NEIL ABERCROMBIE
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STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810-0119

MAY 9 2014

PM-1025.4

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

FILE COPY

MAY 23 2014

Dear Ms. Wooley:

With this letter, the Department of Accounting and General Services hereby transmits the Draft Environmental Assessment and Anticipated Finding of No Significant Impact (DEA-AFONSI) for the Upper Kapahi Reservoir Dam Replacement Project situated at TMK (4)4-6-007:011, in the Puna District on the island of Kauai. This DEA has been prepared pursuant to Chapter 343, Hawaii Revised Statues, and Chapter 11–200, Hawaii Administrative Rules. Please publish notice of this DEA in the May 23, 2014, issue of *The Environmental Notice*.

Enclosed is a completed OEQC Publication Form, two copies of the DEA-AFONSI, an Adobe Acrobat PDF file of the same, and an electronic copy of the publication form in MS Word.

If there are any questions, please contact Wade Ishii of our Project Management Branch at 586-0464.

Very truly yours,

JAMES K. KURATA
Public Works Administrator

WI/si
Enclosures

'14 MAY 12 P4:08

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

Project Name: Upper Kapahi Reservoir Dam Replacement (DAGS Job Number 14-23-7591)
Island: Kaua'i
District: Puna
TMK: (4)4-6-007:011

Permits: Section 404 permit, Section 401 Water Quality Certification, NPDES permit, Coastal Zone Management Act Consistency Approval

Proposing/Determination Agency:

James Kurata
Public Works Division, State of Hawai'i Department of Accounting and General Services
1151 Punchbowl Street, Room 426
Honolulu, HI 96813
(808) 586-0526

Accepting Authority:

(for EIS submittals only)

Consultant:

Ginger Gillin, GEI Consultants, Inc.
700 NE Multnomah Street, Suite 230
Portland, OR 97232
(503) 342-3777

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.

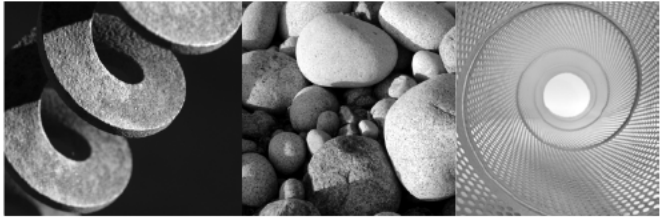
__Section 11-200-27 Determination

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 (Provide proposed action and purpose/need in less than 200 words. Please keep the summary brief and on this one page):

The proposed action is for construction of a new dam on Upper Kapahi Reservoir to provide some agricultural storage to supplement some of the water storage lost when the existing dam was decommissioned. The proposed new dam will be within the footprint of the existing reservoir, a short distance upstream from the existing dam. Storage capacity would be reduced. No significant impacts are anticipated from construction or operation of the new dam. Construction activities are expected to result in short-term increases in noise and traffic, and there is the potential for short-term adverse effects on the air quality, soils, biological resources, and water quality. Use of best management practices and other recommended actions would minimize or eliminate any impacts. Beneficial effects of construction of the new dam would include a short-term effect on socioeconomics from the employment of local people and the purchase of local materials, a long-term benefit to agricultural users once the reservoir could again store water, and a long-term benefit to recreation as the reservoir could potentially be used for swimming, wading, or fishing in a limited capacity. Waterbird populations may also benefit from the restoration of habitat once the reservoir is again functional.



GEI Consultants

Geotechnical
Environmental
Water Resources
Ecological

Draft Environmental Assessment

Upper Kapahi Dam Replacement Project

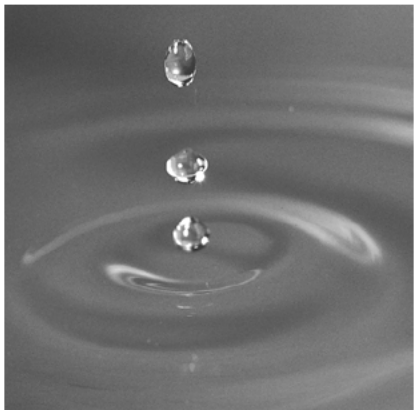
Kapa‘a, Kaua‘i

DAGS Job No. 14-23-7591

Applicant:
Department of Accounting and General Services, State of Hawai‘i

Approving Agency:
Department of Accounting and General Services

May 2014
Project 092496



Ginger Gillin
Vice President/Principal
Environmental Scientist

Summary

Project Name: Upper Kapahi Reservoir Dam Replacement (DAGS Job Number 14-23-7591)

Type of Document: DEA with AFONSI

Date: May13, 2014

Island: Kauaʻi
District: Puna
Tax Map Key (TMK): (4)4-6-007:011

Permits: Section 404 permit, Section 401 Water Quality Certification, NPDES permit, Coastal Zone Management Act Consistency Approval

Applicant: James Kurata, Public Works Division, State of Hawaiʻi Department of Accounting and General Services, 1151 Punchbowl Street, Room 426, Honolulu, HI 96813, (808) 586-0526

Owner: State of Hawaiʻi Department of Land and Natural Resources and Kauaʻi County

Consultant: Ginger Gillin, GEI Consultants, Inc., 700 NE Multnomah Street, Suite 2030, Portland, OR 97232, (503) 342-3777

Approving Agency: State of Hawaiʻi Department of Accounting and General Services

Summary: The proposed action is for construction of a new dam on Upper Kapahi Reservoir to provide some agricultural storage to supplement some of the water storage lost when the existing dam was decommissioned. The proposed new dam will be within the footprint of the existing reservoir, a short distance upstream from the existing dam. Storage capacity would be reduced. No significant impacts are anticipated from construction or operation of the new dam. Construction activities are expected to result in short-term increases in noise and traffic, and there is the potential for short-term adverse effects on the air quality, soils, biological resources, and water quality. Use of best management practices and other recommended actions would minimize or eliminate any impacts. Beneficial effects of construction of the new dam would include a short-term effect on socioeconomics from the employment of local people and the purchase of local materials, a long-term benefit to agricultural users once the reservoir could again store water, and a long-term benefit to recreation as the reservoir could potentially be used for swimming, wading, or fishing in a limited capacity. Waterbird populations may also benefit from the restoration of habitat once the reservoir is again functional.

Anticipated Determination: Finding of No Significant Impact (FONSI)

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1.0 Introduction

1.1 Background

The Upper Kapahi Dam was originally constructed in 1910. The dam and reservoir are located about two miles northwest of Kapa‘a on the island of Kaua‘i, Kaua‘i County, Hawai‘i (Figure 1-1). After the Kaloko Dam failure in 2006, the dam was evaluated by the U.S. Army Corp of Engineers (COE), and it was determined that the current spillway had inadequate capacity for routing the design flood event. Design for a dam improvement project was initiated and included constructing a new box culvert spillway under Kainahola Road, flattening and buttressing the upstream and downstream slopes, and adding erosion protection to the upstream face. Construction of improvements was initiated in 2011. Clearing and excavation on the downstream slope of the dam uncovered significant seepage issues exiting on the downstream slope as well as poorly compacted soil and debris not suitable for embankment fill. A subsequent geophysical survey of the dam and test trenching conducted in 2012 revealed that these undesirable embankment characteristics were present along the majority of the dam crest/road alignment. Based on these findings, the improvement project was suspended, the reservoir was drained, and alternatives were developed to address the safety deficiencies. Dam replacement or repair was advised.

Five alternatives were developed and evaluated to resolve the safety issues presented by the existing dam (GEI 2012). Discussions between the State and County identified a preferred alternative that included maintaining the current alignment of Kainahola Road, breaching the existing dam, and constructing a new dam upstream of the existing embankment dam. The State and County are proceeding with the breach of the existing dam as soon as possible due to public safety concerns. Engineering design work and permitting requirements for the dam breach project have been completed, and construction will be initiated in 2014. Once the existing dam has been decommissioned by breaching, construction on the new dam could begin. This Draft Environmental Analysis (DEA) encompasses only an analysis of potential impacts that could occur from the construction of the new dam, as the dam breach project has already been permitted and approved.

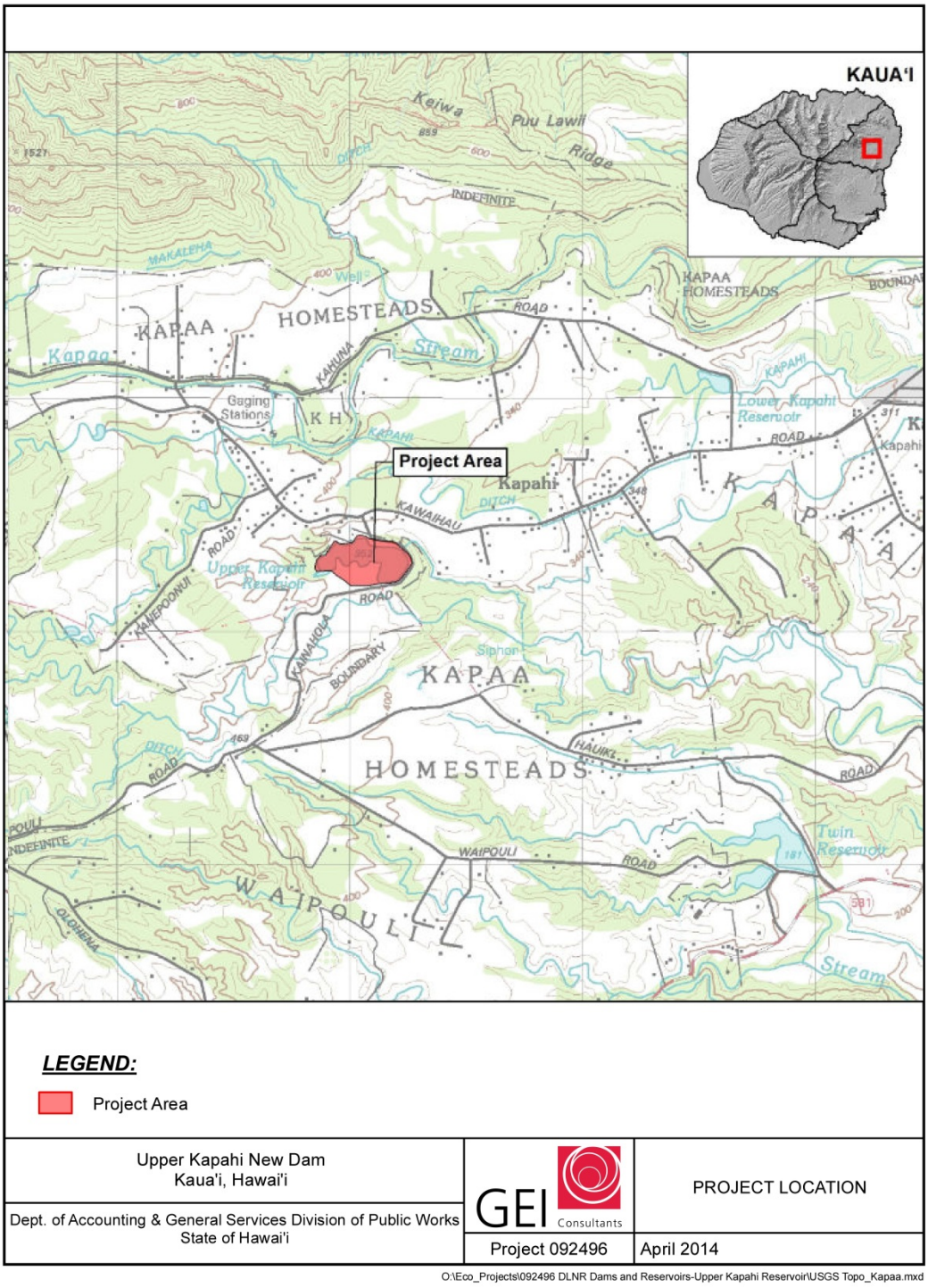

Figure 1-1: Location of Upper Kapahi Reservoir project site on Kaua'i Island in the Hawaiian Islands.

1.2 Purpose and Need for Action

The Upper Kapahi Reservoir was historically used to supply irrigation waters for agricultural uses, and was operated by the East Kauaʻi Water Users' Cooperative (EKWUC). As discussed previously, the existing reservoir was dewatered in 2012, and breaching of the existing dam is planned to occur in 2014 to correct the identified safety deficiencies. Dewatering of the reservoir resulted in a loss of storage capacity for downstream agricultural use compared to historical conditions. The purpose of the proposed project is to restore some of the water storage lost due to decommissioning the existing dam. Of the alternatives analyzed, this was the only one which met the available funds for construction while providing some water storage for agricultural use. As Hawaiʻi is the only state in the U.S. in which the number of farms is increasing (EKWUC 2014), restoring some of the storage capacity to the Upper Kapahi Reservoir would assist in maintaining the ability of the EKWUC to continue to supply water to farmers dependent on this system. It would prevent a shift in agricultural water demand towards the county's water system.

1.3 Proposed Alternatives

1.3.1 No Action Alternative

Under the "no action" alternative, the existing dam would be breached as planned in 2014, and no new dam would be constructed on Upper Kapahi Reservoir. The reservoir would remain in its current dewatered state and would continue to operate as a flow through channel.

1.3.2 Alternatives Considered But Dismissed

When the safety issues were identified during the initial stages of dam improvements in 2011, alternatives were developed to address the debris found within the embankment prism of the dam (GEI 2012). Some of the alternatives developed and evaluated addressed options specific to the dam breach project, while other alternatives addressed options for construction of a new dam or rehabilitation of the existing dam. Alternatives evaluated specific to the meeting the need for water storage included interim stabilization of the existing dam, various methods for rehabilitating the existing dam, and construction of a new dam.

The option of interim stabilization of the existing dam included upstream shoulder erosion protection, downstream grading to match pre-construction slopes, and adding a temporary trashrack at the outlet works intake (GEI 2012). While this alternative provided some additional protection for the dam in the short-term, it was determined to not be viable over time as it did not adequately address the existing spillway deficiencies.

All three of the alternatives developed to rehabilitate the existing dam would have maintained the previous capacity of the reservoir before it was dewatered. The first sub-alternative included partial removal and reconstruction of the existing dam back to the

current design configuration. This would include removal of all trash, debris, and undesirable embankment fill and also require complete reconstruction of Kainahola Road. Disadvantages of this rehabilitation alternative included a longer construction period than the other alternatives, the need for a larger staging and stockpile area for excavated materials and debris removal, less flood protection than the other rehabilitation alternatives, the need for partial removal and replacement of recently placed stability rock berms, issues with the removal and disposal of the buried debris, and the need for additional investigation into the existing embankment and foundation prior to the design being finalized. These disadvantages and the high cost of this sub-alternative suggested it should not be considered further.

The second rehabilitation alternative that was developed consisted of rehabilitating the dam without removing the existing embankment fill and its buried debris by adding a chimney/blanket drain system within the dam on the downstream face and adding downstream fill to stabilize the dam. While this alternative minimized some of the issues noted with the first rehabilitation alternative, a major disadvantage was that the buried debris would still pose uncertainty as to the dam safety. Additionally, the wider dam crest incorporated into this design would potentially cause the downstream toe encroachment to be beyond the property boundary.

A third alternative for dam rehabilitation included constructing additional fill on the upstream slope, adding a chimney filter and blanket filter on the downstream slope, and flattening the downstream slope. Some of the same disadvantages would occur with this alternative as with the other two rehabilitation alternatives, including the continued uncertainty to dam safety from the buried debris, as well as a higher risk of flooding during construction and the use of additional new embankment fill. While all three of the alternatives for dam rehabilitation would have the advantage of restoring the original reservoir storage capacity, they were not selected as the preferred alternative due to the disadvantages each posed.

Another alternative would be to construct a new dam in a different location. This alternative was dismissed because of the much greater environmental impacts of constructing a new dam on an undeveloped site, and the much greater expense of constructing a new dam on an undeveloped site.

1.4 Environmental Review Trigger

The proposed new dam construction requires an environmental review to comply with Chapter 343 of the Hawai‘i Revised Statues (HRS), also known as the Hawai‘i Environmental Policy Act (HEPA). HEPA is designed to ensure that potential impacts of proposed projects are appropriately considered. There are nine possible geographical or administrative instances that trigger HEPA and indicate that conducting an EA is necessary (State of Hawai‘i 2012). In the case of this project, the need for an EA was triggered by the use of state and county lands and funds, as the parcel of land on which Upper Kapahi

Reservoir is located is co-owned by the Hawai‘i State Department of Land and Natural Resources (DLNR) and the County of Kaua‘i (County). The project will be funded through the State of Hawai‘i Department of Accounting and General Services (DAGS).

2.0 Project Description

2.1 Project Location and Existing Condition

Upper Kapahi Reservoir (HI-00013) is located about two miles northwest of Kapa‘a, on the island of Kaua‘i, Kaua‘i County, Hawai‘i (Figure 2-1, Table 2-1). Water is diverted into the reservoir from two sources for agricultural use. Reservoir outflows through the existing outlet works conduit at the existing dam enter a series of ditches (Lateral 8) that distribute water to agricultural users through facilities maintained and operated by the EKWUC. There is a surface water connection from the reservoir to the Pacific Ocean via the ditch system to Kainahola Stream, tributary to Waika‘ea Stream. Upper Kapahi Reservoir was dewatered in 2012 because of the identified safety deficiencies. The reservoir is currently operated as a flow through channel, as the outlet works upstream gate has been removed.

The reservoir drainage area is 0.186 square miles (mi^2) (Table 2-1). Coordinates of the dam are approximately 22.094186^{o}N, 159.365722^{o}W, located in Tax Map Key (4)4-6-007:011. The reservoir parcel and embankment dam are owned by DLNR Land. The existing Upper Kapahi Dam centerline is shared with the centerline of Kainahola Road, which is owned and maintained by the County. The County owns the road right-of-way along the dam crest. The existing spillway is a low spot in the pavement on the southwest end of the dam over the right abutment.

Table 2-1: Pertinent Data and Existing Conditions, HI-00013 Upper Kapahi Dam

Description	Value
Purpose	Previously used for irrigation water supply
Waterway	Water diverted from Kapa'a and Wailua streams
Diversions to Reservoir	Yes; from adjacent Wailua and Kapa'a drainages
Hazard Class	High
Size Class	Small
Dam Crest Elevation	El. 366.5 feet (ft) average; low spot: El. 364.1 ft
Dam Height [1, 2]	40 ft
Dam Length	1,080 ft
Dam Slopes	1:1 to 2.2:1 (H:V)
Downstream Toe Elevation	Approximately El. 320.0 ft
Storage at Spillway Invert El. 364.1 feet [3]	208 acre-ft, however no water is presently being stored in the reservoir
Storage at Dam Crest El. 366.5 feet [3]	235 acre-ft
Total Available Freeboard [4]	40 ft (drained)
Spillway Design Flood	Probable Maximum Flood (PMF)
Drainage Area	0.186 mi^2
Subbasin Elevation Range	250 to 500 ft
Mean Annual Rainfall	60 - 80 inches (in)
Outlet Description	Ungated outlet works intake. 20.5 in x 23 in upstream culvert transitioning to an unlined tunnel
Outlet Invert	Upstream: El. 324.0 ft Downstream: El. 323.2 ft

[1] Existing DLNR Dam Safety records show the height of the dam as 40 feet. This height was believed to be measured from the upstream outlet works invert (El. 324.0 ft). This height does not reflect the elevation of the downstream toe elevation determined by DLNR Dam Safety

[2] Measured from the approximate dam toe elevation (El. 320.0 ft)

[3] With the exception of the inlet channel upstream of the reservoir, the reservoir topography was typically surveyed to El. 366 feet or above around the perimeter of the reservoir.

[4] Measured from the upstream outlet works invert (El. 324.0 ft)

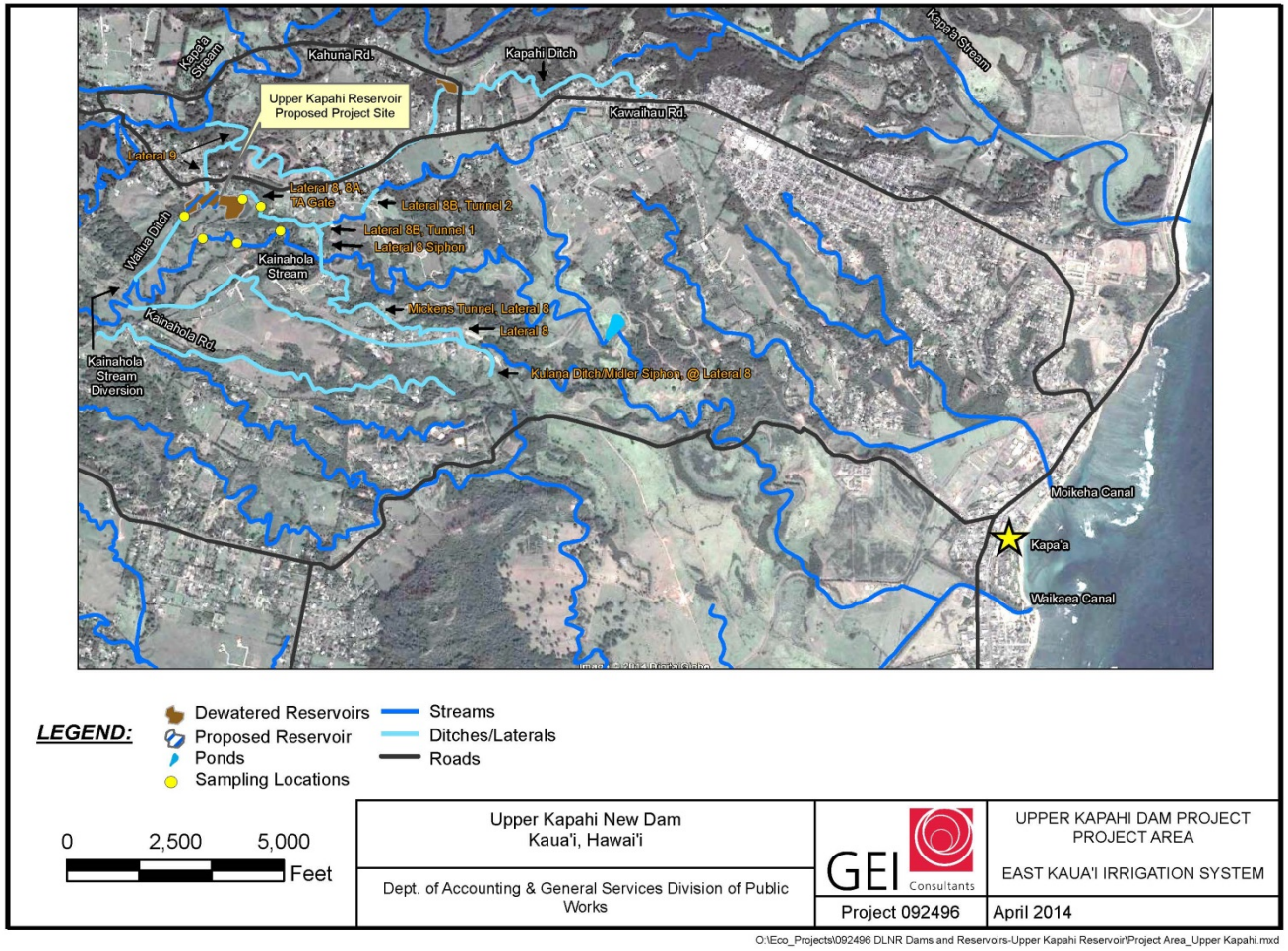

Figure 2-1: Location of Upper Kapahi Reservoir on Kauaʻi Island, Hawaiʻi.

2.2 Project History

A brief chronological history of the Upper Kapahi Dam is presented below.

- 1910 – Original dam construction; no documents from the original construction or subsequent modifications have been found.
- December 1991 – Upper Kapahi Dam was reportedly overtopped during one of the largest storm events recorded on the Konohiki Stream gage (2,530 cubic feet per second [cfs] peak flow).
- 1995 – Lihue Plantation lease expires and irrigation activities cease under this contract.
- September 1997 – First dam inspection report on record.
- June 2001 – Upper Kapahi Dam was inspected by DLNR officials.
- March 2006 – Disaster relief funds allocated for dam work in Hawai‘i after the Kaloko Dam failure on Kaua‘i.
- October 30, 2006 – Post-earthquake inspection observed no damage following a magnitude 3 earthquake.
- August 2007 – USACE conducts a hydrology and dam break study. These studies determine the magnitude of the PMF and the initial one percent flood event inflows and determine the existing spillway cannot pass the PMF without overtopping the dam and therefore dam rehabilitation is required.
- July 2008 – Outlet tunnel is inspected by Austin, Tsutsumi, & Associates, Inc.
- September 18, 2008 – Upper Kapahi Dam was inspected by DLNR officials.
- January 2010 – GEI conducts an evaluation of potential downstream flood impacts resulting from potential dam improvements and develops construction documents to modify the dam.
- July 2011 –Construction of improvements to the Upper Kapahi Dam initiated.
- August 2011 – Construction contractor, Jennings Pacific, begins vegetation removal and exposes debris within the embankment prism.
- January 2012 – A geophysical survey of the dam embankment was conducted and revealed that potential debris extended across nearly the entire length of the dam under the crest and the downstream slope.
- February 13, 2012 – GEI is tasked with developing alternatives for addressing the debris found within the embankment.
- February 15, 2012 – Construction work on the Upper Kapahi improvements project is suspended.
- February 28, 2012 – GEI submits an alternative analysis presenting five options for future work at Upper Kapahi Dam.
- March 2012 – Upper Kapahi Reservoir is drained.

- April 23, 2012 - USACE conducts decommissioning report on Twin Reservoirs Dam that assumes Upper Kapahi Reservoir Dam is operational and can attenuate flood flows. This report revises the initial one percent flood event estimate.
- September 2013 – DLNR Land and the County opt to proceed with breaching the existing Upper Kapahi Reservoir Dam and construct a new dam upstream within the Reservoir.
- October 2013 – GEI initiates the designs of the dam breach and new dam. A new survey is conducted within the Reservoir and is used to develop a new stage-storage relationship for the Reservoir. A geotechnical investigation is initiated at the site.
- April 2014 –Design on the New Upper Kapahi Dam is complete.

2.3 Proposed Action

The primary objective for the construction of the New Upper Kapahi Dam is to regain some of the storage capacity that will be lost when the existing Upper Kapahi Dam is breached as planned in 2014. Major elements of the new dam project (GEI 2014) include:

- Excavation of existing reservoir sediment to a suitable foundation;
- Design of a new non-jurisdictional embankment dam located within the footprint of the existing Upper Kapahi Reservoir;
- Design of a downstream blanket drain and toe drain within the embankment dam to control seepage and prevent piping;
- Construction of a low level outlet works consisting of a concrete intake structure, trash rack, 18 inch diameter reinforced concrete pipe (RCP) outlet pipe, sluice gate, and an impact basin;
- Construction of a catwalk for access to operate the low level outlet gate;
- Construction of a spillway located on the right abutment consisting of an earth approach channel, concrete sill, concrete rundown chute, and stilling basin;
- Construction of a conveyance channel for irrigation diversions;
- Rehabilitation of the outlet works of the existing Upper Kapahi Dam by slip lining the outlet works tunnel; and
- Placement of rock slope protection on the upstream dam face.

The major components of design are shown on Figure 2-2.

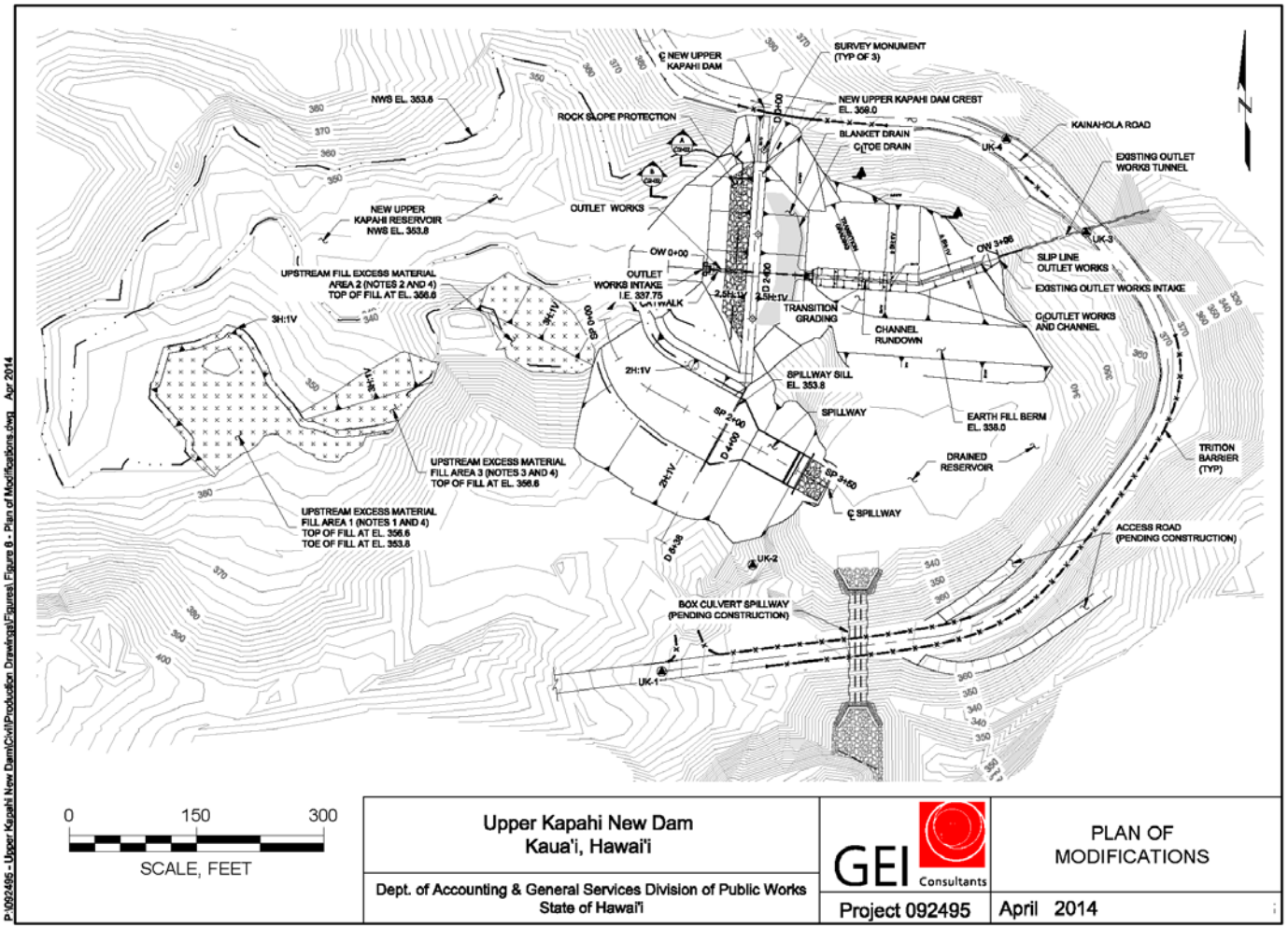

Figure 2-2: Components of new Upper Kapahi Reservoir Dam design.

2.3.1 Replacement Dam Design

The New Upper Kapahi Dam (Figure 2-2) will be a non-jurisdictional, homogenous, embankment dam with an internal filter system (GEI 2014). The nominal dam crest will be El. 359 ft, and upstream and downstream slopes will be 2.5H:1V. The dam has a crest length of approximately 215 ft and a maximum height of about 23 ft from the crest to existing ground. A blanket drain with toe drain will be constructed on the downstream side of the dam to control seepage through the dam and protect against internal erosion. The 3-ft thick blanket drain will consist of filter sand with a drain gravel envelope around the toe drain. The toe drain will consist of 6-inch-diameter slotted PVC pipe and will exit the dam near the outlet works. A filter sand diaphragm is provided near the downstream end of the outlet works conduit for control of seepage and piping along the conduit.

The upstream slope will be protected by riprap from the dam crest to El. 349. The dam crest and downstream slope will be protected by vegetation.

The dam excavation will extend to bedrock within the limits of the existing reservoir. Dam excavation will extend a minimum of 20-feet deep or to top of bedrock on the abutments.

A spillway will be constructed on the right abutment of the dam. This concrete structure will have a 40 foot wide concrete run down which will route excess water out of the reservoir in the event of a large rainstorm. An approach channel will be excavated upstream of the spillway. The spillway will have energy dissipation and riprap at the base to protect the soil beyond the dam.

2.3.2 Construction of Replacement Dam

Material for the embankment construction will be derived primarily from the spillway excavation. Excavated material from the abutments may be able to be reused as embankment fill. Embankment fill is expected to consist of elastic silty sand and sandy elastic silt and will be moisture conditioned, stockpiled, and tested prior to use as embankment fill. While not anticipated to be necessary, additional material can be obtained from the borrow area located on the southwest side of the reservoir. If material is taken from the borrow area, unsuitable soils may be backfilled to existing grades in the borrow area.

Based on the quantity of excavation, excess excavated soils expected to consist of reservoir sediment will be available (GEI 2014). If excess excavated soils are available, they will be placed upstream of the dam on the south side within the excess materials fill areas (Figure 2-2).

The staging and stockpile area is located within the reservoir parcel on the south side of the dam and spillway. Material generated from the spillway excavation will be stockpiled on-site and reused as embankment fill. If materials do not meet the requirements for

embankment fill, they can be used as compacted backfill at the downstream toe of the dam. Additional excess material maybe placed upstream of the dam above the water line.

2.3.2.1 Construction Specifications

The following specifications will be required of the construction contractor:

- Parking for the Contractor's employees (or Subcontractors) will be limited to the available areas within the designated Project Contract Limits or in areas designated by the Contracting Officer. Kainahola Road and other surrounding roads will not be used for parking or staging.

- Contractor shall provide toilet facilities sufficient for all Contractor and State personnel. Facilities shall be kept clean.

- The contractor will comply with all applicable requirements of the State of Hawai'i Department of Health (HDOH) regarding noise and fugitive dust control.

- Mufflers and other devices will be provided on equipment, internal combustion engines and compressors to reduce loud disruptive noise levels.

- Construction activities that create excessive noise and dust problems, such as concrete coring, drilling, hammering, trenching, and demolition, will be scheduled for the late morning and afternoon hours.

- Construction debris and trash to be removed from project site weekly.

- All items having any apparent historical or archaeological interest discovered in the course of construction activities shall be carefully preserved. Should historic remains such as artifacts, burials, concentrations of shell or charcoal be encountered during the construction activities, work shall cease immediately in the adjacent vicinity of the find and the applicable site shall be protected from further damage. The Contractor shall immediately contact the Contracting Officer and the State Historic Preservation Division (SHPD) DLNR at (808) 692-8015. SHPD will assess the significance of the find and recommend an appropriate mitigation measure if necessary.

    - Discharge from dewatering operations during construction shall not be drained directly onto the street, gutter, into streams, or other bodies of water. Groundwater from dewatering operations will be discharged to the outlet structure of the existing dam and be conveyed into the irrigation ditch (Lateral 8).

- Construction materials for the embankment fill will primarily be derived from on-site required excavations. Import fill includes approximately 700 cubic yards (CY) filter

sand and gravel, 200 CY riprap bedding, and 525 CY concrete. These imports would constitute about 90 truckloads of aggregate and 55 truckloads of concrete.

- Equipment and materials are assumed to be brought to the site via Kawaihau Road. Aggregate and concrete is assumed to originate at the Glover facilities located in Lawai. From this location, the proposed route for concrete and aggregate trucks would be Kaumulii Highway (Hwy 50) to Kuhio Highway (Hwy 56) to Olohena Road (Hwy 581) to Kaapumi Road to Kawaihau Road to Kainahola Road at the project site. Haul distance via this route is approximately 24 miles one way.

- The contractor's assumed construction equipment inventory consists of the following pieces of large construction equipment:

    - 2 excavators
    - 2 10-CY haul trucks
    - 1 Sheepsfoot roller
    - 1 vibratory roller
    - 1 bulldozer
    - 1 front end loader
    - 1 compactor
    - Water truck
    - Concrete pump truck
    - Pumps and generators for dewatering

- Water will not be diverted into the reservoir during the construction phase. The only source of water within the existing reservoir footprint during construction would be runoff from precipitation events that occur or groundwater. If a large storm event occurs that results in stormwater volumes that exceed the capacity of the existing outlet works, stormwater may exit the project area through the box culvert that will be constructed when the dam is breached.

2.3.2.2 Project Implementation Schedule and Approximate Cost

The cost of the construction of the new Upper Kapahi Dam is estimated to be approximately $3,500,000. Construction of the new dam would likely begin in 2015, following completion of the breach of the existing dam and when all permits are have been obtained.

The reservoir is currently drained but may fill temporarily after heavy rain events. Therefore, the construction will be conducted during the drier months (April to October). Construction is anticipated to extend over approximately two 7-month periods; however, construction activities could be completed during one construction season if required. This schedule would allow for construction to be performed during a period of relatively low precipitation conditions.

3.0 Description of Affected Environment

This section describes the existing conditions within the area that could potentially be affected by the proposed project. Information provided in each subsection serves to describe the baseline conditions for that resource; these baseline conditions will be utilized to identify and evaluate potential impacts that may occur from construction of the Upper Kapahi Dam or the no action alternative.

3.1 Air Quality

Current air quality is typically good at the project site. The HDOH maintains air quality monitoring stations across the state of Hawai‘i. One monitoring station is located on Kaua‘i, approximately 10 miles south of the Upper Kapahi Reservoir. The primary purpose of this station is to monitor for emissions from cruise ships in Nawiliwili. The station monitors for wind speed and direction, particulate matter ($PM_{2.5}$), sulfur dioxide, and nitrogen dioxide. Criteria pollutant levels remained below state and federal ambient air quality standards at this station in 2012 (HDOH 2013a).

3.2 Noise Levels

Minimal noise occurs in the vicinity of the dam project from local residential traffic and activities from some nearby residences and farmlands. The area near the project site has no major roadways nearby. Kainahola Road is a secondary road, with an estimated 526 vehicles per day (see Section 3.9, Transportation/Traffic).

3.3 Biological Resources

3.3.1 Flora

A survey of the flora within and near the existing Upper Kapahi Reservoir site was conducted in December 2013 (AECOS 2014, included in Appendix G). All plants observed were categorized based on how frequently they were encountered as rare, uncommon, occasional, common, or abundant (Table 3-1). The status of each plant species was also categorized as being native or non-native. Native plants included those that are endemic (native to Hawai‘i and not found naturally in any other locations) or indigenous (native to Hawai‘i but not unique to the Hawaiian Islands). Non-native plants were categorized as either naturalized exotic plants introduced to the Hawaiian Islands since 1778 that have since become well established, ornamental or cultivated exotic plants that are not well-established in areas outside of where they are cultivated, or Polynesian “canoe plants” that were introduced by the Polynesians prior to 1778.

Vegetation within the survey area included open meadows dominated by lush grasses, forest, and recently disturbed ground covered by grasses and other weedy herbaceous plants. The

reservoir basin was dry except for a shallow pond present in the southeast corner, and was covered in grasses. Of the 105 plant taxa identified (Table 3-1), only three taxa were native plants, including hau (*Hibscus tiliaceus*), hala (*Pandanus tectorius*), and possibly a small grass (manienie or *Chrysopogon aciculatus*). All three plants are common in Hawai‘i. Early Polynesian introductions included: ‘ulu or breadfruit (*Artocarpus atilis*), ti or ki (*Cordyline fruticosa*), honohono (*Commelina diffusa*), and mai‘a or banana (*Musa* sp.) All other plants observed are not native to the Hawaiian Islands. Several grass species were abundant, as well as glycine vine (*Neonotonia wightii*) and honohono (day flower, *Commelina diffusa*).

Table 3-1: Checklist of plants identified in the Upper Kapahi Reservoir project site in the 2014 surveys.

Taxa	Common name	Status	Abundance
PTERIDOPHYTES - FERNS & FERN ALLIES			
BLECHNACEAE			
Blechnum appendiculatum	---	Naturalized	Uncommon
THELYPTERIDACEAE			
Christella parasitica	wood fern	Naturalized	Uncommon
NEPHROLEPIDACEAE			
Nephrolepis multiflora	sword fern	Naturalized	Common
POLYPODIACEAE			
Phymatosorus grossus	*laua‘e*	Naturalized	Rare
FLOWERING PLANTS – DICOTS			
ACANTHACEAE			
Thunbergia fragrans	sweet clock-vine	Naturalized	Rare
AMERANTHACEAE			
Amaranthus spinosus	spiny amaranth	Naturalized	Rare
APOCYNACEAE			
Thevetia peruviana	be-still	Ornamental	Rare
ARALIACEAE			
Schefflera actinophylla	octopus tree	Naturalized	Rare
ASTERACEAE			
Ageratum houstonianum	*maile hohono*	Naturalized	Occasional
Bidens pilosa	*ki*	Naturalized	Uncommon
Conyza bonariensis	hairy horseweed	Naturalized	Uncommon
Crassocephalum crepidioides	---	Naturalized	Uncommon
Elephantopus mollis	---	Naturalized	Rare
Emilia fosbergii	Flora’s paintbrush	Naturalized	Rare
Parthenium hysterophorus	false ragweed	Naturalized	Rare
Pluchea carolinensis	---	Naturalized	Uncommon
Sonchus oleraceus	*pualele*	Naturalized	Uncommon
Sphagneticola trilobata	wedelia	Naturalized	Occasional
Synedrella nodiflora	nodeweed	Naturalized	Rare

Taxa	Common name	Status	Abundance
BIGONACEAE			
Spathodea campanulata	African tulip tree	Naturalized	Occasional
CARICACEAE			
Carica papaya	papaya	Naturalized	Rare
CASSURANACEAE			
Cassuarina equisetifolia	ironwood, juvenile	Naturalized	Rare
CONVOLVULACEAE			
Ipomoea obscura	---	Naturalized	Occasional
Ipomoea triloba	little bell	Naturalized	Uncommon
Merremia tuberosa	wood rose	Naturalized	Occasional
EUPHORBIACEAE			
Euphorbia hirta	garden spurge	Naturalized	Uncommon
Euphorbia heterophylla	*kaliko*	Naturalized	Uncommon
Euphorbia hypericifolia	graceful spurge	Naturalized	Rare
Phylanthus debilis	*niuri*	Naturalized	Rare
Ricinus communis	castor bean	Naturalized	Occasional
FABACEAE			
Canavalia cathartica	*maunaloa*	Naturalized	Uncommon
Chamaecrista nictitans	partridge pea	Naturalized	Uncommon
Crotalaria incanum	fuzzy rattlepod	Naturalized	Uncommon
Desmodium incanum	Spanish clover	Naturalized	Occasional
Desmodium tortuosum	Florida beggarweed	Naturalized	Rare
Desmodium triflorum	---	Naturalized	Uncommon
Falcateria moluccana	albizia	Naturalized	Common
Indigophera hendecaphyla	creeping indigo	Naturalized	Rare
Indigofera suffruticosa	indigo	Naturalized	Uncommon
Leucaena leucocephala	*koa haole*	Naturalized	Occasional
Macroptilium atropurpureum	---	Naturalized	Occasional
Mimosa pudica var. *unijuga*	sensitive plant	Naturalized	Common
Neonotonia wightii	glycine vine	Naturalized	Abundant
Senna alata	candle bush	Naturalized	Occasional
LAMIACEAE			
Hyptis pectinata	comb hyptis	Naturalized	Uncommon
Solenostemon scutellarioides	coleus	Ornamental	Rare
LAURACEAE			
Cinnamomum camphora	camphor tree	Naturalized	Common
MALVACEAE			
Hibiscus tiliaceus	*hau*	**Indigenous**	Uncommon
Sida acuta	---	Naturalized	Rare
Sida rhombifolia	---	Naturalized	Uncommon
Sida spinosa	prickly sida	Naturalized	Rare

Taxa	Common name	Status	Abundance
Urena lobata	aramina	Naturalized	Uncommon
MELASTOMATACEAE			
Clidemia hirta	Koster's curse	Naturalized	Common
MORACEAE			
Artocarpus atilis	*'ulu*, breadfruit	**Polynesian**	Rare
Ficus microcarpa	Chinese banyan	Naturalized	Rare
MYRTACEAE			
Eugenia cf. *uniflora**	Surinam cherry	Naturalized	Rare
Psidium cattleianum	strawberry guava	Naturalized	Common
Psidium guajava	common guava	Naturalized	Occasional
Syzygium cuminii	Java plum	Naturalized	Common
Syzygium jambos	rose apple	Naturalized	Rare
*Rhodomyrtus tomentosa**	downy myrtle	Naturalized	Uncommon
ONAGRACEAE			
Ludwigia octovalvus	primrose willow	Naturalized	Occasional
PAPAVERACEAE			
Argemone cf. *mexicana*	Mexican poppy	Naturalized	Rare
PASSIFLORACEAE			
Passiflora cf. *edulis**	passion fruit	Naturalized	Rare
Passiflora suberosa	*huehue haole*	Naturalized	Rare
POLYGALACEAE			
Polygala paniculata	bubblegum plant	Naturalized	Rare
RUBIACEAE			
Hedyotis corymbosa	---	Naturalized	Uncommon
Spermacoce assurgens	buttonweed	Naturalized	Uncommon
SOLANACEAE			
Solanum lycopersicum var. *cerasiforme*	cherry tomato	Naturalized	Rare
VERBENACEAE			
Lanatana camara	lantana	Naturalized	Uncommon
Stachytarpheta cayennensis	vervain	Naturalized	Occasional
FLOWERING PLANTS – MONOCOTS			
AGAVACEAE			
Cordyline fruticosa	ti; *kī*	**Polynesian**	Uncommon
Dracaena marginata	money tree	Ornamental	Rare
ARACEAE			
Xanthosoma rosea	*'ape*	Naturalized	Uncommon
COMMELINACEAE			
Commelina diffusa	day flower; *honohono*	**Polynesian**	Abundant
CYPERACEAE			
Cyperus involucratus	umbrella sedge	Naturalized	Rare

Taxa	Common name	Status	Abundance
Cyperus polysytachyos	---	Naturalized	Uncommon
Fimbristylis miliacea	---	Naturalized	Rare
LILIACEAE			
Asparagus densiflorus	asparagus "fern"	Naturalized	Rare
MUSACAEAE			
Musa acuminata	hybrid banana	**Polynesian**	Rare
Musa velutina	pink-fruited banana	Ornamental	Rare
ORCHIDACEAE			
Arundina graminifolia	bamboo orchid	Naturalized	Rare
Spathoglottis plicata	Malayan ground orchid	Naturalized	Occasional
PANDANACEAE			
Pandanus tectorius	*hala*	**Indigenous**	Rare
POACEAE (GRAMINEAE)			
Andropogon virginicus	broomsedge	Naturalized	Common
Axonopus compressus	broad-leaf carpetgrass	Naturalized	Common
Axonopus fissifolius	narrow-leaf carpetgrass	Naturalized	Uncommon
Cenchrus purpureus	elephant grass	Naturalized	Abundant
Chloris barbata	swollen fingergrass	Naturalized	Uncommon
Chloris virgata	feather fingergrass	Naturalized	Uncommon
Chrysopogon aciculatus	*manienie*	**Indigenous (?)**	Uncommon
Digiteria ciliaris	Henry's crabgrass	Naturalized	Common
Echinochloa crus-galli	barnyard grass	Naturalized	Uncommon
Eleusine indica	wiregrass	Naturalized	Uncommon
Eragrostis pectinacea	Carolina lovegrass	Naturalized	Rare
Melinis minutiflora	molasses grass	Naturalized	Abundant
Oplismenus hirtellus	basketgrass	Naturalized	Uncommon
Paspalum conjugatum	Hilo grass	Naturalized	Occasional
Paspalum dilatatum	Dallis grass	Naturalized	Occasional
Paspalum fimbriatum	Panama grass	Naturalized	Uncommon
Sacciolepis indica	Glenwood grass	Naturalized	Abundant
Schyzachrium condensatum	beardgrass	Naturalized	Uncommon
Setaria gracilis	yellow foxtail	Naturalized	Uncommon
Sporobolus indicus	West Indian dropseed	Naturalized	Rare
Urochloa maxima	Guinea grass	Naturalized	Abundant
Urochloa mutica	California grass	Naturalized	Abundant

*Plant without flower or fruit; identification uncertain

3.3.2 Terrestrial Fauna

A survey of birds and other terrestrial wildlife within the project area was conducted in January 2014 (AECOS 2014). Avian (bird) surveys included setting up three count stations at sites within the project area, one 30-minute time dependent waterbird count at a location

overlooking the ponded water in the south part of the basin, and observations made by a zoologist who walked throughout the project area to look for bird species and habitats not detected during the point counts. The three count stations were located with one station to the southwest end of the proposed new dam, one in the center of the proposed new spillway, and the third on the eastern end of the reservoir adjacent to Kainahola Road. The survey for the mammals was limited to visual and auditory detection, coupled with visual observations of scat, tracks, or other animal signs.

A total of 229 individual birds of 20 species, representing 15 separate families, were recorded during station counts (Table 3-2) (AECOS 2014). An additional species, Hawaiian Coot (*Fulica alai*), was recorded during the time-dependent water bird count. Two of the 21 species detected, Common Gallinule (*Gallinula galeata sandvicensis*) and Hawaiian Coot (*Fulica alai*), are endemic waterbird species and listed as endangered under both federal and state of Hawai‘i endangered species statutes (DLNR 1998; United States Fish and Wildlife Service [USFWS] 2005a, 2005b, 2014). The other 19 species recorded during the course of this survey were not native to the Hawaiian Islands.

The Common Gallinule on Kauaʻi typically occurs in the Wailua river valley of eastern Kauaʻi, and in western Kauaʻi in the Hanalei river valley and the irrigation canals of the Mānā Plains (VanderWerf 2013). In winter counts from 1999 through 2003, an average of 1 to 2 Common Gallinules were observed at the nearby Twin Reservoirs (USFWS 2011a). These waterbirds favor freshwater wetlands and marshes where emergent and shoreline vegetation is dense.

The Hawaiian Coot occurs on Kauaʻi largely in the Hanalei National Wildlife Refuge in the north, and Kauaʻi Lagoons golf course and Waitā Reservoir, both located in the southern part of the island (VanderWerf 2013; USFWS 2011a). Winter surveys conducted from 1999 through 2003, an average of 1-6 Hawaiian Coots were counted at the nearby Twin Reservoirs (USFWS 2011a). Hawaiian Coots are found in a variety of wetland habitat types, including, sewage treatment ponds, irrigation ditches, natural marshes and ponds, and golf course ponds. They prefer freshwater and brackish wetlands with open water and emergent vegetation (VanderWerf 2013).

Avian diversity and densities were in keeping with habitats present on the site and the general location. The four species most commonly observed included the Red Junglefowl (*Gallus gallus*), Zebra Dove (*Geopilia striata*), Common Myna (*Acridotheres tristis*), and Cattle Egret (*Bubulcus ibis*). These species accounted for approximately 48 percent of all birds recorded during station counts. The most frequently recorded species was Red Junglefowl, which accounted for 22 percent of the total number of individual birds recorded during station counts. There was an average of 76 birds per station count.

Table 3-2: Checklist of birds identified in the Upper Kapahi Reservoir project site in the 2014 surveys.

Taxa	Common name	Status	Relative Abundance (Average Number of Birds per Count Station)
GALLIFORMES			
PHASIANIDAE – Pheasants & Partridges			
Gallus gallus	red junglefowl	Alien	17.00
Phasianus colchicus	ring-necked pheasant	Alien	1.33
Pavo cristatus	Indian peafowl	Alien	0.67
PELECANIFORMES			
ARDEIDAE – Herons, Bitterns, & Allies			
Bubulcus ibis	cattle egret	Alien	6.33
GRUIFORMES			
RALLIDAE – Rails, Gallinules, and Coots			
Gallinula galeata sandvicensis	common gallinule	**Endangered Endemic**	1.00
Fulica alai	Hawaiian coot	**Endangered Endemic**	TD-2**
COLUMBIDAE – Pigeons & Doves			
Streptopelia chinensis	spotted dove	Alien	4.67
Geopelia striata	zebra dove	Alien	7.33
PSITTACIFORMES			
PSITTACIDAE – Lories Parakeets, Macaws & Parrots			
Psittacula krameri	rose-ringed parakeet	Alien	1.33
PASSERIFORMES			
CETTIIDAE – Cettia Warblers & Allies			
Cettia diphone	Japanese bush-warbler	Alien	3.33
ZOSTEROPIDAE – White-eye			
Zosterops japonicus	Japanese white-eye	Alien	3.33
TIMALIIDAE – Babblers			
Garrulax canorus	Chinese hwamei	Alien	4.00
TURDIDAE – Thrushes			
Copsychus malabaricus	white-rumped shama	Alien	0.67
STURNIDAE – Starlings			
Acridotheres tristis	common myna	Alien	6.33
THRAUPIDAE - Tanagers			
Paroaria coronata	red-crested cardinal	Alien	4.00
CARDINALIDAE – Cardinals Saltators & Allies			
Cardinalis cardinalis	northern cardinal	Alien	3.67
ICTERIDAE - Blackbirds			
Sturnella neglecta	western meadowlark	Alien	3.33

Taxa	Common name	Status	Relative Abundance (Average Number of Birds per Count Station)
FRINGILLIDAE – Fringilline and Carduleline Finches & Allies			
Haemorhous mexicanus	house finch	Alien	4.67
ESTRILDIDAE - Estrildid Finches			
Estrilda astrild	common waxbill	Alien	1.00
Lonchura punctulata	nutmeg mannikin	Alien	2.33

**Time-dependent waterbird count with number recorded

Although not detected during the 2014 survey, Hawaiian Petrel (*Pterodroma sandwichensis*) and the Hawaiian sub-species of Newell's Shearwater (*Puffinus auricularis newelli*) have been recorded flying over the area in the general vicinity of the project area between late April and the middle of December each year (David 2013; Morgan et al. 2003, 2004; David and Planning Solutions 2008). Additionally, the Save Our Shearwaters Program has recovered both species from the general area on an annual basis over the past three decades (Morgan et al. 2003, 2004; David and Planning Solutions 2008; Save our Shearwater Program 2011). Forested mountain slopes covered with ferns such as *ʻuluhe* (*Dicranopteris linearis*), as is found on Kaiwa Ridge, is typical of the nesting habitat used by both species, though it is currently unknown if there are any colonies in close to the project area.

The petrel is listed as endangered, and the shearwater as threatened, under both federal and State of Hawaiʻi endangered species statutes. The primary cause of mortality in both Hawaiian Petrels and Newell's Shearwaters is thought to be predation by introduced mammalian species at the nesting colonies (USFWS 1983; Simons and Hodges 1998; Ainley et al. 2001). Collision with man-made structures is regarded as the second most significant cause of mortality of these seabird species in Hawaiʻi. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. Disoriented seabirds may collide with manmade structures and, if not killed outright, become easy targets of predatory mammals (Telfer 1979; Sincock 1981; Reed et al. 1985; Telfer et al. 1987; Cooper and Day 1998; Podolsky et al. 1998; Ainley et al. 2001; Hue et al. 2001; Day et al 2003). No suitable nesting habitat for either of these seabird species exists in the Project area.

No mammalian species currently protected or proposed for protection under either the federal or State of Hawaiʻi endangered species programs were detected during the course of this survey (Hawaiʻi DLNR 1998; USFWS 2005a, 2014). With the exception of the Hawaiian hoary bat (*Lasiurus cinereus semotus; ʻōpeʻapeʻa*), all terrestrial mammals currently found on Kauaʻi are introduced species, and most are ubiquitous (AECOS 2014). Two terrestrial mammals were detected during the survey conducted in 2014, including pig (*Sus scrofa*) and dogs (*Canis familiaris*). Pig and dog tracks and scat were observed at several locations within the survey area, and pig entrails were encountered near Kainahola

Road. Dogs were heard barking. Likely several of the four Muridae species of mice and rats that occur on Kaua‘i could live in the vicinity of the project. These species include European house mouse (*Mus musculus domesticus*), roof rat (*Rattus r. rattus*), Norway rat (*Rattus norvegicus*), and Polynesian rat (*Rattus exulans hawaiiensis*). The endangered Hawaiian hoary bat was not detected during the course of this survey. It is, however, probable that this species uses resources within the general project area on a seasonal basis, as the species is all but ubiquitous in the lowlands of Kaua‘i.

3.3.3 Aquatic Resources

Invertebrates and fish were identified in the channel within and downstream from the Upper Kapahi Reservoir during a survey conducted in January 2014 (AECOS 2014, Table 3-3). Dip nets were used to capture and identify any observed organisms. Other sources describing surveys and information on the presence of taxa observed in streams near the project area were also utilized to determine if additional taxa not identified during the survey could be present in the project area as well (AECOS 2002, 2008a, 2008b, 2012; Parham et al. 2008). These streams included Kapa‘a Stream (the stream that historically supplied water to the reservoir through Kapahi Ditch), Makaleha Stream (tributary to Kapa‘a Stream located northwest of the project area), and Waika‘ea Stream (the stream which Kainahola Stream feeds into). The inclusion of other surveys and information was focused on identifying the potential presence of amphidromous species that move between freshwater and saltwater during their life cycle and of other native organisms.

No aquatic species protected by State of Hawai‘i Administrative Rules (DLNR1998, 2007) nor federally endangered or threatened species (USFWS 2011b, 2014) were observed at the stream sites surveyed within the Project area. Poeciliid fish, including mosquitofish (*Gambusia affinis),* guppies (*Poecilia reticulate*), and the Mexican mollies (*P. mexicana/salvatoris*), were the only fishes observed in the 2014 surveys conducted within and downstream of the existing Upper Kapahi Reservoir site (Table 3-3).

The red swamp crayfish (*Procambarus clarkii*) was abundant and was observed burrowing in the silt bottom of the stream channel (Table 3-3). Asiatic flume clam (*Corbicula fluminea*) shells are scattered throughout the dry reservoir; live clams are likely present buried just below the surface of the stream bed. A gastropod (snail) taxa, the red-rimmed melania (*Melanoides tuberculata*), were also observed. Numerous adult damselflies and dragonflies (*Ischnura ramburii, I. posita, Crocothemis servilia, Anax junius*), which have aquatic larvae (nymphs), were observed throughout the grass meadow of the reservoir. *A. junius* is categorized as a native species; all other invertebrate taxa observed were non-native species introduced to Hawai‘i. Frog tadpoles (likely American bullfrogs, *Lithobates catesbeianus,* or Japanese wrinkled frogs, *Glandirana rugoa*) were also observed in the *hau* forest at the upstream end of the reservoir, with frog chirps heard in the stream channel downstream from the reservoir.

Table 3-3: Checklist of aquatic taxa observed during the 2014 surveys.

Taxa	Common name	Status	Abundance
INVERTEBRATES			
INSECTA			
ODONATA (Dragonflies and Damselflies)			
Anax junius	green darner	**Indigenous**	Occasional
Ischnura posita	fragile forktail	Non-native	Common
Ischnura ramburii	Rambur's forktail	Non-native	Occasional
CRUSTACEA			
DECAPODA (Crayfish)			
Procambarus clarkii	American crayfish	Non-native	Abundant
MOLLUSCA			
GASTROPODA (Snails and Slugs)			
*Corbicula fluminea**	Asiatic flume clam	Non-native	Abundant
Melanoides tuberculata	red-rimmed melania	Non-native	Occasional
VERTEBRATES			
ACTINOPTERYGII			
POECILIIDAE (Livebearers)			
Gambusia affinis	mosquitofish	Non-native	Abundant
Poecilia reticulata	guppy	Non-native	Common
Poecilia salvatoris/mexicana	liberty/Mexican molly	Non-native	Occasional
AMPHIBIA			
RANIDAE (Ranid Frogs)			
Indeterminate Ranidae*	frog, adult and tadpole	Non-native	Occasional

*Identified by shell or call only

Kapaʻa Stream is ranked as "outstanding" with respect to aquatic resources (Hawaiʻi Cooperative Park Service Unit [HCPSU] 1990). Three native and amphidromous Gobiidae fishes are found in Kapaʻa Stream or its tributaries, including the ʻoʻopu ʻalamoʻo (*Lentipes concolor*), ʻoʻopu nākea (*Awaous guamensis*), and the ʻoʻopu nōplili (*Sicyopterus stimpsoni*) (HCPSU 1990; Parham et al. 2008; AECOS 2014). These amphidromous species lay their eggs in freshwater streams; the larvae that hatch from these eggs then move downstream and out into the ocean where they develop for a time before migrating back into fresh water to grow to maturity (Ford and Kinzie 1982; Kinzie 1988). In addition to the fish, the occurrence of an endemic and amphidromous gastropod species, the *hihiwai* (*Neritina granosa*), has been documented in the Kapaʻa Stream watershed (Parham et al. 2008). These three fish species and single snail taxon comprise "native species group one" (NG1). The three fishes were sighted as recently as 2011 (AECOS 2012, 2014). At least five species of native damselflies (*Megalagrion* spp.) and a single native dragonfly species (*A. junius*) have also been documented in the upper reach of Kapaʻa Stream (Parham 2008; AECOS 2014).

No amphidromous fish species have been reported from the freshwater portion of Waikaʻea Stream. Non-native fish from the families Centrarchidae (sunfish, *Lepomis* sp.), bass

(*Micropterus* spp.), Cyprinidae (carp or goldfish), and Clariidae (Chinese catfish, *Clarias fuscus*) are reported as present in both Kapaʻa and Waikaʻea streams (Parham et al. 2008; AECOS 2014). Native fish species have been documented in estuary portion of Waikaʻea Stream (AECOS 2002, 2014).

3.4 Water Resources

3.4.1 Water Quality

Surface water quality samples were collected from three sites in January 2014 by AECOS personnel to assess the existing water quality within the project area (AECOS 2014, included in Appendix G). Station 1 was located in the channel in the upper portion of the reservoir, Station 2 was located in the channel near the outlet of the reservoir, and Station 3 was located in the channel downstream of Kainahola Road (Figure 2-2). Biologists measured temperature, dissolved oxygen, and pH in the field, and collected surface water samples for analysis of conductivity, total suspended solids, turbidity, nitrate-nitrite nitrogen, total nitrogen, and total phosphorus from each site.

Temperature, conductivity, dissolved oxygen, pH, and total suspended solids (TSS) were low at the three stations, while turbidity was high (Table 3-4). The parameters measuring nitrogen concentrations in the surface water were lowest at Station 2 near the existing outlet and highest at Station 3 downstream from the reservoir. Phosphorus concentrations were low at all three stations.

Table 3-4: Results of surface water quality sampling in January 2014.

Parameter (units)	Station 1	Station 2	Station 3
Temperature (°C)	20.1	19.6	21.5
Conductivity (µhos/cm)	145	116	177
Dissolved Oxygen (mg/l)	4.20	6.63	5.04
Dissolved Oxygen Saturation (%)	46	73	57
pH	6.32	6.42	6.25
Turbidity (NTU)	11.9	12.8	14.7
Total Suspended Solids (mg/l)	16	16	22
NO3 + NO2 (µg N/l)	78	49	233
Total Nitrogen (µg/l)	353	206	498
Total Phosphorus (µg/l)	24	10	<3

All waterbodies within the project area and the nearby surrounding area are classified as Class 2 “flowing waters” in the Hawaiʻi water quality standards (HDOH 2013b). Beneficial uses of Class 2 waters are designated as such “to protect their use for recreational purposes, the support and propagation of aquatic life, agricultural and industrial water supplies, shipping and navigation”. Furthermore, “these waters shall not act as receiving waters for any

discharge which has not received the best degree of treatment or control compatible with the criteria established for this class".

Kapa'a Stream (Geocode ID No. 2-2-04) is identified as an impaired water body (HDOH 2013c). The HDOH listing indicates that Kapa'a Stream does not meet Hawai'i water quality standards for turbidity in the dry season and may not meet the standards for *Enterococci*. Waika'ea Stream was not identified on the list (HDOH, 2013c).

Specific water quality criteria have been promulgated that, if met, are designed to allow the water bodies to achieve the designated beneficial uses. Samples collected from the project area in 2014 demonstrate generally good water quality, with most values being less than the criteria. Temperature and pH values were fairly typical for gaining reaches of streams at this elevation, and conductivity was low, meeting the criterion at all three stations and suggesting that the primary source of flow in the channel was groundwater. Percent saturation of dissolved oxygen was low, and did not meet the criterion at any of the three stations.

Multiple standards for turbidity, TSS, and nutrients have been set by the HDOH; these criteria are expressed in a statistical format that presents criteria in the form of geometric means not to be exceeded by the geometric mean values calculated from datasets for a site (Table 3-2). Two storm events allowances are included through the 10 percent and 2 percent geometric means not to be exceeded by more than 10 percent and 2 percent of the sample values, respectively. All values from the single sampling event were below the 2 percent exceedance values for the wet season (November through April), and all but nitrate + nitrite at Station 2 were below the 10 percent exceedance values. One or more stations had values greater than the geometric mean exceedance value for each of these parameters. However, as the data collected for these sites were from a single sampling event, a valid comparison cannot be made between a single data point and a geometric mean values and percentage exceedance values.

The high turbidity levels, particularly in the *hau* forest, may be the result of tannins from leaf litter rather than suspended sediments, as the TSS levels were relatively low. Nutrients provide information on biological productivity in the stream and contributions from land runoff or groundwater seepage. Assimilation of nitrates by vegetation in the overgrown stream channel within the reservoir may be responsible for the relatively low nitrogen found at Station 2.

3.4.2 Water Quantity and Hydrology

The Upper Kapahi Reservoir is within the Waikae'a watershed (Surface Water Hydrologic Unit 2039), and also receives diverted water from the Kapa'a watershed (Surface Water Hydrologic Unit 2035). The nearest perennial streams to the project area include Kapa'a Stream (Hawai'i Cooperative Park Service Unit 1990) to the north of the Upper Kapahi Reservoir, and Kainahola Stream south of the reservoir.

The existing reservoir has been in a drained condition since 2012, and it currently operates as a flow through channel, as the outlet works upstream gate has been removed. It is included as a part of the Kapaʻa Section of the East Kauaʻi Irrigation System, which consists of approximately 23 miles of ditches, tunnels, and diverted waters from the North Fork of the Wailua River through the Wailua Ditch Intake and Kapaʻa Stream through the Kapaʻa Stream Intake (Water Resource Associates 2003). There are eight unlined earthen ditches (laterals) and a number of control gates (pani) that direct water from the Wailua Ditch eastward towards to the farm lands and the coast.

The Upper Kapahi Reservoir receives water from two ditches (Figure 2-2). Wailua Ditch carries water into the western portion of the reservoir, and diverts water from Kainahola Stream through the Kainahola Stream Diversion. It is also part of the Main Transmission Line that carries water from Wailua Reservoir to Upper Kapahi Reservoir. The second ditch, Kapahi Ditch (Lateral 9), draws water from Kapaʻa Stream and enters into the north portion of the reservoir.

The Upper Kapahi Reservoir outflow through the existing outlet works conduit feeds into a ditch (Lateral 8) and historically transmitted water to agricultural users through two pathways. One pathway transmitted water in a northeast direction to former sugar cane fields and then into the Lower Kapahi Reservoir. The second pathway transmitted water to the south through a siphon under Kainahola Stream and into Twin Reservoirs. Neither of these reservoirs is utilized for water storage currently. Eventually the series of ditches that comprise the East Kauaʻi Irrigation System transmits water flowing through the Upper Kapahi Reservoir to Waikaʻea Stream, although flow through some of these ditches is intermittent. Water from Waikaʻea Stream enters into the Waikaʻea Canal and then into the Pacific Ocean south of Kapaʻa. No data on flow records for the ditches associated with the reservoir were located. In addition, during large rain events infrequent spillway discharges flow across Kainahola Road and directly into Kainahola Stream, a tributary of Waikaʻea.

3.5 Archeological, Historical, and Cultural Resources

A draft cultural impact assessment was completed by Cultural Surveys Hawaiʻi (2014, included in Appendix F) to document the archeological, historical, and cultural resources that exist within the project area. The preliminary report presents incipient research conducted for the cultural impact assessment. Final results of the community consultation will be provided in a draft cultural impact assessment report to be completed prior to the final environmental assessment.

The area of potential effect was defined as the approximately 15.3 acre area outlined in Figure 3-1. While the investigation focused on this area, the entire *ahupuaʻa* (land division) of Kapaʻa was included in the assessment. Historical documents, maps, and existing archaeological information pertaining to Kapaʻa *Ahupuaʻa* were researched, and

consultations and interviews with targeted groups of relevant stakeholders, local experts, and community members were conducted.

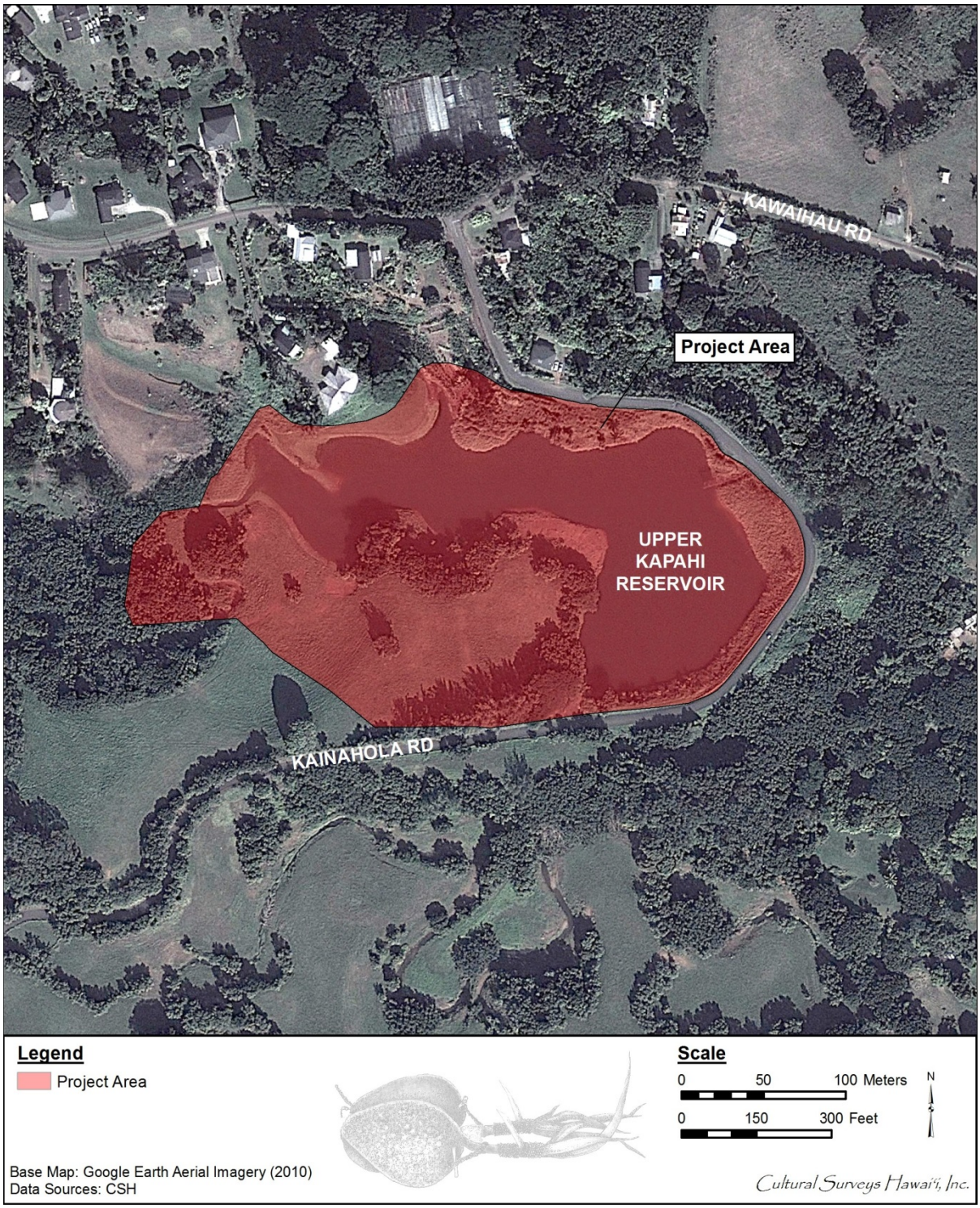

Figure 3-1: Area of potential effect for the archeological, historical, and cultural resources surveys for the Upper Kapahi Reservoir dam replacement project.

The proposed project is located in Kapaʻa Ahupuaʻa, Kapaʻa, which literally translates as "the solid or the closing." The *ahupuaʻa* of Kapaʻa belongs in the ancient district of Puna, one of five ancient *moku*, or districts, on Kauaʻi (King 1935). Historically, this *ahupuaʻa* contained two prominent landscape features, a coastal plain with sand dunes and a large marsh. *Mele* (song, chant) paint Kapaʻa as a place of great expanse of land, with verdant bush in upland areas not occupied by human settlement. The project area is associated with specific *moʻolelo* (story, tale, myth) and *ʻōlelo noʻeau* (proverbs) (Cultural Surveys Hawaiʻi 2014). In addition, Kapaʻa is home to more than a dozen *heiau* (pre-Christian place of worship, shrine) enforcing its cultural significance to Native Hawaiians.

The project area is located 1.8 km from the nearest Lihue Plantation field, which bought out Makee Sugar Plantation. Makee Plantation was established in 1877 and was the first large-scale agricultural enterprise in Kapaʻa (Dole 1916). Makee Plantation employed thousands of Portuguese and Japanese immigrants by the late 1800s, leading to its own railroad and an associated school for its workers.

There have not been as many archaeological studies done in upland Kapaʻa compared to the shoreline. No archaeological sites were observed during a reconnaissance of 52.56 acres of mostly *kula* land in upland Kapaʻa (Hammatt 1981), nor were there any terraces or other sites apparent during a 1986 reconnaissance of the upper reaches of the Makaleha stream valley (Hammatt 1986). Although no historic properties have been documented in the project area, the Upper Kapahi Reservoir built in 1910 qualifies as a potentially eligible property for the National Register of Historic Places.

3.6 Geology and Soils

The Hawaiian Islands are at the southeast end of a chain of volcanic seamounts and islands that began to form more than 70 million years ago. The combined process of magma formation, volcano eruption and growth, and continued movement of the Pacific Plate over the stationary Hawaiian "hot-spot" have left a long trail of volcanoes across the Pacific Ocean floor. The Hawaiian Ridge-Emperor Seamounts chain extends roughly 3,700 miles from the Big Island of Hawaiʻi to the Aleutian Trench off of the Alaskan coast. Each Hawaiian Island is made up of one or more volcanoes, which first erupted on the sea floor and emerged above sea level after numerous eruptions.

The Big Island currently sits over the hot spot at the southeast end of the Hawaiian Island chain, and is the most recent volcanic mass. The island of Kauaʻi, situated at the northwestern end of the chain, is the oldest of the eight principal islands, and estimated to be 3 to 5 million years old.

The bedrock at the Upper Kapahi Reservoir site consists of basalt. Surficial soils generally consist of clays and silts with sand (categorized as ML, MH, CL, and CH under the Unified Soil Classification System) derived from the weathering of basalt. Borings were drilled on

the north and south sides within the existing Upper Kapahi Reservoir to determine sub-surface conditions, and indicated site soils consisted generally of sand and elastic silt with fines contents ranging from 36 to 54 percent (GEI 2014). The Atterberg Limits consistently plot in the MH (inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts) category for all samples. While some samples are classified as elastic silty sand and some are classified as sandy elastic silt, the materials are all very similar in nature, only with fines contents slightly more or slightly less than 50 percent. The soils encountered in this field investigation are considered similar to soils described in geotechnical reports reviewed for other dams on Kauaʻi including Lower Kapahi, Kaloko, and Wailua.

Two borings were also performed along the southwest side of the reservoir near a potential borrow source location. These borings encountered reddish brown, elastic silty sand and sandy elastic silt with fines contents ranging from 36 to 50 percent from ground surface to shallow depths. Potential weathered rock consisting of silty sand and silty sand with gravel was encountered at deeper depths.

3.7 Waste/Hazardous Materials

Within the project area, the only wastes or hazardous materials identified are the surficial trash and debris intermixed with the fill material in the existing Upper Kapahi Dam. These materials were first exposed in 2011 when the dam improvements were originally initiated. When Jennings Pacific, the construction contractor, began removing and stockpiling debris, the debris was determined to contain asbestos. An asbestos abatement process was initiated along with the trash removal, but was halted after approximately 800 cubic yards of material had been sorted, with a portion of this amount removed from the site. Test trenches and a geophysical survey of the dam embankment in 2011 and 2012, respectively, indicated that the debris is intermixed with the fill material for depths of at least 3 to 7 ft below the ground surface. Debris may have extended further below this depth, but the depths of the cuts were limited to avoid damaging the road.

3.8 Recreation

The dewatered state of the Upper Kapahi Reservoir suggests that recreational uses such as fishing, swimming, wading, or boating are not likely to occur in the reservoir currently. No parks, forest reserves, designated hunting or fishing areas, or trail systems were identified in the immediate surrounding area. During the early consultation meeting held in Kapa'a, Hawai'i, April 1, 2014, several attendees mentioned occasional use of the reservoir for fishing and swimming. Additionally, the 1997 Dam Safety Inspection report indicated that a resident fished within the reservoir.

3.9 Transportation/Traffic

Primary access to the proposed project site from Kapaʻa will involve travel on Waipouli Road to Kainahola Road, which borders the eastern portion of the existing reservoir

footprint. Kawaihau Road also intersects with Kainahola Road near the reservoir, and could be traveled to reach the coastal area north of Kapa‘a. The proposed project area is located in an area of agricultural and residential use, with no industrial use. Commercial use in the immediate area surrounding the reservoir appears to be limited to a bed and breakfast and a poi factory. Based on the low densities of houses near the reservoir, traffic on Kainahola Road in the area of the proposed project would be expected to be light. Kainahola Road and Kawaihau Road are both two-lane roads. An average of 526 vehicles per day utilized the Kainahola Road, based on a traffic survey conducted over seven days in October 2010 (SFFM International 2010). A majority of the travel occurred in the hours between 12 p.m. and 12 a.m, with typical peak traffic times in the morning from 6:30 to 7:30 a.m and in the afternoon from hours 2:30 to 5:00 p.m. While Kainahola Road is not a major thoroughfare, it is the shortest route between Kawaihau Road and Waipouli Road.

3.10 Socioeconomics

According to the U.S. Census Bureau (2010), the population in Kapa‘a comprises approximately 16 percent of the total population of Kaua‘i (Table 3-5). The median household income in Kaua‘i and within Kapa‘a is between $63,000 and $64,000. The percentage of the people employed in the agricultural field is relatively low, with higher percentages of people workings in fields such as the arts, entertainment, recreation, accommodation, and food services. While only small percentages of the population work in agriculture, the success of diversified agriculture has been determined to be vitally important to the Kaua‘i economy (Suyderhound 2013). The rise of coffee, seed corn, shrimp, and dairy farming has helped offset the loss in hired farm workers and acres of cropland that occurred between 1987 and the latest data available in 2007. Of all the Hawaiian Islands, Kaua‘i is the most dependent on the visitor sector, and visitors to the island increased substantially between 2012 and 2013.

Table 3-5: Socioeconomic Characteristics of Kaua‘i County and Kapa‘a

Characteristic	Kaua‘i County	Kapa’a
Population[1]	67,090	10,699
Median household income[2]	$64,752	$63,150
Persons below poverty level[2]	11.0%	11.1%
Employment in agriculture[1]	3.2%	1.8%
Land area in square miles[1]	619.96	10.01
Persons per square mile[1]	108.2	1,069

[1]U.S. Census Bureau, 2010.
[2]U.S. Census Data, American Community Survey 5-year estimate, 2008-2012.

In 2013, there was a decreasing trend in the unemployment rate in Kaua‘i which was predicted to continue (County of Kaua‘i Office of Economic Development 2013). However, Kaua‘i was the island that was most affected by the 2008 and 2009 recession in terms of jobs and labor, with an unemployment rate that reached 10 percent (Suyderhound 2013). Job

growth has returned slowly, and the unemployment rate dropped to less than 6 percent. This is still well above the statewide average of one percent (Suyderhound 2013).

3.11 Land Use

The area in which the Upper Kapahi Reservoir is located is zoned as agricultural (County of Kauaʻi 2013). The agricultural productivity rating of the area upon which the reservoir is situated is rated as "E", while the surrounding land is rated as "C" (State of Hawaiʻi Office of Planning 2013). "A" represents the highest productivity rating (very good); "E" represents the lowest (not suitable).

The state of Hawaiʻi owns the parcel of land upon which the Upper Kapahi Reservoir is located. Prior to dewatering, the EKWUC operated the reservoir to supply water downstream for agricultural use. The state also owns the surrounding land to the south of the reservoir, which is also categorized as being used for agriculture on the tax map keys. Smaller tracts of land along the east, north, and west boundaries of the reservoir parcel are categorized on the tax map key as being used for homesteads or residential use.

Forty-one percent of the land in Kauaʻi is utilized for agriculture (Hawaiʻi State Land Use Commission 2014). The area within and around Kapa'a is considered a major agricultural area, with bananas, cattle, flowers, nursery products, and vegetables listed as being produced (Hawaiʻi Department of Agriculture and U.S. Department of Agriculture 2011). Throughout Hawaiʻi, the composition of the agricultural sector has experienced a shift from sugarcane and pineapple production to more diversified agriculture commodities. Kauaʻi had approximately 748 farms based on data from 2007 (U.S. Department of Agriculture 2007). A study on the potential impacts of reservoir closures in Hawaiʻi in 2006 indicated that irrigation of 68 percent of the cropland in Kauaʻi was dependent on use of reservoir water (State of Hawaiʻi Department of Agriculture 2010).

3.12 Scenic Resources

The visual characteristics of the project area could be described as agricultural and residential (Photos 3-1 through 3-4).

Photo 3-1: View of project site from Kainahola Road, March 2014. Photo taken after the reservoir was drained for public safety reasons.

Photo 3-2: View of the project site from the residence on the west (*mauka*) side of the project, looking towards Kainahola Road, March 2014. Water in the center of the photo is from the diversion from Kapa'a Stream. The temporary pond feature of this water was made by the homeowner.

Photo 3-3: Triton barrier along Kainahola Road.

Photo 3-4: View from Kainahola Road looking upstream. Photo taken from near the reservoir outlet. Note rip rap in foreground. This rock was placed during the dam repair project. Road cut on the left mid-field of the photo is the approximate location of the south embankment of the replacement dam.

3.13 Natural Hazards

Natural hazards that the island of Kauaʻi may be subject to include flooding, earthquakes, hurricanes, volcanos, tsunamis, and wildfires.

Upper Kapahi Reservoir is included on two Flood Insurance Rate Maps (FIRM) prepared by the Federal Emergency Management Agency (FEMA) for the County of Kauaʻi and dated September 2005 - Maps No. 150020203E and 1500020201E. The project site is within an area designated as Zone X, indicating it is within an area determined to be outside the 0.2 percent annual chance floodplain and thus has minimal potential for flooding.

Most of the earthquake activity in the Hawaiian Islands has occurred on the island of Hawaiʻi due to the volcanic activity present on the island. Tremors have been recorded on the northwestern region of the islands, which includes Kauaʻi, from earthquakes occurring further south (Fletcher et al. 2002). No seismic activity has originated from Kauaʻi itself.

Multiple hurricanes and tropical storms have affected the Hawaiian Islands (Fletcher et al. 2002). Hurricane Iniki in September 1992 was the strongest and most destructive hurricane to hit the islands since 1950, and passed over Kauaʻi, destroying almost 1,500 homes. Effects from hurricanes or tropical storms are possible within the project area.

Kauaʻi does not contain any active or dormant volcanoes; thus, volcanic eruption or lava flows would not occur within the project area. The project area is also outside of the tsunami evacuation zone. If a tsunami were to occur and affect Kauaʻi, substantial damage would be unlikely to occur within the proposed project area, as it is located more than 5 miles from the coast.

While much of the land immediately surrounding the reservoir is utilized for agricultural or residential use and does not include densely forested areas that would be prone to a high risk of wildfires, the potential for this within the project area does exist. Additionally, the Kealia Forest Reserve is approximately 2.5 miles from the location of the Upper Kapahi Reservoir. Kauaʻi experienced some of the severest fires since the 1960s between May and August 2012 (State of Hawaiʻi Office of the Governor 2013), with approximately 3,000 acres burned in West Kauaʻi in multiple natural or forest reserve areas.

4.0 Environmental Consequences

This section discusses the potential environmental consequences of the construction and operation of the new Upper Kapahi Dam. Potential effects are categorized as adverse or beneficial, and direct, indirect, or cumulative. Direct effects are those impacts caused directly by the action and occur at the same time and location. Indirect effects are those impacts that are reasonably foreseeable and may be caused by the action later in time or farther removed in distance. Cumulative effects are impacts that may occur as the result of the incremental impact of this project with other past, present, or reasonably foreseeable future projects.

4.1 Air Quality

4.1.1 No Action Alternative

No changes to the air quality would result from the no-action alternative.

4.1.2 Proposed Dam Replacement Alternative

During construction, emissions and dust from vehicles, excavation activities, and construction activities may temporarily reduce air quality in the immediate area of the project. Construction equipment that travels to and from the project site could also contribute to local air pollution.

Construction activities would be conducted in accordance with State of Hawai‘i air pollution control regulations (Hawai‘i Administrative Rules [HAR] Title 11, Chapter 60.1), which requires adequate measures to control fugitive dust using water or environmentally friendly chemicals if necessary (HDOH 2013d). A dust control management plan will be developed if necessary to identify and address all activities that have a potential to generate fugitive dust. Exhaust emissions from construction vehicles would be expected to be minor and to readily dissipate. Any increases in dust and vehicle emissions would be short-term and only occur during construction of the new dam. Short-term changes to the air quality would not be anticipated to be significant and would not be expected to result in exceedances of the EPA and HDOH ambient air quality standards. No long-term changes to the air quality would occur as a result of the proposed project.

4.2 Noise

4.2.1 No Action Alternative

No changes to noise would result from the no-action alternative.

4.2.2 Proposed Dam Replacement Alternative

Noise from construction vehicles and equipment (See Section 2.3.2.1) may increase temporarily as a direct result of the project and could adversely affect nearby residences. Mufflers and other devices that reduce noise levels will be provided on all equipment, internal combustion engines, and compressors. Construction is not anticipated to include percussive hammering activities, but other activities that could potentially create noise such as concrete coring, drilling, hammering, trenching, and demolition will occur. These activities will be scheduled for late morning and afternoon hours to minimize disruption. All construction activities will be conducted Monday through Friday, but dewatering pumps may run for 24 hours 7 days a week if necessary to maintain dry conditions within the project area.

The construction contractor would be responsible for enforcement of the permissible occupational noise exposure levels set by the Hawai‘i Occupational Safety and Health Division. Use of personal protective equipment such as earplugs or ear muffs would be required if necessary. Noise is anticipated to be kept within acceptable levels at all times in compliance with HAR Title 11, Chapter 46- Community Noise Control. If noise is expected to be generated at levels exceeding the allowable limits, then a Community Noise Permit will be obtained.

Adverse changes to the noise levels within the project area would be short-term and would only occur during construction of the new dam. Significant increases in noise levels would only impact the project site and immediate surrounding area. No long-term changes to noise levels within the area would be anticipated.

4.3 Biological Resources

4.3.1 Flora

4.3.1.1 No Action Alternative

Under the no action alternative, no vegetation removal or disturbance would occur, and there would be no changes to plant diversity and abundance in the project area.

4.3.1.2 Proposed Dam Replacement Alternative

Vegetation removal during the clearing and grubbing phases of construction would affect the flora within the project area. Generally, only native plants have resource value or are of concern in assessing the potential impacts of a project (AECOS 2014). Native plants were limited in the project area, with three percent of the species identified being native. These species included *hau*, *hala*, and possibly a small native grass. All three of these plants were categorized as rare or uncommon within the project area in 2013, but are generally very common plants throughout Hawai‘i. The Early Polynesian introductions were also commonly found species in the Hawaiian Islands and were not a resource concern. While the

vegetation removal associated with this alternative would potentially decrease the plant diversity within the immediate project area, this effect would likely be minor and mainly impact non-native plant species. No significant effects to the native plant abundance on Kauaʻi would be anticipated since all native plants identified within the project area are common elsewhere.

4.3.2 Terrestrial Fauna

4.3.2.1 No Action Alternative

Under the no action alternative, there will be no changes to bird and mammal populations within the project area. The beneficial effect that could occur from refilling the reservoir and providing additional habitat for waterbirds within the reservoir would not be realized.

4.3.2.2 Proposed Dam Replacement Alternative

With the exception of the Hawaiian Coot and Common Gallinule, no terrestrial species observed at the Project site is listed as threatened or endangered by the U.S. Fish and Wildlife Service under the Endangered Species Act of 1973, as amended, or by the State of Hawaiʻi under its endangered species program (DLNR 1998; USFWS 2011b, 2014). Furthermore, the proposed action will not result in modification of any federally designated Critical Habitat, as there is none present on or adjacent to the location proposed for project work.

The principal potential impact that development activity poses to the endangered waterbirds, such as the Hawaiian Coot and Common Gallinule would be short-term impacts that occur during clearing and grubbing phases of construction. The small pond that exists at the southeast end of the existing reservoir basin may be ephemeral and dry up during portions of the year, but it could serve as marginal habitat for the waterbirds. Neither bird species would be likely to nest within or near the pond. However, both Hawaiian Coot and Common Gallinule are sensitive to disturbance when nesting. Construction activity can destroy nests, cause birds to abandon active nests, or cause birds to leave very young chicks undefended. To avoid adverse impacts to water birds, it is recommended that a nesting waterbird survey be conducted by a qualified biologist prior to the onset of construction to ensure that construction activities do not disturb nesting endangered waterbird species. If a nest is discovered, work would be temporarily halted until all juvenile birds were fledged. The Hawaiian Coot nesting season is typically late winter and spring, but may vary. The Common Gallinule nests year round, but nesting is concentrated in March through August (VanderWerf 2013). Refilling of the reservoir could also potentially benefit these waterbirds after construction is complete by creating habitat for them, as they prefer wetland habitat types, including ponds and irrigation ditches.

The principal potential impact that the project poses to Newell's Shearwater and Hawaiian Petrel is a threat that birds will be downed after becoming disoriented by exterior

lighting if used in conjunction with night construction activities, servicing of construction equipment at night, or streetlights erected for public safety reasons. To reduce the potential for adverse interactions between nocturnally flying seabirds and structures, any external lighting associated with the project be properly shielded. If large flood/work lights are used during construction, they will be placed on poles that are high enough to allow the lights to be pointed directly at the ground (Reed et al., 1985; Telfer et al., 1987). Potential impacts through disorientation would occur only during the construction of the new dam and would not be long-term effects.

The impact that the project potentially poses to bats is during the clearing and grubbing phases of construction as vegetation is removed. The removal of vegetation within the project site could temporarily displace bats using the vegetation for roosting. As bats use multiple roosts within their home territories, this disturbance from the removal of vegetation is likely to be minimal. However, during the pupping season, female bats carrying pups may be less able to rapidly vacate a roost site when the vegetation is cleared. Additionally, adult female bats sometimes leave their pups in the roost tree while they forage and very small pups may be unable to flee a tree that is being felled. Potential adverse impacts from such disturbance will be avoided or minimized by not clearing woody vegetation taller than 15 ft (4.6 meters) between June 1 and September 15, the period when female bats are likely to be tending pups.

4.3.3 Aquatic Resources

4.3.3.1 No Action Alternative

No changes to the aquatic resources would result from the no action alternative.

4.3.3.2 Proposed Dam Replacement Alternative

No aquatic species protected by State of Hawai‘i Administrative Rules (DLNR 1998, 2007) nor federally endangered or threatened species (USFWS 2011b, 2014) were observed within the Project area.

Native stream macrofauna are diadromous. Eggs are laid in the stream and the larvae that hatch from these eggs move down stream and out into the ocean where they develop for a time before migrating back into fresh water to grow to maturity (Ford and Kinzie 1982; Kinzie 1988). The significance of the water flowing in the irrigation system to the distribution of native stream macrofauna within the natural streams is uncertain; however no diadromous species were found in the project site during the January 2014 site surveys.

In order to maintain a dry condition for construction, water will not be diverted from the natural streams into the project site during proposed project construction. The construction site will be suitable only for aquatic species, such as aquatic insects, capable of surviving in

intermittent and shallow waters. Diadromous species would continue to have access to natural stream channel habitats and irrigation canals outside of the project site.

After construction is completed, water will flow through the new outlet works in the replacement dam through a channel into the existing outlet works in the existing dam and out into Lateral 8. Native aquatic macrofauna could utilize the project site during project operation. If diadromous species are present in the irrigation system, they will be able to utilize the project site only if they are able to migrate through the existing outlet gate in the existing dam. Water velocities may be excessive for upstream migration of diadromous species

4.4 Water Resources

4.4.1 Water Quality

4.4.1.1 No Action Alternative

No changes to water quality within the project area would occur under the no action alternative.

4.4.1.2 Proposed Dam Replacement Alternative

The temporary erosion control plan (Appendix E) for the proposed project discusses the Best Management Practices (BMP) that will be implemented to minimize any environmental impacts to water quality in the vicinity of the project site during construction. These BMPs include, but are not limited to, installation of silt fences, silt curtain, grass, fiber rolls, straw mulch, and temporary swales, as described in this exhibit. The BMPs would follow the guidelines for design, layout, and implementation described in Sections 6.21 and 6.62 of the Interim Construction Best Management Practices (BMPs) for Sediment and Erosion Control for the County of Kauaʻi (County of Kauaʻi Department of Public Works 2004). In addition, existing vegetation will be preserved and disturbed areas seeded where possible, following sections 6.32 and 6.10, respectively, of the County's guidelines. HDOH water quality standards and antidegradation policies require that there be no impacts from a proposed project that would adversely affect water quality to the point that existing or designated uses are adversely affected or water quality criteria are not met (HAR Chapter 11-54, HDOH 2013b).

The primary potential impact to water quality would be increased sedimentation, turbidity, and pollutants in the ditch (Lateral 8) that the outflow feeds into and in Kainahola Stream during storm events. BMPs will focus on the prevention or minimization of movement of soils and other materials into the ditches and streams. During most storm events, routing of stormwater would utilize the same drainage into which the existing reservoir outlet works discharge flows, but the clearing of vegetation and increased disturbance associated with the project could increase the amounts of sediment or pollutant concentrations in the stormwater.

If the volume of stormwater exceeds the capacity of the existing outlet works during a large storm event, stormwater may also exit the project area through the box culvert that will be constructed when the dam is breached and will then be discharged into Kainahola Stream. Any increases in sedimentation, turbidity, or pollutants that entered the stream during such an event would be short-term, and the increased streamflows in Kainahola Stream resulting from the storm event would provide dilution for any pollutants. Any such increases would only occur during the construction phase of the project and would not persist long-term.

4.4.2 Water Quantity and Hydrology

4.4.2.1 No Action Alternative

Under the no action alternative, water would continue to be diverted from Kapa‘a Stream and Kainahola Stream through the project site. However, no water storage will be available. Therefore, water deliveries downstream of the project site will be limited to the quantity that can be diverted at the time, without any enhanced flow from storage.

4.4.2.2 Proposed Replacement Dam Alternative

4.4.2.2.1 *During Construction*

Unless permitting requirements dictate that flows must be maintained through the project area during construction, surface water diversion from Kapa‘a Stream and Kainahola Stream during construction will be stopped in order to provide dry conditions in the construction site. Delivery of water to downstream agricultural users would be maintained through a bypass within the ditch system. Some flow may be present from precipitation falling within the reservoir drainage basin (GEI 2014). Other than precipitation events, there would be no supply of surface water to the ditch (Lateral 8) that the existing reservoir outlet feeds into. Flow in Kainahola and Kapa‘a streams may increase slightly during construction as water would not be diverted from these streams into the reservoir.

It is anticipated the Contractor would begin excavation for the new dam on the south side and utilize the existing channel through the reservoir to divert water to the existing outlet works located downstream of the new dam. After construction of the outlet works, water could be diverted through the newly constructed outlet works and begin dam excavation on the north side of the dam. Alternatively, the Contractor may construct temporary piping which would allow water from smaller storms to be routed around the entire excavation. Earth cofferdams constructed from existing reservoir sediment or from excavated materials from the spillway could be used to aid in diverting water to the appropriate locations.

The reservoir is currently in a drained condition because the existing outlet gate downstream of the new dam location has been removed. However, groundwater control will be required for excavation and construction of the embankment dam and may be necessary for the downstream portions of the spillway excavation. It is anticipated that dewatering will be performed using a network of locally placed sump pits, pumps and dewatering trenches to

maintain dry conditions. The dewatering system will have sufficient capacity to provide a work area free from surface water and to maintain groundwater levels at least 2-feet below excavations or maintain foundation excavations on bedrock free of ponding or puddled water prior to embankment fill placement. Groundwater from dewatering operations will be discharged to the outlet structure of the existing dam and be conveyed through the irrigation lateral.

4.4.2.2.2 During Operation

Once construction is complete and the reservoir is filled, outflows from the new Upper Kapahi Reservoir into the ditch would resume. The new Upper Kapahi Reservoir and the area of the existing reservoir that is to remain drained between the new dam and the existing dam will be hydraulically independent (GEI 2014). The only method of water transfer between the two areas will be via new dam outlet releases or spills over the new spillway. Low level outlet releases will be discharged into a channel that conveys flow to the outlet works of the existing dam. A series of boulder drops will provide energy dissipation along the alignment. The new dam outlet works conduit will be gated and flow will not independently transfer between the reservoir segments without adjusting the gate. Spills over the spillway will be discharged through the spillway chute and routed through the box culvert spillway of the permanent breach once constructed.

The proposed spillway will provide the capacity to meet the DLNR Dam Safety requirements for non-jurisdictional spillways for the Peak Maximum Flood (PMF) and one percent storm events (GEI 2014). During large storm events when the reservoir is full, excess water would flow into Kainahola Stream as occurred historically with the existing reservoir.

The maximum capacity of the outlet works under normal water conditions is about 32 cfs with a maximum velocity of about 18 feet per second. The entire capacity of the reservoir can be released in approximately 19 hours, which meets the minimum required total drawdown of two-thirds of the reservoir volume. The outlet works will also function under the average flow diversion requirements of 2.8 cfs (1.5 million gallons per day (MGD)) to 9.3 cfs (5 MGD). As part of the reservoir operations plan, filling will be limited to several feet per day, which is below these diversion flows.

4.5 Archeological, Historical, and Cultural Resources

4.5.1 No Action Alternative

No short-term or long-term effects to the archeological, historical, and cultural resources would occur with the no-action alternative. If the new dam is not constructed, the historic function of the reservoir would not be restored.

4.5.2 Proposed Replacement Dam Alternative

While archeological surveys from areas in upland Kapa‘a are limited, no archeological sites were observed in areas near the proposed project site. Upper Kapahi Reservoir itself could potentially be considered an eligible property for the National Register of Historic Places, but no other historic properties have been documented in the project area. As the proposed project would restore some of the historic function of the reservoir, the historic status of the reservoir would not be adversely affected. Burial sites would not be affected.

Based on the preliminary findings of the assessment conducted for this project (Cultural Surveys Hawai‘i 2014), it is not anticipated that any impacts to cultural resources would occur as a result of construction of the new dam. However, a thorough survey of the project area will be done prior to initiation of the project in order to more fully assess the cultural practices, resources, and beliefs that may potentially be impacted by the proposed project. In addition, personnel involved in this project will be informed of the possibility of inadvertent cultural finds, and will be made aware of the appropriate notification measures to follow.

4.6 Geology and Soils

4.6.1 No Action Alternative

No short-term or long-term effects to the soils would occur with the no-action alternative.

4.6.2 Proposed Replacement Dam Alternative

The geology in the area surrounding the Upper Kapahi Reservoir would not be significantly impacted in the short or long term by the construction or operation of the new dam or by the no-action alternative. Disturbance of the soil would be required for construction of the new dam as the reservoir sediment was excavated to a suitable foundation; the material derived from the spillway excavation will be utilized for the embankment construction. The staging and stockpile area will be located within the reservoir parcel on the south side of the dam and spillway (Figure 2-2) and will be utilized temporarily to stockpile the excavated soil before it is used for the embankment. Adverse effects to the soil through disturbance would be limited in geographical scope to the existing reservoir footprint and staging and stockpile areas, and would occur only during dam construction. No long-term effects would occur after dam construction was complete. If excess excavated soils are available, they will be placed upstream of the dam on the south side within the excess materials fill areas (Figure 2-2).

BMPs and control measures would be utilized during construction to prevent effects to adjoining property from water and eroding soil (Appendix E). These measures could include, but are not limited to, installation of silt fences or curtains, construction of temporary swales, or placement of straw bales, grass, fiber rolls, or straw mulch to stabilize soils. Applicable guidelines described in “Interim Construction Best Management Practices (BMPs) for Sediment and Erosion Control for the County of Kaua‘i (County of Kaua‘i

Department of Public Works 2004) would be followed in developing, installing, and maintaining BMPs. Additionally, conformance with all applicable federal, state, county, and local regulations and ordinances would be followed. These measures would minimize any short-term impacts to the soil within the project area.

4.7 Waste/Hazardous Materials

4.7.1 No Action Alternative

Under the no action alternative or the preferred alternative, the debris (including asbestos) that was determined to be intermixed with the fill in the existing dam will remain in place. Once the existing dam is breached, the risk of dam failure will be reduced, and therefore the risk that the hazardous materials will be exposed is also reduced.

4.7.2 Proposed Replacement Dam Alternative

Under the preferred alternative, the debris (including asbestos) that was determined to be intermixed with the fill in the existing dam will remain in place. There will be even less risk of a dam failure under the proposed replacement dam alternative than under the no action alternative, because the replacement dam will provide an extra measure of security to protect the existing embankment.

There is the potential for hazardous materials such as diesel, oil, gasoline, hydraulic fluid, or brake fluid to be accidentally released within the project from construction equipment and vehicles during construction. Spill kits would be available at the project site to minimize the impact from any such accidental releases if they were to occur. No other increase in wastes or hazardous material is expected to result from the preferred alternative.

4.8 Recreation

4.8.1 No Action Alternative

Under the no action alternative, the reservoir will remain drained. There will not be opportunities for swimming, and the only fishing opportunities would be in the small amount of water diverted through the project site.

4.8.2 Proposed Replacement Dam Project

A small reservoir will be present on the project site which would have some potential value for swimming and fishing. These activities were minimal with the previous reservoir and would be expected to be less attractive in the new reservoir, given its small size.

4.9 Transportation/Traffic

4.9.1 No Action Alternative

No changes to transportation or traffic will occur with the no action alternative.

4.9.2 Proposed Dam Replacement Project

Primary site access to the proposed project site for the Contractor's employees (or subconctractors) will be from Waipouli Road to Kainahola Road from Kapa'a. Based on the locations of the facilities that would likely supply the aggregate and concrete, equipment and materials would be routed from Kaumulii Highway (Hwy 50) to Kuhio Highway (Hwy 56) to Olohena Road (Hwy 581) to Kaapumi road to Kawaihau Road to Kainahola Road at the project site. Traffic could increase in the short-term as construction equipment and workers access the site.

Traffic control and site access will be coordinated with County and DLNR personnel, and a traffic control plan will be created and submitted if needed. Kainahola Road is expected to remain open for the duration of the construction project, although flaggers may be needed during some phases of construction. Emergency response routes are not expected to be affected by the new dam construction. Kainahola Road and other surrounding roads will not be utilized for parking or staging activities. The State of Hawai‘i will monitor any damage that occurs to the roads within the project area through video. Once the project construction is complete, traffic patterns in the area will return to pre-construction levels.

4.10 Socioeconomics

4.10.1 No Action Alternative

Under the no action alternative, there will be no replacement dam construction project. The jobs and beneficial short-term economic impact of the construction project will not occur.

No water storage will be available at the project site. This will have a potential negative economic impact on agricultural water users who rely on this storage to irrigate their crops.

4.10.2 Proposed Dam Replacement Project

The proposed project would indirectly have a beneficial economic effect. The construction of the proposed dam would create construction and construction support jobs for the anticipated duration of the project, and presumably some materials would be purchased from local suppliers. This would provide a short-term indirect economic stimulus from those workers and suppliers who would then use that income to purchase goods and services.

The long term economic benefit is providing water storage for agricultural water users, who will be able to rely on a more consistent and reliable water supply for irrigation.

4.11 Land Use

4.11.1 No Action Alternative

Under the no action alternative, land use would be unchanged, but the benefit of restoring some of the water storage that the reservoir historically provided would not occur.

4.11.2 Proposed Replacement Dam Alternative

No changes to land use would occur within the project area as a result of the preferred alternative other than that the currently dewatered reservoir would again be utilized for water storage as in the years prior to 2012. The water storage capacity provided by this project will be less than what the reservoir historically supplied but will supplement some of the storage lost due to decommissioning the existing dam. This water storage will benefit EKWUC and agricultural users in the region.

4.12 Scenic Resources

4.12.1 No Action Alternative

Under the no action alternative, the reservoir will remain dewatered. At the early consultation meeting for the project (April 1, 2014, Kapa‘a Hawai‘i), concerns were expressed about the visual impact of the dewatered reservoir. Neighbors expressed an interest in having the reservoir restored.

4.12.2 Proposed Replacement Dam Alternative

While construction equipment and activities may adversely affect the views and aesthetics of the project area in the short-term, no long-term adverse impacts would be expected to occur. Construction debris and trash would be removed from the project site on a weekly basis. Visibility would not be affected by the proposed project. While the new reservoir will cover less surface area and the dam height would be lower compared to the previous dimensions of the Upper Kapahi Reservoir and Dam, the reservoir will be filled once the new dam construction is complete and should develop a natural looking appearance within a relatively short time period, which may generally be regarded as more scenic than its current dewatered state.

4.13 Natural Hazards

4.13.1 No Action Alternative

There will be no change to natural hazards under the no action alternative.

4.13.2 Proposed Replacement Dam Alternative

Construction of the new dam would not affect the risk of natural hazards occurring compared to the no action alternative. The potential for adverse effects from flooding, earthquakes, tsunamis, and volcanoes would remain minimal within the project area. The risk of more likely events such as hurricanes and wildfires occurring and the magnitude of any damage from these events if they were to occur would not increase or decrease if the proposed project is constructed and completed. An Emergency Management Plan would be put in place to provide detailed protocols to be followed by those involved in the dam construction process that would include response and evacuation procedures.

4.14 Summary of Direct and Indirect Impacts

Building the new Upper Kapahi Dam would include excavation of the existing reservoir sediments; construction of a new embankment dam, downstream blanket drain, toe drain, low level outlet works, catwalk, spillway, and conveyance channel; rehabilitation of the existing outlet works; and placement of rock slope protection on the upstream dam face. These activities may directly result in short-term adverse effects on the amount of noise, air quality, soils, traffic conditions, biological resources, and water resources.

Noise at the project site and nearby surrounding area will increase due to the use of construction vehicles and equipment, and emissions from these may increase fugitive dust and other associated pollutants, adversely impacting the air quality. Noise is anticipated to be kept within acceptable levels at all times in compliance with HAR. Any increases in dust and vehicle emissions would be short-term and only occur during construction of the new dam. Short-term changes to the air quality would not be anticipated to be significant and would not be expected to result in exceedances of the EPA and HDOH ambient air quality standards. Soil disturbance would occur within the footprint of the existing reservoir, and soils would be stockpiled on the south side of the dam. Traffic could be minimally increased by construction traffic to and from the site.

No significant effects to the native plant abundance on Kauaʻi would be expected to occur since the few native plant species identified within the project area are common elsewhere. The Hawaiian coot and common gallinule, both of which are endangered water birds that were observed near the project area, could be affected during construction of the new dam if their usual nesting behaviors are disrupted by the disturbance. A survey for these birds would be conducted before construction was initiated to minimize the potential for any such impacts to occur. Newell's Shearwater and Hawaiian Petrel could also be impacted by use of exterior lighting at night during dam construction, but the potential for adverse interactions would be minimized by proper shielding and placement of any necessary lighting. Bats are the only native mammal that may potentially utilize the project area; the removal of vegetation within the project site could temporarily displace bats using the vegetation for roosting. The potential adverse impacts from such disturbance would be

avoided or limited by not clearing tall woody vegetation during the period when female bats are likely to be tending pups. Effects to the biological resources would be anticipated to be eliminated or minimized by practices that would be followed during the construction of the new dam, as summarized in the following section.

Potential impacts to the aquatic resources would be most likely to occur if water quality was affected by stormwater runoff associated with the new dam construction. The BMPs summarized in the following section will be implemented to minimize stormwater runoff and any related environmental impacts to aquatic biota and water quality in the vicinity of the project site during construction. Water will not be diverted into the reservoir during construction of the new dam, and the only source of water to the reservoir and the ditch (Lateral 8) will be precipitation events. No significant impacts to streamflows in Kainahola Stream or Kapa‘a Stream would be anticipated to occur. No native fish species were documented as occurring in the channel at the existing reservoir site in 2014, but native species, including some amphidromous species, occur in Kapa‘a Stream watershed.

The proposed project would also be anticipated to have a short-term beneficial effect on socioeconomics resulting indirectly from the employment of local people for the construction process and the purchase of materials from local suppliers. Construction is expected to be ongoing for two 7-month periods, and cleanup activities will be conducted when construction is complete. Given ideal construction weather conditions, construction activities could be completed within a 12-month mobilization period with no winter (rainy season) shut down.

Once the dam is constructed and the reservoir can function at a reduced capacity for water storage, a long-term beneficial effect to land use and socioeconomics would directly result from the project as it would again be capable of supplying water to downstream agricultural users. While storage would be reduced in the new reservoir compared to historical conditions before the reservoir was dewatered, this storage would aid in preventing a shift in demand towards the county’s water system and would provide agricultural users with a more consistent and reliable water supply for irrigation. There will be even less risk of a dam failure under the proposed project than under the no action alterative, because the replacement dam will provide an extra measure of security to protect the existing embankment. Reestablishment of the reservoir would also potentially have a long-term beneficial effect on waterbird populations by providing additional habitat within the project area. While limited by the small size of the reservoir, some beneficial effect could also occur to recreation in the long-term as the reservoir would provide a small area that could potentially be used for swimming, wading, or fishing.

4.15 Summary of Mitigation Measures

As discussed in previous sections, mitigation measures will be employed to minimize or prevent potential impacts to resource that could potentially occur as a result of the proposed project. To minimize the impacts to air quality as a result of construction, measures to

control fugitive dust using water or environmentally friendly chemicals will be employed as discussed by the HDOH (2013d), and a dust control management plan will be developed if necessary. Mufflers and other devices would be provided on all possible construction equipment and vehicles to reduce noise levels during operation. Construction activities that are expected to create excessive noise would be scheduled for late morning and afternoon hours to minimize disruption, and construction activities will not occur during weekends.

Effects on water quality, aquatic biota, and soils resulting from increased erosion and sedimentation will be prevented or minimized by following the BMPs discussed in the Temporary Erosion Control Plan (Appendix E). These measures could include, but are not limited to, installation of silt fences or curtains, construction of temporary swales, or placement of straw bales, grass, fiber rolls, or straw mulch to stabilize soils. Applicable guidelines described in "Interim Construction Best Management Practices (BMPs) for Sediment and Erosion Control for the County of Kaua'i (County of Kaua'i Department of Public Works 2004) would be followed in developing, installing, and maintaining BMPs. In addition, scheduling the construction period to occur during the drier months of April through October will minimize the potential for effects from stormwater runoff. Spill kits would be available at the project site to minimize the impacts from any accidental releases of diesel, oil, gasoline, hydraulic fluid, or brake fluid from construction equipment and vehicles.

Effects to terrestrial wildlife would be eliminated or minimized by practices that would be followed during the construction of the new dam. A survey for nesting Hawaiian Coots and Common Gallinules will be conducted by a qualified biologist prior to the onset of construction to ensure that construction activities do not disturb these endangered species. If a nest is discovered, work would be temporarily halted until all juvenile birds were fledged. As Newell's Shearwater and Hawaiian Petrel have been observed near the project area, any exterior lighting that must be utilized during the construction period will be properly shielded and placed so that the possibility of disorienting these nocturnally flying birds is minimized. The potential for adverse impacts to the native bat species, the Hawaiian hoary bat, that likely utilizes this area would be avoided or limited by not clearing tall woody vegetation during the period when female bats are likely to be tending pups.

4.16 Cumulative Impacts

Cumulative impacts from the dam breach project and the new dam construction would be possible. However, the dam breach project would be complete prior to initiation of the new dam construction, and possible impacts from the dam breach project would only be anticipated to occur during the construction phase of the dam breach. No impacts from the dam breach are likely to occur in the long-term that would have a cumulative effect with the potential impacts from the new dam construction. No other reasonably foreseeably projects were identified that would be expected to have a cumulative impact on resources within the project area.

5.0 Relationship to Plans, Policies, and Controls

This section discusses the compatibility of the proposed project with the land use plans and policies put in place by the State of Hawai‘i and the County of Kaua‘i. Necessary consultations with federal agencies are also discussed, as are permits and approvals that are expected to be required for the project.

5.1 Hawai‘i State Plan

The Hawai‘i State Planning Act was adopted into law in 1978 as HRS Chapter 226. It is intended to serve as a guide to future long-range development of the state. As such, it identifies goals, objectives, policies, and priorities for the state government to: 1) provide a basis for determining priorities and allocating limited resources, such as public funds, services, human resources, land, energy, water, and other resources; 2) improve coordination of federal, state, and county plans, policies, programs, projects, and regulatory activities; and 3) establish a system for plan formulation and program coordination to provide for an integration of all major state and county activities.

The objectives and policies within the State Plan that are most relevant to the project are included in sections 226-7 (Objectives and policies for the economy- agriculture) and 226-16 (Objective and policies for facility systems- water). Specifically, Section 226-7 includes as one of the objectives of the State Plan to “assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs”. Section 226-16 includes as objectives to plan “for the provision of water to adequately accommodate domestic, commercial, industrial, recreational, and other needs within resource capacities”, to “assist in improving the quality, efficiency, service, and storage capabilities of water systems”, and to “promote water conservation programs and practices in government private industry and the general public to help ensure adequate water to meet long-term needs”. This project would support these three objectives and policies as it restores some of the water storage historically provided by the Upper Kapahi Reservoir to agriculture users that was lost when the existing dam was decommissioned.

5.2 State Land Use Law

The State Land Use designation for the project area is agricultural (State of Hawai‘i Land Use Commission 2012). Permissible uses within agricultural districts are detailed for those lands with soil classified as Class A or B by the Land Study Bureau in the Section 205-4.5 of the HRS. The existing site for the reservoir itself is rated as “E” (not suitable) while the surrounding land is rated as “C” (State of Hawai‘i Office of Planning 2013). Based on this, uses on this land are not limited to those permitted in Section 205-4.5. As the land is being used to restore some of the storage lost when the existing Upper Kapahi Dam was decommissioned, the project will overall benefit the agricultural users who previously

utilized the water stored in the reservoir before it was dewatered and would thus conform to the state land use law.

5.3 State Environmental Policy

The proposed project is consistent with the State Environmental Policy, as stated in HRS Chapter 344, to "enhance the quality of life" by "creating opportunities for the residents of Hawai‘i to improve their quality of life through diverse economic activities which are stable and in balance with the physical and social environments". Chapter 344 further states that the economic development of the state be considered and that one of the objectives of the policy is to "promote and foster the agricultural industry of the State". The proposed project would benefit agricultural users by restoring some of the water storage capacity lost when the existing Upper Kapahi Dam was decommissioned, and thus would be considered to promote and foster the agricultural industry.

5.4 County of Kaua‘i General Plan and Zoning Ordinances

The Kaua‘i General Plan was updated and adopted in November 2000. It includes policies that guide future growth on the island over the next twenty years with the welfare of the physical environment, public, culture, and island's historical rural character in mind. The Land Use Map of the General Plan designates the project area as Agricultural (County of Kaua‘i 2013). The plan recognizes that irrigation water systems are a key resource for agricultural use, and includes policies addressing the conservation of irrigation systems for existing and future agricultural use. It further states that "the County and the State shall take measures to maintain viable irrigation systems- both government- and privately owned- and to support the supply of irrigation water to farmers at reasonable prices" and that implementing actions should include "maintaining or rebuilding viable systems". By restoring some of the water storage capacity lost when the existing Upper Kapahi Dam was decommissioned, this project would promote the goal of the County to maintain and rebuild irrigation systems.

The Comprehensive Zoning Ordinance (CZO) of the County regulates land use in the county. Land use regulations consist of development standards, application procedures, and criteria for granting permits and other approvals. The County categorizes the project area as Agricultural. Actions associated with construction of the new Upper Kapahi Dam were not included in the list of activities for which a permit is required under the CZO for land designated for agricultural use.

5.5 Hawai‘i Coastal Zone Management Program

Hawai‘i's Coastal Zone Management (CZM) Program was enacted in 1977 (HRS Chapter 205A) through the Federal CZM Act of 1972. This program is in place to protect and manage Hawai‘i's coastal resources through land and water use regulations. While the entire state is defined to be within the CZM Area based on HRS Chapter 205A, Special

Management Areas (SMAs) were designated within each island to control development in shoreline areas. Land use rules and regulations for those specially designated areas are administered by the individual County planning authorities. The Upper Kapahi Reservoir project site is not located within a SMA and is thus not subject to SMA rules and regulations.

The CZM Act includes objectives and policies relative to recreational resources, historic resources, coastal ecosystems, economic uses, coastal hazards, managing development, public participation, beach protection, and marine resources. The proposed project would conform with these policies and objectives as discussed below.

An objective of the CZM Act is to provide adequate, accessible, and diverse recreational opportunities in coastal areas through improved coordination, funding, and other policies aimed at protecting shoreline resources. The proposed project area is not a coastal development and is not within a SMA, therefore policies regarding shoreline recreational resources would largely not be applicable. However, one of the policies outlined to achieve this objective is to regulate point and non-point sources of pollution to aid in the protection or restoration of the recreational value of coastal waters. The proposed project will address this policy specifically through use of BMPs and compliance with all regulations pertaining to stormwater management. An NPDES permit will also be obtained.

The CZM Act also includes the objective to protect, preserve, and restore natural and manmade historic and prehistoric resources in the CZM area that are significant to Hawaiian and American history and culture. As discussed in sections 3.5 and 4.5, no cultural or archeological resources were identified within the project area that would be impacted by the study. Upper Kapahi Reservoir itself could potentially be considered an eligible property for the National Register of Historic Places, but no other historic properties have been documented in the project area. Construction the new dam would restore some of the historic function of the reservoir, and thus the project would not likely have an adverse effect on this resource.

Additional objectives and policies are included in the CZM Act that focus on the protection of valuable coastal ecosystems and marine resources from disruption and adverse impacts, and on assuring the sustainability of those resources. Policies referenced to aid in reaching these objectives discuss effective regulation of stream diversions, channelization, and other similar land and water uses, and the promotion of water quantity and water quality planning and management practices to avoid any impacts to water quality. Once completed, the proposed project would restore some of the water storage capacity of the Upper Kapahi Reservoir that was lost when the dam was decommissioned and would continue to divert water from Kapa‘a and Kainahola streams as occurred historically. Based on this, it would not be expected to result in any additional disruption or degradation of coastal water ecosystems. As discussed above, the proposed project will also address these policies through use of BMPs and compliance with all regulations pertaining to stormwater management.

The CZM Act encourages public awareness and participation in coastal management. While the proposed new dam is not within a coastal area or a SMA, an informational public meeting was held to encourage public awareness of the project and to allow for attendees to express any concerns. This meeting is discussed in Section 7.1.2, and attendees are listed in Appendix D.

Several of the policies and objectives included in the CZM Act would not be applicable to the proposed project based on its inland location. Objectives and policies included in the Act to protect, preserve, and improve the quality of coastal scenic and open space resources, as well as to protect beaches for public use and recreation, would not apply to the project area since it is not located within or within view of the shoreline or beach property. The policies and objectives focused on managing development and ensuring public or private facilities and improvements important to the State's economy be placed in suitable locations are also not applicable to the proposed project since it does not involve any type of proposed coastal development. Additionally, the policies included in the objective to reduce hazard to life and property are largely not applicable to the proposed project, as it is not located in area prone to flooding or subsidence as discussed in sections 3.13 and 4.13. Erosion is included as a hazard to life and property. There is the potential for increased erosion resulting from the construction activities and disturbance associated with the project, but the BMPs (Appendix E) that will be utilized would prevent or minimize any erosion during construction, as described in Section 4.4.

5.6 Archeological and Historic Preservation Act, National Historic Preservation Act

As no significant disturbance is expected to occur outside of the footprint of the existing Upper Kapahi Reservoir, it is anticipated that the project will have no effect on historic properties and thus the proposed project will be in compliance with these regulations. Section 106 of the National Historic Preservation Act requires the Corps to assess the effect of a proposed project on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. The Corps is required to consult with the State Historic Preservation District (SHPD) in order to determine the project's potential to impact resources of cultural or historical significance. The State Historic Preservation District was consulted by letter on March 12, 2014; their response is pending.

5.7 Clean Air Act

As discussed previously in Section 3.1, air quality within the project area is good, and there are few existing sources of air pollution in the vicinity of the project. Impacts from construction of the new Upper Kapahi Reservoir Dam are anticipated to be minimal and short-term. Based on this, the proposed project would be in compliance with the HDOH Air Quality program, and thus the Clean Air Act.

5.8 Endangered Species Act

The federal Endangered Species Act (ESA) is administered by the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS), with the FWS being responsible for protection of terrestrial and freshwater organisms and their habitat, while the NMFS has responsibility for marine wildlife and their habitat. As discussed in sections 3.3.2 and 4.3.2, two endangered waterbirds, the Hawaiian Coot and Common Gallinule, were observed near the project area in the 2014 surveys, and the endangered Hawaiian petrel and the threatened Newell's shearwater have been documented flying over the general project area in past surveys. Section 4.3.2 describes the actions that will taken during construction of the dam to minimize or eliminate any effects to these birds. Refilling of the reservoir could also potentially benefit the two waterbirds after construction is complete by creating habitat for them, as they prefer wetland habitat types, including ponds and irrigation ditches (VanderWerf 2013). The FWS and NMFS were consulted for their concurrence by letter on March 12, 2014; their response is pending.

5.9 Permits and Approvals

Permits and approvals from state and federal agencies are required prior the proposed project being initiated.

In 2010, a Department of the Army (DA) jurisdictional determination (JD) was requested for the proposed safety improvements planned for the Upper Kapahi Reservoir. The specifications at that time were reviewed pursuant to Section 10 of the Rivers and Harbors Act (RHA) of 1899 and Section 404 of the Clean Water Act (CWA) (U.S. Army COE 2010). Section 10 of the RHA requires that a DA permit be obtained for certain structures or work in or affecting navigable waters of the U.S., while Section 404 of the CWA requires a DA permit be obtained for the placement or discharge of dredged or fill material into waters of the U.S. The COE determined that "while the Upper Kapahi Reservoir was an impoundment of waters subject to the Corp's regulatory jurisdiction under Section 404, a DA permit shall not be required for any activities that would involve either the temporary or permanent placement of fill material within the bed, bank, and spillway structure of Upper Kapahi Dam and Reservoir as it meets the criteria of 33 CFR 324.4(a)(2) for discharges not requiring (DA) permits". This determination was valid for five years. However, as some discoveries since 2010 have resulted in modifications to the project design, a confirmation that the JD was still valid for the new Upper Kapahi Dam project was requested in November 2013 (GEI 2013).

At a meeting with the COE on November 22, 2013, it was determined that the replacement dam project will need a DA permit, because of the amount of fill that will be placed above the high water mark. The DA permit application is in progress. A federal CZM consistency review based off of Section 307 of the Federal CZM Act will be conducted since federal permitting is required. A federal consistency review is required when federal agency

activities, including federal permit activities, have a reasonably foreseeable effect on any land or water use or natural resource of the coastal zone. All of Hawai‘i is considered to be within the CZM area, as discussed in Section 5.5.

In addition, a CWA Section 401 Water Quality Certification must be applied for and approved by the HDOH - Clean Water Branch (CWB). These certifications are required for any activity that may result in a discharge of a pollutant in to waters of the U.S., and the certification asserts that the proposed discharge will not violate applicable water quality standards.

National Pollutant Discharge Elimination Systems (NPDES) permit coverage is also required in addition to the Section 401 Certification for all point source pollutant discharges to state waters and any stormwater associated with municipal separate storm sewer systems, industrial activities, or construction activities for land disturbance of one acre or more. Land disturbance is defined as including, but not limited to, clearing, grading, grubbing, uprooting of vegetation, demolition, staging, stockpiling, baseyards, storage areas, paving activities, and all areas used or blocked off to operate construction equipment or vehicles. Construction of the new Upper Kapahi Dam will include some of these listed activities and disturbance is expected to be greater than an acre.

The HDOH-CWB is delegated by the U.S. Environmental Protection Agency (EPA) to administer the NPDES system in Hawai‘i, as described in HAR Chapter 11-55. There are NPDES General Permits that authorize certain discharges and activities, including one authorizing discharges of stormwater associated with construction activities (Appendix C of HAR Section 11-55) and one for dewatering activities (Appendix G of HAR that may be applicable for the proposed project. A Notice of Intent (NOI) will be submitted requesting coverage under this general permit once a determination that the project activities can comply with every condition listed for the general permit. A Stormwater Pollution Prevention Plan will be developed prior to initiation of any construction associated with the project.

Potentially a Stream Channel Alteration Permit from the Commission on Water Resource Management’s Stream Protection and Management (SPAM) Branch could be necessary for the proposed project. However, as the activities associated with the construction of the new Upper Kapahi Dam would occur within the footprint of the existing reservoir and would not result in any obstruction, diminishment, destruction, modification, or relocation of a natural stream channel, application for this permit was not anticipated. To ensure that it was not required, a Request for Determination was submitted to SPAM. Based on the materials submitted with this request, the SPAM Branch determined that no permit application was necessary for the proposed project as no work was planned to occur within Waika‘ea Stream (State of Hawai‘i Commission on Water Resource Management 2014).

As the proposed project area is not located within a Special Management Area (SMA), no SMA permit would be necessary.

Other permits specific to construction activities will be obtained by the construction contractor, and could include a grading permit, grubbing permit, stockpile permit, and/or building permit from the County or other entities; permits for temporary use of roads and other easements to access owner-provided fill areas and other facilities; and permits for industrial equipment brought to the site, if any. A permit from the DOT Highways Division, Kauai District Office, would be required for the transport of oversized or overweight materials and equipment on State highway facilities.

6.0 Findings and Determination: AFONSI

The following section discusses the criteria used to determine if the proposed construction of the new Upper Kapahi Reservoir dam would be anticipated to have a significant effect on the environment and summarizes the resulting determination.

6.1 Significance Criteria

Under the HEPA process, an agency determines that a proposed project may have a significant impact on the environment if it meets any of the thirteen criteria from HDOH's Administrative Rules Section 11-200-12 (State of Hawai'i 2012). Potential impacts of the proposed project have been assessed with respect to these significance criteria to ensure the project's conformance with these criteria.

1) Involves an irrevocable commitment to, loss or destruction of any natural or cultural resource

   With BMPs and other mitigation measures in place, no significant adverse impacts would be anticipated to occur to the biological or cultural resources within the project area as a result of the new dam construction. **Thus, no irrevocable commitment to or loss or destruction of any natural or cultural resources would be expected to occur.**

2) Curtails the range of beneficial uses of the environment.

   No curtailment of the range of beneficial uses of the environment would occur as a result of the proposed project. The historic use of water storage would be restored, in part. Once the reservoir was refilled, the reservoir could be utilized for some limited recreational activities such as swimming, wading, or fishing.

3) Conflicts with the state's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders.

   The proposed project is consistent with the state's long-term environmental policies, goals, and guidelines established in Chapter 344, HRS. Federal, state, and county agencies identified as having expertise or jurisdiction by law have been and will continue to be consulted during any remaining planning and permitting necessary for the project. In accordance with Chapter 344-5, HRS, this DEA will be available for public review and comment for a period of thirty days. The Final EA will include responses to all comments received.

4) Substantially affects the economic welfare, social welfare, and cultural practices of the community or State.

   Construction of the proposed project will provide short-term beneficial impacts to the economic welfare of the community by providing additional jobs and through the purchasing of materials from local suppliers. In turn, this will result in indirect benefits to local retail businesses. In the long-term, the economic and social welfare of the state will be benefitted by the return of a portion of the water storage to the Upper Kapahi Reservoir that was lost when the existing dam was decommissioned. This water storage would be utilized to supply water to downstream agricultural users, allowing these users to continue to depend on EKWUC rather than county water. **No adverse impacts to the economic welfare, social welfare, or cultural practices of the community or the state would be anticipated to occur as a result of this project.**

5) Substantially affects public health.

   No significant adverse impacts to public health would be anticipated to occur as a result of this project.

6) Involves substantial secondary impacts, such as population changes or effects on public facilities

   No substantial secondary impacts to the population or to public facilities would be expected to occur as a result of this project.

7) Involves a substantial degradation of environmental quality.

   The proposed project would not result in any significant degradation to environmental quality in terms of air quality, water quality, or biological resources. Some short-term environmental impacts could occur, but these would be minimized or eliminated through BMPs and other precautionary actions.

8) Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions

   The breach of the Upper Kapahi Dam was the only other reasonably foreseeable project identified as occurring near the project area. **No adverse cumulative impacts would be expected to result from these projects, and the new Upper Kapahi Dam project is not tied to any larger actions or projects.**

9) Substantially affects a rare, threatened, or endangered species, or its habitat.

   This project would not be anticipated to have any significant adverse effect on rare, threatened, or endangered species or its habitat. Endangered and threatened

bird species have been observed near or flying over the project area, but measures will be taken during construction of the dam to prevent significant effects to these species.

10) Detrimentally affects air or water quality or ambient noise levels.

Short-term and minor effects to air quality, water quality, or noise levels would be expected to occur as a result of construction-related activities. BMPs would minimize impacts to these resources. Potential impacts would only be expected to occur during the construction of the dam, and **no long-term impacts would persist once construction was complete**. The project would be subject to the requirements of the NPDES permit, and a 401 certification would be received before the project is initiated.

11) Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion prone area, geologically hazardous land, estuary, fresh water or coastal waters.

The location for the proposed project is not within an area likely to suffer substantial damage from floods, tsunamis, erosion, or other geologically hazardous land conditions. Best management practices and controls will be utilized during construction to minimize erosion. Any impacts to fresh-water streams from the project are anticipated to be minimal and short-term.

12) Substantially affects scenic vistas and view planes identified in county or state plans or studies.

Scenic vistas and view planes identified in the county or state plans or studies will not be affected by the proposed project.

13) Requires substantial energy consumption

No significant increases in energy consumption will occur from construction or operation of the proposed project.

6.2 Determination

This DEA has determined that the proposed project will not have significant adverse impacts to the environment; therefore, an Environmental Impact Statement (EIS) is not warranted. A Finding of No Significant Impact (FONSI) is anticipated for this project.

7.0 Agencies, Organizations, and Interested Parties Consulted

7.1 Early Consultation Process

Section 11-200-9 of HAR requires that the proposing or approving agency consult or direct an applicant to consult with the planning department for the county and any other agencies or individuals that might have jurisdiction or expertise with respect to the proposed project. As such, coordination and cooperation with various agencies was conducted early in planning stages for the proposed new dam, and will continue as the project progresses. Agency correspondences are presented in Appendix A.

Public involvement was also considered an important step in the EA process. On March 12, 2014, a letter and consultation package (Appendix B) including a project description and maps of the proposed project location was sent out to additional federal, state, regional, and local officials, as well as other interested parties (Table 7-1). The purpose of the early consultation package was to provide the opportunity to provide preliminary comments on the proposed project prior to the DEA being completed. In addition, the early consultation package notified such parties of an informational public meeting to be held to discuss concerns and project details. Letters received in reply to receipt of the consultation package are also presented in Appendix A. Responses to the comments are included in Appendix C.

7.1.1 Parties Consulted During Pre-Assessment

The following parties were sent the early consultation package and/or were contacted as part of the cultural survey:

Federal Agencies
Department of the Interior, Geological Survey, Pacific Islands Water Science Center
Department of the Interior, Fish and Wildlife Service
Department of Commerce, National Marine Fisheries Service, Pacific Islands Regional Office
Department of Agriculture National Resources Conservation Service, Pacific Islands Area Office
Department of Army, Army Corps of Engineers
Environmental Protection Agency Region IX, Pacific Islands Contact Office

State of Hawai‘i
State of Hawai‘i Department of Agriculture
State of Hawai’i, Agribusiness Development Corp.
State of Hawai‘i Department of Business, Economic Development, and Tourism
State of Hawai‘i Department of Business, Economic Development, and Tourism, Office of Planning

State of Hawai‘i Department of Hawaiian Home Lands
State of Hawai‘i, Department of Health, Environmental Health Administration
State of Hawai‘i Department of Land and Natural Resources, Historic Preservation Division
State of Hawai’i, Department of Land and Natural Resources, Engineering Division – Dam Safety Section
State of Hawai‘i Department of Transportation
University of Hawai‘i Water Resources Research Center
University of Hawai‘i Environmental Center
State of Hawai‘i Department of Health, Clean Air Branch
State of Hawai‘i Department of Health, Clean Water Branch-Kaua‘i District Health Office
State of Hawai‘i Department of Health, Solid and Hazardous Waste Branch
State of Hawai‘i , Indoor and Radiological Health Branch, Noise Section
State of Hawai‘i Office of Hawaiian Affairs
State Department of Health, Clean Water Branch
State of Hawai‘i, Office of Planning, Coastal Zone Management Program
State of Hawai’i, Department of Accounting and General Services – Kaua‘i Branch

Government of the County of Kaua‘i
County of Kaua‘i Fire Department
County of Kaua‘i Department of Planning
County of Kaua‘i Police Department
County of Kaua‘i Department of Public Works
County of Kaua‘i Transportation Agency
County of Kaua‘i Department of Parks and Recreation
County of Kaua‘i Office of Economic Development
County of Kaua‘i Department of Water

News Media
The Garden Island
The Honolulu Star Advertiser

Elected and Other Officials
Governor of the State of Hawai‘i The Honorable Neil Abercrombie
Mayor of Kaua‘i, Bernard Carvalho, Jr.
U.S. Senator Mazie Hirono
U.S. Senator Brian Schatz
U.S. Representative District 2 Tulsi Gabbard
State Senator Ronald D. Kouchi (District 8)
State Representative Derek Kawakami (District 14)
State Representative James Kunane Tokioka (District 15)
County Council Representatives (Jay Furfaro, Mason Chock, Sr., Tim Bynum, Gary Hooser, Ross Kagawa, Mel Rapozo, Joann Yukimura)
Office of County Clerk, Council Services Division

East Kaua‘i Water User’s Cooperative
Jerry Ornellas, President

Kelly Gooding, Vice-President
Lincoln Ching, Secretary
Anthony Branco, Treasurer
Leslie P. Milnes
Russ Boyer
Adam Asquith
Alan Rietow
Dan Yamaguchi
Rev. Arumugaswami
Bill Hancock

Other Interested Parties and Individuals:
Pangola Hills LLC
Molly and William Cirksena
Stephan Rapoza Sr.
Doreen Rita
Wallace Otsuka
Bernadine Martins
Erika and Christopher Martins
Alice, John, and Ronald Gordines
Philip Greene
The Baird Family
Mary K. Offley
George Matayoshi
Jacob Martins, Jr.
Kapa'a Grandma's Place
Mervin and Fay Rapoza
Makaleha Gardens
Kaua'i Watershed Alliance
Trae Menard, Nature Conservancy, Kaua'i Program
Hawai'i Association of Watershed Partnerships
Kaua'i Planning and Action Alliance
The Sierra Club, Hawai'i Chapter
Nature Conservancy, Hawai'i Field Office
Historic Hawai'i Foundation
The Dole Cannery
Hawai'i Farmer Union United
Kaua'i Board of Realtors
Kaua'i County Farm Bureau
Kaua'i Chamber of Commerce
The Outdoor Circle
Hawai'i's 1000 Friends
Kaua'i Island Burial Council
Kaua'i Historical Society
Nawiliwili Watershed Council
'Aha Pūnana Leo o Kaua'i

Kaua‘I Island Hawaaiian Civic Club
Community Members of Kapa‘a Ahupua‘a
Hui Mālama I Nā Kūpuna O Hawai‘i Nei
East Kaua‘i Soil & Water Conservation District

7.1.2 Public Meeting

An informational public meeting was held at the Kapa‘a Middle School in Kappa‘a, Hawai‘i on April 1, 2014. All parties included on the mailing list (Table7-1) were informed of the meeting in the early consultation package. Additionally, notices in the *Honolulu Star* and the *Garden Island* newspapers were posted to inform the general public. Comments from attendees either in verbal format were documented. No written comments were received at the meeting. The list of attendees is attached in Appendix D. Responses to comments are included in Appendix C.

8.0 List of Preparers

Table 8-1: List of contributors for each subsection of the Affected Environment and Environmental Consequences sections of the DEA.

Section	Company	Contributors
Air Quality	GEI Consultants, Inc.	Ginger Gillin, Chad Masching, Jeniffer Lynch, Jennifer Shanteau
Biological Resources	AECOS	Susan Burr, Eric Guinther, and Reginald David
	GEI Consultants, Inc.	Ginger Gillin, Jeniffer Lynch,
Water Resources	AECOS	Susan Burr, Eric Guinther, and Reginald David
	GEI Consultants, Inc.	Ginger Gillin, Chad Masching, Jeniffer Lynch
Archeological, Historical, and Cultural Resources	Cultural Surveys Hawai‘i	Margaret Magat, Katie Kamelamela, Hallett Hammatt
Geology and Soils	GEI Consultants, Inc.	Ginger Gillin, Chad Masching, Jeniffer Lynch
Waste and Hazardous Materials	GEI Consultants, Inc.	Ginger Gillin, Chad Masching, Jeniffer Lynch
Recreation	GEI Consultants, Inc.	Ginger Gillin, Chad Masching, Jeniffer Lynch
Transportation/Traffic	GEI Consultants, Inc.	Ginger Gillin, Chad Masching, Jeniffer Lynch, Jennifer Shanteau
Socioeconomics and Land Use	GEI Consultants, Inc.	Ginger Gillin, Chad Masching, Jeniffer Lynch, Jennifer Shanteau
Scenic Resources	GEI Consultants, Inc.	Ginger Gillin, Chad Masching, Jeniffer Lynch
Natural Hazards	GEI Consultants, Inc.	Ginger Gillin, Chad Masching, Jeniffer Lynch

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Appendix A

Correspondence- Copies of letters received

HISTORIC HAWAI'I FOUNDATION
1974 ► 2014

March 18, 2014

Ginger Gillin
GEI Consultants Inc
700 NE Multnomah Street, Suite 230
Portland, OR 97232

RE: Environmental Assessment Early Consultation
Upper Kapahi Dam Replacement Project

Dear Ms. Gillin,

Thank you for referring the Upper Kapahi Dam Replacement Project to Historic Hawai'i Foundation (HHF) for early consultation prior to the draft Environmental Assessment under the Hawai'i Environmental Policy Act. Since 1974, HHF has been a statewide leader for Historic Preservation with a mission to preserve and encourage the preservation of historic properties significant to the history of Hawai'i.

The proposed project includes decommissioning of the current dam, constructed in 1910, and the construction of a new dam which would be located upstream. Based on the information received by GEI consultants, environmental and cultural surveys are currently underway. HHF requests further information:

1. What is the area of potential affect (APE) for this project and the area where the cultural surveys are taking place?
2. Will the cultural surveys include an analysis of the current 1910 dam as a historic resource? Are any previously identified cultural or historical resources located within the vicinity?
3. Hawai'i Revised Statutes Chapter 6E compliance will be required for the project. Will the involvement by the U.S Army Corps of Engineers also trigger National Historic Preservation Act Section 106 consultation?

Historic Hawai'i Foundation will participate in further consultation regarding this project. Megan Borthwick, Preservation Program Manager, will be HHF's point of contact. She can be reached at 808-523-2900 or Megan@historichawaii.org

Very truly yours,

Kiersten Faulkner, AICP
Executive Director

Copies:
Michael Gushard & Susan Lebo, State Historic Preservation Division

680 Iwilei Road, Suite 690 / Honolulu, Hawai'i 96817 / Tel (808) 523-2900 / Fax (808)523-0800
Email preservation@historichawaii.org / Web www.historichawaii.org

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LINDA ROSEN, M.D., M.P.H.
DIRECTOR OF HEALTH

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

In reply, please refer to:
File:
[EPO 14-049]

March 19, 2014

GEI Consultants, Inc.
Attn: Ginger Gillin
700 NE Multnomah St., Suite 230
Portland, OR 97232
ggillin@geiconsultants.com

Dear Mr. Park

SUBJECT: Preparation of Draft Environmental Assessment for Upper Kapahi Dam Replacement Project

The Department of Health (DOH), Environmental Planning Office (EPO), acknowledges receipt of your letter dated March 11, 2014. Thank you for allowing us to review and comment on the subject document. The document was routed to the relevant environmental health divisions and offices. They will provide specific comments to you if necessary.

EPO recommends that you review the standard comments at: http://health.hawaii.gov/epo/home/landuse-planning-review-program/. You are required to adhere to all applicable standard comments. Please ensure that you carefully review the Clean Water Branch Standard Comments. EPO recommends that you review the Departments website dedicated to clean water and quality for pertinent information. http://health.hawaii.gov/water/

Mahalo,

Laura Leialoha Phillips McIntyre, AICP
Program Manager, Environmental Planning Office

Representative Derek S.K. Kawakami

Assistant Majority Leader, and Consumer Protection & Commerce Committee Vice Chair
District 14: East and North Kaua'i

Aloha Kapahi Residents:

Public Informational Meeting on the Upper Kapahi Dam Replacement Project– View Maps and Design

Tuesday, April 1, 2014 5:00 pm– 7:00 pm

Kapaa Middle School Cafeteria

Conducted by: GEI Consultants, Inc.

Administered by: State Department of Accounting and General Services (DAGS)

Contact: DAGS Public Works 808-586-0464

Representative Derek S.K. Kawakami

Assistant Majority Leader, and Consumer Protection & Commerce Committee Vice Chair
District 14: East and North Kaua'i

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Contact: DAGS Public Works 808-586-0464

REPRESENTATIVE DEREK S.K. KAWAKAMI
HAWAIʻI STATE CAPITOL
415 S. BERETANIA ST. Rm 314
HONOLULU, HI 96813

Questions or Concerns? Please contact us at:

Office Direct Line:	808-586-8435
Office FAX:	808-586-8437
Toll Free from Kauaʻi:	274-3141 Ext. 68435
Facebook:	Representative Derek Kawakami
Capitol Website:	www.capitol.hawaii.gov
Email:	repkawakami@capitol.hawaii.gov

REPRESENTATIVE DEREK S.K. KAWAKAMI
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Capitol Website:	www.capitol.hawaii.gov
Email:	repkawakami@capitol.hawaii.gov

From:	Rep. Derek Kawakami
To:	Gillin, Ginger
Cc:	"wiliiam.j.aila@hawaii.gov"; "russell.y.tsuji@hawaii.gov"; "lydia.m.morikawa@hawaii.gov"; "carty.y.chang@hawaii.gov"; "denise.m.manuel@hawaii.gov"; "ldill@kauai.gov"; "ltabata@kauai.gov"
Subject:	Stakeholder Consultation Upper Kapahi Dam Replacement Project
Date:	Saturday, March 15, 2014 8:26:54 PM

Ms. Gillin:

Thank you for your letter dated March 11, 2014 regarding the early consultation for an Evironmental Assessment of the upper Kapahi Dam replacement project.

Unfortunately, I am unable to attend the April 1st informational meeting as we are currently in our legislative session on Oahu and it may not be possible to return back to Kauai for the evening meeting.

This is a long awaited project and I'm encouraged by the timeline and the progress thus far. The Hawaii State Legislators visited the project site in September 2013 and were briefed on the proposed plans by both the State and County engineers.

I will encourage my constituents in the area to attend the informational meeting to view the plans and design.

If you have any further questions, please contact my office at 808-586-8435 and my Office Manager may be able to assist you further.

With warm aloha,

Representative Derek S.K. Kawakami
District 14, East and North Kaua'i
Hawaii State Capitol
415 S. Beretania St. Room 314
Honolulu, HI 96813
repkawakami@capitol.hawaii.gov

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LINDA ROSEN, M.D., M.P.H.
DIRECTOR OF HEALTH

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

In reply, please refer to:
EMD/CWB

03029PCTM.14

March 19, 2014

Ms. Ginger Gillin
Vice President/Principal Environmental Scientist
GEI Consultants, Inc.
700 NE Multnomah St., Suite 230
Portland, OR 97232

Dear Ms. Gillin:

SUBJECT: Comments on the Preparation of Environmental Assessment for the Upper Kapahi Dam Replacement Project Kapaa, Island of Kauai, Hawaii

The Department of Health (DOH), Clean Water Branch (CWB), acknowledges receipt of your letter, dated March 11, 2014, requesting comments on your project. The DOH-CWB has reviewed the subject document and offers these comments. Please note that our review is based solely on the information provided in the subject document and its compliance with the Hawaii Administrative Rules (HAR), Chapters 11-54 and 11-55. You may be responsible for fulfilling additional requirements related to our program. We recommend that you also read our standard comments on our website at: http://health.hawaii.gov/epo/files/2013/10/CWB_Oct22.pdf

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

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

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

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

2. National Pollutant Discharge Elimination System (NPDES) permit coverage is required for pollutant discharges into State surface waters and for certain situations involving storm water (HAR, Chapter 11-55).

a. Discharges into Class 2 or Class A State waters can be covered under an NPDES general permit only if all of the NPDES general permit requirements are met. Please see the DOH-CWB website (http://health.hawaii.gov/cwb/) for the NPDES general permits and instructions to request coverage.

b. All other discharges into State surface waters and discharges into Class 1 or Class AA State waters require an NPDES individual permit. To request NPDES individual permit coverage, please see the DOH-CWB forms website located at: http://health.hawaii.gov/cwb/site-map/clean-water-branch-home-page/forms/

c. NPDES permit coverage for storm water associated with construction activities is required if your project will result in the disturbance of one (1) acre or more of total land area. The total land area includes a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under a larger common plan of development or sale. NPDES permit coverage is required before the start of the construction activities.

   Land disturbance includes, but is not limited to clearing, grading, grubbing, uprooting of vegetation, demolition (even if leaving foundation slab), staging, stockpiling, excavation into pavement areas which go down to the base course, and storage areas (including areas on the roadway to park equipment if these areas are blocked off from public usage, grassed areas, or bare ground).

3. If your project involves work in, over, or under waters of the United States, it is highly recommend that you contact the Army Corp of Engineers, Regulatory Branch (Tel: 438-9258) regarding their permitting requirements.

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

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

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

Sincerely,

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

CTM:tg

Phone Record - Notes – Upper Kapahi Dam Replacement Project

Kathy Offley 808-822-2328

Called 140321 at 1500 Hrs

Ms. Offley has property that abuts the reservoir. Wanted to know if the water will come up higher than it used to? Will they have to tear up the road? Will there be rock on the new dam or concrete?

Said that the road construction will be controversial, a lot of people use that road. Doesn't think there is any way the dam breach project will happen this year – will take much longer.

From:	Gillin, Ginger
To:	"mauie5@aol.com"
Cc:	Masching, Chad
Subject:	RE: Upper Kapahi Dam Replacement Project
Date:	Tuesday, March 18, 2014 5:47:06 PM
Attachments:	dam layout march 2014.pdf

Hi Linda,

Thank you for calling today. After we spoke, I got some additional information for you from Chad Masching, our project engineer (copied here).

He said that the downstream face of the new dam will be grassy. At the end of construction, the downstream surface will be intentionally re-vegetated. The upstream face of the dam will have rip rap (large rocks). I am attaching a more detailed drawing of the project which shows a callout for 'Type B Rock Slope Protection'. That points to the location where the rip rap will be placed. As you will see, this map also has the incorrect information about the landownership of your property. We will get that corrected on future drawings.

This more detailed drawing also shows the location of the catwalk.

The excess fill material area (on the south side of the reservoir) will contain excavated materials which will be gently sloped and seeded, so that it will be vegetated. Aesthetically, it should develop a natural-looking appearance after a short time.

The drained area will be sloped so that it will not contain standing water.

The Kainahola Road will not need to be closed during the construction of the replacement dam. It will be closed for several months however, during the construction of the dam breach project. We do not know yet exactly how long the road will need to be closed.

I spoke to Chad about his schedule while in the islands. He arrives late Monday afternoon, and we thought a visit to the project site after his arrival would be a good idea. My husband, Frank Gillin, will also be curious to see the project site so he will be joining us. We would very much like the opportunity to meet you Monday evening. Would 5:30 be a convenient time for us to stop by?

Regards,

Ginger Gillin, CFP
Vice President - Principal Environmental Scientist
GEI Consultants
Consulting Engineers & Scientists
GEI Consultants, Inc.
700 NE Multnomah Street, Suite 230 | Portland, OR 97232

T: 503.342.3777 | **M:** 406.240.3231
www.geiconsultants.com | vCard | LinkedIn | Twitter | Facebook

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From: mauie5@aol.com [mailto:mauie5@aol.com]
Sent: Tuesday, March 18, 2014 4:49 PM
To: Gillin, Ginger
Cc: mauie5@aol.com
Subject: Upper Kapahi Dam Replacement Project

Dear Ginger,

Thank you for speaking with me by telephone today.

Thank you for the informational letter and packet provided to us and our neighbors. If you are able to share updated schematics, such as the one showing the catwalk /pier, I would appreciate it.

I look forward to continuing to learn more and more and do trust you will pay us a visit with Chad (and your husband, if he so desires) to gain the unique perspective on this work that we have from the vantage point of our residence.

This is from my personal email address, and our name and numbers are repeated again below for your convenience.

Tax Map Key RP 4-4-4-013-030-0000-000

Linda and Phillip Greene
6745 Kawaihau Road (and 6745-A)
Kapaa, HI 96746

(808)821-1075
(859)983-7409 (cell)

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

April 28, 2014

Ref.: RFD.2645.2/3959.2

Ginger Gillin
700 NE Multnomah Street, Suite 230
Portland, OR 97232

Dear Ms. Gillin:

Request for Determination
DLNR's Upper Kapahi Dam, Waikaea Stream, Kapaa, Kauai, TMK (4-4-6-007:011)

We are responding to your April 10, 2014, request for determination regarding the Department of Land and Natural Resources' (DLNR) Upper Kapahi Dam, Waikaea Stream in Kapaa, Kauai. The project proposes to construct a new non-jurisdictional embankment dam located within the footprint of the existing Upper Kapahi Reservoir. Water enters and exits the reservoir from irrigation ditches.

Pursuant to §174C-71(3)(A), Hawaii Revised Statutes, the Commission on Water Resource Management "shall require persons to obtain a permit from the Commission prior to undertaking a stream channel alteration; provided that routine streambed and drainageway maintenance activities are exempt from obtaining a permit[1]."

Based on the materials you submitted and information contained therein, the Commission does not require a Stream Channel Alteration Permit Application to be submitted for the proposed project because no work will be performed within the Waikaea Stream channel. If you have any questions, please contact Rebecca Alakai at 587-0266, or rebecca.r.alakai@hawaii.gov.

Sincerely,

WILLIAM M. TAM
Deputy Director

FILE ID: RFD.2645.2/3959.2
DOC ID: 11588

[1] The Commission's Stream Protection and Management Branch, has the responsibility to protect stream channels from alteration whenever practicable to provide for fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses in the State of Hawaii under the authorization of the State Water Code, HRS Chapter 174C, and Hawaii Administrative Rules Chapter 13-169 (Protection of Instream Uses of Water). Chapter 174C-3, HRS provides definitions for the terms "stream channel", and "channel alteration." "Stream channel" means "a natural or artificial watercourse with a definite bed and banks which periodically or continuously contains flowing water." "Channel alteration" means: 1) to obstruct, diminish, destroy, modify, or relocate a stream channel; 2) to change the direction of flow of water in a stream channel; 3) to place any material or structures in a stream channel; and 4) to remove any material or structures from a stream channel."

Please be advised that the project may require other agency approvals regarding wetlands, water quality, grading, stockpiling, and floodways. This letter should not be used for other regulatory jurisdictions or used to imply compliance with other federal, state, or county rules. Work performed without appropriate permits or authorizations may be subject to fines and/or remedial actions.

NEIL ABERCROMBIE
GOVERNOR

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
FORD N. FUCHIGAMI
RANDY GRUNE
AUDREY HIDANO
JADINE URASAKI

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

IN REPLY REFER TO:
STP 8.1523

April 9, 2014

Ms. Ginger Gillin
GEI Consultants, Inc.
700 NE Multnomah Street, Suite 230
Portland, Oregon 97232

Dear Ms. Gillin:

Subject: Upper Kapahi Dam Replacement Project
Early Consultation for the Preparation of an Environmental Assessment (EA)
TMK: (4) 4-6-007:011

The subject project is not expected to significantly impact the State highway facility. However, a permit from DOT Highways Division, Kauai District Office, is required for the transport of oversized and/or overweight materials and equipment on State highway facilities.

If there are any questions, please contact Mr. Norren Kato of the DOT Statewide Transportation Planning Office at telephone number (808) 831-7976.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

Appendix B

Early Consultation Packet

GEI Consultants

Geotechnical
Environmental
Water Resources
Ecological

March 11, 2014

Re: Preparation of Environmental Assessment for the Upper Kapahi Dam Replacement Project

Dear Sir or Madam,

On behalf of the Hawai‘i Department of Accounting and General Services (DAGS), we are inviting your participation in early consultation for an Environmental Assessment (EA) of the Upper Kapahi Dam Replacement Project. There will be an informational meeting for any interested stakeholder on April 1, 2014 at the Dining Room of the Kapa‘a Middle School, 4867 Olohena Road, Kapa‘a, Hawai‘i. The purpose of this meeting is to gather input from the stakeholders and to respond to any questions or comments that concerned individuals or groups may have about this project and the environmental analysis. This open-house meeting will be held from five to seven o’clock. Attendance at the meeting is not required in order to participate in the early consultation process.

Alternatively, you are welcome to submit comments on the project via mail or email. Written comments may be sent to the following address. Comments should be submitted by April 4, 2014.

GEI Consultants, Inc.
ATTN: Ginger Gillin
700 NE Multnomah St., Suite 230
Portland, OR 97232
ggillin@geiconsultants.com
503-342-3777

Project Background

Upper Kapahi Reservoir is located approximately two miles northwest of Kapa‘a on the island of Kaua‘i, Kaua‘i County, Hawai‘i, and is owned by the Hawaii Department of Land and Natural Resources (State) and the County of Kaua’i (County). The Upper Kapahi Reservoir dam was originally constructed in 1910. After the Kaloko dam failure in 2006, the Upper Kapahi Dam was evaluated by the U.S. Army Corps of Engineers, and it was determined that repairs and improvements were needed to the dam’s spillway. Construction of improvements was initiated in 2011. However, subsequent investigations found significant seepage issues and poorly compacted soil and debris not suitable for embankment fill. These

undesirable embankment characteristics are present along the majority of the dam crest/road alignment. Based on these findings, the improvement project was suspended, the reservoir was drained, and alternatives were developed to address the safety deficiencies.

Discussions between the State and the County identified a preferred alternative that includes maintaining the current alignment of Kainahola Road, breaching the existing dam, and constructing a new dam upstream of the existing embankment dam. This alternative was chosen in part because it removed the dam safety uncertainties of the existing dam and provided some agricultural storage for the East Kauai Water Users' Cooperative to supplement some of the water storage lost due to decommissioning the existing dam. The dam breach project has been designed, and the dam breach project should be complete in 2014.

The EA will address the proposed replacement dam project. This project will involve constructing a new dam within the footprint of the previous reservoir. A detailed project description and maps of the project area are included in the attached information package. In order to evaluate potential environmental impacts of the new dam construction project, we have initiated biological and cultural surveys in the area of the affected environment; results of these surveys will be included in the EA.

We welcome your input, and look forward to potentially meeting you in person on April 1, 2014.

Mahalo,

Ginger Gillin
Vice President/Principal Environmental Scientist

Upper Kapahi Dam Replacement Project

Hawai'i Department of Accounting and General Services

Division of Public Works

Public Informational Meeting:

April 1, 2014 5 PM - 7 PM
Kapa'a Middle School
Dining Room
4867 Olohena Road
Kapa'a, Hawai'i

Project Location

Upper Kapahi Reservoir and Dam is located approximately 2 miles northwest of Kapa'a on the island of Kaua'i, Kaua'i County, Hawai'i, and is owned by the Hawai'i Department of Land and Natural Resources (State) and the County of Kaua'i (County). This dam is an earthen embankment dam that stores irrigation water diverted from Kainahola Stream and Kapa'a Stream. The reservoir is currently dewatered, but historically provided irrigation water to downstream users.

Project History

The Upper Kapahi Dam was originally constructed in 1910. After the Kaloko Dam failure in 2006, the dam was evaluated by the U.S. Army Corps of Engineers, and it was determined that the current spillway had inadequate capacity for routing the design flood event. Design for a dam improvement project was initiated and included constructing a new box culvert spillway under Kainahola Road, flattening and buttressing the upstream and downstream slopes, and adding erosion protection to the upstream face. Construction of improvements was initiated in 2011. Clearing and excavation on the downstream slope of the dam uncovered significant seepage issues on the downstream slope, as well as poorly compacted soil and debris not suitable for embankment fill. A subsequent geophysical survey of the dam and test trenching conducted in 2012 revealed that these undesirable embankment characteristics were present along the majority of the dam crest/road alignment. Based on these findings, the improvement project was suspended, the reservoir was drained, and alternatives were developed to address the safety deficiencies. Dam replacement or repair was advised.

Five alternatives were developed and evaluated to resolve the safety issues presented by the existing dam.

Discussions between the State and County identified a preferred alternative that included maintaining the current alignment of Kainahola Road, breaching the existing dam, and constructing a new dam upstream of the existing embankment dam. This alternative was chosen, in part, because it removed the dam safety uncertainties of the existing dam and provided some agricultural storage for the East Kauai Water Users' Cooperative to supplement some of the water storage lost due to decommissioning the existing dam.

The State and County is proceeding with the breaching of the existing dam as soon as possible, due to public safety concerns. Engineering design work of the dam breach project

is complete, and construction will be completed in 2014. Once the existing dam has been decommissioned by breaching, construction for the new dam could begin.

Upper Kapahi Dam Replacement Project

The proposed new dam will be located within the footprint of the Upper Kapahi Reservoir, a short distance upstream of the existing dam. The alignment of the new dam was selected to have the least new embankment length, and is planned to extend from the northern end of the existing dam alignment to the opposite end of the reservoir. Conceptually, the new dam is planned to be a homogenous embankment with a downstream filter drain and filter blanket. A silt and overburden excavation is assumed to extend 10 feet below the estimated reservoir bottom to reach a suitable foundation. The jurisdictional height of the new dam will be just below 25 feet, a reduction of about 15 feet from the jurisdictional height of the existing dam. The surface area of the impoundment will be reduced from 8.8 acres to 4.6 acres. Storage capacity would be reduced from approximately 110 acre-feet (with the previous dam) to approximately 35 acre-feet with the replacement dam.

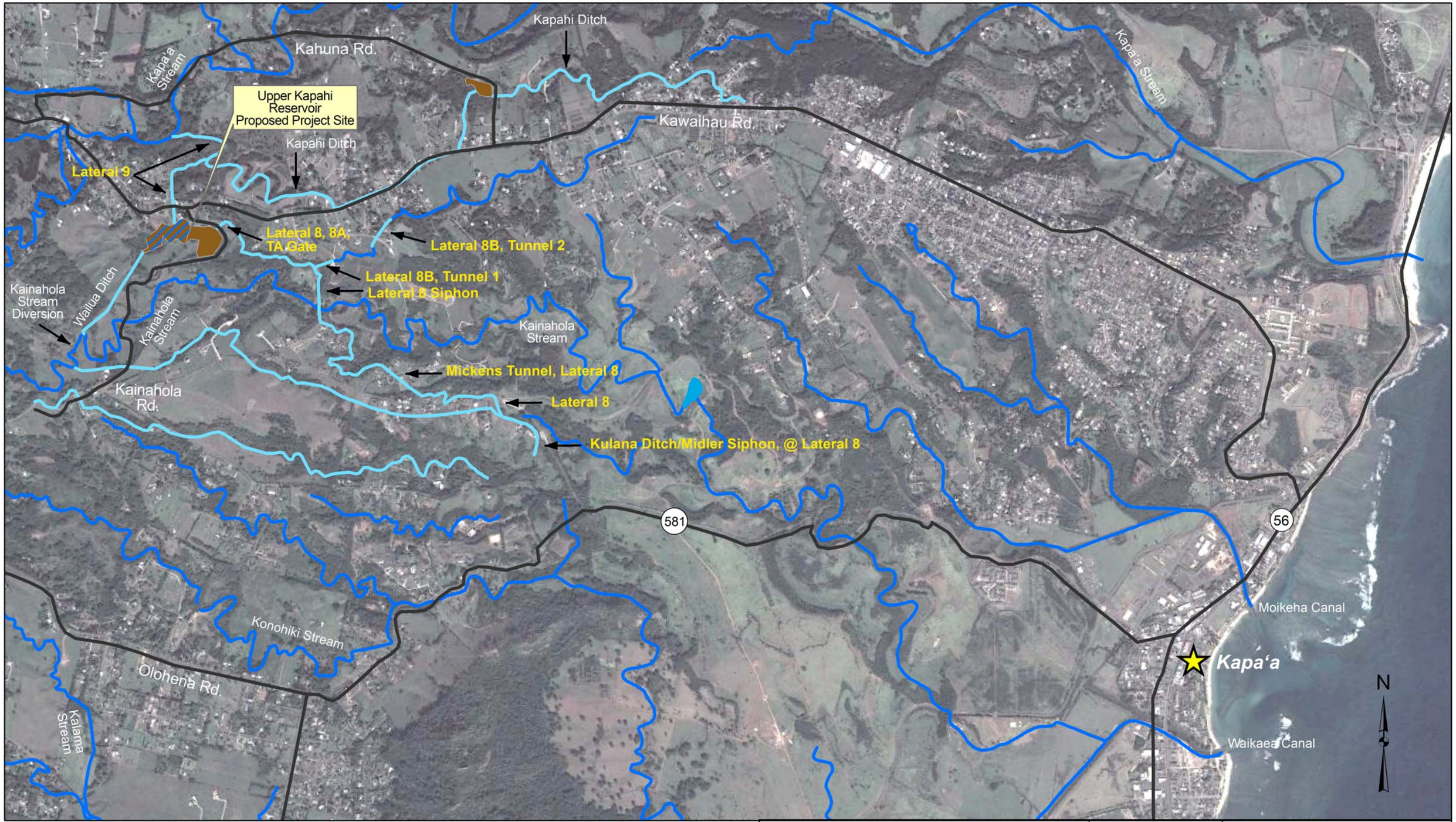
The replacement dam project is in final engineering design, and will be out to bid this month, with bid opening scheduled for June, 2014. This replacement dam project has been determined to need an environmental assessment (EA) to comply with the Hawai'i Environmental Policy Act (HEPA). The EA will include a summary description of the area potentially affected by the project, including the biological and cultural resources that could be affected. It will also include the identification and summary of potential impacts from the project to the affected environment and any mitigation measures that may be proposed to account for those impacts. Various permits are also required, including a Clean Water Act (CWA) Section 404 permit from the U.S. Army Corps of Engineers, a CWA Section 401 Water Quality Certification from the Clean Water Branch Hawai'i Department of Health, and a National Pollution Discharge Elimination System (NPDES) permit from the Clean Water Branch.

Comments on the project can be sumbitted, by April 4, 2014 to:

Ginger Gillin
GEI Consultants, Inc.
700 NE Multnomah Street,
Suite 230
Portland, OR 97232
503-342-3777
ggillin@geiconsultants.com

Modifications of the Existing Dam Include:

1) Demolition of a 200-foot section of Kainahola Road;
2) Excavation through the existing embankment for installation of the box culvert;
3) Construction of a box culvert spillway through the open excavation at the reservoir bottom;
4) Backfilling the embankment excavation above the box culvert spillway;
5) Reconstruction of Kainahola Road to the pre-construction alignment and grade;
6) Placement of rock slope protection at the upstream approach to the box culvert spillway;
7) Construction of rundown modifications; and
8) Construction of permanent access roads to the upstream and downstream ends of the spillway.



LEGEND:

- Dewatered Reservoirs
- Proposed Reservoir
- Ponds
- Streams
- Ditches/Laterals
- Roads

0 1,000 2,000 4,000

Feet

DLNR Dams & Reservoirs on Kaua'i
Upper Kapahi Reservoir, New Dam Design
Kaua'i, Hawai'i

Department of Accounting and General Services
State of Hawai'i
Kapa'a, Hawai'i

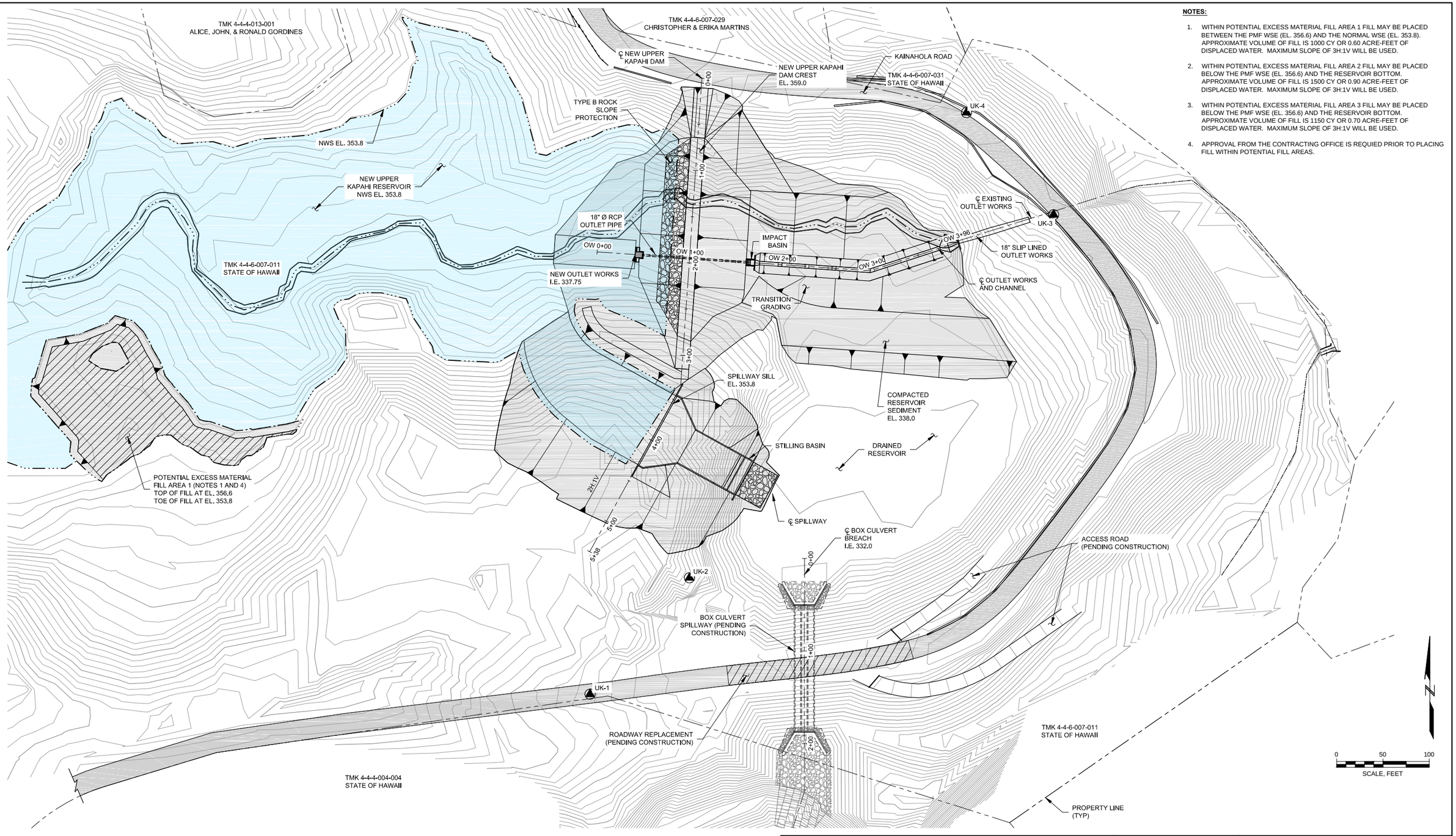
GEI Consultants
Project 092496

UPPER KAPAHI DAM PROJECT,
PROJECT AREA

EAST KAUAI IRRIGATION SYSTEM

March 2014

O:\Eco_Projects\092496 DLNR Dams and Reservoirs-Upper Kapahi Reservoir



NOTES:

1. WITHIN POTENTIAL EXCESS MATERIAL FILL AREA 1 FILL MAY BE PLACED BETWEEN THE PMF WSE (EL. 356.6) AND THE NORMAL WSE (EL. 353.8). APPROXIMATE VOLUME OF FILL IS 1000 CY OR 0.60 ACRE-FEET OF DISPLACED WATER. MAXIMUM SLOPE OF 3H:1V WILL BE USED.
2. WITHIN POTENTIAL EXCESS MATERIAL FILL AREA 2 FILL MAY BE PLACED BELOW THE PMF WSE (EL. 356.6) AND THE RESERVOIR BOTTOM. APPROXIMATE VOLUME OF FILL IS 1500 CY OR 0.90 ACRE-FEET OF DISPLACED WATER. MAXIMUM SLOPE OF 3H:1V WILL BE USED.
3. WITHIN POTENTIAL EXCESS MATERIAL FILL AREA 3 FILL MAY BE PLACED BELOW THE PMF WSE (EL. 356.6) AND THE RESERVOIR BOTTOM. APPROXIMATE VOLUME OF FILL IS 1150 CY OR 0.70 ACRE-FEET OF DISPLACED WATER. MAXIMUM SLOPE OF 3H:1V WILL BE USED.
4. APPROVAL FROM THE CONTRACTING OFFICE IS REQUIED PRIOR TO PLACING FILL WITHIN POTENTIAL FILL AREAS.

P:\092495 - Upper Kapahi New Dam\Civil\Production Drawings\Working Drawings\ Figure X - Upper Kapahi Dam Mods.dwg Mar 2014

Upper Kapahi Dam Replacement Project Kaua'i Hawai'i	GEI Consultants	PLAN OF MODIFICATIONS
Dept. of Accounting & General Services Division of Public Works State of Hawai'i	Project 092495	March 2014 Figure 1

Appendix C

Responses to Comments

Commenter Name and Affiliation	Comment	Response
Laura Leialoha Phillips McIntyre, State of Hawaii Department of Health Environmental Planning Office	Recommended review of applicable standard comments, including Clean Water Branch standard comments.	Clean Water Branch and other applicable standard comments were reviewed and information was utilized for the DEA
	Recommended review of department website for pertinent information.	Website was reviewed and applicable information utilized for the DEA
Kiersten Falkner, Historic Hawai'i Foundation	What is the area of potential affect for this project and the area where the cultural surveys are taking place?	Area of potential effect is shown in Figure 2-1. The area of effect with regarded to cultural and historical conditions and possible impacts to these resources is discussed in sections 3.5 and 4.5. The area where the cultural surveys are taking place was briefly described in Section 3.5, and is discussed more thoroughly in Cultural Surveys Hawai'i's (2014) report.
	Will the cultural surveys include an analysis of the current historic 1910 dam as a historic resource? Are any previously identified cultural or historical resources located within the vicinity?	Yes, the potential for the dam to be considered a historic resource is discussed in sections 3.5 and 4.5. Burials should not be affected. No other cultural or historical resources are within the project area based on the preliminary report submitted by Cultural Surveys Hawai'i (2014).
	Hawai'i Revised Statutes Chapter 6 compliance will be required for the project. Will the involvement by the U.S. Army Corps of Engineers also trigger National Historic Preservation Act Section 106 consultation?	As discussed in Section 5.6, there is the potential that a Section 106 consultation will be triggered The Corps is required to consult with the State Historic Preservation District (SHPD) in order to determine the project's potential to impact resources of cultural or historical significance. The State Historic Preservation District was consulted by letter on March 12, 2014; their response is pending.
	The Historic Hawai'i Foundation would like to participate in further consultation (contact: Megan Borthwick)	It was noted that the foundation would like to be involved in further consultation.
Representative Derek S.K. Kawakami, District 14	Indicated that he was encouraged by the progress so far and encouraged his constituents to attend the informational meeting.	No response was needed.
Alec Wong, State of Hawai'i Department of Health Clean Water Branch	Noted that any project and its potential impacts to State waters must meet the following criteria: antidegradation policy, designated use policy, and water quality criteria	The existing water quality and applicable criteria are discussed in Section 3.4.1, and anticipated impacts on water quality are included in Section 4.3.1. A Section 401 Water Quality Certification and NPDES permit will

Commenter Name and Affiliation	Comment	Response
		also be obtained before the project is initiated, as discussed in Section 5.9.
	Discussed need for NPDES permit coverage	A NPDES permit will be applied for.
	Recommended contacting the Army Corp of Engineers, Regulatory Branch	The Army Corp of Engineers has been contacted, as discussed in Section 5.9.
	Noted that all discharges must comply with the State's Water Quality Standards whether or not they are permitted.	Best management practices will be in place to ensure compliance with water quality standards. A water quality monitoring program will be developed.
Kathy Offley, property owner Linda Greene, property owner	Will the water come up higher than it used to? Will they have to tear up the road? Will there be rock on the new dam or concrete? Also noted that road construction would be controversial.	The jurisdictional height of the dam will be lower than the existing dam; thus, water will not rise to a level higher than it did previously. No road construction is anticipated to occur as a part of this project. The downstream face of the new dam will be grassy, and the upstream face of the dam will have rip-rap. A discussion of the dam design is included in Section 2.3.
Leo Asuncion, State of Hawai'i Office of Planning	A discussion of the proposed project's ability to meet the objectives and policies set forth in HRS 205A-2, including mitigation measures as applicable, should be included in the DEA.	This discussion is included in Section 5.5.
	The DEA should include the Coastal Zone Management (CZM) Act in a list of relationships to land use plans, policies, and controls section.	The CZM Act is discussed in the cited section in subsection 5.5.
	A CZM federal consistency review by the Hawaii CZM program may be required since a 404 permit is required.	A CZM federal consistency review is planned for this project, as discussed in Section 5.5.
	The Office of Planning's Stormwater Impact Assessment document should be incorporated into the DEA.	The Stormwater Assessment document was reviewed, including the data resources, best management practices techniques, and reviewer's checklist sections, and was incorporated into the DEA where appropriate.
Ronald Rickman, U.S. Geological Survey	No comments to offer at this time.	No response was needed.
Glenn M. Okimoto, Ph.D., Director of Transportation, State of Hawai'i Department of	Noted that a permit from DOT Highways Division, Kauai District Office, would be required for the transport of oversized and/or overweight materials and	A reference to obtaining a DOT permit was added to Section 5.9.

Commenter Name and Affiliation	Comment	Response
Transportation	equipment on State highway facilities	
Member of the public at informational meeting	Noted that there was concern over the current reservoir capacity and raised the question of whether or not the dam design allowed for expansion in the future. Also questioned whether there was a cost difference between expanding the reservoir capacity now versus expanding it in the future.	Proposed dam design would not rule out expanding the capacity of the reservoir in the future, but such an expansion would likely be costly. No analysis was completed to determine the cost difference between designing the reservoir to have a larger capacity now versus expanding it in the future. Some of the alternatives analyzed (and discussed in Section 1.3.2) would have maintained the storage capacity that the existing reservoir had before it was dewatered. These alternatives had various disadvantages and were costly. The proposed project was the only alternative which met the available funds for construction while providing some water storage for agricultural use
Member of the public at informational meeting	Traffic impacts and detour concerns were expressed, including safety issues related to truck loads, truck noise, and rocks falling off of trucks. Concerns were also expressed over the possibility of damaging existing road pavement and who would be responsible for any repairs to the roads that occurred as a result of the project.	Impacts to traffic routes from the proposed project are discussed in Section 4.9.2. Existing roads will be monitored using video by the State of Hawai‘i to detect any damage. There will be a project review process initiated by the County.
Member of the public at informational meeting	Concerns were raised regarding the status of the existing water system and how the system would be used and maintained to ensure that an adequate supply of water was available during the construction process.	As stated in Section 4.4.2.2, delivery of water to downstream agricultural users would be maintained through a bypass within the ditch system. EKWUC additionally responded at the meeting that they were trying to fix problems areas in the irrigation system to ensure that customers would continue to receive water throughout the construction process.
Member of the public at informational meeting	Questions were raised as to where the material was coming from to build the new dam.	As discussed in Section 2.3 of the DEA, material for the embankment construction will be derived primarily from the spillway and foundation excavation. While not anticipated to be necessary, additional material can be obtained from the borrow area located on the southwest side of the reservoir. The drain and gravel materials used in the dam construction would be imported

Commenter Name and Affiliation	Comment	Response
		by the chosen Contractor.
Member of the public at informational meeting	Question was raised about what the State was planning to do with the old dam.	Safety deficiencies were identified in the existing dam, and it will be breached in 2014 to address these issues, as described in Section 1 of the DEA. After the dam breach is completed, the existing dam will no longer be under State jurisdiction but will instead be under the County's jurisdiction. The County will then be able to maintain it as a road.
Member of the public at informational meeting	Concerns were raised about the handling of the existing reservoir muck.	Section 2.0 describes the necessary excavations that will occur within the existing reservoir area for the proposed project, and where the excavated sediments will be temporarily stored and/or permanently placed if excess sediment is available.
Member of the public at informational meeting	Concerns were raised regarding the EKWUC's plan for water releases. Questions specifically included how the water would be allocated, and how it would be diverted and routed through the existing system.	As stated in Section 4.4.2.2, delivery of water to downstream agricultural users would be maintained through a bypass within the ditch system during the construction period. Water allocation, distribution, and operations are outside of the scope of the DEA for this project; however, the EKWUC discussed this topic at the meeting.
Member of the public at informational meeting	Questions on the cost of the project were raised, and the reduction in reservoir storage at this cost was of concern.	The approximate cost of this project is $3,500,000, as stated in Section 2.3 of the DEA. The State replied at the meeting that the dam breach that is scheduled to occur before the new dam is constructed is estimated to cost approximately $2,000,000. Approximately $2,500,000 has already been spent on the two projects. Addressing safety issues and staying within the limited budget were factors in choosing this alternative.
Member of the public at informational meeting	Noted that the planned tree removal in the vicinity of the new dam would have a beneficial effect from this individual's point of view, and that an increase in vegetation removal would be preferred.	These concerns were noted; however, existing vegetation will be preserved where possible as part of the BMPs proposed for this project to minimize erosion and sedimentation and minimize aesthetic impacts.
Member of the public at informational meeting	An opinion was expressed that the existing dam likely did not constitute a safety concern due to the root reinforcement.	The safety deficiencies of the existing dam are discussed in Section 2.0 of the DEA.
Member of the public at	Concern was expressed over the water coming in to the	As discussed in Section 2.0, the reservoir is currently dewatered and

Commenter Name and Affiliation	Comment	Response
informational meeting	reservoir and the planned dewatering.	water will be diverted around the reservoir during the construction period. Some dewatering will occur during the construction period to ensure that the project area remains dry. Once construction is complete, the water will enter the reservoir through the same pathways that it entered historically. The Contractor will ensure dewatering is conducted responsibly.
Member of the public at informational meeting	Concern was expressed over the grading being conducted appropriately downstream of the new dam and upstream of the existing dam. Further concern was expressed over the vegetation growth and maintenance.	The grading plan was discussed at the meeting. The grade will be maintained during grading operations so as to prevent damage to adjoining property from water and soil erosion. BMPs include the preservation of existing vegetation where possible. Disturbed areas will be reseeded where possible and erosion controls will be maintained until the desired stand of vegetation is established. During construction, weed removal and mowing will occur.
Member of the public at informational meeting	Concern was raised about the status of the existing outlet.	The existing outlet will be left open during the construction period, although no water will be diverted into the reservoir during this time.
Member of the public at informational meeting	A question was raised on the jurisdictional status of the new dam.	As discussed in Section 2.0, the new dam will not be under State jurisdiction due to its storage and height dimensions. The dam will be designed to industry standards.
Member of the public at informational meeting	A question was raised on the debris inside the existing dam.	As discussed in Section 2.0, the debris inside the existing dam was basically trash, and the properties of the existing dam could not be determined, which lead to the dam being designated as a safety concern.
Member of the public at informational meeting	A question was raised as to why the existing dam was not being fixed instead of a new dam being constructed.	The alternatives evaluated included rehabilitating the new dam, as discussed in Section 1.3. Based on the identified safety deficiencies in the existing dam and the cost of fixing it, construction of the new dam was determined to be a more feasible alternative.
Member of the public at informational meeting	Concern was raised over the hazards of the existing dam and the new dam.	Criteria for the design flood and anticipated flood maximum water levels were discussed at the meeting. This information is available in the dam design report completed in March 2014 by GEI.
Member of the	A comment was made that one	The specifics of the error were not

Commenter Name and Affiliation	Comment	Response
public at informational meeting	of the plan maps was not quite correct.	documented, but plan maps have been updated in the interim since the meeting occurred.
Member of the public at informational meeting	A comment was made that the public and State officials appreciated the meeting and handouts.	No response was needed.
Member of the public at informational meeting	Concern over the project schedule and the impact of possible hydrological events was expressed.	The general schedule is presented in Section 2.0. Hydrological events could affect the schedule, but the plan currently extends over two years during the drier months, which would limit that possibility.
Kaua‘i Fire Department representative at informational meeting	Concern was expressed over the detour plan and emergency vehicle access.	The proposed plan is not anticipated to affect emergency vehicle access, as discussed in Section 4.9. Traffic may be increased in the project area. A follow-up discussion with the County Road Department will occur.

Appendix D

List of Attendees at Information Meeting

Upper Kapahi Replacement Dam
Public Information Meeting
Hawai‘i Department of Accounting and General Services
Hawai‘i Department of Land and Natural Resources
Tuesday, April 1, 2014, 5-7 PM
Kapa‘a Middle School, Kapa‘a, Hawai‘i

List of Attendees:

1. Anthony Branco, East Kaua‘i Water User’s Cooperative
2. Ken Jopling
3. Gerald Ida, Cultural Surveys Hawaii
4. Marvin Mikasa, Department of Land and Natural Resources Land Dir.
   3060 Eiwa Street
   Lihu‘e, HI
   274-3491
   Marvin.t.mikasa@hawaii.gov
5. Michael Moule, Engineering Branch, County of Kauai's Public Works Department
   4444 Rice Street, #175
   Lihu‘e, HI 96766
   808-241-4891
   mmoule@kauai.com
6. Casey Riemer
7. Rayne Regush, The Sierra Club + Wailua Kapaa Neighborhood Assn
8. Duane Wakuta, Wakuta Farms
9. Jerry Ornellas, President, East Kaua‘i Water User’s Cooperative
10. Robert Westerman, County of Kaua‘I Fire Department
11. Lelan Nishek, KNL
12. Dennis Mendonca
13. George F. Rapozo
14. Johnny Gordines, Kauai Farm Bureau / Tropical Flower Farm
15. M…? (handwriting illegible)
16. Max Graham, East Kauai Water Users Cooperative
17. Wade Ishii, DAGS
    1151 Punchbowl Street, #427
    Honolulu, HI 96813
    586-0464
    Wade.t.ishii@hawaii.gov
18. Lydia Morikawa, DLNR
    1151 Punchbowl Street, #220

Honolulu, HI 96813
587-0410
Lydia.m.morikawa@hawaii.gov

19. Eric Nishimoto, DAGS
    1151 Punchbowl Street, #427
    Honolulu, HI 96813
    586-0460
    Eric.k.nishimoto@hawaii.gov
20. Ian Hirokawa
    1151 Punchbowl Court, Room 220
    Honolulu, HI 96813
    587-0420
    ian.c.hirokawa@hawaii.gov
21. Rev. Katir, Saiva Church and EKWUC
22. Sandi Kate-Klutke, ADC
23. Phillip and Linda Greene
24. Bernadine Martins
25. Howard Carvalho
26. Jim ? (handwriting illegible)
27. Laurie Ho
28. Leslie P. Milnes, EKWUC
29. Lurline Bettencourt
30. Marj Denie
31. Cani Rapazo
32. Adam Asquita

Appendix E

Temporary Erosion Control Plan

SECTION – 02254 TEMPORARY EROSION CONTROL

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes temporary soil erosion and sediment control requirements during construction. The work includes, but is not limited to, installation of silt fences, silt curtain, grass, fiber rolls, straw mulch, and/or temporary swales.

B. Related Sections include the following:
   1. SECTION 01500 – TEMPORARY FACILITIES AND CONTROLS.
   2. SECTION 02317 – EARTHWORK.
   3. SECTION 02920 – LAWNS AND GRASS.

1.02 REFERENCES

A. ASTM International (ASTM):
   1. ASTM D 4632 – Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
   2. ASTM D 4491 – Standard Test Methods for Water Permeability of Geotextiles by Permittivity
   3. ASTM D 6462 – Standard Practice for Silt Fence Installation.

1.03 SUBMITTALS

A. Shop Drawings.
   1. Soil Erosion and Sediment Control Plan.
      a. Submit within 15 calendar days after receipt of Notice to Proceed.
      b. Provide detailed temporary soil erosion and sediment control plan, including narrative and diagrams, describing methods, materials and maintenance procedures to minimize water pollution, soil erosion, and dust control within the Project Site and adjacent areas.
      c. Follow applicable guidelines in “Best Management Practices (BMPs) Manual for Construction Sites in Honolulu” (Department of Environmental Services, City and County of Honolulu) in developing, installing, and maintaining BMPs.
      d. Conform to applicable state, county and local regulations and ordinances.
   2. Manufacturer's data for all materials intended for use in temporary erosion control plans.

B. Quality Control:
   1. Submit certificates of compliance documenting conformance with Specification requirements for the following items:
      a. Silt fence
      b. Silt curtain

c. Straw mulch

d. Grass

e. Fiber rolls

1.04 EROSION CONTROL REQUIREMENTS

A. Pay all fees, fines and related costs resulting from failure to install or maintain approved soil erosion and sedimentation control measures.

B. Repair damages to the Project Site and to neighboring areas to the Contracting Officer's satisfaction at no additional cost to the State.

1.05 QUALITY CONTROL

A. Establish soil erosion and sediment control measures before respective land or reservoir disturbance activities commence and progressively augment and maintain in accordance with paragraph 3.01.

B. Plan and conduct land or reservoir disturbance activities to limit the size of exposed area(s) at any one time; minimize time of exposure.

C. Deliver, store and handle products in a manner that protects them from adverse weather, vandalism, damage or other conditions that may adversely impact the required performance of the product.

PART 2 – PRODUCTS

2.01 SILT FENCES

A. Fabric:
   1. Woven polypropylene with integral reinforcement layer.

   2. Minimum width: 36 inches (900 mm).

   3. Minimum tensile strength (ASTM D 4632): 0.45-kN.

   4. Permittivity (ASTM D 4491): Between 0.10 sec^{-1} and 0.15 sec^{-1}.

B. Posts:
   1. Wood stakes:
      a. Commercial quality lumber.

      b. Minimum 2-inch square, 48-inch long.

      c. Free from decay, splits or cracks longer than the thickness of the stake, or other defects that would weaken the stake or cause the stake to be structurally unsuitable.

   2. Steel bars:
      a. Equivalent to #4 reinforcing bar or greater.

b. Cover exposed bar ends to prevent injury.

C. Attachment:
1. For Wood Stakes: Staples not less than 1.75 inches long, fabricated from 0.06 inch or heavier wire.

2. For Steel Bars: 0.12 inch or heavier wire.

3. Galvanizing of staples or fastening wire is not required.

2.02 SILT CURTAIN

A. Fabric.
1. Heavy-weight, flexible, nylon-reinforced, polypropylene geotextile or flexible nylon reinforced thermoplastic.

2. Weight: Minimum 22 ounces per square yard; heavier if necessary to control turbidity created during construction

3. Sewn into panels; hemmed with finished edges to prevent raveling.

B. Floatation.
1. Made of expanded polystyrene.

2. Sufficient number and size to maintain the top of the curtain above the water surface with a minimum of 6 inches of freeboard.

C. Ballast and Anchorage.
1. Ballast: Galvanized steel chain integrated into the bottom of the fabric; sufficient size and weight to keep the curtain vertical and in contact with reservoir bottom.

2. Load Lines: Galvanized wire rope with vinyl coating; strength sufficient to resist all internal and external loads.

3. Connectors: Galvanized steel snap hooks and rings.

D. Furnish a complete silt curtain system, including fabric, ballast, anchorage, floatation and accessories, designed by the curtain manufacturer.

2.03 STRAW MULCH

A. Clean and free of noxious weeds. Straw that has been used for stable bedding will not be allowed.

2.04 GRASS

A. Quick-growing species such as rye grass, Italian rye grass, or cereal grasses.

B. Suitable to the area. Capable of providing a temporary cover that will not compete later with permanent cover.

2.05 STRAW BALES

A. Straw: Clean and free of noxious weeds. Straw that has been used for stable bedding will not be allowed.

B. Binding: Either wire-bound or string-tied with bindings around sides.

C. Size: Minimum of 14 inches wide, 18 inches high and 36 inches long; minimum weight of 51 lb.

D. Composed entirely of vegetative matter, except for the binding material.

E. Bale Bindings:
   1. Steel wire, nylon or polypropylene string placed horizontally and around sides. Jute and cotton binding will not be allowed.

   2. Wire: Minimum 0.06 inch diameter.

   3. Nylon or polypropylene string: Approximately 0.08 inch diameter, with minimum breaking strength of 360 N.

D. Stakes: As specified in paragraph 2.01.B of this Section.

2.06 FIBER ROLLS

A. Prefabricated rolls or rolled tubes of erosion control blanket.

B. Prefabricated rolls:
   1. Made from rice straw and wrapped in tubular black plastic netting.

   2. Netting: Strand thickness of 0.03 inch, knot thickness of 0.055 inch, weight of 0.35 ounce per foot (each +/- 10%); made from 85% high density polyethylene, 14% ethyl vinyl acetate and 1% color for UV inhibition.

   3. The Fiber rolls shall be nine inches in diameter (+/- one inch), twenty-five feet long (+/- 0.5 feet) and weigh approximately 35 pounds (+/- 10%).

C. Rolled tubes:
   1. Minimum of 8 inches in diameter.

   4. Bound at each end and at every 4 ft along the length of the roll with jute-type twine.

2.07 EROSION CONTROL BLANKETS

A. As defined in SECTION 02920 – LAWNS AND GRASS.

PART 3 – EXECUTION

1.01 GENERAL

A. Provide and maintain soil erosion and sediment control measures during construction Activities; maintain until final erosion control seeding has been placed and the desired stand of vegetation is established in accordance with SECTION 02920 – LAWNS AND GRASS.

B. Provide and maintain soil erosion and sediment control measures prior to and following each land-disturbing activity, and as otherwise required by the Contracting

Officer. Provide and maintain soil erosion and sediment control measures at all staging and parking areas if soils disturbance is expected or otherwise occurs.

C. Control surface water runoff originating upgrade of disturbed areas to reduce soil erosion and sediment loss during the period of exposure.

3.02 PROTECTION FOR EXISTING VEGETATION

A. Prior to Jobsite Start Date, the Contracting Officer will identify all existing vegetation on Site that is to be protected. The Contractor shall mark such areas in the field to prevent disturbance during construction activities.

B. Protect all vegetation adjacent to the Project Site.

C. Protect all vegetation located downslope from a grading operation with Silt Fence installed upslope of the vegetation.

3.03 SILT FENCE

A. Install in accordance with ASTM D 6462 unless indicated otherwise and approved by the Contracting Officer.

B. Install below the toe of exposed and erodible slopes and along the perimeter of the Project Site except as otherwise approved by the Contracting Officer.

C. Follow ground contours as closely as practicable.

D. Where ends of fabric come together, overlap by at least 24 inches, fold and staple to prevent sediment bypass.

E. Inspect Silt Fences after each rainfall event and weekly. Periodically remove trapped materials so that the integrity and strength of the Silt Fence is not diminished. Dispose of removed sediment at appropriate off-site location.

F. Space stakes or posts at 8.3 feet maximum; position on the downstream side of the fence.

3.04 STRAW BALES

A. Straw bale erosion control fences are appropriate for the following general locations:
   1. Sheet flow applications: Place bales in a single row, lengthwise along the ground contour with ends of adjacent bales tightly abutting one another.

   2. Channel flow applications: Place bales in a single row, lengthwise and oriented perpendicular to the direction of flow with ends of adjacent bales tightly abutting one another. Extend the barrier so that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale to assure that sediment laden runoff will flow either through or over the barrier but not around it**.**

B. Entrench and backfill bales. Excavate a trench the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. After the bales are staked and chinked, backfill against the barrier with excavated soil. Place backfill to ground level on the downhill side and to 4 inches above ground level on the uphill side.

C. Securely anchor each bale with at least 2 stakes or rebar driven through the bale. Drive the first stake in each bale toward the previously set bale to force the bales together. Install stakes or rebar at least 12 inches into the ground or deep enough to securely anchor the bales, whichever is greater.

D. Fill gaps between bales by wedging with straw to prevent water from escaping between the bales. Scatter loose straw over the area immediately uphill from a straw bale barrier to increase barrier efficiency.

3.05 GRASS

A. In accordance with SECTION 02920 – LAWNS AND GRASS.

3.06 STRAW MULCH

A. Use as temporary stabilization on disturbed and erodible areas following construction Activities and prior to revegetation.

B. When weather conditions are suitable, straw mulch may be pneumatically applied using equipment that will not render it unsuitable for incorporation into the soil.

C. Apply at a rate of at least 4,000 pounds per acre; apply evenly without clumps or wads.

D. Anchor in place with a tackifier or by mechanically punching into the soil.
   1. Tackifier:
      a. Used to glue the straw fibers together and to the soil surface.

      b. Select based on longevity and ability to hold fibers in place.

      c. Apply at a rate of 125 lb/ac; in windy conditions, increase application rate to 178 lb/ac.

   2. Punching:
      a. Use on slopes with soils which are stable enough and of appropriate gradient to safely support construction equipment without contributing to compaction and instability problems.

      b. Use a knife-blade roller or a straight bladed coulter or “crimper.”

E. Remove and dispose of straw mulch used as temporary erosion control prior to installation of permanent erosion protection, or as otherwise required by the Contracting Officer.

3.07 FIBER ROLLS

A. Install in 2- to 4-inch deep trenches, staked at 4 feet maximum on center with wood stakes that are at least 24 inches long.

B. Overlap ends of adjacent fiber rolls by at least 24-inches; do not abut ends.

C. Place on the face of slopes following ground contours at the following spacings measured horizontally:
   1. Slope inclination of 4H:1V or flatter: 40 feet.

2. Slope inclination of 4H:1V to 2H:1V: 30 feet.

3. Slope inclination 2H:1V or greater: 20 feet.

D. Inspect following rainfall events and a least daily during prolonged rainfall.

E. Maintain as necessary to retain functionality or as required by the Contracting Officer. Remove sediment accumulation before sediment reaches three quarters (3/4) of the barrier height. Dispose of removed sediment at appropriate off-site location.

3.08 EROSION CONTROL BLANKETS

A. Install as required to establish vegetation on slopes steeper than 3H:1V per SECTION 02920 – LAWNS AND GRASS.

3.09 TEMPORARY SWALES

A. Approved uses:

1. To divert flows originating from disturbed areas away from down-gradient sensitive undisturbed areas.

2. At regular spacings across disturbed areas to shorten overland flow distances.

3. To direct sediment-laden water along the base of slopes to a sediment-trapping device such as a Silt Fence or Straw Bale barrier.

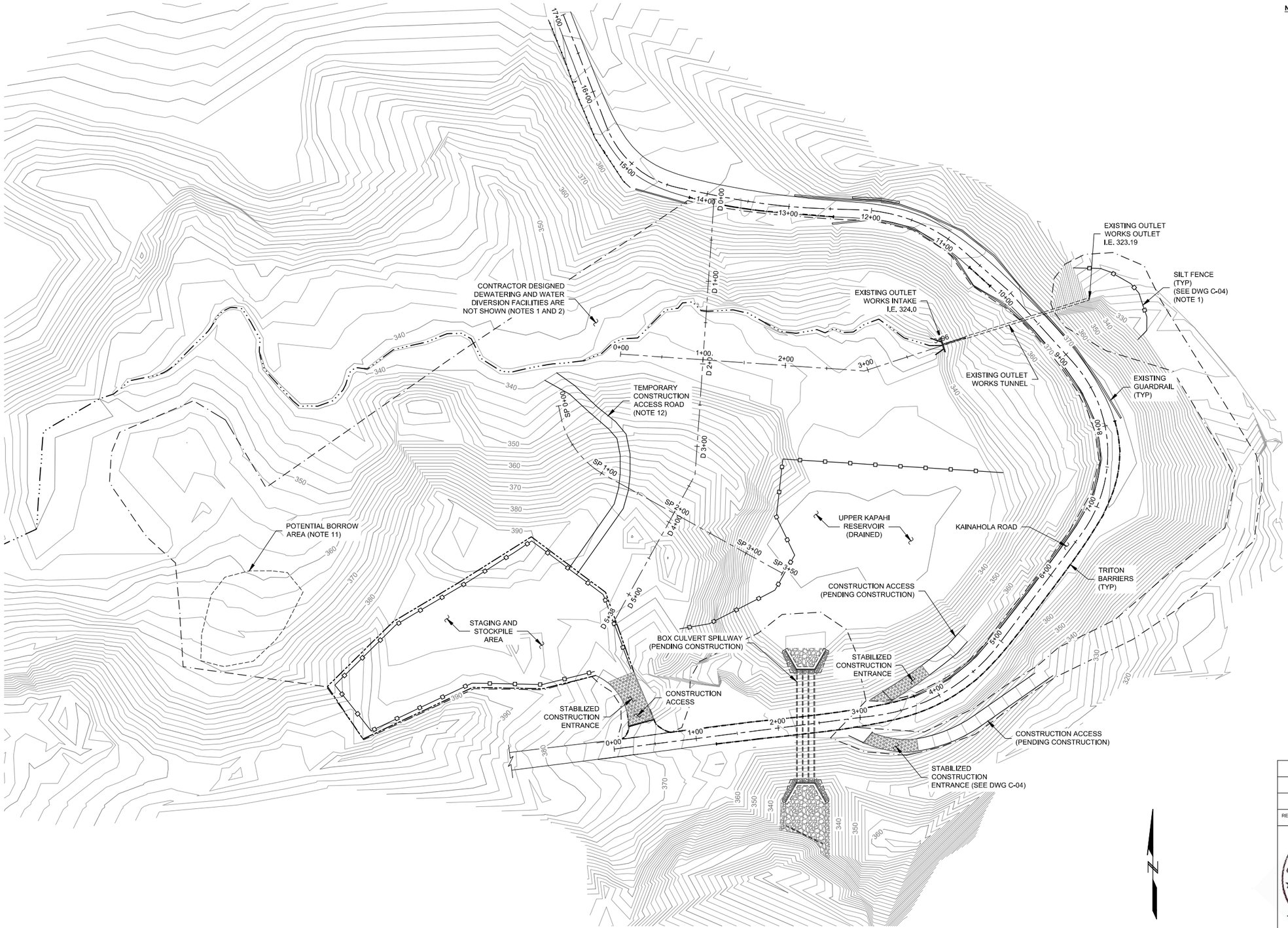
B. Line with drain rock conforming to the requirements for Type B Rock Fill, as specified in SECTION 02317 – EARTHWORK.

C. Provide an outlet that functions with minimum erosion and dissipates runoff velocity prior to discharge to the sediment trapping device or off the Project Site.

D. Convey runoff to a sediment-trapping device until the drainage area above the swale is adequately and permanently stabilized.

E. Adjust swale location(s) as necessary to meet field conditions in order to utilize the most suitable outlet condition.

END OF SECTION 02254



NOTES:

1. CONTRACTOR DESIGNED DEWATERING FACILITIES ARE NOT SHOWN. REFER TO DWG C-02 FOR ANTICIPATED GROUNDWATER ELEVATIONS. DESIGN STORM TO BE COORDINATED WITH THE CONTRACTING OFFICER.
2. CONTRACTOR DESIGNED WATER CONVEYANCE FACILITIES ARE NOT SHOWN. STORM WATER RUNOFF MUST BE CONVEYED TO THE EXISTING DAM OUTLET WORKS FOR DISCHARGE INTO THE STREAM.
3. INSTALL, MAINTAIN AND REMOVE SOIL EROSION AND SEDIMENT CONTROL MEASURES (EROSION CONTROL MEASURES) IN ACCORDANCE WITH APPROVED SOIL EROSION AND SEDIMENT CONTROL PLAN, THE PROVISIONS OF SECTION 02254 - TEMPORARY EROSION CONTROL, AND OTHER APPLICABLE PROVISIONS OF THE SPECIFICATIONS.
4. SEE DWG C-04 FOR EROSION CONTROL DETAILS.
5. COMPLY WITH APPLICABLE REQUIREMENTS OF PROJECT PERMITS.
6. EROSION CONTROL MEASURES MAY BE PHASED CONSISTENT WITH OVERALL CONSTRUCTION SEQUENCING. INCLUDE PHASING PROVISIONS IN SOIL EROSION AND SEDIMENT CONTROL PLAN. PHASING OF EROSION CONTROL MEASURES THAT ARE NOT DESCRIBED IN THE APPROVED SOIL EROSION AND SEDIMENT CONTROL PLAN WILL NOT BE ALLOWED.
7. INSTALL AND MAINTAIN EROSION CONTROL MEASURES TO PROTECT ADJACENT WATERWAYS AND TO PREVENT OFF-SITE TRANSPORT OF SEDIMENT.
8. AS A MINIMUM, INSTALL AND MAINTAIN EROSION CONTROL MEASURES SHOWN ON THIS DRAWING. INSTALL AND MAINTAIN ADDITIONAL EROSION CONTROL MEASURES AS NECESSARY TO COMPLY WITH PROJECT SPECIFICATIONS AND PERMIT REQUIREMENTS. LOCATIONS OF SPECIFIC EROSION CONTROL FEATURES SHOWN ON THIS DRAWING ARE APPROXIMATE. FINAL LOCATIONS SHALL BE DETERMINED BY CONTRACTOR AND INCLUDED IN SOIL EROSION AND SEDIMENT CONTROL PLAN.
9. REMOVE ACCUMULATED SEDIMENT AS NECESSARY TO MAINTAIN PROPER FUNCTIONING OF EROSION CONTROL MEASURES. DISPOSE OF SEDIMENT IN ACCORDANCE WITH THE APPROVED SOIL EROSION AND SEDIMENT CONTROL PLAN.
10. BEST MANAGEMENT PRACTICES (BMP'S) SHALL BE EMPLOYED AT ALL TIMES TO THE MAXIMUM EXTENT PRACTICABLE TO PREVENT DAMAGE BY SEDIMENTATION, EROSION, OR DUST TO STREAMS, WATERCOURSES, NATURAL AREAS, AND THE PROPERTY OF OTHERS.
11. POTENTIAL BORROW AREA IS NOT ANTICIPATED TO BE NEEDED DURING CONSTRUCTION. IF BORROW AREA BECOMES NECESSARY, TEMPORARY CONTROLS INCLUDING SILT FENCE, ETC. WILL BE REQUIRED AROUND THE BORROW AREA. BORROW BEYOND THE REQUIRED EXCAVATION LIMITS MUST BE APPROVED BY THE CONTRACTING OFFICER.
12. CONTRACTOR TO ADJUST LOCATIONS OF TEMPORARY CONSTRUCTION ROADS AS NECESSARY TO CONSTRUCT THE WORK.

LEGEND:

- SILT FENCE
- STABILIZED CONSTRUCTION ENTRANCE
- STAGING AREA BOUNDARY
- LIMITS OF CONSTRUCTION
- LIMITS OF BORROW AREA
- TRITON BARRIERS

REVISION NO.	SYM.	DESCRIPTION	SHT __ OF __	DATE	APPROVED: PUBLIC WORKS ADMINISTRATOR

STEPHEN W. VERIGIN ★ LICENSED PROFESSIONAL ENGINEER No. 13646-CE ★ HAWAII U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION.
APRIL 2014
EXPIRATION DATE OF LICENSE

DEPT. OF ACCOUNTING AND GENERAL SERVICES
DIVISION OF PUBLIC WORKS
STATE OF HAWAI'I

DLNR DAMS & RESERVOIRS ON KAUA'I
NEW UPPER KAPAHI RESERVOIR DAM
KAUA'I, HAWAI'I

TEMPORARY CONTROLS PLAN

GEI Consultants, Inc.		DAGS JOB NO. 14-23-7591	DRAWING NO. C-03
DESIGNED BY: K. PRICE	CHECKED BY: SANCHEZ		
DRAWN BY: K. PRICE	APPROVED BY: MASCHING	DATE MAR. 2014	SHEET 6 OF 36
SCALE: AS NOTED			

FILE _____ DRAWER _____ FOLDER _____

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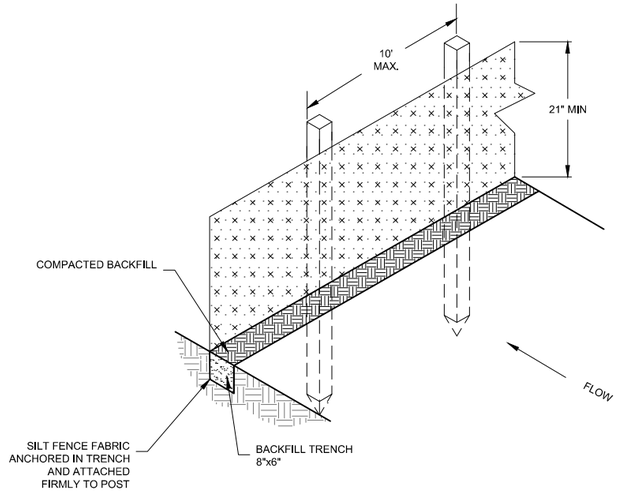
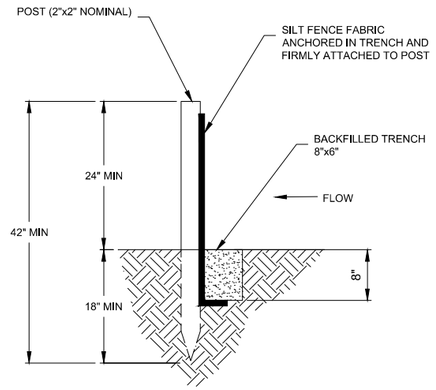


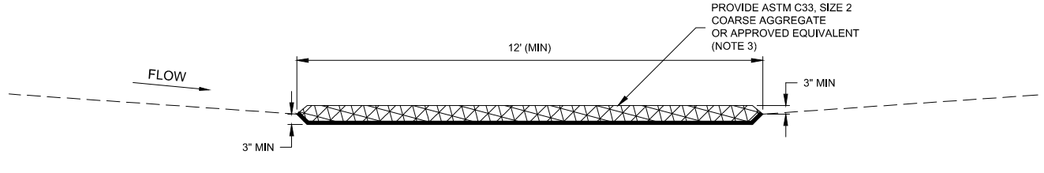


DETAIL

SILT FENCE
NTS

PLAN

STABILIZED CONSTRUCTION ENTRANCE
(NOTE 3)
NTS



SECTION

STABILIZED CONSTRUCTION ENTRANCE
(NOTE 3)
NTS

NOTES:

1. SEE DWG C-03 FOR EROSION CONTROL PLAN.
2. REFER TO SPECIFICATION SECTION 02254 - TEMPORARY EROSION CONTROL.
3. STABILIZED CONSTRUCTION ENTRANCES TO BE 60' LONG OR AS REQUIRED BY CONTRACTING OFFICER.

REVISION NO.	SYM.	DESCRIPTION	SHT — OF —	DATE	APPROVED: PUBLIC WORKS ADMINISTRATOR

STEPHEN W. YUEN ORIGIN
LICENSED PROFESSIONAL ENGINEER
NO. 13646-CE
HAWAII U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION.
APRIL 2014
EXPIRATION DATE OF LICENSE

DEPT. OF ACCOUNTING AND GENERAL SERVICES
DIVISION OF PUBLIC WORKS
STATE OF HAWAI'I

DLNR DAMS & RESERVOIRS ON KAUA'I
NEW UPPER KAPAHI RESERVOIR DAM
KAUA'I, HAWAI'I

EROSION CONTROL DETAILS

GEI Consultants, Inc.		DAGS JOB NO.	DRAWING NO.
DESIGNED BY: K. PRICE	CHECKED BY: SANCHEZ	14-23-7591	C-04
DRAWN BY: K. PRICE	APPROVED BY: MASCHING	DATE MAR. 2014	SHEET 7 OF 36
SCALE AS NOTED			

FILE _____ DRAWER _____ FOLDER _____

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Appendix F

Draft Cultural Impact Assessment

Draft

Cultural Impact Assessment, including Preliminary Report, Upper Kapahi Reservoir Project Kapa‘a Ahupua‘a, Puna District, Kaua‘i TMK: [4] 4-6-007:011

Prepared for
GEI Consultants, Inc.

Prepared by
Margaret Magat, Ph.D.,
Katie L. Kamelamela, M.S.,
and
Hallett H. Hammatt, Ph.D.

Cultural Surveys Hawai‘i, Inc.
Kailua, Hawai‘i
(Job Code: KAPAA 11)

March 2014

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Prefatory Remarks on Language and Style

A Note about Hawaiian and Other Non-English Words:

Cultural Surveys Hawai‘i (CSH) recognizes that the Hawaiian language is an official language of the State of Hawai‘i, it is important to daily life, and using it is essential to conveying a sense of place and identity. In consideration of a broad range of readers, CSH follows the conventional use of italics to identify and highlight all non-English (i.e., Hawaiian and foreign language) words in this report unless citing from a previous document that does not italicize them. CSH parenthetically translates or defines in the text the non-English words at first mention, and the commonly used non-English words and their translations are also listed in the Appendix A: Glossary for reference. However, translations of Hawaiian and other non-English words for plants and animals mentioned by community participants are referenced separately (see explanation below).

A Note about Plant and Animal Names:

When community participants mention specific plants and animals by Hawaiian, other non-English or common names, CSH provides their possible scientific names (Genus and species) in the Appendix B: Common and Scientific Names of Plants and Animals Mentioned by Community Participants. CSH derives these possible names from authoritative sources, but since the community participants only name the organisms and do not taxonomically identify them, CSH cannot positively ascertain their scientific identifications. CSH does not attempt in this report to verify the possible scientific names of plants and animals in previously published documents; however, citations of previously published works that include both common and scientific names of plants and animals appear as in the original texts.

Management Summary

Reference	A Preliminary Report of the Cultural Impact Assessment (CIA) for the Upper Kapahi Dam Replacement Project, Kapa‘a Ahupua‘a, Puna District, Kaua‘i TMK: [4] 4-6-007:011
Date	March 2014
Project Number (s)	Cultural Surveys Hawai‘i (CSH) Job Code: KAPAA 11
Agencies	State of Hawai‘i Department of Health/Office of Environmental Quality Control (DOH/OEQC)
Project Location	The project area falls within TMK: [4] 4-6-007:011, and includes Upper Kapahi Reservoir. Upper Kapahi Reservoir is located approximately 2 miles northwest of Kapa‘a, in Kapa‘a Ahupua‘a on the island of Kaua‘i, Kaua‘i County
Land Jurisdiction	Hawai‘i Department of Land and Natural Resources Land Division (State of Hawai‘i) and County of Kaua‘i (County)
Agencies	State of Hawai‘i Department of Land and Natural Resources/State Historic Preservation Division (SHPD); State Office of Environmental Quality Control (OEQC)
Project Description	The State and County are proposing to build a new dam located within the footprint of Upper Kapahi Reservoir, a short distance upstream of the existing dam. The alignment of the new dam was selected to have the least new embankment length, and is planned to extend from the northern end of the existing dam alignment to the opposite end of the reservoir. The new dam will be an earth fill dam with a downstream filter drain and filter blanket. A silt and overburden excavation is assumed to extend 10 ft below the estimated reservoir bottom to reach a suitable foundation. The jurisdictional height of the new dam will be just below 25 ft, 15 ft less than the jurisdictional height of the existing dam (a dam’s jurisdictional height refers to the vertical distance measured from the lowest point at the downstream toe of the dam to its maximum storage elevation). The surface area of the impoundment (body of water contained in dam) will be reduced from 8.8 acres to 4.6 acres.
Project Acreage	Approximately 15.3 acres
Area of Potential Effect (APE) and Survey Acreage	For the purposes of this CIA, the APE is defined as the approximately 15.3 acre area outlined in Figure 1. While this investigation focuses on the project APE, the study area included the entire *ahupua‘a* of Kapa‘a.

Document Purpose	The project requires compliance with the State of Hawai‘i environmental review process (Hawai‘i Revised Statutes [HRS] §343), which requires consideration of a proposed project’s effect on cultural practices and resources. Through document research and CSH’s initial cultural consultation efforts, this preliminary report provides preliminary information pertinent to the assessment of the proposed project’s impacts on cultural practices and resources (per the *Office of Environmental Quality Control’s Guidelines for Assessing Cultural Impacts*), which may include Traditional Cultural Properties (TCP) of ongoing cultural significance that may be eligible for inclusion on the State Register of Historic Places. The preliminary report is intended to support the project’s environmental review and may also provide preliminary information to support the project’s historic preservation review under HRS §6E and Hawai‘i Administrative Rules (HAR) §13–275. *This preliminary report presents incipient research conducted for the cultural impact assessment and, in and of itself, does not satisfy §343 requirements regarding the proposed project’s impact on cultural practices and resources.*
Consultation Effort	Hawaiian organizations, agencies and community members were initially contacted in order to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the permanent project footprint and the vicinity. The organizations consulted included the State Historic Preservation Division (SHPD), the Office of Hawaiian Affairs (OHA), the Kaua‘i Island Burial Council (KIBC), Hui Mālama I Nā Kūpuna O Hawai‘i Nei, Kauai Historical Society, State Department of Land and Natural Resources (DLNR) Kauai Land Division, Nawiliwili Watershed Council, ‘Aha Pūnana Leo o Kaua‘i, Kauai Island Hawaiian Civic Club, and community members of Kapa‘a Ahupua‘a.
Results of Background Research	Background research for this project yielded the following results: 1. The proposed project is located in Kapa‘a Ahupua‘a, Kapa‘a literally translates as “the solid or the closing.” Kapa‘a Ahupua‘a is located on the eastern side of Kaua‘i between Keālia Ahupua‘a in the north and Waipouli Ahupua‘a in the south. The *ahupua‘a* of Kapa‘a belongs in the ancient district of Puna, one of five ancient *moku*, or districts, on Kaua‘i (King 1935:228). Its location on the windward side exposes the area to the prevailing trade winds and their associated weather patterns. Historically, this *ahupua‘a* contained two prominent landscape features, a coastal plain with sand dunes and a large marsh. *Mele* (song, chant) paint Kapa‘a as a place of great expanse of land, with verdant bush in upland areas not occupied by human settlement. 2. The project is area is associated with specific *mo‘olelo* (story, tale, myth) and *‘ōlelo no‘eau* (proverbs) including, but not limited to, chief Mō‘īkeha who is said to have enjoyed peaceful Kapa‘a as his permanent home; Pāka‘a, who can command winds when his mother from Kapa‘a

	gifts him the wind gourd of La‘amaomao containing the bones of his great-grandmother, the goddess of winds; various accounts of Kawelo (Kaweloleimākua) and Ka‘ililauokekoa (Mō‘īkeha's daughter, or granddaughter); the *mo‘o* or reptile Kalamainu‘u and the origins of the *hīna‘i hīnālea* or the fish trap used to catch the *hīnālea* fish; the story of Lonoikamakahiki; Ka‘ea, the supernatural banana grove of Palila believed to be located in the *mauka* (upland) region of Kapa‘a and where a banana stalk takes at least two men to encircle its girth; the expanse of *kalukalu* grass which is used for making fine soft mats enjoyed by lovers; Kanaka-nunui-moe, the Sleeping Giant of Kapa‘a who is beloved by the people for his gentle and helpful ways; the legend of Lepeamoa, which tells of a famous battle between Lepeamoa’s brother, the hero Kauilani, and a demigod named Akuapehuale. 3. Kapa‘a is home to more than a dozen *heiau* (pre-Christian place of worship, shrine) enforcing its cultural significance to Native Hawaiians. 4. During the Māhele, Kapa‘a was taken as Crown Lands (Office of the Commissioner of Public Lands of the Territory of Hawaii, 1929). The *‘ili* (land section next in importance to *ahupua‘a*) of Paikahawai and Ulakiu in Kapa‘a Ahupua‘a were retained as Government Lands. 5. The LCA pattern in Kapa‘a shows taro *lo‘i* (irrigated terrace, especially for taro) and *kula* (plain, field, open country) on the rim of the swamplands and extending somewhat into watered valleys. Marshlands without known LCAs may have had *lo‘i* along the edges. All six LCA claimants had shoreline house lots *makai* (seaward) of the swamp. Permanent settlement is assumed to have existed in association with *mauka* (upland) agricultural lands in the pre-Contact period, but this is not reflected in the LCA testimonies. 6. Only five individuals were awarded land parcels in Kapa‘a. Four of the five awardees received multiple parcels which show similarities. All four had *lo‘i* or irrigated *kalo* (taro) fields on the *mauka* side of the lowland swampy area, sometimes extending a short distance up into small, shallow gulches and valleys. Many of these *lo‘i* parcels name *pali* or hills/cliffs as boundaries. Other natural and cultural resources mentioned in the LCAs include fishponds, freshwater springs, pig pens, *hau* bushes, *hala* clumps, streams, *‘auwai* (ditch), and *kula* or pasturelands. 7. The project area is located 1.8 km from the nearest Lihue Plantation field, which bought out Makee Sugar Plantation. Makee Plantation was the first large-scale agricultural enterprise in Kapa‘a and it began in 1877 (Dole 1916:8). Makee Plantation employed thousands of Portuguese and Japanese immigrants by the late 1800s, leading to its own railroad and an associated school for its workers.

	8. In 1913, Hawaiian Canneries Company, Ltd., opened in Kapa‘a at the site now occupied by Pono Kai Resort, just north of Waika‘ea Canal (Cook 1999:56). A resident of Kapa‘a described how the town “came alive” after the cannery opened (Fernandez 2009:48). Japanese, Portuguese and other immigrants opened shops and businesses and Kapa‘a became “an integrated multi-racial town, containing an extraordinary mix of people living and working together in harmony” all due to the new cannery (Fernandez 2009:48). 9. In 1923, Hawaiian Canneries Company, Ltd., purchased the approximately 8.75 acres of land they were leasing through the Hawaiian Organic Act (Hawai‘i Bureau of Conveyances, Grant 8248). At that time, the cannery only contained four structures but by 1956, 1.5 million cases of pineapple were being packed. By 1960, 3,400 acres were in pineapple and the cannery employed 250 full-time and 1,000 seasonal workers (*Honolulu Advertiser*, 20 March 1960). In 1962, Hawaiian Canneries went out of business due to competition from canneries in other countries. 10. The Ahukini Terminal and Railway Company was formed in 1920 to establish a railroad to connect Anahola, Keālia, and Kapa‘a to Ahukini Landing and to carry plantation sugar to be shipped out (Condé and Best, 1973:185). This company was responsible for extending the railroad line from the Makee Landing, which was no longer in use, to Ahukini Landing, and for constructing the original Waika‘ea Railroad Bridge and the Mō‘īkeha Makai Railroad Bridge. 11. In 1934, the Lihue Plantation Company absorbed the Ahukini Terminal and Railway Company and Makee Sugar Company (Condé and Best, 1973:167). The railway and rolling stock formerly owned by Makee Sugar Company became the Makee Division of the Lihue Plantation. At this time, besides hauling sugar cane, the railroad was also used to haul plantation freight. The Lihue Plantation began to phase out in the last part of the twentieth century. Kapa‘a Town suffered after the closing of the Kapa‘a Cannery; however, the growing tourist industry helped ease the economic effects of the cannery’s closing. 12. There have not been as many archaeological studies done in upland Kapa‘a compared to the shoreline. No archaeological sites were observed during a reconnaissance of 52.56 acres of mostly *kula* land in upland Kapa‘a (Hammatt 1981), nor were there any terraces or other sites apparent during a 1986 reconnaissance of the upper reaches of the Makaleha stream valley (Hammatt 1986). 13. Although no historic properties have been documented in the project area, the Upper Kapahi Reservoir built in 1910 qualifies as a potentially eligible property for the National Register of Historic Places.

Results of Community Consultation	As of the date of this preliminary report, one community contact and one state agency have provided comments regarding the proposed project; an interview with a *kupuna* is pending approval and a response from SHPD is included below. Responses from remaining cultural organizations, agencies and community members are pending. SHPD provided the following comment: SHPD recommends the canvassing of the project area to determine cultural and traditional practices that might be affected by this project. In addition, SHPD recommends a literature review of SHPD's library which might prove helpful in determining the cultural practices, resources, and beliefs in the project area.
Recommendations	Based on the preliminary findings of this assessment, CSH recommends that a thorough survey of the project area be done in order to determine cultural practices, resources, and beliefs that may potentially be impacted by the proposed project. In addition, as a precautionary measure, personnel involved in future development activities in the area should be informed of the possibility of inadvertent cultural finds, and should be made aware of the appropriate notification measures to follow. *Final results of the community consultation will be provided in a draft cultural impact assessment report to be completed in the next few months.*

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Section 1 Introduction

1.1 Project Background

At the request of GEI Consultants, Inc., Cultural Surveys Hawai‘i, Inc. (CSH) is conducting this cultural impact assessment (CIA) for the Upper Kapahi Dam Replacement Project located in Kapa‘a Ahupua‘a, Puna District, Kaua‘i TMK: [4] 4-6-007:011 (Figure 1 through Figure 3).

Upper Kapahi Dam is owned by the Hawai‘i Department of Land and Natural Resources Land Division (State) and County of Kaua‘i (County). This dam is an earthen embankment dam that stores irrigation water diverted from Kainahola Stream and Kapa‘a Stream. The reservoir is currently dewatered, but historically provided irrigation water to downstream users.

The project area is approximately 15.3 acres. The proposed project is intended to improve the Upper Kapahi Reservoir. This will consist of enlarging the existing spillway and stabilizing the existing berm to ensure safety of the area. This study will be designed to inform the project's environmental assessment.

The State and County are proposing to build a new dam located within the footprint of Upper Kapahi Reservoir, a short distance upstream of the existing dam. The alignment of the new dam was selected to have the least new embankment length, and is planned to extend from the northern end of the existing dam alignment to the opposite end of the reservoir. The new dam will be an earth fill dam with a downstream filter drain and filter blanket. A silt and overburden excavation is assumed to extend 10 ft below the estimated reservoir bottom to reach a suitable foundation. The jurisdictional height of the new dam will be just below 25 ft, 15 ft less than the jurisdictional height of the existing dam (a dam's jurisdictional height refers to the vertical distance measured from the lowest point at the downstream toe of the dam to its maximum storage elevation). The surface area of the impoundment (body of water contained in dam) will be reduced from 8.8 acres to 4.6 acres.

In 2007, the U.S. Army Corps of Engineers evaluated the existing Upper Kapahi Dam and determined that dam rehabilitation was required. Construction of improvements was initiated in 2011, but a subsequent survey of the dam in 2012 revealed that the dam contained undesirable embankment materials along the majority of the dam crest and road alignment. Based on this, the improvement project was suspended, the reservoir was drained, and alternatives were developed to address the safety deficiencies. Dam replacement or repair was advised.

The proposed project is based on a combined alternative agreed upon by the State and County. The preferred alternative includes maintaining the current alignment of Kainahola Road, breaching the existing dam, and constructing a new dam upstream of the existing embankment dam. This alternative removes dam safety uncertainties by allowing the trash within the dam to remain in place, and it will maintain some agricultural storage within the reservoir for East Kaua‘i Water Users' Cooperative to supplement some of the water storage lost due to decommissioning the existing dam. Storage capacity would be reduced from approximately 110 acre-ft to approximately 35 acre-ft.

Due to public safety concerns, the State and County are proceeding with the breaching of the existing dam as soon as possible. The dam breach is a separate project from the Upper Kapahi Reservoir Project.

1.2 Document Purpose

The project requires compliance with the State of Hawai‘i environmental review process (Hawai‘i Revised Statutes [HRS] §343), which requires consideration of a proposed project’s effect on cultural practices and resources. CSH is conducting this CIA at the request of GEI Consultants Inc. Through document research and CSH’s initial cultural consultation efforts, this preliminary report provides preliminary information pertinent to the assessment of the proposed project’s impacts to cultural practices and resources (per the *Office of Environmental Quality Control’s Guidelines for Assessing Cultural Impacts*), which may include Traditional Cultural Properties (TCP) of ongoing cultural significance that may be eligible for inclusion on the State Register of Historic Places. The preliminary report is intended to support the project’s environmental review and may also provide preliminary information to support the project’s historic preservation review under HRS §6E and Hawai‘i Administrative Rules (HAR) §13–275. *This preliminary report presents incipient research conducted for the cultural impact assessment and, in and of itself, does not satisfy §343 requirements regarding the proposed project’s impact on cultural practices and resources.*

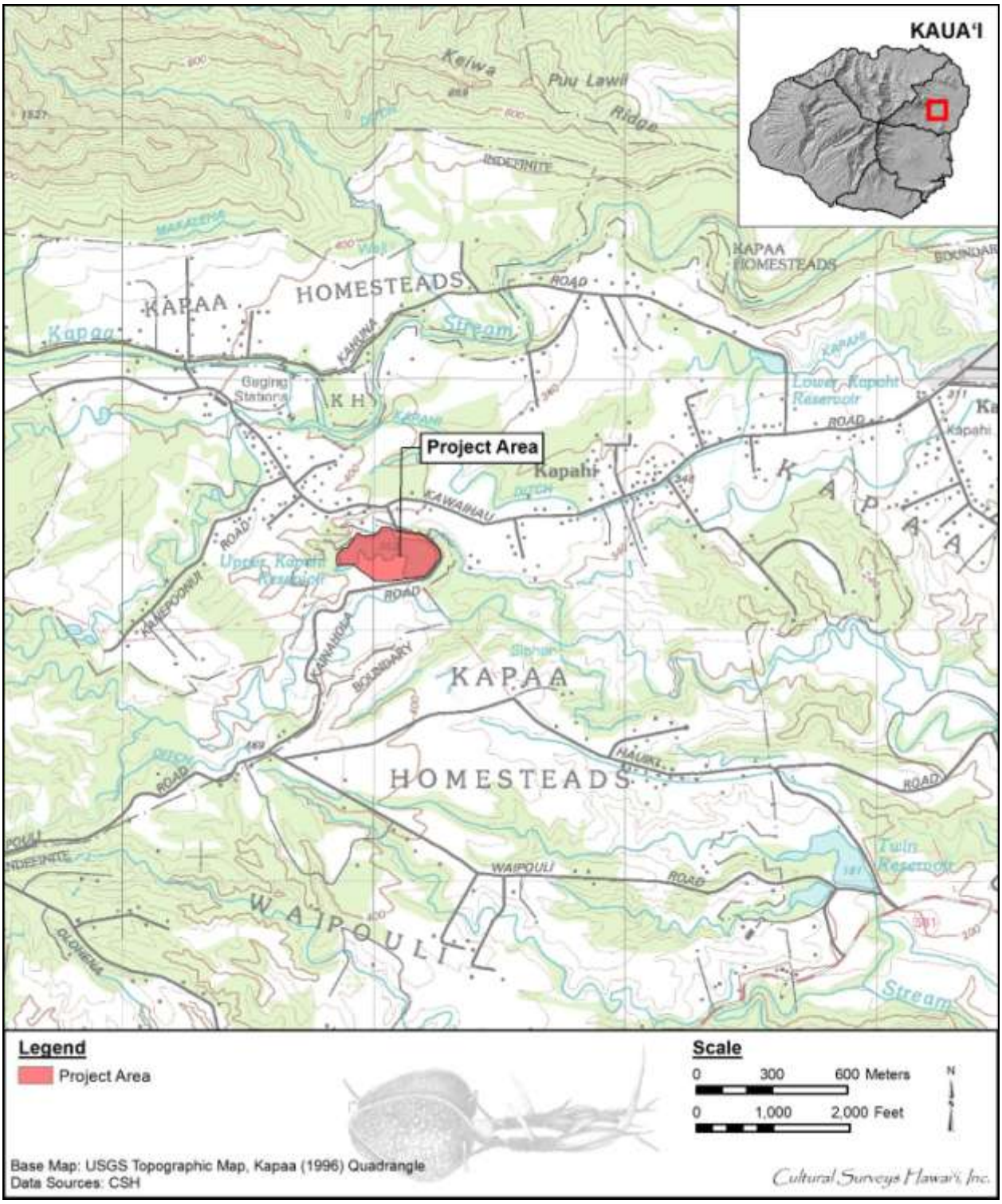

Figure 1. Portion of the 1996 Kapaa USGS 7.5-Minute Series Topographic Quadrangle showing location of the project area

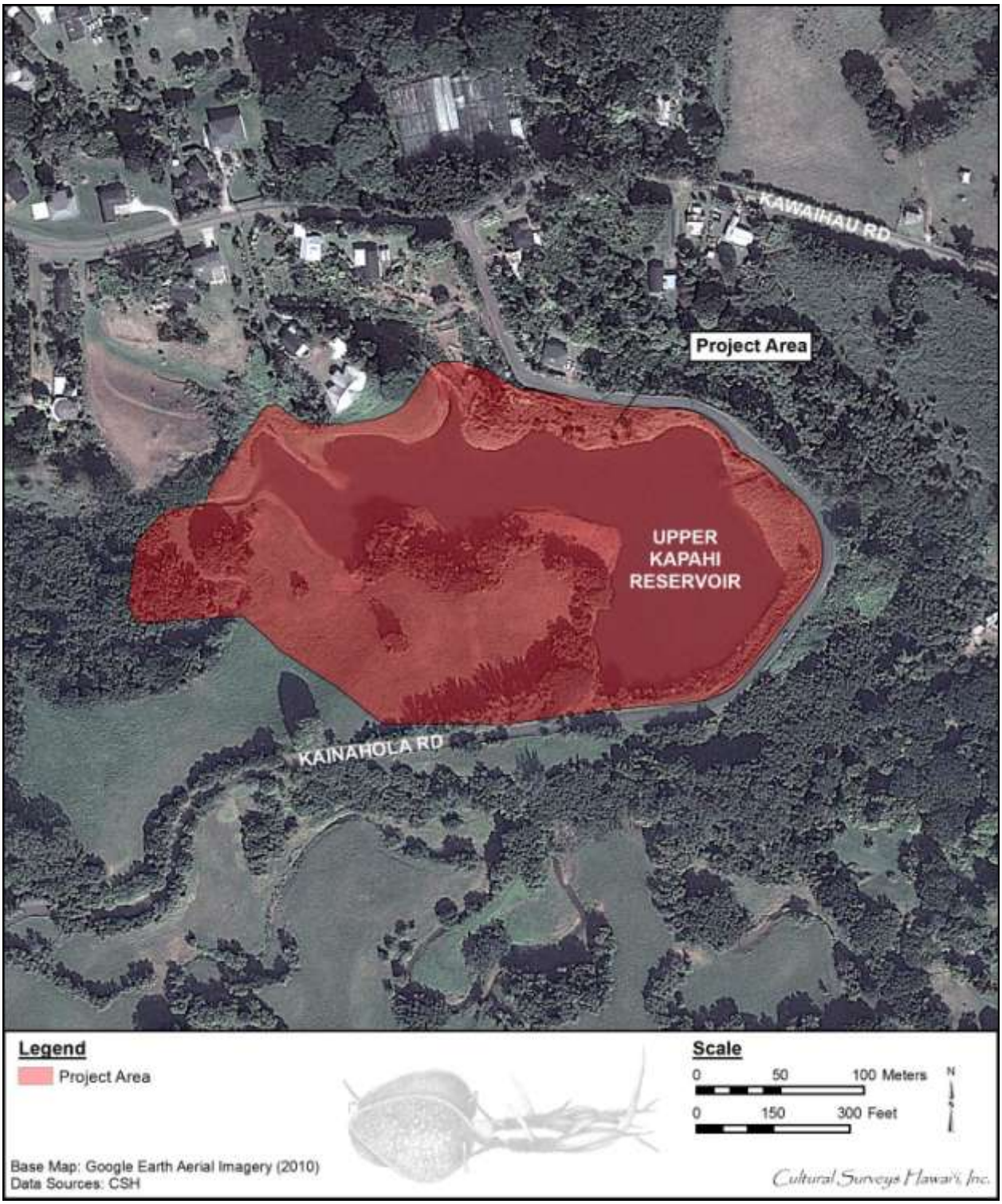

Figure 2. Aerial photograph showing the project area (Google Earth 2010)

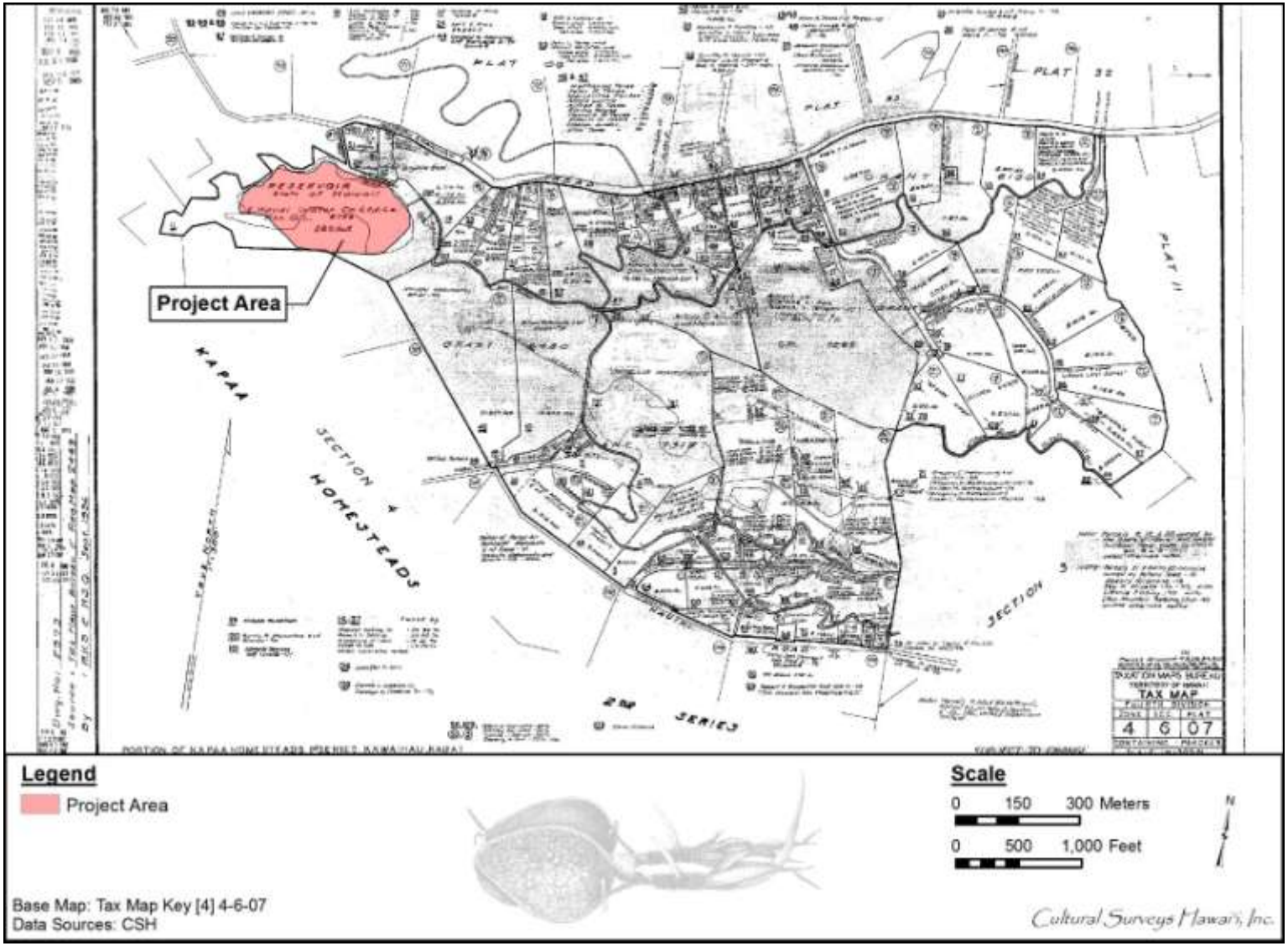

Figure 3. TMK [4] 4-6-07 highlighting the project area (Hawai‘i TMK Service 2012).

1.3 Scope of Work

The scope of work for this CIA includes:

1. Examination of cultural and historical resources, including Land Commission documents, historic maps, and previous research reports, with the specific purpose of identifying traditional Hawaiian activities including gathering of plant, animal, and other resources or agricultural pursuits as may be indicated in the historic record
2. Review of previous archaeological work at and near the subject parcel that may be relevant to reconstructions of traditional land use activities; and to the identification and description of cultural resources, practices, and beliefs associated with the parcel
3. Consultation and interviews with knowledgeable parties regarding cultural and natural resources and practices at or near the parcel; present and past uses of the parcel; and/or other practices, uses, or traditions associated with the parcel and environs
4. Preparation of a report that summarizes the results of these research activities and provides recommendations based on findings

1.4 Environmental Setting

1.4.1 Natural Environment

Kapa‘a Ahupua‘a is located on the eastern side of Kaua‘i between Keālia Ahupua‘a in the north and Waipouli Ahupua‘a in the south. Its location on the windward side exposes the area to the prevailing tradewinds and their associated weather patterns. Rainfall on the coastal plains and plateaus of Kapa‘a averages approximately 40 inches per year (Juvik and Juvik 1998:56). Historically, this *ahupua‘a* contained two prominent landscape features, a coastal plain with sand dunes and a large marsh. Kapa‘a can be characterized as fairly flat, with irregularly shaped gulches and small valleys in the uplands, through which small tributary streams run, including Kapahi, Makaleha, and Moalepe. Some of these streams combine with other tributaries in neighboring Keālia to form Kapa‘a Stream (often referred to as Keālia River) which empties into the ocean at the northern border of the *ahupua‘a*. Others flow directly into the lowlands of Kapa‘a, creating a large (approximately 170-acre) swamp area that has been mostly filled in modern times (Handy and Handy 1972:394, 423).

The Upper Kapahi Resevoir project area is located in the uplands (*mauka*) of Kapa‘a Stream Valley west of Kapa‘a Town in Kapa‘a Ahupua‘a, Kawaihau District, on the east side of Kaua‘i Island (Figure 4). Foote et al (1972) described the soil in this area as being Kapa‘a Silty clay. Kapa‘a Silty clay consists of “well-drained soils on the uplands on the islands of Kaua‘i and Oahu,” with soil material coming from basic igneous rock. With elevations ranging from 200 to 800 ft, the soils are “gently sloping to extremely steep” (Figure 5) (Foote et al. 1972:61). The *mauka* locale receives an average annual rainfall of approximately 2,000 mm (79 inches) (Giambelluca et al. 1986:47).

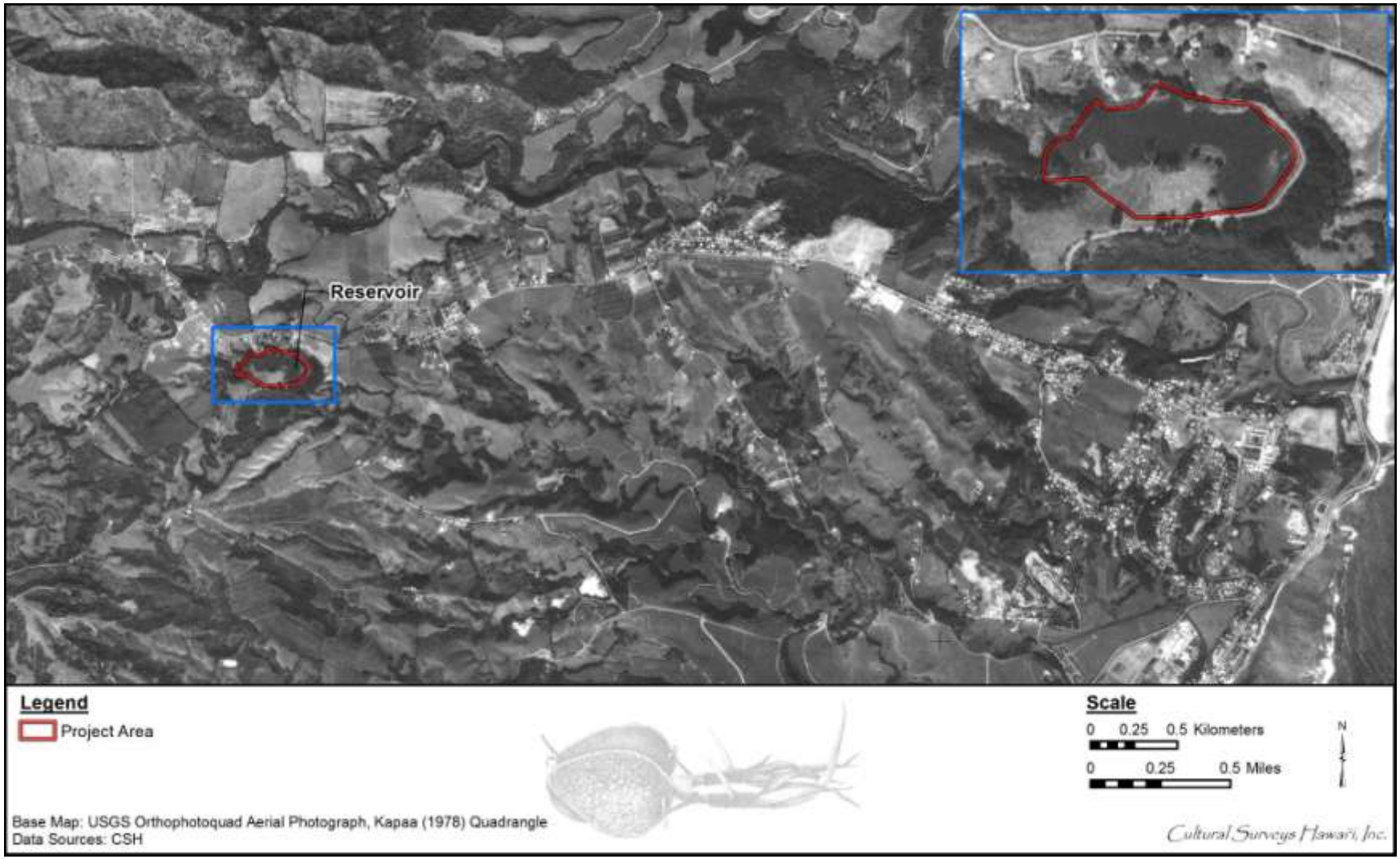

Figure 4. Portion of project area on USGS Orthophotoquad aerial photograph, Kapaa (1978) Quadrangle

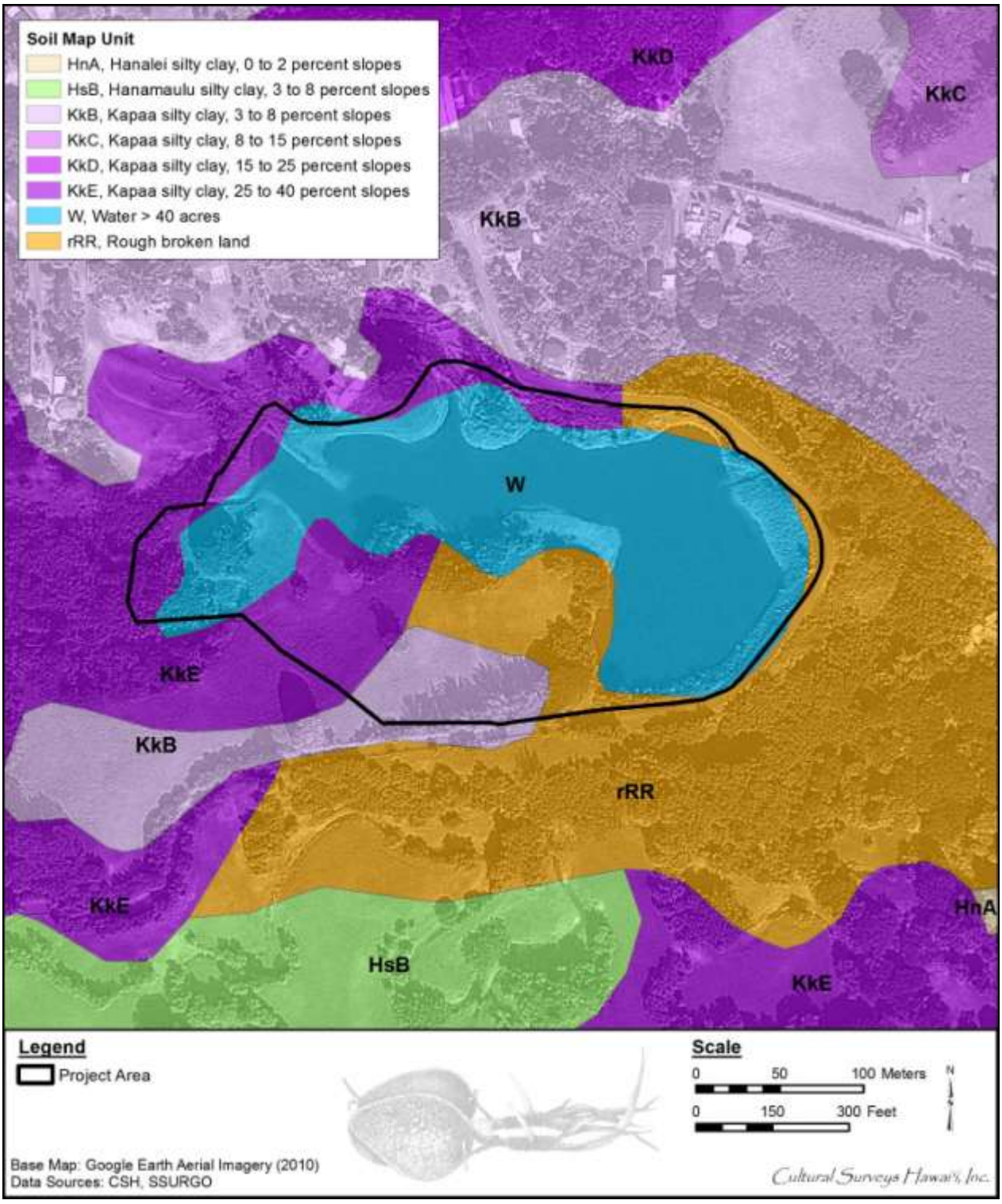

Figure 5. Project area with soils overlay (Foote et al. 1972)

1.4.2 Built Environment

The Upper Kapahi Reservoir is off Kawaihau Road, skirted on the north, east, and southern boundaries by Kainahola Road (Figure 6 through Figure 8). The Reservoir consists of at least one residential home on the water's edge where coconut and *lauhala* trees are used for landscaping. Volunteer plants in the area include wedelia, African tulip, java plum, and ironwoods in addition to invasive Christmasberry tree. There is limited building in the area. A Lihue Plantation field is located about 1.8 km from the project area.

Figure 6. Google Map (2014) street view of Upper Kapahi Reservoir, near 1193 Kainahola Road

Figure 7. Google Map (2014) street view of Upper Kapahi Reservoir, on Kainahola Road

Figure 8. Google Map (2014) street view of Upper Kapahi Reservoir, near 1167 Kainahola Road

Section 2 Methods

2.1 Archival Research

Historical documents, maps, and existing archaeological information pertaining to Kapa‘a Ahupua‘a were researched at the CSH library and other archives including the University of Hawai‘i at Mānoa’s Hamilton Library, the State Historic Preservation Division (SHPD) library, the Hawai‘i State Archives, the State Land Survey Division, and the Bishop Museum Archives. Previous archaeological reports for the area were reviewed, as were historic maps and photographs and primary and secondary historical sources. Information on Land Commission Awards (LCAs) was accessed through Waihona ‘Aina Corporation’s Māhele database (Waihona ‘Aina 2000), the Office of Hawaiian Affairs (OHA) Papakilo Database (Office of Hawaiian Affiars 2011), as well as a selection of CSH library references.

For cultural studies, research for the Traditional Background section centered on Hawaiian activities including religious and ceremonial knowledge and practices; traditional subsistence land use and settlement patterns; gathering practices and agricultural pursuits; as well as Hawaiian place names and *mo‘olelo* (stories), *mele* (songs), *oli* (chants), *‘ōlelo no‘eau* (proverbs) and more. For the Historic Background section, research focuses on land transformation, development, and population changes beginning in the early post–Western Contact era to the present day (see Scope of Work above).

2.2 Community Consultation

2.2.1 Sampling and Recruitment

A combination of qualitative methods, including purposive, snowball, and expert (or judgment) sampling, were used to identify and invite potential participants to the study. These methods are used for intensive case studies, such as CIAs, to recruit people who are hard to identify, or are members of elite groups (Bernard 2006:190). Our purpose is not to establish a representative or random sample. It is to “identify specific groups of people who either possess characteristics or live in circumstances relevant to the social phenomenon being studied . . . This approach to sampling allows the researcher deliberately to include a wide range of types of informants and also to select key informants with access to important sources of knowledge” (Mays and Pope 1995:110).

We began with purposive sampling informed by referrals from known specialists and relevant agencies (see Table 5; Section 6 Community Consultation). For example, we contacted via letter the SHPD, OHA, Kaua‘i and Ni‘ihau Island Burial Councils (KNIBC), and community and cultural organizations in Kapa‘a Ahupua‘a for their brief response and review of the project and to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the permanent project footprint and vicinity, cultural and lineal descendants, and other appropriate community representatives and members (see Table 5). Based on their in-depth knowledge and experiences, these key respondents then referred CSH to additional potential participants who were added to the pool of invited participants. This is snowball sampling, a chain referral method that entails asking a few key individuals (including agency and organization representatives) to provide their comments and referrals to other locally recognized experts or stakeholders who

may be likely candidates for the study (Bernard 2006:192). CSH also employs expert or judgment sampling which involves assembling a group of people with recognized experience and expertise in a specific area (Bernard 2006:189–191). CSH maintains a database that draws on over two decades of established relationships with community consultants, cultural practitioners and specialists, community representatives, and cultural and lineal descendants. The names of new potential contacts were also provided by colleagues at CSH and from the researchers' familiarity with people who live in or around the study area. Researchers often attend public forums (e.g., Neighborhood Board, Burial Council and Civic Club meetings) in (or near) the study area to recruit participants. Please see Table 5 for a complete list of individuals and organizations contacted for this CIA and Interviews in Section 7 for a detailed account.

CSH focuses on obtaining in-depth information with a high level of validity from a targeted group of relevant stakeholders and local experts. Our qualitative methods do not aim to survey an entire population or subgroup. A depth of understanding about complex issues cannot be gained through comprehensive surveying. Our qualitative methodologies do not include quantitative (statistical) analyses, yet they are recognized as rigorous and thorough. Bernard (2006:25) describes the qualitative methods as "a kind of measurement, an integral part of the complex whole that comprises scientific research." Depending on the size and complexity of the project, CSH reports include in-depth contributions from about one-third of all participating respondents. Typically this means three to 12 interviews.

2.2.2 Informed Consent Protocol

An informed consent process was conducted as follows: 1) before beginning the interview the CSH researcher explained to the participant how the consent process works, the project purpose, the intent of the study and how his/her information will be used; 2) the researcher gave him/her a copy of the Authorization and Release Form to read and sign (Appendix A); 3) if the person agreed to participate by way of signing the consent form or providing oral consent, the researcher started the interview; 4) the interviewee received a copy of the Authorization and Release Form for his/her records, while the original is stored at CSH; 5) after the interview was summarized at CSH (and possibly transcribed in full), the study participant was afforded an opportunity to review the interview notes (or transcription) and summary and to make any corrections, deletions or additions to the substance of their testimony/oral history interview; this was accomplished either via phone, post or email or through a follow-up visit with the participant; 6) the participant received the final approved interview and any photographs taken for the study for their records. If the participant was interested in receiving a copy of the full transcript of the interview (if there is one; not all interviews are audio-recorded and transcribed), a copy was provided. Participants were also given information on how to view the report on the OEQC website and offered a hard copy of the report once the report is a public document.

2.2.3 Interview Techniques

To assist in discussion of natural and cultural resources and cultural practices specific to the study area, CSH initiated semi-structured interviews (as described by Bernard 2006) asking questions from the following broad categories: cultivation, gathering practices and *mauka* and *makai* (seaward) resources, burials, trails, historic properties, and *wahi pana*. The interview protocol is tailored to the specific natural and cultural features of the landscape in the study area identified through archival research and community consultation. For example, for this study,

cultivation and gathering practices were emphasized over other categories less salient to project participants. These interviews and oral histories supplement and provide depth to consultations from government agencies and community organizations that may provide brief responses, reviews and/or referrals gathered via phone, email and occasionally face-to-face commentary.

2.2.3.1 In-depth Interviews and Oral Histories

Interviews are conducted with individuals or in focus groups comprised of *kūpuna* (elder) and *kama‘āina* (Native-born) who have a similar experience or background (e.g., the members of an area club, elders, fishermen, hula dancers). Interviews are conducted initially at a place of the study participant’s choosing (usually at the participant’s home or at a public meeting place) and/or—whenever feasible—during site visits to the proposed project. Generally, CSH’s preference is to interview a participant individually or in small groups (two–four); occasionally participants are interviewed in focus groups (six–eight). Following the consent protocol outlined above, interviews may be recorded on tape and in handwritten notes, and the participant photographed. The interview typically lasts one to four hours, and records the who, what, when and where of the interview. In addition to questions outlined above, the interviewee is asked to provide biographical information (e.g., connection to the study area, genealogy, professional and volunteer affiliations).

2.3 Compensation and Contributions to Community

Many individuals and communities have generously worked with CSH over the years to identify and document the rich natural and cultural resources of these islands for cultural impact, ethno-historical and, more recently, TCP studies. CSH makes every effort to provide some form of compensation to individuals and communities who contribute to cultural studies. This is done in a variety of ways. Individual interview participants are compensated for their time in the form of a small honorarium and/or other *makana* (gift); community organization representatives (who may not be allowed to receive a gift) are asked if they would like a donation to a Hawaiian charter school or nonprofit of their choice to be made anonymously or in the name of the individual or organization participating in the study; contributors are provided their transcripts, interview summaries, photographs and—when possible—a copy of the CIA report; CSH is working to identify a public repository for all cultural studies that will allow easy access to current and past reports; CSH staff do volunteer work for community initiatives that serve to preserve and protect historic and cultural resources. Generally our goal is to provide educational opportunities to students through internships, share our knowledge of historic preservation and cultural resources and the State and Federal laws that guide the historic preservation process, and through involvement in an ongoing working group of public and private stakeholders collaborating to improve and strengthen the §343 environmental review process.

Section 3 Traditional Background

This section draws from archaeology and ethnography, histories, *mo‘olelo* written by Native Hawaiians, and an archive of historic documents and images to present a portrait of Hawaiian culture and history as it relates to the specific permanent project footprint.

3.1 Overview

The *ahupua‘a* (land division) of Kapa‘a belongs in the ancient district of Puna, one of five ancient *moku*, or districts, on Kaua‘i (King 1935:228). Puna was the second largest district on Kaua‘i, behind Kona, and extended from Kīpū, south of Līhu‘e to Kamalomalo‘o, just north of Keālia. For taxation, educational and judicial reasons, new districts were created in the 1840s. The Puna District, with the same boundaries, became the Līhu‘e District, named for an important town in that district. In 1878, King Kalākaua secured a future and name for the new Hui Kawaihau, by creating the new district of Kawaihau (see Section 4). This new district encompassed the *ahupua‘a* ranging from Olohena on the south to Kīlauea on the north. Subsequent alterations to district boundaries in the 1920s left Kawaihau with Olohena as its southernmost boundary and Moloa‘a as its northernmost boundary (King 1935:222).

3.2 Place Names

Place names and *wahi pana* (legendary places) are an integral part of Hawaiian culture. “In Hawaiian culture, if a particular spot is given a name, it is because an event occurred there which has meaning for the people of that time” (McGuire 2000:17). Hawaiian place names convey a wide variety of information about the relationships among people, landscapes, and other natural and cultural resources. Place names may also express cultural, historical and/or spiritual values and concepts important to Hawaiian world views. It is common for places and landscape features to have multiple names, some of which may only be known to certain *‘ohana* (families) or even certain individuals within *‘ohana*, and many of which have been lost, forgotten or kept secret through time. Place names may also convey *kaona* (hidden meanings) and *huna* (secret) information that may even have political or subversive undertones. Before the introduction of writing to the islands, when cultural information was exclusively preserved and perpetuated orally, Hawaiians gave names to literally everything in their environment, including individual garden plots and *‘auwai* (ditch, canal), house sites, intangible phenomena such as meteorological and atmospheric effects, *pōhaku* (rocks), *pūnāwai* (freshwater springs), and many others.

In this section, translations are presented without attribution from Pukui et al. (1974). Spelling and diacritics also follow Pukui et al.’s (1974) usage.

3.2.1 Place Name of Kapa‘a

Kapa‘a is the name of a land section, town, ditch, elementary school, weir, and beach park in the Kawaihau District in Kaua‘i. Kapa‘a literally translates as “the solid or the closing.” The name Kapa‘a is also a place in Kailua, O‘ahu where a rock quarry has been located since the 1950s. While Pukui et al. (1974) believed the name Kapa‘a may have been derived from the solid rock of the place, no explanations are offered for how Kapa‘a on the island of Kaua‘i was named.

Kahana is the name of a land (possibly) and *‘ili* (land section, a subdivision of an *ahupua‘a*) in Kapa‘a where uncultivated *lo‘i* (taro pondfield) were claimed (LCA 03971). Kahana literally translates as “cutting.”

Kalolo/Kaloko is the name of a village or house lot in the Kapa‘a Ahupua‘a (LCA 3638, 8843).

Kaloloku is the name of a swamp in the back of Kapa‘a and Waipouli.

Kehau is the name of a wind of Kapa‘a (Fornander 1916-1919:V:96–97).

Kuahiahi/Kaahiahi/Keahiahi are the possible names of a rocky headland at the north end of Kapa‘a Ahupua‘a; it is also the location of the first Kapa‘a School from 1883 to 1908 and the location of a former *heiau* (house of worship) called Kuahiahi (Lahainaluna Students 1885:216). It is also the place where the legendary figure and keeper of the wind gourd of La‘amaomao, Pāka‘a (sometimes spelled Paka‘a, e.g., in Pukui 1983), grew up and fished (Wichman 1998:85).

Kupanihi is the name of a pond in the Puna district associated with Kaeo, Kaumuali‘i‘s older brother (Lahainaluna Students 1885:216). It is also the name of a fishpond and land in Kapa‘a claimed in LCAs 3971 and 3243.

Maele‘ele is the name of a land division, possibly an *‘ili* in Kapa‘a in which *lo‘i* were cultivated (LCA 3638).

Mailehuna is the name of a hill where the present-day Kapa‘a School is located. It is also the name of a former *heiau* at this location (Lahainaluna Students 1885).

Mō‘īkeha Canal is the canal that is traversed by two plantation-era railroads near the present day Kapa‘a Public Library and the Coral Reef Hotel.

Puhi is the name of a village or house lot in the Kapa‘a Ahupua‘a claimed in LCAs 3554 and 3599.

Waika‘a/Waikaee is a canal and boat ramp in Kapa‘a described as being located in the uplands near Nonou (Akina 1913).

Waimahanalua is the name of a stream and school located near the old Makee Landing near the present-day Mō‘īkeha Canal (Akina 1913). The name *mahanalua* suggests the stream was forked and fed by multiple streams which could well be the case since the backlands of Kapa‘a were swamp lands fed by many streams.

Ulukiu is the name of a village or house lot in the Kapa‘a Ahupua‘a claimed in LCA 08837.

3.3 ‘Ōlelo No‘eau

Hawaiian sayings collected, translated, and annotated by Mary Kawena Pukui offer a unique opportunity to relish the wisdom, poetic beauty, and earthy humor of the Hawaiian language. They reveal deeper layers of meaning, revealing understanding not only of Hawai‘i and its people but of all humanity. These sayings are considered to be the highest form of cultural expression in old Hawai‘i and they bring one closer to the everyday thoughts and lives of the Hawaiians who created them (Pukui 1983:VII).

The following poetic sayings refer to the place of study, Kapa‘a, Kaua‘i:

Pukui (1983:187) associates the *kalukalu* with lovers in "*ke kalukalu moe ipo o Kapa‘a*; the *kalukalu* of Kapa‘a that sleeps with the lover:"

> *Ka lulu o Mō‘īkeha i ka laulā o Kapa‘a.*
>
> *The calm of Mō‘īkeha in the breadth of Kapa‘a.*
>
> The chief Mō‘īkeha enjoyed the peace of Kapa‘a, Kaua‘i, the place he chose as his permanent home

It is said the *kalukalu* is a fern somewhat like the *palapalai* (*Microlepia strigosa*) famous to Kapa‘a, Kaua‘i. Mō‘īkeha's love for Kapa‘a is recalled in the *‘ōlelo no‘eau*, "*Ka lulu o Mō‘īkeha i ka laulā o Kapa‘a*. The calm of Mō‘īkeha in the breadth of Kapa‘a" (Pukui, 1983:157):

> *Ke kalukalu moe ipo o Kapa‘a.*
>
> The *kalukalu* of Kapa‘a that sleeps with the lover.
>
> Lovers were said to like whiling the time in the soft kalukalu plants.

When describing types of mats or piles of mats, *kūmoena,* an account by Pukui and Elbert (1986:182) also strongly links *kalukalu* with Kapa‘a.

> *‘Oia kūmoena kalukalu ho‘i o Kapa‘a.*
>
> That expanse of kalukalu grass of Kapa‘a.

Kapa‘a is famous for its *kalukalu* grass, described as a kind of rush or grass like *kaluhā* sedges, famous on Kaua‘i. It is the fine gauze-like tapa made on Kaua‘i, reserved for chiefs (Pukui and Elbert 1986:124).

3.4 *Mo‘olelo* Associated with Specific Place Names

3.4.1 Palila and Ka‘ea

High in the *mauka* region of Kapa‘a in the Makaleha mountains at a place called Ka‘ea is reported to be the supernatural banana grove of the Kaua‘i *kupua* or demigod Palila, grandson of Hina (Handy and Handy 1972:424). Joseph Akina writing for *Kuokoa* newspaper in 1913 illustrates Palila's banana grove:

> The stalk could hardly be surrounded by two men, and was about 35 feet high from the soil to the lowest petiole. The length of the cluster from stem to lowest end of the bunch of bananas was about 1 ¾ fathoms long (one anana and one muku). There were only two bananas on each about 4 ½ inches around the middle. There were just two bananas, one on the east side and one on the west, each about a foot or more in length. The one on the east side was tartish, like a waiawi (Spanish guava) in taste and the one on the west was practically tasteless. The diameter of the end of the fruit stem of this banana seemed to be about 1 ½ feet. This kind of banana plant and its fruit seemed almost supernatural . . . [Akina 1913:5]

3.4.2 Ka Lulu o Mō‘īkeha

Kapa‘a was the home of the legendary *ali‘i* (chief) Mō‘īkeha. Born at Waipi‘o on the island of Hawai‘i, Mō‘īkeha sailed to Kahiki (Tahiti), the home of his grandfather Maweke, after a disastrous flood. On his return to Hawai‘i, he settled at Kapa‘a, Kaua‘i. Kila, Mō‘īkeha's favorite of three sons by the Kaua‘i chiefess Ho‘oipoikamalani, was born at Kapa‘a and was said to be the most handsome man on the island. It was Kila who was sent by his father back to Kahiki to slay his old enemies and retrieve a foster son, the high chief La‘amaikahiki (Beckwith 1970:352–358; Fornander 1917:IV:1:160; Handy and Handy 1972:424; Kalākaua 1888:130–135). Mō‘īkeha’s love for Kapa‘a is recalled in the *‘ōlelo no‘eau: Ka lulu o Mō‘īkeha i ka laulā o Kapa‘a*. “The calm of Mō‘īkeha in the breadth of Kapa‘a” (Pukui 1983:157).

Lulu-o-Mō‘īkeha is described as being situated “near the landing and the school of Waimahanalua” (Akina 1913:5). The landing in Kapa‘a was known as the Makee Landing and was probably constructed in the late 1870s, along with the Makee Sugar Mill. Today, in place of the old Makee Landing is part of a breakwater located on the north side of Mō‘īkeha Canal near the present-day Coral Reef Hotel.

Akina (1913) tells the story of how Mō‘īkeha’s son, Kila, stocks the islands with the fish *akule* (Big-eyed scad fish, *Selar crumenophthalmus*), *kawakawa* (bonito, *Euthynnus yaito*), and *‘ōpelu* (mackerel scad, *Decapterus pinnulatus*). When Kila travels to Kahiki, he seeks out his grandfather Maweke and explains that he is the child of Mō‘īkeha. When Maweke asks Kila if Mō‘īkeha is enjoying himself, Kila answers with the following chant:

My father enjoys the billowing clouds	*I walea no ku‘u makuakāne i ke ao*
over Pōhaku-pili,	*ho‘okanunu, iluna o Pōhakupili*
The sticky and delicious poi,	*I ka poi uouo ono ae no a,*
With the fish brought from Puna,	*Me ka i‘a i na mai o ka Puna,*
The broad-backed shrimp of Kapalua,	*Ka opae hoainahanaha o Kapalua;*
The dark-backed shrimp of Pōhakuhapai,	*Na opae kua hauli o Pohakuhapai,*
The potent awa root of Maiaki‘i,	*Na puawa ona mai no o Maiakii,*
The breadfruit laid in the embers at Makialo	*Me ka ulu moelehu mai no o Makialo,*
The large heavy taros of Keahāpana	*Me na kalo pehi hua o Keahapana,*
The crooked surf of Makāiwa too	*A i kekee nalu ae no hoi o Makaiwa,*
The bending hither and thither of the reed	*A i ke kahuli aku kahuli mai o ka pua*
and rush blossoms,	*uku me ka pua neki,*
The swaying of the kalukalu grasses	*A i ka nu‘a ae no o ke kalukalu*
of Puna	*o Puna,*
The large, plump, private parts of	*A i na mea nui nepunepu no a ku‘u*
my mothers,	*mau makuahine.*
Of Ho‘oipoikamalanai and Hinau-u,	*O Hoioipo ikamalanai me Hinau-u,*
the sun that rises and sets,	*A i ka la hiki ae no a napoo aku,*
He enjoys himself on Kaua’i,	*Walea ai no ka nohona ia Kaua‘i*
All of Kaua’i is Mō’īkeha‘s	*Ua puna a puni Kaua‘i ia Mō‘īkeha*

[Akina 1913:6]

Maweke was delighted and when the boy is questioned as to his purpose, Kila tells his grandfather he is seeking fish for his family. Maweke tells Kila to lead the fish back to his homeland. This is how Kila led the *akule, kawakawa* and *‘ōpelu* to Hawai‘i.

3.4.3 Paka‘a and the Wind Gourd of La‘amaomao (Keahiahi)

Kapa‘a also figures prominently in the famous story of Pāka‘a, and the wind gourd of La‘amaomao. Pāka‘a was the son of Kūanu‘uanu, a high-ranking retainer of the Big Island ruling chief Keawenuia‘umi (the son and heir to the legendary chief ‘Umi), and La‘amaomao, the most beautiful girl of Kapa‘a and member of a family of high status *kahuna* (priest). Kūanu‘uanu left the island of Hawai‘i, traveled throughout the other islands and finally settled on Kaua‘i, at Kapa‘a. It was there that he met and married La‘amaomao, although he never revealed his background or high rank to her until the day a messenger arrived, calling Kūanu‘uanu back to the court of Keawenuia‘umi.

By that time, La‘amaomao was with child but Kūanu‘uanu could not take her with him. He instructed her to name the child Pāka‘a if it turned out to be a boy. Pāka‘a was raised on the beach at Kapa‘a by La‘amaomao and her brother Ma‘ilou, a bird snarer. He grew to be an intelligent young man and it is said he was the first to adapt the use of a sail to small fishing canoes. Although Pāka‘a was told by his mother from a very young age that his father was Ma‘ilou, he suspected otherwise and after constant questioning, La‘amaomao told her son the truth about Kūanu‘uanu.

Intent on seeking out his real father and making himself known to him, Pāka‘a prepared for the journey to the island of Hawai‘i. His mother presented to him a tightly covered gourd containing the bones of her grandmother, also named La‘amaomao, the goddess of the winds. With the gourd and chants taught to him by his mother, Pāka‘a could command the forces of all the winds in Hawai‘i. While this story continues on at length about Pāka‘a and his exploits on Hawai‘i Island and later on Moloka‘i, it will not be dwelt upon further here. It is important to note several versions of this story do include the chants which give the traditional names of all the winds of all the districts on all the islands, preserving them for this and future generations (Beckwith 1970:86–87; Fornander 1918-19:V:1:78–128; Nakuina 1990; Rice 1923:69–89; Thrum 1923:53–67).

Frederick Wichman (1998:84) writes that Pāka‘a grew up on a headland named Keahiahi. It was said that at Keahiahi, Pāka‘a learned to catch *mālolo,* his favorite fish. After studying the ocean and devising his plan to fabricate a sail, Pāka‘a wove a sail in the shape of a crab claw and tried it out on his uncle’s canoe. One day, after going out to catch *mālolo*, he challenged the other fishermen to race to shore. He convinced them to fill his canoe with fish suggesting it was the only way he could truly claim the prize if he won:

> The fishermen began paddling toward shore. They watched as Pāka‘a paddled farther out to sea and began to fumble with a pole that had a mat tied to it. It looked so funny that they began to laugh, and soon they lost the rhythm of their own paddling. Suddenly Pāka‘a’s mast was up and the sail filled with wind. Pāka‘a turned toward shore and shot past the astonished fishermen, landing on the beach far ahead of them. That night, Pāka‘a, his mother, and his uncle had all the mālolo they could eat. [Wichman 1998:85]

3.4.4 Kaweloleimākua

Kapa‘a is also mentioned in traditions concerning Kawelo (Kaweloleimākua), Ka‘ililauokekoa (Mō‘īkeha's daughter, or granddaughter, depending on different versions of the tale), the *mo‘o* or reptile Kalamainu‘u and the origins of the *hīna‘i hīnālea* or the fish trap used to catch the *hīnālea* fish, and the story of Lonoikamakahiki (Fornander 1917:IV:2:318, IV:3:704-705; Kamakau 1976:80; Rice 1923:106-108; Thrum 1923:123-135).

3.4.5 Kaililauokekoa the Chiefess of Kapa‘a and the Lute Kanikawi

The tradition of Kaililauokekoa (“The leaf-bark of the Koa”) tells the story of a daughter of Mō‘īkeha who goes off to have adventures in the uplands with a certain youth of Pihanakalani who plays artfully on the musical instrument named Kanikawi. The residence of Mō‘īkeha and Kaililauokekoa is said to have been at Kapa‘a with a poetic reference to the grass (“the night drooping grass of Kapa‘a;” see the discussion of the *kalukalu* grass below). Mō‘īkeha commanded his subjects to search for his errant daughter and “The valleys, pits, cliffs, hills and plains, were crowded with the common people.” (Thrum 1923:131). Her lover is captured and is imprisoned down in Kapa‘a. A boy surreptitiously brings the prisoner food by sneaking through the *kalukalu* grass and *Ahuawa* rushes. Kahuna end up giving their blessing to the marriage of the young couple.

Many Kaua‘i legends refer to Ka‘ililauokekoa (Mo‘ikeha’s daughter, or granddaughter, depending on different versions of the tale), the *mo‘o* Kalamainu‘u and the origins of the *hīna‘i hīnālea* or the fish trap used to catch the *hīnālea* fish, and the story of Lonoikamakahiki (Fornander 1917:IV:2:318, IV:3:704–705; Kamakau 1976:80; Rice 1923:106–108; Thrum 1923:123–135).

3.4.6 Lepeamoa

In the Legend of “Lepeamoa (The Chicken Girl of Pālama)” (Thrum 1923:177) is a reference to a fantastic battle at Kapa‘a between Lepeamoa’s brother, the hero Kauilani and a supernatural *kupua* called Akuapehuale (“god of swollen billows”):

> Kauilani struck him a heavy blow and the spear leaped again and again upon him, till he rolled into a mountain stream at a place called Kapa‘a, out of which he crawled, almost drowned. Then he was driven along even to the image houses, where a fierce battle took place, in which the wooden images took part, many of them being torn to pieces by the teeth of Akuapehuale. [Thrum 1923:177]

3.5 Heiau

In the 1880s, a group of Lahainaluna students traveled throughout Hawai‘i collecting stories. During their expedition, they stopped in Kapa‘a and Keālia and gathered information regarding *heiau* (place of worship) in the region. More than a dozen *heiau* were named in Kapa‘a and Keālia, which reinforces the traditional significance of these *ahupua‘a* to Native Hawaiians (Lahainaluna Students 1885). Table 1 lists the location, type, associated chief or priest, and other relevant comments or references for each *heiau*.

Table 1. List of *Heiau* in Kapa‘a (source: Bushnell et al. 2002)

Name	Location	Type	Associated Chief/Priest
Mailehuna	Kapa‘a (Mailehuna is the area of the present day Kapa‘a School)	Unknown	Kiha, Kaumuali‘i/ Lukahakona
Pueo	Kapa‘a	Unknown	Kiha, Kaumuali‘i/ Lukahakona
Pahua	Kapa‘a/Keālia	Unknown	Kiha/Lukahakona
Kumalae	Kapa‘a/Keālia	Unknown	Kiha/Lukahakona
Waiehumalama	Kapa‘a/Keālia	Unknown	Kiha/Lukahakona
Napuupaakai	Kapa‘a/Keālia	Unknown	Kiha/Lukahakona
Noemakalii	Kapa‘a/Keālia	“*Heiau* for birth of Kauai Chiefs, like Holoholokū”	Unknown
Puukoa	Kapa‘a/Keālia	“*Unu*” (*heiau* for fishermen or an agricultural *heiau*)	Unknown
Piouka	Kapa‘a/Keālia	“*Unu*-type *heiau*”	Unknown
Una	Kapa‘a/Keālia	Unknown	Kiha/Lukahakona
Mano	Kapa‘a/Keālia	Unknown	Kiha/Lukahakona
Kuahiahi	Kapa‘a (where government school stands now)	Unknown	Kiha/Lukahakona
Makanalimu	Upland of Kawaihau	Unknown	Kaumuali‘i
Kaluluomoikeha	Kapa‘a	Unknown	Mō‘īkeha

The exact locations of these *heiau* are unknown. The locations of two of the *heiau* correlate with locations of *wahi pana* that are known to be near the coast, Kuahiahi and Kaluluomō‘īkeha. Kuahiahi (also spelled Kaahiahi and Keahiahi) is the rocky headland at the north end of Kapa‘a where the first Kapa‘a School was once located. Kaluluo Mō‘īkeha is thought to be the general area near the Mō‘īkeha Canal and the present-day Coral Reef Hotel.

3.6 Settlement and Subsistence

The association of the *ahupua‘a* of Kapa‘a with legendary historical figures such as Mō‘īkeha implies the area was settled prior to Mō‘īkeha’s time (early fourteenth century), although the extent of this settlement is not known. Handy (1940) counts Kapa‘a as one of the major settlement areas of Kaua‘i in pre-Contact times, and both Vancouver (1798) and Wilkes

(1844) were impressed with this “most fertile and pleasant district” with its fields of “sugarcane, taro” and other crops. Through archaeology and other sources, it is known that at one time agricultural and domestic activities extended into the far *mauka* areas of Kapa‘a, but were abandoned by the mid-nineteenth century.

The LCA pattern (see Section 4.3) in Kapa‘a shows taro *lo‘i* and *kula* on the rim of the swamplands and extending somewhat into watered valleys. Marshlands without known LCAs may have had *lo‘i* along the edges. All six LCA claimants had shoreline house lots *makai* of the swamp. Permanent settlement is assumed to have existed in association with *mauka* agricultural lands in the pre-Contact period, but this is not reflected in the LCA testimonies. The *mauka* settlements were probably abandoned before the nineteenth century. Permanent settlement occurred along the coast throughout late pre-Contact, as indicated by the presence of extensive and thick habitation deposits in the shore and backshore areas of Kapa‘a, especially along Inia Street and Kūhiō Highway (Hammatt 1991). However, in the early twentieth century, the entire area behind Kapa‘a Town was rice and *kula* lots. Flood control measures were instituted in the 1960s, resulting in marshlands used previously for taro and then rice being drained to become cane and pasture.

The current project area is situated *mauka* of Kapa‘a Town.

3.7 *Mele* (Song) and *‘Oli* (Chant)

Mele and *‘oli* were recorded by Emerson (1965) and these two genres reference “the expanse of the Kapa‘a uplands” as well as reflect life near the ocean.

Mele Kahea

Kunihi ka mauna i ka la‘i e,

O Wai-ale-ale o la i Wai-lua,

Huki a‘e la i ka lanli

Ka papa au-wai o ka Wai-kini;

Alai la a‘e la e Nou-nou,

Nalo ka Ipu-ha‘a,

Ka laula mauka o Kapa‘a, e!

Mai pa‘a i ka leo !

He ole ka hea mai, e!

[Translation]

Passwora-Song

Steep stands the mountain in calm,

Profile of Wai-ale-ale at Wai-lua.

Gone the stream-spanning plank of Wai-kini,

Filched away by Nou-nou;

Shut off the view of the hill Ipu-ha‘a,

And the upland expanse of Ka-pa‘a.

Give voice and make answer.

Dead silence-no voice in reply.

[Emerson 1965:40]

The answer to this appeal for admission was in these words:

Mele Komo

E hea i ke kanaka e komo maloko,

E hanai ai a hewa waha;

Ela no ka uku la, o ka leo,

A he leo wale no, e!

[Translation]

Welcoming-Song

Call to the man to come in,

And eat till the mouth is stopped;

And this the reward, the voice,

Simply the voice.

The cantillation of the mele komo, in answer to the visitor’s petition, meant not only the opening to him of the halau door, but also his welcome to the life of the halau as a heart-guest of honor, trebly welcome as the bringer of fresh tidings from the outside world. [Emerson 1965:40]

Another *mele* that Emerson (1965) places in Kapa‘a describes:

Some woman, appreciating the situation, posted to the house and waked the sleeper with the information. Ka‘iama hastened to the shore, and as he strained his vision to gain sight of the woman of his infatuation the men at the paddles and the bristling throng on the central platform-the *pola*—of the craft, vanishing in the twilight, made on his imagination the impression of a hazy mountain thicket floating on the waves, but hiding from view some rare flower. He gave vent to his feelings in song:

Mele

Pua ehu kamalena· ka uka o Kapa‘a;

Luhi·ehu iho la ka pua i Maile-huna;

Hele a ha ka iwi a ke Koolau,
Ke pua. mai i ka maka o ka nahelehele,
I hali hoo-muu, hoohalana i Wailua.
Pa kahea a Koolau·wahine,
O Pua-ke‘i, e-e-e-e!
He pua laukona· ka moe e aloh‘ai;
O ia moe la, e kaulele hou,!
No ka po i hala aku aku nel.
Hoiho kaua a eloelo, e ka hoa, e,
A hookahi!

[Translation]
Song
Misty and dim, a bush in the wilds of Kapa‘a,
The paddlers bend to their work, as the flower-laden
Shrub inclines to the earth in Maile-huna;
They sway like reeds in the breeze to crack their bones-
Such the sight as I look at this tossing grove,
The rhythmic dip and swing on to Wailua.
My call to the witch shall fly with the breeze,
Shall be heard at Pua-ke‘i, e-he, e-he!
The flower-stalk Laukona beguiles man to love,
Can bring back the taste of joys once our own,
Make real again the hours that are flown.
Turn hither, mine own, let’s drench us with love-
Just for one night!
[Emerson 1965:237]

The unchivalrous indiscretion of the youth in publishing the secret of his amour elicited from Kamehameha only the sarcastic remark, ‘Couldn’t he eat his food and keep his mouth shut?’ The lady herself took the same view of his action. There was no evasion in her reply; her only reproach was for his childishness in blabbing. [Emerson 1965:238]

Both of these *mele* briefly mention Kapa‘a and identify it as a place of great expanse of land, describing the verdant “bush in the wilds” along with misty accounts in the area. There is allusion to the upland areas not being occupied by human settlement and this is reflected in the earliest maps of Kapa‘a (Figure 9).

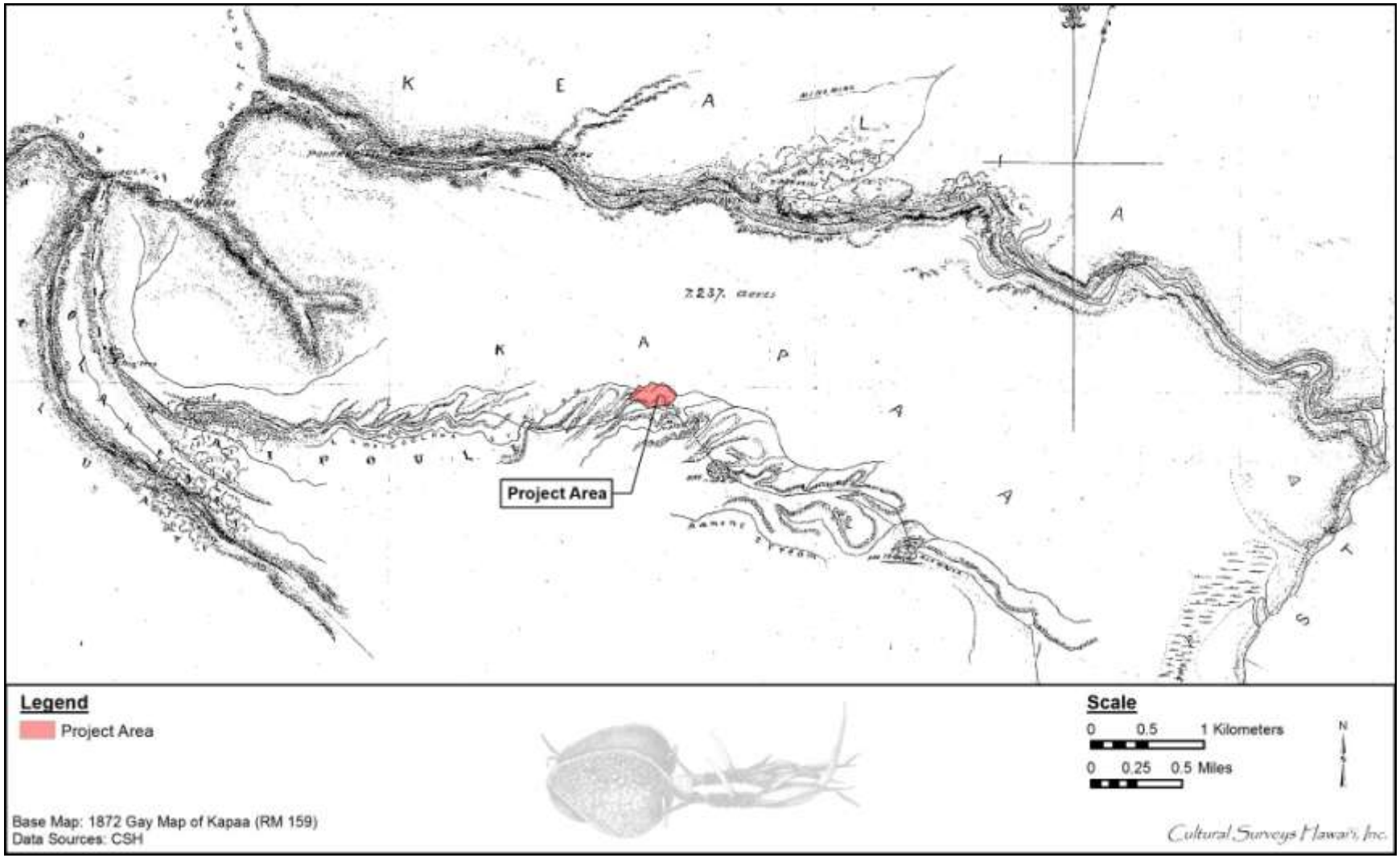

Figure 9. Project area identified in 1872 Gay map of Kapa‘a

Section 4 Historical Background

4.1 Overview

The following section briefly summarizes the historical background of Kapa‘a from the time of Captain Cook or the early post-Contact period, to modern times.

4.1.1 *Kalukalu* Grass of Kapa‘a

“*Kūmoena Kalukalu Kapa‘a*” or “Kapa‘a is like the *Kalukalu* mats” is a line from a chant recited by Lonoikamakahiki. *Kalukalu* is a sedge grass, apparently used for weaving mats (Fornander 1917:IV:2:318–19). Pukui (1983:187) associates the *kalukalu* with lovers in “*ke Kalukalu moe ipo o Kapa‘a*; the *Kalukalu* of Kapa‘a that sleeps with the lover.” According to Wichman (1998:84), “a *Kalukalu* mat was laid on the ground under a tree, covered with a thick pile of grass, and a second mat was thrown over that for a comfortable bed.” Kaua‘i was famous for this peculiar grass, and it probably grew around the marshlands of Kapa‘a. It is thought to be extinct now, but an old-time resident of the area recalled that it had edible roots, “somewhat like peanuts.” Perhaps it was a famine food source (Kapa‘a Elementary School 1933:VI).

4.1.1.1 Kanaka-Nunui-Moe—The Sleeping Giant

One version of the legend features Kanaka-Nuinui-Moe, the Sleeping Giant, beloved by the residents of Kapa‘a Town for his gentle, helpful ways (Wichman 1985). He towered over the tallest coconut trees and resembled a hill when sitting still. Using his great weight, he would often flatten a hilltop making it suitable for cultivation. Wherever he stepped, he created footprints which the people would use to cultivate bananas, his favorite food. Called Nuinui for short, the giant would often yawn and cause wind blasts from his mouth which often blew down houses that he would immediately repair. He would have to sleep after a hundred years, lying down at a hillside for hundreds of years while around him, a dense forest would grow. It is believed that he would wake up again someday (Wichman 1985:13-16).

4.2 Early Historic Period

In 1793, George Vancouver (1798:221–223) examined the east coast of the island from his ship and stated that it was the “most fertile and pleasant district of the island.” However, he did not anchor nor go ashore due to inhospitable ocean conditions.

In 1840, Peale and Rich, with Charles Wilkes’ (1844) United States Exploring Expedition, traversed the coastline on horseback heading north from Wailua:

> The country on the way is of the same character as that already seen. They passed the small villages of Kuapau [Kapa‘a], Keālia, Anehola, Mowaa, and Kauharaki, situated at the mouths of the mountain streams, which were closed with similar sand-bars to those already described. These bars afforded places to cross at, though requiring great precaution when on horseback. The streams above the bars were in most cases, deep, wide, and navigable a few miles for canoes. Besides the sugarcane, taro, etc., some good fields of rice were seen. The country may be called open; it is covered with grass forming excellent pasture-grounds, and abounds in plover and turnstones, scattered in small flocks. [Wilkes 1844:69]

Although most of the historic record documents for Kaua‘i in this period revolve around missionary activities and the missions themselves, there was indication that the Kapa‘a area was being considered for new sugar cane experiments, similar to those occurring in Kōloa. In a historic move, Ladd and Company received a 50-year lease on land in Kōloa from Kamehameha III and Kaua‘i Governor Kaikio‘ewa. The terms of the lease allowed the new sugar company "the right of someone other than a chief to control land" and had profound effects on "traditional notions of land tenure dominated by the chiefly hierarchy" (Donohugh 2001:88). In 1837, a very similar lease with similar terms was granted to Wilama Ferani, a merchant and U.S. citizen based in Honolulu (Hawai‘i State Archives 1837). The lease was granted by Kauikeaouli for the lands of Kapa‘a, Keālia, and Waipouli for 20 years for the following purpose:

> for the cultivation of sugar cane and anything else that may grow on said land, with all of the right for some place to graze animals, and the forest land above to the top of the mountains and the people who are living on said lands, it is to them whether they stay or not, and if they stay, it shall be as follows: They may cultivate the land according to the instructions of Wilama Ferani and his heirs and those he may designate under him. [Hawai‘i State Archives 1837]

Unlike Ladd & Company which eventually became the Koloa Sugar Company, there is no further reference to Wilama Ferani and his lease for lands in Kapa‘a, Keālia, and Waipouli. In a brief search for information on Honolulu merchant Wilama Ferani, nothing was found. It is thought that perhaps Wilama Ferani may be another name for William French, a well-known Honolulu merchant who is documented as having experimented with grinding sugar cane in Waimea, Kaua‘i at about the same time the 1837 lease for lands in Kapa‘a, Keālia, and Waipouli was signed (Joesting 1984:152).

In 1849, the son of Wai‘oli missionary William P. Alexander recorded a trip his father took around Kaua‘i. Although he focuses on the larger mission settlements like Kōloa and Hanalei, he does mention Kapa‘a.

> A few miles from Wailua, near Kapa‘a we passed the wreck of a schooner on the beach, which once belonged to Capt. Bernard. It was driven in a gale over the reef, and up on the beach, where it now lies. A few miles further we arrived at Keālia. We had some difficulty crossing the river at this place, owing to the restiveness of our horses. The country here near the shore was rather uninviting, except the valley which always contained streams of water. [Alexander 1991:123]

In later years, the notorious Kapa‘a reef became the location of many shipwrecks, particularly once a landing was built there in the 1880s.

The first large-scale agricultural enterprise in Kapa‘a began in 1877 with the Makee Sugar Plantation and the Hui Kawaihau (Dole 1916:8). Makee Plantation employed thousands of Portuguese and Japanese immigrants by the late 1800s, leading to its own railroad and an associated school for its workers. For a historical background on the prominent Hui Kawaihau, its connections with Makee Plantation, and the importance of the plantation and its influence on the local economy, see Section 4.4.1 below.

Narrow wagon roads gave way to macadamized roads in the early part of the twentieth century. This new road was called the Kaua‘i Belt Road and parts of it are thought to have

followed the “Old Government Road” (Cook 1999). In Kapa‘a, the present day Kūhiō Highway probably follows the same route as the original Government Road and subsequent Kaua‘i Belt Road. The location of the *kuleana* awards in Kapa‘a indicates the majority of the house lots were situated along the Government Road. LCA 3243 names a “road” as one of its boundaries.

4.3 The Māhele

Toward the mid-nineteenth century, the Organic Acts of 1845 and 1846 initiated the process of the Māhele—the division of Hawaiian lands—which divided the lands for private property ownership amongst all Hawaiians. In 1848, the crown, the Hawaiian government, and the *ali‘i* received their land titles.

The *maka‘āinana* received their *kuleana* (Native land rights) awards (individual land parcels) in 1850 and thereafter. Although many Hawaiians did not submit or follow through on claims for their lands, the distribution of LCA parcels can provide insight into patterns of residence and agriculture. Many of these patterns had probably existed for centuries past. It is through records for Land Commission Awards (LCAs) generated during the Māhele that specific documentation of traditional life in Kapa‘a Ahupua‘a comes to light.

During the Māhele, Kapa‘a was taken as Crown Lands (Office of the Commissioner of Public Lands 1929). The *‘ili* of Paikahawai and Ulakiu in Kapa‘a Ahupua‘a were retained as Government Lands. Table 2 displays LCA number, claimant’s name, *‘ili* name the claim is found in, and land use of parcels (if applicable).

Table 2. Māhele Land Claims in Kapa‘a Ahupua‘a

LCA	Claimant	*‘Ili*	Land use	Award
08843	Kiau and son, Apahu	Apopo, Kalolo Village	Six *lo‘i*, small *kula* and house lot	Two *‘āpana*; 2.75 acres
10564	Oleloa, Daniela	Kapa‘a, Puna;	With one fishpond; ten *lo‘i* and a fishpond	No award in Kapa‘a, Puna; award in Waioli, Halelea
08247	Ehu	Moalepe	Approx. 20 *lo‘i* lying waste, some orange trees	One *‘āpana*, Kapa‘a
08837	Kamapa‘a	Awawaloa, Ulukiu Village	Nine *lo‘i*, and adjoining *kula*; house lot	Awawaloa: one *‘āpana*; Wakiu three *‘āpana*
03638	Huluili, Kahoiu (Kadaio)	Maeleele, Kaloko Village	Fifteen *lo‘i* in Maeleele and adjoining *kula*; house lot in village of Kaloko (Kalolo) Maeleele: two *‘āpana*, 5 acres	Maeleele: two *‘āpana*, 5 acres
03971, 03243	Honoli‘i, Ioane	Kahana, Kupanihi	Six uncultivated *lo‘i*, house lot in Kupanihi Village	Kupanihi: two *‘āpana*, 1 acre
03554, 03599	Keo	Hahanui,	Entire *‘ili* of Kahanui, 15 *lo‘i*, house lot in Puhi Village	No award in Kapa‘a, Puna; award in Waila‘au, Kona

The land claims during this period show that only five individuals were awarded land parcels in the relatively large *ahupua‘a* of Kapa‘a. The five awardees include Kiau (#08843), Kamapa‘a (#08837), Ioane Honoli‘i (#03971), Huluili (#03638), and Ehu (#08247). In addition, two land claims (#10564 and #03554 [together] and #3559) were not awarded in Kapa‘a. Four of the five awardees received multiple parcels which show similarities. All four had *lo‘i* or irrigated *kalo* fields on the *mauka* side of the lowland swampy area, sometimes extending a short distance up into small, shallow gulches and valleys. Many of these *lo‘i* parcels name *pali* or hills/cliffs as boundaries (Figure 10). Each LCA also had a separate house lot located on the *makai* side of the swamp, near the beach. Three of the land claims name ponds on their lands, including Puhi Pond (LCA #03554), as well as fishponds in Kupanihi ‘Ili (LCA #03971) and Hahanui ‘Ili (LCA #10564). Loko Kihapai may be the same as the fishpond in Hahanui as it was named in the same land claim. The other two *loko* are associated with house lots, situated on the *makai* edge of the Kapa‘a swamplands, suggesting modification of the natural swamplands. Other natural and cultural resources mentioned in the LCAs include freshwater springs, pig pens, *hau* bushes, *hala* clumps, streams, *‘auwai*, and *kula* or pasturelands.

Interestingly, the residential “village” of Kapa‘a did not exist as a single entity, but was a series of probably small settlements or compounds, perhaps even individual house lots which stretched along the shoreline of the *ahupua‘a* and included (south to north) Kupanihi (Makahaikupanihi), Kalolo (Kaulolo), Puhi, and Uluki.

The fifth individual, Ehu (LCA #08247), was the only person to be awarded a single parcel in the upland area of Kapa‘a, in Moalepe Valley, approximately 5 miles *mauka* of the coast. In 1848, when Ehu made his claim, he was the only one living there. A few years later, according to Honoli‘i’s testimony to support Ehu’s claim, “There are no houses and no people now living on the land. Ehu found himself lonely there, all his neighbors having either died or left the land. Ehu now lives in Wailua.” Evidently Ehu may have been the last person to live at and cultivate in the traditional way, the far *mauka* region of Kapa‘a.

There were no *kuleana* claims found within the project area north of the Kapa‘a Homesteads.

4.4 Late Nineteenth Century to Present

E. Craighill Handy (1940) describes the remains of agricultural sites in Kapa‘a in the early part of the twentieth century:

> There are extensive terrace areas on the flatlands below the mountains, watered by Kapahi, Makaleha, and Moalepi Streams, where the upper Kapaa homesteads are located. Kapaa river is formed by the union of these three streams. For 4 miles or more along the course of this river the pockets of flatland along the river bottom were built into terraces. A little way up Kaehulua, there were small terrace areas which are now either in cane or under grass. The flatlands of Waianuenue and coastal Kapaa, which are now mostly planted in sugar cane, were presumably terrace anciently, except perhaps the marshy sections. [Handy 1940:68]

These agricultural fields were used to grow irrigated taro; Kapa‘a once had a “highly developed irrigation system,” and thus was one of the pre-Contact centers of population (Handy and Handy 1972:269). Handy also mentions that Kapa‘a is a district with a broad coastal plain bordering the sea “which would be suitable for sweet potato plantings; presumably

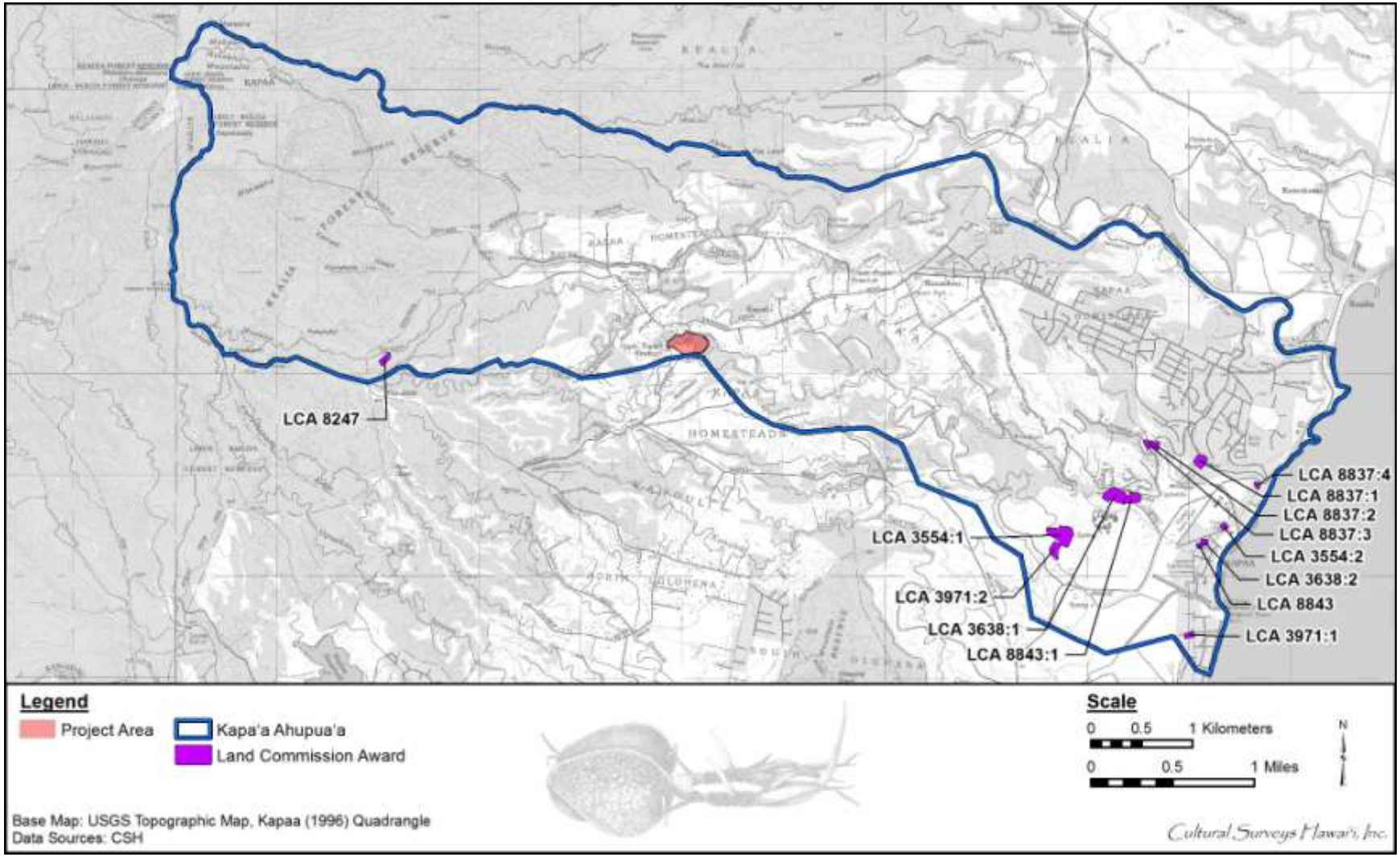

Figure 10. Project area with related Land Commission Awards in Kapa‘a (USGS 1996)

a great many used to be grown in this section" (Handy 1940:153). Yams were grown inland in all sections of Puna (Handy 1940:171). The farmers in the valleys of Puna practiced "diversified farming: taro, sweet potatoes, breadfruit, coconuts" (Handy and Handy 1972:423). By 1905, the upland areas of Kapa‘a were parceled out and also include reference to a reservoir (Figure 11). A 1910 USGS topographic map illustrates the steep landscape that both homesteaders and farmers were assigned (Figure 12).

4.4.1 Makee Sugar Plantation and the *Hui* Kawaihau

As mentioned above, the first large-scale agricultural enterprise in Kapa‘a was established in 1877 by the Makee Sugar Plantation and the Hui Kawaihau (Dole 1916:8). The Hui Kawaihau was originally a choral society begun in Honolulu whose membership consisted of many prominent names, both Hawaiian and *haole* (Caucasian, foreigner). It was Kalākaua's thought that the Hui members could join forces with Makee, who had previous sugar plantation experience on Maui, to establish a successful sugar corporation on the east side of Kaua‘i. Captain Makee was given land in Kapa‘a to build a mill and he agreed to grind cane grown by Hui members. Kalākaua declared the land between Wailua and Moloa‘a to be the Kawaihau District, a fifth district. For four years, the Hui attempted to grow sugar cane at Kapahi, on the plateau lands above Kapa‘a (Figure 13). After a fire destroyed almost one half of the Hui's second crop of cane and the untimely death of one of their principal advocatesCaptain James Makee—the Hui began to disperse and property and leasehold rights passed on to Makee's son-in-law and new Makee Plantation owner, Colonel Z.S. Spalding (Dole 1916:14).

As part of the infrastructure of the new plantation, a sugar mill was erected and the Makee Landing was built in Kapa‘a during the early years of the Makee Sugar Plantation. Following Captain Makee's death, Colonel Spalding took control of the Plantation and in 1885 moved the mill to Keālia (Cook 1999: 51) (Figure 14). The deteriorating stone smokestack and landing were still there well into the 1900s (Damon 1931:359).

Condè and Best (1973:180) suggest that railroad construction for the Makee Plantation started just prior to the mid-1890s. There is one reference to a railroad line leading from the Kapa‘a landing to Keālia in 1891. During Queen Lili‘uokalani's visit to Kaua‘i in the summer of 1891, the royal party was treated to music by a band, probably shipped in from O‘ahu. "The band came by ship to Kapa‘a and then by train to Keālia" (Joesting 1984:252). This line is depicted on a 1910 USGS map which shows the line heading south from Keālia Mill (Figure 12) and splitting near the present Coral Reef Hotel, one finger going to the old Kapa‘a Landing (Makee Landing) and another line heading *mauka*, crossing the present Mō‘īkeha Canal, traveling southwest up Lehua Street and through what is now goat pasture, along a plateau and into the *mauka* area behind Kapa‘a swamplands. This railroad line was part of a 20 mile network of plantation railroad with some portable track and included a portion of Keālia Valley and in the *mauka* regions of the plateau lands north of Keālia (Condé and Best 1973:180).

By the late 1800s, Makee Plantation was a thriving business with more than 1,000 workers employed (Cook 1999:51). Hundreds of Portuguese and Japanese immigrants found work on Makee Plantation and the new influx of immigrants required more infrastructure. In 1883, a lease for a school lot was signed between Makee Sugar Company and the Board of Education (Kapa‘a Elementary School 1983:9). Stipulations found in the Portuguese immigrant contracts with Makee Sugar Company stated that "children shall be properly instructed in the public

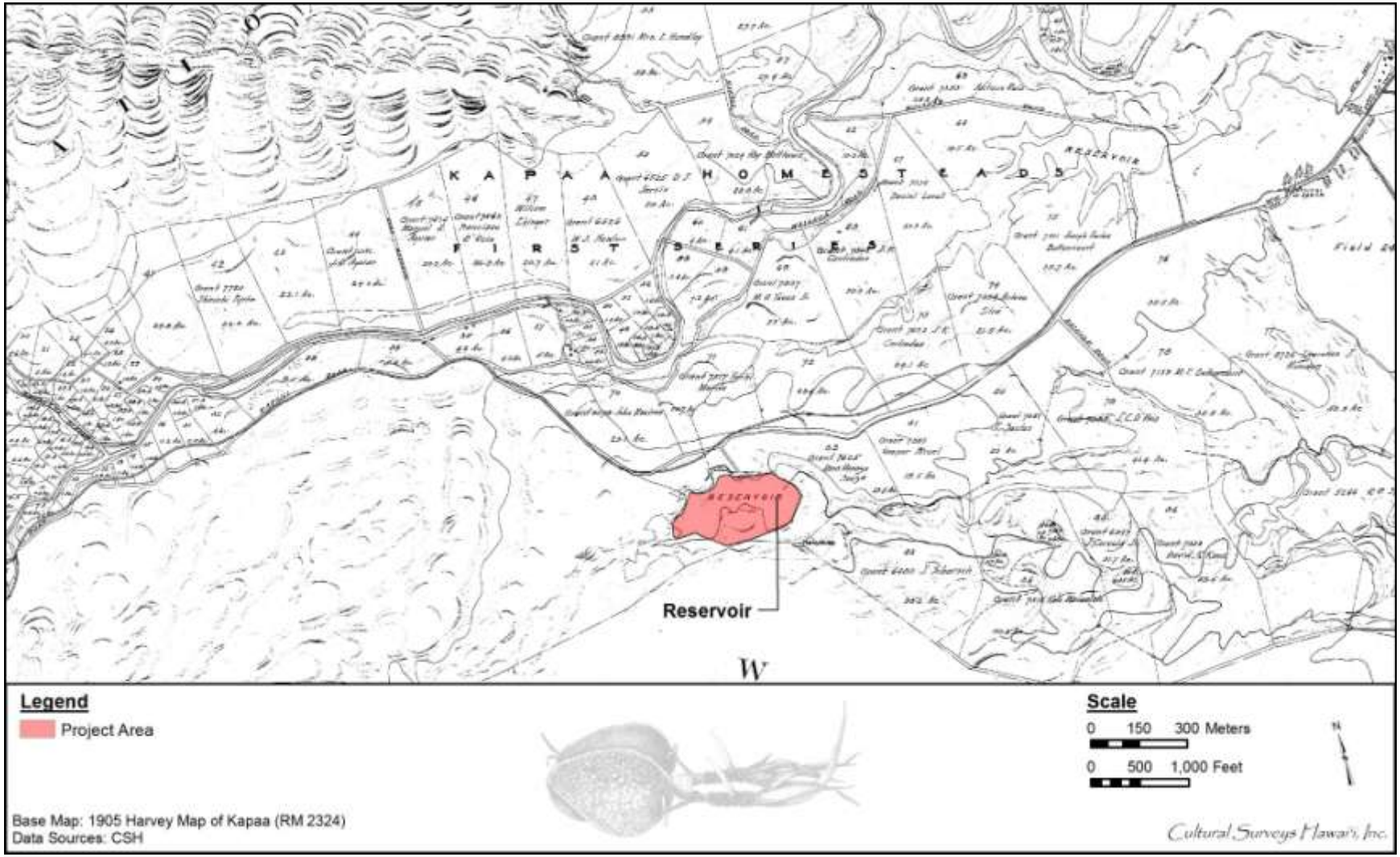

Figure 11. Project area and reservoir overlapped on a 1905 Harvey map of Kapa‘a

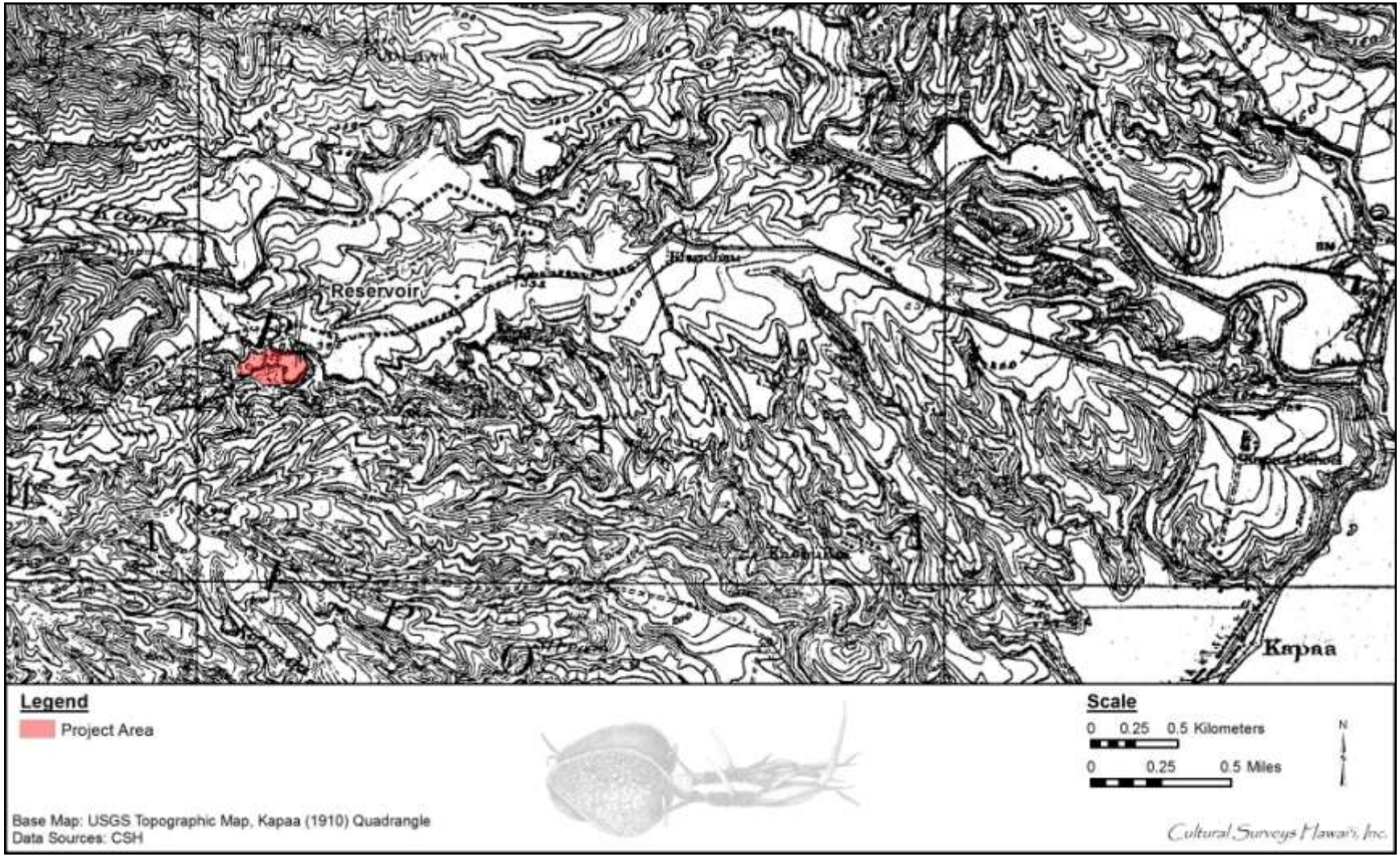

Figure 12. Project area identified on USGS Topographic Map, Kapaa (1910) Quadrangle

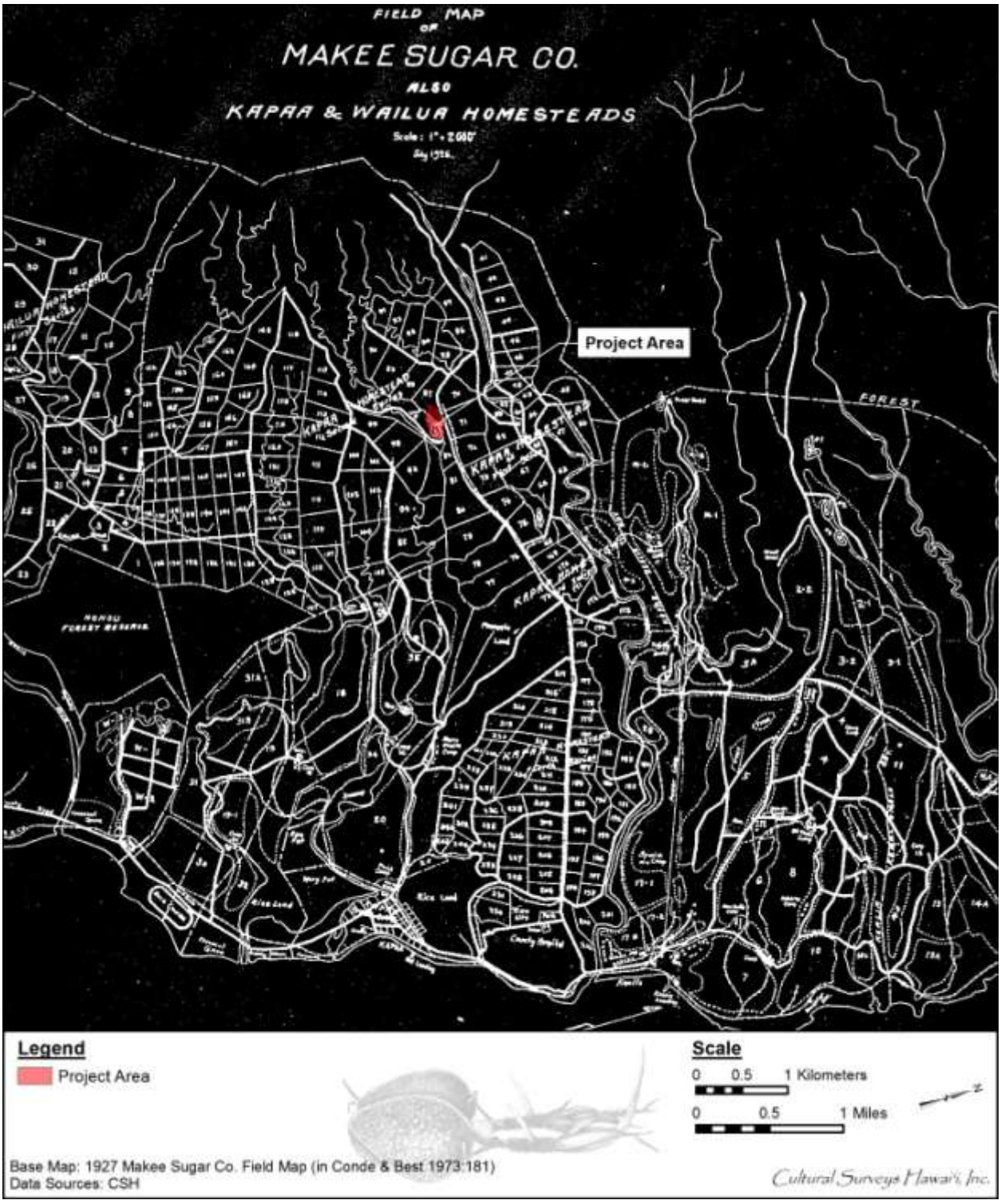

Figure 13. Project area highlighted (red) in 1927 Makee Sugar Co. Field Map (in Conde & Best 1973: 181)

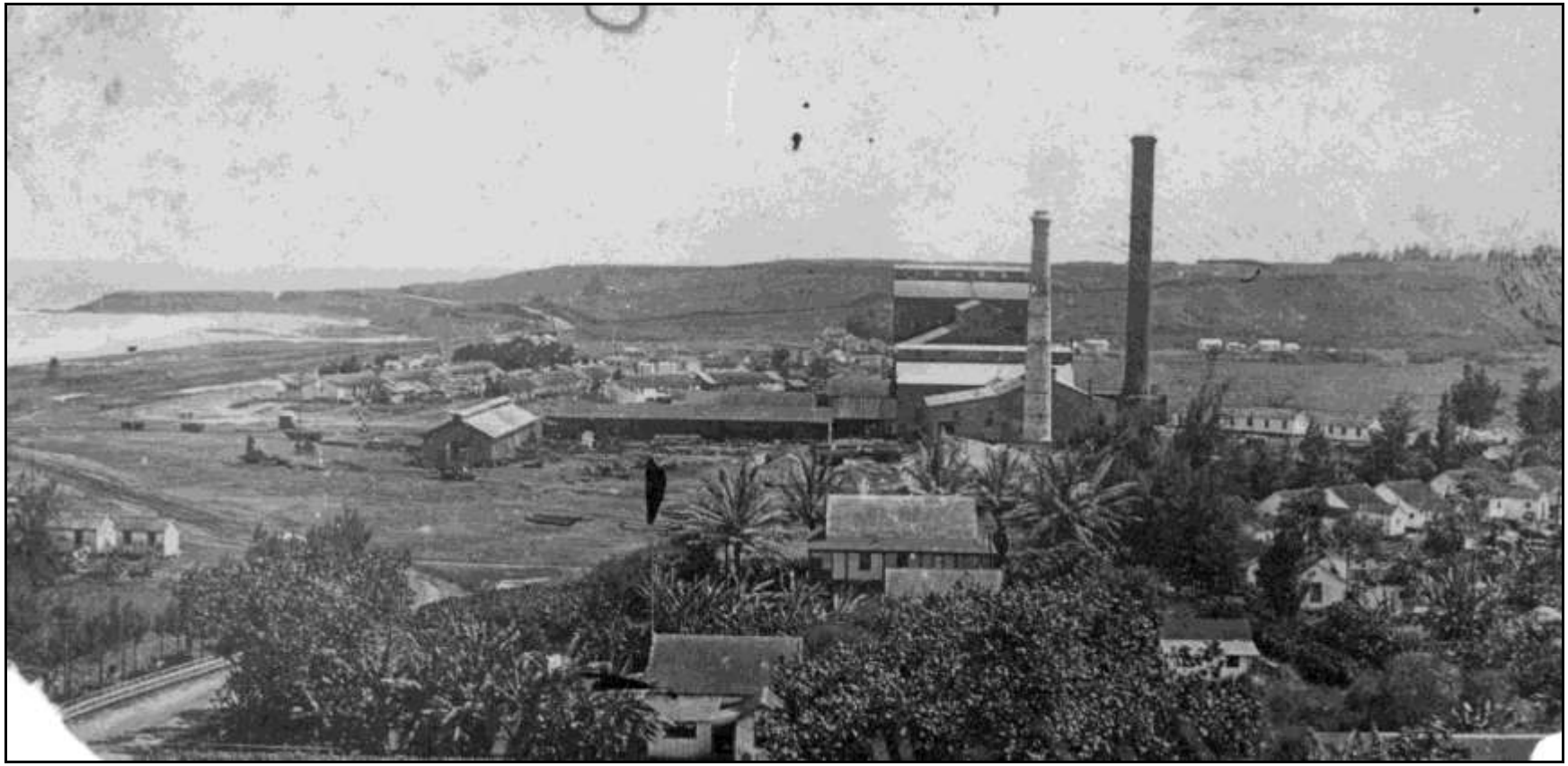

Figure 14. Photograph of Kealia Sugar Mill (foreground), ridgeline (background), Kawaihau Road area (date unknown) (Kaua‘i Historical Society)

schools" (*Garden Island*, 1 April 1983). The original Kapaa School was constructed in 1883 on a rocky point adjacent to the Makee Sugar Company railroad. Traditionally, this point was known as Kaahiahi (Kapa‘a Elementary School, 1983:10). In 1908, Kapaa School was moved to its present site directly *mauka* and up the hill at Mailehune (Figure 15).

4.4.2 Chinese in Kapa‘a

As in much of the rest of Hawai‘i, the Chinese rice farmers began cultivating the lowlands of Kapa‘a with increasing success in the latter half of the 1800s. Several Hawaiian *kuleana* owners leased or sold their parcels *mauka* of the swamp land to Chinese rice cultivators. Other Chinese rice cultivators appealed to the government for swamplands, first leasing the lands and then later buying them. As a result of the growing rice and sugar industries, the economic activity displaced the house lot *kuleana* on the *makai* side of the marsh for increasing commercial and residential development (Lai 1985:148-161).

4.4.1 Construction of Upper Kapahi Reservoir

One of the first maps recorded of Kapa‘a, Kaua‘i was in 1872 by Gay (see Figure 9). Following the Waipouli ridgeline and Kawaihoolana Stream, above the waterfall, there is no mapped record of an upland reservoir. Other landscape features such as *hau* (*Hibiscus tiliaceus*) trees in upland areas, swampland on the coastline and prominent peaks are recorded. There is no account of cultivation in the uplands other than two references to *hau* trees.

In 1905, Harvey mapped the classification of lands within Kapa‘a. At this time various Grant and LCA parcels have been allocated to claimants. It is recorded that near Rosa Rapozo Souza's Grant 7625 of 15.5 acres lies a reservoir labeled with a clear boundary delineation (see Figure 11). This map illustrates the movement of population into the uplands of Kapa‘a, especially with the identification of Kapa‘a Homesteads.

USGS created a topographic map of Kapa‘a in 1910 (see Figure 12) which again highlights the steep terrain in the area. Notable is an outcrop in the shape of a reservoir labeled 358. On the coastline buildings are starting to become visible on the landscape, where swamplands were previously labeled.

After construction was completed in 1910, Wall in 1914 created a new map (Figure 16). Just as in the 1905 Harvey map, a reservoir is clearly delineated in relation to Kapa‘a Homesteads.

In reviewing previous historic maps to understand the placement and construction of the Upper Kapahi Reservoir through time, it is clear that at one point there was not much activity in the uplands of Kapa‘a. Shortly after population movement *mauka*, a reservoir was utilized (Harvey 1905) prior to the official completion of dam construction. The utilization of the reservoir may have been simple capitalization of natural land features in the area for water storage, control, and allocation.

Today the Upper Kapahi Reservoir is fed off-stream by a tributary of Waikaea Canal and is used for irrigation purposes. According to the East Kauai Water User's Cooperative (2014) Upper Kapahi Reservoir is only a portion of the larger extent of the Kapa‘a irrigation system which provided water for approximately 6,000 acres of land under sugar cane. The system comprises 22.5 miles of ditch and tunnel, the Wailua Reservoir of 242 million gallon capacity, the Upper Kapahi Reservoir with 30 million gallon capacity, and three smaller reservoirs. The

ditch system is largely abandoned in the now urbanized areas but intact and flowing elsewhere. Regarding evaluation of the system by the East Kauai Water User's Cooperative, "The most important ditch, the 'transmission line' from Wailua Reservoir to Upper Kapahi Reservoir was in overall good condition, however nearly all gates, especially those on the reservoirs, are in need of repair" (East Kauai Water User's Cooperative 2014).

4.4.2 Hawaiian Canneries Company, Limited

In 1913, Hawaiian Canneries Company, Ltd., opened in Kapa‘a at the site now occupied by Pono Kai Resort, just north of Waika‘ea Canal (Cook 1999:56). A resident of Kapa‘a described how the town "came alive" after the cannery opened (Fernandez 2009:48). Following the completion of their plantation contracts, the Japanese plantation workers moved into town and ". . . opened mom and pop grocery stores" (Fernandez 2009:48):

> Portuguese opened dairy farms in the hinterland or repair shops in Kapa‘a. Former plantation laborers became farmers, raising pineapple and other crops for sale. Service businesses started: the slop-gatherer who came to homes to take the garbage as feed for his pigs, the fish monger selling fish on their street, the cattle rancher who slaughtered cows and provided fresh meat to the market, the traveling wagon man hawking fresh fruits and vegetables. [Fernandez 2009:48]

Kapa‘a became "an integrated multi-racial town, containing an extraordinary mix of people living and working together in harmony" all due to the new cannery (Fernandez 2009:48).

In 1923, Hawaiian Canneries Company, Ltd., purchased the approximately 8.75 acres of land they were leasing through the Hawaiian Organic Act (Hawai‘i Bureau of Conveyances, Grant 8248). At that time, the cannery only contained four structures but by 1956, 1.5 million cases of pineapple were being packed. By 1960, 3,400 acres were in pineapple and the cannery employed 250 full-time and 1,000 seasonal workers (*Honolulu Advertiser*, 20 March 1960) (Figure 18). In 1962, Hawaiian Canneries went out of business due to competition from canneries in other countries.

4.4.3 Ahukini Terminal & Railway Company

The Ahukini Terminal & Railway Company was formed in 1920 to establish a railroad to connect Anahola, Keālia, and Kapa‘a to Ahukini Landing and "provide relatively cheap freight rates for the carriage of plantation sugar to a terminal outlet" (Condé and Best 1973:185). This company was responsible for extending the railroad line from the Makee Landing, which was no longer in use, to Ahukini Landing, and for constructing the original Waika‘ea Railroad Bridge and the Mō‘īkeha Makai Railroad Bridge.

4.4.4 Lihue Plantation Company

In 1934, Lihue Plantation Company absorbed the Ahukini Terminal & Railway Company and Makee Sugar Company (Condé and Best 1973:167). The railway and rolling stock formerly owned by Makee Sugar Company became the Makee Division of the Lihue Plantation. At this time, besides hauling sugar cane, the railroad was also used to haul plantation freight including "fertilizer, etc. . . . Canned pineapple from Hawaiian Canneries to Ahukini and Nāwiliwili, pineapple refuse from Hawaiian Canneries to a dump near Anahola and fuel oil from Ahukini to Hawaiian Canneries Co., Ltd." (Hawaii Territorial Planning Board 1940:11). Former plantation

Figure 15. 1924 photo overlooking Waipouli and Kapa‘a, Kapa‘a High School (background to the right, up on the hill of Mailehune) (Kaua‘i Historical Society)

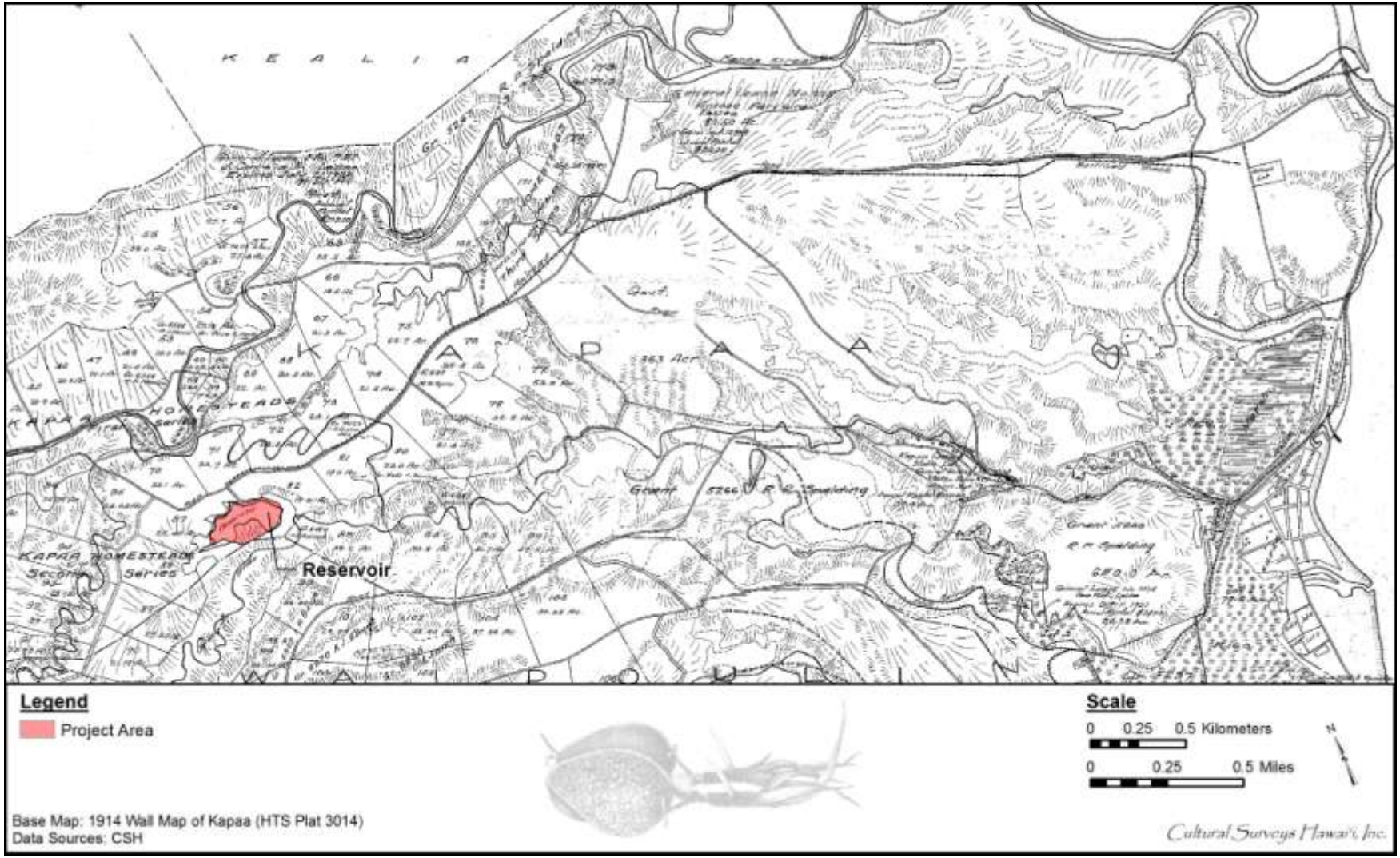

Figure 16. Project area in 1914 Wall map of Kapa‘a

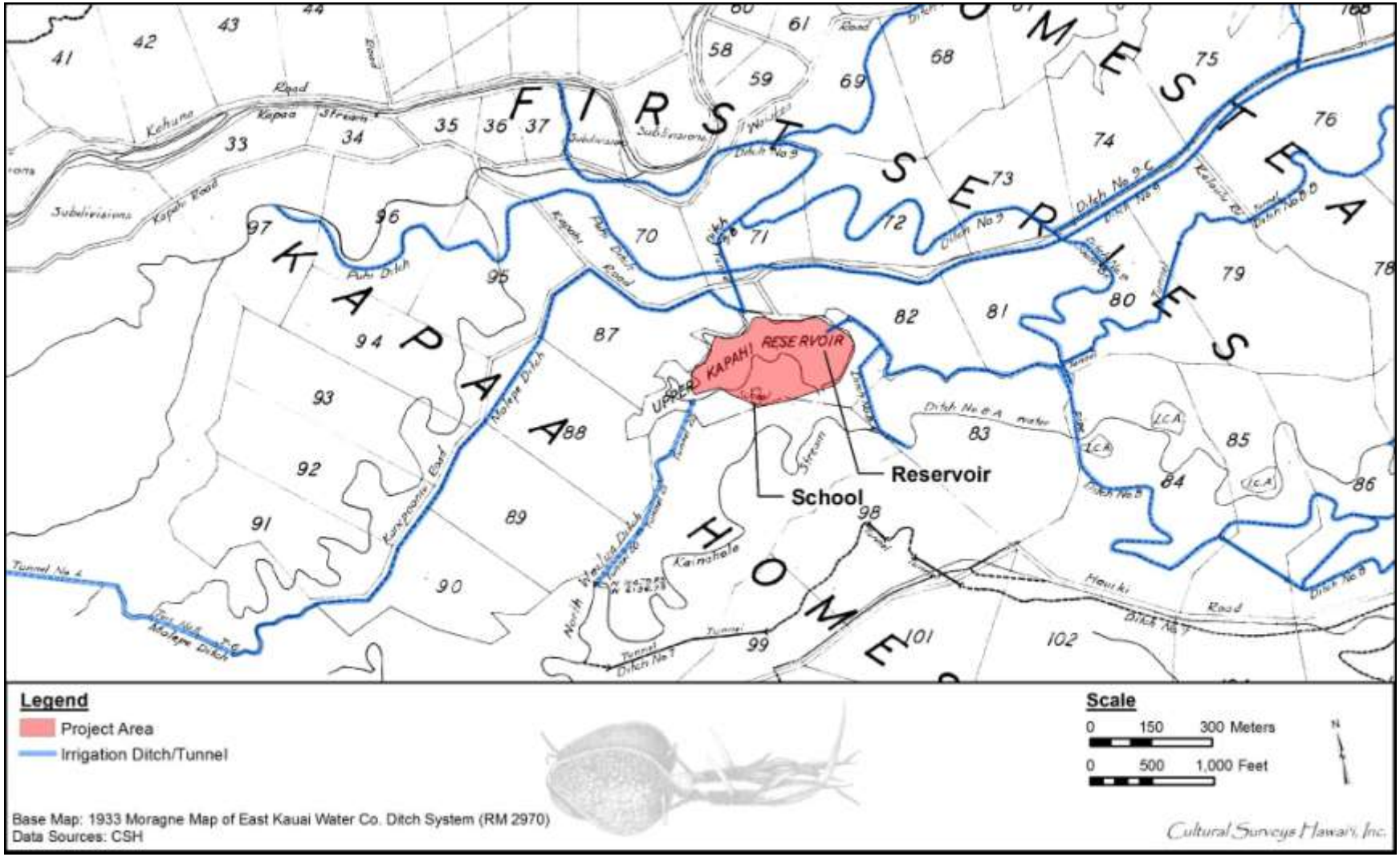

Figure 17. Project area overlaid on 1933 Moragne map of East Kauai Water Company Ditch System with irrigation ditch/tunnels in blue

Figure 18. Photo of Kaua‘i women working in the pineapple fields of Kapa‘a (*Garden Island* 2010)

workers and *kama‘āina* growing up in Kapa‘a remember when the cannery would send their waste to the pineapple dump, a concrete pier just north of Kumukumu Stream (SIHP # 50-30-08-789 Feature H) by railroad. The structure is built over the water where the rail cars dumped the pineapple waste. The current would carry the waste to Kapa‘a which would attract fish and sharks (Bushnell et al. 2002).

Lihue Plantation was the last plantation in Hawai‘i to convert from railroad transport to trucking (Condé and Best 1973:167). “By 1957 the company was salvaging a part of their plantation railroad, which was being supplanted by roads laid out for the most part on or close to the old rail bed” (Condé and Best 1973:167). By 1959, the plantation had completely converted over to trucking. The cane haul road which begins near the intersection of Haua‘ala Road and Kūhiō Highway is thought to date to the late 1950s and follows the alignment of the old railroad until just before or near ‘Āhihi Point.

4.4.5 Flooding in Kapa‘a

Severe floods in Kapa‘a in 1940 led to the dredging and construction of the Waika‘ea and Mō‘īkeha Canals sometime in the 1940s (Hawaiian Territorial Planning Board 1940:7). The construction of Waika‘ea Canal had been proposed as early as 1923 (Bureau of Land Conveyances, Grant 8248). A 1940 Master Plan for Kapa‘a requested the Territorial Legislature set aside funds for the completion of a drainage canal and for filling *makai* and *mauka* of the canal (Hawaiian Territorial Planning Board 1940:7). In 1955, a report was published on proposed coral dredging for the reef fronting Kapa‘a Beach Park (*Garden Island*, 1 September 1955). The coral was to be used for building plantation roads. This dredging was later blamed for accelerated erosion along Kapa‘a Beach (*Garden Island*, 30 October 1963). Today, there are several sea walls along the Kapa‘a Beach Park to check erosion. Old-time residents claim the sandy beach in Kapa‘a was once much more extensive than it is now (Bushnell et al. 2002).

After the incorporation of Makee Sugar Company into Lihue Plantation in the 1930s, many plantation workers bought property of their own and moved out of plantation camps. The plantation camps that bordered Kūhiō Highway were finally disbanded in the 1980s. The Lihue Plantation began to phase out in the last part of the twentieth century. Kapa‘a Town suffered after the closing of the Kapa‘a Cannery; however, the growing tourist industry helped ease the economic effects of the cannery’s closing.

4.5 Historic Maps

A series of historic maps illustrate the dramatic changes that occurred within the project area as residential and commercial interests supplanted the traditional Native Hawaiian way of life.

An 1872 map by Gay (see Figure 9) shows the project area in the *mauka* region of Kapa‘a near to the Waipouli ridge and Kawaihoolana Stream. *Hau* trees, swampland, and well identified peaks were also recorded. Although no houses are shown on the map, this does not mean there were no cottages. Early surveyors mapped only what they considered substantial “permanent” structures, not grass houses or “beach cottages.” Also of note is the stream, which is north of the project area and does not empty into the ocean but into swamplands.

A 1905 map compiled by Harvey see (Figure 11) depicts the parceling of lands in the *mauka* regions. There is clear building of community through establishment of Kapa‘a Homesteads in the north. Almost engulfing the reservoir are large landowners ranging in parcel sizes from 13.5 to 38.2 acres.

In 1914, Wall mapped Kapa‘a identifying a feature clearly as a Reservoir. The allotment of parcels surrounds the reservoir with parcels ranging 19.5 to 38.2 acres.

Makee Sugar Company mapped their lands in 1927 (see Figure 13). The lands were parceled for sugar plantation workers as well as crops. The project area where the reservoir stands is almost unrecognizable.

In 1910, USGS compiled the first topographic map for Kapa‘a Ahupua‘a (see Figure 12). Some roads have been identified. There is not much development recorded near the project area but some can be identified along the coastline.

In 1933, Moragne mapped the East Kaua‘i Watershed Company Ditch System (see Figure 17). Upper Kapahi Reservoir is integrated into the ditch systems allotting water to Wailua Ditch, Molepe Ditch, and Ditch No. 8A. Located near the reservoir was a school.

A 1963 USGS topographic map (Figure 19) shows greater concentration of buildings in the coastal area of Kapa‘a, with limited encroachment near the project area.

The 1978 USGS orthophotoquad aerial photograph (Figure 20) shows the reservoir still removed from general commercial or residential areas with limited housing surrounding the periphery of the northern boundary of the reservoir. Kainahoa Street curves around the reservoir.

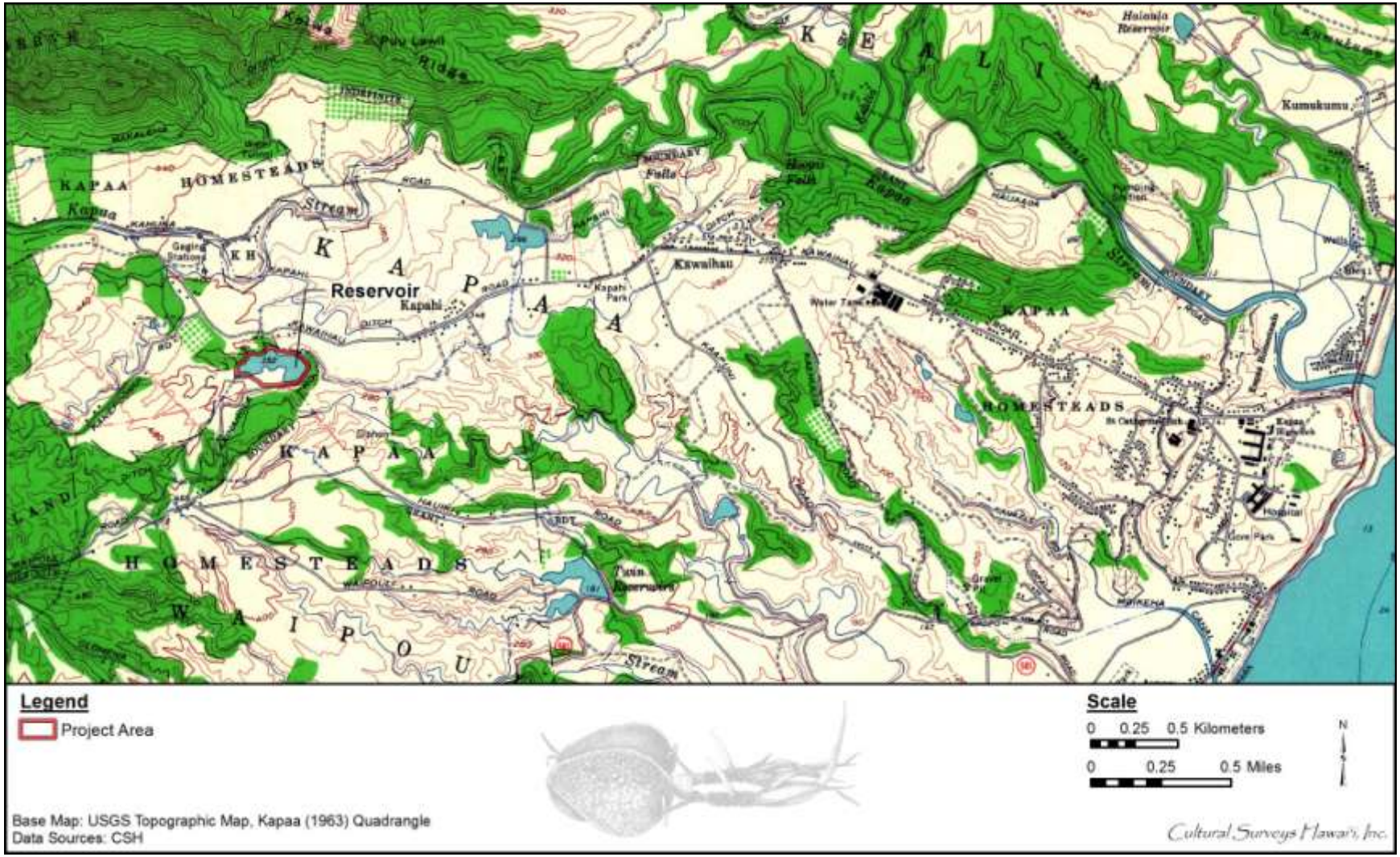

Figure 19. Project area outlined (red) on 1963 Kapaa USGS Topographic Quadrangle

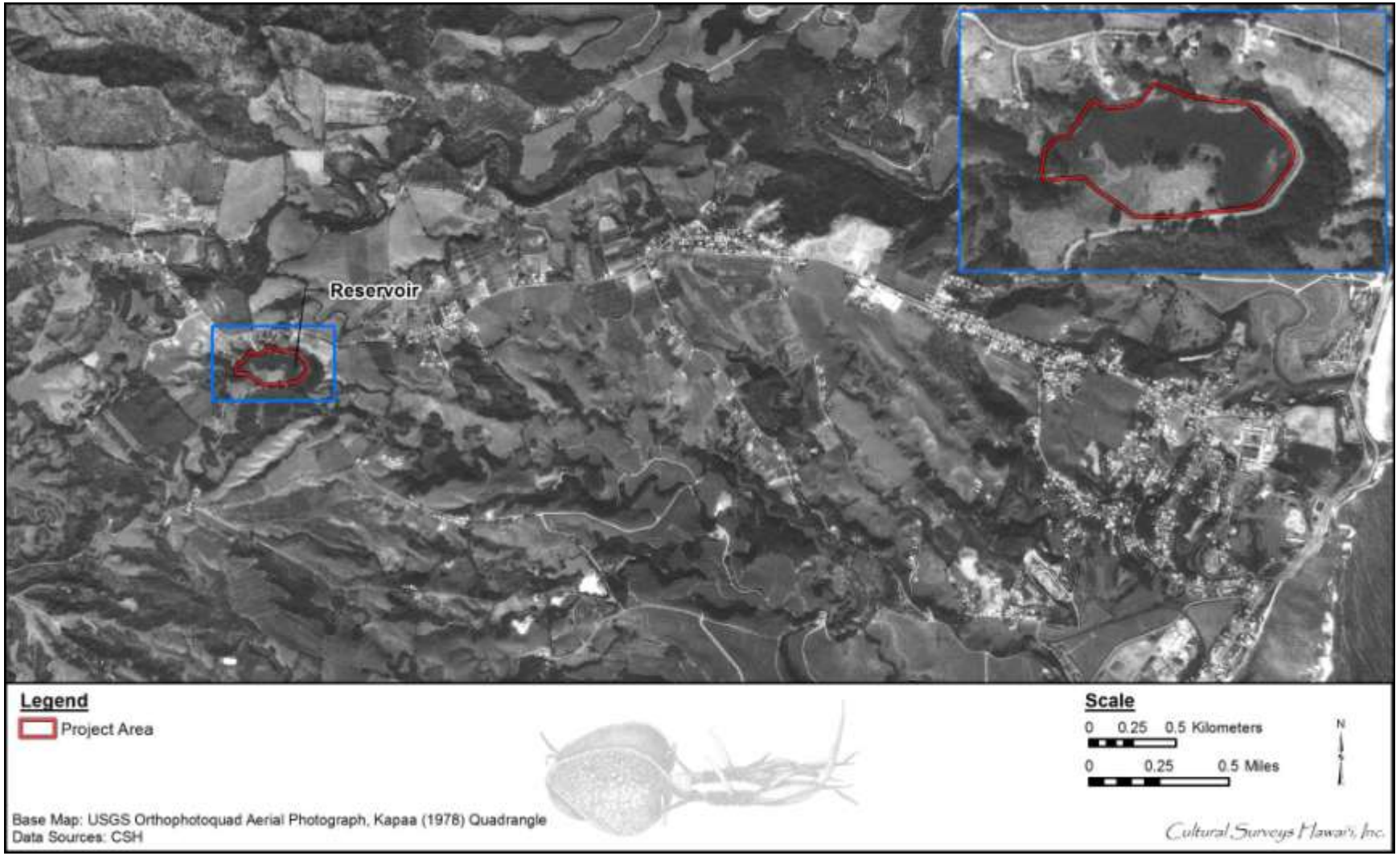

Figure 20. Project area indicated in USGS Orthophotoquad aerial photograph, Kapaa (1978) Quadrangle

Section 5 Archaeological Research

5.1 Archaeological Studies and Sites in Kapa‘a

The following table outlines the archaeological research (Table 3) and historic properties (Table 4) identified in Kapa‘a Ahupua‘a. These tables are followed by discussion of the research and historic properties. Table 3 provides a list of archaeological research conducted within Kapa‘a Ahupua‘a, including columns for reference, type of study and results. The locations of these archaeological studies are shown in Figure 21. Table 4 is a list of known historic properties within the *ahupua‘a* and includes columns for state site numbers, description, and author. The locations of identified sites within Kapa‘a Ahupua‘a are shown in Figure 22.

5.1.1 Tomonari-Tuggle 1984

At the request of M & E Pacific, Inc., an archaeological reconnaissance survey of a proposed microwave antenna site was undertaken. The site is located on Mount Wekiu, the summit of the Makaleha Mountains (TMK: [3] 4-6-001:001), which mark a portion of the boundary between the judicial districts of Hanalei and Kawaihau, Kaua‘i. Wekiu lies at the head of the traditional *ahupua‘a* of Kaua‘i. The purpose of the survey was to determine the presence or absence of archaeological sites in the parcel, in preparation of an environmental impact assessment for the project, which includes the antenna tower, a control building, and a helicopter pad (Tomonari-Tuggle 1984).

The archaeological survey consisted of walking the entire area, except for the steep sides of the peaks. Although most attention was paid to the immediate project area, a random walk-through of the flat to the northwest of Wekiu was also carried out. Carrying out work at the same time were the staff engineer for M & E Pacific, Inc. and the consultant botanist and wildlife biologist.

No cultural remains were found. However, a concentration of nine rounded pebbles was found within a 1 sq m area on the southern slope of the helicopter site. Although most of the pebbles were of locally derived material, at least one was of a porous basalt which did not seem to originate from the area. The pebbles, which were all approximately 3 cm in diameter, did not appear to be worked.

The pebbles are noted in the report because of the possibility that Wekiu may have served as a Hawaiian fortification; the pebbles being sling stones. Although there is no apparent evidence for human modification or construction, the peak itself could have been a natural fort; it stands high and steeply above the surrounding area and would have been easily defensible except from the east.

Although the pebbles pose an interesting and intriguing possibility for use of this mountain site, the absence of any surface remains and documentary evidence weigh against this area having any traditional Hawaiian significance. It is possible the pebbles are naturally formed or were carried by pig and goal hunters who frequent the area. No further archaeological work was recommended.

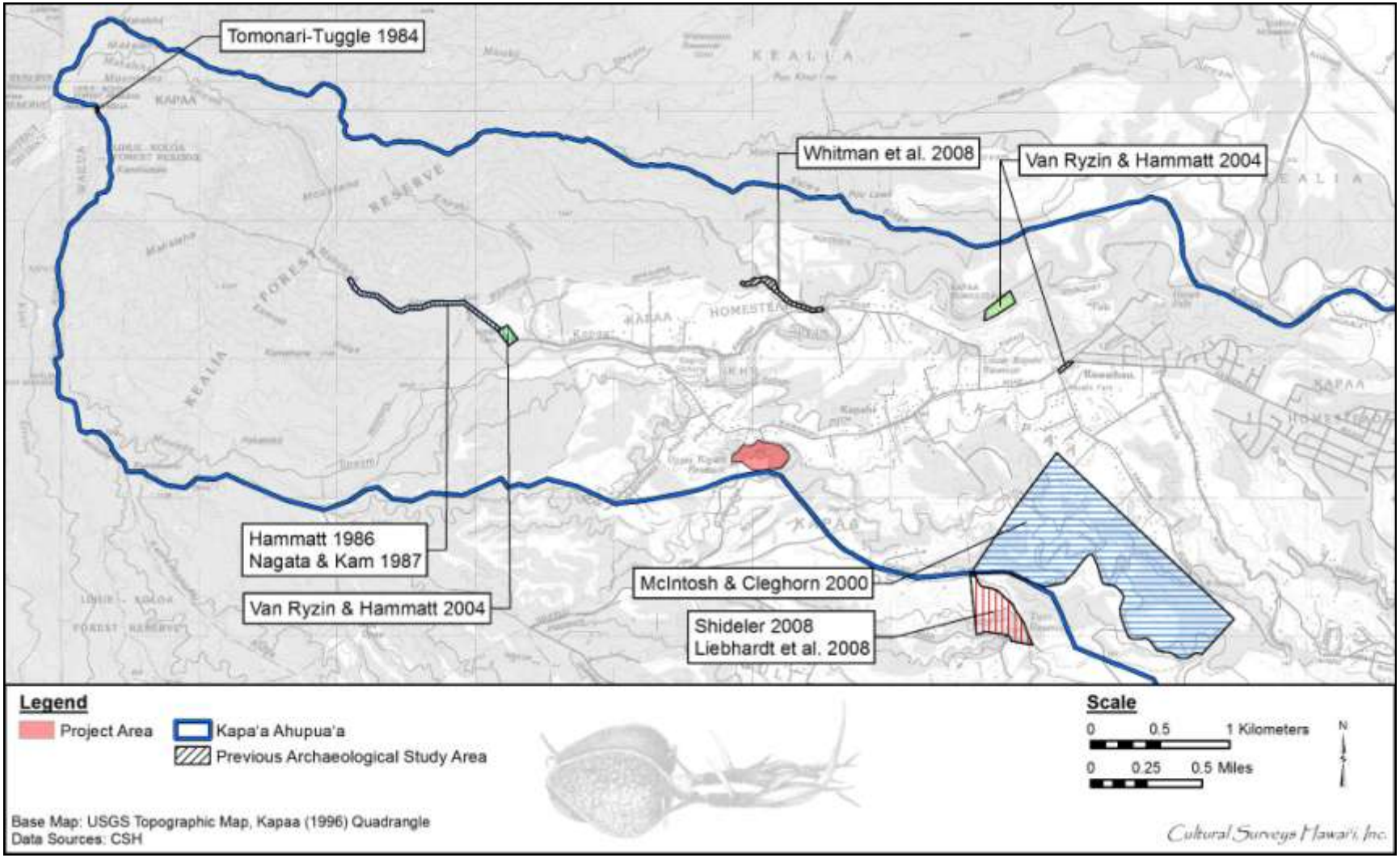

Figure 21. Previous archaeological studies within Kapa‘a Ahupua‘a.

Table 3. Previous Archeological Studies in Kapa‘a Ahupua‘a

Reference	Type of Study	Results
Tomonari-Tuggle 1984	Archaeological reconnaissance survey	Concentration of pebbles (possibly used as sling stones) noted; absence of any other surface remains and documentary evidence weigh against the area having any traditional Hawaiian significance
Hammatt 1986	Archaeological reconnaissance	No significant findings
Nagata and Kam 1987	Field inspection	Possible cultural resources in project area may have been covered by existing vegetation; recommendation for archaeologist monitor during construction activities
McIntosh and Cleghorn 2000	Archaeological inventory survey	Eleven features recorded (SIHP #50-30-08-989, Features 1 through 11), all associated with the sugar industry; no traditional Hawaiian archaeological sites found in project area
Van Ryzin and Hammatt 2004	Archaeological assessment	No significant findings
Shideler 2008	Archaeological field inspection	Seven historic properties observed (CSH 1 through 7), all of post-Contact origin, associated with twentieth century agriculture; no traditional Hawaiian sites observed or believed to be present in project area
Leibhardt et al. 2008	Archaeological inventory survey	Twin Reservoirs Dam, its ancillary components and an irrigation ditch confirmed (SIHP #50-30-08-2081, Features A through F); earthen irrigation ditch also found (SIHP #50-30-08-5027); no further archaeological investigations considered necessary
Whitman et al. 2008	Archaeological literature review and field inspection	Irrigation ditch (SIHP #50-30-08-590) and L-shaped water diversion structure (SIHP #-591) located; no further structures of interest visible within project area

5.1.2 Hammatt 1986

On 1 October 1986, an archaeological planning reconnaissance of the Makaleha Stream for Makaleha Springs Water Source Development was conducted for the purpose of locating and evaluating archaeological sites within the project area and assessing impacts of the proposed project. The project included construction of a spring catchment system at the Upper Makaleha Springs with a 4,000 ft long pipeline from the springs to an existing million-gallon water tank, involving some road construction at least partially up the valley (Hammatt 1986).

The route of the proposed pipeline was observed to be steep-sided and susceptible to flooding. The valley slopes appeared to be too steep and too constricted to make agricultural terracing practical. If terraces or other archaeological features were present, they would have been destroyed by flooding or covered by slopewash. Based on fieldwork, it appeared that the proposed pipeline construction would have no impact on archaeological resources and no further archaeological investigations were recommended. There is a possibility that ancient terraces may be found at the mouth of the valley on the west side of the stream. If this area is to be impacted by construction, it should be examined first by an archaeologist.

5.1.3 Nagata and Kam 1987

On 19 December 1986, Wendell Kam, Staff Archaeologist of the SHPD, conducted a field inspection of the proposed project area at the Makaleha Stream Well. The purpose of the inspection was to determine the validity of the recommendations and results of the archaeological reconnaissance survey previously completed by CSH (Hammatt 1986). SHPD's inspection consisted of walking along the proposed pipeline route beginning at the existing million-gallon water tank. The results of the field inspection yielded a possibility that construction of a proposed access road may expose cultural resources previously covered by existing vegetation (Nagata and Kam 1987).

5.1.4 McIntosh and Cleghorn 2000

In 2000, Pacific Legacy Inc. conducted a one day field inspection for a 398.45-acre parcel located at TMK: [3] 4-3-003:005. The subject parcel was formerly under sugar cane cultivation for over 100 years (McIntosh and Cleghorn 2000).

A total of 11 features were recorded under a single site designation (SIHP # 50-30-08-989) and were all associated with the sugar industry. Features included an irrigation ditch tunnel (-989:1); a rock wall (-989:2); a 3.3-acre reservoir (-989:3); a railroad bridge remnant (-989:4); a bridge (-989:5); a concrete bridge (-989:6); a concrete bridge with curbing (-989:7); a concrete bridge with curbing over a double concrete culvert (-989:8); a concrete bridge with curbing extended over an irrigation ditch (-989:9); concrete and wooden irrigation ditch control gate (-989:10); and a concrete water diversion (-989:11). No further work was required for the project.

5.1.5 Van Ryzin et al. 2004

In 2004, CSH conducted an archaeological assessment of a parcel of land in Kapa‘a located at TMK: [3] 4-6-003:010. In addition, CSH surveyed and assessed two additional parcels as alternative sites in TMKs: [3] 4-6-011:003 and 4-6-008:023. The survey was accomplished to

address any historic preservation or cultural impact issues that might be raised by the proposed development of a water reservoir within one of the three parcels (Van Ryzin et al. 2004).

The field checks examined the areas of proposed impact and found no archaeological sites or historic preservation concerns in the vicinity of any of the parcels. The authors recommend no further historic preservation work.

5.1.6 Shideler 2008

In 2008, CSH prepared a letter report documenting an archaeological field inspection for an approximately 26.08-acre project area located in Waipouli Ahupua‘a at TMK: [3] 4-3-003:004. The project area was located between Hauiki Road and Waipouli Road and encompasses a portion of the Twin Reservoir. The purpose of the archaeological study was to determine if there are any major archaeological concerns within the 26.08-acre parcel and to develop data on the general nature, density, and distribution of archaeological resources (Shideler 2008).

A total of seven historic properties (CSH 1–7) were observed during the field inspection. Historic properties included an earthen irrigation ditch not in use (CSH 1); an earthen irrigation ditch in use (CSH 2); an irrigation tunnel excavated through a basalt bedrock knoll (CSH 3 and 4); an earthen irrigation tunnel (CSH 5); a wooden water control and gauging structure (CSH 6); and the Twin Reservoir (CSH 7).

5.1.7 Leibhardt et al. 2008

In 2008, Archaeological Consultants of Hawai‘i, Inc. conducted an archaeological inventory survey with subsurface testing on a property located in Waipouli Ahupua‘a (Liebhardt et al. 2008). The purpose of the investigation was to determine if significant historic properties exist within the project limits and to properly document and evaluate those sites.

Archaeological findings included previously identified SIHP # 50-30-08-2081 and Features A through F (Shideler 2008), as well as SIHP # 50-30-08-5027 (irrigation ditch). Features associated with SIHP # -2081 include an earthen irrigation ditch (Feature A); Spillway #1 (Feature B); Spillway #2 (Feature C); Spillway #3 (Feature D); a wooden and concrete service bridge and gate (Feature E); and the Twin Reservoirs Dam (Feature F). SIHP # -5027 consists of an earthen irrigation ditch. Based on its distance from the reservoir, it appears this site is unrelated to the Twin Reservoirs Dam.

5.1.8 Whitman et al. 2008

In 2008, CSH conducted an archaeological literature review and field inspection for the Akulikuli Tunnel (Whitman et al. 2008). The project area began at the end of Akulikuli Road and continued approximately 1,000 ft west ending at the existing Akulikuli Well and Tunnel. The project proposed to renovate existing water tunnels. These improvements include 1) the construction of a paved driveway from the end of Akulikuli Road to the tunnel entrance; 2) construction of a temporary dirt access road from portal A to portal E; 3) and the laying of a new water line next to an existing water line (approximately 1,900 ft).

A pedestrian inspection confirmed the presence of two historic properties within the study area including a stone-lined *‘auwai* (irrigation ditch) with a sluice gate (SIHP # 50-30-08-590) and a historic water diversion structure (SIHP # -591). It was suggested that the project should be designed to ensure these two structures are not affected by the building of the tunnel access road.

No further structures of interest were visible within the project area. The proposed water line runs through an open grassy field in one of the Kapa’a Homestead land parcels. Any surface features would have been removed at the time of clearing the field.

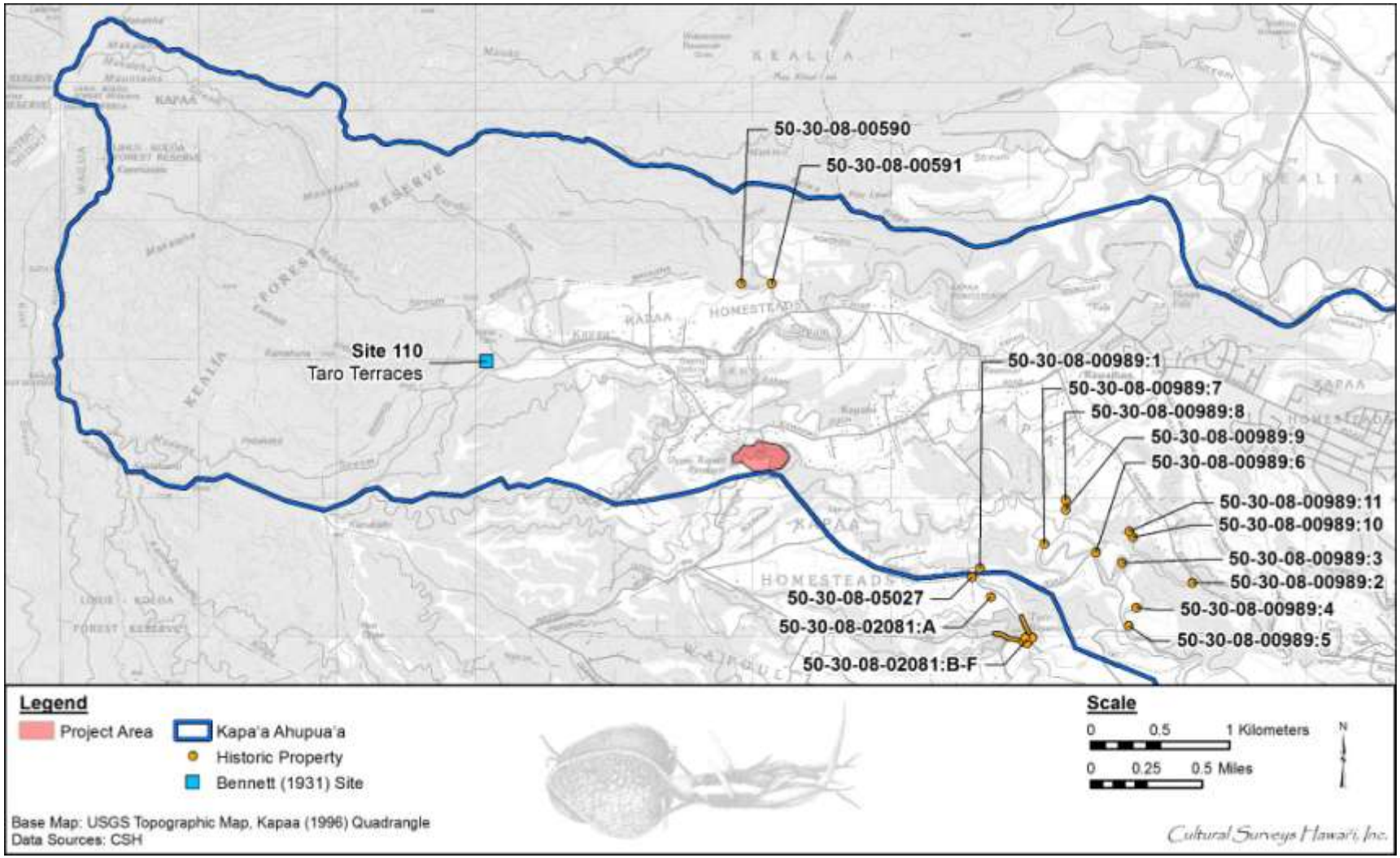

Figure 22. Previously identified Historic Sites and Properties in *mauka* Kapa‘a Ahupua‘a.

Table 4. Previously Identified Historic Sites and Properties.

SIHP #50-30-08	Description	Author
Site 110	Taro terraces and bowl	Bennett 1931
-590	Irrigation ditch	Whitman et al. 2008
-591	Historic L-shaped water diversion structure with sluice gate	Whitman et al. 2008
-989:1	Irrigation ditch tunnel	McIntosh and Cleghorn 2000
-989:2	Rock wall along Ka‘apuni Road; 3.4 m high, 8 m wide; constructed of rounded sub-angular basalt boulders and cobbles	McIntosh and Cleghorn 2000
-989:3	3.3-acre reservoir	McIntosh and Cleghorn 2000
-989:4	Railroad bridge remnant spanning 5 m long across the stream, 1.8 m wide, and extends 5.5 m above the stream	McIntosh and Cleghorn 2000
-989:5	Bridge over stream measuring 13 m long and 7 m wide	McIntosh and Cleghorn 2000
-989:6	Concrete bridge measuring 5 m wide, 8.5 m long, and 3.5 m high; base of bridge constructed of basalt cobbles, upper portion formed from a wooden form	McIntosh and Cleghorn 2000
-989:7	Concrete bridge with curbing measuring 5.8 m long, 4.3 m wide, and 2 m high; curbing measures 0.2 m high and 0.2 m wide on the inside	McIntosh and Cleghorn 2000
-989:8	Concrete bridge with curbing over a double concrete culvert measuring 4 m long, 5 m wide, and 1.15 m high; each culvert is 0.6 m in diameter; curbing measures 0.2 m wide and 0.3 high on the inside; a date inscribed on the curbing reads “6/27/46”	McIntosh and Cleghorn 2000
-989:9	Concrete bridge with curbing extending over an irrigation ditch; bridge measures 3.5 m long, 4.5 m wide, and 0.8 m high	McIntosh and Cleghorn 2000
-989:10	Concrete and wooden irrigation ditch control gate; a date in the concrete reads “11/24/68”	McIntosh and Cleghorn 2000
-989:11	Concrete water diversion	McIntosh and Cleghorn 2000
-2081:A	Inlet serving as a diversion from Wailua Ditch	Liebhardt et al. 2008

SIHP #50-30-08	Description	Author
-2081:B-F	Feature B: Spillway #1 measuring 7 ft high by 5 ft in width running north to south Feature C: Spillway #2, partially lined earth tunnel, measuring 7 ft by 5 ft running north-northeast to south-southwest Feature D: Spillway #3 measures 7 ft by 6ft, running northeast to southwest, discharging through natural stream beds and eventually entering Waikaea Canal Feature E: Wooden and concrete service bridge/gate running northwest to southeast; a 24-inch culvert runs below Feature E Feature F: Twin Reservoirs Dam; constructed in 1920, measuring 48.5 ft in height and 1,810 ft in length	Liebhardt et al. 2008
-5027	Earthen irrigation ditch approximately 50 m long, 1.5 to 2 m wide, and 50 cm to 100 cm deep	Liebhardt et al. 2008

Section 6 Community Consultation

Throughout the course of this assessment, an effort was made to contact and consult with Hawaiian cultural organizations, government agencies, and individuals who might have knowledge of and/or concerns about traditional cultural practices specifically related to the study area. This effort was made by letter, email, and telephone. The initial outreach effort began in March 2014 and community consultation is ongoing.

In the majority of cases, a letter (Appendix B), map, and an aerial photograph of the project area were mailed. In most cases, one to multiple attempts were made to contact individuals, organizations, and agencies apposite to the CIA for the project. The results of the community consultation process are presented in Table 5. Written statements from organizations, agencies, and community members are presented in Sections 6.1 below and summaries of interviews with individuals are presented in Section 7.

Table 5. Community Contact Table

Name	Affiliation	Comments
‘Aha Pūnana Leo o Kauai	Hawaiian Language School	CSH emailed letter and figures on 18 March 2014
Aiu, Danita	Chairperson, Kaua‘i Historic Preservation Review Commission (KHPRC)	CSH mailed letter and figures on 13 March 2014
Ako, Uncle Valentine	*Kupuna*	CSH mailed letter and figures on 13 March 2014; Mr. Ako called CSH on 17 March 2014 and CSH made appointment to talk with Mr. Ako; CSH interviewed Mr. Ako on 23 March 2014; interview is pending approval
Kauai Island Hawaiian Civic Club	Association of Hawaiian Civic Clubs	CSH emailed letter and figures on 18 March 2014
Ayau, Halealoha	Hui Mālama I Na Kupuna ‘O Hawai‘i Nei	CSH emailed letter and figures on 18 March 2014
Ching, Milton	*Kama‘āina*	CSH mailed letter and figures on 13 March 2014
Kekua, Kumu Kehaulani	Kauai Heritage Center/Ka‘ie‘ie Foundation	CSH mailed letter and figures on 13 March 2014
Hoomanawanui, Kauanoe M.	Burial Site Specialist, SHPD, (Hawai‘i and Kaua‘i)	CSH emailed letter and figures on 20 March 2014
Kon, Arlene	Native Hawaiian Education Council	CSH mailed letter and figures on 14 March 2014

Name	Affiliation	Comments
Lovell-Obatake, Auntie Cheryl	Nawiliwili Watershed Council	CSH mailed letter and figures on 13 March 2014
Medina, Wayne	Pastor	CSH mailed letter and figures on 19 March 2014
Milnes, Les	County Planning Inspector	CSH mailed letter and figures on 14 March 2014
Muraoka, Auntie Beverly	*Kupuna*	CSH mailed letter and figures on 13 March 2014
Oi, Tommy		CSH emailed letter and figures on 19 March 2014
Ornellas, Jerry	Expert, founder of East Kauai Water Cooperative	CSH emailed letter and figures on 19 March 2014
Rodrigues, Hinano B.A., J.D.	Cultural Historian/Acting History and Culture Branch Chief DLNR-State Historic Preservation Division-Maui	CSH emailed letter and figures on 20 March 2014; Mr. Rodrigues replied with the following statement on 24 March 2014: *As Cultural Impact Assessments should address: whether or not there were cultural/traditional practices in the area; whether those practices are ongoing; and whether or not this project might affect those practices, I would strongly recommend canvassing the area, In addition, a literature review of SHPD's library would be helpful.*
Santos, Kaliko	Community Outreach Coordinator, OHA	CSH emailed letter and figures on 19 March 2014
Say, Auntie Barbara	*Kupuna*	CSH mailed letter and figures on 14 March 2014
Trugillo, William	Ka Leo o Kauai	CSH emailed letter and figures on 19 March 2014
Wichman, Randy	Executive Director, Kauai Historical Society	CSH mailed letter and figures on 13 March 2014
Yap, Keith	Vice-Chair, Kaua‘i Island Burial Council	CSH emailed letter and figures on 19 March 2014

6.1 State Historic Preservation Division

Section 7 Interviews

7.1 Acknowledgements

The authors and researchers of this report extend our deepest appreciation to everyone who took time to speak and share their *mana‘o* (thought, idea, belief) with CSH whether in interviews or brief consultations, including contacts who opted not to contribute to the current cultural study but nevertheless spent time explaining their position on the proposed project. We request that if these interviews are used in future documents, the words of the contributors be reproduced accurately and not in any way altered, and that if large excerpts from interviews are used, report preparers obtain the prior written consent of the interviewee/s.

7.2 Kupuna Valentine Ako

Interview pending approval

Section 8 Traditional Cultural Practices

Traditional cultural practices are based on a profound awareness concerning harmony between man and their natural resources. The Hawaiians of old depended on these cultural practices for survival. Based on their familiarity with specific places and through much trial and error, Hawaiian communities were able to devise systems that fostered sustainable use of nature's resources. Many of these cultural practices have been passed down from generation to generation and are still practiced in some of Hawai‘i's communities today.

This project seeks to assess traditional cultural practices as well as resources pertaining to the project area within Kapa‘a Ahupua‘a. This section will convey the different types of traditional practices and cultural resources associated with the vicinity.

Discussions of specific aspects of traditional Hawaiian culture as they may relate to the project area are presented below. This section integrates information from Sections 3–5 in examining cultural resources, beliefs and practices identified within or in proximity to the project area in the broader context of the encompassing Kapa‘a Ahupua‘a. Once consultation has been completed, excerpts from interview sessions will be incorporated throughout this section where applicable.

8.1 *Wahi Pana* and *Mo‘olelo*

A survey of traditional mythological literature shows Kapa‘a prominently associated with some of the most famous legendary and historical figures including Mō‘īkeha, Palila, Paka‘a, and Kanaka Nunui Moe. The 14 documented *heiau* of Kapa‘a is a testament to both the substantial population and the social/political/religious importance of this *ahupua‘a*.

What few specific references there are suggest that high status habitation was focused near the coast with less intensive utilization of the uplands which were regarded as wild places. The most notable feature of the traditional accounts are references to grasses and sedges (*kalukalu* grass and *ahuawa* rushes) which undoubtedly reflect in part the natural marsh lands near the coast but may also reflect transformation of the landscape through a denuding of forest areas by the activities of a relatively dense population harvesting slow growing trees for firewood and construction materials over many centuries.

8.2 Gathering for Plant Resources

Hawaiians utilized upland resources for a multitude of purposes. Forest resources were gathered, for not only the basic needs of food and clothing, but for tools, weapons, canoe building, house construction, dyes, adornments, hula, medicinal, and religious purposes. The present project area is dominated by coconut and *lauhala* trees used for landscaping along the reservoir's edge. Volunteer plants in the area include wedelia, African tulip, java plum, and ironwoods in addition to invasive Christmasberry tree. As of the date of this preliminary report, consultation regarding plant gathering practices is pending.

8.3 Historic Properties

Upper Kapahi Reservoir itself is potentially eligible to be listed as a historic property in the National Register of Historic Places. No other historic properties were identified within the

project area or in the vicinity. The density of identified historic properties is far greater near the coast of Kapa‘a Ahupua‘a. For a listing of the historic properties of Kapa‘a, Kaua‘i, see **Error! Reference source not found.**.

8.4 Burials

No burials are believed to be present within the project area and none are known in the vicinity.

8.5 Trails

Based on nineteenth and twentieth century maps, the primary transportation routes *mauka/makai* correlated closely to the existing major roadways.

Section 9 Summary and Recommendations

CSH undertook this CIA at the request of GEI Consultants, Inc. The research broadly covered the entire *ahupua‘a* of Kapa‘a including the approximately 15-acre area of potential effect.

9.1 Results of Background Research

Background research for this project yielded the following results:

1. The proposed project is located in Kapa‘a Ahupua‘a, Kapa‘a literally translates as “the solid or the closing.” Kapa‘a Ahupua‘a is located on the eastern side of Kaua‘i between Keālia Ahupua‘a in the north and Waipouli Ahupua‘a in the south. The *ahupua‘a* of Kapa‘a belongs in the ancient district of Puna, one of five ancient *moku*, or districts, on Kaua‘i (King 1935:228). Its location on the windward side exposes the area to the prevailing tradewinds and their associated weather patterns. Historically, this *ahupua‘a* contained two prominent landscape features, a coastal plain with sand dunes and a large marsh. *Mele* (song, chant) paint Kapa‘a as a place of great expanse of land, with verdant bush in upland areas not occupied by human settlement.
2. The project area is associated with specific *mo‘olelo* (story, tale, myth) and *‘ōlelo no‘eau*,(proverbs) including, but not limited to, chief Mō‘īkeha who is said to have enjoyed peaceful Kapa‘a as his permanent home; Pāka‘a, who can command winds when his mother from Kapa‘a gives him the gift of the wind gourd of La‘amaomao containing the bones of his great-grandmother, the goddess of winds; various accounts of Kawelo (Kaweloleimākua) and Ka‘ililauokekoa (Mō‘īkeha's daughter, or granddaughter); the *mo‘o* or reptile Kalamainu‘u and the origins of the *hīna‘i hīnālea* or the fish trap used to catch the *hīnālea* fish; the story of Lonoikamakahiki; Ka‘ea, the supernatural banana grove of Palila believed to be located in the *mauka* (upland) region of Kapa‘a and where a banana stalk takes at least two men to encircle its girth; the expanse of *kalukalu* grass which is used for making fine soft mats enjoyed by lovers; Kanaka-nunui-moe, the Sleeping Giant of Kapa‘a who is beloved by the people for his gentle and helpful ways; the legend of Lepeamoa, which tells of a famous battle between Lepeamoa’s brother, the hero Kauilani, and a demigod named Akuapehuale.
3. Kapa‘a is home to more than a dozen *heiau* (pre-Christian place of worship, shrine) enforcing its cultural significance to Native Hawaiians.
4. During the Māhele, Kapa‘a was taken as Crown Lands (Office of the Commissioner of Public Lands 1929). The *‘ili* (land section next in importance to *ahupua‘a*) of Paikahawai and Ulakiu in Kapa‘a Ahupua‘a were retained as Government Lands.
5. The LCA pattern in Kapa‘a shows taro *lo‘i* (irrigated terrace, especially for taro) and *kula* (plain, field, open country) on the rim of the swamplands and extending somewhat into watered valleys. Marshlands without known LCAs may have had *lo‘i* along the edges. All six LCA claimants had shoreline house lots *makai* (seaward) of the swamp. Permanent settlement is assumed to have existed in association with *mauka* (upland) agricultural lands in the pre-Contact period, but this is not reflected in the LCA testimonies.

6. Only five individuals were awarded land parcels in Kapa‘a. Four of the five awardees received multiple parcels which show similarities. All four had *lo‘i* or irrigated *kalo* (taro) fields on the *mauka* side of the lowland swampy area, sometimes extending a short distance up into small, shallow gulches and valleys. Many of these *lo‘i* parcels name *pali* or hills/cliffs as boundaries. Other natural and cultural resources mentioned in the LCAs include fishponds, freshwater springs, pig pens, *hau* bushes, *hala* clumps, streams, *‘auwai* (ditch), and *kula* or pasturelands.
7. The project area is located 1.8 km from the nearest Lihue Plantation field, which bought out Makee Sugar Plantation. Makee Plantation was the first large-scale agricultural enterprise in Kapa‘a and it began in 1877 (Dole 1916:8). Makee Plantation employed thousands of Portuguese and Japanese immigrants by the late 1800s, leading to its own railroad and an associated school for its workers.
8. In 1913, Hawaiian Canneries Company, Ltd., opened in Kapa‘a at the site now occupied by Pono Kai Resort, just north of Waika‘ea Canal (Cook 1999:56). A resident of Kapa‘a described how the town “came alive” after the cannery opened (Fernandez 2009:48). Japanese, Portuguese, and other immigrants opened shops and businesses and Kapa‘a became “an integrated multi-racial town, containing an extraordinary mix of people living and working together in harmony” all due to the new cannery (Fernandez 2009:48).
9. In 1923, Hawaiian Canneries Company, Ltd., purchased the approximately 8.75 acres of land they were leasing through the Hawaiian Organic Act (Hawai‘i Bureau of Conveyances, Grant 8248). At that time, the cannery only contained four structures but by 1956, 1.5 million cases of pineapple were being packed. By 1960, 3,400 acres were in pineapple and the cannery employed 250 full-time and 1,000 seasonal workers (*Honolulu Advertiser*, 20 March 1960). In 1962, Hawaiian Canneries went out of business due to competition from canneries in other countries.
10. The Ahukini Terminal & Railway Company was formed in 1920 to establish a railroad to connect Anahola, Keālia, and Kapa‘a to Ahukini Landing and to carry plantation sugar to be shipped out (Condé and Best, 1973:185). This company was responsible for extending the railroad line from the Makee Landing, which was no longer in use, to Ahukini Landing, and for constructing the original Waika‘ea Railroad Bridge and the Mō‘īkeha Makai Railroad Bridge.
11. In 1934, the Lihue Plantation Company absorbed the Ahukini Terminal & Railway Company and Makee Sugar Company (Condé and Best, 1973: 167). The railway and rolling stock formerly owned by Makee Sugar Company became the Makee Division of the Lihue Plantation. At this time, besides hauling sugar cane, the railroad was also used to haul plantation freight. The Lihue Plantation began to phase out in the last part of the twentieth century. Kapa‘a Town suffered after the closing of the Kapaa Cannery; however, the growing tourist industry helped ease the economic effects of the cannery’s closing.
12. There have not been as many archaeological studies done in upland Kapa‘a compared to the shoreline. No archaeological sites were observed during a reconnaissance of 52.56 acres of mostly *kula* land in upland Kapa‘a (Hammatt 1981), nor were there any

terraces or other sites apparent during a 1986 reconnaissance of the upper reaches of the Makaleha stream valley (Hammatt 1986).

13. Although no historic properties have been documented in the project area, the Upper Kapahi Reservoir built in 1910 qualifies as a potentially eligible property for the National Register of Historic Places.

9.2 Results of Community Consultation

As of the date of this preliminary report, one community contact and one state agency have provided comments regarding the proposed project; an interview with a *kupuna* is pending approval and a response from SHPD is included below. Responses from remaining cultural organizations, agencies and community members are pending.

SHPD provided the following comment:

> SHPD recommends the canvassing of the project area to determine cultural and traditional practices that might be affected by this project. In addition, SHPD recommends a literature review of SHPD's library which might prove helpful in determining the cultural practices, resources, and beliefs in the project area.

9.3 Recommendations

Based on the preliminary findings of this assessment, CSH recommends a thorough survey of the project area be done in order to determine cultural practices, resources and beliefs that may potentially be impacted by the proposed project. In addition, as a precautionary measure, personnel involved in future development activities in the area should be informed of the possibility of inadvertent cultural finds, and should be made aware of the appropriate notification measures to follow. *Final results of the community consultation will be provided in a draft cultural impact assessment report to be completed in the next few months.*

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Appendix A Authorization & Release Form

Cultural Surveys Hawai'i, Inc.
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AUTHORIZATION AND RELEASE FORM

Cultural Surveys Hawai'i (CSH) appreciates the generosity of the *kūpuna* and *kama'āina* who are sharing their knowledge of cultural and historic places, experiences of past and present cultural practices. Cultural Surveys Hawai'i Inc. (CSH) is conducting a Cultural Impact Assessment (CIA) for the Upper Kapahi Dam Replacement Project located in the Kapa'a and Waipouli Ahupua'a, Puna District, Kaua'i Island TMK (4) 4-6-007:011. The CIA will support an Environmental Assessment (EA) being prepared by GEI Consultatnts, Inc. We understand our responsibility in respecting the wishes and concerns of the interviewees participating in our study. Here are the procedures we promise to follow:

1. The interview will not be tape-recorded without your knowledge and explicit permission.
2. You will have the opportunity to review the written transcript or notes of our interview with you. At that time you may make any additions, deletions or corrections you wish.
3. You will be given a copy of the interview transcript or notes for your records.
4. You will be given a copy of this release form for your records.

For your protection, we need your written confirmation that:

1. You consent to the use of the complete transcript and/or interview quotes for reports on cultural sites and practices, historic documentation, and/or academic purposes.
2. You agree that the interview shall be made available to the public.

I, _____, agree to the procedures outlined above and, by my
(Please print your name here)
signature, give my consent and release for this interview and/or photograph to be used as specified.

_____
(Signature)

_____
(Date)

Appendix B Community Outreach Letter

Cultural Surveys Hawai‘i, Inc.
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Aloha e,

At the request of GEI Consultants, Inc., Cultural Surveys Hawai‘i, Inc. (CSH) is preparing a cultural impact assessment (CIA) for the Upper Kapahi Dam Replacement Project located in the Kapa‘a Ahupua‘a, Puna District, Kaua‘i Island TMK (4) 4-6-007:011. Please see accompanying USGS, Aerial and TMK maps.

Upper Kapahi Dam is owned by the Hawai‘i Department of Land and Natural Resources Land Division (State) and County of Kaua‘i (County). This dam is an earthen embankment dam that stores irrigation water diverted from Kainahola Stream and Kapa‘a Stream. The reservoir is currently dewatered, but historically provided irrigation water to downstream users.

The State and County are proposing to build a new dam located within the footprint of Upper Kapahi Reservoir, a short distance upstream of the existing dam. The alignment of the new dam was selected to have the least new embankment length, and is planned to extend from the northern end of the existing dam alignment to the opposite end of the reservoir. The new dam will be an earth fill dam with a downstream filter drain and filter blanket. A silt and overburden excavation is assumed to extend 10 feet below the estimated reservoir bottom to reach a suitable foundation. The jurisdictional height of the new dam will be just below 25 feet, 15 feet less than the jurisdictional height of the existing dam (a dam's jurisdictional height refers to the vertical distance measured from the lowest point at the downstream toe of the dam to its maximum storage elevation). The surface area of the impoundment (body of water contained in dam) will be reduced from 8.8 acres to 4.6 acres.

Project History

In 2007, the U.S. Army Corps of Engineers evaluated the existing Upper Kapahi Dam and determined that dam rehabilitation was required. Construction of improvements was initiated in 2011, but a subsequent survey of the dam in 2012 revealed that the dam contained undesirable embankment materials along the majority of the dam crest and road alignment. Based on this, the improvement project was suspended, the reservoir was drained, and alternatives were developed to address the safety deficiencies. Dam replacement or repair was advised.

The proposed project is based on a combined alternative agreed upon by State and County. The preferred alternative includes maintaining the current alignment of Kainahola Road, breaching the existing dam, and constructing a new dam upstream of the existing embankment dam. This alternative removes dam safety uncertainties by allowing the trash within the dam to remain in place, and it will maintain some agricultural storage within the reservoir for East Kaua‘i Water Users' Cooperative to supplement some of the water storage lost due to decommissioning the existing dam. Storage capacity would be reduced from approximately 110 acre-feet to approximately 35 acre-feet.

Due to public safety concerns, the State and County are proceeding with the breaching of the existing dam as soon as possible. The dam breach is a separate project from the Upper Kapahi Reservoir Project.

An information meeting for the public on the Environmental Assessment for the Upper Kapahi Dam Replacement Project will be held on April 1, 2014, from 5 to 7 p.m., at the Dining Room of the Kapa‘a Middle School, 4867 Olohena Road, Kapa‘a, Hawai‘i.

I am seeking your *kōkua* (help) and guidance regarding the following aspects of our study:

- **General history and present and past land use of the Project area.**
- **Knowledge of cultural sites which may be impacted by future development of the Project area - for example, historic sites, archaeological sites, and burials.**
- **Knowledge of gathering practices in the Project area, both past and ongoing.**
- **Cultural associations of the Project area, such as legends and traditional uses.**
- **Referrals of kūpuna (elders) and kama‘āina (native born) who might be willing to share their cultural knowledge of the Project area and the surrounding ahupua‘a lands.**
- **Any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the Project area.**

Appendix G

Biological Surveys for Upper Kapahi Dam Replacement Project

AECOS No. 1375

Biological surveys for Upper Kapahi Dam Replacement Project, Kapaʻa, Kauaʻi

Prepared by:

AECOS, Inc.
45-939 Kamehameha Hwy, Suite 104
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April 9, 2014

Biological surveys for Upper Kapahi Dam Replacement Project, Kapa‘a, Kaua‘i

April 9, 2014 *AECOS* No. 1375

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Introduction

In December-January (2013-14), *AECOS*, Inc. biologists conducted biological resources and water quality surveys of Upper Kapahi Reservoir located near Kapa‘a on the Island of Kaua‘i (Fig 1). The dam is owned by the state Department of Land and Natural Resources (DLNR) and County of Kaua‘i; the reservoir is presently dewatered. The Upper Kapahi Dam Replacement Project (“Project”) proposes to construct a new dam and enlarged spillway within the existing reservoir. The existing dam will be breached (while maintaining the footprint of Kainahola Road) with an enlarged culvert to allow passage of flood waters that come over the new spillway.

Section 404 of the Clean Water Act (CWA) assigns regulatory authority to the U.S. Army Corps of Engineers (USACE) over certain activities in “waters of the U.S.” The project is connected to the perennial Kapa‘a and Waika‘ea streams, both jurisdictional waters[2] as they are perennial streams (termed relatively permanent waters or RPWs in regulatory jargon) that flow into a traditionally navigable water (TNW; that is, the Pacific Ocean). The Upper Kapahi Reservoir Dam Replacement Project will involve construction partly within the footprint of the existing Upper Kapahi Reservoir, an agricultural reservoir created by excavating and berming uplands to collect, impound, and otherwise retain diverted stream waters (U.S. Army Corps of Engineers, letter dated May 13, 2010). The purpose of the new dam is to provide irrigation

[1] Rana Biological Consulting, Inc., Kailua-Kona, Hawai‘i.
[2] The term “jurisdictional water” is synonymous with “waters of the U.S.,” meaning aquatic features that fall under the regulatory authority of the federal government.

water to the East Kauai Water Users Association. A Department of the Army permit may be required for Project construction. *AECOS* was contracted by GEI Consultants[3] to investigate biological resources and water quality in the proposed Project area. This report details findings of those surveys.

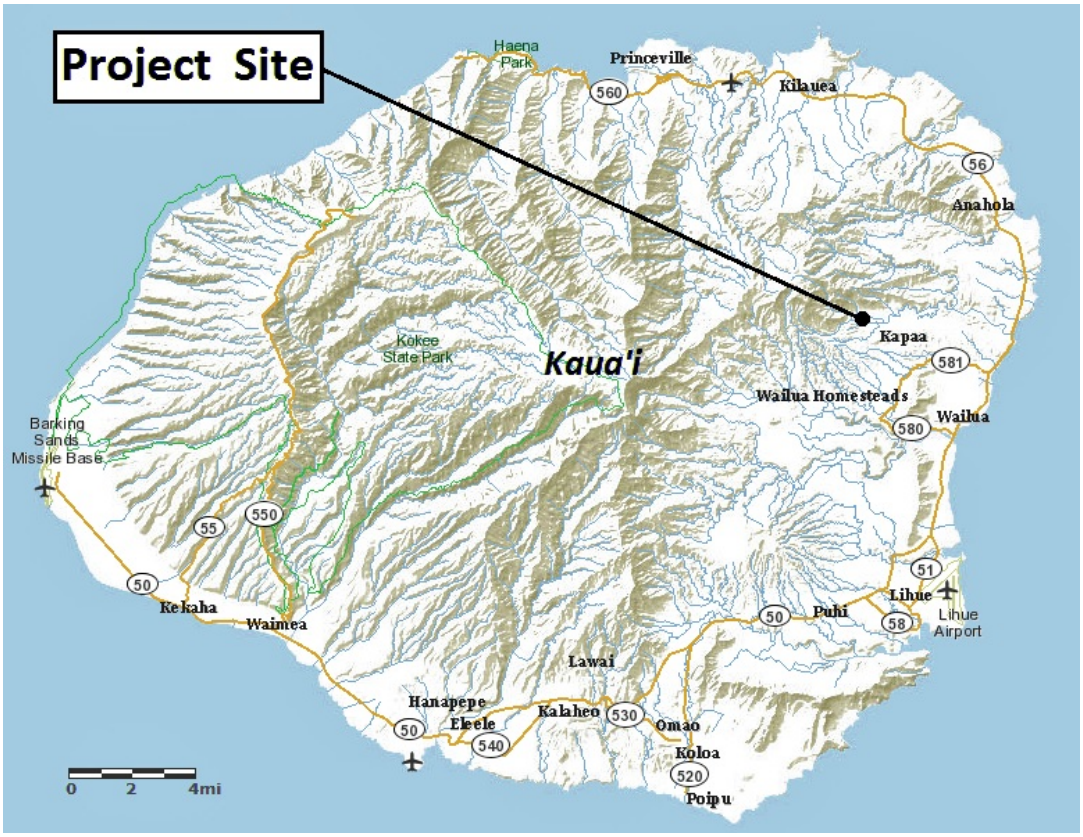

Figure 1. General location of Upper Kapahi Reservoir on the island of Kaua‘i.

Site Description

The system of water diversion ditches that Upper Kapahi Reservoir is a part of (Fig. 2), was built by Lihue Plantation in the period 1922-26 (Wilcox, 1996), although Cultural Surveys (2014) points out that this reservoir is clearly shown on the 1905 Harvey map of the area. Upper Kapahi reservoir, with a storage capacity of 30 million gallons, was the second largest reservoir in the Lihue Plantation gravity flow system and received water from two watersheds: Kapa‘a and Waika‘ea. Kapahi Ditch feeds water into the reservoir from Makaleha

[3] This document will be incorporated into the Environmental Assessment (EA) for the project and become part of the public record.

Stream, a tributary of Kapa‘a Stream. Another ditch feeds water from Waika‘ea Stream and Wailua Ditch to the reservoir at its far west end. Outflow from the reservoir (through “Lateral 8”) has two potential paths: to the northeast to former sugar cane fields and on to Lower Kapahi Reservoir near Kahuna Road; and to the south through a siphon under Waika‘ea Stream and into Twin Reservoir. These systems are still present and under consideration for repairing and enhancing in order to deliver water to various agricultural users in the area. The reservoir outlet works delivers water to Lateral 8 during large rain events and then into Waika‘ea Stream, which in turn flows into Waika‘ea Canal on the coastal plain at Kapa‘a.

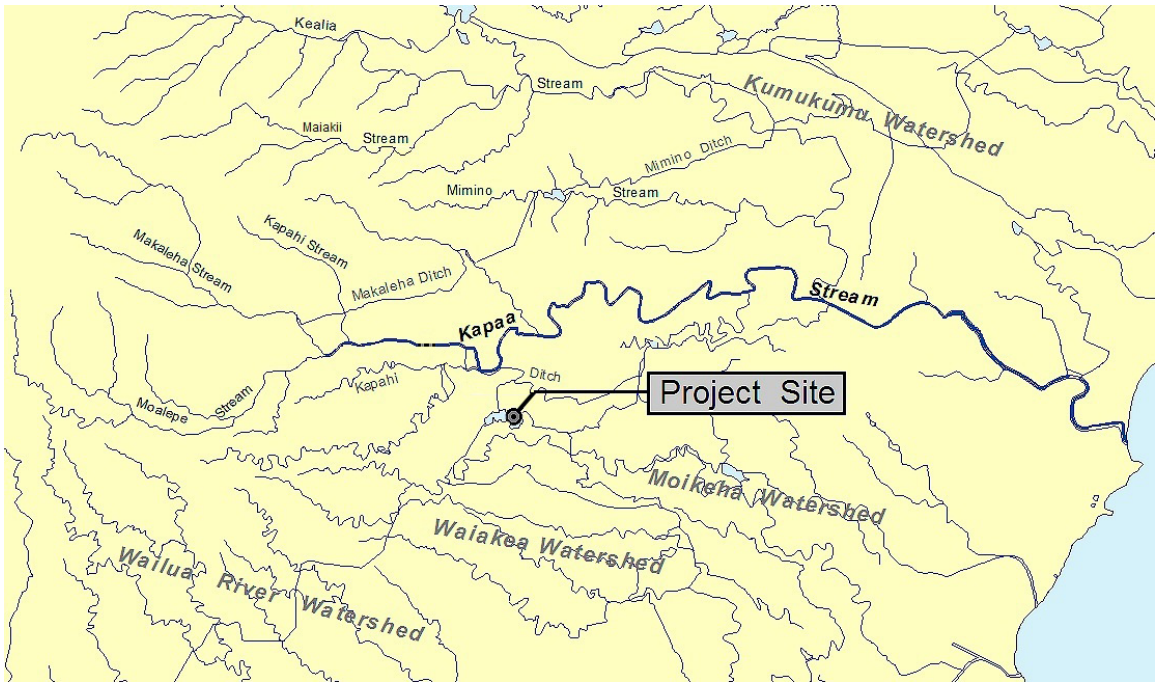

Figure 2. The project location on a map of area streams and (mostly former) water supply ditches.

Kapa‘a Stream

The waters of Kapa‘a Stream originate on the slopes of the Makaleha Mountains in the Keālia Forest Reserve in east Kaua‘i. Moalepe, Makaleha, and Kapahi tributaries originate south of the Keiwa Ridge and contribute to flow in Kapa‘a Stream upstream from the project site. Mimino, Keālia, and Maiakii Streams originate north of the Keiwa ridge and flow seaward before reaching confluence

with Kapaʻa Stream in lower Kapaʻa Homesteads—downstream from Upper Kapahi Reservoir. The terminus of Kapaʻa Stream is a coastal estuary at the ocean at the southern end of Keālia Beach. The 16.5 mi^2 (42.7 km^2) Kapaʻa Watershed is highly modified with numerous reservoirs, ditches, and siphons diverting waters from their natural flow. The complex stream system has a total stream length of 59.2 mi or 95.3 km (Parham et al, 2008).

Waikaʻea Stream

Like Kapaʻa Watershed, Waikaʻea Watershed has been extensively modified with numerous reservoirs, ditches, and siphons diverting waters from their natural flow. Waikaʻea Watershed is approximately 19.7 km^2 (7.6 mi^2; much smaller than that of Kapaʻa Stream) as it originates at an elevation of only 365 m (1198 ft; Parham et al, 2008). Waikaʻea Stream eventually connects with Waikaʻea Canal before entering the Pacific Ocean.

Methods

Water Quality

Biologists made field measurements for temperature, dissolved oxygen, and pH and collected water samples for analysis of conductivity, total suspended solids, turbidity, nitrate-nitrite nitrogen, total nitrogen, and total phosphorus from three stations in the Project area. All water samples were collected in screw cap-polypropylene bottles on January 29, 2014 and delivered to *AECOS* laboratory in Kaneʻohe, Oʻahu for laboratory analyses (*AECOS* Log No. 29737). Table 1 lists analytical methods and instrumentation used in the analyses.

Table 1. Analytical methods and instruments used for water quality analyses of Upper Kapahi Reservoir (January 29, 2014).

Analysis	Method	Reference	Instrument[†]
Temperature	SM 2550 B	SM (1998)	YSI Model 550A DO meter thermistor
Conductivity	SM 2510-B	SM (1998)	Hydach pH/conductivity meter
pH	SM 4500 H+	SM (1998)	pH Hep HANNA meter
Dissolved Oxygen	SM 4500-O G	SM (1998)	YSI Model 550A Dissolved Oxygen Meter

Table 1 (continued).

Analysis	Method	Reference	Instrument†
Turbidity	EPA 180.1 Rev 2.0	EPA (1993)	Hach 2100N Turbidimeter
Total Suspended Solids	Method 2540 D	SM (1998)	Mettler H31 analytical balance
Nitrate + Nitrite	Grasshoff	Grasshoff et al. (1983)	Seal AA3 Autoanayzer, colorimetric
Total Nitrogen	Grasshoff	Grasshoff et al. (1983)	Seal AA3 Autoanayzer, UV
Total Phosphorus	Grasshoff	Grasshoff et al. (1983)	Seal AA3 Autoanayzer, UV

† typical instruments listed, others may have been substituted.

Figure 3 shows the locations of our three water quality sampling stations. Station 1 was located in a channel with flowing water at the upper end of Upper Kapahi Reservoir. Station 2 was located at the point just before this water, flowing across the bottom of the reservoir basin, enters the outlet of the reservoir. Station 3 was located in the auwai beyond the reservoir. All stations were located near the center of the wetted width of the channel and samples were collected from just below the stream surface.

Botanical Survey Methods

A survey of the flora in and in the vicinity of the existing Upper Kapahi Reservoir, concentrating on areas of probable impacts related to the proposed modifications, was undertaken on December 18, 2013. Species names follow the nomenclature in *Manual for the Flowering Plants of Hawai'i: Volumes I and II* (Wagner et al., 1990) and *Hawai'i's Ferns and Fern Allies* (Palmer, 2003), and as updated by various more recently published papers as summarized by Imada (2012).

Aquatic Biota Survey Methods

The biologists made observations of aquatic organisms as they covered the stream channel within and downstream from Upper Kapahi Reservoir area on foot. They used dip nets to capture and observe organisms because the water was too shallow to snorkel. As the survey progressed, notes were made on relative abundances of each species (e.g., rare, common, abundant).

Avian Survey Methods

Three avian count stations were sited within the project area on December 18, 2013. One station was located at the southwest end of a proposed new dam,

Figure 3. Location of water quality sampling stations sampled on January 29, 2014. The reservoir was mostly dry at the time of the sampling event and flow through from the *auwai* or irrigation system was sampled.

one in the center of a proposed new spillway, and a third on the eastern end of the reservoir adjacent to Kaiahola Road. A single eight-minute avian point count was made at each count station. Field observations were made with the aid of Leica 8 X 42 binoculars and by listening for vocalizations. Avian counts were conducted in the early morning hours. One 30–minute, time-dependent waterbird count was made at a location overlooking ponded water in the south part of the reservoir basin. In addition, the zoologist walked the project area looking for avian species and habitats not detected during the point counts. Weather conditions were good, with limited light rain showers, unlimited visibility, and winds between 2 and 8 kilometers-per-hour.

Avian phylogenetic order and nomenclature used in this report follow the *AOU Check-List of North American Birds* (American Ornithologists' Union, 1998) and the 42nd through the 51st supplements to the Check-List (American

Ornithologists' Union, 2000; Banks et al., 2002, 2003, 2004, 2005, 2006, 2007, 2008; Chesser et al., 2009, 2010, 2011, 2012, 2013).

Mammalian Survey Methods

With the exception of the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*; *ʻōpeʻapeʻa*), all terrestrial mammals currently found on the Island of Kauaʻi are alien species, and most are ubiquitous. The survey of mammals was limited to visual and auditory detection, coupled with visual observation of scat, tracks, and other animal sign. A running tally was kept of all vertebrate species observed, heard, or detected by other means within the general project area. Mammal scientific names follow (Wilson and Reeder, 2005).

Survey Results

Water Quality

Water quality results for the January 29, 2014 sampling event are presented in Table 2. Temperature (19.6 to 21.5°C), conductivity (116 to 177 µmhos/cm), and pH (6.25 to 6.32) were fairly low at all three stations. Dissolved oxygen (DO) was also low at the three stations (4.20 to 6.63 mg/l), representing 46 to 73% saturation.

Particulate levels are measured by turbidity and total suspended solids (TSS) and these two parameters often correlate. On January 29, turbidity was high at all three stations (11.9 to 14.7 ntu), while TSS was relatively low (16.0 to 22.0 mg/l). Since turbidity is strongly influenced by extremely fine particles, the result suggests water clarity was mostly being influenced by phytoplankton or clay particles in the water. Nitrate plus nitrite (NO_3+NO_2) and Total N levels were relatively low at Sta. 2 in the reservoir (49 µg N/l and 206 µg N/l, respectively), slightly elevated at Sta. 1 upstream from the reservoir (78 µg N/l and 353 µg N/l, respectively), and elevated at Sta. 3 downstream from the reservoir (233 µg N/l and 498 µg N/l, respectively). Total phosphorus levels were low and ranged from (<3 to 24 µg P/l).

Vegetation

The survey area includes open meadow dominated by lush grasses, some forest, and recently disturbed ground covered by grasses and other weedy herbaceous plants (Fig. 4). The reservoir basin is mostly dry, and covered by grasses, although a shallow pond is present in the southeast corner (Fig. 5).

Table 2. Water quality results from January 29, 2014 sampling event.

Station	Time	Temp. (°C)	Conduct. (µmhos/cm)	Dissolved Oxygen (mg/l)	DO % sat (%)	pH
1	1230	20.1	145	4.20	46	6.32
2	1330	19.6	116	6.63	73	6.42
3	1440	21.5	177	5.04	57	6.25

Station	Time	Turbidity (ntu)	TSS (mg/l)	NO_3+NO_2 (µg N/l)	Total N (µg N/l)	Total P (µg N/l)
1	1230	11.9	16.0	78	353	24
2	1330	12.8	16.0	49	206	10
3	1440	14.7	22.0	233	498	<3

Flora

Table 1 is a listing of all plants (ferns and flowering plants) identified in the survey area on December 18, 2013. The table includes the "status" of each identified plant. By status (column 3 in Table 1) is meant whether a plant is native or non-native, and if non-native, whether it is naturalized ("Nat"; growing on its own in the wild) or ornamental ("Orn"; growing by human maintenance; not typically surviving in the wild). Native plants are either indigenous ("**Ind**") or endemic ("**End**") depending upon their natural distribution within and outside of the Hawaiian Islands (see Legend at end of Table 1). Finally, a special group of botanically non-native species are the so-called "canoe plants" or early Polynesian introductions ("**Pol**"): species introduced by the early Polynesian migrants when settling the Hawaiian Islands.

Only native plants typically have resource value or are of concern in assessing impacts of a project. Others may have either cultural or landscape values. Total taxa identified in our survey is 105. Only three species (or 3% of the total) in the list are native plants: *hau* (*Hibscus tiliaceus*), *hala* (*Pandanus tectorius*), and pos-

Figure 4. Graded area in vicinity of proposed new spillway.

Figure 5. Lower end of Upper Kapahi Reservoir basin showing grass-covered bottom with a small remaining pond in the southeast corner. Water quality Sta. 2 is before a culvert at the base of the dam, center background.

Table 3. Checklist of plants recorded in the Upper Kapahi Reservoir survey area.

Family *Genus species*	Common name	STATUS	ABUNDANCE	NOTES
PTERIDOPHYTES - FERNS & FERN ALLIES				
BLECHNACEAE				
Blechnum appendiculatum Willd.	---	Nat	U	
THELYPTERIDACEAE				
Christella parasitica (L.) H. Lév	wood fern	Nat	U	
NEPHROLEPIDACEAE				
Nephrolepis multiflora (Roxb.) F.M. Jarrett ex C.V. Morton	sword fern	Nat	C1	
POLYPODIACEAE				
Phymatosorus grossus (Langsd. & Fisch.) Brownlie	*laua'e*	Nat	R	
FLOWERING PLANTS – DICOTS				
ACANTHACEAE				
Thunbergia fragrans Roxb.	sweet clock-vine	Nat	R	
AMERANTHACEAE				
Amaranthus spinosus L.	spiny amaranth	Nat	R	
APOCYNACEAE				
Thevetia peruviana (Pers.) K. Schum.	be-still	Orn	R	
ARALIACEAE				
Schefflera actinophylla (Endl.) Harms	octopus tree	Nat	R	
ASTERACEAE				
Ageratum houstonianum Mill.	*maile hohono*	Nat	O	
Bidens pilosa L.	*kī*	Nat	U	
Conyza bonariensis (L.) Cronq.	hairy horseweed	Nat	U	
Crassocephalum crepidioides (Benth.) S. Moore	---	Nat	U	
Elephantopus mollis Kunth	---	Nat	R	
Emilia fosbergii Nicolson	Flora's paintbrush	Nat	R	
Parthenium hysterophorus L.	false ragweed	Nat	R1	
Pluchea carolinensis		Nat	U1	
Sonchus oleraceus L.	*pualele*	Nat	U	
Sphagneticola trilobata L.	wedelia	Nat	O3	
Synedrella nodiflora (L.) Gaertn.	nodeweed	Nat	R	

Table 3 (continued)

Family *Genus species*	Common name	STATUS	ABUNDANCE	NOTES
BIGONACEAE				
Spathodea campanulata P. Beauv.	African tulip tree	Nat	O	
CARICACEAE				
Carica papaya L.	papaya	Nat	R	
CASSURANACEAE				
Cassuarina equisetifolia L.	ironwood, juv.	Nat	R	
CONVOLVULACEAE				
Ipomoea obscura (L.) Ker-Gawl.	---	Nat	O	
Ipomoea triloba L.	little bell	Nat	U	
Merremia tuberosa (L.) Rendle	wood rose	Nat	O	
EUPHORBIACEAE				
Euphorbia hirta L.	garden spurge	Nat	U	
Euphorbia heterophylla L.	*kaliko*	Nat	U1	
Euphorbia hypericifolia L.	graceful spurge	Nat	R	
Phylanthus debilis Klein ex Willd.	*niuri*	Nat	R	
Ricinus communis L.	castor bean	Nat	O	
FABACEAE				
Canavalia cathartica Thouars	*maunaloa*	Nat	U	
Chamaecrista nictitans (L.) Moench	partridge pea	Nat	U	
Crotalaria incanum L.	fuzzy rattlepod	Nat	U	
Desmodium incanum DC.	Spanish clover	Nat	O1	
Desmodium tortuosum (Sw.) DC.	Florida beggarweed	Nat	R2	
Desmodium triflorum (L.) DC.	---	Nat	U	
Falcateria moluccana (Miq.) Barneby & Grimes	albizia	Nat	C1	
Indigophera hendecaphyla Jacq.	creeping indigo	Nat	R	
Indigofera suffruticosa Mill.	indigo	Nat	U	
Leucaena leucocephala (Lam.) deWit	*koa haole*	Nat	O	
Macroptilium atropurpureum (DC.) Urb.	---	Nat	O	
Mimosa pudica var. *unijuga* (Duchass. & Walp.) Griseb.	sensitive plant	Nat	C	
Neonotonia wightii (Wight & Arnott) lackey	glycine vine	Nat	A1	
Senna alata (L.) Roxb.	candle bush	Nat	O	
LAMIACEAE				
Hyptis pectinata (L.) Poit.	comb hyptis	Nat	U	
Solenostemon scutellarioides (L.) Codd	coleus	Orn	R	

Table 3 (continued)

Family *Genus species*	Common name	STATUS	ABUNDANCE	NOTES
LAURACEAE				
Cinnamomum camphora (L.) J. Presl.	camphor tree	Nat	C1	
MALVACEAE				
Hibiscus tiliaceus L.	*hau*	**Ind**	U	
Sida acuta N. L. Burm.	---	Nat	R	
Sida rhombifolia L.	---	Nat	U	
Sida spinosa L.	prickly sida	Nat	R	
Urena lobata L.	aramina	Nat	U1	
MELASTOMATACEAE				
Clidemia hirta (L.) D. Don	Koster's curse	Nat	C1	
MORACEAE				
Artocarpus atilis (Z) Fosberg	*'ulu,* breadfruit	**Pol**	R	
Ficus microcarpa L. fil.	Chinese banyan	Nat	R	
MYRTACEAE				
Eugenia cf. *uniflora* L.	Surinam cherry	Nat	R	<1>
Psidium cattleianum Sabine	strawberry guava	Nat	C	
Psidium guajava L.	common guava	Nat	O	
Syzygium cuminii (L.) Skeels	Java plum	Nat	C	
Syzygium jambos (L.) Alston	rose apple	Nat	R	
Rhodomyrtus tomentosa (W. Aiton) Hasskarl	downy myrtle	Nat	U	<1>
ONAGRACEAE				
Ludwigia octovalvus (Jacq.) Raven	primrose willow	Nat	O	
PAPAVERACEAE				
Argemone cf. *mexicana* L.	Mexican poppy	Nat	R2	<1>
PASSIFLORACEAE				
Passiflora cf. *edulis* Sims	passion fruit	Nat	R	<1>
Passiflora suberosa L.	*huehue haole*	Nat	R	
POLYGALACEAE				
Polygala paniculata L.	bubblegum plant	Nat	R	
RUBIACEAE				
Hedyotis corymbosa (L.) Lam.	---	Nat	U	
Spermacoce assurgens Ruiz & Pav.	buttonweed	Nat	U	
SOLANACEAE				
Solanum lycopersicum var. *cerasiforme* (Duval) Spooner, G.J. Anderson, & R.K, Jansen	cherry tomato	Nat	R	

Table 3 (continued)

Family *Genus species*	Common name	STATUS	ABUNDANCE	NOTES
VERBENACEAE				
Lanatana camara L.	lantana	Nat	U	
Stachytarpheta cayennensis (Rich.) Vahl	vervain	Nat	O	
FLOWERING PLANTS – MONOCOTS				
AGAVACEAE				
Cordyline fruticosa (L.) A. Chev.	ti; *kī*	**Pol**	U1	
Dracaena marginata Lam.	money tree	Orn	R	
ARACEAE				
Xanthosoma rosea Schott	*'ape*	Nat	U2	
COMMELINACEAE				
Commelina diffusa N.L. Burm.	day flower; *honohono*	**Pol**	A	
CYPERACEAE				
Cyperus involucratus Rottb.	umbrella sedge	Nat	R	
Cyperus polysytachyos Rottb.	---	Nat	U	
Fimbristylis miliacea (L.) Vahl	---	Nat	R	
LILIACEAE				
Asparagus densiflorus (Kunth) Jessop	asparagus "fern"	Nat	R	
MUSACAEAE				
Musa acuminata Colla	hybrid banana	**Pol**	R	
Musa velutina H. Wendl.	pink-fruited banana	Orn	R	
ORCHIDACEAE				
Arundina graminifolia (D. Don) Hochr.	bamboo orchid	Nat	R	
Spathoglottis plicata Blume	Malayan ground orchid	Nat	O	
PANDANACEAE				
Pandanus tectorius S. Parkinson ex Z	*hala*	**Ind**	R	
POACEAE (GRAMINEAE)				
Andropogon virginicus L.	broomsedge	Nat	C1	
Axonopus compressus (Sw.) P. Beauv.	brd-lf carpetgrass	Nat	C	
Axonopus fissifolius (Raddi) Kuhlm.	nrw-lf carpetgrass	Nat	U	
Cenchrus purpureus (Schumach.) Marrone	elephant grass	Nat	A1	
Chloris barbata (L.) Sw.	swollen fingergrass	Nat	U	
Chloris virgata Sw.	feather fingergrass	Nat	U2	
Chrysopogon aciculatus (Retz.) Trin.	*manienie*	**Ind?**	U1	
Digiteria ciliaris (Retz.) Koeler	Henry's crabgrass	Nat	C	
Echinochloa crus-galli (L.) P. Beauv.	barnyard grass	Nat	U	

Table 3 (continued)

Family *Genus species*	Common name	STATUS	ABUNDANCE	NOTES
POACEAE (continued)				
Eleusine indica (L.) Gaertn.	wiregrass	Nat	U	
Eragrostis pectinacea (Michx.) Nees	Carolina lovegrass	Nat	R	
Melinis minutiflora P. Beauv.	molasses grass	Nat	A	
Oplismenus hirtellus (L.) P. Beauv.	basketgrass	Nat	U	
Paspalum conjugatum Bergius	Hilo grass	Nat	O	
Paspalum dilatatum Poir.	Dallis grass	Nat	O	
Paspalum fimbriatum Kunth	Panama grass	Nat	U	
Sacciolepis indica (L.) Chase	Glenwood grass	Nat	A	
Schyzachrium condensatum (Kunth) Nees	beardgrass	Nat	U3	
Setaria gracilis Kunth	yellow foxtail	Nat	U	
Sporobolus indicus (L.) R.Br.	West Indian dropseed	Nat	R	
Urochloa maxima (Jacq.) R.D. Webster	Guinea grass	Nat	A	
Urochloa mutica (Forssk.) T.Q. Nguyen	California grass	Nat	AA	

Key to Table 3.

Status = distributional status
- End. = endemic; native to Hawaii and found naturally nowhere else.
- Ind. = indigenous; native to Hawaii, but not unique to the Hawaiian Islands.
- Nat. = naturalized, exotic, plant introduced to the Hawaiian Islands since 1778 and well-established.
- Orn. = exotic, ornamental or cultivated; plant not naturalized (not well-established outside of cultivation).
- Pol. = Polynesian introduction before 1778.R

Abundance = occurrence ratings for plants in survey area.
- R – Rare - only one, two, or three plants seen.
- U - Uncommon - several to a dozen plants observed.
- O - Occasional - found regularly around the site.
- C - Common - considered an important part of the vegetation and observed numerous times.
- A - Abundant - found in large numbers; may be locally dominant.
- Numbers after letter indicates clustered distribution: number of plants greater than abundance category (for R, U, or O), which then becomes indication of number of clusters. For C or A number indicates species very common or abundant in limited area(s) only.

Notes:
- <1> Plant without flower or fruit; identification uncertain.

sibly native grass) *manienie* (*Chrysopogon aciculatus*). All three are common plants in Hawai‘i. Early Polynesian introductions include: *‘ulu* or breadfruit (*Artocarpus atilis*), ti or *kī* (*Cordyline fruticosa*), *honohono* (*Commelina diffusa*), and *mai‘a* or banana (*Musa* sp.) Again, these are common species and of no special resource

concern. All other plants observed during our survey are not native to the Hawaiian Islands and therefore do not enjoy any special protections.

Aquatic Biota

Table 4 is a listing of aquatic animals identified by *AECOS* biologists on January 29, 2014 in waterway flowing through the reservoir basin and in the *hau* forest upstream and downstream of the reservoir. Results of biota surveys conducted elsewhere in Kapa‘a and Waika‘ea streams from other *AECOS* surveys (*AECOS*, 2002, 2008a, 2008b, and 2012) and reported in the watershed atlas (Parham, et al., 2008) are also included in this table to assess the potential for migration of native amphidromous[4] animals and the distribution of naturalized organisms throughout the streams. These records are identified in the table as occurring in the estuary and middle reach of Waika‘ea Stream and the estuary, lower, middle, and upper reach of Kapa‘a Stream.

Several poeciliids (*Gambusia affinis*, *Poecilia reticulata*, *P. mexicana/salvatoris*) are the only fishes we observed in our survey. The red swamp crayfish (*Procambarus clarkii*) is abundant, burrowing in the silt bottom of the stream channel. Shells of Asiatic flume clam (*Corbicula fluminea*) are scattered throughout the dry reservoir bottom; live clams are likely present buried just below the sediment surface where water is present. Numerous damselflies and dragonflies (*Ischnura ramburii*, *I. posita*, *Anax junius*, and *Crocothemis servilia*), which have aquatic larvae (nymphs), were observed throughout the grass meadow of the reservoir. We observed frog tadpoles (probably *Lithobates catesbeianus*) in the *hau* forest at the upper end of the reservoir and heard frog chirps downstream from the reservoir.

Kapa‘a Stream, which feeds into Upper Kapahi Reservoir through Kapahi Ditch, is ranked as “outstanding” with respect to aquatic resources (HCPSU, 1990). Four key native amphidromous species (*Lentipes concolor*, *Awaous guamensis*, *Sicyopterus stimpsoni*, and *Neritina granosa*) comprise “native species group one” (NG1) and all four are found in Kapa‘a Stream or its tributaries (the three fishes were sighted as recently as 2011). At least five species of native damselflies (*Megalagrion* spp.) have been observed in the upper reach of Kapa‘a Stream. No native amphidromous species have been reported from Waika‘ea Stream. Cyprinids (carp, koi, goldfish) are reported as present in both stream systems. Bass (*Micropterus* spp.) are present in Kapa‘a Stream.

[4] Meaning they move between fresh and salt water as part of their life cycle.

Table 4. List of aquatic species animals in unnamed tributary to Waikaʻea Stream (W mid) and elsewhere in Kapaʻa (K) and Waikaʻea (W) watersheds.

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name	Abundance	Status	ID Code (reach)
	ALGAE			
CHLOROPHYTA				
CLADOPHORACEAE				
Rhizoclonium sp. Kuetzing		0	**Ind**	1 (K mid)
	INVERTEBRATES			
PLATYHELMINTHES				
TURBELLARIA, TRICLADIDA				
PLANARIIDAE				
Dugesia sp.	flatworm	O	Nat	1 (K mid) 6 (K mid, up)
unid.	flatworm	O	Nat	3 (K low)
ANNELIDA				
CLITELLATA, HIRUDINEAE				
HIRUDINEA	leach			
indet. Hirudinea		--	---	6 (K up)
ANNELIDA				
CLITELLATA, OLIGOCHAETA				
indet. Oligochaeta		--	**--**	6 (K mid)
ANNELIDA				
POLYCHAETA				
indet. Polychaeta	bristleworm	--	**--**	5 (W mid)
ANNELIDA				
POLYCHAETA, PHYLLODOCIDA				
NEREIDIDAE				
Namalycastis sp.		--	**Ind**	5 (W mid)
MOLLUSCA,BIVALVIA				
VENEROIDA				
CYRENIDAE				
Corbicula fluminea (O.F. Müller, 1774)	Asiatic flume clam	A†	Nat	0,5 (W mid)
MOLLUSCA,GASTROPODA				
indet. Gastropoda		---	---	6 (K up)
MOLLUSCA,GASTROPODA				
NERITIMORPHA				
NERITIDAE				
Ferrissia sharpi		---	**End**	5 (W mid) 6 (K mid)

Table 4 (continued).

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name	Abundance	Status	ID Code (reach)
NERITIDAE (continued)				
Neritina granosa Sowerby I, 1825	*hihiwai*	--	**End**	6 (K mid)
Nerita picea Recluz	pitchy nerite	A	**Ind**	7 (W est)
MOLLUSCA, GASTROPODA **BASOMMATOPHORA**				
LYMNAEIDAE				
unid.	lymnaeid snail	A	---	1 (K mid) 6 (K up)
MOLLUSCA, GASTROPODA **NEOTAENIOGLOSSA**				
LITTORINIDAE				
Littorina sp.	common periwinkle	A	---	7 (W est)
THIARIDAE				
Melanoides tuberculata Muller	red-rimmed melania	O C,C,A,A	Nat	0 (W mid) 1 (K mid or up) 2,3 (K low) 4,6 (K mid)
ARTHROPODA, INSECTA **DIPTERA**				
CANACEIDAE	surf fly	--	**Ind**	6 (K mid)
Procanace sp.		--	Nat	5 (W mid)
CHIRONOMIDAE	non-biting midge			
indet. Chironomidae	larva	--	Nat	5 (W mid) 6 (K mid)
Orthocladius sp.	--	--	**End**	6 (K mid)
EMPIDIDAE				
indet. Empididae	dance-fly	--	--	6 (K mid)
EPHYDRIDAE				
indet. Ephydridae		--	--	6 (K mid, up)
Scatella sp.	shore fly	--	**Ind**	6 (K mid)
Scatella kauaiensis (Wirth, 1948)	shore fly	--	**End**	6 (K up)
TIPULIDAE				
indet. Tipulidae	crane-fly	--	Nat	5 (W mid) 6 (K mid, up)
ARTHROPODA, INSECTA **LEPIDOPTERA**				
COSMOPTERIGIDAE				
Hyposmocoma sp.	Hawaiian case-making moth	0	**End**	1 (K up)

Table 4 (continued).

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name	Abundance	Status	ID Code (reach)
ARTHROPODA, INSECTA				
ODONATA				
AESHNIDAE				
Anax junius Drury	green darner	O R,R	**Ind**	0 (W mid) 1 (K mid or up) 2 (K low)
COENAGRIONIDAE				
Enallagma civile (Hagen, 1861)	familiar bluete	--	Nat	6 (K up)
Ischnura posita Hagen	fragile florktailt	C R	Nat	0 (W mid) 1 (K mid or up) 6 (K mid, up)
Ischnura ramburii Selys	Rambur's forktail	O R,U	Nat	0 (W mid) 1 (K mid or up) 2 (K low) 6 (K up)
Megalagrion sp.	damselfly	--	**End**	6 (K up)
Megalagrion heterogamias (Perkins)	Kauai mountain damselfly	--	**End**	6 (K up)
Megalagrion oresitrophum (Perkins)	slender Kauai damselfly	--	**End**	6 (K up)
Megalagrion orobates (Perkins)	yellowface Kauai damselfly	O	**End**	6 (K up)
Megalagrion vagabundum (Perkins)	scarlet Kauai damselfly	O	**End**	1,6 (K up)
Megalagrion williamsoni (Perkins)	Williamson's Hawaiian damselfly	O	**End**	6 (K up)
LIBELLULIDAE				
Crocothemis servilia (Drury)	Oriental scarlet	R	Nat	0
Pantala flavescens Fabricius	globe skimmer	R,U	**Ind**	1 (K mid or up) 2 (K low)
ARTHROPODA, INSECTA	caddisfly			
TRICHOPTERA				
indet. Tricoptera		--	Nat	6 (K mid)
HYDROPSYCHIDAE				
Cheumatopsyche analis (Banks, 1903)		--	Nat	5 (W mid) 6 (K mid, up)
HYDROPTILIDAE				
Hydroptila sp.	micro-caddisfly	--	Nat	5 (W mid) 6 (K mid, up)

Table 4 (continued).

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name	Abundance	Status	ID Code (reach)
ARTHROPODA, CRUSTACEA				
unidentified Copepoda	copepod	--	--	5 (W mid) 6 (K up)
unidentified Ostracoda	ostracod	--	--	5 (W mid) 6 (K mid, up)
ARTHROPODA, MALACOSTRACA, AMPHIPODA				
indet. Amphipoda	amphipod	--	**Ind**	6 (K mid)
ARTHROPODA, MALACOSTRACA, DECAPODA				
ATYIDAE				
Atyoida bisulcata J.W. Randall	*ōpae kala'ole*	--	**End**	6 (K est, low, mid, up)
CAMBARIDAE				
Procambarus clarkii Girard	American crayfish	A O	Nat	0 (W mid) 2,3 (K low) 4 (K mid) 6 (K low, mid)
GRAPSOIDEA				
Grapsus tenuicrustatus (Herbst, 1783)	*a'ama*, rock crab	O	**Ind**	7 (W est)
PALAEMONIDAE				
Macrobrachium grandimanus J.W.Randall	*'opae oeha'a*	O	**End**	3 (K low) 6 (K est, low, mid, up)
Macrobrachium lar J.C. Fabricius	Tahitian prawn	R	Nat	1 (K mid or up) 2,3 (K low) 6 (K low, mid)
FISHES				
CHORDATA, ACTINOPTERYGII				
ACANTHURIDAE				
Acanthurus triostegus (Linnaeus, 1758)	*manini*, convict tang	C	**Ind**	7 (W est)
CARANGIDAE				
indet. Carangidae	*papio*	O	**Ind**	7 (W est)
CENTRARCHIDAE				
Lepomis sp.	sunfish	--	Nat	5 (W mid) 6 (K low, mid, up)

Table 4 (continued).

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name	Abundance	Status	ID Code (reach)
CENTRARCHIDAE (continued)				
Micropterus sp.	bass	--	Nat	5 (W mid) 6 (K mid, up)
Micropterus dolomieu Lacèpede	smallmouth bass	O	Nat	3 (K low) 6 (K low)
Micropterus salmoides (Lacèpede, 1802)	largemouth bass	--	Nat	6 (K low)
CICHLIDAE				
Oreochromis mossambicus (Peters, 1852)	Mozambique tilapia	--	Nat	6 (K low)
Sarotherodon melanotheron Rüppell	blackchin tilapia	--	Nat	2,3 (K low)
Tilapia sp.	tilapia	--	Nat	5 (W mid)
CLARIIDAE				
Clarias fuscus (Lacepède, 1803)	Chinese catfish	--	Nat	5 (W mid) 6 (K mid, up)
COBITIDAE				
Misgurnus anguillicaudatus Cantor	*dojo*; oriental weatherfish	R	Nat	1 (K mid) 6 (K low)
CYPRINIDAE				
indet. Cyprinidae	carp	--	Nat	5 (W mid) 6 (K mid)
Carassius auratus (Linnaeus, 1758)	goldfish	--	Nat	6 (K mid)
ELEOTRIDAE				
Eleotris sandwicensis Vaillant and Sauvage	*ʻoʻopu ʻakupa*	A	**End**	3,6 (K low)
GOBIIDAE				
indet. Gobiidae	goby	--	**Ind**	6 (K est)
Awaous guamensis Valenciennes in Cuvier and Valenciennes	*ʻoʻopu nākea*	A	**Ind**	1 (K mid or up), 2,3 (K low), 6 (K low, mid, up)
Lentipes concolor Gill	*ʻoʻopu ʻalamoʻo*	C	**End**	1 (K up) 6 (K mid, up)
Sicyopterus stimpsoni Gill	*ʻoʻopu nōplili*	R	**End**	1 (K up) 6 (K mid, up)
Stenogobius hawaiiensis Watson	*ʻoʻopu naniha*	--	**End**	2,3,6 (K low)
KUHLIIDAE				
Kuhlia xenura (Jordan & Gilbert, 1882)	*ʻaholehole*, Hawaiian flagtail	A	**End**	7 (W est) 6 (K low)
MULLIDAE				
Mulloidichthys sp.	*ʻoama*, goatfish	A	**End**	7 (W est)

Table 4 (continued).

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name	Abundance	Status	ID Code (reach)
POECILIIDAE				
Gambusia affinis Baird and Girard	mosquitofish	A C	Nat	0 (W mid) 1 (K mid or up) 2,3 (K low) 4 (K mid) 6 (low, up)
Poecilia reticulata Peters	guppy	C	Nat	0 (W mid) 1 (K mid or up) 2,3 (K low) 4 (K mid) 6 (K low, mid)
Poecilia sphenops Valenciennes, 1846	Mexican molly	--	Nat	6 (K low)
Poecilia salvatoris/mexicana	liberty/Mexican molly	O A	Nat	0 (W mid) 1 (K mid or up) 2,3 (K low)
Xiphophorus helleri Heckel	swordtail	O	Nat	1 (K mid or up) 2,3 (K low) 4 (K mid) 6 (K est, low, mid)
SPHYRAENIDAE				
Sphyraena cf. *barracuda* (Edwards, 1771)	*kaku*, great barracuda	O	**Ind**	7 (W est)
	AMPHIBIANS			
CHORDATA, AMPHIBIA **ANURA** **BUFONIDAE**				
Rhinella marina Linnaeus	cane toad	R	Nat	1 (K mid or up) 2,3 (K low) 6 (mid, up)
RANIDAE				
indeterminate Ranidae	frog, adult† and tadpoles	O	Nat	0 (W mid) 6 (K up)

Table 4 (continued).

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name	Abundance	Status	ID Code (reach)
RANIDAE (continued)				
Lithobates catesbeianus Shaw	American bullfrog	O	Nat	1 (K mid or up) 2,3 (K low) 4 (K mid) 6 (K mid, up)
BIRDS				
VERTEBRATA, AVES				
ARDEIDAE				
Nycticorax nycticorax hoactli Gmelin	*auku'u*; Black-crowned Night Heron	R	**Ind**	3 (K low) 4 (K mid)
RALLIDAE				
Galinula galeata sandwicensis	Common Gallinule	R	**End**	<a>
Fulica alai	Hawaiian Coot	R	**End**	<a>

KEY TO TABLE 4:

Abundance categories:
- R – Rare – only one or two individuals observed.
- O – Occasional – seen irregularly in small numbers
- C – Common -observed everywhere, although generally not in large numbers.
- A – Abundant – observed in large numbers and widely distributed.
- † – identified by shell or call only

Status categories:
- **End** – Endemic – species found only in Hawai'i.
- **Ind** – Indigenous – species found in Hawai'i and elsewhere.
- Nat – Naturalized – species introduced to Hawai'i intentionally, or accidentally.

ID codes:
- 0 – observed in or near Kapahi Reservoir on January 29, 2014.
- 1 – observed in Kapa'a or Makaleha Stream on Oct. 20-21, 2011 (*AECOS*, 2012).
- 2 – observed in Kapa'a Stream or estuary on July 26, 2002 (AECOS, 2002).
- 3 – observed in Kapa'a Stream or estuary on January 17, 2008 (AECOS, 2008a).
- 4 – observed in unamed tributary to Kapa'a located NE of project site on November 28, 2007 (AECOS, 2008b).
- 5 –reported in Waika'ea Watershed (Parham et al., 2008).
- 6 – reported in Kapa'a Watershed (Parham et al., 2008).
- 7 – observed in Waika'ea Stream or estuary on July 26, 2002 (*AECOS*, 2002).

Reach codes:
- Est – estuary; between coast line and 1-m elevation ASL.
- Low – lower reach; between 1- and 20-m elevation ASL.
- Mid – middle reach; between 20- and 200-m elevation ASL.
- Up – upper reach; greater than 750-m elevation ASL.
- <a> - from avian biologist's time-dependent waterbird count on December 18, 2013.

Avian Survey Results

A total of 229 individual birds of 20 species, representing 15 separate families, were recorded during station counts (Table 5). An additional species, Hawaiian Coot (*Fulica alai*), was recorded during the time-dependent water bird count. Two of the 21 species detected—Common Gallinule (*Gallinula galeata sandvicensis*) and Hawaiian Coot—are endemic waterbird species, both listed as endangered under federal and state of Hawai'i endangered species statutes (DLNR, 1998; USFWS, 2005a, 2005b, 2013). The other 19 species recorded during the course of this survey are aliens in the Hawaiian Islands.

Table 5. – Avian Species Detected During Point Counts Upper Kapahi Reservoir.

Common Name	Scientific Name	*ST*	*RA*
	GALLIFORMES		
	PHASIANIDAE - Pheasants & Partridges		
	Phasianinae - Pheasants & Allies		
Red Junglefowl	*Gallus gallus*	A	17.00
Ring-necked Pheasant	*Phasianus colchicus*	A	1.33
Indian Peafowl	*Pavo cristatus*	A	0.67
	PELECANIFORMES		
	ARDEIDAE – Herons, Bitterns & Allies		
Cattle Egret	*Bubulcus ibis*	A	6.33
	GRUIFORMES		
	RALLIDAE - Rails, Gallinules and Coots		
Common Gallinule	*Gallinula galeata sandvicensis*	**EE**	1.00
	COLUMBIDAE - Pigeons & Doves		
Spotted Dove	*Streptopelia chinensis*	A	4.67
Zebra Dove	*Geopelia striata*	A	7.33
	PSITTACIFORMES		
	PSITTACIDAE - Lories Parakeets, Macaws & Parrots		
	Psittacinae - Typical Parrots		
Rose-ringed Parakeet	*Psittacula krameri*	A	1.33
	PASSERIFORMES		
	CETTIIDAE - Cettia Warblers & Allies		
Japanese Bush-Warbler	*Cettia diphone*	A	3.33

Table 5 (continued)

Common Name	Scientific Name	*ST*	*RA*
	ZOSTEROPIDAE - White-eyes		
Japanese White-eye	*Zosterops japonicus*	A	3.33
	TIMALIIDAE - Babblers		
Chinese Hwamei	*Garrulax canorus*	A	4.00
	TURDIDAE - Thrushes		
White-rumped Shama	*Copsychus malabaricus*	A	0.67
	STURNIDAE - Starlings		
Common Myna	*Acridotheres tristis*	A	6.33
	THRAUPIDAE - Tanagers		
Red-crested Cardinal	*Paroaria coronata*	A	4.00
	CARDINALIDAE - Cardinals Saltators & Allies		
Northern Cardinal	*Cardinalis cardinalis*	A	3.67
	ICTERIDAE - Blackbirds		
Western Meadowlark	*Sturnella neglecta*	A	3.33
	FRINGILLIDAE - Fringilline and Carduleline Finches & Allies		
	Carduelinae - Carduline Finches		
House Finch	*Haemorhous mexicanus*	A	4.67
	ESTRILDIDAE - Estrildid Finches		
	Estrildinae - Estrildine Finches		
Common Waxbill	*Estrilda astrild*	A	1.00
Nutmeg Mannikin	*Lonchura punctulata*	A	2.33

Key to Table 3

ST	Status
EE	Endangered Endemic – A native and unique to Hawai'i, which is also listed as an endangered species
A	Alien – Introduced to the Hawaiian Islands by humans
RA	Relative Abundance – Number of birds detected divided by the number of count stations (3)

Avian diversity and densities were in keeping with habitats present on the site and the general location of the Project. Four species—Red Junglefowl (*Gallus gallus*), Zebra Dove (*Geopilia striata*), Common Myna (*Acridotheres tristis*), and Cattle Egret (*Bubulcus ibis*)—accounted for slightly less than 48.5% of all birds recorded during station counts. The most frequently recorded species was Red Junglefowl, which accounted for slightly more than 22% of the total number of individual birds recorded during station counts. The site was exceptionally "birdy"; we recorded an average of 76 birds per station count, a number which is high for the east side of the Island of Kaua'i.

Time-Dependant Waterbird Count

The result from a single 30-minute time-dependant waterbird count made at a location overlooking the ponded water in the existing reservoir basin was two Common Gallinule and one Hawaiian Coot.

Mammalian Survey

Two terrestrial mammalian species were detected during the course of this survey. Pig (*Sus scrofa*) tracks, scat, and limited sign were encountered in several locations within the survey area. Additionally, the entrails of a pig were encountered close to Kainahola Road within the project area. Dogs (*Canis familiaris*) were heard barking from locations outside of the survey area, and tracks and scat of this species were encountered within the area.

Assessment

Water Quality

In the project vicinity, Waikaʻea Stream is classified as Class 2 "flowing waters" in the Hawaiʻi water quality standards (HDOH 2013a). Beneficial uses of Class 2 waters are designated as follows:

> "The objective of class 2 waters is to protect their use for recreational purposes, the support and propagation of aquatic life, agricultural and industrial water supplies, shipping and navigation. The uses to be protected in this class of waters are all uses compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation on and in these waters. These waters shall not act as receiving waters for any discharge which has not received the best degree of treatment or control compatible with the criteria established for this class. No new treated sewage discharges shall be permitted within estuaries".

Specific water quality criteria have been promulgated that, if met, are designed to allow the water bodies to achieve the designated beneficial uses. Criteria for streams are presented in Table 6.

Kapaʻa Stream (Geocode ID No. 2-2-004) is identified as an impaired water body (HDOH, 2013b). The Hawaiʻi Department of Health (HDOH) listing indicates that Kapaʻa Stream does not meet Hawaiʻi water quality standards for turbidity in the dry season and may not meet the standards for *Enterococci*. Kapaʻa

Stream is listed as: a "Category 2" water body, meaning data show previously-listed parameters are attained (e.g., total nitrogen, nitrate+nitrite, total phosphorus, and total suspended solids); a "Category 3" water body, meaning not enough data are available to evaluate; and a "Category 5" water body, meaning that data show at least one use is not attained and a total maximum daily load (TMDL) is needed. Waikaʻea Stream is not identified on the HDOH impaired water body list.

Table 6. State of Hawaiʻi water quality criteria for streams for wet (Nov. 1-Apr. 30) and dry (May 1-Oct. 31) seasons from HAR §11-54-5.2(b) (HDOH, 2013a).

Parameter	Total Nitrogen (µg N/l)	Nitrate + Nitrite (µg N/l)	Total Phosphorus (µg P/l)	Total Suspended Solids (mg/l)	Turbidity (NTU)
Geometric mean not to exceed given value					
(wet season)	250.0	70.0	50.0	20.0	5.0
(dry season)	180.0	30.0	30.0	10.0	2.0
Not to exceed more than 10% of the time					
(wet season)	520.0	180.0	100.0	50.0	15.0
(dry season)	380.0	90.0	60.0	30.0	5.5
Not to exceed more than 2% of the time					
(wet season)	800.0	300.0	150.0	80.0	25.0
(dry season)	600.0	170.0	80.0	55.0	10.0

- pH – shall not deviate more than 0.5 units from ambient and not be lower than 5.5 nor higher than 8.0.
- Dissolved oxygen – not less than 80% saturation.
- Temperature – shall not vary more than 1 °C from ambient.
- Conductivity – not more than 300 micromhos/cm.

Water quality samples collected in the Project area on January 29, 2014 were of water passing through the basin of Upper Kapahi Reservoir and coming from either or both local springs or water diverted into the irrigation system (see Fig. 3) and demonstrated generally good water quality. Temperature and pH values were fairly typical for gaining reaches of streams at this elevation. The slightly lower temperature of water at Sta. 2, in a pool exposed to sunlight and at the lower end of the Upper Kapahi Reservoir basin, suggested spring water may be contributing to the flow at this location. Percent saturation of dissolved oxygen was low, particularly in the sluggish waters of the *hau* forest at Stas. 1 and 3,

and would not meet the water quality criterion at any of the three stations. Conductivity was low—indicating the primary source of flow was perhaps groundwater—and met the criterion at all three stations.

Criteria for turbidity, TSS, and nutrients are for comparison with geometric means and values not to exceed 10% and 2% of the time. Thus the data we collected for these parameters on January 29 cannot be compared to the standards. The high turbidity levels, particularly in the *hau* forest, may be the result of biological floc rather than suspended sediments, as the TSS levels were low. Nutrients provide information on biological productivity in the stream and contributions from land runoff or groundwater seepage. Uptake of nitrates by vegetation in the overgrown channel within the reservoir may be responsible for the relatively low nitrogen found at Sta. 2.

Aquatic Resources

No aquatic species protected by State of Hawai'i Administrative Rules (DLNR, 1998, 2007) nor federally endangered or threatened species (USFWS, 2008, 2011) were observed within the Project area. Native stream macrofauna are diadromous: eggs are laid in the stream and the larvae that hatch from these eggs move down stream and out into the ocean where they develop for a time before migrating back into fresh water to grow to maturity (Ford and Kinzie, 1982; Kinzie, 1988). The significance of water flowing in this system to the distribution of native stream macrofauna within the providing natural streams is unknown. Presumably, if a connection downstream to either the ocean or other perennial stream is lacking, blocking the entire stream bed during construction at Kapahi Reservoir would not have any adverse impact on migrations by native aquatic macrofauna as a preferred alternate route would still exist.

Avian Resources

Although not detected during this survey, Hawaiian Petrel (*Pterodroma sandwichensis*) and the Hawaiian sub-species of Newell's Shearwater (*Puffinus auricularis newelli*) have been recorded over-flying the general project vicinity between late April and the middle of December each year (David, 1995, 2011; Morgan et al., 2003, 2004; David and Planning Solutions, 2008). Additionally, the Save Our Shearwaters Program has recovered both species from the general area on an annual basis over the past three decades (Morgan et al., 2003, 2004; David and Planning Solutions, 2008; Save our Shearwater Program, 2011). The '*uluhe* (*Dicranopteris linearis*) fern-covered slopes of Kaiwa Ridge (Figure 6, above) is typical of the nesting habitat used by both species, though it is currently unknown if there are any colonies in close to the project area.

The petrel is listed as endangered, and the shearwater as threatened, under both federal and State of Hawai'i endangered species statutes. The primary cause of mortality in both Hawaiian Petrels and Newell's Shearwaters is thought to be predation by alien mammalian species at the nesting colonies (USFWS 1983; Simons and Hodges, 1998; Ainley et al., 2001). Collision with man-made structures is regarded as a second most significant cause of mortality of these seabird species in Hawai'i. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. Disoriented seabirds may collide with manmade structures and, if not killed outright, become easy targets of predatory mammals (Hadley, 1961; Telfer, 1979; Sincock, 1981; Reed et al., 1985; Telfer et al., 1987; Cooper and Day, 1998; Podolsky et al., 1998; Ainley et al., 2001; Hue et al., 2001; Day et al 2003). No suitable nesting habitat for either of these seabird species exists in the Project area.

The principal potential impact that the Project poses to Newell's Shearwater and Hawaiian Petrel is a threat that birds will be downed after becoming disoriented by exterior lighting if used in conjunction with night construction activities, servicing of construction equipment at night, or streetlights erected for public safety reasons.

The principal potential impact that development activity poses to endangered waterbirds, such as the Hawaiian Coot and Common Gallinule, is during clearing and grubbing phases of construction. Both Hawaiian Coot and Common Gallinule are sensitive to disturbance when nesting. Construction activity can destroy nests, and/or can cause birds to abandon active nests, or leave very young chicks un-defended.

Mammalian Resources

No mammalian species currently protected or proposed for protection under either the federal or State of Hawai'i endangered species programs were detected during the course of this survey (DLNR, 1998; USFWS; 2005a, 2012).
The findings of the mammalian survey are in keeping with the habitats present and the general nature of the project site. It is likely that several of the four Muridae species: European house mouse (*Mus musculus domesticus*), roof rat (*Rattus r. rattus*), Norway rat (*Rattus norvegicus*), and Polynesian rat (*Rattus exulans hawaiiensis*)—all known to be established on the Island of Kaua'i—occur in the vicinity of the Project on a regularly basis.

The endangered Hawaiian hoary bat was not detected during the course of this survey. It is, however, probable that this species uses resources within the general project area on a seasonal basis, as the species is all but ubiquitous in

the lowlands of Kaua'i. The impact that the project potentially poses to bats is during the clearing and grubbing phases of construction as vegetation is removed. The removal of vegetation within the project site may temporarily displace bats using the vegetation for roosting. As bats use multiple roosts within their home territories, this disturbance from the removal of vegetation is likely to be minimal. However, during the pupping season, female bats carrying pups may be less able to rapidly vacate a roost site when the vegetation is cleared. Additionally, adult female bats sometimes leave their pups in the roost tree while they forage and very small pups may be unable to flee a tree that is being felled. Potential adverse impacts from such disturbance can be avoided or minimized by not clearing woody vegetation taller than 4.6 m (15 ft) between June 1 and September 15, the period when female bats are likely to be tending pups.

Conclusions

The proposed action will not result in modification of any federally designated Critical Habitat, as there is none present on or adjacent to the location proposed for project work. However, the Hawaiian Coot and Common Gallinule (latter seen just off property) constitute the only listed species observed at the Project site.

To avoid adverse impacts to bats that may be present in the project area, woody vegetation taller than 4.6 meters (15 ft) should not be cleared between June 15 and September 15, the period in which roosting bats are potentially at risk from vegetation clearing.

The small pond at the southeast end of the reservoir basin may be ephemeral, drying up in the dry season. This pond serves as rather marginal habitat for waterbirds and neither Coot nor Gallinule are likely to attempt to nest here. However, in the event that the pond remains after the rains cease and irrigation water presently reaching the basin is cut-off, we recommend having a qualified biologist conduct a nesting waterbird survey prior to the onset of construction to ensure that construction activities do not disturb nesting endangered waterbird species. If a nest is discovered, work cannot proceed in that particular area until all juvenile birds are fledged.

To reduce the potential for adverse interactions between nocturnally flying seabirds and structures, it is recommended that any external lighting associated with the project be properly shielded; If large flood/work lights are used during construction, they should be placed on poles that are high enough to allow the lights to be pointed directly at the ground (Reed et al., 1985; Telfer et al., 1987).

A Best Management Practices (BMP) plan should be designed and implemented to minimize any environmental impacts to water quality and aquatic biota in the vicinity of the Project site(s) during construction. In particular, construction of the new spillway adjacent to Waikaʻea Stream will require considerations of the Ordinary High Water Mark in relation to the outlet location and design, and attention to control of materials (prevention of movement of soils and other materials into the stream) during construction.

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