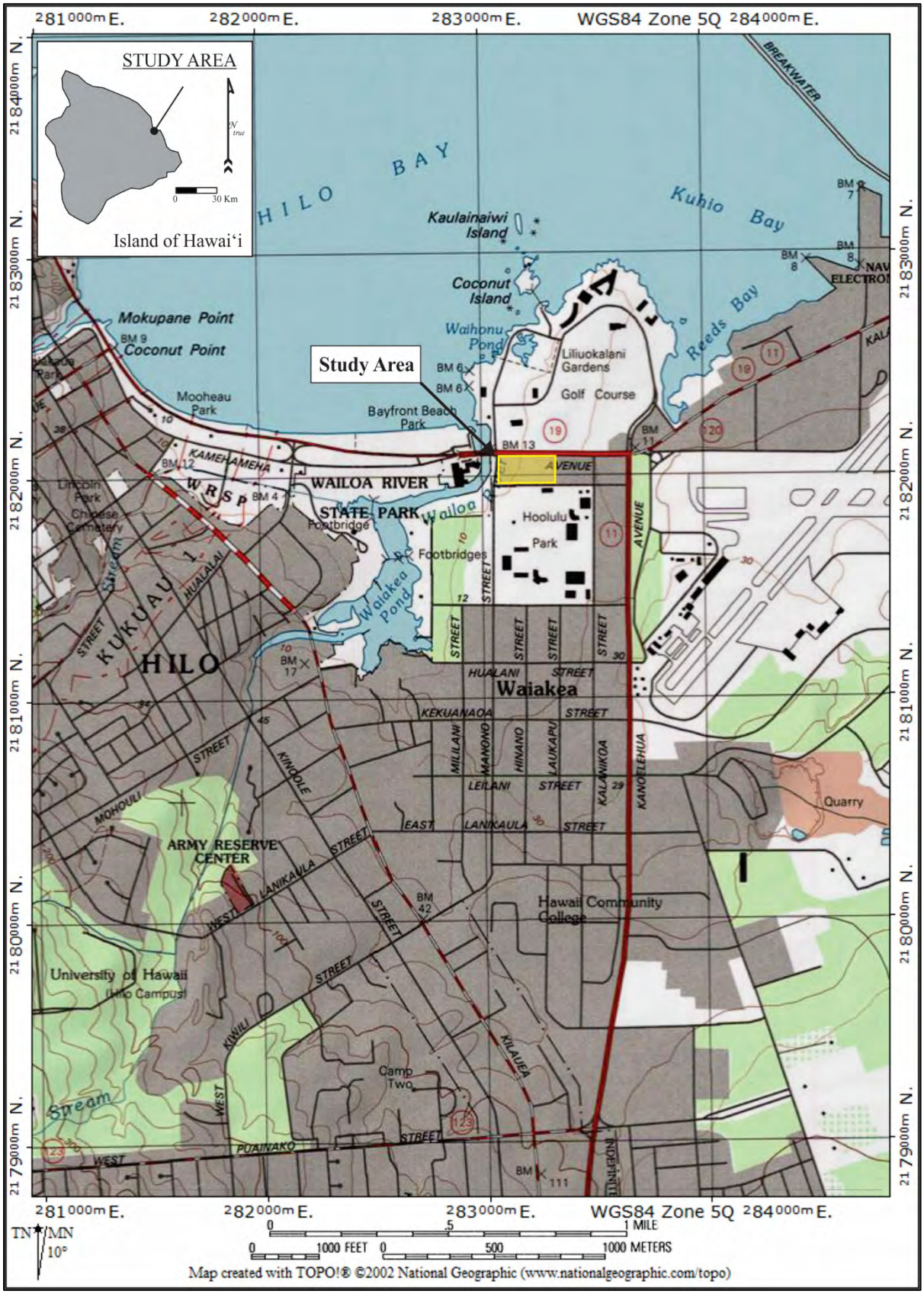

Figure 1. Study area location.

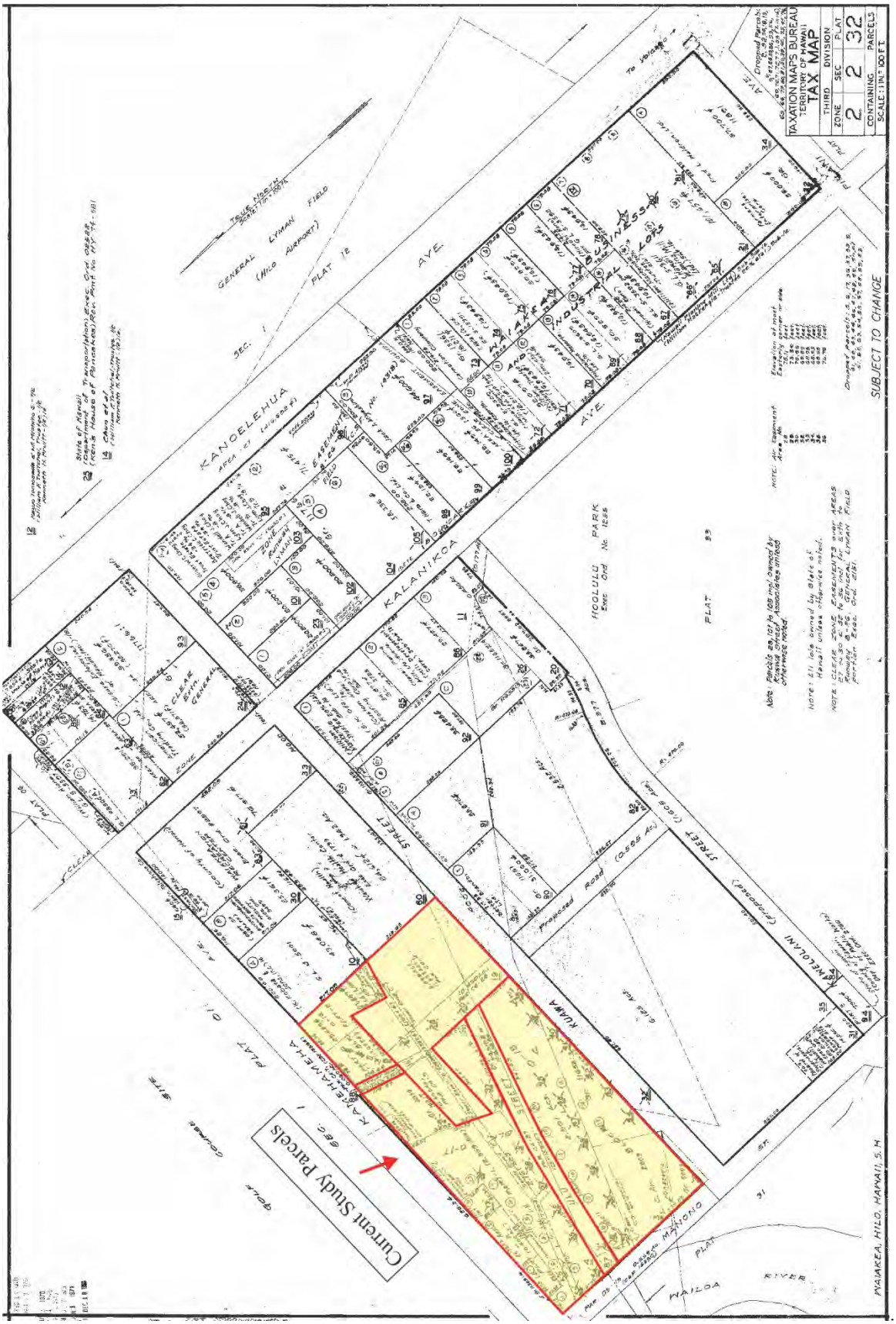

Figure 2. Tax Map Key (TMK) (3) 2-2-032 with current study parcels (003, 004, 008, 019, 087 and 088) outlined in red.

Figure 3. Google Earth™ satellite image of the study area (outlined in red).

Figure 4. Mowed grass cover in the central and western portions of the study area, view to the west.

Figure 5. Vegetation in the eastern portion of the study area, view to the north.

2. BACKGROUND

This section of the report describes and synthesizes prior archaeological, cultural, and historical research relevant to the current study area; and contains a culture-historical background. This information is provided in order to generate a set of expectations regarding the nature of cultural resources that might be encountered within the study area, and to establish a basis for the assessment of the significance of any such resources.

PRIOR RESEARCH

Since the early 1900s, several studies have examined where Precontact and Early Historic Hawaiians established settlements in the area near Hilo Bay. The earliest survey of archaeological sites in the vicinity of the current study area was conducted by Alfred Hudson between 1930 and 1932, as part of an attempt to inventory the sites of the entire eastern coast of Hawai‘i Island for the B. P. Bishop Museum. Hudson 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 Ahupua‘a near Coconut Island (Mokuola) and the current study area:

> 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 [see Consultation section of the current report for further discussion of this *heiau*]. 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 archaelogical 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 time s 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].

The four decades between Hudson’s site inventory survey and the implementation of environmental review as an integral part of construction and development on Hawai‘i Island in the 1970s, did not produce any cultural resource reports that are relevant for the current study area. 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 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 adjacent to the current study area (Figure 6). These sites include the Hawaii Consolidated Railway’s eight-stall roundhouse, or locomotive garage (SIHP Site 7432), located on Kalanikoa Street next to what is now the County swimming pool, the “*Tsunami* Clock” (SIHP Site 7452) located along Kamehameha Avenue opposite the study area, and the Wailoa River Bridge (SIHP Site 7484) located near the northwestern corner of the study area beneath Kamehameha Avenue.

By the 1980s, more strict environmental regulations lead 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). This comprehensive study covers the period between 1794 and 1980, beginning with a narrative of early life at Hilo Bay (1794-1839), followed by the Americanization of Hilo (1840-1898), and concluding with the commercial development and public improvements around the bay (1898 to 1980). The information outlined by Kelly et al. (1981) provides the historic framework for the culture-historical context presented below, in which specific historical accounts pertinent to the current study area are highlighted.

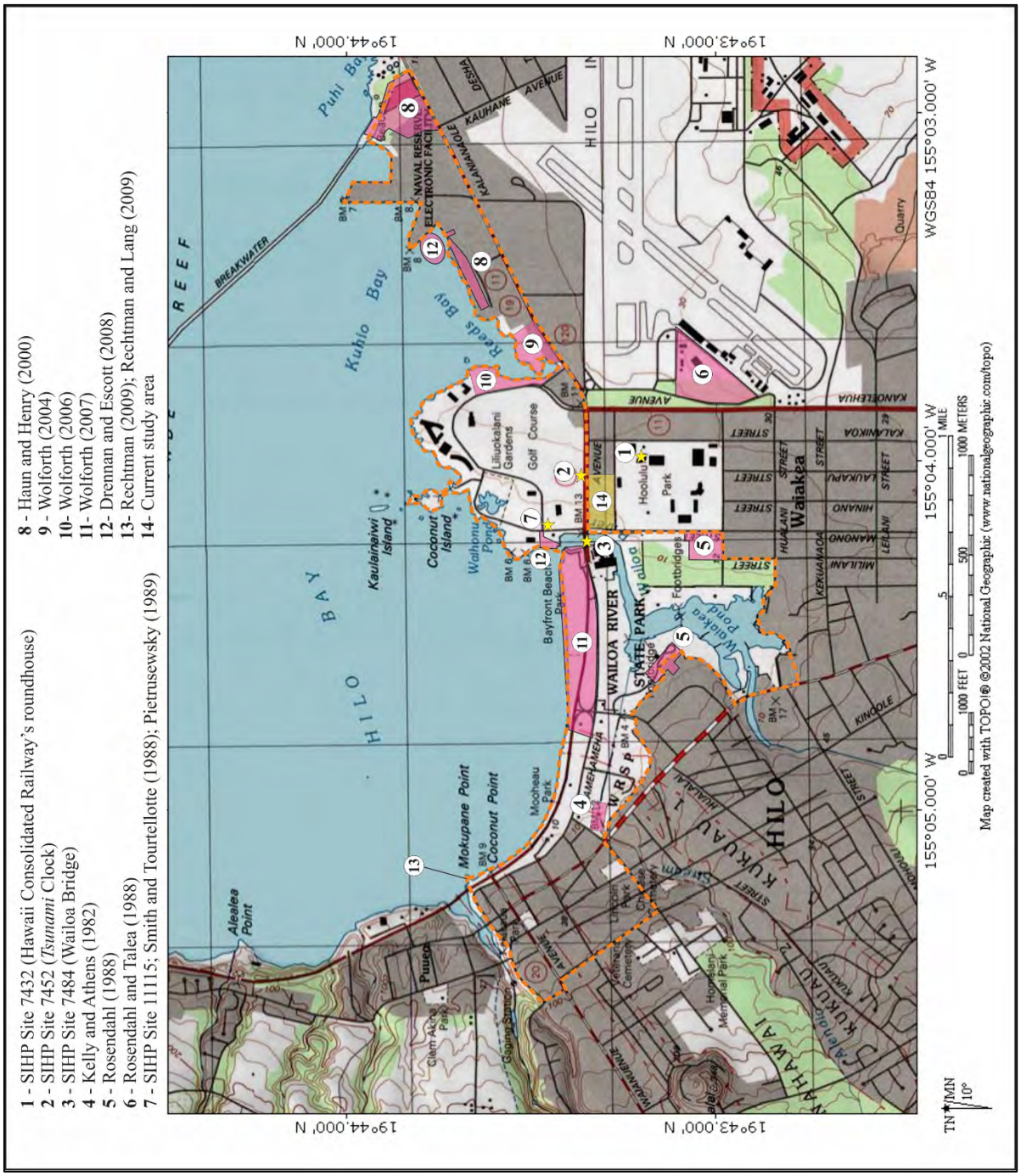

Figure 6. Previous archaeological study areas in the vicinity of the current study area.

Since the late 1980s there have been several archaeological and cultural studies in the coastal portions of Waiākea and neighboring *ahupuaʻa*, thirteen of which (DMH, Inc. 1990; Drennan and Escott 2008; Haun and Henry 2000; Kelly and Athens 1982; Pietrusewsky 1989; M. Rosendahl 1988; Rosendahl and Talea 1988; Rechtman 2009; Rechtman and Lang 2009; Smith and Tourtellotte 1988; Wolforth 2004, 2006, 2007) are of particular relevance to the current project. All of these studies were conducted for locations or at sites in an around the current project area (see Figure 6) and their findings are briefly discussed below.

In 1982 the Bishop Museum conducted a study (Kelly and Athens 1982) of the then proposed improvements to the Alenaio Stream channel. The *makai* portion of their study area included the Waiōlama Marsh area along the coast of Hilo Bay to the west of the current study area (see Figure 6). Kelly and Athens (1982:7) concluded that although no sites were discovered there was the potential for the discovery of subsurface "historic or prehistoric Hawaiian agricultural remains" in the former Waiōlama Marsh area.

As part of a larger study to identify suitable locations for the construction of the Hilo Judiciary Complex, M. Rosendahl (1988) investigated two locations within the current Wailoa State Park and concluded that there were no intact cultural resources within her study areas (see Figure 6). Likewise Rosendahl and Talea (1988) reported no archaeological findings as a result of a reconnaissance survey conducted to the southeast of the current study area along Kanoelehua Avenue (see Figure 6).

Also in 1988, during the renovation of the Wailoa Bridge, human skeletal remains were exposed within a cable trench adjacent to the east side of Lihiwai Street, directly across from Suisan Fish Market on TMK: (3) 2-1-01:12 (see Figure 6). The incomplete remains, identified as SIHP Site 50-10-35-11115, were removed from the trench (Smith and Tourtellotte 1988) and studied by Pietrusewsky (1989). The inadvertently discovered remains were determined to be that of a middle-aged male of Polynesian ancestry, and believed to have constituted a traditional Hawaiian burial. This discovery, while only that of a single set of remains, does indicate that the possibility exists for additional remains, especially in coastal areas of sand deposits along the Hilo bay front.

In 1990, a comprehensive statewide study of Hawaiian fishponds was conducted that identified ten fishponds or former fishponds in the current project vicinity (DMH, Inc. 1990). Nine of these ponds were assigned reference numbers corresponding to their mapped locations (Figure 7). Ponds 75, 76, and 77 are known from historical records to have existed in the Waiōlama area of Kūkūau Ahupuaʻa. Five ponds were identified at the Wailoa River area of Waiākea: Hoakimau (78), Mohoʻuli (79), Waiākea (80), Waihole (81), and Kalepolepo (not numbered). Waiohinu Pond (82) was identified at the Liliʻuokalani Gardens area of the Waiākea Peninsula, and Kanakea Pond (83) (also locally known as "ice pond" and assigned SIHP Site 18896) was identified at Reed's Bay.

Haun and Henry (2000) conducted an archaeological inventory survey of two locations on either side of Hilo Harbor (TMK: (3) 2-1-09:002, 012, 041 and 042 and TMK: (3) 2-1-07:20-037; see Figure 6) east of the current study area. One Historic Period site and four features were recorded including the remains of a residential complex (Site 22486) at Baker Beach, three foundation slabs (Features A, B, and D), and roadside curbing (Feature C).

Wolforth conducted two archaeological studies (see Figure 6) for proposed parks within the greater Hilo Bay area for Kūhiō-Kalanianaʻole Park (2004), and for Reedʻs Bay Beach Park (2006). As a result of his 2004 study, Wolforth identified three sites, Kanakea Pond (SIHP Site 18896), another small-unnamed pond (SIHP Site 24230), and a remnant feature (SIHP Site 7413) of the former railroad. Preservation was recommended for the two pond sites and no further work for the railroad trestle support. Wolforth's (2006) Reed's Bay archaeological study identified five sites, two of which were recorded in his earlier study (Wolforth 2004). In addition to Sites 7413 and 18896, Site 24917 (Reed's Bay Beach), Site 24918 (location of Scott-Legionnaire Hotel), and Site 24919 (Pecked Basins) were identified. No further work was recommended for three of these sites, and preservation was recommended for Sites 7413 and 18896.

Wolforth (2007) prepared a cultural impact assessment for the Hilo Bayfront Master Plan for improvements to the Bayfront Beach Park in Hilo. The project area, situated along the eastern portion of Hilo Bay to the west of the current study area (see Figure 6), was the former location of Kanukuokamanu in the *ʻIli* of Piʻopiʻo, a place of royal residence for ages. Wolforth (2007) did not identify any traditional cultural properties, nor did he foresee any negative impacts to cultural practices for the Hilo Bay Master Plan. An archaeological surface survey of the project area identified bridge abutments for two former bridges that once crossed the Wailoa River, but did not identify any evidence of other historical events and activities that took place there, which Wolforth (2007) suggests may only be encountered in a disturbed subsurface context. Wolforth articulates:

> The problem is that the subsurface archaeological remains are not likely to be intact. In other words, they are not likely to exist as layer upon layer of distinct 'horizons' of occupation and use. Rather, the continuous developments in this location over the years have taken place on the same ground surface. The royal families lived and played on the same surface that the Shinmachi residents and businesses built on, and the railroad built on, and the 1946 tsunami scoured clean, and the industry and warehouse built on, and the 1960 tsunami scoured clean, and the current roads were built on. Consequently, while there is a likelihood that material remains are present, their context is certain to be mixed and disturbed to the point that there is little value in the recovery of those material remains. (Wolforth 2007:30)

Drennan and Escott (2008) conducted an underwater archaeological reconnaissance and historical investigation of a wreck site near Pier 3 in Hilo Bay (TMK: (3) 2-1-007 por.), east of the current study area (see Figure 6). This study resulted in the discovery of a wrecked pontoon barge (Site 26466) comprised of four features that included bollards (Feature 1), C-rings/Pad-eyes (Feature 2), U-plates (Feature 3), and a tear-shaped buoy (Feature 4).

In 2009 Rechtman Consulting, LLC conducted an archaeological assessment survey (Rechtman 2009) and a cultural impact assessment (Rechtman and Lang 2009) for the proposed Hilo Bayfront Trails Project across the coastal portions of Pi'ihonua, Punahoa, Pōnāhawai, Kūkūau, and Waiākea *ahupua'a* (see Figure 6). The proposed trail alignments, which will provide the physical means for walking, running, biking or skating from one location to another within the town of Hilo and offer nearby amenities to provide basic resources, trail information, and educational information about the natural and cultural resources of Hilo, will extend along Kamehameha Avenue adjacent to the current study area. As for the archaeological findings, although the proposed trail alignments are designed to pass by or through many historic places and sites (e.g., Kanakea Fishpond, Banyan Drive, Lili'uokalani Gardens, Moku Ola, Suisan Fish Market, Wailoa Bridge, Waiākea Fishpond Complex, Waiākea Mill Site, Waiōlama Marsh area, Kaipalaoa Point, and downtown Hilo), Rechtman reported that "no specific archaeological features were observed within any of the proposed alignments" (2009:30) that would be impacted by the project. Most pertinent to the current study area, Rechtman does relate, when discussing the Hawaii Consolidated Railway roundhouse (SIHP Site 7432) and citing Lang (2007:12), that "*makai* of nearby Kuawa Street [within the current study area], the base of the flagpole that stood in front of the Hawaii Consolidated Railway office can still be seen" (2009:21). While no specific archaeological features were identified within the Hilo Bayfront Trails project area, Rechtman (2009:30) recommended that an archaeological monitor be present during all ground-disturbing activities associated with undeveloped segments of the proposed trail alignments as the potential remained for as yet undiscovered buried features to be encountered during subsurface development activities.

Rechtman and Lang (2009), in an effort to assess the potential cultural impacts to resources, practices, and beliefs as a result of developing the Hilo Bayfront Trail alignments, undertook a substantial amount of community consultation, and they found that while the entire area of the proposed Hilo Bayfront Trails project could be considered a historic/cultural landscape, no specific resources or practices were identified that would be impacted by the development and use of the trail network. In fact, many of individuals who were consulted believed that the development of the Hilo Bayfront Trails project would result in a positive community and cultural benefit.

CULTURE-HISTORICAL CONTEXT

The island of Hawai'i is divided into six traditional districts or *moku* (Cordy 2000). The current study area falls within the traditional *moku* of Hilo and the historic district of South Hilo on the rainy windward side of the island. Sometime during the A.D. 1400s, the *moku* were further divided into distinct land units known as *ahupua'a* (Kirch 1985). *Ahupua'a* were ideally long wedge-shaped slices of land that incorporated all of the eco-zones from the mountains to the sea and several hundred yards beyond, which afforded their inhabitants unlimited access to a diverse subsistence resource base (Cordy 2000). Of the twenty plus *ahupua'a* that make up the Hilo district, only two approach this ideal including Waiākea, where the current study area is located. Waiākea, one of the largest *ahupua'a* in all the Hawaiian Islands, stretches from the eastern shores of Hilo Bay up the slopes of Mauna Kea to an elevation of 6,000 feet and is markedly broader than its neighboring *ahupua'a* to the north (Figure 8). Entire *ahupua'a*, or portions of the land were managed by appointed *konohiki*, or lesser chiefs, who acted as overseers under the rule of an *ali'i 'ai ahupua'a*. The *ali'i 'ai ahupua'a* in turn answered to an *ali'i 'ai moku,* a higher chief who ruled over the *moku* and claimed the abundance of the entire district. Thus, *ahupua'a* resources supported not only the *maka'āinana* (commoners) and *'ohana* (extended families) who lived on the land, but also provided support to the ruling class of higher chiefs and ultimately the crown.

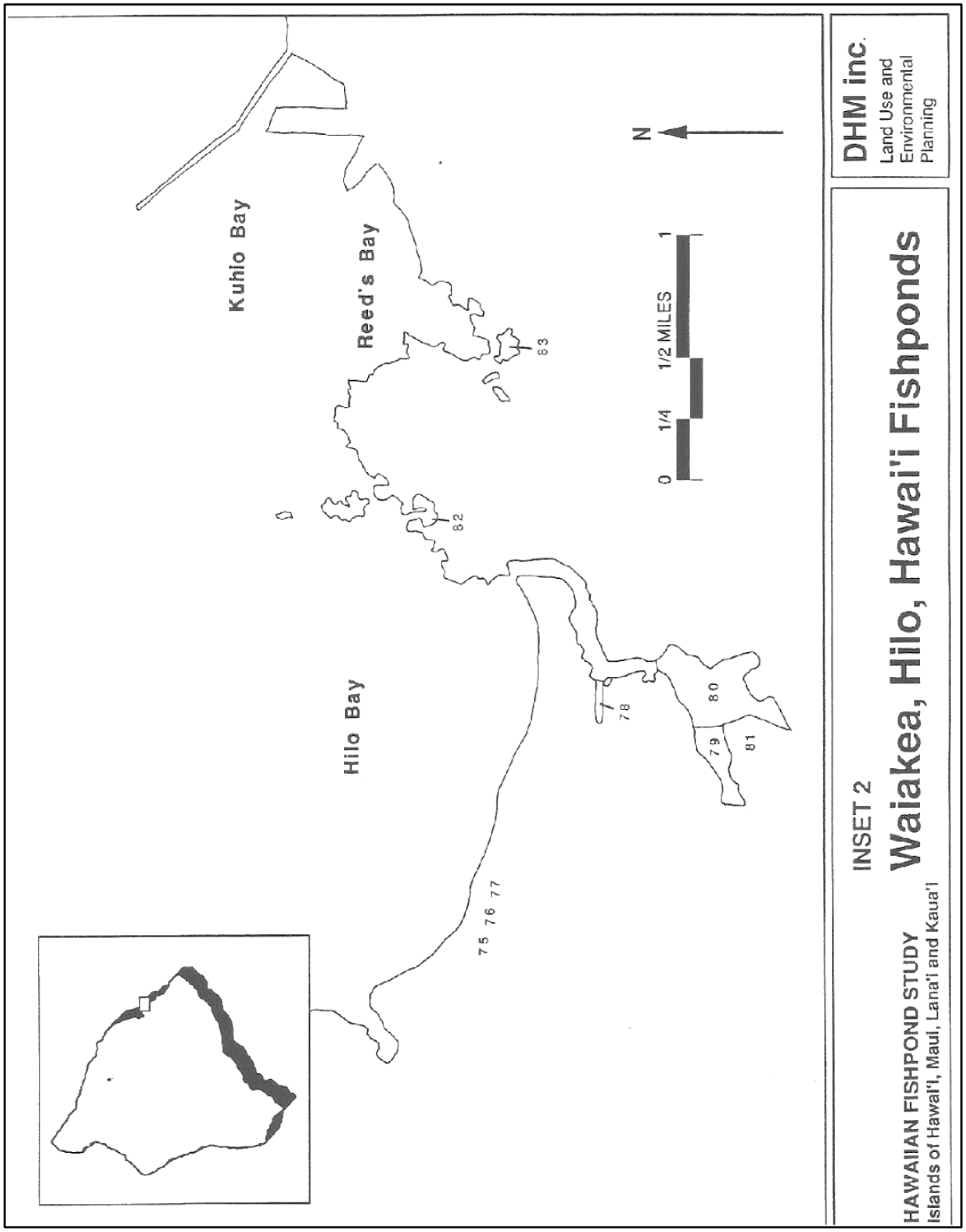

Figure 7. Locations of former and current fishponds in the project area vicinity (from DMH, Inc. 1990).

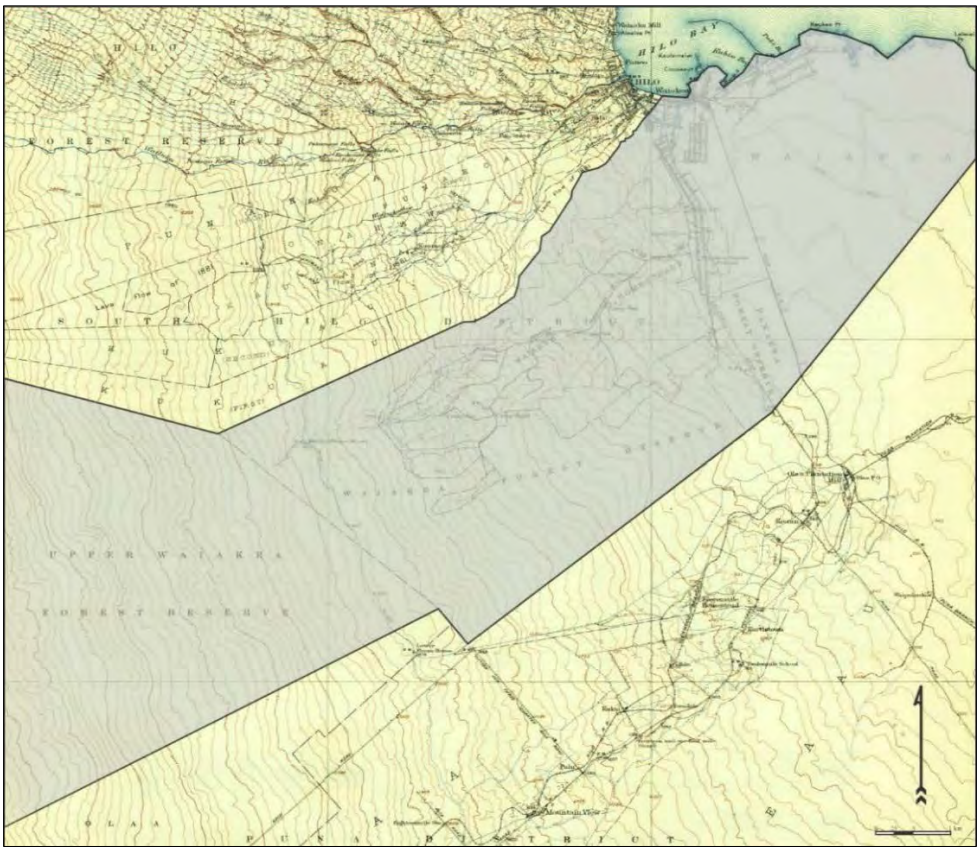

Figure 8. 1932 USGS map of the Hilo quadrangle of Hawaiʻi Island with Waiākea Ahupuaʻa shaded.

Waiākea, which translates as "broad waters" (Pukui et al. 1974:220) is home to the Wailoa River and portions of Hilo, Reed's, Kuhio, and Puhi Bays. Historically, the ocean resources of Hilo Bay were vital to everyday subsistence, Kamakau describes various fishing techniques as follows:

> … 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… (Kamakau 1976:59-60 cited in Kelly et al. 1981:16-17)

Fishing appears to have been a male dominated subsistence method while women and children gathered edible seaweed (*limu*) along the shoreline; limpets and other marine invertebrates were also gathered in the shallow coastal waters for food and medicinal purposes (Kelly et al 1981).

Marine based subsistence was also 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, north of the current study area near present day Coconut Island (Maly 1996). 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 in the fishery (Kelly et al. 1981).

Extensive fishponds were cultivated in the vicinity of Hilo Bay including the Royal Fish Ponds, five spring-fed inland ponds whose yield was reserved solely for the highest of *aliʻi*. The largest of these Royal Ponds, known as Waiākea was located southwest of the current study area in the Wailoa River (Figure 9). Religious ritual accompanied the creation and maintenance of the Royal Ponds, which according to a historic account from 1823, were surrounded by small huts for their caretakers (Kelly et al. 1981).

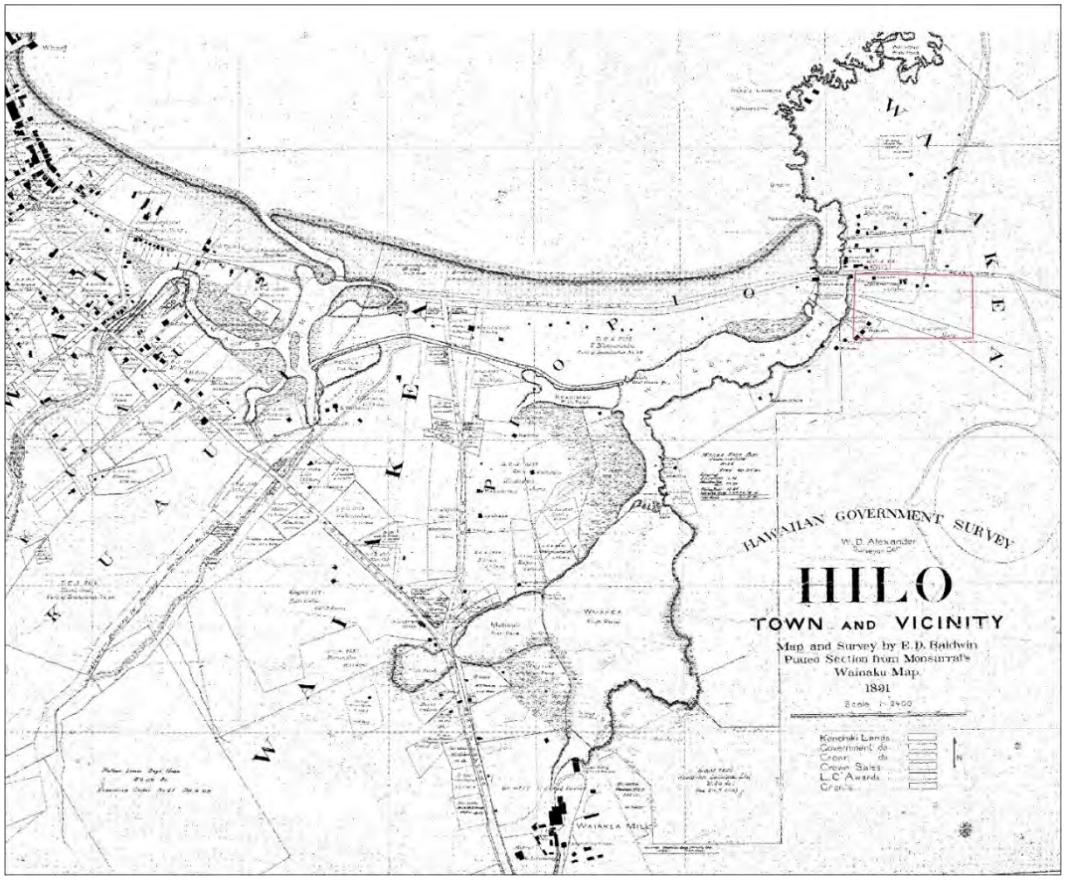

Figure 9. 1891 Hawai‘i Government Survey Map of Hilo town and vicinity showing Fish Ponds (current study area outlined in red).

In 1846, Chester Smith Lyman recorded the following scenes at the Royal Fish Ponds:

> 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 tho' 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)

According to historic accounts, the rivers and fishponds of Hilo also supported scores of water fowl that were part of the diet (Kelly et al. 1981).

In addition to marine resources, agricultural resources were essential to the residents of Waiākea. 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 1996). According to historical accounts published by Handy and Handy (1972) dry taro was planted wherever there was enough soil on the lava fields of Waiākea and on the slopes between the rivers.

The earliest historical knowledge of Hilo comes from legends written by Kamakau (1961) of a 16th century chief ‘Umi-a-Liloa (son of Liloa) who at that time ruled the entire island of Hawai‘i. Descendants of Umi and his sister-wife were referred to as “Kona” chiefs, controlling Ka‘ū, Kona, and Kohala, while descendants of Umi and his Maui wife were referred to as “Hilo” chiefs, controlling Hāmākua, Hilo, and Puna (Kelly et al. 1981). 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).

Hilo was one of the larger population centers on the Island of Hawai‘i, and also an area frequented by the *ali‘i* (Moniz n.d.), with early chiefly residences established at Waiākea (Kelly et. al. 1981) that lasted up through the early Historic Period (Cordy 2000).

Postcontact (Historic) Descriptions of Life and Industry in Waiākea and Hilo Bay

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 n.d.; Tolleson 2001). 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) surmised 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. It was during this early Historic Period that Waiākea Ahupuaʻa became part of Kamehameha I's personal land holdings (Moniz n.d.).

William Ellis, one of the first missionaries to arrive in Hawaiʻi, spent five days in Waiākea in 1823; he described it as a well-watered place, with some of the heaviest rains and densest fog he had encountered on the island (Ellis 1963). Ellis estimated that a population of 2,000 residents inhabited nearly 400 houses scattered among the breadfruit trees and coconut palms along Hilo Bay and were fortunate to have well-stocked fishponds, fertile soil, and the proximity of timber forest (Cordy 2000).

In 1825 the H.M.S. *Blonde*, commanded by Lord Byron, arrived in Hilo Bay bearing the bodies of Kamehameha I's son Liholiho and his wife Kamamalu who had both died of measles in England. Kaʻahumanu, Kamehameha I's widow and self-declared prime minister of Hawaiʻi, declared Hilo Bay would henceforth by known as Byron's Bay in honor of the Commander. During shore-leave Lord Byron stayed in Waiākea, at a large house appropriated by Kaʻahumanu on the banks of the Wailoa River, likely near the current study area. The visit of the HMS Blonde generated four major accounts of the voyage rife with vivid descriptions of Waiākea (Kelly et al. 1981). The officers onboard described the bay as deep and calm and mentioned that the Wailuku and Wailoa rivers were convenient watering places for visiting ships (Kelly et. al. 1981). An 1825 map of Byron Bay prepared by the crew of the *H.M.S.* Blonde (Figure 10) shows the extent of the wet taro fields and fishponds of Waiākea in addition to the coconut groves that existed in the current study area.

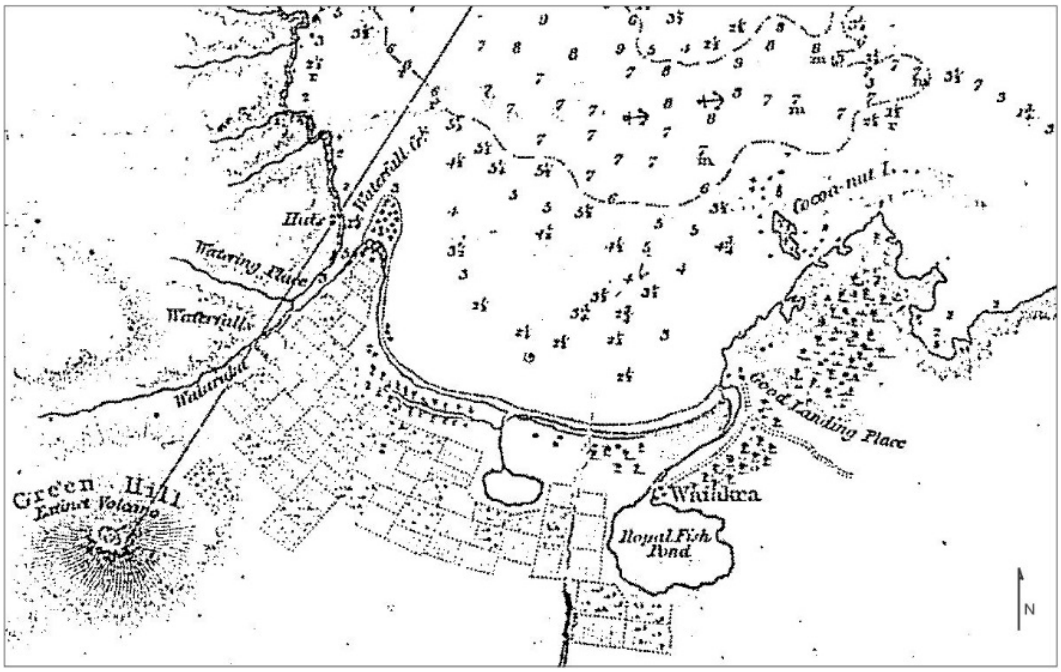

Figure 10. Detail of 1825 Plan of Byron Bay (current study area location approx. under G of "Good Landing Place").

The ship's log neatly summarized the potential of Hilo Bay:

> Byron Bay will, no doubt, become the site of the capital of Hawaiʻi. 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 addition to providing valuable subsistence resources, the protected waters and sandier shores of Hilo Bay 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 Liholio'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.

At the end of the 1830s, industrial development was on the rise in Hilo, despite the decline in whaling and the end of the sandalwood trade. In a letter written in 1840, Reverend Titus Coan remarked on the conditions in Hilo:

> 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)

A period of great social change in Hilo began with the arrival of the first missionaries to Waiākea in 1824 and ended in 1848 with the formal land division known as the Great *Māhele*. The introduction of new spiritual concepts combined with an increased involvement in international trade and global politics lead to a shift in settlement patterns from traditionally dispersed Hawaiian villages to more concentrated urban population centers. Then, on November 7, 1837 at 7 p.m. a *tsunami* wave hit Hilo Bay, Reverend Coan described the scene as follows:

> … we heard a heavy sound as of a falling mountain upon the beach. This noise was followed by loud wailing and cries of distress, extending for miles around the shores of the bay… House furniture, calabashes, fuel, timber, canoes, food, clothing, everything floated wild upon the flood. The waters rushed up valleys, carried away fish-ponds, and swept over many plantations of food. (Maly 1996:18)

After the *tsunami*, Hilo became the site of a large scale religious revival that lasted from 1837 until 1840 and included mass conversions and meetings of up to 10,000 worshippers. Other events that had a profound effect on the demography of Hilo were the measles epidemic of 1848, which claimed one third of the population of the island, followed by an outbreak of smallpox in 1853; later outbreaks of plague and leprosy caused the population to dwindle even further (McEldowney 1979).

The Great *Māhele* (1848-1873)

Pressure from foreign investors combined with the above-described demographic and socioeconomic changes, resulted in a shift from traditional land tenure to a system of private land ownership that culminated in the formal land division known as the *Māhele ʻĀina* or Great *Mahele* of 1848. During the *Māhele ʻĀina* all the lands of Hawaiʻi were placed into one of three categories: Crown Lands (for the occupant of the throne), Konohiki Lands (to be divided among 245 chiefs) and Government Lands. Conditions of the *Māhele ʻĀina* also afforded native tenants the right to claim, and acquire title to, parcels that they actively lived on or cultivated for a living (Maly 1996). These *kuleana* claims were essentially transfers of ownership from the *aliʻi nui* (high chief) or *konohiki* (lesser chief/overseer), who had been awarded ownership of the *ahupuaʻa* by Kamehameha III, to the commoners. The Board of Commissioners oversaw the program and administered the *kuleana* as Land Commission Awards (LCAw.).

Historically, the entire *ahupuaʻa* 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 (Kameʻeleihiwa 1992), who later relinquished the *ahupua'a* during the *Māhele ʻĀina.* As a result of the *Māhele*, Waiākea Ahupuaʻa was set aside as Crown Lands for Kamehameha III. In addition, twenty-six *kuleana* claims or LCAw. were registered within Waiākea for houselots and cultivated fields. Most LCAw. were located along major inland roads or fishponds near Hilo Bay (Devereux et. al. 1997; Moniz n.d.). Portions of three *kuleana* claims lie within the current study area; see Table 1 for details and Figure 11 for their locations.

Table 1. LCAw. within the current study area.

LCAw	*Name*	*Date*	*Area (acres)*	*Type of land use*	*No. of Houses*
1-E	Mahoe	4/5/1849	4.46	1 cultivated field	0
4004	Hale	11/17/1848	4.25	4 partially cultivated fields	2
2603	Napeahi	11/16/1848	1.3	House lot	4

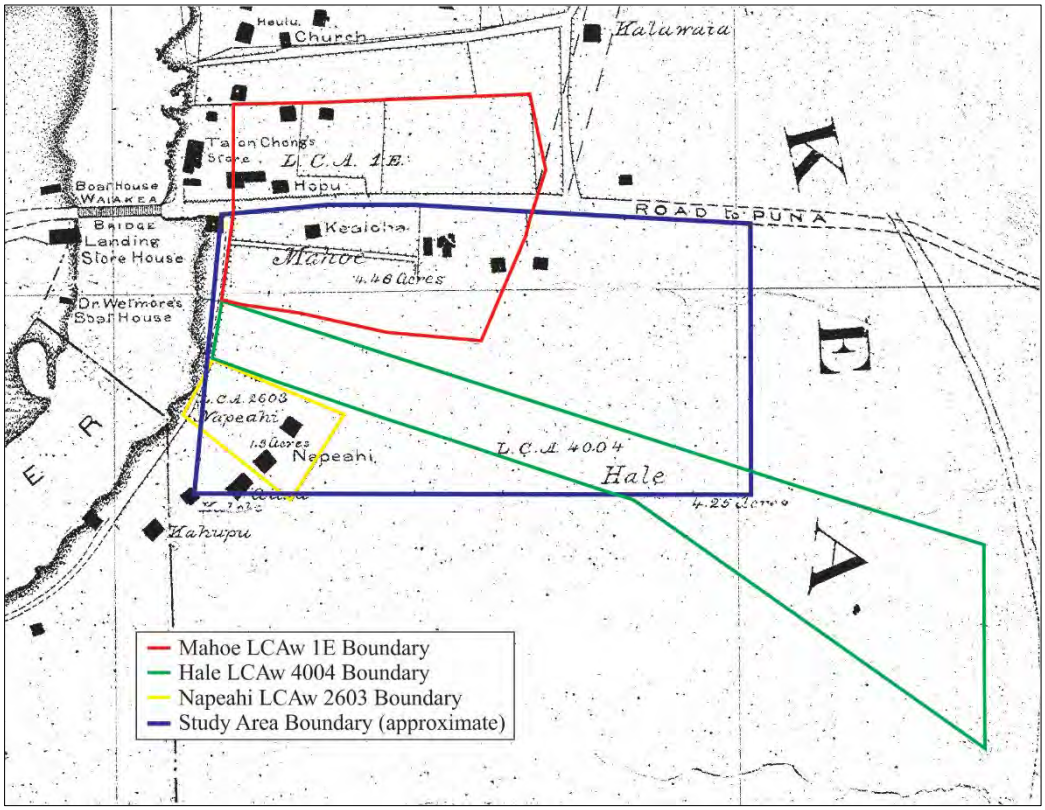

Figure 11. Portion of 1891 Government Survey Map of Hilo Town and Vicinity with LCAws and study area.

The southern portion of LCAw. 1-E awarded to Mahoe falls within the northwest quarter of the current study area. According to Board of Land Commission documentation from 1849, the cultivated field on the east bank of the Wailoa River was unfenced and had no house, the claimant had it from Konohiki Pea for 6 years, undisturbed. LCAw. 4004 awarded to Hale extended from the east bank of the Wailoa River at the western edge of the study area (just south of LCAw. I-E) to beyond the southeast corner of the study area. According to Land Commission records dated 1848, the four cultivated fields included 1 house that belonged to the claimant and another to Mahi, "who has no right in the soil." Hale's land had descended to him from his forefathers' time during Kamehameha's reign without objection. Most of the land associated with LCAw. 2603 awarded to Napeahi falls within the southwestern portion of the study area. According to Land Commission records dating from 1848, the unfenced house lot contained one house that belonged to the claimant and three other houses that belonged to Paakai, Kamokualiiole, and Kalua. Napeahi claimed to have inherited the land from his forefathers and "no one had ever disputed his right."

The Sugar Industry in Waiākea

The sugarcane mentioned in the 1840 Reverend Coan letter (see above) had a profound impact on Waiākea Ahupuaʻa. Although this impact was felt further inland than in the vicinity of the current study area, the population of Waiākea increased as a result of the industrial and economic growth brought about by the sugar industry (Wolforth 2007). Therefore, a brief history of the sugar industry in Waiākea is worth presenting.

The cultivation of sugarcane was initially practiced by Hawaiians long before European contact, however, sugar processing was introduced only after the arrival of the foreigners (Kelly et al. 1981). 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 saw an increase in the appropriation of land by foreigners for commercial sugar cultivation.

By 1874, "Hilo ranked as the second largest city in the islands, as a result of its central position in the rapidly expanding and intensified sugar industry at Waiākea" (McEldowney 1979:39). The first lease for commercial sugar cultivation was granted in 1874 and was eventually taken over by Waiākea Mill Company; in 1879 they established the Waiākea Sugar Plantation and built the Waiākea Mill (Kelly et al 1981). The Waiākea Mill was located at the inland end of Waiākea fish pond southwest of the current study area (see Figure 9). The Mill Company started with about 350 acres of cultivated land that extended south from the mill to the uplands of Waiākea Ahupuaʻa. By 1901 Hilo was the epicenter of sugar production and export. By 1918 the land cultivated for sugar reached 7,000 acres and fell under new homesteading laws that required the government to lease portions of it to individual homesteaders who would grow sugarcane in exchange (Kelly et al. 1981). Waiākea Ahupuaʻa was divided up by the Territory of Hawaiʻi into house lots, homesteads, and cane lots of 10-76 acres for lease and purchase (Kelly et al. 1981). The house lots were primarily for the working men and their families to establish residences, centered along present day Kīlauea Avenue and extended to the southwest of the current study area (Figure 12). Contractual and legal problems combined with the declining sugar market and the devastating *tsunami* of 1946 led the Waiākea Mill Company to cease operations in 1947.

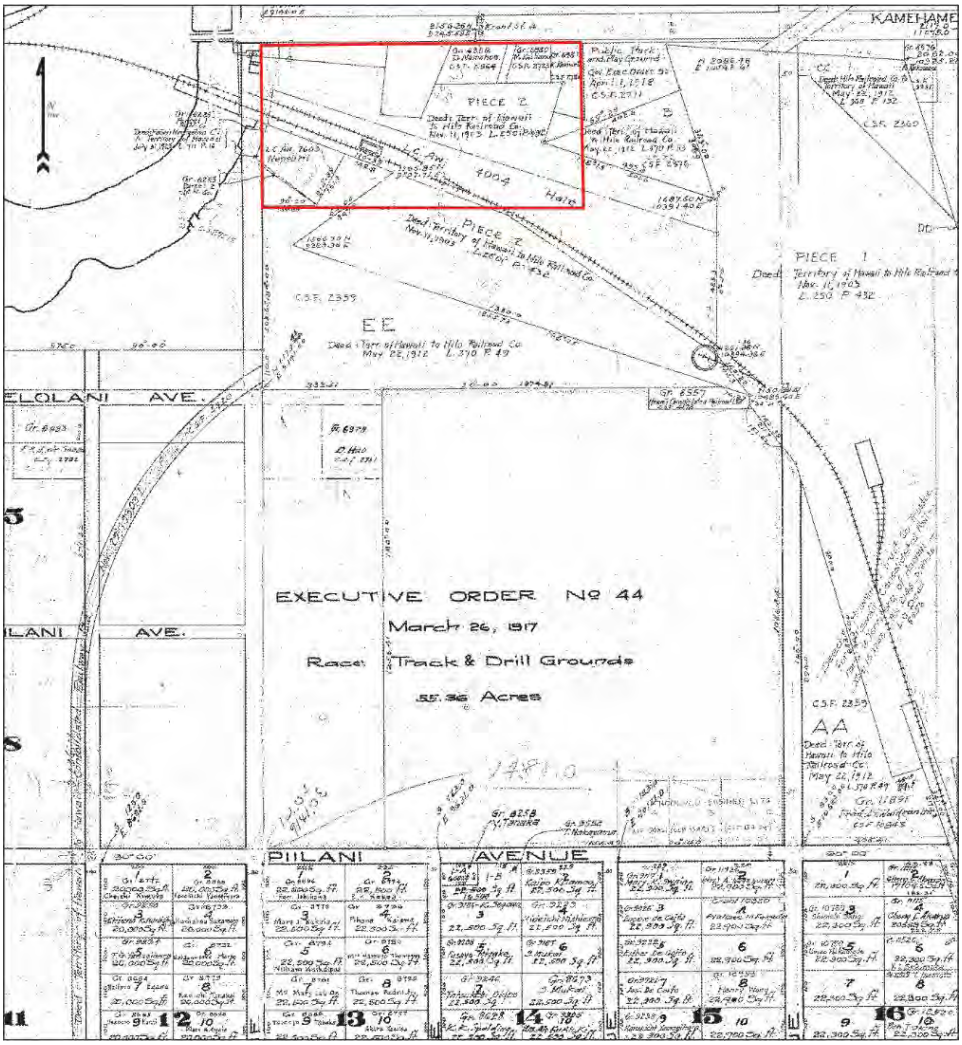

Figure 12. Portion of 1913 Waiākea House Lots Map with study area outlined in red.

The Railroad in Hilo and the Waiākea Rail Yard

The railroad in Hilo was in operation from 1899 until 1946. The railroad's primary business centered on the transport of raw sugar from the mills to the harbor and hauling plantation freight while the transport of passengers was merely a secondary interest. The Hilo Railroad Company (HRR) was granted a Charter of Incorporation by the Department of the Interior of the Republic of Hawai'i on March 28 1899:

> … to contruct, maintain and operate a railroad or railroads on the Island of Hawai'i for the transportation as common carriers of passengers and freight from the port of Hilo through the District of Hilo to and through the districts of Hamakua, Kohala and Kona and also… to and through the Districts of Puna, Kau and Kona… And also to purchase, own, develop, sell, lease, or otherwise deal in lands on the said Island of Hawai'i along or near the line or lines of the railroad… for the purpose of inducing the settlement of population along or near said line or lines of railroad…and also, subject to law, to construct and own all wharves, docks, piers, and appurtences necessary for the purposes of the Company… and also to create, operate and maintain water works for the purpose of supplying water to the lands acquired by it… Provided however, that such right to deal in land shall be held to extend and apply only to such lands as shall be at the date of this Charter of an agricultural, forest, pastoral or waste character, and to such made land, so called as said Company shall fill in or reclaim from the sea or other places. (Kelly et al. 1981:297-299)

On April 18, 1899 the Republic of Hawai'i and the Hilo Railroad Company reached an agreement for HRR to "build and operate a railroad in, from between and through the districts of Hilo, Puna, Hāmākua, Kohala, Kona, and Kau" (Kelly et al. 1981:303). This rather liberal agreement granted the following to the HRR, subject to the approval of the Minister of the Interior: Government lands for HRR to build their stations, depots and other structures, a free right of way across Government Lands and roads, and free use of water for the construction of the railroad (Kelly et al. 1981).

Six experienced Honolulu businessmen, who hoped to recreate their success on O'ahu in the cultivation and transport of sugarcane, were behind the HRR venture on the island of Hawai'i. In the fall of 1899, HRR began building its tracks from its terminus in Waiākea 8.3 miles south to the Olaa Sugar Company Mill near Kea'au, Puna District (Kelly et al. 1981). The investors behind HRR chose this route as their first rail service because they were behind the Olaa Sugar enterprise as well. Furthermore, the first product transported by rail from Olaa Sugar Company was not sugar, in fact, it was wood that had been recently cleared from forests in the area and supplied to HRR as 35,000 railroad ties (Kelly et al. 1981).

In 1900, a small wharf was constructed along the eastern bank of the Wailoa River near the current study area (to the west of the Napeahi LCAw.) for the landing of material necessary to build the tracks, buildings, and railroad cars. The first locomotive made landfall on May 15, 1900 and rail service from Hilo to Kea'au began on June 18, 1900. The Wailoa River railroad wharf was expanded in 1901 and a large warehouse was built to store up to 15,000 bags of sugar (Kelly et al. 1981). By the end of 1901, HRR had completed construction of more than 35 miles of railroad line, which included 25.1 miles from Waiākea to Kapoho and a 5 mile branch to Pāhoa. In 1902, a new sugar warehouse, with a 35,000 bag capacity, was built on the eastern shore of the Wailoa River near the current study area. In 1903, a new railroad wharf was built north of the mouth of the Wailoa River in Hilo Bay and the railroad line from Waiākea to Hilo Town was completed, including two bridges over the Wailoa River just west of the study area.

HRR ran mostly deficits during 1901-1905, however the arrival of trans-Pacific steamships to Hilo Bay seemed to be the answer to their problems. In 1906, HRR directors paid to put together a proposal to construct a breakwater in order to accommodate the steamships and presented it to the U.S. Army Corps of Engineers. The proposal was met with little faith in the amount of commerce going through Hilo. In response, HRR was able to secure the appropriation for the breakwater in 1907, by making assurances to the U.S. government that they would construct a railroad north of Hilo in addition to wharf facilities (Kelly et al. 1981). Breakwater construction began in 1908 and HRR hauled most of the rock from Puna to Hilo for the breakwater project, which compensated for the decline in the sugar industry and resulted in increased revenue for the years 1908-1910. From 1909 to 1913, HRR laid track from Hilo northward to the district of Hāmākua and southward through Puna, this expansion was funded by $4.5 million worth of stocks and bonds with annually rising interest rates that HRR could not afford to pay. HRR's failure to meet their bond interest obligations resulted in foreclosure in 1916.

In 1916, the Hilo Railroad Company was reorganized as the Hawaii Consolidated Railway (HCR) under the leadership of businessmen who represented the companies that ran the sugar plantations along the railroad. Of the original investors and staff of HRR, only Lorrin A. Thurston and R.W. Filler continued as the general manager and superintendent of the railroad, respectively. A significant portion of HCR's Waiākea Rail Yard falls within the current study area (Figures 13, 14, and 15), including the former site of the main railroad tracks, the commissary, main office, and railroad workers' residences (for further details, refer to consultation section below).

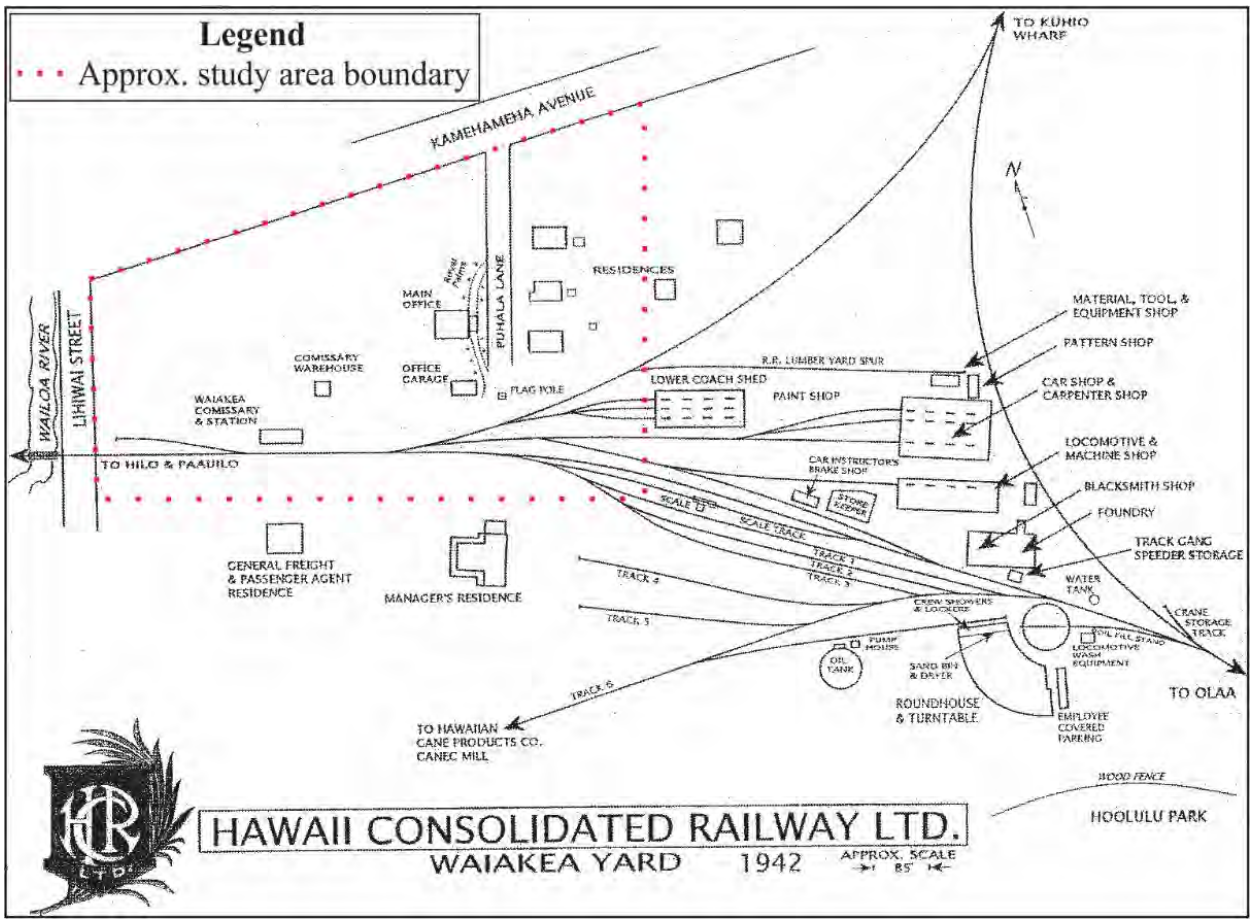

Figure 13. 1942 map of HCR's Waiākea Yard with study area approximated in red outline.

Figure 14. HCR comissary in Waiākea Rail Yard within current study area (ca. 1945), looking east.

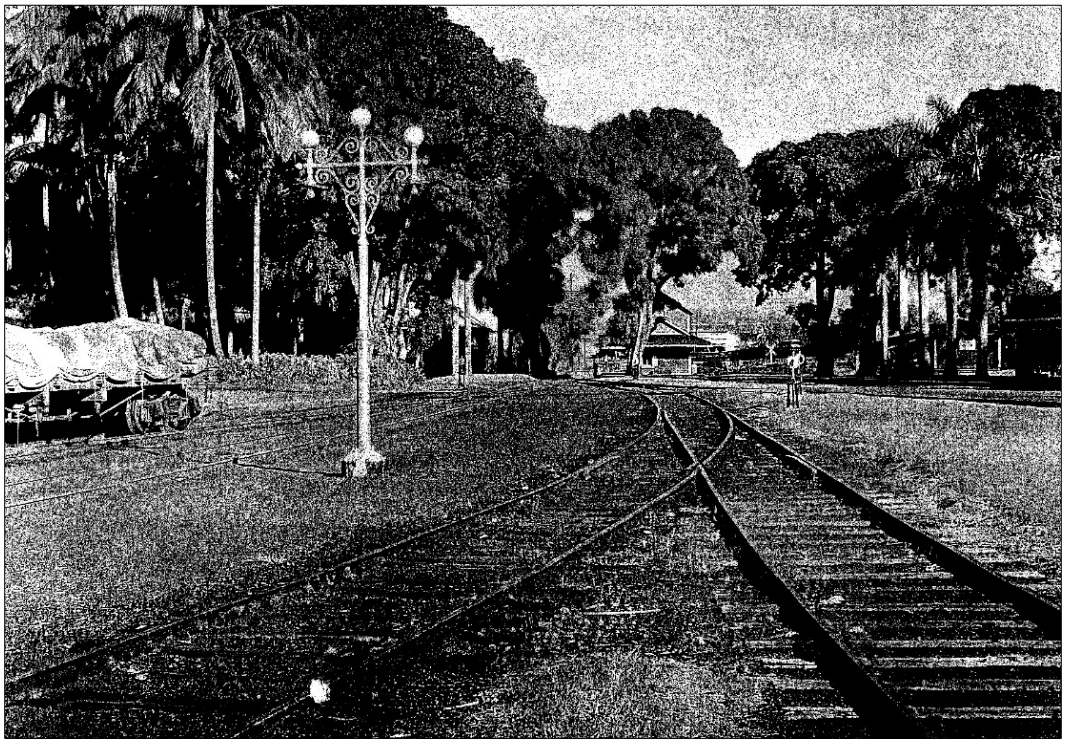

Figure 15. View across current study area (ca. 1945), looking west.

In response to competition from the use of automobiles for personal transportation, HCR lowered their fares, which resulted in an increase in passengers between Hilo and Hakalau and Hilo and Kea‘au. After a 1917 drought caused a marked reduction in sugar production for the years of 1918 and 1919, HCR began to transport freight for four additional sugar plantations, which resulted in increased revenue for 1920 and 1921. In 1921, HCR constructed a new railroad roundhouse in Waiākea that could accommodate eight engines as opposed to only three in the earlier roundhouse. This roundhouse still exists at its original location today, just to the southeast of the current study area.

Between 1921 and 1924, HCR sustained damage from storm surges and heavy rains, which led to costly repairs; however, the amount of freight and gross earnings increased for most of the years between 1922 and 1929. Hauling of rock for the Hilo breakwater project continued to be an important source of revenue for HCR and when the project concluded in 1930, revenue and gross earnings plummeted. Tonnage and gross earnings continued to fluctuate from 1931 through 1946 with some of HCR’s highest grossing years falling within that period.

Rail busses, also known as motor coaches, were the primary vehicle for passenger transport for HCR. These motor coaches became an especially popular form of transportation during World War II when mandatory gas rationing was in effect for all residents (Best 1978). By 1946, however, rail travel was becoming less popular, and less profitable, due to improved roads and increased trucking, which likely influenced HCR’s decision not to rebuild after the 1946 *tsunami* destroyed most of the railroad and its infrastructure. The 1946 *tsunami* washed out the swing bridge over the Wailoa River (Figure 16), the main railroad line and the switching tracks (see Figure 15) near and within the current study area. After the *tsunami*, the stockholders of HCR voted to liquidate and on July 12, 1946 the authorization for the abandonment of the entire railroad line of HCR was granted by the U.S. Interstate Commerce Commission. For additional information regarding the history of HCR in relation to the current study area, please refer to the consultation section below.

Figure 16. Bridges over Wailoa River mouth as seen before the 1946 *tsunami*.

Waiākea Town

Gloria Kobayashi and Richard Nakamura open their book *The Yashijima Story: The History of Waiakea Town*, with the following description of Waiākea Town:

> … a community located on the banks of the Wailoa River with an economy based on fishing, stevedoring, sugar, railroading and service industries. At its peak, some 5,000 people lived in very close quarters covering some 10 square miles. It was a community of blue-collar workers and shop owners of predominantly Japanese, Hawaiian and Portuguese extraction and haole supervisors for the Hilo Railroad and Waiakea Mill. (2008:23)

In the 1920s and 1930s, Waiākea Town was also known as *Yashijima*, which means "coconut island" in Japanese (Kobayashi and Nakamura 2008). Most people alive today identify this area as Waiākea Town as opposed to *Yashijima*. The geographic boundaries of the Waiākea Town included the Wailoa River to the west, the Waiākea fish ponds and Hoʻolulu Park to the south, the extent of Waiākea Peninsula to the north, and Reed's Bay to the east (Figure 17). The boundaries of Waiākea Town are approximated by the following present day roadways Manono Street (west boundary), Piʻilani (south boundary), Kalanikoa (east boundary) and Banyan Drive (north boundary). The entire current study area falls within Waiākea Town. In addition to the Waiākea Rail Yard and the assorted storefronts up and down Kamehameha Avenue (Figure 18), Waiākea Town was home to a movie theater, a Buddhist temple, various parks, a Japanese language school (Yashijima Nippon Go Gakko), Waiakeakai Elementary and Intermediate Schools, and a fire station. Additionally, within the current study area there were numerous restaurants and stores, residential structures and a Shinto Shrine (Hilo Daijingu). The Waiākea Town community endured the *tsunami* of 1946 and rebuilt only to have their homes and businesses destroyed by the 1960 *tsunami*. Waiākea Town was largely abandoned and its residents scattered inland after the 1960 *tsunami*, many businesses were relocated and remain active in the Hilo community today, such as KTA Super Stores, Kuhio Grill, and Café 100. Please refer to the "Consultation" section below for further information about Waiākea Town's history.

Figure 17. Aerial view of Waiākea Town before the1960 *tsunami* (current study area outlined area in red).

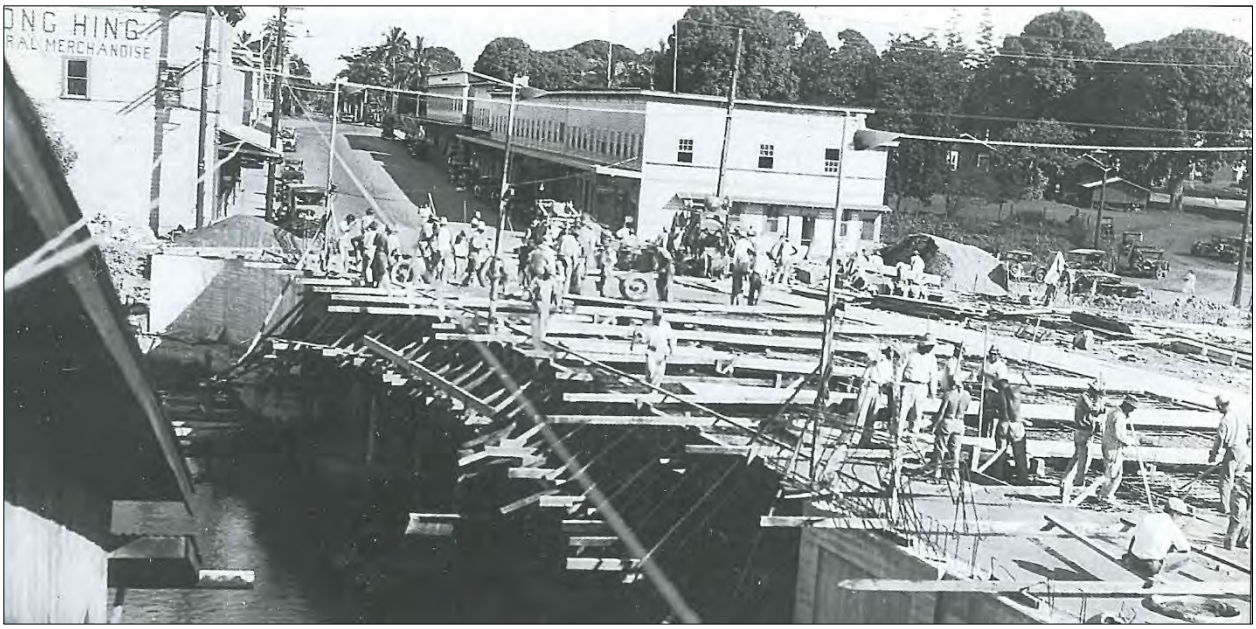

Figure 18. View of the portion of Waiākea Town storefronts and Rail Yard (current study area), from the Wailoa Bridge construction project (ca. 1937).

The *Tsunami* of 1946

The *tsunami* of April 1, 1946 damaged a great deal of industry and property in Hilo and in the current study area in particular. Hawaii Consolidated Railway sustained overwhelming damage to the main tracks and structures in the rail yard at the western end of the current study area, closer to the Wailoa River and Manono Street. The businesses located at the northern edge of the study area on the south side of Kamehameha Avenue remained standing largely because the brunt of the destructive force was absorbed by the buildings along the north side of Kamehameha Avenue (Figure 19). The storefronts and homes did not escape water damage however, and some of the businesses never recovered (Kobayashi and Nakamura 2008).

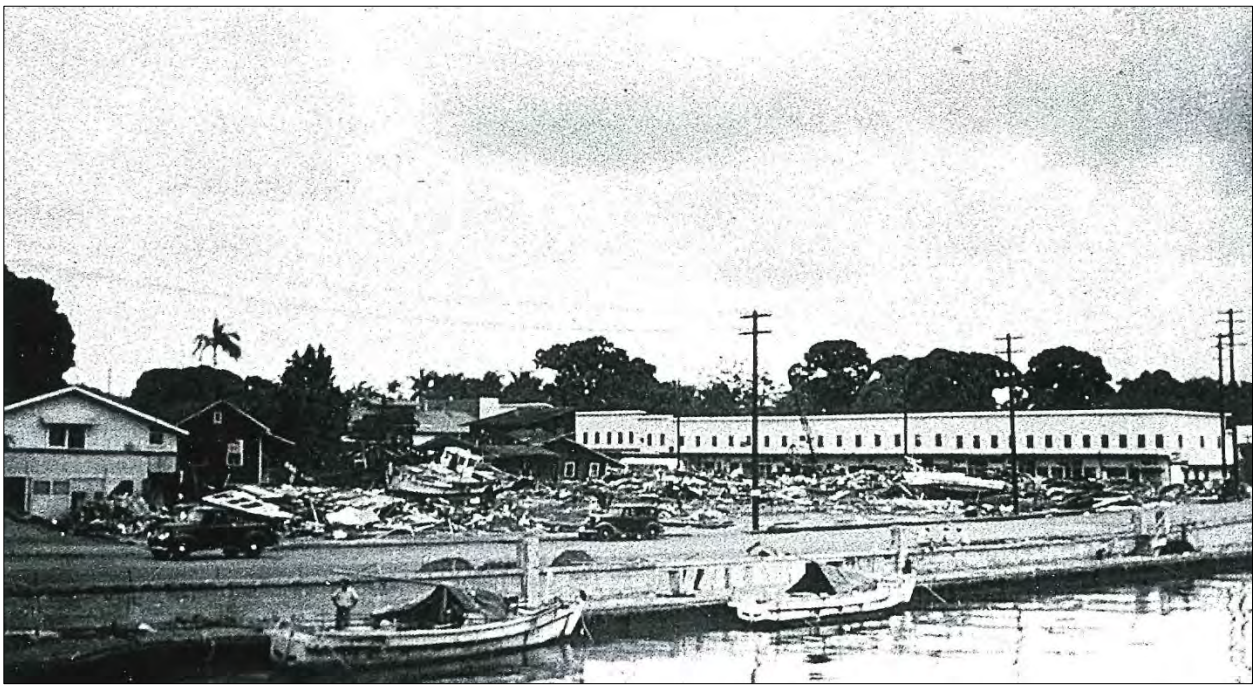

Figure 19. View of Waiākea Town just after the 1946 *tsunami* showing the storefronts on north side of Kamehameha Avenue totally destroyed, while those on the south side of Kamehameha Avenue remain standing.

The *Tsunami* of 1960

Around one o'clock in the morning on May 23, 1960 a *tsunami* roared through Hilo Bay and claimed the lives of 61 people. The series of eight waves destroyed more than 500 buildings and caused millions of dollars of property damage. The community at Waiākea Town, including the current study area, was decimated by the *tsunami* (Figure 20) and associated flooding, which inundated an area from central Hilo east to Keaukaha (Figure 21). The waves crushed some structures and lifted others off of their foundations and swept them inland (Figure 22). Waiākea Town never recovered from the devastation and was not rebuilt. As a result of the1960 *tsunami*, the government established safety zones in most of the low-lying areas that flooded, including the current study area, where businesses and residences were not permitted to rebuild; the government also exchanged state lands for the resettlement of families and their businesses (Kobayashi and Nakamura 2008). See the discussion of the Kaiko'o Project below and the Consultation Section for further details regarding the 1960 *tsunami* and its aftermath.

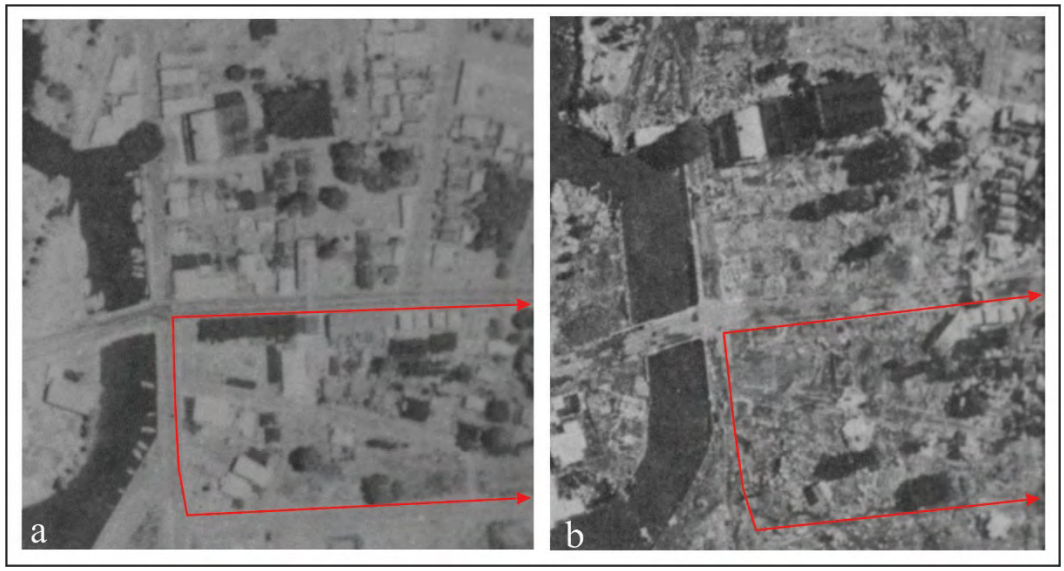

Figure 20. Aerials of Waiākea Town showing the current study area outlined in red before (a) the 1960 *tsunami* and after (b).

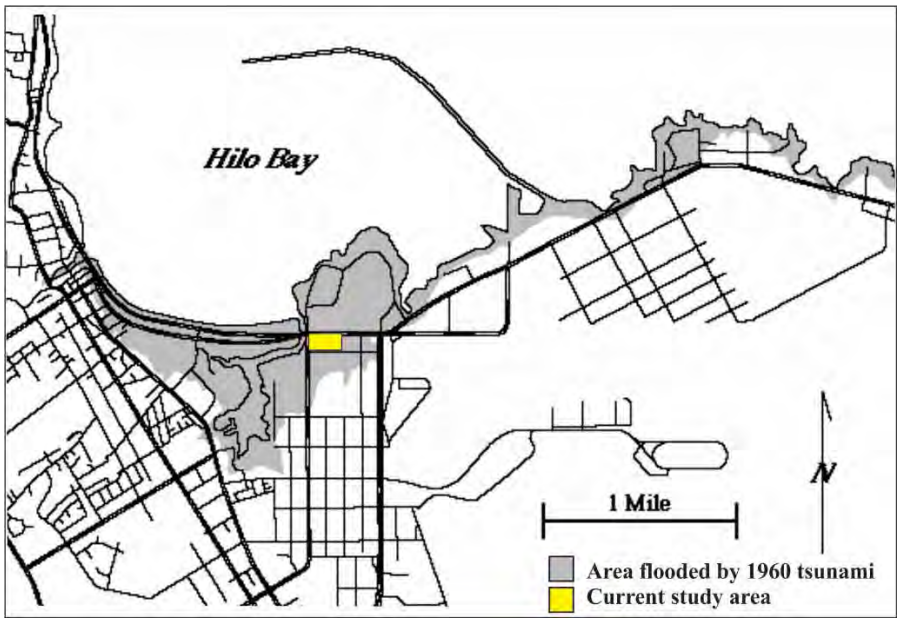

Figure 21. USGS map from http://hvo.wr.usgs.gov/volcanowatch/archive/1994/ showing area flooded by 1960 *tsunami* and current study area highlighted in yellow.

Figure 22. Intersection of Kamehameha Avenue and Manono Street after the 1960 *tsunami* (northwest corner of current study area).

Hilo Daijingu

In 1898, Kakuta Koshi completed building a Shinto shrine known as Yamato Shrine on Pi‘opi‘o Street in Hilo. His successor, Jikko Koshi took over in 1902 and changed the name of the shrine to Hilo Daijingu in 1903 (Hilo Daijingu 2000). In 1926, the membership of the Shrine desired to rebuild the Shrine on fee simple land, and in 1928 the Hilo Diajingu shrine (Figure 23) was built near the corner of Manono Street and present day Kuawa Street in the southwest portion of the current study area within the Napeahi LCAw. According to Kobayashi and Nakamura (2008), there was a sumo ring next to the Shinto shrine, where amateur wrestlers could be seen practicing throughout the week and goodwill tournaments were held between locals and visiting Japanese sailors. In 1941, the U.S. government seized the shrine and its lands and interned the head priest, Rev. Isamu Kudo before repatriating him to Japan (Hilo Dainjingu 2000). In the absence of a head priest, no activities were conducted by the shrine from 1941 until 1955, at which time the shrine’s lands were returned and an interim head priest, Rev. Chonosuke Kanno was appointed (personal comm. Richard Kunimoto 4/27/2015). Rev. Kanno was replaced by Rev. Miyazaki in 1959 and shortly thereafter, the *tsunami* of 1960 destroyed the shrine buildings. However, Rev. Miyazaki fled inland and was able to rescue the sacred objects (Goshintai), which were then enshrined in Onomea until 1966, when the Hilo Daijingu was rebuilt at their current location on Anela Street in Hilo.

Figure 23. Opening day celebration at Hilo Daijingu shrine ca. 1928 (within current study area), looking east from the Wailoa River.

Summary of Land Transfers within the Study Area between 1912 and 1965

The current study area has a somewhat complicated land use history. The following summary of land ownership was derived from an extensive review of historical material and includes specific references to Grant numbers in addition to Copy of Survey Furnished (CSF) and Land Court Application documents. One of the earliest land exchange deeds covered the transfer of 290,102 square feet of land from the Territory of Hawai‘i to the Hilo Railroad Company in 1912 (CSF 08359).

Other land transfers and acquisitions coincided with roadway construction and improvement projects. The present day Kamehameha Avenue was known as Front Street in the early 1900s. In early 1915, Daniel Namahoe received Grant 6336 consisting of 17,042 square feet of government land “along the new south side of the Front St. extension” (CSF 02564) located along the eastern boundary of the Mahoe *kuleana* property, perhaps in exchange for the Front Street extension project encroaching on the Mahoe *kuleana*, which would suggest that Mahoe and Namahoe are the same family. Other transactions within the study area associated with the Front Street extension project included Grant 6980 to Meliaka Kailanu, 11,642 square feet of land along Front Street, across Puhala Lane from Daniel Namahoe’s property (CSF02783); and Grant 6981 to Kue Kaaiwela. 17,847 square feet of land neighboring Meliaka Kailanu’s property to the east (CSF 02784). All three properties are shown on a 1916 survey map (Figure 24). M. Kailanu’s property was later purchased by George Lonohiwa Machado in 1952 (Land Court Application 1650). Mr. Machado and his wife Louise McGregor Machado also purchased K. Kaaiwela’s property that same year (Land Court Application 1651).

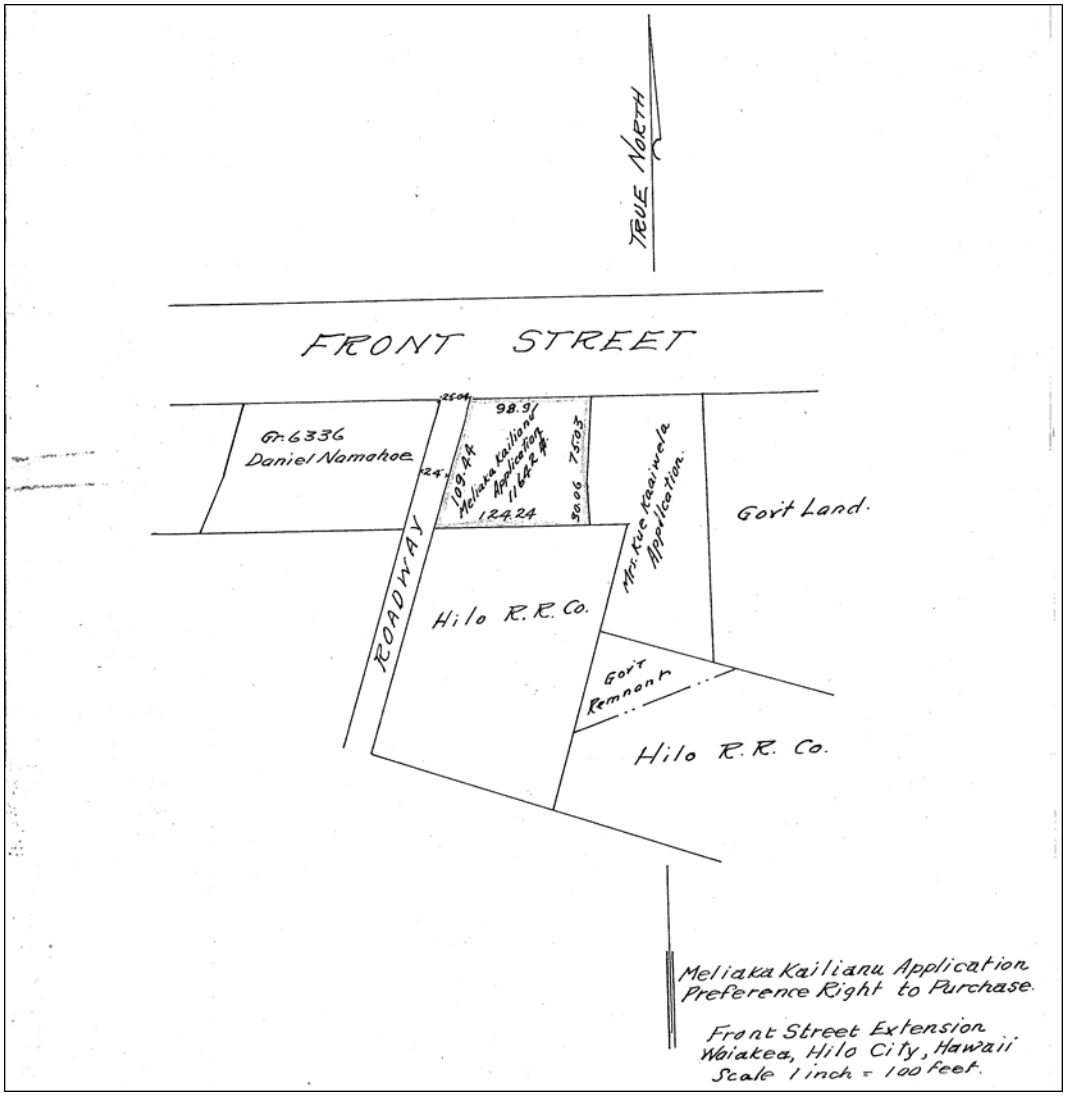

Figure 24. 1916 survey map of properties along Puhala Lane within study area (CSF 02783).

In October of 1916, a 24 foot wide strip of land (0.126 acres) was set aside for the construction of a roadway from "Waiakea Road to Front St. Extension" (CSF 02716), which included portions of LCAw. 1E to Mahoe and LCAw. 4004 to Hale. This short, curved roadway predates Manono Street and connected the southern edge of the Waiākea Rail Yard to Front Street (Figure 25).

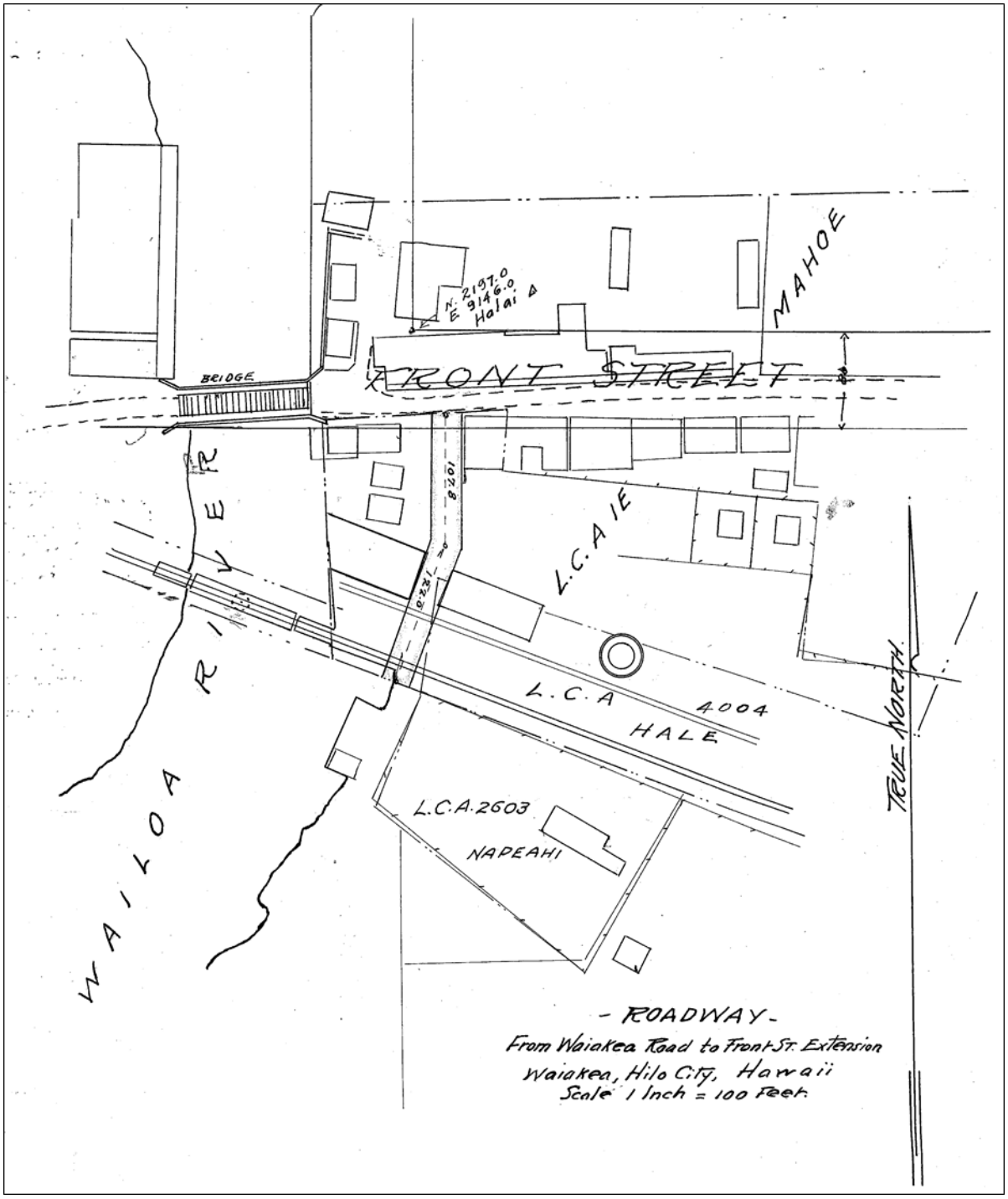

Figure 25. 1916 survey map of proposed roadway at western end of study area (CSF 2716).

In March of 1917, 50,557 square feet of land at the northwest corner of the study area was set aside for the development of a Public Park and Play Ground at Front Street (CSF 02771). The location of this park was corroborated by informant Donald Leopoldino who recalled that there was a county park right outside his back door (see Consultation section for more details).

In the summer of 1923, Matson Navigation Company exchanged 832 square feet of land (CSF 03991) at the southwest corner of the study area for two government remnants: Grant 8289 Parcel 1 totaling 377 square feet (CSF 03989) and Grant 8289 Parcel 2 totaling 457 square feet (CSF 03990) from the Territory of Hawai‘i. This land exchange was conducted in order to provide lands for the Manono Street extension project, which extended south over the Wailoa River from Kamehameha Street and overlapped with the earlier roadway mentioned above. Both of these government remnants bordered the Napeahi *kuleana*, which according to historic survey maps by 1923 was owned by the Matson Navagation Company (Figure 26).

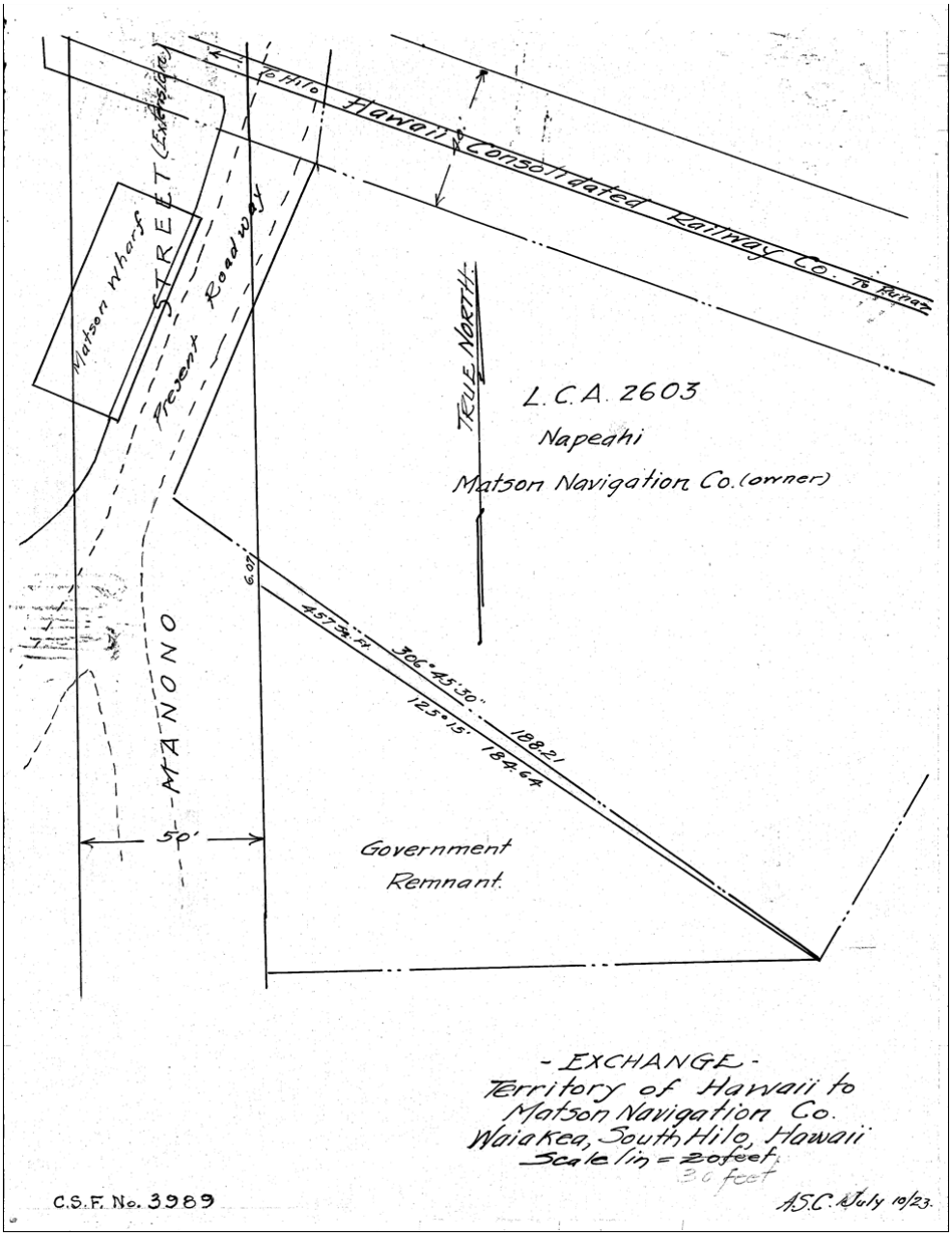

Figure 26. Survey map dated 1923 identifying exchange deed lands in southwest corner of the current study area (CSF 3989).

The former Napeahi *kuleana* seems to have changed hands within the next 5 years, as a survey map dated October 18, 1928 associated with the Hilo Daijingu (J. Koshi) lease application indicates the name "M. Ishibashi" as the owner of both the Napeahi *kuleana* and Grant 8289 parcel 2 (Figure 27).

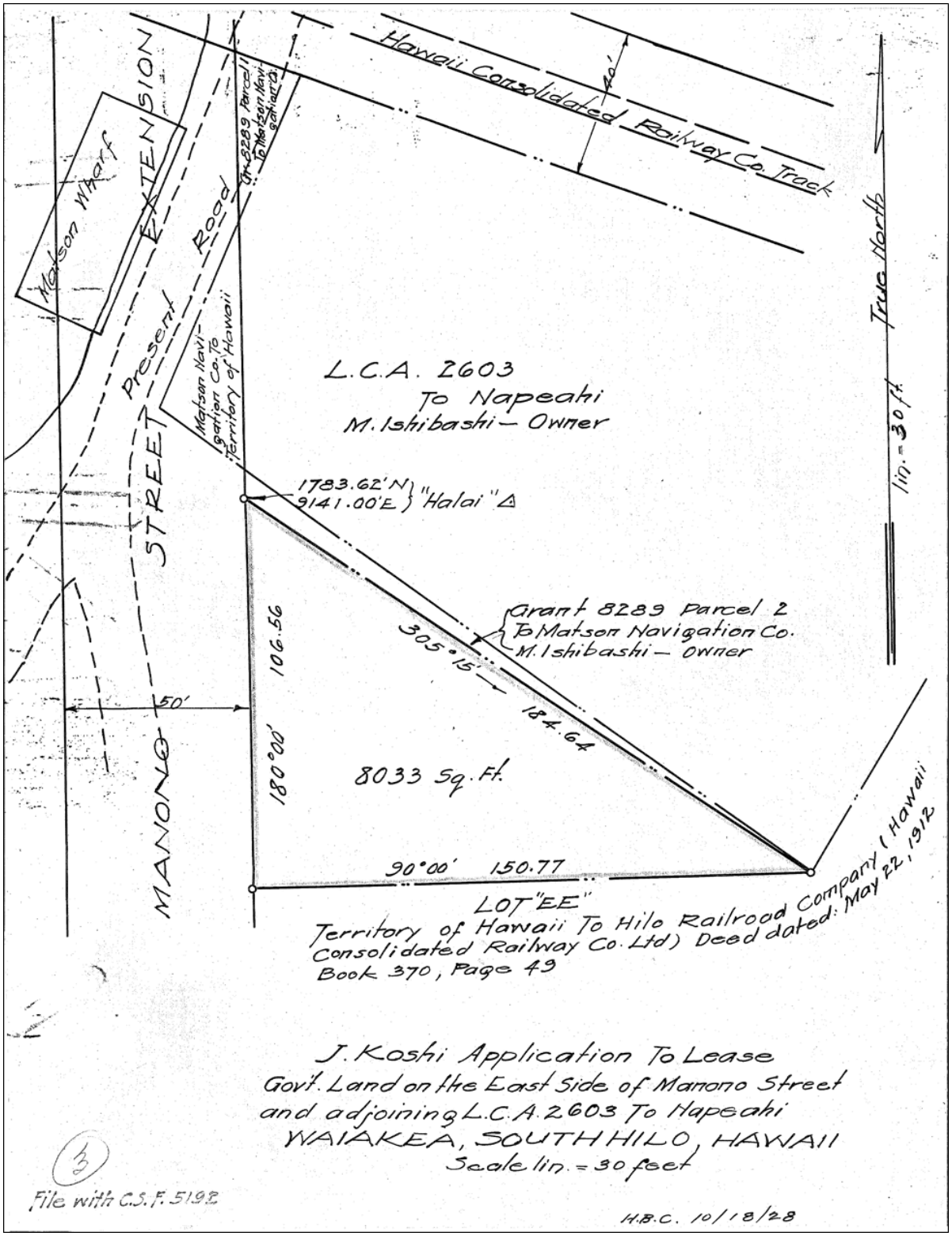

Figure 27. Survey map dated 1928 that accompanied J. Koshi's application to lease (CSF 5192).

In October 1928, J. Koshi applied to lease 457 square feet of land (Grant 8289 parcel 2) in conjunction with an additional 8,033 square feet of government land to the south (CSF 05192). J. Koshi was likely Jikko Koshi, the second *guuji* (high priest) for the Hilo Daijingu and founder of its Japanese elementary school. Then in June 1931, Tomoichi Machida, trustee for Hilo Daijingu Temple, purchased these properties (Grant 9993) at auction "for church or school purposes" (CSF 05192).

The portion of the Mahoe *kuleana* (LCAw. 1-E) within the current study area was also subject to land rights/ownership transfers. Beginning in 1936 by William Hardy Hill, and finalized in 1945, a portion of the Mahoe *kuleana* totaling 17, 516 square feet was subdivided into three lots, under the ownership of Ouida Hill, through the Land Court of the Territory of Hawai'i. The three lots coincided with the buildings that made up the storefronts on Kamehameha Avenue at the west end of the study area.

On September 16, 1947, Hawai'i Consolidated Railway Ltd. surrendered a total of 47.098 acres, "Excepting and reserving therefrom all of R.P. 2756, LCAw. 4004 to Hale containing an area of 4.849 acres, more or less and LEAVING A NET AREA OF 42.249 ACRES" (CSF 10476). The surrendered lands had all been acquired by the Hawai'i Consolidated Railway from the Hilo Railroad Company in 1903 and 1912. On July 10, 1948, Hawaii Consolidated Railway's trustee, Hawaiian Trust Co., transferred ownership to the Territory of Hawai'i (Land Office Deed 8456) of all the surrendered lands. Shortly thereafter, Grant 11652 returned four parcels of land to the Hawai'i Consolidated Railway as part of the tidal wave land exchanges (CSF 10602). Three of these parcels (totaling 0.28 acres) fell within the current study area.

In 1951, a portion of the property formerly owned by Hawaii Consolidated Railway Ltd. within the current study area was divided into 23 lots by a private owner, Shigeru K. Oda, for a proposed subdivision. The map submitted for the subdivision of the land (Figure 28) included a proposed 40 foot roadway over the former tracks, which eventually became Ulu Street. Once the subdivision proposal was approved new TMK parcel numbers (3) 2-2-032:036-058 were assigned to the corresponding 23 lots (Figure 29).

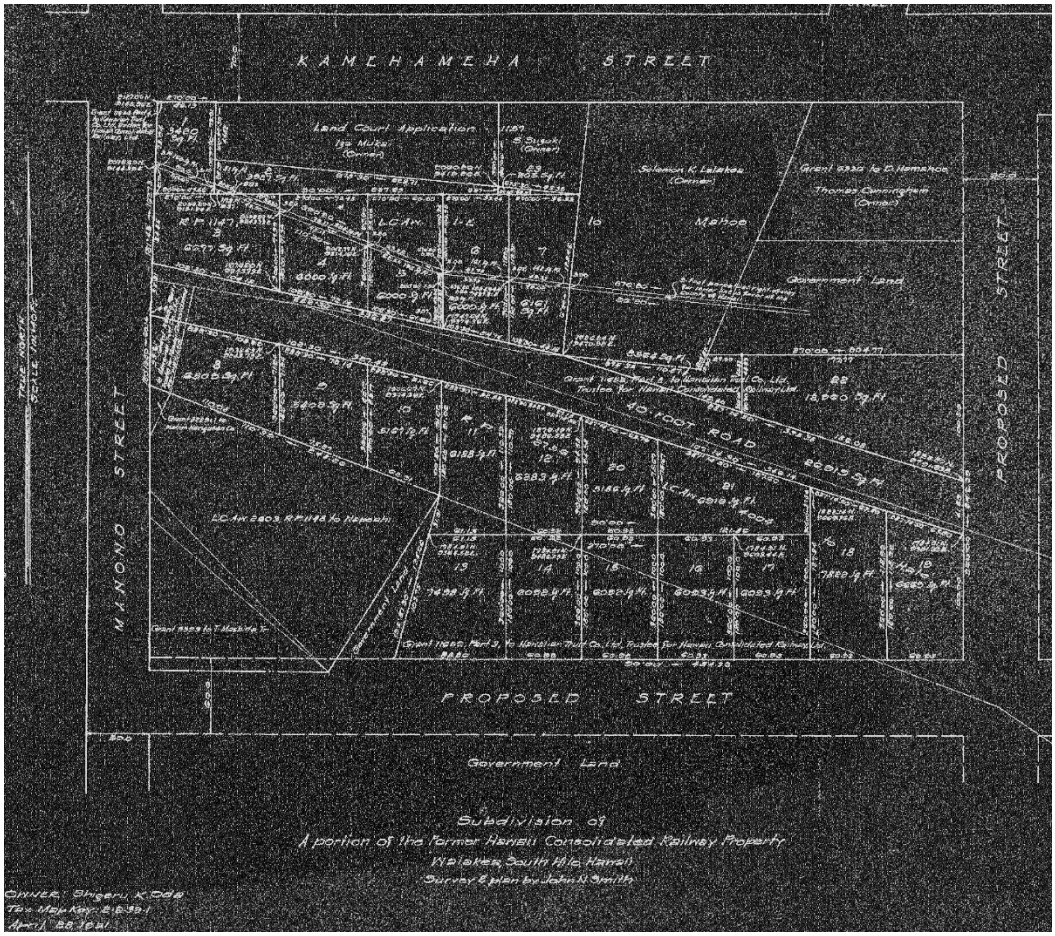

Figure 28. 1951 subdivision map of the current study area.

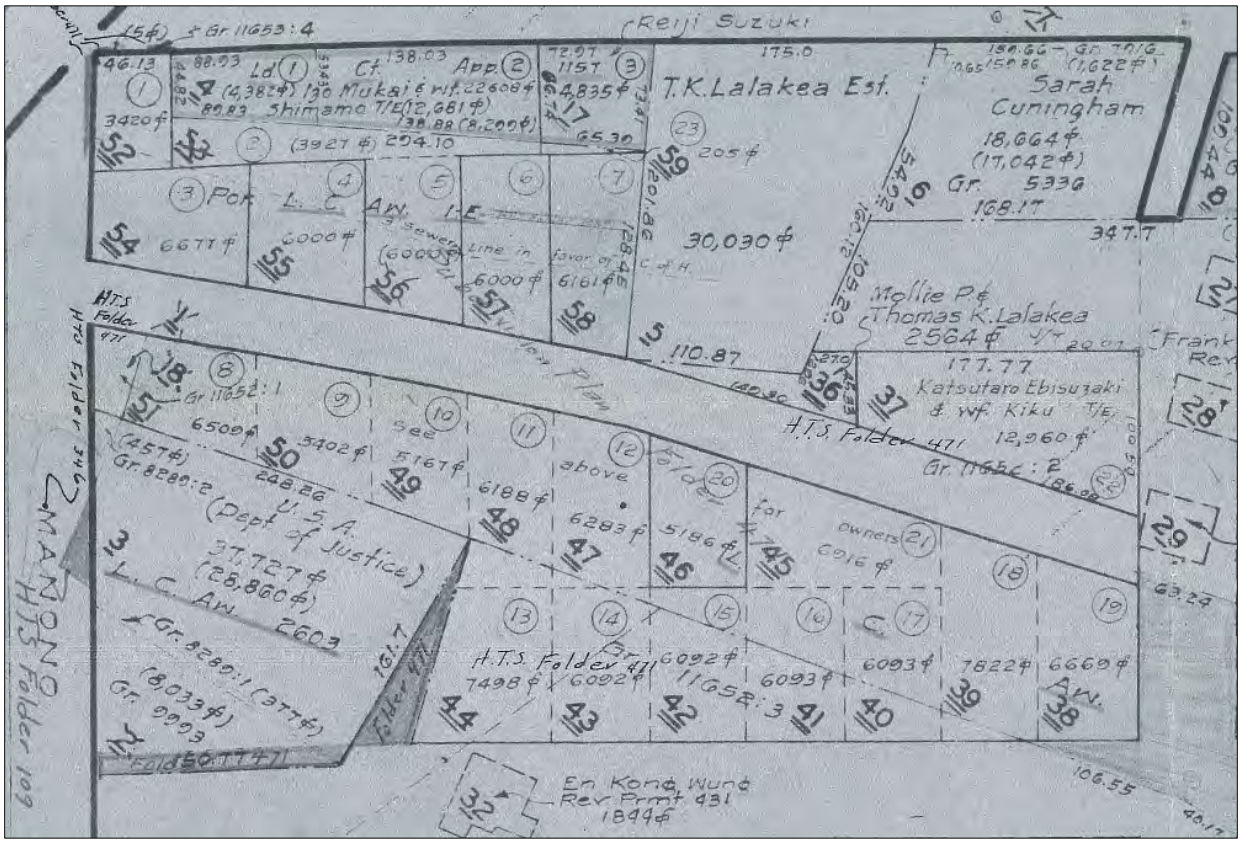

Figure 29. Portion of 1950s TMK: (3) 2-2-032 showing subdivided parcels.

According to a Territory of Hawai‘i Field Book Land Sheet, the parcel owned by Hilo Daijingu (inclusive of the former Napeahi *kuleana*) became property of the Office of Alien Property of the United States Department of Justice; ownership was not restored to Hilo Daijingu until 1955. These records support information gathered from a history published as part of the Hilo Daijingu’s centennial celebration in 2000, which states that the Daijingu property was seized on December 7, 1941 and that the shrine itself remained under the jurisdiction of the United States Army until the Enemy Alien Property Agency took over ownership sometime after 1946. The owner of the property is clearly marked as U.S. Dept. of Justice in the 1950s TMK (see Figure 29). These details were further corroborated by informants, see Consultation section below for further information. Four years after the Hilo Daijingu got the property back they were part of a minor land exchange with the Territory of Hawai‘i that resulted in the creation of Kuawa Street in 1959 (CSF 12993, 12994) shortly before the 1960 *tsunami*.

During 1962 and 1963, the County of Hawai‘i exercised eminent domain and acquired numerous parcels of land as part of the Hawaii Redevelopment Agency’s Kaiko‘o Project. Figure 30 shows how the current study area was divided into parcels and blocks as part of the redevelopment project. In 1965, the Hawaii Redevelopment Agency published an amended urban renewal plan for their Kaiko‘o Project (No. Hawaii R-4), which focused on the land affected by the1960 *tsunami*. The purpose of the Kaiko‘o project was to:

> … designate lands within the Project Area for such reuse as will minize 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)

In a collaborative effort, the Hawaii Redevelopment Agency, the State Department of Land and Natural Resources, and the County of Hawai‘i, focused on disaster clearance and redevelopment of the Kaiko‘o Project area, also referred to as the “Urban Renewal Area.” Project activities included the following: 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.

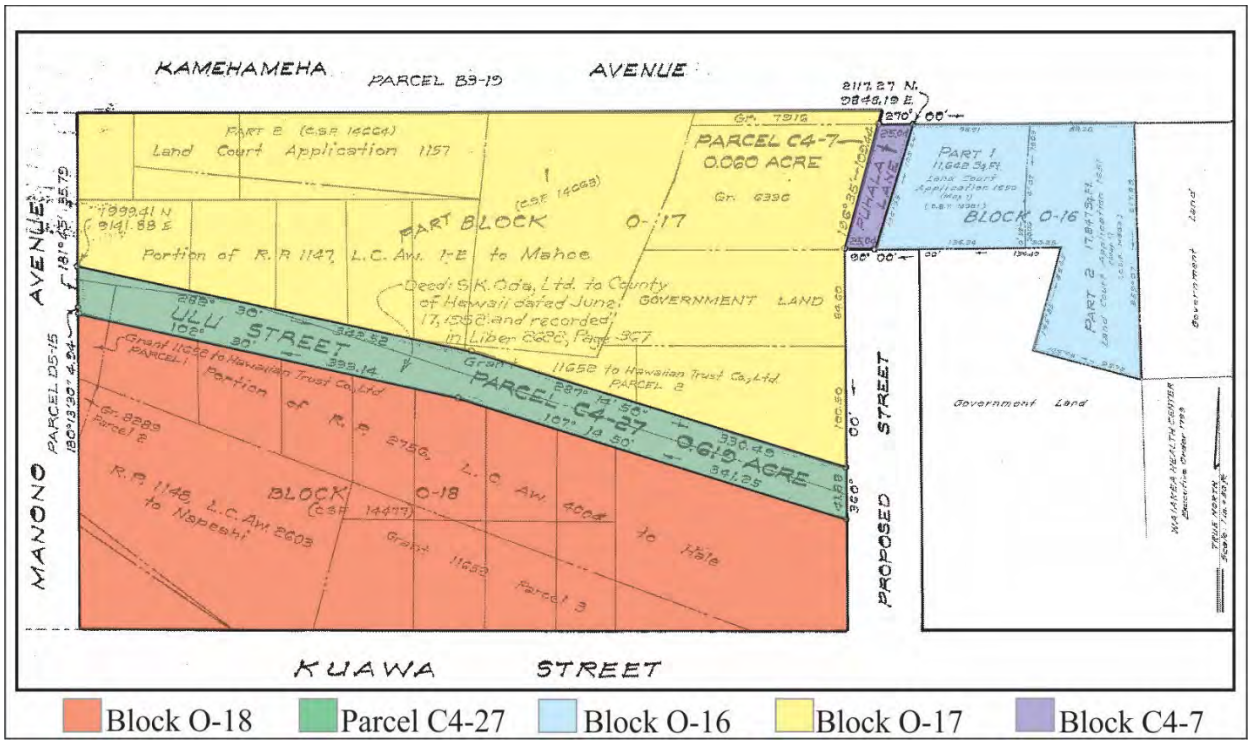

Figure 30. Composite of survey maps dated 1965 showing the land within the current study area as acquired by State of Hawai‘i for Kaiko‘o Project.

All lands within the 349 acre Urban Renewal Area (Figure 31) were designated as either Elevated Areas or Open Areas. Elevated areas, were determined to be high enough above sea level to afford “a reasonable degree of protection or safety” from severe destruction from a *tsunami.* Elevated areas were zoned for commercial use exclusively with residential, manufacturing, and industrial use strictly prohibited. The lands deemed open areas had sustained the most damage during the 1960 *tsunami* because of their low elevation and proximity to the ocean. These open areas were zoned for limited commercial and industrial use, open use and temporary non-conforming use. Limited commercial use included structures that were built according to wave-resistant standards such as service stations, off-street parking areas, bus terminals and drive-in restaurants. Limited industrial use was limited to the Iron Works and commercial fishing and related activities. The current study area falls within the Open Area designation, which was limited to land uses that:

> . . . present minimum danger to human life or serious economic loss in event of future disasters, and shall include public uses such as parks and play grounds, botanical and cultural gardens, golf courses, swimming pools and other recreational facilities provided by government agencies or concessionaires thereof… (Hawaii Redevelopment Agency 1965:6)

Temporary non-conforming use was intended for those structurally sound buildings in open areas that managed to remain standing after the 1960 *tsunami* and whose operations or function made vital contributions to the local economy and the community. The restrictions and requirements of the Kaiko‘o Project regarding land use and building requirements were to be binding upon all purchasers and lessee of the lands within the project area for 35 years from the date of sale or lease of the first parcel of land sold or leased by the Agency in each land use category.

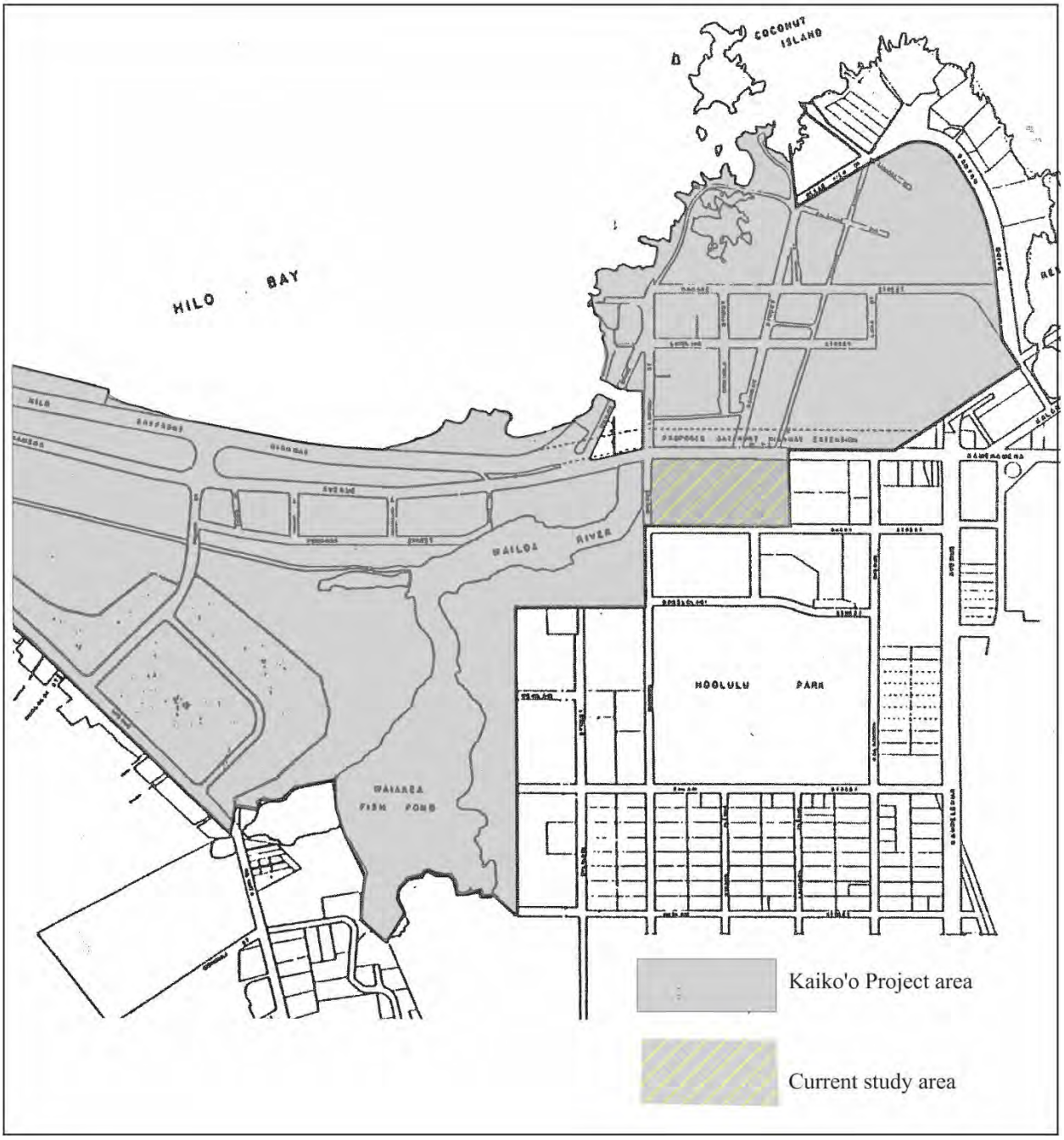

Figure 31. Hawaii Redevelopment Agency's Kaiko‘o Project boundary shaded gray with current study area shaded yellow.

3. CONSULTATION

Informants were selected based on their personal connection to the land within the current study area. In addition to gathering their memories related to the study area, a primary focus of the interviews was to elicit each informant's reaction to the proposed project.

Six individuals participated in informal (unrecorded) "talk story" interviews conducted by one or both authors between April 23, 2015 and May 11, 2015. Historic maps and photographs were provided to the informants, when appropriate, in order to facilitate discussion of the study area and proposed development. Detailed hand-written notes were taken during each interview and in some cases the informants provided additional historic resources to the interviewers in the form of books and images. Following each interview, the authors typed their handwritten notes and reviewed them for any gaps in information that might necessitate a follow up inquiry; follow up contact was made when necessary. Upon completion, the interviews were summarized for inclusion in the current report.

The six informants included a former employee of the Hawaii Consolidated Railroad (Roy C. Wilson), two former residents of Waiākea Town (Gloria Kobayashi and Donald Leopoldino), a member of the Hili Daijingu congregation (Richard Kunimoto), and two descendant of original LCAw. *kuleana* recipients Napeahi and Hale (Terri Napeahi and Earl Veloria, respectively). A seventh individual was also contacted (Tom Goya) whose historical expertise was more associated with the Shinmachi region of Hilo and he simply offered that the history of the proposed project area should be incorporated into the proposed park development.

ROY CLARENCE WILSON

Born Shotaro Suzuki on August 8, 1920 to a Japanese father and half Hawaiian/half Caucasian mother, Roy Wilson worked for Hawaii Consolidated Railway Ltd. from 1939 until 1946. Shotaro's years with the railway began in Kukaiau, where he worked as a section man, repairing track for six months. He was then transferred to Kapoho in March of 1940. In early 1941 he became a brakeman and ticket conductor for the Puna-Hilo runs, based out of Kauleau. In 1944 he moved to Hilo and continued alternating between working as a ticket conductor on the passenger motor coach wagons (Figure 32) and as brakeman on the big trains. Between 1944 and 1946, the Waiākea Rail Yard was the place where Shotaro would start and end his three routes or 'runs': the Puna run, the Hakalau run and the wharf run. In 1944, Shotaro Suzuki changed his name to Roy Clarence Wilson in order to continue working the wharf run because wharf access was denied to people of Japanese descent during the WWII era. The name change process took only four days and allowed him to continue working the wharf run until Hawaii Consolidated Railway Ltd. dissolved in 1946. Today, Roy is a revered *kupuna* always eager to talk story with people interested in the history of the railroad.

Figure 32. Roy C. Wilson conducting his rail bus (motor coach and wagon) ca. 1945.

Regarding Hawaii Consolidated Railway Ltd., Roy recalls that most of the workers were of Hawaiian and Portuguese descent. Within and adjacent to the current study area, Roy described the following facilities (Figure 33): a dead end sidetrack at the west end of the yard that was utilized as storage where up to ten railroad cars could be parked when they were not in use; the main office where employees picked up their paychecks; the commissary; and the concrete flagpole foundation, which Roy said was whitewashed.

According to Roy, the following people lived at the HCR residences between 1944 and 1946 (see Figure 33): Shusei Kondo, one of two yard men who was responsible for operating the swing bridge that was cranked into position by hand for boats to pass and for trains to cross the Wailoa River; Herbert Watson who was the master mechanic and lived in the northernmost residence on Puhala Lane, even after he retired; Robert Stevens who eventually took over as master mechanic; Frank Tavares who was the warehouse supply master, and as Roy explained "he got you everything you needed" including parts for the engines and cars, etc.; Stanley Can who was a mechanic and machinist; and Dan Correa who was foreman for the wharf operation and who was swept away (never to be found) by the second wave of the 1946 *tsunami* when he returned to the rail yard from the bay front to turn off the switch that controlled the electricity to the yard.

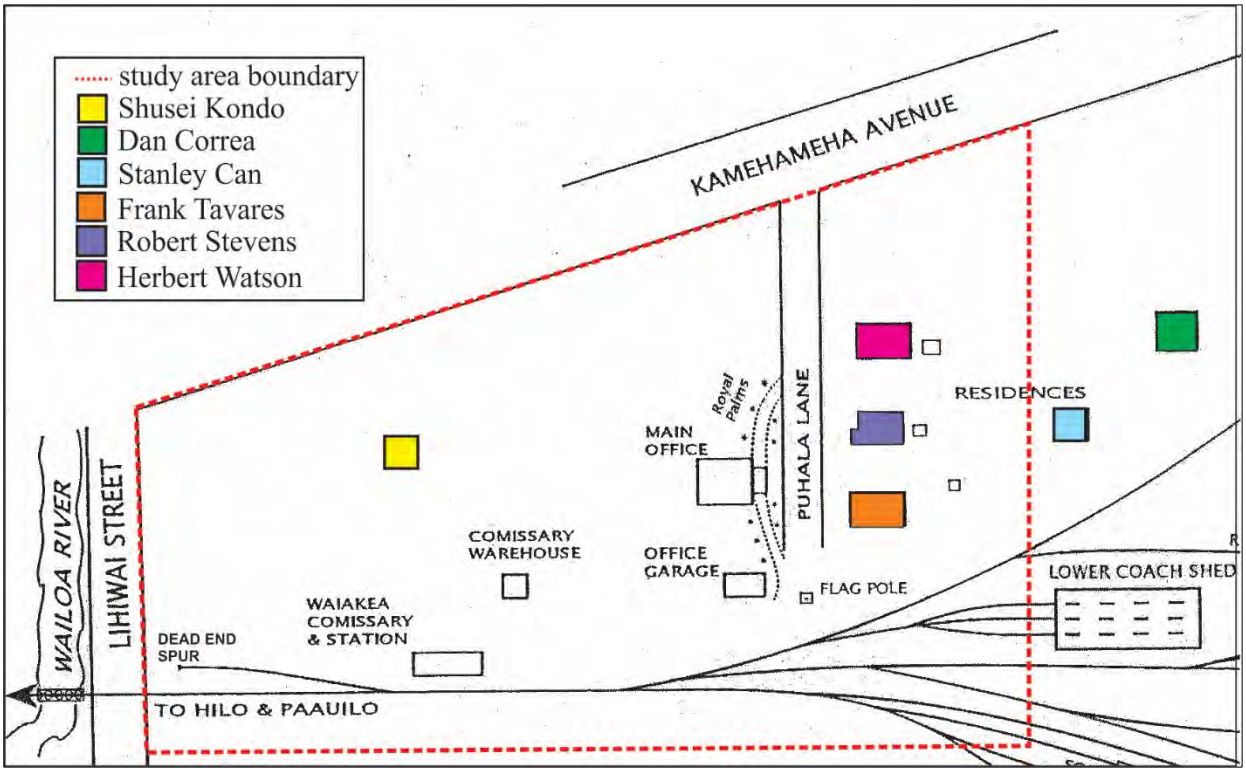

Figure 33. Waiākea Rail Yard detail showing residents from 1944-1946 as per Roy C. Wilson.

With respect to the terrain within the current study area, Roy stated that Hawaii Consolidated Railway Ltd. graded the land before laying track as early as 1899. Additionally, when they rebuilt the bridge higher for the scows to pass under, the west end of the current study area was filled in with sand dredged from the river and waterfront. According to Roy, when the tracks were still present with the study area the terrain west of the commissary was mostly fill while the area to the east of the commissary was *pāhoehoe*.

When asked how he felt about the county developing a park on this land he said he thought it was a good idea. In particular, Roy stressed that if the land is getting used then they would have to maintain it. He suggested that the flagpole is the only remaining evidence of the railroad within the current study area, and that it should preserve and keep it from deteriorating. He also made the following recommendation for the flagpole: "dress it up with gravel or flowers around the edges with a plaque or something that should mention how the railroad got started in the 1880s and about it".

GLORIA KOBAYASHI

Gloria Kobayashi is a retired librarian and active historian, and was born Gloria Miyashiro in 1946 to Hawaiian-born parents of Okinawan descent. Her mother was from O‘ahu and her father from Hakalau. Her grandparents had originally come to Hawai‘i to work the sugar plantations. Her father, Richard Miyashiro, was studying in Honolulu at the time of the attack on Pearl Harbor. As a result, he enlisted with the 100th Battalion and served in Italy. After the war, he returned to Hawai‘i and moved to the Big Island because his brother was already set up in Hilo with a restaurant business. On January 21, 1946, Gloria’s father started his own restaurant in Waiākea Town (Figure 34), that he called Café 100 in reference to his military Battalion. Café 100 was located at the corner of Manono Street and Kamehameha Avenue, at the northwest end of the current study area.

Figure 34. Baby Gloria in her father’s arms in front of the original Café 100 storefront ca. 1947.

Gloria’s mother was six months pregnant with her when the *tsunam*i struck on April 1, 1946. She and her mother were carried to safety from the Wailoa Bridge to higher ground by a kind stevedore. In the aftermath, her family repaired the damage to the cafe and her two sisters were born shortly thereafter. Gloria and her family lived above Café 100 until she was 13 years old. In 1959 they moved into a brand new three bedroom house at the corner of Ulu and Manono Streets, just north of the Hilo Daijingu shrine, near the southwest end of the current study area. Her father built a brand new location for Café 100 (Figure 35), which celebrated their Grand Opening three short weeks before the 1960 *tsunami*.

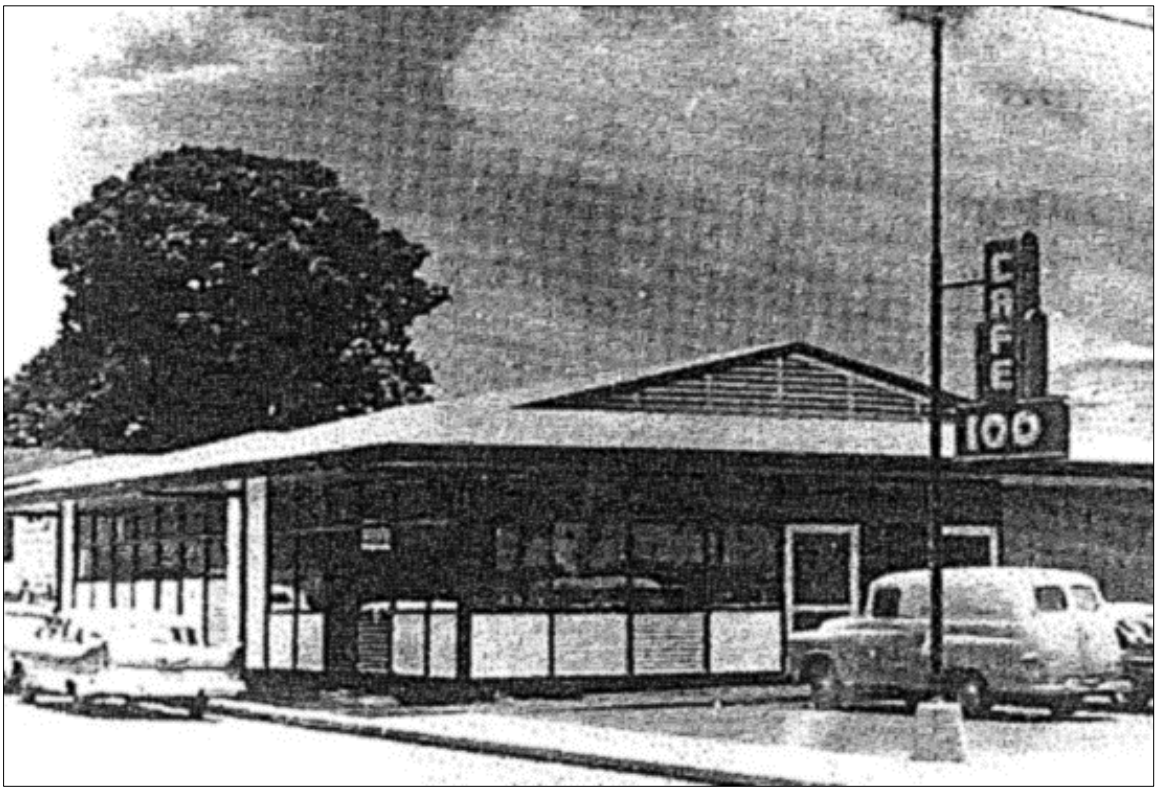

Figure 35. Café 100 at corner of Ulu and Manono Streets on May 1, 1960.

On May 23, 1960, Gloria's family decided not to evacuate in response to the *tsunami* warning because they had experienced a false alarm a few weeks before. As a result, Gloria and her family were home when disaster struck. A large wave broke the picture window in the living room of their home, and as the house filled with water the *tsunami* lifted it off its foundation and "turned it into a boat." Gloria said that her parents had gone down to the Wailoa River to look at the waves and had run back after they saw the water receding. They arrived just before the house began its slow ride on the water. Of that fateful night, Gloria writes in her memoir *Our House Became a Boat,* published as part of her edited volume *Aloha ʻĀina Volume II: More Big Island Memories*:

> It was a dark and scary night of waiting until the Red Cross volunteers came to rescue us around three o'clock that morning. In the darkness, we climbed out my bedroom window and into row boats. (2014:118)

The *tsunami* destroyed the new Café 100 building and everything inside. Although a devastating loss, the restaurant building had acted as a buffer between the surge from the Wailoa River and Gloria's home and as a result, it saved their lives. By August of 1962, Gloria's father had rebuilt Café 100 for the third time at its current location at 969 Kilauea Avenue. Today the Café 100 legacy is being carried on by Gloria's son Rick. Gloria's family home survived its night as a boat and was relocated to Iwalani Street, where it remains to this day.

When asked about the proposed park, Gloria responded that she thinks it is a good idea and that the land is just sitting there doing nothing today. She mentioned that there is a need for more places for kids to play. As a historian she would like to see a historic element included in the park project. The following words she read out loud from her edited volume during her interview sum up her feelings for the current study area:

> I recently walked the same stretch of sidewalk that used to front most of the businesses in Waiākea Town. It took me only six minutes and 320 steps to walk the entire block while the noisy traffic of the four-lane Kamehameha Avenue whizzed by. Gone are the buildings, businesses, and people of my childhood home town. Only the Wailoa River remains. Kept safe in its ever-flowing dark waters are my memories of Waiākea Town. (2014:119)

For her *Yashijima Story* book (Kobayashi and Nakamura 2008), Gloria put together a map of the Waiākea Town businesses from her own memories after 1957 and from oral histories she collected that spanned from 1924 until the *tsunami* of 1946. The map is reproduced below (Figure 36) in its entirety.

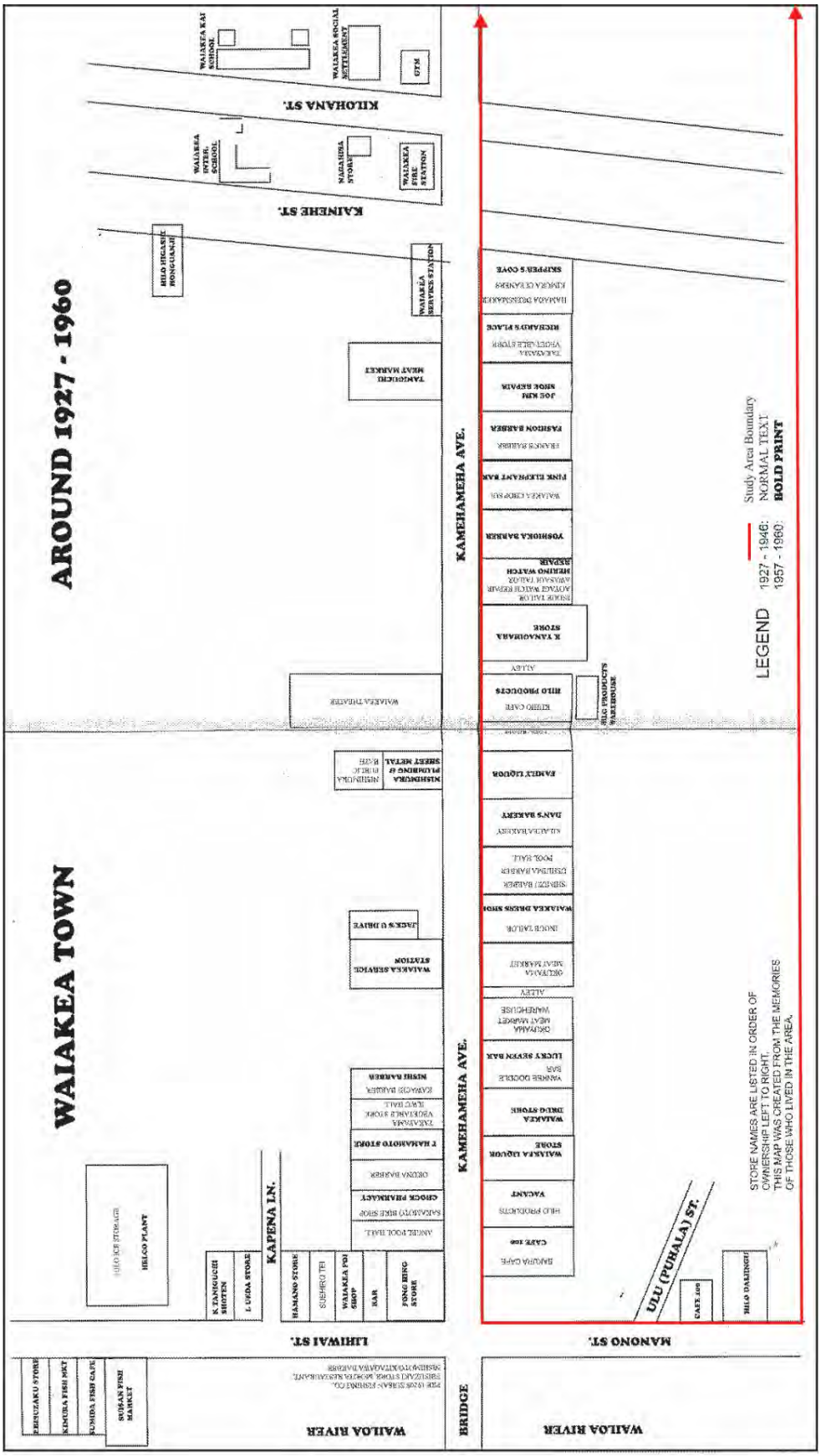

Figure 36. Map form Kobayashi and Nakamura (2008:36-7), current study outlined in red.

DONALD "LEO" LEOPOLDINO

Donald Leopoldino was born in 1935 at the Board of Health in Waiākea Town to parents of Portuguese descent. His mother was from Pāhoa and his father from Pa‘auilo. His father, Manuel Leopoldino, worked as an engineer/engine operator for the railroad and his family lived in a three bedroom house, at the east edge of the Waiākea Rail Yard, immediately adjacent to the current study area. Donald lived with his family in that house until he enlisted in the service at the age of 23. He served two years in Korea and while overseas he was given the nickname "Leo." Leo is able to tell how people know him based on the name they use; if they call him Donald, they knew him from his days in Waiākea Town; if they call him Leo, they know him from his post military days. Leo returned to Hilo at the age of 25 and moved in with his fiancée's family. At the age of 27, he and his wife started their own family. Today, he is retired after having passed his local business Leo's Rubbish Service to one of his sons.

According to Donald, the population of Waiākea Town was mostly Japanese and Portuguese. He attended Waiakeakai Elementary school on the north side of Kamehameha Avenue (see Figure 36). In 6th grade Donald acted as a Junior Police Officer crossing guard for the elementary school and he recalls that Kamehameha Avenue was only one lane across at that time. The Waiakeakai Elementary school was close to a Japanese school and during WWII the U.S. military took over both schools. As result, the students did not attend classes for one year and the following year classes were held in the Hilo Daijingu building that was located in the southwest corner of the current study area (see Figure 37). Leo recalls: "we learned to put on gas masks there."

Also during WWII, the railroad made improvised bomb shelters using empty tankers that were formerly used to transport fuel or molasses. They cut them in half and placed them over ditches. According to Leo, three of these shelters were arranged around the flagpole, one facing south, another east, and the last to the north about 50 feet from the flagpole. He recalled that "we would have to hide in there in the dark and just feel our way around." Leo also has fond memories of evenings spent around the Hawaii Consolidated Railway, Ltd. flagpole during the war. Kids and adults would gather after dinner from 7 o'clock until 9 or 9:30 to talk story. Occasionally the railroad Manager Mr. Laferty (Mr. "Lefty"), would bring them coffee with cream and sugar in "real glass Portugee coffee cups…3 times larger than regular teacups." Leo remembers Mr. Lefty as being very supportive of the workers and a good man to work for. When Leo's father lost his leg in a work-related accident, the railroad "sent him to the mainland for a new one." Leo recalled that most of the higher ranking positions at the railroad were held by "Portugee men" and that the section man was Japanese. He and his family used to shop at the commissary, which the locals referred to as "the station" even though it was really just a grocery store for the railroad workers and their families.

Leo was 12 years old when the 1946 *tsunami* struck Waiākea Town. He saw the first wave at 7 a.m. and recalls that, there were three waves. The waves were "very black" because they had churned up the sand on Black Sand Beach (now known as Bayfront). The waves derailed the train his father was on and he and the crew were forced to abandon it. They sought refuge in the Coca-Cola building, which was made of cement and tile and effectively "saved their lives." Leo had moved inland with his wife by the time the 1960 *tsunami* wiped out Waiākea Town. However his mother and father still resided in his childhood home. Leo and his brother waded thru waist deep water to help his parents out of their house.

According to Leo, many of the homes on Iwalani Street between W. Puainako Street and W Kawailani Street belong to people he refers to as "Waiākea Town transplants." These people either lost everything in the 1960 *tsunami* and rebuilt there, or had their homes picked up and moved to a safer inland locale at a significantly higher elevation. Despite this mass relocation, Donald's mother and father continued to live in his boyhood home until they sold it in 1962. The house was originally built in Kapoho and rented to his father by the railroad for $10.00 a month. In 1946, his father purchased the house for $50.00 from the Hawaii Consolidated Railway, Ltd after they ceased operations. The family house was sold in 1962, and the new owners moved it to Kalanikoa Street where it is still present today (Figure 37).

Figure 37. Former Leopoldino house now located on Kalanikoa Street

Leo was able to recall most of the names of the businesses along Kamehameha Avenue from the 1950s, which coincides with the information on Gloria Kobayashi's map (see Figure 37). Donald was also able to provide information about structures to the east of Puhala Lane, which included duplex apartments owned by the Cunningham family, a Japanese run dairy distribution center, and a public park to the east of the current study area. Donald also recalled that there was a parking lot at the northwest corner of the current study area adjacent to the original Café 100 restaurant. According to Donald, the parking lot and all the storefronts were level with Kamehameha Avenue and he does not remember a hill at Manono Street. He thinks the scrubbing effect of the 1960 *tsunami* likely hollowed out the northwest end of the study area.

When asked about the proposed park project, Leo responded "that would be a beautiful thing." Leo refers to the flagpole feature as "the monument" and he has made efforts in the past to clean and preserve it. He recommends that the monument be protected and that the sports field park incorporate the name Waiākea Town or Waiakeakai.

RICHARD KUNIMOTO

Richard Kunimoto was born in 1941 and resided in Onomea. He became a member of the Hilo Daijingu congregation during the 1960s, when the *Goshintai* were relocated to Onomea and the shrine was rebuilt there as a result of the 1960 *tsunami.* He never saw the shrine at Manono Street but as an active member of the Daijingu, he was able to confirm some of its history. According to Richard, the residence and activity center were in one building and the *Goshintai* and shrine were in the other (Figure 38). He was able to corroborate that the building was used as a school for a time during WWII and that the U.S. military took it over. He also stated that there were likely no activities or ceremonies between the years of 1941 and 1955 because there was no head priest until Rev. Kanno took over as interim priest in 1955. When asked about the geographic origins of the Hilo Daijingu congregation he responded that members hail from across all 47 prefectures of Japan and Okinawa and that most members are third and fourth generation now. In addition to Richard Kunimoto, one of the authors also spoke with the current High Priest of Hilo Daijingu, Reverend Hotta, who is very eager to restore some of the shrine's history leading up to the devastation of the 1960 *tsunami*. The 1960 *tsunami* destroyed all of the earlier written records that were housed at the Manono Street facility. Reverend Hotta summed up the challenges associated with his efforts, "although we are the oldest shrine built outside of Japan, as far back as 1898, our history *begins* in 1960."

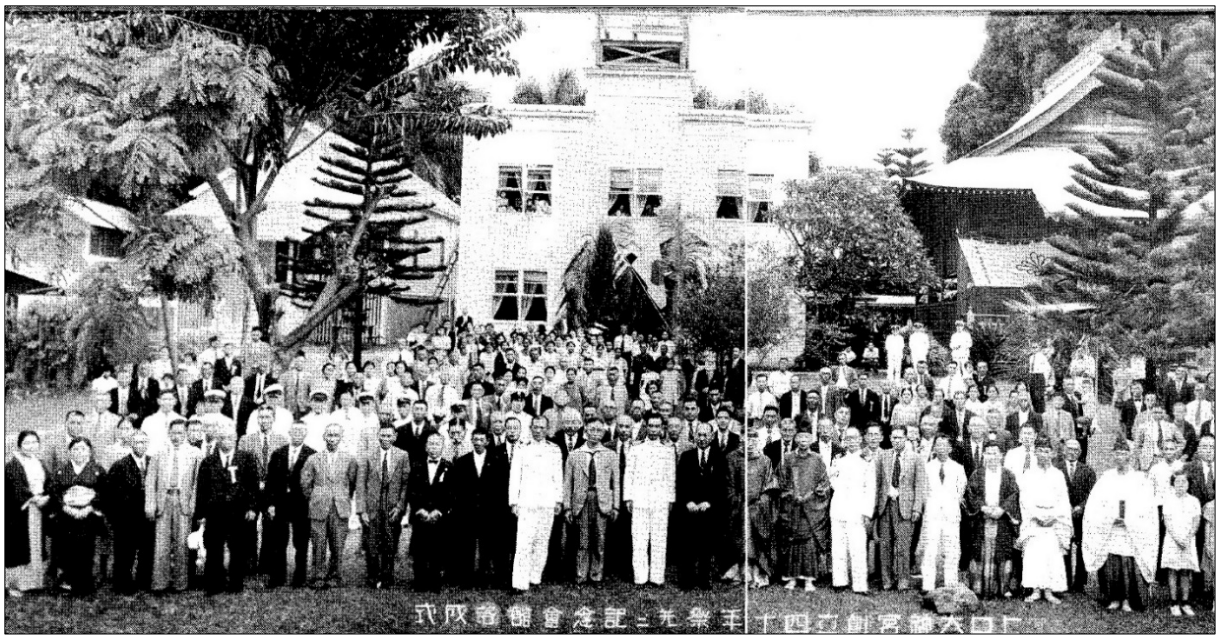

Figure 38. Hilo Daijingu buildings in 1939: activity center and residence (center) and shrine (at right) during the 40th Anniversary celebration, view from Wailoa River.

TERRI NAPEAHI

Terri Napeahi is a descendant of the original recipient of one of the three *kuleana* properties that fall within the current study area. Terri was born in 1961 to Hawaiian parents that trace their roots to the early days of Waiākea Ahupuaʻa. Terri's personal connection to the land and her ancestors remains strong. For the past twenty years Terri has been pursuing her family's history and in particular, seeking evidence of the Napeahi Family link to an ancient *heiau* known as Kuakaananuu, which was located on the shore opposite Mokuola (Coconut Island). According to family oral history, her ancestors were associated with the traditional activities that took place at Kuakaananuu Heiau (perhaps the same as Makaoku Heiau so dubbed by Hudson (1932) and earlier Thrum (1907)). Typescript notes in the Bishop Museum prepared by Theodore Kelsey in the early 1920s seems to match the Napeahi oral history with respect to this *heiau*:

> The heiau of Kuakaananuu, which formerly stood on the land of Makaoku was a pyramidal structure about sixty feet high perhaps, which was connected with the puuhonua of Mokuola. The stones were taken by Capt. Spencer in the sixties for a boat landing. The stones marking the site of the lua pa-u, or bone pit, may still be seen in the ground mauka of the big kamani tree. The victims were killed by two priests who stood on either side and dropped a heavy stone named Makaokuʻi ka lani, still preserved by and old man of Waiakea, on their chests, as they lay bound to the big square stone of Makaokuʻ, now at the end of the landing. They were then hung on the lele, or scaffold, for a day and a night, after which they were layed on a stone named Pohaʻ Kau, which for sometime lay just off shore a little to the left of the present Mokuola landing, but is now broken up, and covered the body with lau hulu, or dried banana leaves, during one or two nights of pule, after which the body was suspended from a double canoe and the body sprinkled with horse-tails of ahala, or the root of the hala, by two men. After this, about twenty days from the time of death, the body might be taken by relatives and holeholed, or stripped, when the flesh was thrown into the lua pa-u and bones taken to Kaulaʻinaiwi to dry. (Kelsey n.d.)

In addition to recording oral traditions of the Hilo area, Kelsey also took photographs of his informants. In one of his photographs (Figure 39), which was reproduced in Kelly et al. (1981:98), Kelsey depicts two Hawaiian men standing behind what appears to be Makaokuʻi Ka Lani (it is perhaps these men that shared information with Kelsey about Kuakaananuu Heiau and it is perhaps the older of the two who Kelsey is referring, when he states "still preserved by an old man of Waiakea"). When shown a copy of this photograph, Terri was able to identify the older taller man in the photograph as her great great grandfather George Kahilihiwa Kekaula and the other man as George's son-in-law and her great grandfather David Napeahi. Terri also identified the upright stone as Makaokuʻi Ka Lani, which is currently in her possession.

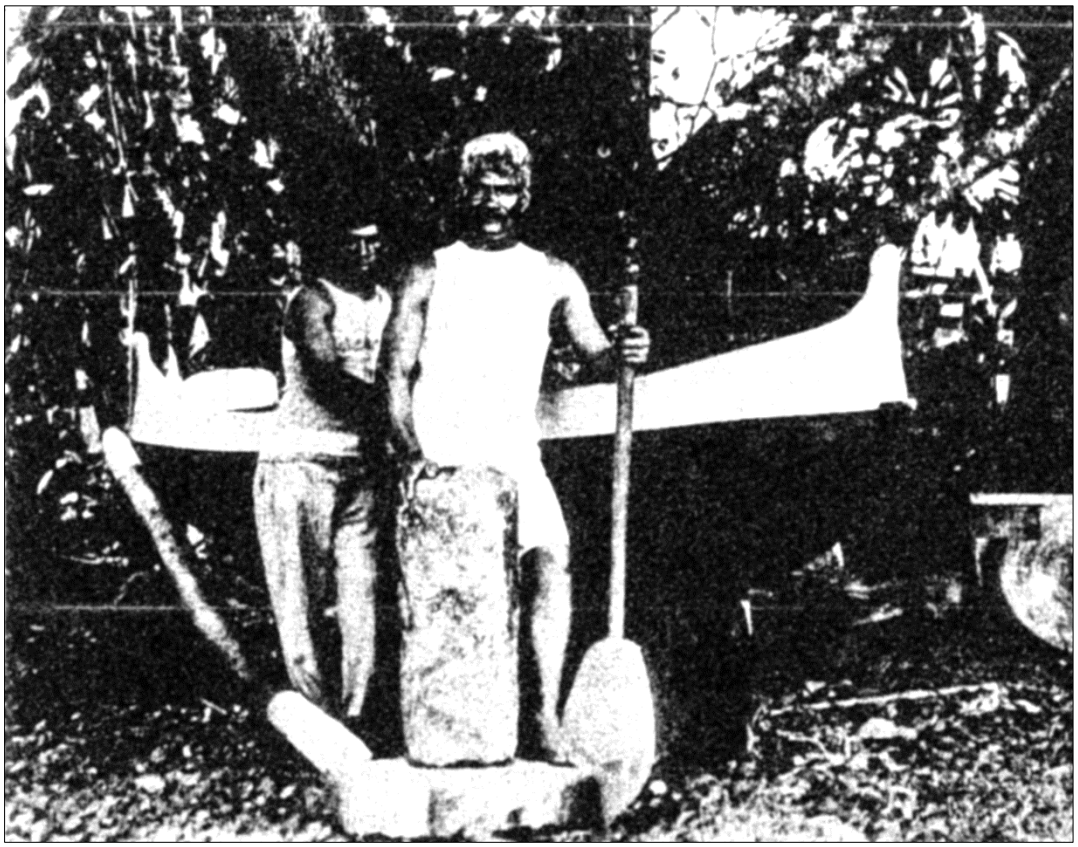

Figure 39. Kelsey photograph taken ca. 1920 showing stones from *heiau* that was destroyed when Capt. Spencer built a wharf at Waiākea in the 1860s (from Kelly et al. 1981:98).

Terri Napeahi's quest also led her to identify a pile of large water rounded stones, currently situated in the Wailoa Boat Ramp parking lot under a tree (Figure 40), as additional *pōhaku* from the former Kuakaananuu Heiau. These stones were moved to this location from the vicinity of the Mokuola parking lot when it was renovated, and she believes that these are some of the stones that her family oral traditions recount as be retrieved and curated.

When asked about the proposed park project, Terri was in favor of creating more sports fields for the community youth. She did express that the early history of the area (the use of the area by her ancestors) should be an important element of public interpretation associated with park development. She also requested that an area in a portion of the park in the vicinity of her family's former *kuleana* land be used for the establishment of a cultural preserve where all of the known *pōhaku*–including Makaokuʻi Ka Lani–from Kuakaananuu Heiau could be assembled, where interpretive material can be displayed telling the story of the events and practices associated with the *heiau*, and where Terri and others could exercise modern cultural practice.

EARL VELORIA

Earl Veloria was born in 1939 to Luka Hale and Esteban Veloria. Earl's parents lived in Earl's maternal grandfather's (Isaac Hale) house in Waiākea Town in the 1920s and 1930s. Earl's eldest brother Richard was born there in 1933, and the Hale family house was sold by 1938. This house was located on a remnant portion of the former *kuleana* parcel that was awarded to one of the Hale families ancestors (likely Earl's 4th or 5th great grandfather). Earl, the oldest of the living Hale family members, has no direct recollection of their former property; but knowledge that it existed, lives in the collective memory of his living siblings. Earl was interviewed during a brief phone call and he expressed no opposition when asked about the proposed park project.

Figure 40. Collection of water rounded stones directly across from the current study area in the Wailoa Boat Ramp parking lot.

4. STUDY AREA EXPECTATIONS

Based on location and elevation, the current study area falls within the Coastal Settlement Zone (Zone I) as defined by McEldowney (1979). Archaeological expectations for this zone include Precontact habitation sites, burial sites, ceremonial sites, and fishponds. *Māhele* records indicate that during the Precontact to Historic Period transition the study area was used for both residential purposes and for agriculture. Beginning in the late 1890, the study area saw rapid development as a rail yard with associated infrastructure. Throughout the twentieth century, the study area was developed with residential and commercial buildings, which were destroyed by *tsunami* events in 1946 and again in 1960. The intensity of the land use and natural disasters during the twentieth century would have had a significant impact on any earlier evidence of land use, and the mechanical cleanup following the 1960 *tsunami* no doubt obliterated the earlier twentieth century remains. The expectations for finding any intact archaeological resources are very limited.

5. FIELDWORK

Fieldwork for the current study was conducted on March 8, 2015 by Matthew R. Clark, B.A, Teresa Gotay, M.A, and Ivana Hall (UHH intern), under the supervision of Principal Investigator Robert B. Rechtman, Ph.D.

METHODS

Fieldwork consisted of a pedestrian survey of the entire study area augmented with six mechanically excavated test trenches. As the study area is clearly defined and vegetated with a mowed lawn and a few large trees, fieldworkers were afforded excellent accessibility and ground visibility. Upon completion of the surface survey, fieldworkers identified locations for the excavation of test trenches, visually monitored the excavation process, and inspected all back dirt for the presence of cultural material. The trench locations were selected based on a careful review of historic maps and photographs, which indicated the locations of former Land Commission Awards and previously existing structures. Test trenches (TT) were oriented in either a north-south or east-west direction; and each trench was 5 meters long by approximately 70 centimeters wide (one bucket width), with the exception of TT-5 that was truncated in length due to the presence of a water line. Soil was removed in approximately ten centimeter increments until bedrock was encountered. Following the mechanical soil removal, fieldworkers used hand trowels to better expose the trench floors and level off the trench walls in order to maximize the visibility of the soil horizons for photographs and stratigraphic profile drawings. Fieldworkers recorded and photographed all historical debris encountered during the mechanical excavation. Only two artifacts (intact glass bottles) were recovered from the excavations. These items were taken to the ASM Affiliates laboratory facility in Hilo where they were washed, described, photographed, and cataloged. The locations of the test trenches and recorded surface features were recorded with a Trimble Geo XH Geo Explorer 6000 series handheld GPS receiver and processed using Pathfinder software and ArcGIS to produce a study area map (Figure 41).

FINDINGS

As a result of the current fieldwork three surface sites (Table 2), all dating from the early to middle twentieth century were recorded. Two of these are remnant asphalt pavements (perhaps the former roadways Puhala Lane and Ulu Street) and the third is a concrete foundation associated with Hawaii Consolidated Railway. Subsurface testing did not reveal any intact buried cultural deposits or features from either the Precontact or Historic Periods. While Historic Period cultural material was encountered during the subsurface testing, an assessment of the stratigraphy indicates that the study area experienced a high level of prior ground disturbance and there were no intact deposits encountered.

Table 2. Sites recorded during the current study.

*SIHP Site #**	*Formal Type*	*Functional Type*	*Age*
30288	Asphalt pavement	Roadway	Historic
30289	Asphalt pavement	Roadway	Historic
30290	Concrete foundation	Flagpole base	Historic

*SIHP site number is preceded by state, island, and U.S.G.S. quad prefix 50-10-55.

SIHP Site 30288

SIHP Site 30288 are discontinuous sections of remnant asphalt pavement (Figure 42) extending in a roughly north/south direction in the northeastern portion of the study area in the vicinity of former Puhala Lane (see Figure 41). Oral information from Donald Leopoldino indicates that Puhala Lane was paved with asphalt from Kamehameha Avenue to roughly the flagpole. While the physical evidence of this site is scant, its mapped location and oral information obtained during the current study identify this site as the former Puhala Lane. Historic map data seems to indicate that it was constructed in 1912 as an un-named roadway. The name Puhala Lane first shows up on a 1924 map. This site is in poor condition and retains very little integrity.

SIHP Site 30289

SIHP Site 30289 is a more or less contiguous remnant of asphalt pavement (Figure 43) extending in a roughly east/west direction in the east-central portion of the study area (see Figure 41). Where it is seemingly intact (Figure 44), it measure 20 feet wide. Given the historic map data and oral information presented in this study, this site likely represent former Ulu Street, which appears to have been built in conjunction with the 1950 subdivision (see Figure 28) within the study area. There appears to be one manhole feature (Figure 45) associated with this former street in the vicinity of its intersection with Puhala Lane. Consistent use of Ulu Street seems to have ceased following the 1960 *tsunami*. Like Site 30289, this site is in poor condition and retains very little integrity.

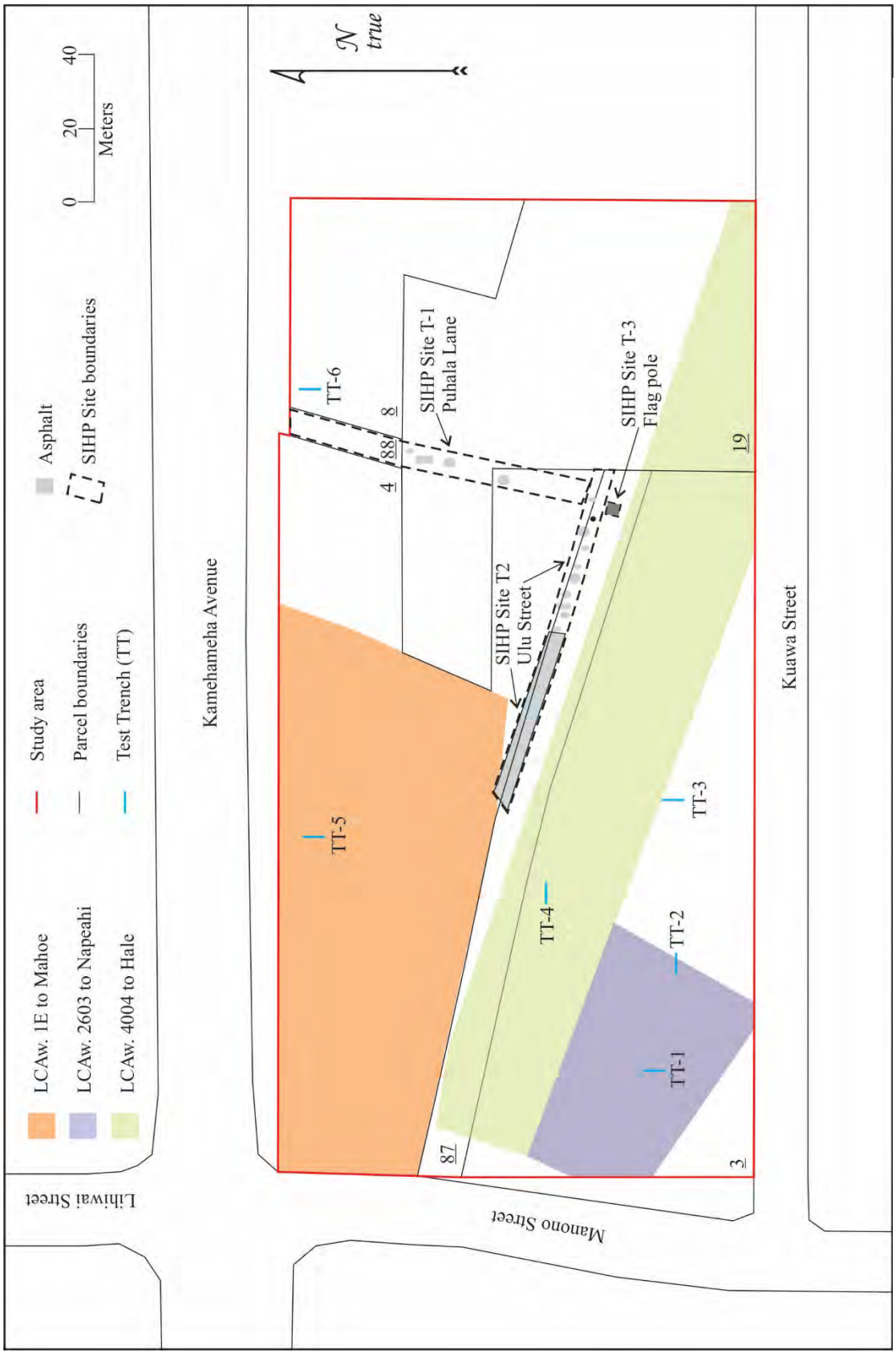

Figure 41. Study area plan view.

Figure 42. SIHP Site 30288 remnant portions of asphalt visible in the grass, view to the northeast.

Figure 43. SIHP Site 30289 remnant section of asphalt pavement, view to the northwest.

Figure 44.Seeming intact width of Ulu Street (Site 30289), view to the southeast.

Figure 45. Manhole feature within former Ulu Street (Site 30289).

SIHP Site 30290

SIHP Site 30290 is a concrete foundation for a flagpole located approximately 45 meters north of Kuawa Street in the southwestern portion of the study area, within TMK: (3) 2-2-032:087 (see Figure 41). The foundation is two-tiered and square in shape (Figures 46 and 47). The upper tier measures 5 feet across and 16 inches high and rests on a lower tier that measures 8 feet across, extends 15 inches above the ground surface, and may extend as much as 10 to 15 feet underground according to a study informant Donald Leopoldino. On the top surface of the upper tier there is a centrally located, 1-foot diameter aperture within an inset block (Figure 48) that once held a wooden flagpole, In the western face of the upper tier of the foundation, the Hawaii Consolidated Railway Ltd. logo and the year 1926 have been molded (Figure 49). The concrete feature is in relatively good condition although there is some evidence of spalling.

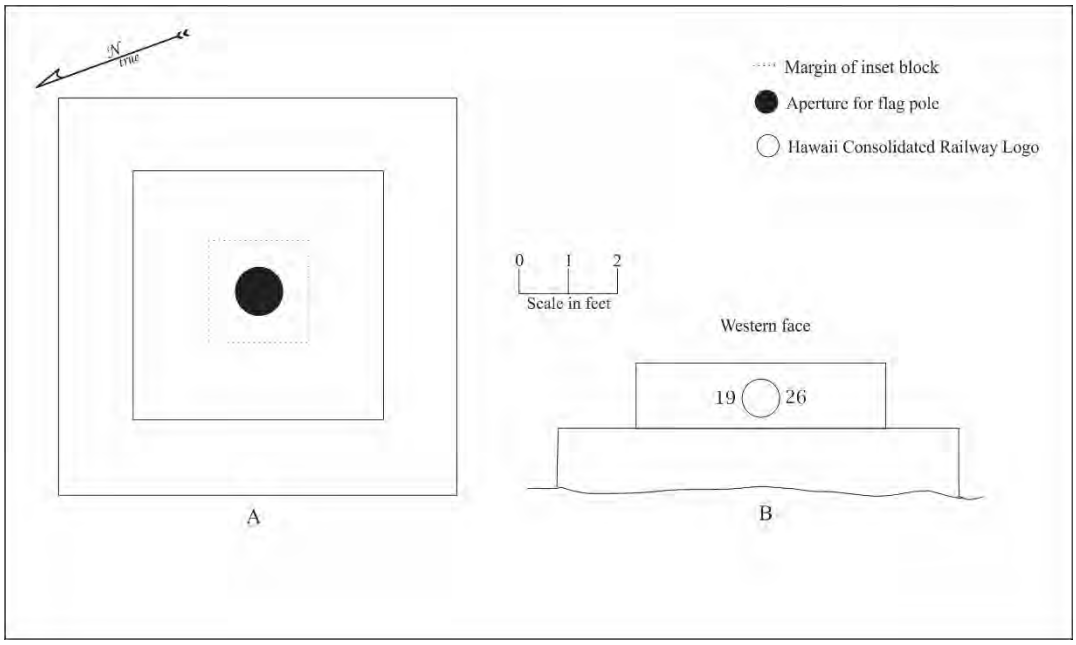

Figure 46. SIHP Site 30290 plan view (A) and profile (B).

Figure 47. SIHP Site 30290, view to the southeast.

Figure 48. SIHP Site 30290 flagpole hole with wood pole remnants.

Figure 49. SIHP Site 30290 detail view of logo and date.

Test Trenches

Six Test Trenches (TT-1 to 6) were mechanically excavated in order to examine the subsurface for the presence of intact cultural deposits and to determine the stratigraphy of the study area (see Figure 41 for TT locations). The dimensions of the trenches were consistently 5 meters long by approximately 70 centimeters wide (one bucket width), with the exception of TT-5, which was truncated in length due to the presence of a water line (see detailed description below). Detailed stratigraphic information for each test trench is presented below.

TT-1 was located near the southwestern corner of the study area (see Figure 41), and was oriented in a north/south direction (Figure 50). Excavated to a maximum depth ranging between 35 centimeters and 80 centimeters, TT-1 exhibited a simple 3-layer stratigraphy (Figure 51). Layer I was a humus/root zone occupying the top 10 centimeters just below the surface. Layer II was a roughly 20-30 centimeter thick deposit of dark brown (10 YR 3/2) silty clay loam over a 20-60 centimeters thick deposit of dark brown (7.5 YR 3/3) rocky clayey sand (Layer III). Layer II terminated on bedrock except in the extreme northern end of the trench where a layer of fill sand was found. A scattering of Historic debris was encountered throughout the trench that included glass fragments, stoneware and whiteware fragments, a cow tooth, a ceramic ball bottle stopper, and metal fragments (Figure 52). This material seemed to be in a mixed context and was not restricted to any specific stratigraphic layer.

Figure 50. TT-1, view to the north.

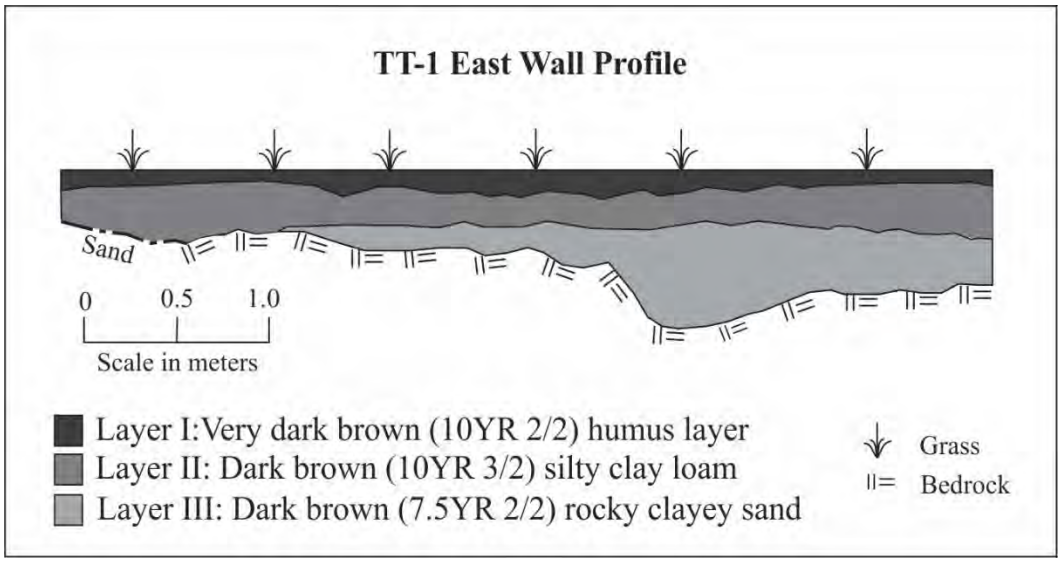

Figure 51. TT-1 east wall profile.

Figure 52. Historic debris observed in TT-1.

TT-2 also located in the southwestern portion of the study area (see Figure 41), was oriented east-west (Figure 53). It was excavated to bedrock ranging between 75 and 150 centimeters below the surface (except at the extreme east end of the trench where the maximum depth was recorded at approximately 180 centimeters, terminating in a sandy zone rather than bedrock). TT-2 exhibited four stratigraphic layers (Figure 54) with Layer I as the humus/root zone and Layer II a 10-30 centimeters thick deposit of black (2.5 Y 2.5/1) gravelly clay loam over a deposit of very dark grayish brown (10 YR 3/2) smeary wet clayey sand (Layer III). Layer IV, above the bedrock trench floor, consisted of dark olive brown (2.5 Y 3/3) loamy sand. At the western end of TT-2 within Layers II and III (between 10 and 60 centimeters in depth) some Historic debris was encountered and included multiple plain and decorated whiteware and porcelain fragments, bottle and flat glass fragments, brick fragments, a metal pipe fragment, a porcelain toilet fragment, a metal fork, a cowry shell fragment, and some coral fragments (Figure 55).

Figure 53. TT-2, view to southeast.

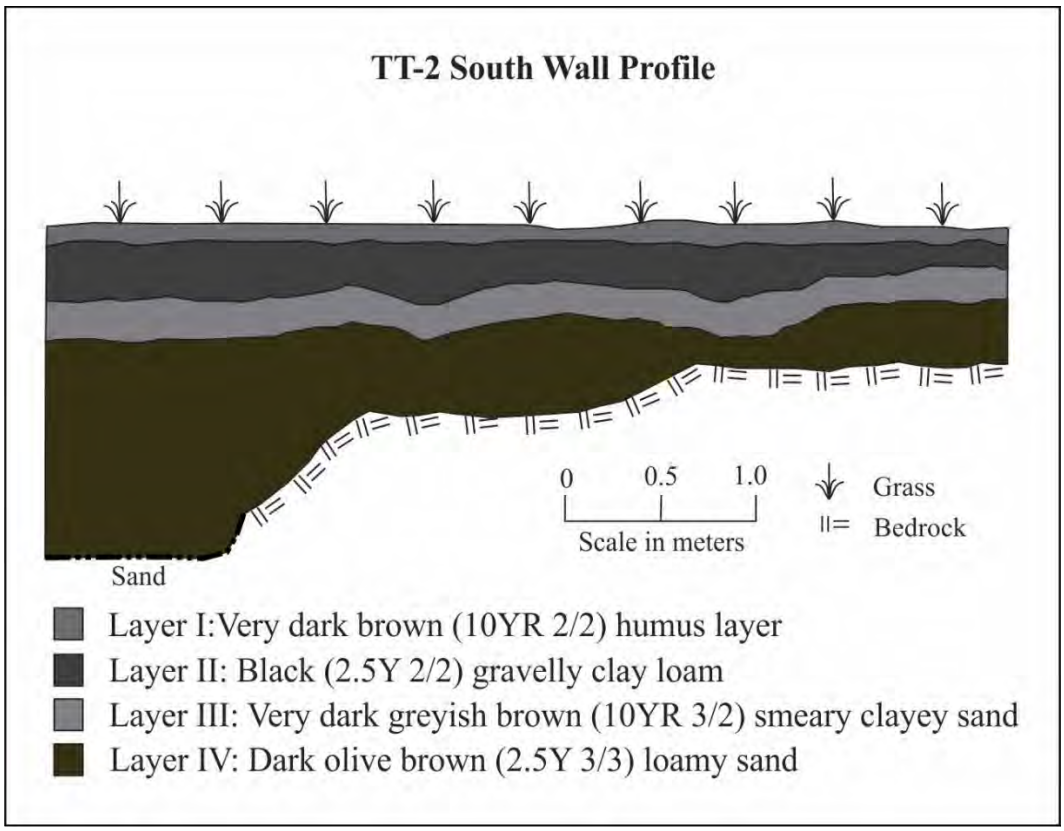

Figure 54. TT-2 south wall profile.

Figure 55. Historic debris observed in TT-2.

TT-3 was located 40 meters east of TT-2 in the southern central portion of the study area (see Figure 41). Oriented in a north/south direction (Figure 56), TT-3 was excavated to a maximum depth ranging between 70 centimeters and 140 centimeters (Figure 57). TT-3 presented a slightly more complex stratigraphy, with the characteristic humus layer (Layer I) over a 10 centimeter thick deposit of dark yellowish brown (10 YR 3/6) clayey sand that extended only 1.5 meters from the south edge of the trench (Layer II.1) within Layer II.2, a 25 centimeters to 60 centimeters thick deposit of dark brown (10 YR 3/3) cobbley sandy clay loam. Layer III consisted of a deposit of very dark brown (10 YR 2/2) clayey sand measuring between 10 and 90 centimeters thick, before reaching bedrock. Historic debris encountered at the north end of the trench included relatively large iron pipe fragments, a few whiteware and porcelain fragments, a couple of marbles, and a stoneware fragment (Figure 58).

Figure 56. TT-3, view to south.

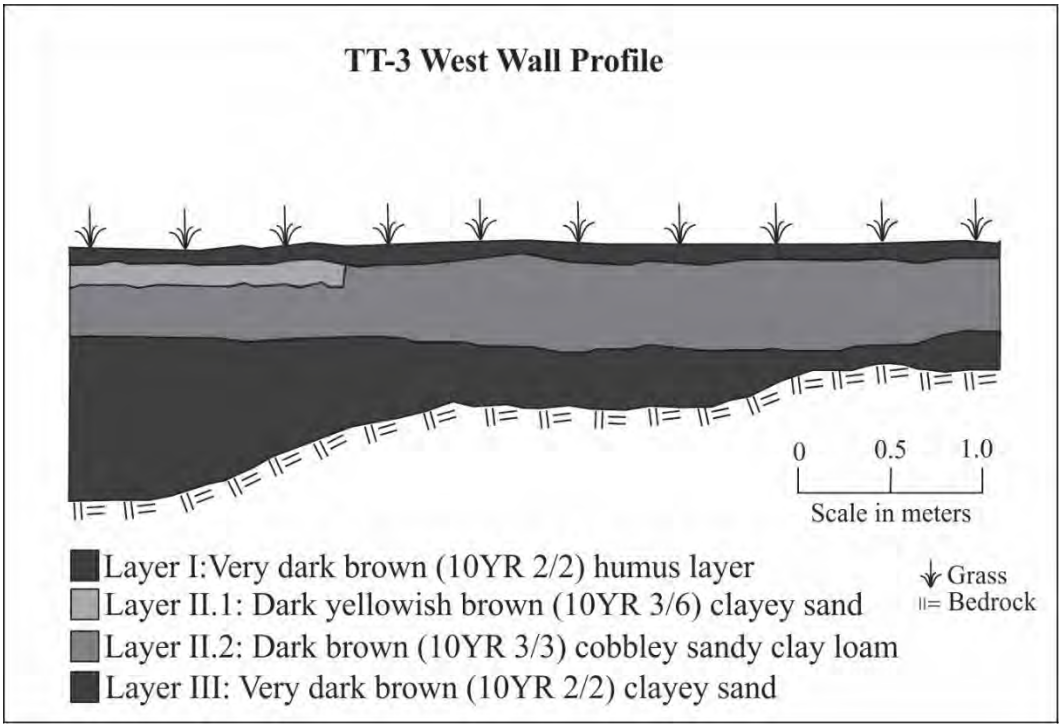

Figure 57. TT-3 west wall profile.

Figure 58. Historic debris observed in TT-3.

TT-4 was located 35 meters north of BT-2 in the west central portion of the study area (see Figure 41). Oriented in an east/west direction (Figure 59), TT-4 was excavated to a maximum depth of between 150 and 210 centimeters (Figure 60). TT-4 presented the most complex stratigraphy observed in the study area, with the humus layer (Layer I) over a 30-50 centimeters thick deposit of very dark grayish brown (10 YR 3/2) smeary wet clayey sand (Layer II). Layer III consisted of a roughly 20 centimeter thick deposit of black (2.5 Y 2.5/1) mottled gravelly clay loam at the east end of the trench extending halfway across the trench. Level IV consisted of a deposit of very dark brown (10 YR 2/2) clayey sand measuring between 80 and 130 centimeters thick, before reaching bedrock. Historic debris was observed in Layer II and included whiteware, stoneware, and glass fragments (Figure 61).

Figure 59. TT-4, view to west.

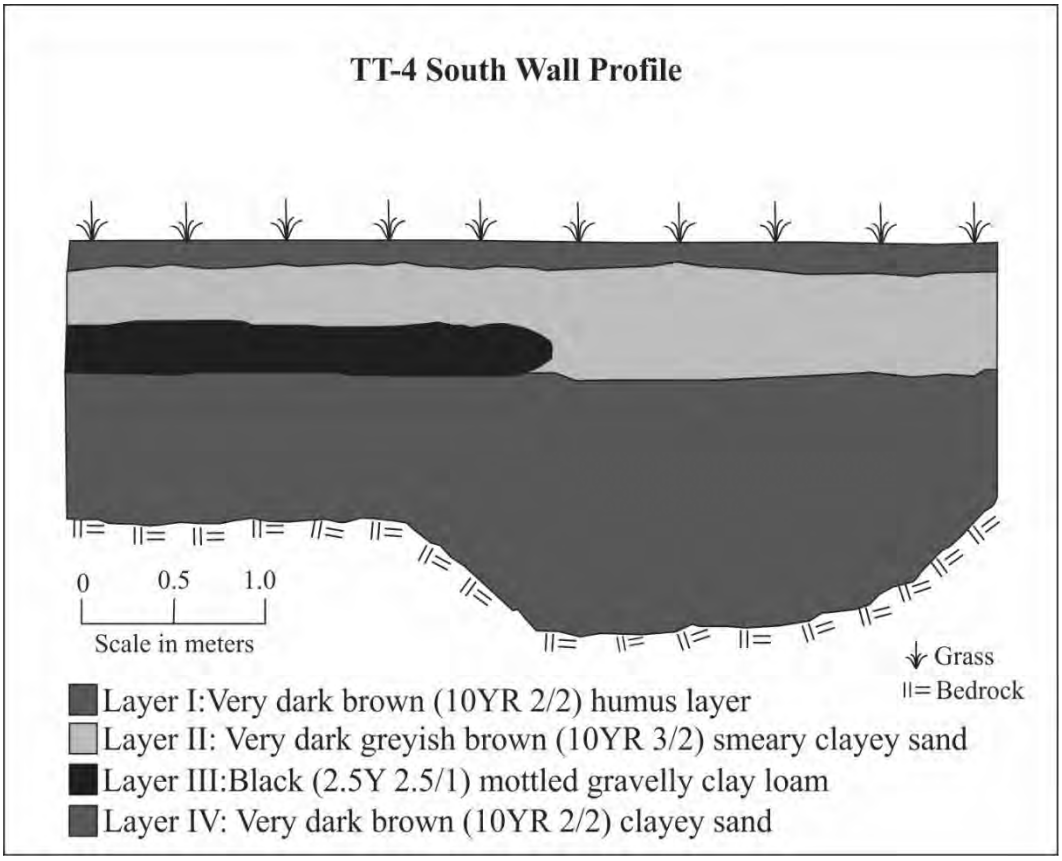

Figure 60. TT-4 south wall profile.

Figure 61. Historic debris observed in TT-4.

TT-5 was located in the north central portion of the study area (see Figure 41). Oriented in a north/south direction (Figure 62), TT-5 was excavated to a maximum depth of approximately 130 centimeters. TT-5 was shortened to a length of 4 meters due to the discovery of a buried water line at the south end of the trench. TT-5 revealed the largest amount of historical debris and a unique stratigraphic layer (Layer III) not found in any of the other trenches (Figure 63). The Layer I humus stratum presented over a 50-70 centimeters thick deposit of dark brown (10 YR 3/3) sandy clay loam (Layer II) with cobbles concentrated at the north end. Layer III, which interrupted Layer II beginning roughly 40 cm from the north end of the trench and extending a length of approximately 250 cm, consisted of a thin (2-5 centimeters thick),very pale brown (10 YR 8/3), deposit with some well-defined shell and coral inclusions (this appears to be a decomposed foundation). Layer IV consisted of a deposit of very dark brown (10 YR 2/2) clayey sand measuring roughly 10 centimeters thick. Historical debris encountered (Figure 64) included assorted railroad spikes and square nails, miscellaneous metal fragments, a water-worn cobble, multiple coral fragments, brick and ceramic pipe fragments, a large assortment of whiteware and porcelain fragments, and bottle glass fragments in a variety of colors including blue, brown, green, and clear. The only Historic material recovered were two intact glass bottles (TT-5-1 and TT-5-2) found in situ at the base of Layer IV on bedrock (Figure 65).

TT-5-1 is a brown, turn-molded champagne style beer bottle. It measures 28.3 centimeters (11.1 inches) tall with a base diameter ranging between 7.6 and 8.0 centimeters (3.0 and 3.15 inches). It has a tooled brandy/wine finish, and its base has a 2.0-centimeter tall push-up. The bottle was deformed while tooling the finish, and the neck has a scar gouged below the finish from the tool. The body of the bottle has many small longitudinal bubbles. TT-5-2 is a brown, turn-molded export-style beer bottle. It measures 28.2 centimeters tall (11.1 inches) with a base diameter of 7.5 centimeters (2.9 inches). It has a tooled oil/ring finish and its base has a 1-centimeter (0.39-inch) embossed dot at its center. Based on stylistic and technological data, both of these bottles (Figure 66) were most likely manufactured during the 1890s (Lindsey 2015).

Figure 62. TT-5, view to the south.

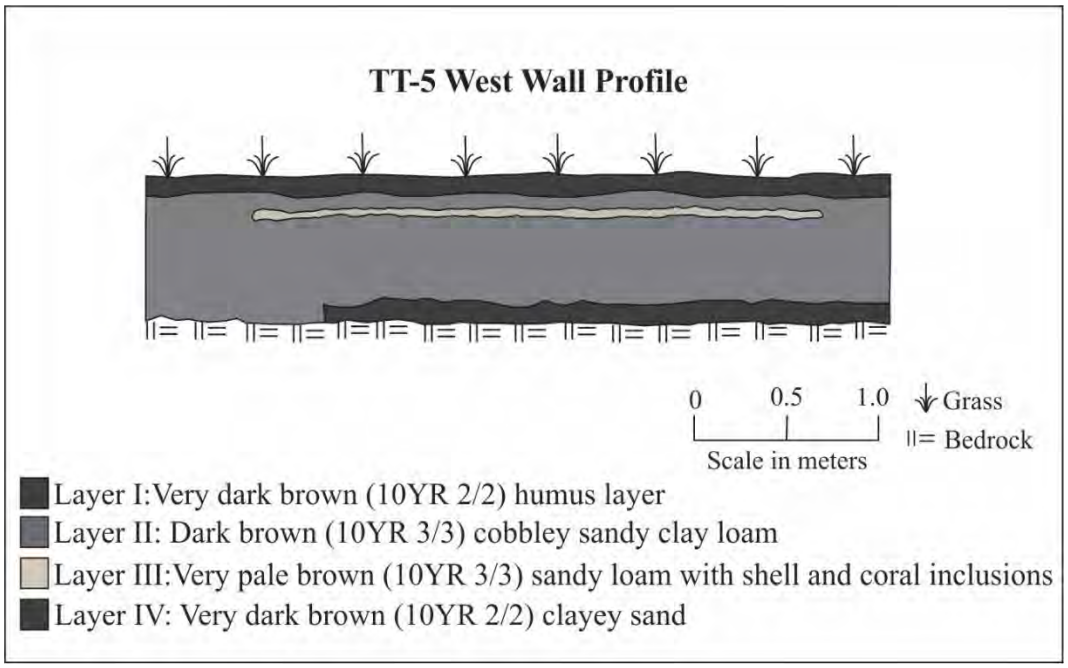

Figure 63. TT-5 west wall profile.

Figure 64. Historic debris observed in TT-5.

Figure 65. Intact glass bottles found in situ in TT-5.

Figure 66. Bottles (TT-5-1 and TT-5-2) found at base of TT-5.

TT-6- was located in the northeastern portion of the study area (see Figure 41). Oriented north/south, TT-6 (Figure 67) was excavated to a maximum depth of 160 centimeters (Figure 68). The humus layer (Layer I) presented over a roughly 30 centimeters thick deposit of dark brown (10 YR 3/3) cobbley clayey silt (Layer II); while Layer III consisted of mixed cinder and decomposing *ʻaʻā* roughly150 centimeters thick, with some strong brown (7.5 YR 5/6) silt also included. Layer III terminated at level *pāhoehoe* bedrock. Within TT-6 only two small whiteware ceramic fragments were observed.

Figure 67. TT-6, view to the north.

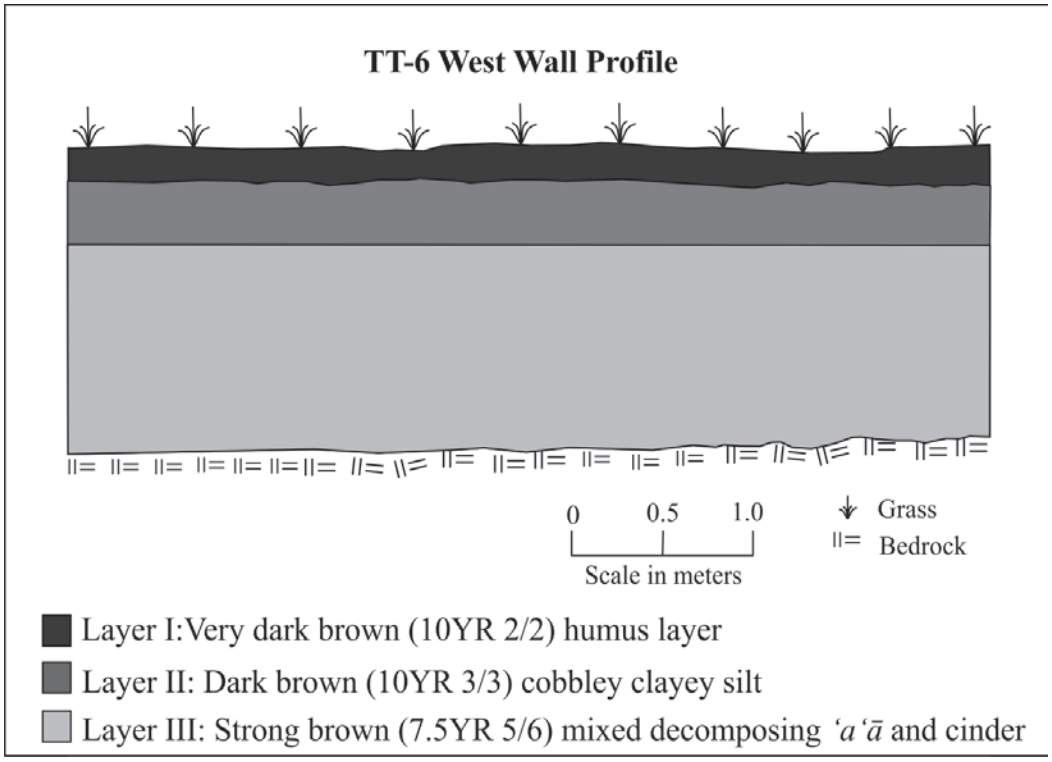

Figure 68. TT-6 west wall profile.

Summary of Field Findings

As a result of the inventory survey fieldwork, three surface sites were recorded, two former roadways and a 1926 flagpole foundation. These sites are remnants of a former community landscape (a once thriving railway and later residential and commercial area), which suffered the devastating effects of the 1946 and 1960 *tsunami*. The cleanup efforts after the 1960 *tsunami* also had significant impacts on both the surface and subsurface of the study area. Subsurface testing indicated that there were no intact cultural deposits associated with either the earlier Precontact use of the area or the *Māhele*-age *kuleana* use of the area. While Historic Period debris was found scattered throughout the subsurface test trenches, this material was determined to be in secondary depositional contexts.

6. SIGNIFICANCE EVALUATION, SITE TREATMENT RECOMMENDATIONS, AND CULTURAL CONSIDERATIONS

The recorded archaeological sites are assessed for their significance based on criteria established and promoted by the DLNR-SHPD and contained in the Hawai‘i Administrative Rules 13§13-284-6. This significance evaluation should be considered preliminary until DLNR-SHPD provides concurrence. For a resource to be considered significant it must possess integrity of location, design, setting, materials, workmanship, feeling, and association and meet one or more of the following criteria:

- **a** Be associated with events that have made an important contribution to the broad patterns of our history;
- **b** Be associated with the lives of persons important in our past;
- **c** Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value;
- **d** Have yielded, or is likely to yield, information important for research on prehistory or history;
- **e** Have an important traditional cultural value to the native Hawaiian people or to another ethnic group of the state due to associations with traditional cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity.

The significance and recommended treatment for the three sites that were documented as part of the current study, is presented in Table 3 and discussed below.

Table 3. Site significance and treatment recommendations.

*SIHP Site #**	*Site Type*	*Temporal Affiliation*	*Significance*	*Recommended Treatment*
30288	Road remnant	Historic	d	No further fork
30289	Road remnant	Historic	d	No further work
30290	Concrete foundation	Historic	a, d	Preservation

*SIHP Site number is preceded by the state, island, and U.S.G.S prefix 50-10-35.

SIHP Sites 30288 and 30289 are both former paved roadways. Site 30288, Puhala Lane, was constructed in the early 1900s and Site 30289, Ulu Street, was built in the middle 1900s. Both roads were abandoned after the 1960 *tsunami*, and both are evaluated to be significant under Criterion d for the information they have yielded about the twentieth century growth of the Waiākea Town region of Hilo. It is suggested that the archival and archaeological documentation presented in the current study about these sites serves to mitigate any potential impacts from future development, and thus no further historic preservation work is recommend relative to Sites 30288 and 30289.

SIHP Site 30290 is a concrete foundation structure that once supported a flagpole associated with Hawaii Consolidated Railway Ltd., which operated on the study property from 1899 to 1946 (from 1899-1916 as the Hilo Railroad Company). This foundation appears to have been built in 1926, and while the foundation has withstood the effects time (including the 1946 and 1960 *tsunami*), the wooden flagpole that it supported has long since disappeared, perhaps emblematic of the railway company itself that ceased operation after the 1946 *tsunami*. Site 30290 is evaluated as significant under Criterion a as it is one of the few physical reminders of the railway industry that was instrumental in the development of Hilo and the greater east Hawai‘i region. This site is also significant under Criterion d for the information it adds to the understanding of the use and development of the Waiākea Town portion of Hilo. It is recommended that Site 30290 be preserved as part of the current proposed park development, and that it be rehabilitated and put back into use as a flagpole feature with interpretive information provided to the public concerning its origin and significance. An archaeological preservation plan should be prepared in accordance with HAR 13§13-277 and submitted to DLNR-SHPD for review and approval.

As indicated by the subsurface testing that was conducted as a part of the current study, the likelihood of encountering intact subsurface archaeological deposits is remote; therefore, archaeological monitoring is not recommended with respect to development of the property. However, in the unlikely event that any unanticipated archaeological resources are unearthed during development activities, in compliance with HAR 13§13-280, work in the immediate vicinity of the finds should be halted and DLNR-SHPD contacted.

The proposed park development was supported by everyone contacted during the consultation effort that was conducted as a part of the current study. It is our conclusion that the conversion of the current study area by the County of Hawai‘i into a sports complex will not negatively impact any traditionally valued cultural or natural resources or constitutionally protected customary practices. In fact, if the recommendations presented below are implemented, the proposed development could provide for positive cultural and historical effects. Based on information shared during consultation, there are several recommendations and cultural consideration that are offered. The first of these is that the name of the proposed park should contain the appropriate geohistorical reference, that being Waiākea Town. Thus, we offer the name "Waiākea Town Sports Complex" for the proposed park; the name Kuawa is relatively new and historically unfamiliar. A second recommendation is that all proposed buildings and fixtures (e.g., concessions, restrooms, light posts, etc.) within the park be designed in such a way that their façades are visually reminiscent of late teens- to middle 1920s-era architecture that is seen in railway-related buildings. This can serve as a visual aid in the historical interpretation of former activities that took place within the study area and provide for the thematic integration of the rehabilitated flagpole feature (Site 30290). It is also recommended that interpretive signage be developed and displayed in partnership with interested organizations at various locations within the proposed park that describe the following historical contexts:

- native Hawaiian *kuleana* use of the area,
- development and use of the Waiākea Rail Yard,
- land use history associated with the Japanese Daijingu Shrine, and
- history of Waiākea Town.

As a result of the consultation with Terri Napeahi, it is the recommendation of the current study that an area in the southwestern portion of the proposed park, in the vicinity of the former Napeahi *kuleana* parcel, be set aside for an interpretive cultural display and for cultural practice. The exact nature of this cultural area should be developed through a partnership with family descendants of the former *kuleana*. As determined by the family descendants, this display may feature the *pōhaku* (including *Makaoku‘i ka lani*) from Kuakaananuu Heiau that were historically retrieved and curated by the Napeahi family. Although this *heiau* was originally located on the shore opposite Moku‘ola, the activities that took place there were associated with the Napeahi ‘Ohana.

Lastly, while not a full-blown recommendation, we suggest that some consideration be given to linking the proposed park with the Hilo Bayfront Trails project so that the preserved historical and cultural features and their associated interpretive displays are not only accessible to the park users, but also to the larger community and visitor populations.

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Kuawa Street New Sports Fields Development

Environmental Assessment

APPENDIX 4
Traffic Impact Assessment Report

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Kuawa Street New Fields Development

Traffic Impact Analysis Report

Hilo, Island of Hawai‘i

April 8, 2015

Prepared for

County of Hawai‘i

Prepared by

SSFM INTERNATIONAL

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I. PROJECT DESCRIPTION

The County of Hawaiʻi, Department of Parks and Recreation, is proposing to develop two new recreation multi-use fields and associated improvements on an approximately eight-acre undeveloped parcel. It will be located in the southeast corner of Kamehameha Avenue and Manono Street across Kuawa Street from the Walter Victor Baseball Complex, Wong Stadium, and Afook-Chinen Civic Auditorium (see location map in Figure 1). Access to the parking lots is proposed to be off of Kuawa Street.

The proposed project is anticipated to occur in multiple design/construction phases. Phase 1 will include the construction of two new recreation multi-use fields. The first field will be capable of hosting adult level regulation games for football, soccer and rugby. The second field will be capable of hosting youth games for baseball, softball and soccer. In addition to the two fields, covered bleachers, team seating, appropriate fencing, drinking fountain and other amenities will also be provided. Phase 1 is anticipated to be constructed by the end of 2015.

Additional park improvements completed in a subsequent phase or phases will include the installation of field lighting, comfort station, storage building, walkway, fencing and children's playgrounds. Field lighting will include lighting for the multi-use fields, buildings, walkways and parking lots for nighttime play or use. The storage building will be provided for use by sport organizations and teams. An onsite path network will be provided for park users who want to walk or jog within the park. The entire park perimeter will be fenced to prevent unauthorized motor vehicle access onto the site. The designated area for the children's playground equipment will include a system for two to five year olds and a system for five to 12 year olds. Subsequent improvements are anticipated to be constructed by the year 2020.

This traffic impact analysis report (TIAR) will evaluate existing conditions and assess traffic impacts in the surrounding area as a result of the full-build conditions for this development. The TIAR was prepared in support of an Environmental Assessment.

Figure 1: Location Map

Kuawa Street New Fields Development – Hilo, Island of Hawai'i

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II. EXISTING CONDITIONS

A. Geometric Configuration

Kamehameha Avenue (State Route 19) is a four-lane, two-way, undivided roadway with bike lanes and paved sidewalks on both sides of the street. It is a State owned road with the functional classification of urban principal arterial and a posted speed limit of 35 mph. The road travels along the Hilo Bay coastline. The street name changes along its extent and is also called Kalaniana‘ole Street, Bayfront Highway, and Hawai‘i Belt Road in places. However, the street name adjacent to the project site is Kamehameha Avenue and is oriented in the east-west direction. There are no bus stops along Kamehameha Avenue adjacent to the project site. The closest bus stop is located along Banyan Drive less than a quarter of a mile north of the intersection of Kamehameha Avenue and Manono Street.

The intersection of Kamehameha Avenue and Manono Street is signalized with marked crosswalks on all legs. Dedicated left and right turn lanes exist along the Kamehameha Avenue approaches. Manono Street approaches have a dedicated left-turn lane and shared through/right-turn lane with right-turn acceleration lane along Kamehameha Avenue.

Manono Street is a two-lane, two-way, undivided roadway with paved shoulders and sidewalks on both sides of the street from Kamehameha Avenue to Pi‘ilani Street. It is owned by the County of Hawai‘i and had the functional classification of urban major collector and posted speed limit of 35 mph. This road is oriented in the north-south direction. Manono Street becomes Lihiwai Street north of Kamehameha Avenue.

Kuawa Street is a two-lane, two-way, undivided roadway with no paved shoulders or sidewalks. There are no posted speed limit signs along the roadway and therefore the speed limit is 25 mph. It is a County of Hawai‘i owned road and oriented in the east-west direction, parallel to Kamehameha Avenue. A driveway connecting to the Wailoa Small Boat Harbor is located at the west leg of the intersection of Manono Street and Kuawa Street.

The intersection of Manono Street and Kuawa Street is controlled with a stop sign on the Kuawa Street/driveway approaches. It has marked crosswalks on the west, north, and east legs. There are no dedicated turn lanes along any approach. The Wailoa Small Boat Harbor driveway is about 80-feet wide. The wider driveway allows for vehicles with boat trailers to make wide turn movements in and out of the boat harbor area. However, the wider driveway also has the consequence of allowing vehicle movements to occur in different areas.

B. Volumes

1. 24-Hour Roadway Volumes

In 2013, average daily traffic (ADT) during the weekdays along Kamehameha Avenue in the project area was 23,000 vehicles, based on Hawai‘i Department of Transportation (HDOT) *Historical Traffic Station Maps*. The ADT along Manono Street in the project area in 2013 was 10,700 vehicles. Table 1 provides the roadway weekday ADT along Kamehameha Avenue and along Manono Street. Appendix A includes the detailed 24-hour HDOT traffic count data.

Table 1: Roadway Traffic Volumes

Roadway	Location	2013 ADT (vehicles)
Kamehameha Avenue	Between Kalanikoa Street and Manono Street	23,000
Manono Street	Between Pi‘ilani Street and Kuawa Street	10,700

Source: *Historical Traffic Station Maps* (HDOT)

A graph of directional weekday hourly distribution along Kamehameha Avenue and Manono Street are shown in Figure 2 and 3 respectively. Of the approximately 1,800 vehicles traveling along Kamehameha Avenue during the AM peak hour (7:15-8:15 AM), about 800 vehicles were traveling in the eastbound direction and 1,000 in the westbound direction. This equates to approximately 400 vehicles per hour per lane (vphpl) eastbound and 500 vphpl westbound. There were approximately 1,800 vehicles along Kamehameha Avenue during the PM peak hour (2:30-3:30 PM) with an equal eastbound and westbound split. This equates to approximately 900 vehicles per direction and 450 vphpl. This would suggest that there is additional roadway capacity along Kamehameha Avenue hours however traffic congestion does exist in the area during the peak hours.

During the weekend peak hour, there were approximately 1,100 vehicles travelling along Kamehameha Avenue with an equal eastbound and westbound split. This equates to approximately 550 vehicles per direction and 275 vphpl which is much less than the weekday peaks.

There were approximately 650 vehicles traveling along Manono Street during the AM peak hour (7:30-8:30 AM) with an equal northbound and southbound split. This equates to approximately 325 vphpl. During the PM peak hour (4:00-5:00 PM), there were approximately 900 vehicles traveling along Manono Street. There were about 400 vehicles traveling in the northbound direction and 500 vehicles traveling in the southbound direction.

During the weekend peak hour, there were approximately 750 vehicles traveling along Manono Street with an equal northbound and southbound split. This equates to approximately 375 vphpl which is equal to the weekday peak. Both of these are under the roadway capacity.

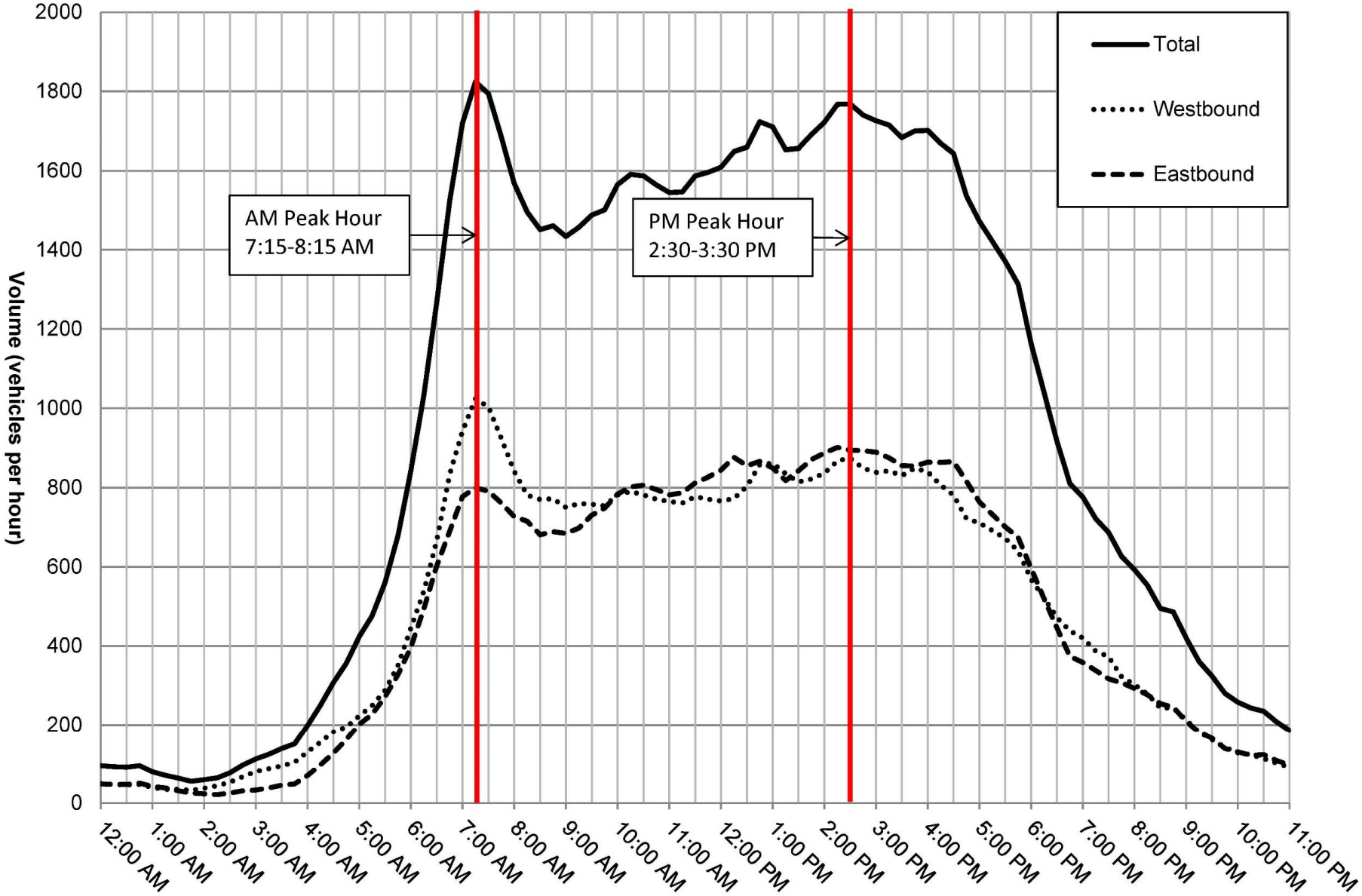

Figure 2: Kamehameha Avenue between Kalanikoa Street and Manono Street, 24-Hour Volume Distribution

Kuawa Street New Fields Development – Hilo, Island of Hawai'i

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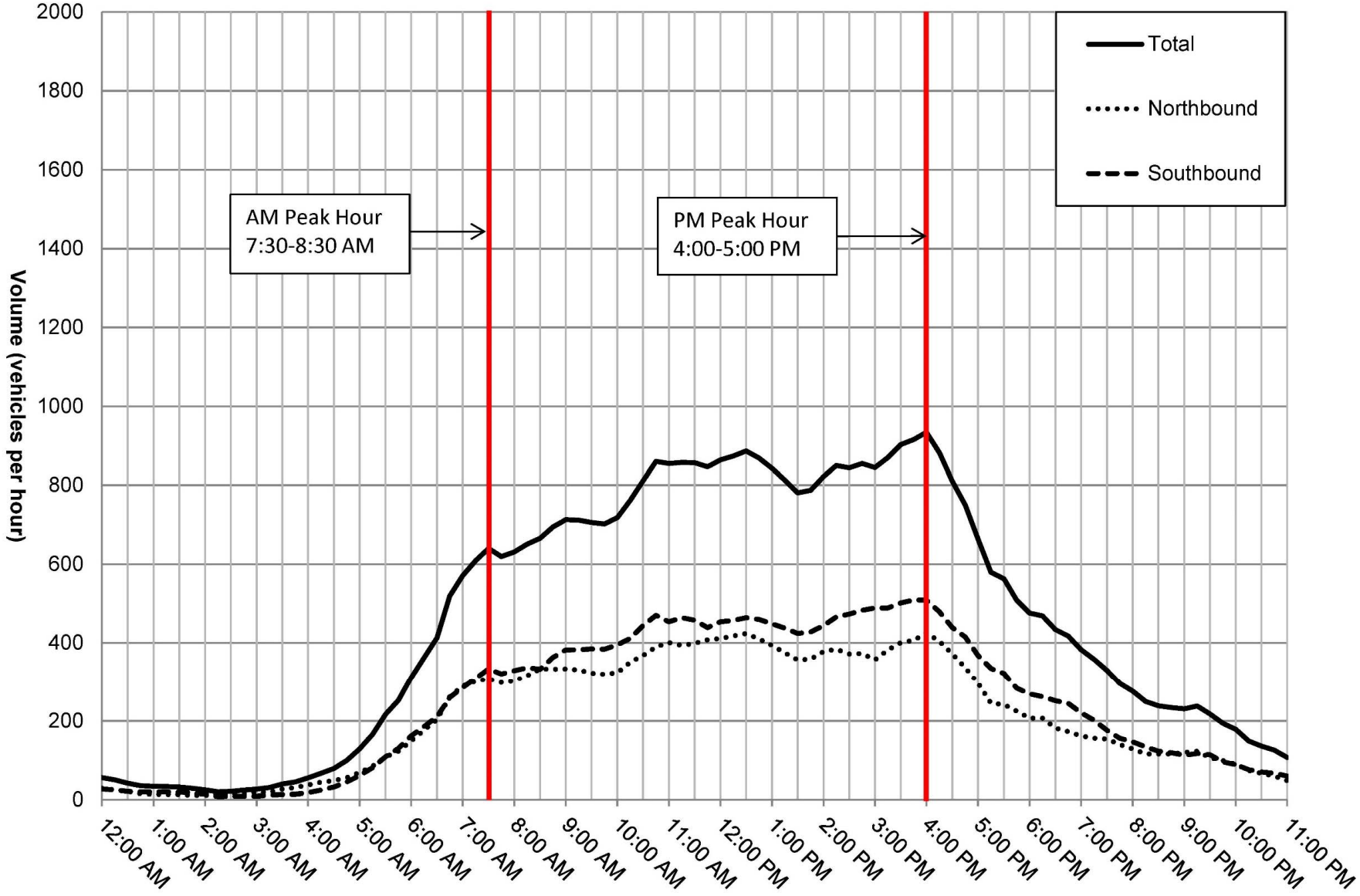

Figure 3: Manono Street between Pi'ilani Street and Kuawa Street, 24-Hour Volume Distribution

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2. Intersection Peak Hour Volumes

Although there are higher traffic volumes along Kamehameha Avenue during the weekday peak hours, it was assumed that the magnitude of the project generated trips during the weekday peak hours will not have as much of an effect on the roadway and intersection operations as it will over the weekend. It is because of this that weekend intersection volumes were analyzed. Multi-modal turning movement traffic counts were taken at the study intersections on Saturday, March 14, 2015 during the midday peak period from 11:30 AM to 1:30 PM. This time period was selected after a review of sporting events occurring at the adjacent facilities (see Table 2). Intersection counts were taken during the weekend to account for the volume of traffic generated by the various sporting events for the existing facilities and projected uses of the Kuawa Street New Fields Development.

Table 2: Sporting Events Occurring on Saturday March 14, 2015

Location	Sporting Event	Time
Walter Victor Baseball Complex	T-Ball Tournament	6:30 AM – 5:00 PM
Afook-Chinen Civic Auditorium	Youth Volleyball Tournament	8:00 AM – 4:00 PM
Francis Wong Stadium	High School BIIF Baseball Game	12:00 PM – 5:00 PM

The turning movement traffic counts included classification of passenger vehicles, heavy vehicles (buses, trucks, vehicles with trailers), bicycles, and pedestrians. Table 3 provides the two-hour peak period volumes for the heavy vehicles, bicycles, and pedestrians at each intersection. The percentage of heavy vehicles, bicycles and pedestrians volumes are each less than 1% of the total intersection volumes.

Table 3: Heavy Vehicles, Bicycles and Pedestrian Volumes during the Two-Hour Peak Period

Intersection	Heavy Vehicle		Bicycle		Pedestrian	
	Volume	%	Volume	%	Volume	%
Kamehameha Avenue at Manono Street/Lihiwai Street	20	0.5	24	0.6	23	0.6
Manono Street at Kuawa Street/Wailoa Small Boat Harbor driveway	4	0.2	14	0.9	13	0.8

The peak hour at the study intersections occurred from 11:30 AM to 12:30 PM. Peak hour turning movement volumes at each study intersection are presented in Figure 4. Appendix A includes the detailed turning movement classification count data.

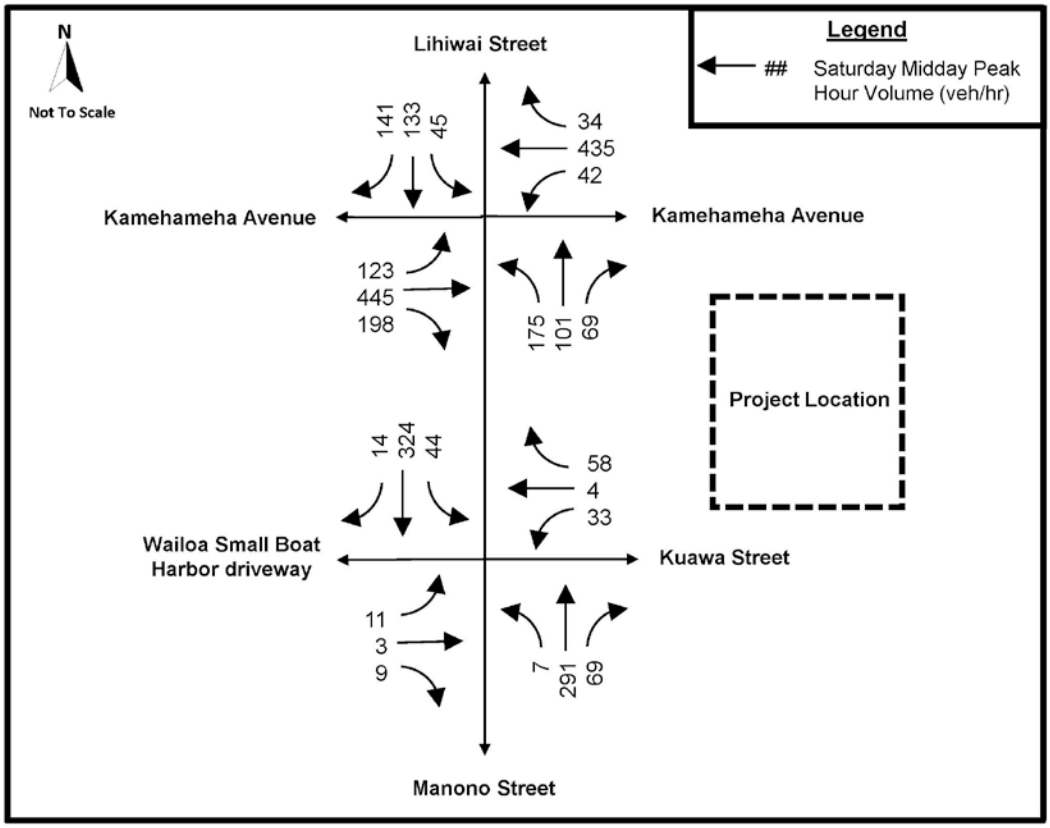

Figure 4: Existing (2015) Weekend Peak Hour Volumes

3. Transit Bus Volumes

The Hawai'i County transit system (Hele-On Bus) has three bus routes in the project area. The three bus routes are "Intra Hilo Waikea-Uka", "Intra Hilo Kaumana", and "Keaukaha." Appendix B includes the detailed bus route schedule and map for these routes.

The "Intra Hilo Waiākea-Uka" bus route runs from 7:05 AM to 4:45 PM typically from Monday through Saturday and serves the downtown Hilo area from Waiākea-Uka. There are five buses that travel in each direction throughout the day. There is one bus in each direction that passes the project site during the weekend peak hour. The "Intra-Hilo Kaumana" bus route runs from 7:15 AM to 5:20 PM. There are six buses that travel from downtown Hilo and five buses that travel from Kaumana. During the weekend peak hour, there are three buses that pass the project site. The average ridership of "Intra Hilo Waiākea-Uka" combined with "Intra-Hilo Kaumana" is approximately 2,200 passengers per month.

The "Keaukaha" bus route runs from 7:00 AM to 5:00 PM. There are nine buses that travel from Keaukaha and eight buses that travel from downtown Hilo throughout the day. During the weekend peak hour, there are no buses that pass the project site. The average ridership is approximately 2,950 passengers per month.

4. Pedestrians and Bicycle Volumes

Pedestrian and bicycles were counted at the study intersections during the peak period. Over the two-hour peak period, there were 23 pedestrians and 24 bicycles counted at the intersection of Kamehameha

Avenue and Manono Street/Lihiwai Street. At the intersection of Manono Street and Kuawa Street/Bayfront driveway, there were 13 pedestrians and 14 bicycles counted over the two-hour peak period. There are sidewalks and bike facilities in the area which make it easier for pedestrians and bicyclists to travel along the roadways.

C. Vehicle Level of Service

1. Methodology

Level of service (LOS) is a rating system used in traffic engineering to measure the effectiveness of roadway operating conditions. There are six LOS ranging from A to F. LOS A is defined as being the least interrupted flow conditions with little or no delays, whereas LOS F is defined as conditions where extreme delays exist. *A Policy on Geometric Design of Highways and Streets* (AASHTO, 2011) states that an "appropriate" LOS for an urban arterial, which is the classification of Kamehameha Avenue through the study area, is LOS C or D. An "appropriate" LOS for an urban collector, which is the classification of Manono Street is LOS D or better. Therefore, it is assumed that appropriate LOS for study intersections and turning movements should be LOS D or better. Intersection LOS and delay was determined for the weekend peak hour using *HCS 2010* traffic analysis software.

As stated in the *Highway Capacity Manual (HCM)* (TRB, 2010), LOS for a two-way stop controlled (TWSC) intersection is determined by the measured control delay (see Table 4) and is defined for each minor movement, not for the intersection as a whole. Vehicles traveling along the major, free-flow road, of a TWSC intersection, proceed through with minimal delay. Those vehicles approaching the intersection along the minor movement are controlled by a stop sign and thus experience delay attributable to the volume of vehicles passing along the free-flow road and the gaps available.

Table 4: LOS Criteria for Unsignalized Intersections

Average Control Delay (s/veh)	LOS by v/c Ratio	
	<=1.0	>1.0
≤ 10.0	A	F
>10 and ≤15	B	F
>15 and ≤25	C	F
>25 and ≤35	D	F
>35 and ≤50	E	F
>50	F	F

Source: *Highway Capacity Manual* (TRB, 2010)

The LOS analysis for signalized intersections is based on average total vehicle delay based on the methodologies of the *HCM* (TRB, 2010) shown in Table 5. High numbers of vehicles passing the intersection, long cycle lengths, inappropriate signal phasing, or a poor signal progression can result in long delays, and consequently poor LOS.

Table 5: LOS Criteria for Signalized Intersections

Average Control Delay (s/veh)	LOS by v/c Ratio	
	<=1.0	>1.0
≤ 10.0	A	F
>10 and ≤20	B	F
>20 and ≤35	C	F
>35 and ≤55	D	F
>55 and ≤80	E	F
>80	F	F

Source: *HCM* (TRB, 2010)

Another measure of intersection operation is the volume to capacity (v/c) ratio. This is the ratio of the volume of traffic utilizing the intersection compared to the maximum volume of vehicles that can be accommodated by the intersection during a specific period of time. A v/c ratio under 0.85 means the intersection is operating under capacity and excessive delays are not experienced. An intersection is operating near its capacity when v/c ratios range from 0.85 to 0.95. Unstable flows are expected when the v/c ratio is between 0.95 and 1.0. Any v/c ratio greater than or equal to 1.0 indicates that the intersection is operating at or above capacity which results in a LOS F per the *HCM* (TRB, 2010). A traffic movement can have a poor LOS but low v/c which suggests that the traffic volumes along that movement are low but have to wait a long time to make the movement. This is common for low volume protected turn movements or side streets that have to wait through a long cycle length for their split to come up.

2. Existing (2015) Intersection Conditions

Existing (2015) LOS for the unsignalized and signalized intersection and traffic movements operated at an appropriate LOS D or better during the weekend peak hour (see Table 6). V/C for all movements were under capacity. Appendix C provides the detailed analysis reports for the Existing (2015) conditions.

Table 6: Existing (2015) Intersection Level of Service

Unsignalized Intersection	App	Mvmt	Saturday Midday		
			Delay	v/c	LOS
Manono Street at Kuawa Street/Wailoa Small Boat Harbor driveway	EB	LTR	16.6	0.07	C
	WB	LTR	15.7	0.23	C
	NB	L	8.0	0.01	A
	SB	L	8.2	0.04	A
Signalized Intersection	**App**	**Mvmt**	**Saturday Midday**		
			Delay	**v/c**	**LOS**
Kamehameha Avenue at Manono Street	Intersection		22.5	-	C
	EB	L	12.3	0.25	B
		T	16.0	0.27	B
		R	16.5	0.27	B
	WB	L	13.4	0.10	B
		T	17.3	0.28	B
		R	15.2	0.05	B
	NB	L	27.0	0.67	C
		TR	31.6	0.41	C
	SB	L	30.7	0.14	C
		TR	42.2	0.88	D

III. FUTURE (2020) CONDITIONS

Future conditions are assessed for Year 2020, the year of full build out.

A. Surrounding Area Conditions

1. Roadway Construction

From research into the Statewide Transportation Improvements Program (STIP), no roadway construction is expected to be completed along Kamehameha Avenue, Manono Street or Kuawa Street near the project site by the year 2020.

2. Surrounding Developments

From research into the State of Hawaii Office of Environmental Quality Control library, no future developments are expected to be complete by the year 2020 that would affect the roadway geometrics or traffic volumes along Kamehameha Avenue, Manono Street and Kuawa Street in the project area.

B. Geometric Conditions

Currently, there is no defined driveway location for the existing project site. No dedicated turn lanes exist for the existing or adjacent properties along Kuawa Street. The project proposes to provide one parking lot serviced by multiple driveways off of Kuawa Street.

C. Future (2020) Volumes

1. Background Growth

The *Hawai'i Long Range Land Transportation Plan (LRLTP) TransCAD model* (CH2MHill, 2013) projects a compounded annual increase of 1.3% along Kamehameha Avenue and 1.4% along Manono Street near the project area. The increase was applied to the existing traffic along Kamehameha Avenue and Manono Street to get the forecasted volumes for Future (2020) Without Project conditions.

2. Surrounding Area Development

No additional increase in traffic volumes were assumed for future developments in the surrounding area. Figure 5 shows the Future (2020) Without Project weekend peak hour volumes at the two study intersections.

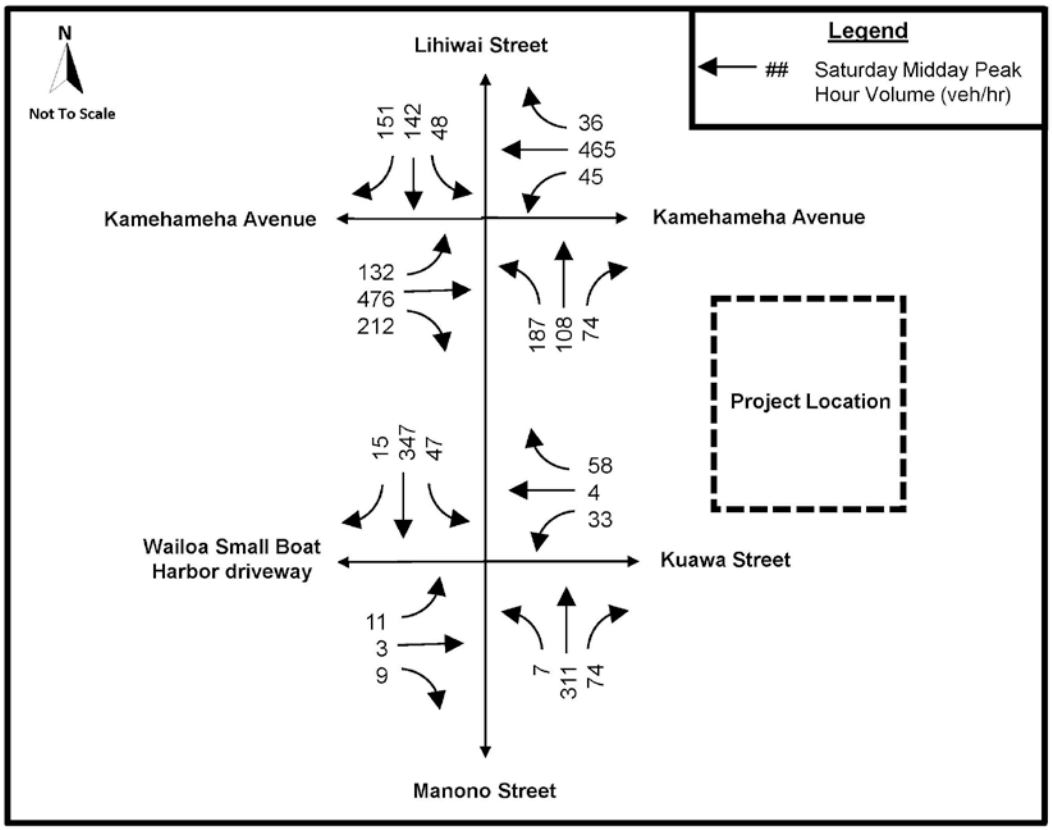

Figure 5: Future (2020) Without Project Weekend Peak Hour Volumes

3. Project Related Volumes

Phase 1 includes the development of an adult multi-use field (soccer/football/rugby) and a youth multi-use field (baseball/softball/soccer) and will be constructed by 2015. Additional park improvements completed in subsequent phases will include field lighting, comfort station, storage building, walkway, fencing and children's playgrounds. Subsequent improvements will be completed by 2020. Future conditions were analyzed for 2020 to assess the worst case impact on the area.

a) Trip Generation

The approximately eight-acre project site will be developed to include an adult multi-use field (soccer/football/rugby) and a youth multi-use field (baseball/softball/soccer) with field lighting, comfort station, storage building, walkway, fencing and children's playgrounds.

Trips generated from the proposed development were calculated using nationally accepted land use rates for a "County Park." The *Trip Generation, 8th Edition* (ITE, 2008) defines a "County Park" as a park that is owned and operated by a county and includes ball fields, picnic facilities and open space which was determined to be applicable for use with this project. The trip generation rates during the AM and PM weekday peak hours were small, resulting in a negligible impact on intersection and roadway operations. Therefore, the trips generated for a Saturday peak hour of generator were calculated and used to account for the impact occurring during a weekend when sporting events are likely to occur at the project site and in the surrounding area. This also includes an anticipated higher use of the adjacent Wailoa Small Boat

Harbor. The resulting trips (see Table 7) calculated for a Saturday during the peak hour of the project were still lower than expected for a park with two sports fields.

Table 7: Project Related Volumes Trip Generation Based on ITE Land Use Rates

Land Use [ITE Code]	Quantity	Trip Generation on Saturday			
		Daily	Peak Hour Volumes		
			In	Out	Total
County Park [412]*	8 acres	97	11	7	18

**Source: Trip Generation, 8th Edition (ITE, 2008)*

For comparison, the *Pāhoa Park Master Plan Transportation Impact Analysis Report* (Fehr & Peers, 2013) devised a separate methodology for calculating trips generated based on the number of attendees for various sporting events (soccer, baseball, volleyball, and basketball). A soccer game was considered to generate the most traffic. Therefore, to account for the highest generating scenario, trip generation was calculated for two soccer games.

For a multi-use field being used for a soccer game, it was assumed that each team would attract 47 people, including coaches, players, parents, and spectators. For a game that includes two teams and three officials, this results in a total of 97 people per game. With an estimated vehicle occupancy of 2.2 persons per vehicle, this results in a trip generation of 44 vehicles. It was also assumed that during the given peak hour, one game would end and another would begin. Therefore, for each field, two teams would arrive and two teams would depart during the period of one hour. To account for a worst-case scenario, it was assumed that both fields will be used at the same time each having one game end and another begin. This results in a total of 88 vehicles arriving and leaving during the peak hour (see Table 8).

Table 8: Project Related Volumes Trip Generation

Land Use	Quantity	Trip Generation*		
		Peak Hour Volumes		
		In	Out	Total
Multi-Use Field (1st field)	1 Game	44	44	88
Multi-Use Field (2nd field)	1 Game	44	44	88
Total		88	88	176
**For assumption source: Pāhoa Park Master Plan TIAR (Fehr & Peers, 2013)*				

b) Trip Distribution/Assignment

Trip distribution matches trip maker's origins and destinations to determine the number of trips originating in each region. Traffic assignment involves the selection of routes between the specified origins and destinations. Origin-destination data taken from the Hawai'i LRLTP suggests distribution of trips in the area in relation to the project site as: 7% east, 19% immediately south, 33% west, and 41% further south. It was determined that this appropriately reflects the breakdown of residential development in the area and therefore vehicles generated by the proposed project will have a similar distribution. Figure 6 illustrates this project trip distribution. Figure 7 shows the forecast project related trips at the two study intersections during the weekend peak hour.

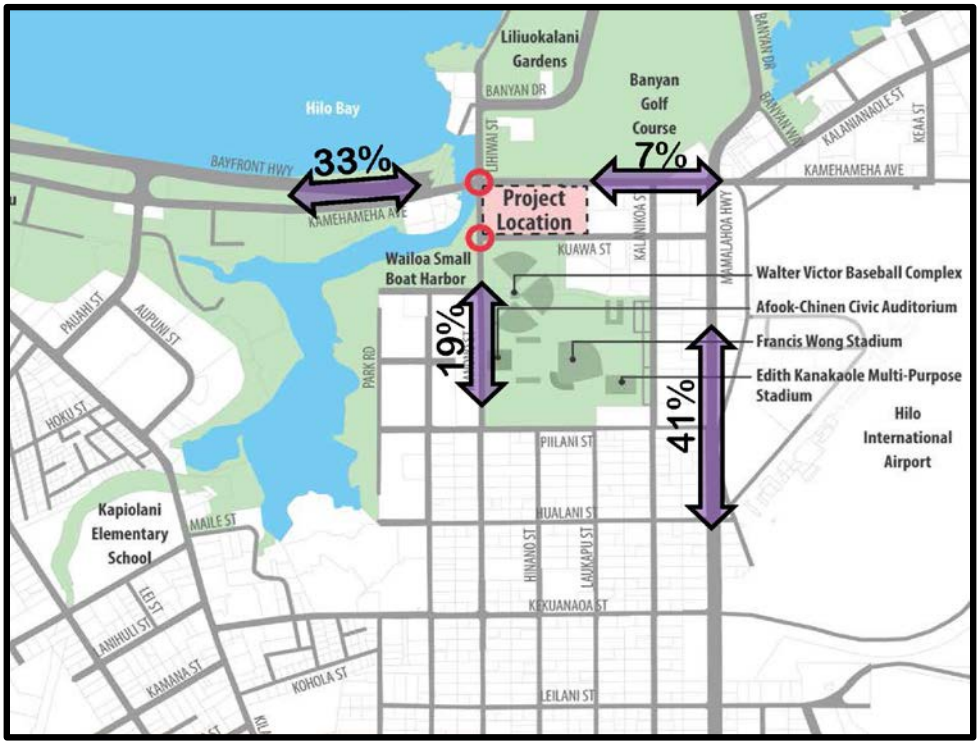

Figure 6: Trip Distribution

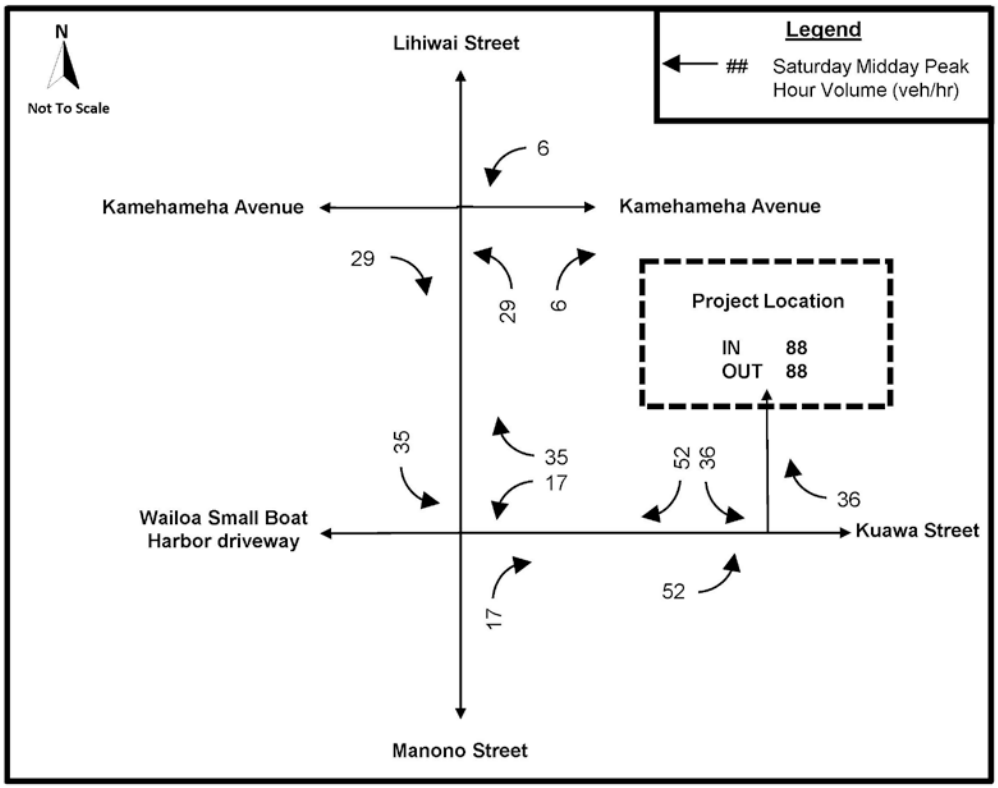

Figure 7: Project Related Trips

4. Future (2020) With Project Volumes

Project related trips were added to the Future (2020) Without Project volumes to calculate the Future (2020) With Project volumes (see Figure 8). The impact of the project related volumes resulted in less than a 2% increase in traffic at each study intersection in comparison to Future (2020) Without Project traffic volumes during the weekend peak hour.

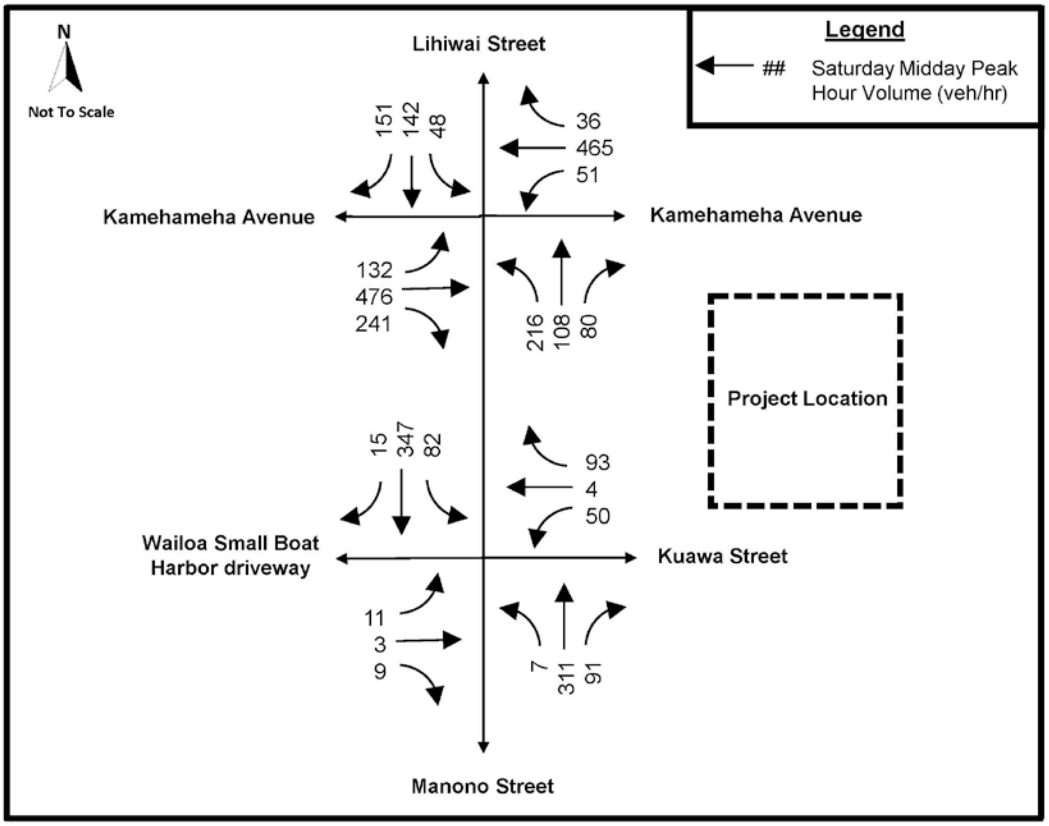

Figure 8: Future (2020) With Project Weekend Peak Hour Volumes

D. Future (2020) Level of Service

1. Intersection LOS

a) Future (2020) Without Project LOS

Future (2020) Without Project LOS for the unsignalized and signalized intersection and movements continued to operate at an appropriate LOS D or better during the weekend peak hour with all v/c under capacity (see Table 9). Appendix D provides the detailed analysis reports for the Future (2020) Without Project conditions.

Table 9: Future (2020) Without Project Intersection Level of Service

Unsignalized Intersection	App	Mvmt	Saturday Midday		
			Delay	v/c	LOS
Manono Street at Kuawa Street/Wailoa Small Boat Harbor driveway	EB	LTR	17.8	0.08	C
	WB	LTR	16.7	0.25	C
	NB	L	8.1	0.01	A
	SB	L	8.3	0.04	A
Signalized Intersection	**App**	**Mvmt**	**Saturday Midday**		
			Delay	**v/c**	**LOS**
Kamehameha Avenue at Manono Street	Intersection		23.1	-	C
	EB	L	13.2	0.29	B
		T	17.3	0.30	B
		R	17.9	0.30	B
	WB	L	14.5	0.12	B
		T	18.9	0.31	B
		R	16.4	0.05	B
	NB	L	26.5	0.70	C
		TR	30.6	0.41	C
	SB	L	29.7	0.15	C
		TR	41.5	0.88	D

b) Future (2020) With Project LOS

Future (2020) With Project LOS for the unsignalized and signalized intersection and movements continued to operate at an appropriate LOS D or better during the weekend peak hour with all v/c under capacity (see Table 10). Some delay and v/c ratios slightly increased but not sufficient to change the LOS from Future (2020) Without Project conditions. Appendix E provides the detailed analysis reports for the Future (2020) With Project conditions.

Table 10: Future (2020) With Project Intersection Level of Service

Unsignalized Intersection	App	Mvmt	Saturday Midday		
			Delay	v/c	LOS
Manono Street at Kuawa Street/Bayfront driveway	EB	LTR	21.1	0.09	C
	WB	LTR	21.6	0.43	C
	NB	L	8.1	0.01	A
	SB	L	8.4	0.08	A
Signalized Intersection	**App**	**Mvmt**	**Saturday Midday**		
			Delay	**v/c**	**LOS**
Kamehameha Avenue at Manono Street	Intersection		23.6	-	C
	EB	L	13.9	0.29	B
		T	18.2	0.31	B
		R	19.5	0.36	B
	WB	L	15.1	0.14	B
		T	19.7	0.32	B
		R	17.1	0.06	B
	NB	L	25.9	0.76	C
		TR	29.8	0.41	C
	SB	L	29.7	0.14	C
		TR	41.5	0.88	D

IV. SUMMARY AND RECOMMENDATIONS

The two multi-use recreational fields and associated improvements are being proposed on an undeveloped, approximately eight-acre, project site by the County of Hawai'i, Department of Parks and Recreation. Access to the proposed facility parking lots will be off of Kuawa Street. It is anticipated that the largest traffic impact on the area will result from trips generated during a Saturday mid-day as a result of multiple sporting events. Although there are higher traffic volumes along Kamehameha Avenue during the weekday peak hours, it was assumed that the magnitude of the project generated trips during the weekday peak hours will not have as much of an effect on the roadway and intersection operations as the weekend.

Existing (2015) intersection operations at Kamehameha Avenue and Manono Street and at Manono Street and Kuawa Street/Wailoa Small Boat Harbor driveway during the weekend peak hour have appropriate LOS D or better conditions. No surrounding area developments or roadway construction are anticipated by 2020. With the increase in background traffic, Future (2020) Without Project intersection operations at the two study intersections are projected to continue to operate at LOS D or better.

Trips generated from the proposed project were calculated for the weekend peak hour to assess the largest vehicular impact in the area. With those trips added to Future (2020) Without Project conditions, there were a slight increase in delay and v/c ratio but the intersection operations continued to operate at LOS D or better for the Future (2020) With Project conditions.

Multi-modal access is good with bus, pedestrian walkways, and bike routes all available to the site. In conclusion, the two multi-use recreational fields are anticipated to have minimal impact to traffic in the surrounding roadway network following the full build-out in 2020. The impact following the Phase 1 development in 2015 will be negligible as well.

V. REFERENCES

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Appendix A

24-Hour HDOT Traffic Data and Weekend Peak Period Traffic Counts

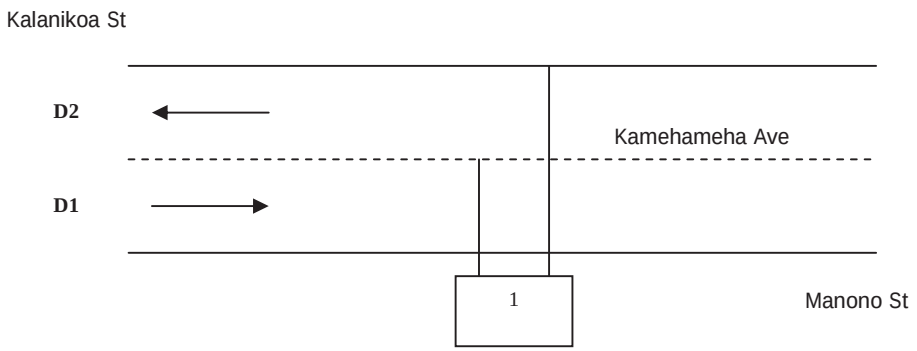
Traffic Data Service

Traffic Station Sketch

N

Island: Hawaii
Area: Pahoa

Section ID/Station #: B71001900093



Meter #	File Name	GPS
1. bg75	D1106015_B71001900093 D1106016_B71001900093	19.72255, -155.0694

Station Description:

Kamehameha Ave: Kalanikoa St to Manono St

Survey Beginning Date/Time: 11/6/13 @ 0000		Survey Ending Date/Time: 11/7/13 @ 2400

Survey Method:	Road Tube	Data Type:	Vol
Survey Crew:	LM		V2
Sketch Updated:		By:	SR
Remarks:	1318		

FACILITY NAME	JURI	FUNC CLASS	AREA TYPE	ROUTE NO.	ROUTE MILE
Kamehameha Ave		14		0019	

D1= Direction to End — D1: Manono St / Palani Rd (Rte 190)

D2= Direction to Begin — D2: Kalanikoa St / ent to Kuhio Wharf

Run Date: 2014/05/30

Hawaii Department of Transportation
Highways Division — Highways Planning Survey Section
2013 Program Count - Summary

Site ID: B71001900093 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 20500
Functional Class: URBAN:PRINCIPAL ARTERIAL - OTHER **Count Type:** VOLUME **Counter Type:** Tube **Route No:** 19
Location: Kamehameha Ave - Kalanikoa St to Manono St

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
DATE : 11/06/2013															
12:00-12:15	13	12	25	06:00-06:15	77	70	147	12:00-12:15	193	221	414	06:00-06:15	176	183	359
12:15-12:30	11	14	25	06:15-06:30	93	95	188	12:15-12:30	216	209	425	06:15-06:30	155	148	303
12:30-12:45	12	10	22	06:30-06:45	105	108	213	12:30-12:45	196	215	411	06:30-06:45	139	174	313
12:45-01:00	14	15	29	06:45-07:00	206	155	361	12:45-01:00	179	221	400	06:45-07:00	107	109	216
01:00-01:15	13	14	27	07:00-07:15	146	174	320	01:00-01:15	226	246	472	07:00-07:15	132	103	235
01:15-01:30	4	20	24	07:15-07:30	229	214	443	01:15-01:30	234	214	448	07:15-07:30	122	95	217
01:30-01:45	15	11	26	07:30-07:45	312	190	502	01:30-01:45	231	217	448	07:30-07:45	110	66	176
01:45-02:00	5	5	10	07:45-08:00	317	234	551	01:45-02:00	198	227	425	07:45-08:00	81	77	158
02:00-02:15	3	4	7	08:00-08:15	266	193	459	02:00-02:15	181	221	402	08:00-08:15	81	76	157
02:15-02:30	9	2	11	08:15-08:30	221	203	424	02:15-02:30	183	219	402	08:15-08:30	95	71	166
02:30-02:45	9	4	13	08:30-08:45	224	204	428	02:30-02:45	228	219	447	08:30-08:45	64	89	153
02:45-03:00	10	6	16	08:45-09:00	207	217	424	02:45-03:00	191	232	423	08:45-09:00	72	77	149
03:00-03:15	11	2	13	09:00-09:15	199	173	372	03:00-03:15	200	247	447	09:00-09:15	64	54	118
03:15-03:30	22	8	30	09:15-09:30	196	157	353	03:15-03:30	210	221	431	09:15-09:30	57	42	99
03:30-03:45	26	9	35	09:30-09:45	231	177	408	03:30-03:45	211	242	453	09:30-09:45	55	60	115
03:45-04:00	20	10	30	09:45-10:00	192	207	399	03:45-04:00	201	225	426	09:45-10:00	42	37	79
04:00-04:15	25	8	33	10:00-10:15	210	214	424	04:00-04:15	222	219	441	10:00-10:15	29	36	65
04:15-04:30	36	13	49	10:15-10:30	190	195	385	04:15-04:30	196	210	406	10:15-10:30	32	33	65
04:30-04:45	30	15	45	10:30-10:45	185	193	378	04:30-04:45	223	227	450	10:30-10:45	40	37	77
04:45-05:00	46	31	77	10:45-11:00	202	253	455	04:45-05:00	201	254	455	10:45-11:00	30	32	62
05:00-05:15	49	41	90	11:00-11:15	225	214	439	05:00-05:15	156	217	373	11:00-11:15	29	25	54
05:15-05:30	57	53	110	11:15-11:30	188	198	386	05:15-05:30	174	199	373	11:15-11:30	25	27	52
05:30-05:45	36	50	86	11:30-11:45	223	163	386	05:30-05:45	177	182	359	11:30-11:45	24	17	41
05:45-06:00	97	76	173	11:45-12:00	208	221	429	05:45-06:00	177	189	366	11:45-12:00	18	23	41

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:15 AM to 08:15 AM		
AM - PEAK HR VOLUME	1124	831	1955
AM - K FACTOR (%)			8.20
AM - D (%)	57.49	42.51	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:15 AM to 08:15 AM	07:45 AM to 08:45 AM	
AM - PEAK HR VOLUME	1124	834	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:00 PM to 04:00 PM		
PM - PEAK HR VOLUME	822	935	1757
PM - K FACTOR (%)			7.37
PM - D (%)	46.78	53.22	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:15 PM to 04:15 PM	03:00 PM to 04:00 PM	
PM - PEAK HR VOLUME	844	935	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:15 AM to 08:15 AM		
AM - PEAK HR VOLUME	1124	831	1955
AM - K FACTOR (%)			8.20
AM - D (%)	57.49	42.51	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	01:00 PM to 02:00 PM		
PM - PEAK HR VOLUME	889	904	1793
PM - K FACTOR (%)			7.52
PM - D (%)	49.58	50.42	100.00

NON-COMMUTER PERIOD (09:00-15:00)			
TWO DIRECTIONAL PEAK			
PEAK HR TIME	01:00 PM to 02:00 PM		
PEAK HR VOLUME	889	904	1793
DIRECTIONAL PEAK			
PEAK HR TIME	01:00 PM to 02:00 PM	01:00 PM to 02:00 PM	
PEAK HR VOLUME	889	904	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	4,852	4,422	9,274
AM 12-HR PERIOD (00:00-12:00)	5,425	4,855	10,280
PM 6-HR PERIOD (12:00-18:00)	4,804	5,293	10,097
PM 12-HR PERIOD (12:00-24:00)	6,583	6,984	13,567
24 HOUR PERIOD	12,008	11,839	23,847
D (%)	50.35	49.65	100.00

Run Date: 2014/05/30

Hawaii Department of Transportation
Highways Division — Highways Planning Survey Section
2013 Program Count - Summary

Site ID: B71001900093 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 20500
Functional Class: URBAN:PRINCIPAL ARTERIAL - OTHER **Count Type:** VOLUME **Counter Type:** Tube **Route No:** 19
Location: Kamehameha Ave - Kalanikoa St to Manono St

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
DATE : 11/07/2013															
12:00-12:15	15	12	27	06:00-06:15	66	54	120	12:00-12:15	208	192	400	06:00-06:15	152	168	320
12:15-12:30	9	9	18	06:15-06:30	91	86	177	12:15-12:30	172	229	401	06:15-06:30	156	182	338
12:30-12:45	11	5	16	06:30-06:45	115	101	216	12:30-12:45	162	167	329	06:30-06:45	141	130	271
12:45-01:00	11	16	27	06:45-07:00	136	121	257	12:45-01:00	205	233	438	06:45-07:00	108	96	204
01:00-01:15	11	7	18	07:00-07:15	184	144	328	01:00-01:15	188	232	420	07:00-07:15	103	97	200
01:15-01:30	13	4	17	07:15-07:30	210	186	396	01:15-01:30	218	182	400	07:15-07:30	90	87	177
01:30-01:45	10	10	20	07:30-07:45	244	195	439	01:30-01:45	232	187	419	07:30-07:45	101	93	194
01:45-02:00	4	10	14	07:45-08:00	240	216	456	01:45-02:00	194	193	387	07:45-08:00	98	96	194
02:00-02:15	10	10	20	08:00-08:15	228	170	398	02:00-02:15	180	195	375	08:00-08:15	88	83	171
02:15-02:30	10	7	17	08:15-08:30	177	178	355	02:15-02:30	228	224	452	08:15-08:30	88	69	157
02:30-02:45	11	6	17	08:30-08:45	172	122	294	02:30-02:45	249	241	490	08:30-08:45	45	50	95
02:45-03:00	10	5	15	08:45-09:00	186	165	351	02:45-03:00	229	221	450	08:45-09:00	69	68	137
03:00-03:15	17	8	25	09:00-09:15	175	167	342	03:00-03:15	224	196	420	09:00-09:15	57	74	131
03:15-03:30	15	9	24	09:15-09:30	180	156	336	03:15-03:30	216	208	424	09:15-09:30	54	52	106
03:30-03:45	21	13	34	09:30-09:45	169	165	334	03:30-03:45	214	215	429	09:30-09:45	54	61	115
03:45-04:00	25	6	31	09:45-10:00	157	165	322	03:45-04:00	199	221	420	09:45-10:00	39	38	77
04:00-04:15	17	11	28	10:00-10:15	183	153	336	04:00-04:15	209	196	405	10:00-10:15	30	34	64
04:15-04:30	15	19	34	10:15-10:30	181	185	366	04:15-04:30	205	180	385	10:15-10:30	37	29	66
04:30-04:45	37	12	49	10:30-10:45	207	182	389	04:30-04:45	238	228	466	10:30-10:45	32	33	65
04:45-05:00	52	28	80	10:45-11:00	203	191	394	04:45-05:00	180	212	392	10:45-11:00	24	26	50
05:00-05:15	42	32	74	11:00-11:15	184	189	373	05:00-05:15	209	197	406	11:00-11:15	20	26	46
05:15-05:30	48	39	87	11:15-11:30	168	189	357	05:15-05:30	177	194	371	11:15-11:30	25	38	63
05:30-05:45	58	48	106	11:30-11:45	146	190	336	05:30-05:45	166	175	341	11:30-11:45	24	23	47
05:45-06:00	57	64	121	11:45-12:00	186	197	383	05:45-06:00	182	172	354	11:45-12:00	14	12	26

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:15 AM to 08:15 AM		
AM - PEAK HR VOLUME	922	767	1689
AM - K FACTOR (%)			7.66
AM - D (%)	54.59	45.41	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:15 AM to 08:15 AM	07:15 AM to 08:15 AM	
AM - PEAK HR VOLUME	922	767	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:00 PM to 04:00 PM		
PM - PEAK HR VOLUME	853	840	1693
PM - K FACTOR (%)			7.67
PM - D (%)	50.38	49.62	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:00 PM to 04:00 PM	03:00 PM to 04:00 PM	
PM - PEAK HR VOLUME	853	840	

AM PERIOD (00:00-12:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:15 AM to 08:15 AM		
AM - PEAK HR VOLUME	922	767	1689
AM - K FACTOR (%)			7.66
AM - D (%)	54.59	45.41	100.00

PM PERIOD (12:00-24:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	02:15 PM to 03:15 PM		
PM - PEAK HR VOLUME	930	882	1812
PM - K FACTOR (%)			8.21
PM - D (%)	51.32	48.68	100.00

NON-COMMUTER PERIOD (09:00-15:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PEAK HR TIME	02:00 PM to 03:00 PM		
PEAK HR VOLUME	886	881	1767
DIRECTIONAL PEAK			
PEAK HR TIME	02:00 PM to 03:00 PM	02:00 PM to 03:00 PM	
PEAK HR VOLUME	886	881	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	4,188	3,867	8,055
AM 12-HR PERIOD (00:00-12:00)	4,717	4,257	8,974
PM 6-HR PERIOD (12:00-18:00)	4,884	4,890	9,774
PM 12-HR PERIOD (12:00-24:00)	6,533	6,555	13,088
24 HOUR PERIOD	11,250	10,812	22,062
D (%)	50.99	49.01	100.00

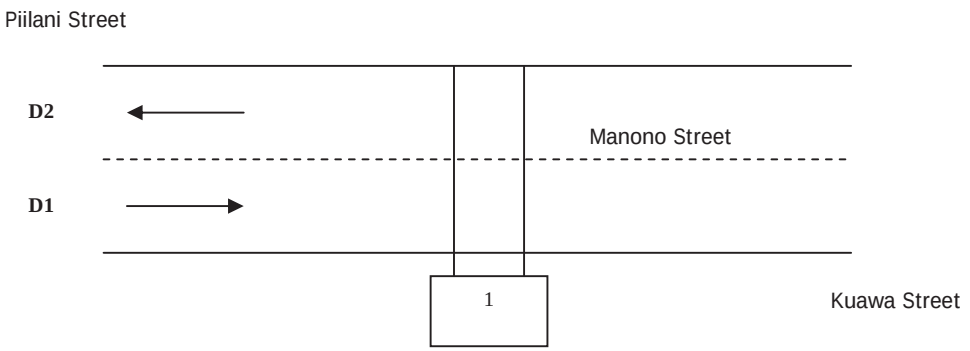
Traffic Data Service

Traffic Station Sketch

N

Island: Hawaii
Area: Hilo

Section ID/Station #: B71277000332



Meter #	File Name	GPS
1. bw89	D0718009_B71277000332 D0718010_B71277000332	19.72071, -155.07

Station Description:

Manono Street: Piilani Street to Kuawa Street

Survey Beginning Date/Time: 7/18/13 @ 0000		Survey Ending Date/Time: 7/19/13 @ 2400

Survey Method:	Road Tube	Data Type:	Class
Survey Crew:	LM		C1B
Sketch Updated:		By:	SR
Remarks:			

FACILITY NAME	JURI	FUNC CLASS	AREA TYPE	ROUTE NO.	ROUTE MILE
Manono Street		17		2770	

D1= Direction to End D2= Direction to Begin	D1: Kuawa Street / Kamehameha Avenue D2: Piilani Street / Haihai Street

Run Date: 2014/05/29

Hawaii Department of Transportation
Highways Division — Highways Planning Survey Section
2013 Program Count - Summary

Site ID: B71277000332
Town: Hawaii
DIR 1: +MP **DIR 2:** -MP **Final AADT:** 10300
Functional Class: URBAN:COLLECTOR
Count Type: CLASS
Counter Type: Tube **Route No:** 2770
Location: Manono Street - Piilani Street to Kuawa St

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
DATE : 07/18/2013															
12:00-12:15	7	9	16	06:00-06:15	33	33	66	12:00-12:15	109	114	223	06:00-06:15	32	62	94
12:15-12:30	5	10	15	06:15-06:30	42	43	85	12:15-12:30	108	114	222	06:15-06:30	45	76	121
12:30-12:45	12	8	20	06:30-06:45	30	36	66	12:30-12:45	94	115	209	06:30-06:45	55	63	118
12:45-01:00	6	7	13	06:45-07:00	57	67	124	12:45-01:00	110	116	226	06:45-07:00	39	70	109
01:00-01:15	1	4	5	07:00-07:15	64	51	115	01:00-01:15	108	118	226	07:00-07:15	31	52	83
01:15-01:30	1	2	3	07:15-07:30	71	69	140	01:15-01:30	120	125	245	07:15-07:30	34	55	89
01:30-01:45	5	5	10	07:30-07:45	98	87	185	01:30-01:45	96	101	197	07:30-07:45	27	45	72
01:45-02:00	4	7	11	07:45-08:00	75	84	159	01:45-02:00	84	111	195	07:45-08:00	38	33	71
02:00-02:15	5	9	14	08:00-08:15	75	79	154	02:00-02:15	85	100	185	08:00-08:15	36	38	74
02:15-02:30	2	2	4	08:15-08:30	83	77	160	02:15-02:30	82	109	191	08:15-08:30	30	28	58
02:30-02:45	2	3	5	08:30-08:45	76	81	157	02:30-02:45	107	113	220	08:30-08:45	31	42	73
02:45-03:00	4	4	8	08:45-09:00	80	75	155	02:45-03:00	99	137	236	08:45-09:00	23	20	43
03:00-03:15	4	1	5	09:00-09:15	76	81	157	03:00-03:15	97	126	223	09:00-09:15	16	20	36
03:15-03:30	2	1	3	09:15-09:30	88	80	168	03:15-03:30	81	117	198	09:15-09:30	20	16	36
03:30-03:45	5	4	9	09:30-09:45	87	89	176	03:30-03:45	83	124	207	09:30-09:45	22	29	51
03:45-04:00	6	4	10	09:45-10:00	83	98	181	03:45-04:00	82	132	214	09:45-10:00	21	21	42
04:00-04:15	3	4	7	10:00-10:15	87	79	166	04:00-04:15	117	134	251	10:00-10:15	23	19	42
04:15-04:30	9	0	9	10:15-10:30	85	83	168	04:15-04:30	96	108	204	10:15-10:30	9	14	23
04:30-04:45	8	3	11	10:30-10:45	80	98	178	04:30-04:45	99	138	237	10:30-10:45	13	11	24
04:45-05:00	16	7	23	10:45-11:00	83	123	206	04:45-05:00	112	117	229	10:45-11:00	6	9	15
05:00-05:15	15	11	26	11:00-11:15	109	103	212	05:00-05:15	84	87	171	11:00-11:15	6	6	12
05:15-05:30	17	8	25	11:15-11:30	81	118	199	05:15-05:30	61	92	153	11:15-11:30	7	11	18
05:30-05:45	15	18	33	11:30-11:45	92	126	218	05:30-05:45	53	108	161	11:30-11:45	9	2	11
05:45-06:00	26	16	42	11:45-12:00	87	107	194	05:45-06:00	69	61	130	11:45-12:00	7	9	16

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:30 AM to 08:30 AM		
AM - PEAK HR VOLUME	331	327	658
AM - K FACTOR (%)			6.33
AM - D (%)	50.30	49.70	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:30 AM to 08:30 AM	07:30 AM to 08:30 AM	
AM - PEAK HR VOLUME	331	327	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:00 PM to 05:00 PM		
PM - PEAK HR VOLUME	424	497	921
PM - K FACTOR (%)			8.86
PM - D (%)	46.04	53.96	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:00 PM to 05:00 PM	03:45 PM to 04:45 PM	
PM - PEAK HR VOLUME	424	512	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	10:45 AM to 11:45 AM		
AM - PEAK HR VOLUME	365	470	835
AM - K FACTOR (%)			8.03
AM - D (%)	43.71	56.29	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:00 PM to 05:00 PM		
PM - PEAK HR VOLUME	424	497	921
PM - K FACTOR (%)			8.86
PM - D (%)	46.04	53.96	100.00

NON-COMMUTER PERIOD (09:00-15:00)			
TWO DIRECTIONAL PEAK			
PEAK HR TIME	12:30 PM to 01:30 PM		
PEAK HR VOLUME	432	474	906
DIRECTIONAL PEAK			
PEAK HR TIME	12:45 PM to 01:45 PM	12:30 PM to 01:30 PM	
PEAK HR VOLUME	434	474	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	1,822	1,967	3,789
AM 12-HR PERIOD (00:00-12:00)	2,002	2,114	4,116
PM 6-HR PERIOD (12:00-18:00)	2,236	2,717	4,953
PM 12-HR PERIOD (12:00-24:00)	2,816	3,468	6,284
24 HOUR PERIOD	4,818	5,582	10,400
D (%)	46.33	53.67	100.00

Run Date: 2014/05/29

Hawaii Department of Transportation
Highways Division — Highways Planning Survey Section
2013 Program Count - Summary

Site ID: B71277000332 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 10300
Functional Class: URBAN:COLLECTOR **Count Type:** CLASS **Counter Type:** Tube **Route No:** 2770
Location: Manono Street - Piilani Street to Kuawa St

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
DATE : 07/19/2013															
12:00-12:15	8	9	17	06:00-06:15	22	27	49	12:00-12:15	89	114	203	06:00-06:15	55	68	123
12:15-12:30	6	2	8	06:15-06:30	32	34	66	12:15-12:30	96	111	207	06:15-06:30	78	70	148
12:30-12:45	8	4	12	06:30-06:45	33	42	75	12:30-12:45	122	107	229	06:30-06:45	47	69	116
12:45-01:00	3	5	8	06:45-07:00	47	40	87	12:45-01:00	93	115	208	06:45-07:00	61	59	120
01:00-01:15	6	10	16	07:00-07:15	47	56	103	01:00-01:15	104	116	220	07:00-07:15	56	64	120
01:15-01:30	3	2	5	07:15-07:30	56	58	114	01:15-01:30	96	114	210	07:15-07:30	40	71	111
01:30-01:45	2	5	7	07:30-07:45	81	88	169	01:30-01:45	92	113	205	07:30-07:45	56	73	129
01:45-02:00	3	5	8	07:45-08:00	83	74	157	01:45-02:00	88	99	187	07:45-08:00	40	49	89
02:00-02:15	0	5	5	08:00-08:15	62	77	139	02:00-02:15	89	111	200	08:00-08:15	39	40	79
02:15-02:30	2	0	2	08:15-08:30	56	100	156	02:15-02:30	98	103	201	08:15-08:30	40	45	85
02:30-02:45	2	4	6	08:30-08:45	85	69	154	02:30-02:45	84	109	193	08:30-08:45	25	35	60
02:45-03:00	4	0	4	08:45-09:00	86	99	185	02:45-03:00	110	105	215	08:45-09:00	33	43	76
03:00-03:15	5	0	5	09:00-09:15	87	90	177	03:00-03:15	89	130	219	09:00-09:15	33	32	65
03:15-03:30	1	3	4	09:15-09:30	88	89	177	03:15-03:30	74	108	182	09:15-09:30	50	36	86
03:30-03:45	5	4	9	09:30-09:45	72	120	192	03:30-03:45	111	117	228	09:30-09:45	33	40	73
03:45-04:00	8	0	8	09:45-10:00	84	113	197	03:45-04:00	96	121	217	09:45-10:00	42	30	72
04:00-04:15	6	4	10	10:00-10:15	71	95	166	04:00-04:15	119	121	240	10:00-10:15	33	41	74
04:15-04:30	10	6	16	10:15-10:30	75	91	166	04:15-04:30	98	144	242	10:15-10:30	27	32	59
04:30-04:45	9	7	16	10:30-10:45	73	109	182	04:30-04:45	106	118	224	10:30-10:45	29	23	52
04:45-05:00	9	5	14	10:45-11:00	92	111	203	04:45-05:00	103	136	239	10:45-11:00	40	28	68
05:00-05:15	8	8	16	11:00-11:15	103	104	207	05:00-05:15	107	109	216	11:00-11:15	17	27	44
05:15-05:30	11	13	24	11:15-11:30	112	120	232	05:15-05:30	68	80	148	11:15-11:30	14	23	37
05:30-05:45	18	18	36	11:30-11:45	106	133	239	05:30-05:45	82	99	181	11:30-11:45	19	26	45
05:45-06:00	26	27	53	11:45-12:00	110	95	205	05:45-06:00	67	99	166	11:45-12:00	14	15	29

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	08:00 AM to 09:00 AM		
AM - PEAK HR VOLUME	289	345	634
AM - K FACTOR (%)			5.74
AM - D (%)	45.58	54.42	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	08:00 AM to 09:00 AM	08:00 AM to 09:00 AM	
AM - PEAK HR VOLUME	289	345	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:00 PM to 05:00 PM		
PM - PEAK HR VOLUME	426	519	945
PM - K FACTOR (%)			8.56
PM - D (%)	45.08	54.92	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:00 PM to 05:00 PM	04:00 PM to 05:00 PM	
PM - PEAK HR VOLUME	426	519	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	11:00 AM to 12:00 PM		
AM - PEAK HR VOLUME	431	452	883
AM - K FACTOR (%)			7.99
AM - D (%)	48.81	51.19	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:00 PM to 05:00 PM		
PM - PEAK HR VOLUME	426	519	945
PM - K FACTOR (%)			8.56
PM - D (%)	45.08	54.92	100.00

NON-COMMUTER PERIOD (09:00-15:00)			
TWO DIRECTIONAL PEAK			
PEAK HR TIME	11:00 AM to 12:00 PM		
PEAK HR VOLUME	431	452	883
DIRECTIONAL PEAK			
PEAK HR TIME	11:00 AM to 12:00 PM	10:45 AM to 11:45 AM	
PEAK HR VOLUME	431	468	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	1,763	2,034	3,797
AM 12-HR PERIOD (00:00-12:00)	1,926	2,180	4,106
PM 6-HR PERIOD (12:00-18:00)	2,281	2,699	4,980
PM 12-HR PERIOD (12:00-24:00)	3,202	3,738	6,940
24 HOUR PERIOD	5,128	5,918	11,046
D (%)	46.42	53.58	100.00

Run Date: 2014/05/28

Hawaii Department of Transportation
Highways Division
Highways Planning Survey Section

Vehicle Classification Data Summary
2013

Site ID:	**B71277000332**	**Route No:**	**2770**	**Date From:**	2013/07/18 0:00
Town:	**Hawaii**	**Direction:**	+MP	**Date To:**	2013/07/19 23:45
Location:	**Manono Street - Piilani Street to Kuawa St**				

Functional Classification: 17 URBAN:COLLECTOR

REPORT TOTALS - 48 HOURS RECORDED

	VOLUME	%	NUMBER OF AXLES
Cycles	122	0.57%	244
PC	15394	71.78%	30788
2A-4T	5746	26.79%	11492
LIGHT VEHICLE TOTALS	21262	99.14%	42525
	HEAVY VEHICLES		
Bus	74	0.35%	185
SINGLE UNIT TRUCK			
2A-6T	57	0.27%	114
3A-SU	16	0.07%	48
4A-SU	3	0.01%	12
SINGLE-TRAILER TRUCKS			
4A-ST	21	0.10%	84
5A-ST	10	0.05%	50
6A-ST	0	0.00%	0
MULTI-TRAILER TRUCKS			
5A-MT	0	0.00%	0
6A-MT	0	0.00%	0
7A-MT	2	0.01%	14
HEAVY VEHICLE TOTALS	183	0.85%	507
CLASSIFIED VEHICLES TOTALS	21445 (A)	100.00%	43032 (B)
UNCLASSIFIED VEHICLES TOTALS	1	0.00%	

AXLE CORRECTION FACTOR (A/C) = 0.997

ROADTUBE EQUIVALENT(B/2) = 21516 (C)

PEAK HOUR VOLUME : 945 2013/07/19 16:00	**PEAK HOUR TRUCK VOLUME**	**% TOTAL PEAK HOUR VOLUME**	**24 HOUR TRUCK VOLUME**	**AADT**	**% OF AADT**	**HPMS K-FACTOR (PEAK/AADT) (ITEM 66)**
SINGLE UNIT TRUCKS (TYPE 4-7)	**1**	**(65A-1) 0.11%**	**75**	**10300**	**(65A-2) 0.73%**	**9.17%**
COMBINATION (TYPE 8-13)	**2**	**(65B-1) 0.21%**	**16**		**(65B-2) 0.16%**	**9.17%**

SSFM International, Inc

501 Sumner Street, Suite 620
Honolulu, Hawaii 96817
(808) 531-1308

File Name : 150314 SAT Manono_KamAve
Site Code : 00000000
Start Date : 3/14/2015
Page No : 1

Groups Printed- Passenger - Bicycle - Heavy Vehicle

	Lihiwai Street Southbound					Kamehameha Avenue Westbound					Manono Street Northbound					Kamehameha Avenue Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
11:30 AM	9	32	34	1	76	17	102	13	1	133	40	31	13	3	87	31	131	47	0	209	505
11:45 AM	18	28	34	1	81	9	101	3	1	114	50	24	13	1	88	33	96	63	0	192	475
Total	27	60	68	2	157	26	203	16	2	247	90	55	26	4	175	64	227	110	0	401	980
12:00 PM	5	33	37	0	75	11	113	9	0	133	36	25	19	1	81	24	96	47	1	168	457
12:15 PM	13	40	36	0	89	5	119	9	2	135	49	21	24	0	94	35	122	41	0	198	516
12:30 PM	7	47	39	1	94	11	82	2	0	95	46	32	15	0	93	36	109	43	0	188	470
12:45 PM	16	32	28	2	78	13	90	11	1	115	25	25	10	0	60	26	127	45	0	198	451
Total	41	152	140	3	336	40	404	31	3	478	156	103	68	1	328	121	454	176	1	752	1894
01:00 PM	24	34	42	1	101	8	87	8	0	103	38	27	12	0	77	36	106	37	1	180	461
01:15 PM	19	41	32	1	93	9	90	4	1	104	26	29	6	2	63	48	131	30	1	210	470
Grand Total	111	287	282	7	687	83	784	59	6	932	310	214	112	7	643	269	918	353	3	1543	3805
Apprch %	16.2	41.8	41	1		8.9	84.1	6.3	0.6		48.2	33.3	17.4	1.1		17.4	59.5	22.9	0.2		
Total %	2.9	7.5	7.4	0.2	18.1	2.2	20.6	1.6	0.2	24.5	8.1	5.6	2.9	0.2	16.9	7.1	24.1	9.3	0.1	40.6	
Passenger	111	284	278	7	680	81	774	59	6	920	309	211	110	7	637	265	908	348	3	1524	3761
% Passenger	100	99	98.6	100	99	97.6	98.7	100	100	98.7	99.7	98.6	98.2	100	99.1	98.5	98.9	98.6	100	98.8	98.8
Bicycle	0	3	2	0	5	2	4	0	0	6	0	3	2	0	5	4	2	2	0	8	24
% Bicycle	0	1	0.7	0	0.7	2.4	0.5	0	0	0.6	0	1.4	1.8	0	0.8	1.5	0.2	0.6	0	0.5	0.6
Heavy Vehicle	0	0	2	0	2	0	6	0	0	6	1	0	0	0	1	0	8	3	0	11	20
% Heavy Vehicle	0	0	0.7	0	0.3	0	0.8	0	0	0.6	0.3	0	0	0	0.2	0	0.9	0.8	0	0.7	0.5

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Page No : 2

	Lihiwai Street Southbound					Kamehameha Avenue Westbound					Manono Street Northbound					Kamehameha Avenue Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 11:30 AM to 01:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 11:30 AM																					
11:30 AM	9	32	34	1	76	17	102	13	1	133	40	31	13	3	87	31	131	47	0	209	505
11:45 AM	18	28	34	1	81	9	101	3	1	114	50	24	13	1	88	33	96	63	0	192	475
12:00 PM	5	33	37	0	75	11	113	9	0	133	36	25	19	1	81	24	96	47	1	168	457
12:15 PM	13	40	36	0	89	5	119	9	2	135	49	21	24	0	94	35	122	41	0	198	516
Total Volume	45	133	141	2	321	42	435	34	4	515	175	101	69	5	350	123	445	198	1	767	1953
% App. Total	14	41.4	43.9	0.6		8.2	84.5	6.6	0.8		50	28.9	19.7	1.4		16	58	25.8	0.1		
PHF	.625	.831	.953	.500	.902	.618	.914	.654	.500	.954	.875	.815	.719	.417	.931	.879	.849	.786	.250	.917	.946

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File Name : 150314 SAT Manono_Kuawa
Site Code : 00000000
Start Date : 3/14/2015
Page No : 1

Groups Printed- Passenger - Bicycle - Heavy Vehicle

	Manono Street Southbound					Kuawa Street Westbound					Manono Street Northbound					Bayfront driveway Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
11:30 AM	10	85	6	3	104	12	2	13	0	27	2	75	22	2	101	1	2	2	0	5	237
11:45 AM	16	84	2	0	102	6	1	16	0	23	1	66	16	1	84	4	0	4	0	8	217
Total	26	169	8	3	206	18	3	29	0	50	3	141	38	3	185	5	2	6	0	13	454
12:00 PM	11	79	4	0	94	8	1	12	1	22	3	69	16	1	89	2	1	2	0	5	210
12:15 PM	7	76	2	0	85	7	0	17	0	24	1	81	15	1	98	4	0	1	0	5	212
12:30 PM	13	79	7	1	100	9	1	17	0	27	2	68	9	1	80	1	1	1	0	3	210
12:45 PM	13	81	1	0	95	7	1	4	0	12	2	57	10	0	69	3	2	2	0	7	183
Total	44	315	14	1	374	31	3	50	1	85	8	275	50	3	336	10	4	6	0	20	815
01:00 PM	10	66	2	1	79	7	0	6	0	13	1	72	20	1	94	3	1	2	0	6	192
01:15 PM	8	73	1	0	82	10	0	10	0	20	6	50	10	1	67	3	1	1	0	5	174
Grand Total	88	623	25	5	741	66	6	95	1	168	18	538	118	8	682	21	8	15	0	44	1635
Apprch %	11.9	84.1	3.4	0.7		39.3	3.6	56.5	0.6		2.6	78.9	17.3	1.2		47.7	18.2	34.1	0		
Total %	5.4	38.1	1.5	0.3	45.3	4	0.4	5.8	0.1	10.3	1.1	32.9	7.2	0.5	41.7	1.3	0.5	0.9	0	2.7	
Passenger	88	616	22	4	730	66	6	95	1	168	18	535	118	8	679	19	7	14	0	40	1617
% Passenger	100	98.9	88	80	98.5	100	100	100	100	100	100	99.4	100	100	99.6	90.5	87.5	93.3	0	90.9	98.9
Bicycle	0	4	3	0	7	0	0	0	0	0	0	3	0	0	3	2	1	1	0	4	14
% Bicycle	0	0.6	12	0	0.9	0	0	0	0	0	0	0.6	0	0	0.4	9.5	12.5	6.7	0	9.1	0.9
Heavy Vehicle	0	3	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
% Heavy Vehicle	0	0.5	0	20	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2

SSFM International, Inc

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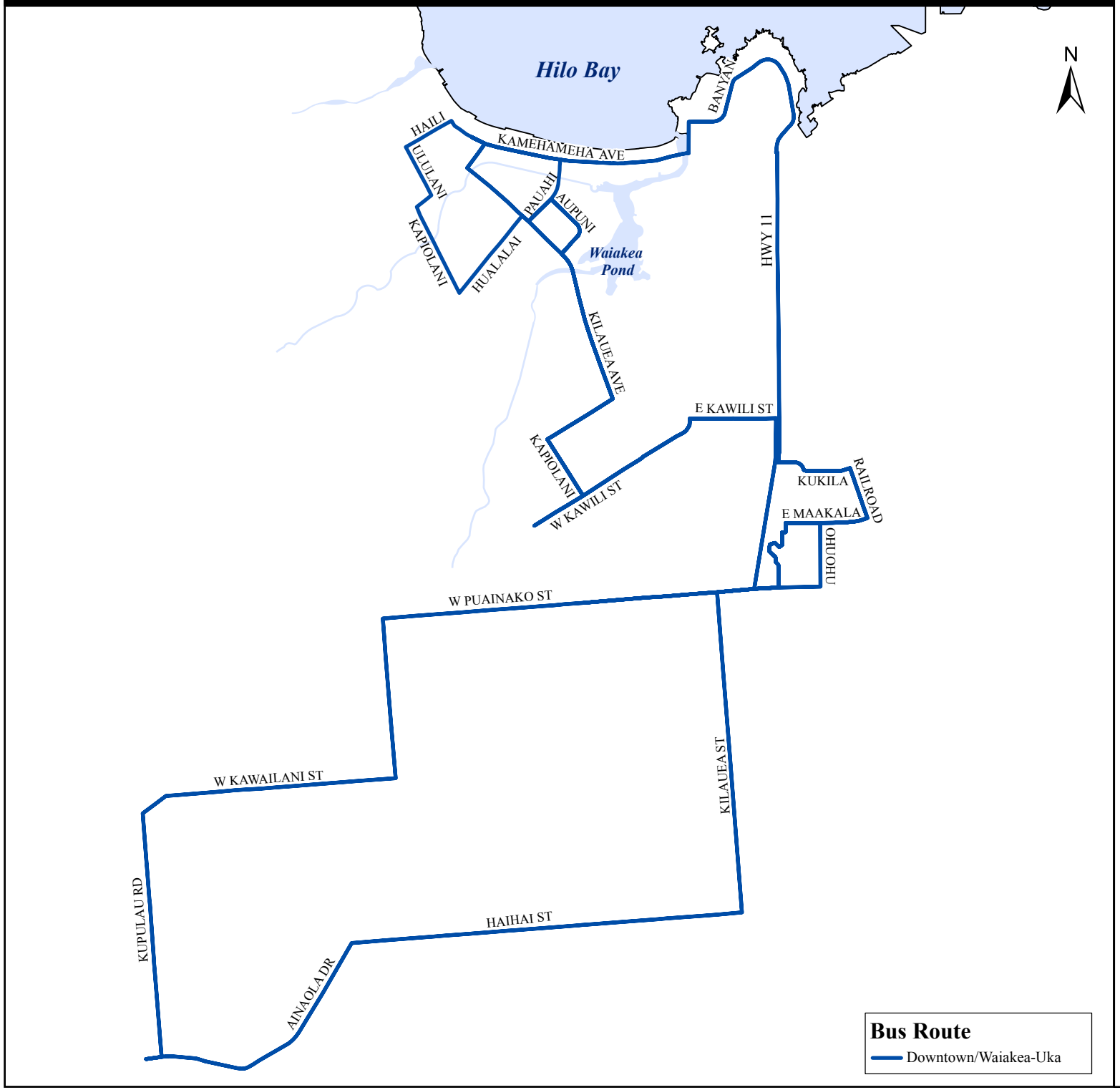
File Name : 150314 SAT Manono_Kuawa
Site Code : 00000000
Start Date : 3/14/2015
Page No : 2

	Manono Street Southbound					Kuawa Street Westbound					Manono Street Northbound					Bayfront driveway Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 11:30 AM to 01:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 11:30 AM																					
11:30 AM	10	85	6	3	104	12	2	13	0	27	2	75	22	2	101	1	2	2	0	5	237
11:45 AM	16	84	2	0	102	6	1	16	0	23	1	66	16	1	84	4	0	4	0	8	217
12:00 PM	11	79	4	0	94	8	1	12	1	22	3	69	16	1	89	2	1	2	0	5	210
12:15 PM	7	76	2	0	85	7	0	17	0	24	1	81	15	1	98	4	0	1	0	5	212
Total Volume	44	324	14	3	385	33	4	58	1	96	7	291	69	5	372	11	3	9	0	23	876
% App. Total	11.4	84.2	3.6	0.8		34.4	4.2	60.4	1		1.9	78.2	18.5	1.3		47.8	13	39.1	0		
PHF	.688	.953	.583	.250	.925	.688	.500	.853	.250	.889	.583	.898	.784	.625	.921	.688	.375	.563	.000	.719	.924

Appendix B

Hele-On Bus Schedules and Map

INTRA-HILO WAIAKEA-UKA



COUNTY OF HAWAII MASS TRANSIT AGENCY 961-8744

INTRA-HILO WAIAKEA-UKA BUS SCHEDULE

Operates Monday-Saturday

In consideration of others and for your safety:

1. Shirts and footwear are required.
2. Remain seated.

The following are prohibited on transit buses:

1. Obstructing or interfering with operator.
2. Smoking.
3. Refusing to vacate priority seating for the elderly and disabled passengers.
4. Consumption of food and beverage.
5. Talking on cell phones.
6. The playing of radios, tape players, dvd players, without headphones/earphones.
7. Horseplaying, yelling or talking loudly.
8. Surboards and bodyboards.
9. Flammable, explosive or toxic materials.
10. Expectorating or spitting.

The following will be charged $1.00:

1. Pets provided they are kept in an enclosed pet carrier or cage (except service animals).
2. Any item larger than 16″ x 10″ and/or more than one item ($1.00 per item).
3. Bicycle
4. Skateboard

How to board the bus:

1. Please utilize designated bus stops zones whenever possible.
2. Wait on the proper side of the roadway for the bus.
3. Flag the bus (please call for bus stop information).
4. Wait until the bus makes a complete stop.

How to exit the bus:

1. Before reaching your desired "get off" spot, pull cord located by the window of the bus.
2. Remain seated until the bus comes to a complete stop.
3. Exit from front of bus.

DISCLAIMER: The County of Hawaii will not be responsible for any inconvenience, expense, or damages resulting from the failure to depart or arrive at stated times or for any items brought on the bus.

For more information visit **www.co.hawaii.hi.us**

County of Hawaii is an Equal Opportunity Employer and Provider

7/6/10

INTRA HILO WAIAKEA-UKA BUS SCHEDULE

Operates Monday through Saturday

Effective August 2, 2011

Downtown Hilo to Waiakea-Uka (Bus is marked "6 WAIAKEA-UKA")

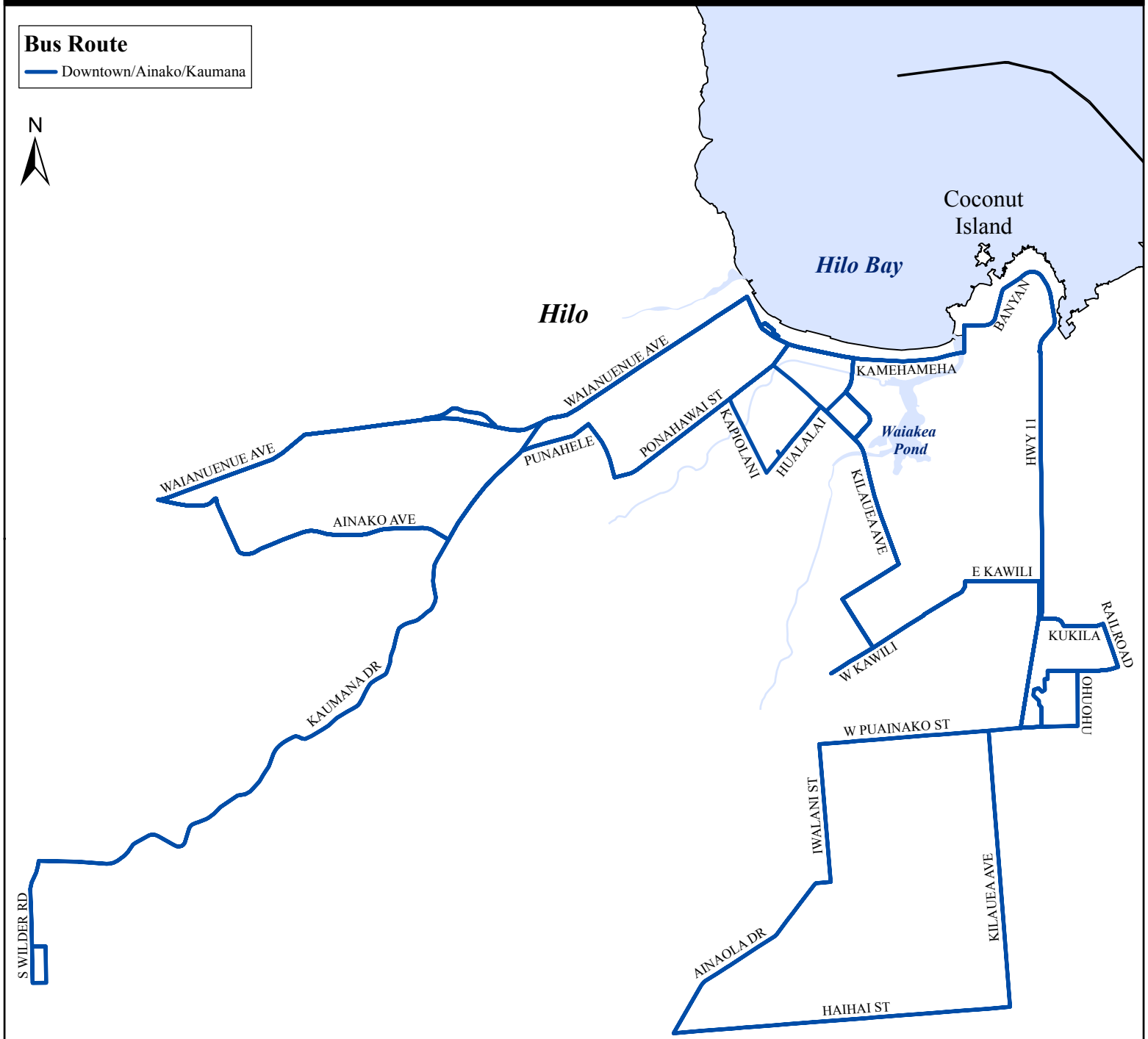
Mooheau Bus Terminal	Aupuni Center	Hilo Shopping Center	U.H.H.	H.C.C.	Prince Kuhio Plaza	Kilauea/ Haihai	Haihai/ Ainaola	Waiakea-Uka Gym
7:05	**7:15**	**7:18**	**7:20**	**7:22**	**7:25**	**7:40**	**7:45**	**7:50**
9:30	**9:35**	**9:40**	**9:45**	**9:47**	**9:50**	**9:55**	**10:00**	**----**
10:50	**10:55**	**11:00**	**11:05**	**11:07**	**11:10**	**11:15**	**11:20**	**----**
12:05	12:10	12:15	12:20	12:22	12:25	12:30	12:35	12:40
3:20	3:25	3:28	3:33	3:36	3:40	3:50	3:55	4:00

Waiakea-Uka to Downtown Hilo (Bus is marked "7 DOWNTOWN HILO")

Waiakea-Uka Gym	Life Care Center	Prince Kuhio Plaza	H.C.C.	U.H.H.	Hilo Shopping Center	Aupuni Center	Banyan Drive	Mooheau Bus Terminal
7:50	**7:55**	**8:05**	**8:07**	**8:10**	**8:15**	**8:20**		**8:25**
----	**----**	**10:10**	**----**	**----**	**----**	**----**	**10:20**	**10:25**
----	**----**	**11:30**	**----**	**----**	**----**	**----**	**11:40**	**11:45**
12:40	12:45	12:50	**----**	**----**	**----**	**----**	1:05	1:10
4:00	4:05	4:20	4:25	4:28	4:33	4:38	**----**	4:45

Bold = Morning

INTRA-HILO KAUMANA



COUNTY OF HAWAII MASS TRANSIT AGENCY 961-8744 INTRA-HILO KAUMANA BUS SCHEDULE

Operates Monday-Saturday

In consideration of others and for your safety:

1. Shirts and footwear are required.
2. No flammable, explosive or toxic material.
3. No smoking, consumption of food or beverage.
4. Discarding of litter.
5. Expectorating or spitting.
6. The playing of radios, tape players, dvd players, and cell phones are prohibited without headphones.
7. Refrain from horseplaying, yelling or talking loudly.
8. The following items are prohibited unless prior permission is granted:
   a. Bodyboards
9. **$1.00 charge for pets (except service animals) provided they are kept in an enclosed container or cage**
10. **$1.00 charge per item larger than 16” x 10”or more than one item that cannot fit underneath your seat. $1.00 charge for bicycle.**
11. Please utilize designated bus stop zones whenever possible.

How to board the bus:

1. Wait on the proper side of the roadway for the bus.
2. Flag the bus (please call for bus stop information).
3. Wait until the bus makes a complete stop.
4. Boarding will be denied if passengers appear to be intoxicated on liquor or drugs; engaged in activities that violate any other law or ordinance.

How to exit the bus:

1. Before reaching your desired “get off” spot, pull cord located by the window of the bus.
2. Remain seated until the bus comes to a complete stop.
3. Exit from front of bus.

DISCLAIMER: The County of Hawaii will not be responsible for any inconvenience, expense, or damages resulting from the failure to depart or arrive at stated times or for any items brought on the bus.

For more information visit www.heleonbus.org

County of Hawaii is an Equal Opportunity Employer and Provider

7/9/09

INTRA HILO KAUMANA BUS SCHEDULE

Operates Monday through Saturday

Effective 12/09/2013

Downtown Hilo to Ainako and Kaumana (Bus is marked "4 KAUMANA")

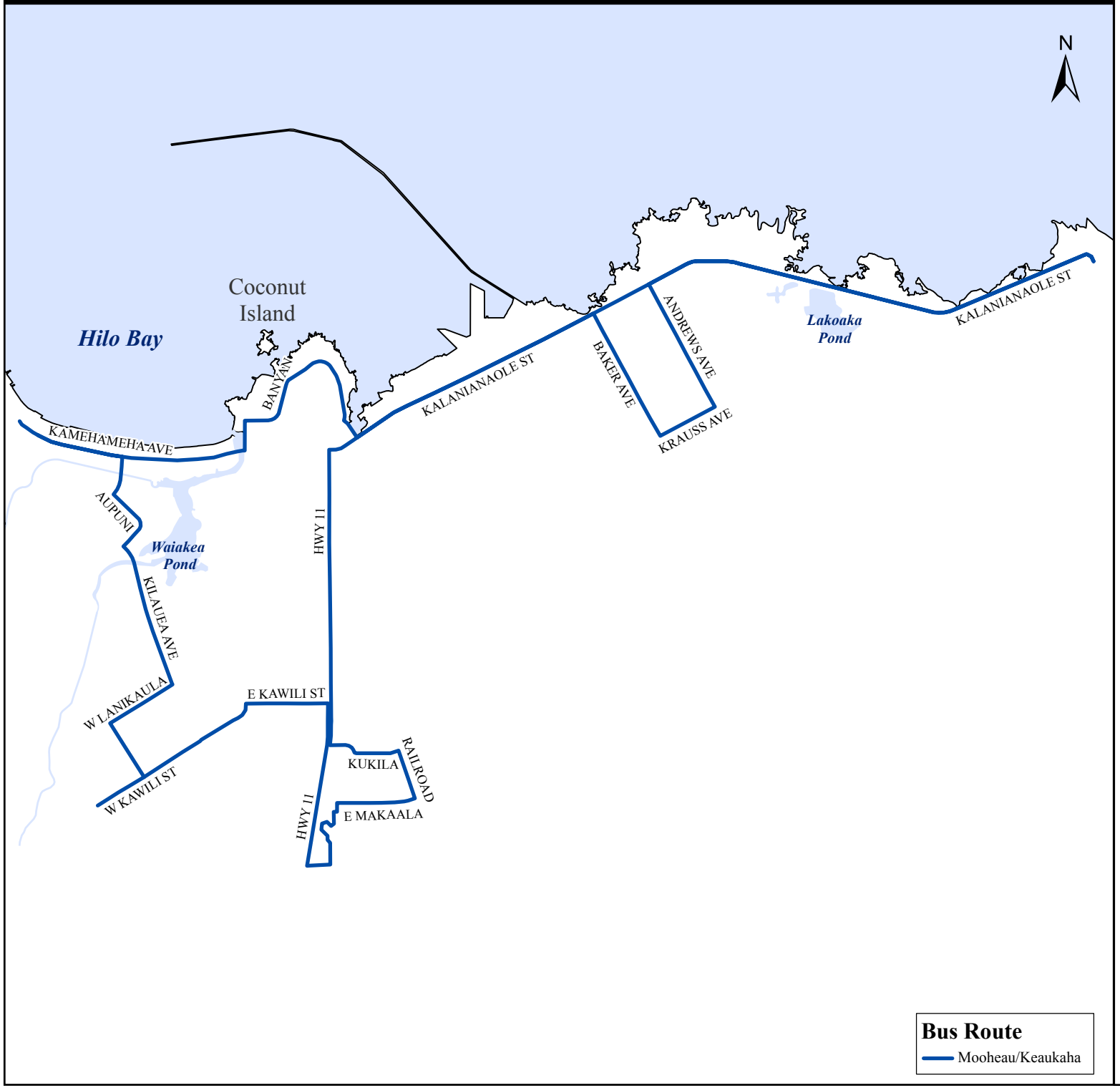
Prince Kuhio Plaza	Aupuni Center	Banyan Drive	Mooheau Bus Terminal	Hilo Library	Hilo Medical Center	Ainako/ Kaumana	Chong/ Kaumana	Gentry Subdivision	Kaumana City
7:15	**7:25**	**----**	**7:35**	**---**	**7:45**	**7:50**	**----**	**----**	**----**
----	**----**	**8:30**	**8:35**	**8:40**	**8:45**	**8:50**	**----**	**----**	**9:00**
10:10	**----**	**10:20**	**10:25**	**10:30**	**10:35**	**10:40**	**----**	**----**	**----**
11:30	**----**	**11:40**	**11:50**	**11:55**	12:00	12:05	**----**	**----**	12:15
----	2:15	**----**	2:20	2:25	2:30	2:35	2:40	**----**	2:50
4:20	4:38	**----**	4:45	4:50	4:55	5:00	**----**	5:10	5:20

Kaumana and Ainako to Downtown Hilo (Bus is marked "7 DOWNTOWN HILO")

Kaumana City	Gentry Subdivision	Chong/ Kaumana	Kaumana Terrace	Ainako	Kawaena Lapaau	Mooheau Bus Terminal	Aupuni Center	Prince Kuhio Plaza	Banyan Drive
----	**----**	**----**	**----**	**7:50**	**----**	**8:00**	**8:05**	**----**	**8:30**
9:00	**9:05**	**9:10**	**9:15**	**9:20**	**9:25**	**9:30**	**9:35**	**9:50**	**----**
----	**----**	**----**	**----**	**10:40**	**10:45**	**10:50**	**10:55**	**11:10**	**11:40**
12:15	12:20	12:25	12:30	12:35	12:40	12:45	**----**	**----**	**----**
2:50	2:55	3:00	3:05	3:10	3:15	3:20	3:25	3:40	**----**

Bold = Morning

KEAUKAHA



COUNTY OF HAWAII MASS TRANSIT AGENCY 961-8744

KEAUKAHA BUS SCHEDULE

Effective 2/17/09

In consideration of others and for your safety:

1. Shirts and footwear are required.
2. Remain seated.

The following are prohibited on transit buses:

1. Obstructing or interfering with operator.
2. Smoking.
3. Refusing to vacate priority seating for the elderly and disabled passengers.
4. Consumption of food and beverage.
5. Talking on cell phones.
6. The playing of radios, tape players, dvd players, without headphones/earphones.
7. Horseplaying, yelling or talking loudly.
8. Surboards and bodyboards.
9. Flammable, explosive or toxic materials.
10. Expectorating or spitting.

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3. Exit from front of bus.

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For more information visit **www.co.hawaii.hi.us**

County of Hawaii is an Equal Opportunity Employer and Provider

7/6/10

KEAUKAHA

Operates Monday through Saturday

2/21/2009

KEAUKAHA TO MO'OHEAU BUS TERMINAL

King's Landing	Kalanianaole (Richardson)	Kalanianaole (Onekahakaha)	Oceanfront Kitchen (Chinese Take-Out)	Banyan Drive	Mo'oheau Bus Terminal
7:00	**7:03**	**7:08**	**7:10**	**7:15**	**7:20**
8:00	**8:03**	**8:08**	**8:10**	**8:15**	**8:20**
9:00	**9:03**	**9:08**	**9:10**	**9:15**	**9:20**
10:00	**10:03**	**10:08**	**10:10**	**10:15**	**10:20**
11:00	**11:03**	**11:08**	**11:10**	**11:15**	**11:20**
1:35	1:38	1:43	1:45	1:50	1:55
2:35	2:38	2:43	2:45	2:50	2:55
3:35	3:38	3:43	3:45	3:50	3:55
4:40	4:43	4:48	4:50	4:55	5:00

MO'OHEAU BUS TERMINAL TO KEAUKAHA

Mo'oheau Bus Terminal	Aupuni Center	Hilo Shopping Center	University of Hawaii Hilo	Hawaii Community College	Prince Kuhio Plaza	Keaukaha Market	Baker Street/ Krauss Street	Seaside Restaurant	King's Landing
7:25	**7:30**	**7:33**	**7:35**	**7:40**	**7:45**	**7:50**	**7:53**	**7:55**	**8:00**
8:25	**8:30**	**8:33**	**8:35**	**8:40**	**8:45**	**8:50**	**8:53**	**8:55**	**9:00**
9:25	**9:30**	**9:33**	**9:35**	**9:40**	**9:45**	**9:50**	**9:53**	**9:55**	**10:00**
10:25	**10:30**	**10:33**	**10:35**	**10:40**	**10:45**	**10:50**	**10:53**	**10:55**	**11:00**
1:00	1:05	1:08	1:10	1:15	1:20	1:25	1:28	1:30	1:35
2:00	2:05	2:08	2:10	2:15	2:20	2:25	2:28	2:30	2:35
3:00	3:05	3:08	3:10	3:15	3:20	3:25	3:38	3:30	3:35
4:00	4:05	4:08	4:10	4:15	4:20	4:25	4:28	4:30	4:35

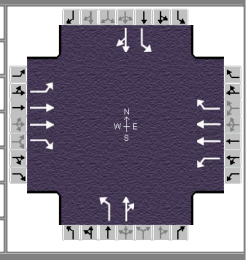
BOLD = MORNINGS

Appendix C

Analysis Reports
Existing (2015) Conditions

HCS 2010 Signalized Intersection Results Summary

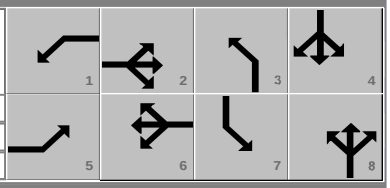
General Information				Intersection Information	
Agency	SSFM International, Inc			Duration, h	0.25
Analyst	jtw	Analysis Date	3/24/2015	Area Type	Other
Jurisdiction	County of Hawaii	Time Period	Saturday Midday	PHF	0.95
Intersection	at Manono Street	Analysis Year	2015	Analysis Period	1> 7:00
File Name	150324 jtw Manono_KamAve SAT.xus				
Project Description	Kuawa Street New Fields Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	123	445	198	42	435	34	175	101	69	45	133	141

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	3.5	2.1	45.7	3.7	0.8	19.1
Yellow	4.0	0.0	4.0	4.0	4.0	4.0
Red	1.0	0.0	1.0	1.0	1.0	1.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	3.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	10.7	52.8	8.5	50.7	14.5	30.0	8.7	24.1
Change Period, $(Y+R_c)$, s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway *(MAH)*, s	3.1	0.0	3.1	0.0	3.1	3.2	3.1	3.2
Queue Clearance Time (g_s), s	5.6		3.3		9.3	10.5	4.1	18.3
Green Extension Time (g_e), s	0.2	0.0	0.1	0.0	0.3	0.9	0.1	0.9
Phase Call Probability	0.97		0.71		0.99	1.00	0.73	1.00
Max Out Probability	0.00		0.00		0.00	0.00	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate *(v)*, veh/h	129	468	208	44	458	36	184	179		47	288	
Adjusted Saturation Flow Rate *(s)*, veh/h/ln	1792	1791	1594	1792	1791	1594	1792	1753		1792	1722	
Queue Service Time (g_s), s	3.6	7.8	7.8	1.3	8.0	1.2	7.3	8.5		2.1	16.3	
Cycle Queue Clearance Time (g_c), s	3.6	7.8	7.8	1.3	8.0	1.2	7.3	8.5		2.1	16.3	
Capacity *(c)*, veh/h	516	1713	763	442	1637	729	274	438		337	329	
Volume-to-Capacity Ratio *(X)*	0.251	0.273	0.273	0.100	0.280	0.049	0.674	0.409		0.141	0.876	
Available Capacity (c_a), veh/h	959	1713	763	1191	1637	729	551	690		880	577	
Back of Queue *(Q)*, veh/ln (50th percentile)	1.4	3.2	2.9	0.5	3.2	0.5	3.1	3.6		0.9	7.0	
Overflow Queue (Q_3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Queue Storage Ratio *(RQ)* (50th percentile)	0.11	0.00	0.24	0.07	0.00	0.06	0.44	0.00		0.18	0.00	
Uniform Delay (d_1), s/veh	12.2	15.7	15.7	13.4	16.9	15.1	25.9	31.3		30.7	39.3	
Incremental Delay (d_2), s/veh	0.1	0.4	0.9	0.0	0.4	0.1	1.1	0.2		0.1	2.9	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay *(d)*, s/veh	12.3	16.0	16.5	13.4	17.3	15.2	27.0	31.6		30.7	42.2	
Level of Service (LOS)	B	B	B	B	B	B	C	C		C	D	
Approach Delay, s/veh / LOS	15.6	B		16.9	B		29.2	C		40.6	D	
Intersection Delay, s/veh / LOS	22.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.3	B	2.3	B	3.0	C	3.0	C
Bicycle LOS Score / LOS	1.2	A	0.9	A	1.1	A	1.0	A

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HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: jtw
Agency/Co.: SSFM International
Date Performed: 3/24/2015
Analysis Time Period: Saturday Midday
Intersection:
Jurisdiction: County of Hawaii
Units: U. S. Customary
Analysis Year: Existing (2015)
Project ID: Kuawa Street New Fields Development
East/West Street: Kuawa Street
North/South Street: Manono Street
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	7	291	69	44	324	14
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR	7	316	74	47	352	15
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	33	4	58	11	3	9
Peak Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR	35	4	63	11	3	9
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

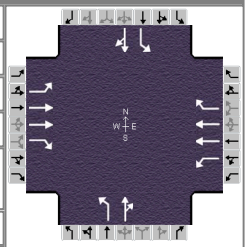
Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	7	47		102			23	
C(m) (vph)	1203	1180		439			332	
v/c	0.01	0.04		0.23			0.07	
95% queue length	0.02	0.12		0.89			0.22	
Control Delay	8.0	8.2		15.7			16.6	
LOS	A	A		C			C	
Approach Delay				15.7			16.6	
Approach LOS				C			C	

Appendix D

Analysis Reports
Future (2020) Without Project Conditions

HCS 2010 Signalized Intersection Results Summary

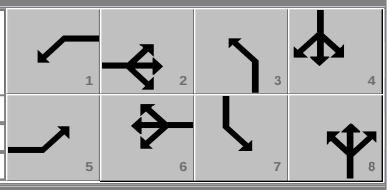
General Information				Intersection Information	
Agency	SSFM International, Inc			Duration, h	0.25
Analyst	jtw	Analysis Date	3/24/2015	Area Type	Other
Jurisdiction	County of Hawaii	Time Period	Saturday Midday	PHF	0.95
Intersection	at Manono Street	Analysis Year	Future (2020) Without Project	Analysis Period	1> 7:00
File Name	150325 jtw Manono_KamAve SAT 2020wo.xus				
Project Description	Kuawa Street New Fields Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	132	476	212	45	465	36	187	108	74	48	142	151

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	3.7	2.4	43.7	3.8	1.0	20.4
Yellow	4.0	0.0	4.0	4.0	4.0	4.0
Red	1.0	0.0	1.0	1.0	1.0	1.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	3.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	11.1	51.2	8.7	48.7	14.8	31.4	8.8	25.4
Change Period, *(Y+R$_c$)*, s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway *(MAH)*, s	3.1	0.0	3.1	0.0	3.1	3.2	3.1	3.2
Queue Clearance Time *(g$_s$)*, s	6.0		3.4		9.6	11.0	4.2	19.4
Green Extension Time *(g$_e$)*, s	0.2	0.0	0.1	0.0	0.2	1.0	0.0	1.0
Phase Call Probability	0.98		0.73		1.00	1.00	0.75	1.00
Max Out Probability	0.00		0.00		0.01	0.00	0.32	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate *(v)*, veh/h	139	501	223	47	489	38	197	192		51	308	
Adjusted Saturation Flow Rate *(s)*, veh/h/ln	1792	1791	1594	1792	1791	1594	1792	1753		1792	1721	
Queue Service Time *(g$_s$)*, s	4.0	8.8	8.8	1.4	8.9	1.4	7.6	9.0		2.2	17.4	
Cycle Queue Clearance Time *(g$_c$)*, s	4.0	8.8	8.8	1.4	8.9	1.4	7.6	9.0		2.2	17.4	
Capacity *(c)*, veh/h	488	1654	736	412	1566	697	280	463		348	351	
Volume-to-Capacity Ratio *(X)*	0.285	0.303	0.303	0.115	0.312	0.054	0.704	0.414		0.145	0.880	
Available Capacity *(c$_a$)*, veh/h	913	1654	736	917	1566	697	409	880		423	761	
Back of Queue *(Q)*, veh/ln (50th percentile)	1.5	3.6	3.3	0.6	3.7	0.5	3.2	3.8		0.9	7.4	
Overflow Queue *(Q$_3$)*, veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Queue Storage Ratio *(RQ)* (50th percentile)	0.12	0.00	0.28	0.08	0.00	0.06	0.46	0.00		0.19	0.00	
Uniform Delay *(d$_1$)*, s/veh	13.1	16.8	16.8	14.4	18.3	16.2	25.3	30.4		29.7	38.6	
Incremental Delay *(d$_2$)*, s/veh	0.1	0.5	1.1	0.0	0.5	0.1	1.2	0.2		0.1	2.9	
Initial Queue Delay *(d$_3$)*, s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay *(d)*, s/veh	13.2	17.3	17.9	14.5	18.9	16.4	26.5	30.6		29.7	41.5	
Level of Service (LOS)	B	B	B	B	B	B	C	C		C	D	
Approach Delay, s/veh / LOS	16.8	B		18.3	B		28.5	C		39.8	D	
Intersection Delay, s/veh / LOS	23.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.3	B	2.3	B	3.0	C	3.0	C
Bicycle LOS Score / LOS	1.2	A	1.0	A	1.1	A	1.1	A

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HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: jtw
Agency/Co.: SSFM International
Date Performed: 3/24/2015
Analysis Time Period: Saturday Midday
Intersection:
Jurisdiction: County of Hawaii
Units: U. S. Customary
Analysis Year: Future (2020) Without Project
Project ID: Kuawa Street New Fields Development
East/West Street: Kuawa Street
North/South Street: Manono Street
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	7	311	74	47	347	15
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR	7	338	80	51	377	16
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	33	4	58	11	3	9
Peak Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR	35	4	63	11	3	9
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

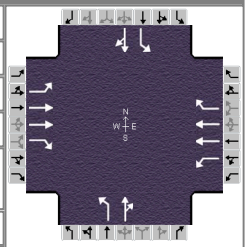
Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	7	51		102			23	
C(m) (vph)	1177	1152		409			304	
v/c	0.01	0.04		0.25			0.08	
95% queue length	0.02	0.14		0.97			0.24	
Control Delay	8.1	8.3		16.7			17.8	
LOS	A	A		C			C	
Approach Delay				16.7			17.8	
Approach LOS				C			C	

Appendix E

Analysis Reports
Future (2020) With Project Conditions

HCS 2010 Signalized Intersection Results Summary

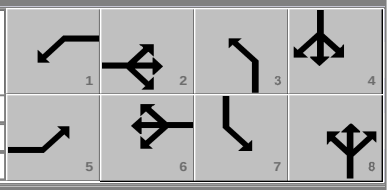
General Information				Intersection Information	
Agency	SSFM International, Inc			Duration, h	0.25
Analyst	jtw	Analysis Date	3/24/2015	Area Type	Other
Jurisdiction	County of Hawaii	Time Period	Saturday Midday	PHF	0.95
Intersection	at Manono Street	Analysis Year	Future (2020) With Project	Analysis Period	1> 7:00
File Name	150330 jtw Manono_KamAve SAT 2020wproj.xus				
Project Description	Kuawa Street New Fields Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	132	476	241	51	465	36	216	108	80	48	142	151

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	3.9	2.3	42.5	3.8	2.2	20.4
Yellow	4.0	0.0	4.0	4.0	4.0	4.0
Red	1.0	0.0	1.0	1.0	1.0	1.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	3.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	11.2	49.8	8.9	47.5	16.0	32.6	8.8	25.4
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2	3.1	3.2
Queue Clearance Time (g_s), s	6.1		3.7		10.6	11.3	4.2	19.4
Green Extension Time (g_e), s	0.2	0.0	0.1	0.0	0.4	1.0	0.0	1.0
Phase Call Probability	0.98		0.77		1.00	1.00	0.75	1.00
Max Out Probability	0.00		0.00		0.00	0.00	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	139	501	254	54	489	38	227	198		51	308	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1792	1791	1594	1792	1791	1594	1792	1747		1792	1721	
Queue Service Time (g_s), s	4.1	9.0	10.4	1.7	9.1	1.4	8.6	9.3		2.2	17.4	
Cycle Queue Clearance Time (g_c), s	4.1	9.0	10.4	1.7	9.1	1.4	8.6	9.3		2.2	17.4	
Capacity (*c*), veh/h	477	1604	714	397	1521	677	301	482		358	351	
Volume-to-Capacity Ratio (*X*)	0.291	0.312	0.355	0.135	0.322	0.056	0.756	0.411		0.141	0.880	
Available Capacity (c_a), veh/h	807	1604	714	805	1521	677	570	808		577	672	
Back of Queue (*Q*), veh/ln (50th percentile)	1.6	3.7	4.0	0.7	3.8	0.5	3.6	3.8		0.9	7.4	
Overflow Queue (Q_3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Queue Storage Ratio (*RQ*) (50th percentile)	0.12	0.00	0.33	0.09	0.00	0.07	0.52	0.00		0.19	0.00	
Uniform Delay (d_1), s/veh	13.8	17.7	18.1	15.1	19.2	17.0	24.4	29.6		29.6	38.6	
Incremental Delay (d_2), s/veh	0.1	0.5	1.4	0.1	0.6	0.2	1.5	0.2		0.1	2.9	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	13.9	18.2	19.5	15.1	19.7	17.1	25.9	29.8		29.7	41.5	
Level of Service (LOS)	B	B	B	B	B	B	C	C		C	D	
Approach Delay, s/veh / LOS	17.9	B		19.1	B		27.7	C		39.8	D	
Intersection Delay, s/veh / LOS	23.6						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.3	B	2.3	B	3.0	C	3.0	C
Bicycle LOS Score / LOS	1.2	A	1.0	A	1.2	A	1.1	A

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HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: jtw
Agency/Co.: SSFM International
Date Performed: 3/24/2015
Analysis Time Period: Saturday Midday
Intersection:
Jurisdiction: County of Hawaii
Units: U. S. Customary
Analysis Year: Future (2020) With Project
Project ID: Kuawa Street New Fields Development
East/West Street: Kuawa Street
North/South Street: Manono Street
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	7	311	91	82	347	15
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR	7	338	98	89	377	16
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	50	4	93	11	3	9
Peak Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR	54	4	101	11	3	9
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	7	89		159			23	
C(m) (vph)	1177	1134		373			246	
v/c	0.01	0.08		0.43			0.09	
95% queue length	0.02	0.26		2.07			0.31	
Control Delay	8.1	8.4		21.6			21.1	
LOS	A	A		C			C	
Approach Delay				21.6			21.1	
Approach LOS				C			C	